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REMEDIAL INVESTIGATION/RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORK PLAN FOR SITE 12 JERICHO ISLAND DISPOSAL AREA REVISION 1 MCRD PARRIS ISLAND SC

7/7/1998

BROWN AND ROOT ENVIRONMENTAL

Rev. 1
07/07/98

RI/RFI Work Plan
for
Site 12/SWMU 10 - Jericho Island Disposal Area

Marine Corps Recruit Depot
Parris Island, South Carolina
U.S. EPA Identification Number
SC6 170 022 762

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0053

July 1998

Foster Plaza VII
661 Andersen Drive
Pittsburgh, PA 15220-2745

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Brown & Root Environmental

C-49-07-8-011

July 7, 1998

Project Number 7803

Commanding Officer
Department of Navy
SOUTHNAVFACENGCOM
ATTN: Art Sanford (Code 1862)
2155 Eagle Drive
North Charleston, South Carolina 29406

Reference: CLEAN III Contract Number N62467-94-D-0888
Contract Task Order Number 0053

Subject: Marine Corps Recruit Depot; Parris Island, South Carolina
Site 12/SWMU 10 - Jericho Island Disposal Area
Final Work Plan

Dear Mr. Sanford:

Please find enclosed two copies of revised pages for the subject document. The revised sheets are dated July 7, 1998 and are referred to as Revision 1. These pages are being submitted to replace sheets from the draft Work Plan - Revision 0, dated 04/24/98.

The revised sheets incorporate comments from National Oceanic and Atmospheric Administration and a comment response letter is attached. Please note that as indicated in the attached comment response letter, the overall approach for work at the Jericho Island Site is expected to follow the presumptive remedy of containment for impacted soils at the site. However, as part of this remedy, other actions can be considered for impacted sediments (if present) such as consolidation on the island, if these actions make environmental and economical sense.

For ease in updating the report, use the following instructions for inserting the enclosed revision sheets.

REMOVE (DRAFT)	INSERT (FINAL - REVISION 1)
Cover and Spine	Cover and Spine
Signature Page	Signature Page
----	RTC - Pages RTC-1 to 2
Chapter 2 - Pages 2-3 to 2-8	Chapter 2 - Pages 2-3 to 2-8
Chapter 3 - Pages 3-1 to 3-2	Chapter 3 - Pages 3-1 to 3-2
Chapter 5 - Page 5-3	Chapter 5 - Page 5-3
Chapter 9 - Pages 9-1 to 9-2	Chapter 9 - Pages 9-1 to 9-2

At your request, copies of the enclosed report are being distributed to the Parris Island Tier I Partnering Team.

C-49-07-8-011

Please call me at (412) 921-8375 if you have any questions regarding the enclosed report.

Sincerely,

David D. Brayack, P.E.
Task Order Manager

Enclosure

K. Atchley, Bechtel (1 copy)
J. Brown, TtNUS (1 copy)
T. Dillon, NOAA (1 copy)
D. Duncan, US F&W (1 copy)
D. Evan-Ripley, SOUTHDIV (w/o enclosure)
D. Hargrove SCDHEC (1 copy)
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P. Wendt, SCDNR (1 copy)
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G. Wagner, TtNUS (1 copy)
File 7803 (1 copy)

Response to Comments
NOAA's and SCDNR Comments on Parris Island Jericho Island WP

1. Section 2.3.2 Relative Risk Evaluation

Comment: First reading suggested two separate sampling/analysis events. To clarify, combine/condense the two paragraphs in this section. When referring to "screening levels", specify they are for human health only. Comparison to ecological screening values was not done but should have been. Report sample locations. Suggest these be added to figure 2-1.

Response: Agreed. The two paragraphs will be modified and combined to indicate that only one sample event occurred. The sample locations will be added to Figure 2-1.

Two of the referenced columns in Table 2-1 (USEPA Region IV Sediment Screening Values and USEPA Region III Soil Screening Values) are specific to ecological risks. Only the Risk Based Concentration Soil - Ingestion - Residential values are specific to human health.

Please note that a typographic error was noted with this table. Under the column for USEPA Region III Soil Screening Values, the criteria for arsenic, beryllium, and iron will be reduced by a factor of 1000 (ppb to mg/kg).

2. Hexavalent Chromium

Comment: Describe analytical method in Section 4.2.2.4

Response: The analytical method for hexavalent chromium is provided in Table 10-2.

Comment: In Table 7-1, explain how and why limited number of samples will be analyzed for hexavalent chromium.

Response: Hexavalent chromium represents the most toxic form of chromium. However, it is also the least stable and therefore is rarely detected in the environment. The purpose of the hexavalent chromium analysis is to determine what fraction (if any) of total chromium detected is of the hexavalent state.

Since hexavalent chromium testing is difficult, not always accurate, and complicates field efforts because of its short holding time (24 hours), the testing is only being conducted on a limited number of samples.

3. Section 5.2 Ecological Risk

Comments: Next to last paragraph:

insert "toxicity" between "conservative" and "thresholds for".
insert "no observable" between "for" and "adverse ecological".
insert "chemical" between "maximum" and "ingestion rates".
insert "toxicity" between "the" and "threshold values".

Last paragraph, insert "for review by the Parris Island Partnering Team" between "as possible" and "in case".

Response: The changes will be made as requested.

4. Page 3-1

Comment: Delete "detailed" from last sentence of first paragraph.

Response: Agreed.

Brown & Root Environmental

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C-49-04-8-144

April 27, 1998

Project Number 7803

Commanding Officer
Department of the Navy
SOUTHNAVFACENGCOM
ATTN: Art Sanford (Code 1862)
2155 Eagle Drive
North Charleston, South Carolina 29406

Reference: Clean III Contract No. N62467-94-D-0888
Contract Task Order No. 0053

Subject: Marine Corps Recruit Depot; Parris Island, South Carolina
Draft Remedial Investigation/RCRA Facility Investigation Work Plan
Site 12/SWMU 10

Dear Mr. Sanford:

Please find enclosed one (1) copy of the Draft Remedial Investigation/RCRA Facility Investigation Work Plan for Site 12/SWMU 10.

If you have any questions or concerns regarding the enclosed materials, please contact myself at (412) 921-8916 or Jason Brown at (412) 921-8401.

Very truly yours,

Mark P. Speranza

Mark P. Speranza, P.E.
Task Order Manager

Enclosure

c: D. Evans-Ripley, SOUTHDIV (w/o enclosure)
T. Harrington, MCRD Parris Island (1 copy)
K. Lapierre, U.S. EPA (2 copies)
D. Hargrove, SCDHEC (1 copy)
S. Peterson, SCDHEC (1 copy)
P. Wendt, SCDNR (1 copy)
T. Dillon, NOAA (1 copy)
D. Duncan, U.S. Fish & Wildlife (1 copy)
K. Atchley, Bechtel Environmnetal, Inc., (1 copy)
D. Wroblewski, B&R Environmental (w/o enclosure)
M. Perry, B&R Environmental (1 copy)
J. Brown, B&R Environmental (1 copy)
B. Rushe, B&R Environmental (1 copy)
File 7803

Rev. 1
07/07/98

RI/RFI WORK PLAN
FOR
SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA

MARINE CORPS RECRUIT DEPOT
PARRIS ISLAND, SOUTH CAROLINA
U.S. EPA IDENTIFICATION NUMBER
SC6 170 022 762

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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

Submitted by:
Brown & Root Environmental
661 Anderson Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0053

JULY 1998

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ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
AVS/SEM	Acid Volatile Sulfide/Simultaneous Extracted Metals
B&R Environmental	Brown & Root Environmental
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLPs	Contract Laboratory Procedures
COCs	Chemicals of Concern
CTO	Contract Task Order
DGPS	Differential Global Positioning System
DQO	Data Quality Objective
EISOPQAM	Environmental Investigations Standard Operating Procedures Quality Assurance Manual
FID	Flameionization Detector
FOL	Field Operations Leader
FSP	Field Sampling Plan
GPS	Global Positioning System
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
IAS	Initial Assessment Study
I.D.	Inside Diameter
IDW	Investigative-Derived Waste
IR	Installation Restoration
K_h	Horizontal Hydraulic Conductivity
K_v	Vertical Hydraulic Conductivity
LQAP	Laboratory Quality Assurance Plan
MCLs	Maximum Contaminant Levels
MCRD	Marine Corps Recruit Depot
MSL	Mean Sea Level
NAVFAC	Naval Facilities Engineering Command
NCP	National Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NFA	No Further Action
NGS	National Geodetic Survey

NPL	National Priorities List
NSF	National Sanitation Foundation
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photoionization Detector
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manager
QAP	Quality Assurance Plan
RBCs	Risked-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
SCDHEC	South Carolina Department of Health and Environmental Control
SOPs	Standard Operating Procedures
SOUTHDIV	Southern Division
SSO	Site Safety Officer
SVOCs	Semivolatile Organic Compounds
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
TOC	Total Organic Carbon
TOM	Task Order Manager
U.S.	United States
U.S. EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

FOREWORD

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act of 1986 (SARA) establishes a program for the cleanup of hazardous waste disposal and spill sites nationwide. This program contains provisions for the cleanup of contamination from past hazardous waste operations and past hazardous material spills and is the framework for installation restoration (IR) programs at numerous Navy and Marine Corps installations. The Resource Conservation and Recovery Act (RCRA), as amended, also establishes a cleanup program that provides for current and future hazardous waste management practices, as well as cleanup of past disposal sites at permitted or interim status Navy/Marine Corps installations.

Because of the past hazardous waste activities conducted at the Marine Corps Recruit Depot (MCRD) Parris Island, South Carolina, the MCRD meets criteria for conducting IR activities under the CERCLA regulatory framework. To date, the MCRD has completed steps equivalent to the Preliminary Assessment/Site Inspection phases of the CERCLA remedial action process. The MCRD also meets the criteria for conducting IR activities under RCRA because in the late 1980's, the MCRD applied for a RCRA permit. Under RCRA, this action required the MCRD to conduct corrective action for the release of hazardous waste or hazardous constituents from solid waste management units. An interim R[illegible] Facility Assessment was conducted in 1990 as part of this requirement. Since this time, the MCRD has withdrawn its application for a RCRA permit.

Because of the circumstances surrounding the MCRD's IR program history, discussions have been held between representatives from the United States (U.S.) Marine Corps, U.S. Navy, South Carolina Department of Health and Environmental Control, and the U.S. Environmental Protection Agency, Region 4 to determine the appropriate regulatory framework for conducting IR activities at the MCRD. From these discussions, it has been decided that this site-specific work plan will encompass both CERCLA and RCRA requirements and will be dually titled as such. The success/lessons learned of this approach will used for subsequent IR activities as well as used to negotiate a Federal Facility Agreement for the MCRD.

1.0 INTRODUCTION

This Work Plan for Site 12/Solid Waste Management Unit (SWMU) 10 - Jericho Island Disposal Area, MCRD Parris Island, South Carolina, has been prepared by Brown & Root Environmental, B&R Environmental) for the Southern Division (SOUTHDIV) Naval Facilities Engineering Command (NAVFAC) under the Navy Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0053. This Work Plan outlines the requirements and describes the procedures for performing a field investigation at Site 12/SWMU 10 that meets the requirements of both a CERCLA Remedial Investigation (RI) and a RCRA Facility Investigation (RFI). It is intended to be used in conjunction with the Master Work Plan, Volumes I, II, and III for the MCRD Parris Island (B&R Environmental, 1998).

MCRD Parris Island is located along the southern coast of South Carolina approximately 1 mile south of the city of Port Royal and 3 miles south of the city of Beaufort within Beaufort County. MCRD Parris Island covers approximately 8,047 acres, consisting of dry land, salt marshes, saltwater creeks, and ponds, as shown in Figure 1-1. MCRD Parris Island is the reception and recruit training facility for the Marine Corps for enlisted men from states east of the Mississippi River and enlisted women nationwide.

1.1 SCOPE AND OBJECTIVE

The preamble of the National Contingency Plan (NCP) (U.S. EPA, 1991) identifies a municipal landfill as a site where the treatment of wastes may be impracticable because of the size and heterogeneity of the landfill's contents (i.e., municipal waste co-disposed with industrial/hazardous waste). Because treatment usually is impractical, the United States Environmental Protection Agency (U.S. EPA) generally considers containment to be the appropriate response action, or the "presumptive remedy" for the source areas of municipal landfill sites (U.S. EPA, 1993). Therefore, an investigation approach is proposed that will correspond with the approach outlined in U.S. EPA's *Presumptive Remedy for CERCLA Municipal Landfill Sites* (U.S. EPA, 1993) and *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills (Interim Guidance)* (U.S. EPA, 1996a).

The objectives of this investigation are to characterize the extent of contamination in areas where the potential for offsite migration of contamination exists from past waste disposal at Site 12/SWMU 10. Media that will be investigated include surface water, sediment, surface soil and groundwater.

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P:\GIS\PARRIS\JERICHO.APR 4/24/98 SMT DEPOT LOCATION MAP

SOURCE: USGS 7.5 MINUTE PARRIS ISLAND QUADRANGLE, 1956. PHOTOREVISED 1979.

DEPOT LOCATION MAP
MCRD, PARRIS ISLAND, SOUTH CAROLINA

3000 0 3000 6000 Feet

FIGURE 1-1

Brown & Root Environmental

Data collected from this investigation will be used to assess the human health and ecological risks associated with potential migration and potential direct contact with contaminants. Human health risks to adolescent trespassers, adult and adolescent recreational users, and future residents, as well as ecological risks to the site's native flora and fauna, will be assessed. Also, sampling is proposed to determine whether media contain contaminants at concentrations above applicable or relevant and appropriate requirements (ARARs). Based on this information, decisions for remedial action will be evaluated and determined. If the results of field activities indicate that offsite areas have been impacted by contaminant migration and chemical concentrations in these areas exceed regulatory standards or pose unacceptable human and ecological risks, characterization of the extent of contamination within the disposal area may be considered if it is determined that the presumptive remedy is not appropriate.

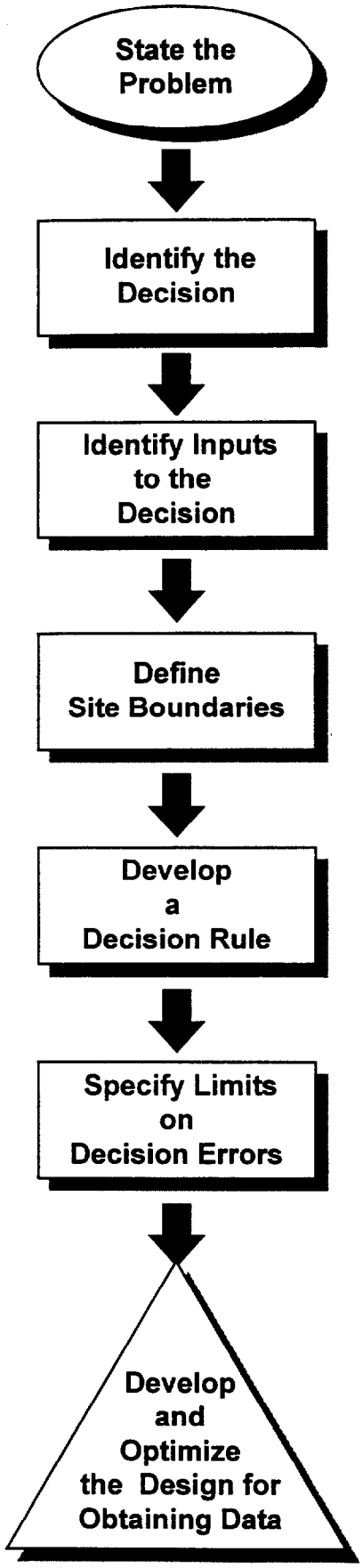
1.2 DATA QUALITY OBJECTIVES

This Work Plan has been developed using the Data Quality Objective (DQO) Process. The DQO Process is a focused, iterative process for developing data collection design to support decision-making. The goal of the process is to conduct investigations in an efficient and effective manner without unnecessary precision or redundancy of data. The process consists of seven steps, ordered in a downward decision flow. A flow diagram with descriptions of each step is provided in Figure 1-2. The DQO Process is further explained in Volume I, Section 1.2.2, of the Master Work Plan (B&R Environmental, 1998).

1.3 PLANNING DOCUMENT ORGANIZATION

This Work Plan is intended to be used in conjunction with the Master Work Plan for MCRD Parris Island (Volumes I through III) and references the Master Work Plan where appropriate. This Work Plan includes the site-specific information to be used for sampling at Site 12/SWMU 10, while the Master Field Sampling Plan (FSP) and the Master Quality Assurance Plan (QAP) provide general information that is applicable to all sites on MCRD Parris Island. Sections 1.0 through 4.0 of this site-specific Work Plan identify the project scope and objectives, summarize background information and existing data, and present the conceptual model and proposed sampling. Section 5.0 discusses the proposed methodology for human health and ecological risk assessments that will be conducted. Sections 6.0 and 7.0 present the site-specific FSP and Sections 8.0 through 10.0 describe the Quality Assurance and Quality Control (QA/QC) measures for ensuring that usable data is obtained.

FIGURE 1-2
DATA QUALITY OBJECTIVES PROCESS



- Review of historical & background information (Section 2.0)
- Statement of problem for data collection (Section 2.4)
- Preliminary assessment of existing data (Section 3.0)

- Statement of the action-based decision to resolve problem (Section 4.0)

- Identification of measurable variables and action levels to support decisions (Section 5.0)

- Definition of sampling population, and spatial and temporal boundaries and limitations (Section 4.0)

- Single statement synthesizing previous steps and summarizing how data will be used to make a decision (Master Work Plan, Volume III)
- An "if...then" statement defining values for deciding between alternative actions (Master Work Plan, Volume III)

- Definition of acceptable limits of decision error and potential consequences of incorrect decisions (Decision Document; Master Work Plan, Volume III)

- Development of alternative sampling designs and selection of most effective design for sampling and analysis (Section 4.2)

2.0 SITE BACKGROUND

This section presents a brief history of Site 12/SWMU 10 - Jericho Island Disposal Area. It describes the existing site conditions and summarizes the results of previous investigations. Figure 2-1 illustrates the location of Site 12/SWMU 10 at the MCRD Parris Island facility where investigation activities are scheduled to take place.

2.1 SITE DESCRIPTION AND HISTORY

MCRD Parris Island is located approximately three miles south of the city of Beaufort, South Carolina. MCRD Parris Island was placed on the U.S. EPA's CERCLA NPL in January of 1995, primarily due to the presence of unlined landfills placed in direct contact with surrounding wetlands.

Site 12/SWMU 10 covers an area approximately 100 feet by 250 feet along the central part of the southern edge of Jericho Island in the northwest section of the Depot. The site extends from the island's edge southward onto the marsh. The island was acquired by the Depot to enable the facility to comply with the limited distance arc required for weapons ranges.

Reportedly, wastes were brought to the island by local residents prior to the Depot's acquisition of the island. The Depot has not used this site as a disposal area. No organized landfill operations occurred by the local residents. Disposal of waste at this site occurred from about 1955 to 1968. The disposal area received routine domestic refuse that included the following: small metal cans, beer and soda bottles, hubcaps, tires, buckets, cinder blocks, rusted metal five-gallon cans, sheet metal, paper, plastic, and wood. Analytical results from prior investigations, such as the Initial Assessment Study and Relative Risk Evaluation, identified various metals, phthalates, pesticides, polynuclear aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). The results from the analysis detected inorganics, SVOCs, and PCBs/pesticides in the sediment and inorganics, SVOCs, VOCs, and PCBs/pesticides in the surface soil. The area has an irregular, undulating surface due to the random scattering of waste piles, ranging up to approximately 30 feet in diameter and 5 feet in height (Kearney, 1990).

2.2 SITE HYDROGEOLOGY

A summary of the site hydrogeology for Site 12/SWMU 10 is provided in this section. The site hydrogeology has been based on investigations at other sites within MCRD Parris Island.

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SOURCE: USGS 7.5 MINUTE PARRIS ISLAND QUADRANGLE, 1956. PHOTOREVISED 1979.

DRAWN BY DLT DATE 7/2/98	Brown & Root Environmental	CONTRACT NO. 7803	OWNER NO. 0053
CHECKED BY DATE	SITE LOCATION MAP MCRD, PARRIS ISLAND, SOUTH CAROLINA	APPROVED BY DATE	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 2-1	REV. 0

2.2.1 Surficial Aquifer

The surficial, or water table aquifer at Site 12/SWMU 10 is unconsolidated and restricted to the shallow, Pleistocene- to Holocene-age, fine-grained, sedimentary deposits of the Pamplico and Waccamaw Formations (Hughes et al., 1989). Based upon previous investigations at MCRD Parris Island, the upper 20 feet of sediment consists of very fine, yellow-brown sand with traces of clay and silt with thin (approximately 6 inches thick), discontinuous layers of greenish-gray silty clay. The surficial aquifer is estimated to be 30 feet thick in the area. An estimated transmissivity of 1,300 ft^2/day with a storage coefficient of 0.20 has been reported for sands within the shallow deposits (Hassen, 1985). Water table depths range from 0 to 10 feet, and seasonal changes can be as great as 6.5 feet (NEESA, 1986).

2.2.2 Confining Layer

The surficial aquifer is underlain by the unconsolidated, Miocene-age, Hawthorn Formation (Hughes et al., 1989). The Hawthorn Formation is a geological formation that hydraulically separates the unconfined surficial aquifer from the underlying, artesian Floridan Aquifer. The elevation at the top of the Hawthorn Formation is reported to be within the range of 30 to 60 feet below mean sea level (msl) at Parris Island. The thickness of the Hawthorn Formation at Site 12/SWMU 10 is anticipated to be between 20 to 40 feet (NEESA, 1986). The actual depth of this formation at Site 12/SWMU 10 will be determined during the field investigation. Hughes, et al. (1989) calculated the leakage through the Hawthorn Formation to be 0.0002 ft^3/day for every foot of head difference (using an average formation thickness of 30 feet and vertical hydraulic conductivity of 0.006 ft/day).

2.2.3 Floridan Aquifer

The principal source of groundwater used for consumption in the Beaufort County, South Carolina area is the Floridan Aquifer (Smith, 1987). This artesian aquifer system is contained within the Santee Limestone Formation, has a total depth of approximately 1,000 feet, and is divided into the Upper Unit and the Lower Unit (NEESA, 1986).

The only public supply well identified within a 1/4-mile radius of the MCRD is located approximately 600 feet northwest of the MCX Service Station and is illustrated on Figure 1-1. The MCX Service Station is located in the north central portion of the MCRD. The well was once used as a hot water source (Sirrine Environmental Consultants, Inc., 1991). It is currently not in use but has not been abandoned.

2.3 PREVIOUS INVESTIGATIONS

2.3.1 Initial Assessment Study

In 1986, the Naval Energy and Environmental Support Activity (NEESA) conducted an Initial Assessment Study (IAS) (NEESA, 1986) to identify potentially contaminated sites at MCRD Parris Island that may pose a threat to human health or the environment. NEESA reviewed historical records and conducted a site survey. The IAS identified Site 12/SWMU 10 - Jericho Island Disposal Area as a site that contains non-hazardous waste. NEESA concluded that there is no potential threat for contaminant migration from the site and that Site 12/SWMU 10 poses no threat to human health or the environment. Therefore, NEESA did not recommend a confirmation study for Site 12/SWMU 10.

2.3.2 Relative Risk Evaluation

B&R Environmental conducted sampling and analysis of surface soils and sediments at MCRD Parris Island to provide the Navy with sufficient information in order to generate a contaminant hazard score and a resulting relative risk ranking. One soil and two sediment samples were collected at Site 12/SWMU 10 and were analyzed for Target Analyte List (TAL) metals and cyanide, Target Compound List (TCL) PCBs/pesticides, TCL volatile organic compounds (VOCs), and TCL semivolatile organic compounds (SVOCs). All analytical methods followed Contract Laboratory Procedures (CLPs). The results from the analysis showed detections of inorganics, SVOCs, and PCBs/pesticides in the sediment directly south of Jericho Island and inorganics, SVOCs, VOCs, and PCBs/pesticides in the surface soil directly south of Jericho Island.

Refer to Table 2-1 for a summary of contaminants above one or more of the screening levels for Risk-Based Concentrations (RBCs), U.S. EPA Region IV Sediment Screening Values, and U.S. EPA Region III Soil Screening Values.

2.3.3 Geophysical Survey

A high resolution vertical magnetic gradient survey and global positioning system (GPS) survey was performed at the Jericho Island Site by B&R Environmental in May 1998. The purpose of the vertical magnetic gradient survey was to delineate the lateral extent of waste disposal activities that were suspected to have been historically performed at this site. The purpose of the GPS survey was to provide

TABLE 2-1

SUMMARY OF CONTAMINANTS ABOVE SCREENING LEVELS
RELATIVE RISK EVALUATION
SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA

	Risk-Based Concentrations Soil-Ingestion - Residential	U.S. EPA Region IV Sediment Screening Values	U.S. EPA Region III Soil Screening Values	PI-012-01(35) Sediment	PI-012-02(36) Sediment	PI-012-03(37) Soil
INORGANICS (mg/kg)						
Arsenic	23	7.24	328	40.6	49.7	
Beryllium	0.15		0.020	0.33	0.47	0.19
Iron	23000		12	122000	307000	
SVOCs (µg/kg)						
Bis(2-ethylhexyl)phthalate	46,000	182		10000	780	150
VOCs (µg/kg)						
Carbon Tetrachloride	4900		< 300			6
PESTICIDES/PCBs (µg/kg)						
4,4'-DDD	2700	1.22	< 100	150	19	
4,4'-DDE	1900	2.07	< 100	520	96	
4,4'-DDT	1900	1.19	< 100	580	38	
Alpha-chlordane	1800				6.2	
Aroclor-1254	1600		100	30000		
Dieldrin	40	0.02	< 100	93	6.2	
Endrin	23,000	0.02	< 100	1200		
Heptachlor epoxide	70		< 100	150		
Heptachlor	140					0.99

station position information for the vertical magnetic gradient data. The GPS was also used to map the perimeter of the island for future planning activities.

It was anticipated that the disposed waste contained metallic objects and debris. For this reason, a vertical magnetic gradient survey was performed at this site to assist in determining the lateral limits of disposal activities. A high resolution Geometrics G-858 cesium vapor magnetometer and gradiometer was used at this site to map the presence of buried metallic debris and objects associated with the historic disposal operation.

The GPS was used to trace out the boundary of the island. This was performed during low tide. The area that was walked marks the boundary between the marsh vegetation and the land vegetation or at the base of the defined topographic difference between the marsh and the island. The GPS indicated that Jericho is at present, approximately 25 acres in area. The vertical magnetic gradient results indicated the presence of four areas that may contain ferrous metals at Jericho Island. The first suspected area of disposal was observed in the northern extreme of the island near the intersection of the access causeway and the island. This area was observed to be hummocky during data collection, suggesting that it had received fill materials.

The second suspected disposal area was observed in the central and eastern portion of the site. A galvanized vertical pipe was observed in this area. The former property owner informed the field crew that a small farm was operated on the island during the period of disposal activities. The anomalous response at this area may represent a disturbed area where a house or barn was located during the 1900's through the late 1920's or may represent a disposal area. Surface metal objects including cans, wire and a washing machine drum were observed at this location.

A steel reinforced concrete foundation was observed at the third suspected disposal area. The former property owner informed the field crew that this foundation was used by the Marine Corps as a foundation for a landing light for a run-way to a near-by air field. A suspected disposal area was observed around this foundation. Metallic debris composed mostly of metal cans and a large volume of broken glass from bottles was observed in this area. The metallic debris extended into the marsh to the south of the island. A causeway connecting Jericho Island to a small island to the south was observed to have been constructed of the same disposed materials. The magnetometer survey was extended onto the northern extent of this other island to help define the extent of the disposal activities. It appears that the northern extent of this other island has also received discarded material. In speaking with the former property owner, he informed the field crew that the entire island that was located to the south of Jericho Island had

disposal activities conducted. A fourth suspected disposal area was observed east of the foundation and surrounding area. This anomaly may also represent a small disposal area.

2.4 STATEMENT OF PROBLEM

Based on the suspected disposal practices, the Initial Assessment Study, and the Relative Risk Evaluation conducted at Site 12/SWMU 10, it has been determined that environmental media have been affected by the site and that further evaluation is required to determine potential risks to human health and ecological receptors.

3.0 PRELIMINARY ASSESSMENT

This section presents a conceptual model and discussion of potential migration and human and ecological exposure pathways of contaminants from Site 12/SWMU 10. Figure 3-1 presents a conceptual model of the site. A discussion of potential receptors, media of concern, and exposure routes is found in Section 5.0.

3.1 SURFACE WATER

It is assumed that surface water from Site 12/SWMU 10 generally flows from the center of the island radially outward towards the edge of the island. Impacts to the surface water may be from direct runoff from the site and may also originate from groundwater beneath the site discharging (e.g., through seeps) to the surrounding marsh.

No surface water samples were collected during the Relative Risk Evaluation (B&R Environmental, 1996). However, inorganics, SVOCs, VOCs, and PCBs/pesticides have been detected in nearby surface soil and/or sediment. Therefore, the surface water surrounding the site may also be adversely impacted and may be a pathway for further contaminant migration. If surface water is found to be adversely impacted, incidental ingestion and dermal contact with contaminants in surface water by human receptors would be possible exposure pathways of concern. Ingestion, direct contact, and bioaccumulation by ecological receptors (aquatic organisms) would also be anticipated exposure pathways.

3.2 SEDIMENT

During the Relative Risk Evaluation (B&R Environmental, 1996), detections of inorganics, SVOCs, and PCBs/pesticides were found in the area directly south of Jericho Island. Sediment contamination may have resulted from contaminants that are directly adsorbed to eroded soils or from contaminants adsorbing to sediment during transportation and deposition. Incidental ingestion and dermal contact with contaminants in sediment by human receptors are possible exposure pathways of concern. Incidental ingestion, direct contact, and bioaccumulation by ecological receptors (organisms living and/or feeding on the water bottom) would also be anticipated exposure pathways.

3.3 GROUNDWATER

No information is available concerning the direction of flow and gradient of the surficial aquifer or the Floridan aquifer below Site 12/SWMU 10. Additionally, no groundwater samples were collected from

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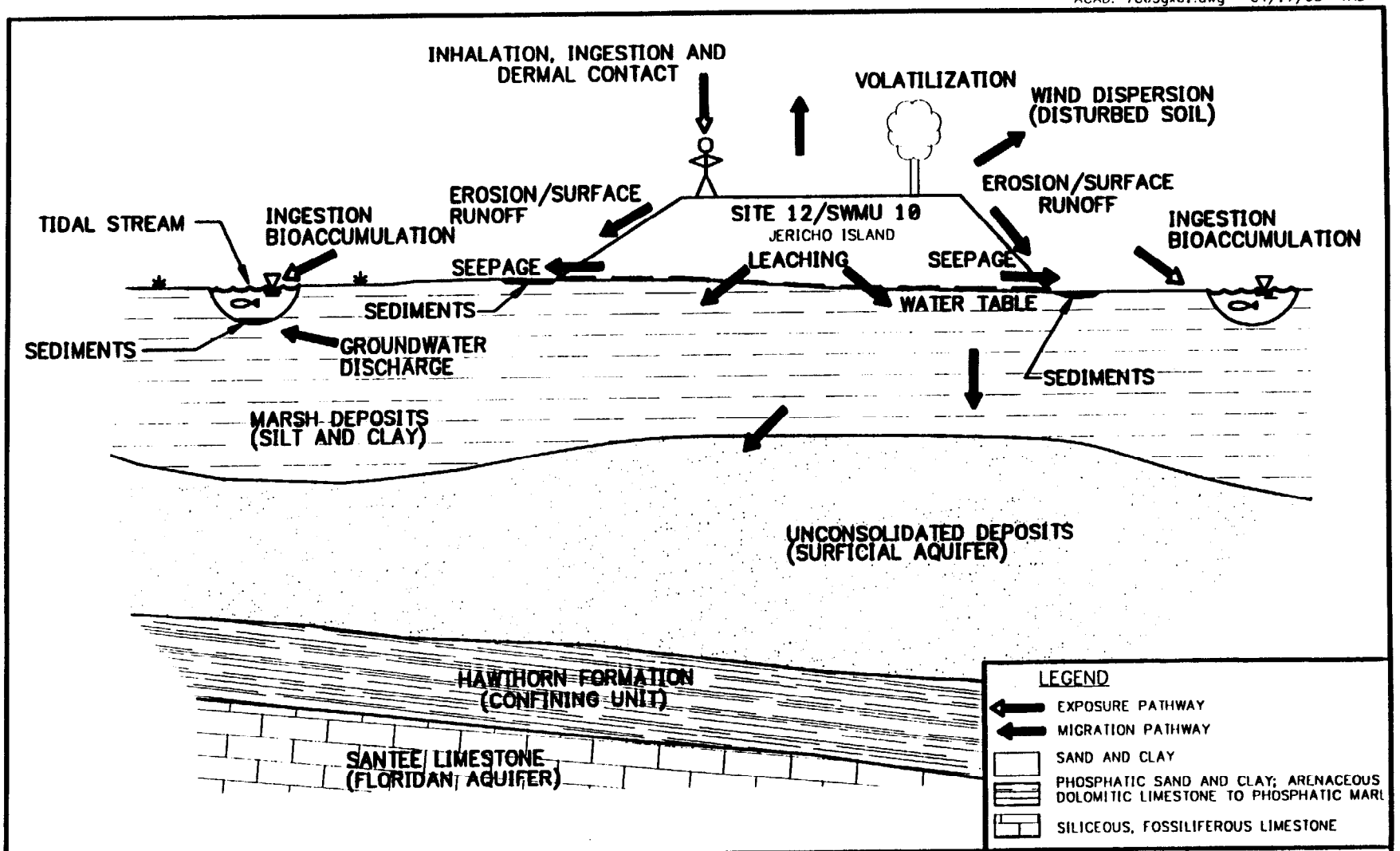


DRAWN BY TAD DATE 4/20/98	SITE CONCEPTUAL MODEL SITE 12/SWMU 10 JERICHO ISLAND DISPOSAL AREA MCRD PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 7803	OWNER NO. ----
CHECKED BY BER DATE 4/20/98		APPROVED BY	DATE
COST/SCHED-AREA		APPROVED BY	DATE
SCALE NOT TO SCALE		DRAWING NO. FIGURE 3-1	REV. 0

FO D NO TENUS_AH.DWG - REV 0 - 1/22/98

either aquifer during the Relative Risk Evaluation (B&R Environmental, 1996). It is suspected that marsh deposits including the clay comprising the Hawthorn Formation may act as a partial barrier to the Floridan Aquifer. The presence of such deposits and the consistency of the Hawthorn Layer will be investigated during the proposed field investigation.

Inorganics, SVOCs, VOCs, and PCBs/pesticides have been detected in nearby soil and/or sediment. Contaminants in soil and sediment have the potential to leach into groundwater through rainfall infiltration. If groundwater is adversely impacted through this transport mechanism, ingestion, dermal contact, and inhalation (via showering) of contaminants in groundwater by human receptors are possible exposure pathways of concern, albeit unlikely exposure pathways. Direct exposure to groundwater is not anticipated for ecological receptors.

3.4 SOIL

During the Relative Risk Evaluation (B&R Environmental, 1996), detections of inorganics, SVOCs, VOCs, and PCBs/pesticides were observed in the southern portion of Jericho Island. The surface soil at Site 12/SWMU 10 may be a contaminant source to surface water and sediment via leaching and surface water runoff. If surface soil is found to be adversely impacted, incidental ingestion and dermal contact with contaminants within the soil by human receptors would be possible exposure pathways of concern. In addition, the surface soil, if disturbed, may serve as a source for airborne transport of contaminants. Contaminants in the soil may also be accumulated by natural or cultural vegetation which could be ingested by wildlife and/or human receptors. Additional exposure pathways involving direct ingestion or contact with contaminated soil by terrestrial receptors may also be of concern.

3.5 AIR

Since vegetative cover reduces the potential for suspension of particulates and subsequent airborne transport, the air pathway is not considered to be significant to human or ecological risk other than the potential for particulate inhalation by human receptors if the soil is disturbed. The potential for suspension of particles and subsequent airborne transport will be evaluated during the risk assessment using the results from surface soil sampling.

4.0 INVESTIGATION SCOPING

The scope of this investigation is consistent with the U.S. EPA guidance entitled Presumptive Remedy for *CERCLA Municipal Landfill Sites* (U.S. EPA, 1993) and *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills (Interim Guidance)* (U.S. EPA, 1996a). In summary, field activities will characterize the extent of contamination in areas where potential for offsite migration of contamination exists. Surface water, sediment, surface soil, and groundwater will be sampled throughout the site during this investigation.

If the results of the sampling activities indicate that offsite contamination migration exceeds regulatory standards or poses unacceptable human and ecological risks, characterization of the extent of contamination within the disposal area may be considered. Additionally, if analytical results indicate the surficial aquifer has been adversely impacted by the site, then further investigation to determine the competency of the confining layer and an evaluation of the lower aquifer may be warranted. If analytical results indicate that both the lower surficial aquifer has been adversely impacted by the disposal area and the Hawthorn Formation does not adequately act as a confining layer, then investigation activities may be warranted to evaluate potential impacts to the underlying Floridan aquifer.

In accordance with U.S. EPA guidance, the Administrative Record will include the necessary generic and site-specific information documenting the selection or non-selection of the containment presumptive remedy (U.S. EPA, 1996a).

4.1 INVESTIGATION RATIONALE

Previous investigations indicated the presence of inorganics, SVOCs, and PCBs/pesticides in sediment and inorganics, SVOCs, VOCs, and PCBs/pesticides in the soil. The investigation proposed for Site 12/SWMU 10 will include the following media. Table 4-1 summarizes the rationale for investigation of specific media at Site 12/SWMU 10.

- Surface Water - Previous investigations did not include surface water sampling. Surface water sampling is proposed to determine whether contaminants are migrating to the surface water at levels above ARARs and risk-based criteria (ecological and human health).

TABLE 4-1

INVESTIGATION RATIONALE
SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 2

Media	Identified/Suspected Contaminants	Preliminary Assessment	Data Gaps/Needs	Resolution Of Data Gaps/Needs
Surface Water	No previous sampling conducted	Surface water may be an exposure pathway of contaminants to human and ecological receptors. Contaminant migration to surface water may originate from soil, sediment, and/or groundwater.	RI/RFI • Nature and extent characterization • Risk assessment • Define background concentrations and ecological parameters FS/CMS • Modeling • Site hydrology	• TCL, TAL (metals and cyanide, total and dissolved) parameters • Water quality parameters • Hexavalent chromium • Water-level measurements • Tidal influence study
Sediment	Inorganics, SVOCs, and PCBs/pesticides	Sediments may be an exposure pathway of contaminants for human and ecological receptors. Contaminant migration to sediment may originate from soil, surface water, and/or groundwater.	RI/RFI • Nature and extent characterization • Risk assessment • Define background concentrations and ecological parameters FS/CMS • Modeling • Volume calculations	• TCL, TAL (metals and cyanide) parameters • Hexavalent chromium • AVS/SEM • TOC • Grain-size analysis • Bulk density • pH • Sediment sampling results

TABLE 4-1

INVESTIGATION RATIONALE
SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 2

Media	Identified/Suspected Contaminants	Preliminary Assessment	Data Gaps/Needs	Resolution Of Data Gaps/Needs
Groundwater	No previous sampling conducted	Groundwater may be a pathway of contaminants from soils to surface water and sediment. Groundwater is a potential pathway of contaminants to human receptors.	RI/RFI • Nature and extent characterization • Risk assessment FS/CMS • Modeling • Site hydrogeology	• TCL, TAL (metals and cyanide, total and dissolved) parameters • Water quality parameters • Appendix IX parameters • Hexavalent chromium • Horizontal hydraulic conductivity • Vertical hydraulic conductivity • Groundwater modeling parameters • Water-level measurements • Tidal influence study
Surface Soil	Inorganics, SVOCs, VOCs and PCBs/pesticides	Soils may be a pathway of contaminants to surface water, groundwater, and sediment as a potential pathway to human and ecological receptors.	RI/RFI • Nature and extent characterization • Risk assessment • Define background concentrations FS/CMS • Geotechnical characterization • Determine presence and extent of cover (fill) material • Stratigraphy • Modeling	• TCL, TAL (metals and cyanide) parameters • Hexavalent chromium • AVS/SEM • Soil classification • Lithology • Groundwater modeling parameters

- Sediment - Previous investigations detected inorganics, SVOCs, and PCBs/pesticides in the area directly south of Jericho Island. Sediment sampling is proposed to determine the extent of contaminants and whether site-related constituents are present in sediments at levels above ARARs and risk-based criteria (ecological and human health).

- Groundwater - Previous investigations did not include groundwater sampling. Sampling of the shallow and deep surficial aquifer is proposed to determine whether site-related compounds are leaching from the suspected disposal areas at concentrations above ARARs and risk-based criteria (ecological and human health). For use in the human health risk assessment, sampling and analysis will be conducted in order to evaluate the use of groundwater as a practical drinking water source according to CERCLA (U.S. EPA, 1991).

- Surface Soil - Previous investigations detected inorganics, SVOCs, VOCs, and PCBs/pesticides in the area directly south of Jericho Island. Surface soil sampling is proposed to determine the extent of contaminants above ARARs and risk-based criteria (ecological and human health), to determine the fill extent, whether the soil is a source of contamination for the other migration pathways, and whether site-related compounds are leaching from the suspected disposal areas at concentrations above ARARs and risk-based criteria (ecological and human health).

- Subsurface Soil - Subsurface soil samples are proposed for groundwater modeling purposes to model contaminant fate and transport.

- Air - Airborne contamination is not anticipated to pose a risk at this site and, therefore, will not be investigated directly. Airborne contamination will be investigated indirectly when evaluating potential surface soil transport in the risk assessment.

4.2 INVESTIGATION SUMMARY

The following sections present the proposed investigation. All data will be collected in accordance with the Master FSP, the Master QAP (B&R Environmental, 1998), and U.S. EPA Region 4 Environmental Investigations Standard Operating Procedures Quality Assurance Manual (EISOPQAM) (U.S. EPA, 1996b).

4.2.1 Sampling Activities

Table 4-2 summarizes the field investigation activities for Site 12/SWMU 10 - Jericho Island Disposal Area.

4.2.2 Analytical Parameter Rationale

This section provides the rationale for the proposed analytical program to be conducted on the samples collected from Site 12/SWMU 10.

4.2.2.1 TCL and TAL Parameters

To determine if contamination exists in the various media (surface water, sediment, groundwater, and surface soil), fixed base laboratory analysis of site-specific samples will be conducted. Samples from each medium will be analyzed for TCL organics and TAL inorganics. These analyses are necessary to provide sufficient data within Site 12/SWMU 10 to determine the nature and extent of contamination and to conduct human health and ecological risk assessments. The TCL organics analysis includes volatile organics, semivolatile organics, and PCBs/pesticides. TAL metals (total) and cyanide will be analyzed because these constituents are potential components of the wastes disposed of at Site 12/SWMU 10. The results of these analyses will be compared against the screening criteria established in the decision document (Volume III of the Master Work Plan, B&R Environmental, 1998) to determine whether there is a potential risk to human or ecological receptors.

4.2.2.2 AVS/SEM

All sediment and surface soil samples collected at Site 12/SWMU 10 will be analyzed for AVS/SEM.

4.2.2.3 RCRA Appendix IX Constituents

8oz HDPE Simultaneously extracted metals.

One groundwater sample will be collected and analyzed for the inorganic (total and dissolved metals) and volatile, semivolatile, pesticide/PCB, organophosphorus, and herbicide organic constituents listed in Appendix IX of 40 CFR Part 264. The sample will be collected to satisfy RCRA requirements for the field investigation. The location of this sample will be identified in Section 7.0.

4.2.2.4 Hexavalent Chromium

At Site 12/SWMU 10, three surface water, sediment, groundwater, and surface soil samples will be collected and analyzed for hexavalent chromium for risk assessment purposes. Sampling locations are

TABLE 4-2

SITE-SPECIFIC INVESTIGATION SUMMARY
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 5

Media	Data Gap/Need	Investigation Activity	Number of Locations	Samples per Location[1]	Analysis
Surface Water	• TCL and TAL parameters	• Collect surface water samples.	16[2]	1	TCL VOCs TCL SVOCs TCL Pesticides/PCBs TAL Metals and Cyanide (Total and Filtered)
	• Water quality parameters	• Collect surface water samples.	16[2]	1	TOC pH Hardness ($CaCO_3$) Dissolved Oxygen Salinity
	• Ecological parameters	• Collect surface water samples.	16[2]	1	Temperature and Secchi Disk readings
	• Tidal influence study	• Collect water elevations during 24-hour period.	1	48	Field Analysis
	• Risk Assessment Assumptions	• Collect surface water samples.	3	1	Hexavalent chromium

TABLE 4-2

SITE-SPECIFIC INVESTIGATION SUMMARY
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 5

Media	Data Gap/Need	Investigation Activity	Number of Locations	Samples per Location[1]	Analysis
Sediment	• TCL and TAL parameters	• Collect shallow sediment samples.	16[2]	1	TCL VOCs TCL SVOCs TCL Pesticides/PCBs TAL Metals/Cyanide Acid Volatile Sulfide/ Simultaneous Extracted Metals (AVS/SEM)
	• TCL and TAL parameters	• Collect deep sediment sample.	1	1	TCL VOCs TCL SVOCs TCL Pesticides/PCBs TAL Metals (Total) and Cyanide
	• Ecological Parameters	• Collect sediment samples.	16[2]	1	TOC, pH
	• Ecological Parameters	• Collect sediment samples.	3	1	Grain-size analysis and Bulk density
	• Risk Assessment Assumptions	• Collect sediment samples.	3	1	Hexavalent chromium

TABLE 4-2

SITE-SPECIFIC INVESTIGATION SUMMARY
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 3 OF 5

Media	Data Gap/Need	Investigation Activity	Number of Locations	Samples per Location[1]	Analysis
Groundwater	• TCL and TAL parameters	• Collect shallow and deep groundwater samples.	13	1	TCL VOCs TCL SVOCs TCL Pesticides/PCBs TAL Metals and Cyanide (Total and Dissolved Metals)
	• RCRA	• Collect deep groundwater sample.	1	1	Appendix IX VOCs Appendix IX SVOCs Appendix IX Pesticides/ PCBs Appendix IX Organo-phosphorus Compounds Appendix IX Herbicides Appendix IX Metals (Total and Dissolved)
	• Water quality parameters	• Collect shallow and deep groundwater samples.	14	1	TOC pH Hardness ($CaCO_3$) Turbidity, Total Dissolved Solids, Total Suspended Solids, Chloride, Fluoride, Nitrate/Nitrite, Sulfate, Dissolved Oxygen, Salinity
	• Horizontal hydraulic conductivity	• Perform slug tests.	14	1	Evaluation of horizontal hydraulic conductivity

TABLE 4-2

SITE-SPECIFIC INVESTIGATION SUMMARY
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 4 OF 5

Media	Data Gap/Need	Investigation Activity	Number of Locations	Samples per Location[1]	Analysis
Groundwater (Continued)	• Vertical hydraulic conductivity	• Collect Shelby tube at confining layer.	1	1	Permeability test
	• Groundwater modeling parameters	• Measure monitoring well groundwater levels.	14	2	Collect water levels at high and low tide. (Can be incorporated in tidal influence readings.)
		• Tidal influence study.	14	48	Collect water levels every 30 minutes over a 24-hour period during a full or new moon.
	• Risk assessment assumptions	• Collect groundwater sample.	3	1	Hexavalent chromium
Soil	• TCL and TAL parameters	• Collect surface soil samples.	17[2]	1	TCL VOCs TCL SVOCs TCL Pesticides/PCBs TAL Metals/Cyanide AVS/SEM
	• Vertical hydraulic conductivity	• Collect Shelby tube at confining layer.	1	1	Permeability test
	• Soil Classification	• Collect surface soil sample.	1	1	Grain-size analysis, Atterberg Limits, and Natural moisture content
	• Soil Classification	• Collect subsurface soil samples.	14	2 samples/boring	Grain-size analysis, Atterberg Limits, and Natural moisture content
	• Risk Assessment Assumptions	• Collect surface soil samples.	3	1	Hexavalent Chromium

TABLE 4-2

SITE-SPECIFIC INVESTIGATION SUMMARY
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 5 OF 5

Media	Data Gap/Need	Investigation Activity	Number of Locations	Samples per Location[1]	Analysis
Soil (Continued)	• Groundwater Modeling Parameters	• Collect subsurface soil samples in aquifer.	7	1	TOC pH Bulk density Specific gravity Porosity Grain-size analysis
	• Groundwater Modeling Parameters	• Collect soil sample from surface.	2	1	TOC pH Bulk density Specific gravity Porosity Grain-size analysis
	• Soil Loggings	• Document soil characteristics during monitoring well installation.	14	1	Continuous soil logs

1 Does not include QA/QC samples.
2 Includes three background samples.

chosen based on the likelihood of contaminant migration/accumulation and/or the results of previous investigations.

4.2.2.5 Water Quality Parameters

In addition to determining contaminant concentrations in surface water and/or groundwater, water quality parameters such as Total Organic Carbon (TOC), pH, and hardness will also be obtained. These parameters are necessary for modeling and risk assessment. Surface water measurements shall also include dissolved oxygen, temperature, Secchi Disk readings, and salinity to assist in the ecological risk assessment. If the surface water is not deep enough to provide valid Secchi Disk readings, then turbidity meter readings will be used instead.

4.2.3 Groundwater and Ecological Modeling Parameter Rationale

Modeling will be conducted to evaluate contaminant fate and transport. General parameters which are required to perform modeling include:

Aquifer

- Horizontal Hydraulic Conductivity (K_h) of surficial aquifer
- Vertical Hydraulic Conductivity (K_v) of confining layer
- TOC
- Porosity
- Bulk Density
- Grain-Size Analysis
- Specific Gravity
- pH

Ecological

- TOC
- Bulk Density
- Grain-Size Analysis
- pH
- Hardness
- Secchi Disk Readings

4.2.3.1 Soil Classification

Soil classification is used to determine the geotechnical properties of the soil and includes grain-size analysis, Atterberg Limits, and moisture content. Grain-size analysis is useful for determining the heterogeneity of the soil and can be used to estimate seepage velocities. The moisture content of the soil is important in evaluating potential remedial actions and for contaminant transport through the vadose zone. The Atterberg Limits are used to determine engineering properties (water content boundaries) of the soil.

4.2.3.2 Horizontal Hydraulic Conductivity (K_h)

A slug test will be conducted in each monitoring well to determine the bulk horizontal hydraulic conductivity of the aquifer in the immediate vicinity of the well. This information will be used to characterize the aquifer for groundwater modeling and evaluation of an aquifer remediation alternative, if necessary.

4.2.3.3 Vertical Hydraulic Conductivity (K_v)

A core sample of the Hawthorn Formation (confining unit), which underlies the surficial aquifer, will be collected and tested to determine its vertical hydraulic conductivity. ASTM Method D5084-90 and analysis Method SW-846-9100 will be utilized for the permeability testing. The sample will be collected using a Shelby Tube. The vertical hydraulic conductivity of the confining unit is useful to evaluate the potential of the unit to impede the migration of contaminated groundwater into the underlying Floridan aquifer.

4.2.3.4 Groundwater-Level Measurements

Groundwater-levels provide information that can be used to determine the depth, flow direction, and gradient of the groundwater. The natural variation of the water levels are also useful for setting calibration targets for modeling purposes. Groundwater-level measurements will be collected in accordance with B&R Environmental SOP GH-1.2, "Evaluation of Existing Monitoring Wells and Water-level Measurements," and the information obtained will be used to establish groundwater potentiometric surface maps and to provide information concerning the site hydrogeology. The groundwater-level measurements will be collected synoptically at high and low groundwater elevations as determined by the tidal study.

4.2.3.5 Tidal Influence Study

Site 12/SWMU 10 is located in an area that is affected by tidal influences. To evaluate the effect of the tidal fluctuations on contaminant flushing, a tidal study will be conducted over a minimum period of 24

hours. The goal of the study will be to determine how the surface water tidal fluctuations and the groundwater elevations are related.

The tidal influence study will consist of collecting groundwater elevations and surface water elevations every 30 minutes over a minimum of a 24-hour period. Measurements will be continued until the high and low tide elevations are measured for both the surface water and groundwater (i.e., the lag time between the surface water and groundwater will be determined). The length of the study will depend on the lag time between the high/low surface water elevation and the high/low groundwater elevations.

Groundwater-level measurements will be collected in accordance with B&R Environmental SOP GH-1.2, "Evaluation of Existing Monitoring Wells and Water-Level Measurement." Surface water measurements will be obtained by installing a staff gauge in the surface water body and collecting measurements from a known reference point to the surface water elevation. Measurements will be collected during a full or new moon so that the extremes in water-level elevation can be determined.

Published local tide tables and precipitation data will also be obtained during the course of the field investigation from the nearest local resource. The information will be used to determine tidal cycle peaks and precipitation impacts on surface water and groundwater.

5.0 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

The following two sections briefly describe the methodology that will be used to complete the human health and ecological risk assessments for Site 12/SWMU 10.

5.1 HUMAN HEALTH RISK

A human health risk assessment will be performed for this site. Analytical data generated under this Work Plan, as well as historical data for the site, will be used to determine whether measured chemical concentrations pose a significant threat to human receptors. The general methodologies which will be used to assess human health risks are contained in Appendix A of the Master Work Plan Volume III for MCRD, Parris Island (B&R Environmental, 1998).

The U.S. EPA Region III RBCs screening levels (U.S. EPA, 1997) will be used to identify site-specific potential COCs for surface soil, sediment, surface water, and groundwater at Site 12/SWMU 10. Included in the groundwater analysis will be pH, turbidity, dissolved solids, TOC, chloride, fluoride, nitrate/nitrite, dissolved oxygen, salinity, and sulfate to aid in determining whether the groundwater at Site 12/SWMU 10 is suitable for use as a drinking water source. If it is determined that the groundwater is not potable, groundwater will be removed as a pathway of concern from the human health risk assessment.

The following potential receptor groups will be evaluated in the human health risk assessment.

- Adolescent Trespassers
  - Soil: ingestion, dermal contact
  - Surface Water: ingestion, dermal contact
  - Sediment: ingestion, dermal contact

- Future Residents
  - Soil: ingestion, dermal contact
  - Groundwater: ingestion, dermal contact, inhalation (showering)

- Adult and Adolescent Recreational Users
  - Surface Water: ingestion, dermal contact
  - Finfish: ingestion

Site workers (e.g., construction and maintenance workers) will not be considered potential receptor groups and will not be evaluated in the human health risk assessment for the following reasons. No development (industrial, commercial, or residential) exists at the site and any development by the Depot is extremely unlikely because the island is within the distance arc required for the Depot's small arms weapons range. Additionally, access to the island is limited. Within the confines of the Depot, no direct route exists from the main portion of the base to Jericho Island. To access the island, Depot personnel must exit the main gate of the Depot, drive through a residential community, and access the island via a causeway from a residential street. Industrial or commercial development (by the Depot or a third party owner) is extremely unlikely. As such, only future residents, trespassers, and recreational users will be evaluated in the human health risk assessment.

Additional details on receptors and complete exposure pathways to be considered in the development of the human health risk assessment are provided in Section 3.3 of the Human Health Risk Assessment Methodology provided in Appendix A of the Master Work Plan, Volume III.

5.2 ECOLOGICAL RISK

An ecological risk assessment for this site will be performed. Analytical data generated under this Work Plan, as well as historical data for the site, will be used to determine if measured chemical concentrations potentially pose a significant threat to ecological receptors. The general methodologies which will be used to assess risks to ecological receptors are contained in Appendix B of the Master Work Plan Volume III for MCRD, Parris Island (B&R Environmental, 1998).

Selection of contaminants of potential concern will be accomplished by the comparison of maximum detected site concentrations to U.S. EPA Region IV screening values. Arsenic, iron, bis(2-ethylhexyl) phthalate, Aroclor 1254, and several organochlorine pesticides have been identified as potential contaminants in the Relative Risk Evaluation (B&R Environmental, 1996).

The preliminary ecological risk assessment will begin with a "screening level problem formulation and ecological evaluation" step, including review of historical documents, potential COCs, site characteristics, photographs, maps, and notes from a site visit. Fate and transport mechanisms, complete exposure pathways, and potential receptors will be also addressed in this step. Media of concern include surface soil, sediment, surface water, and groundwater. Additionally, groundwater discharge to surface water will be included as an exposure medium. Receptors may be exposed to such contaminants through direct contact, inhalation, ingestion of media, and ingestion of contaminated food. Preliminary receptors of concern at Site 12/SWMU 10 include:

- Terrestrial invertebrates,
- Terrestrial vertebrates, and
- Aquatic life, including benthic invertebrates.

These may be more narrowly focused, depending on the results of sampling and site visits.

The next step in the preliminary risk assessment will be an evaluation of ecological effects. In this step, exposure levels that represent conservative toxicity thresholds for no observable adverse ecological effects are established. A preliminary exposure assessment will follow and will entail the compilation of maximum contaminant concentrations in exposure media. If necessary, maximum chemical ingestion rates for indicator species will be calculated. The preliminary risk calculations will be in the form of ratios; the exposure levels to be divided by the toxicity threshold values.

The preliminary risk assessment will be initially documented in the form of a technical memorandum. The purpose of the memorandum is to provide results as quickly as possible to the Parris Island Partnering Team in case more investigation may be required. The preliminary risk assessment will conclude with recommendations for further investigation. If more work is required, a work plan addendum would be prepared and submitted.

6.0 FIELD OPERATIONS

This section is the Site-Specific FSP for the investigation at Site 12/SWMU 10 - Jericho Island Disposal Area. It outlines the project-specific field investigation activities to be performed at Site 12/SWMU 10. This section also describes the procedures for performing the field investigation activities. It is to be used in conjunction with the Master FSP, Volume II of the Master Work Plan for MCRD, Parris Island (B&R Environmental, 1998) and references the Master FSP where appropriate.

Field operation activities to be performed at MCRD Parris Island for this investigation include mobilization of equipment, soil boring installation and soil sampling, monitoring well installation, hydraulic conductivity testing (slug tests), surface water and sediment sampling, groundwater sampling, water-level measurements, site surveying, equipment decontamination, waste handling, and site restoration. Monitoring well installation will be a priority of the field effort followed by water-level measurements. The results of these measurements will be used to better characterize the depth, flow direction, and gradient of the groundwater.

All field activities will be performed as described in the Master FSP and as per the B&R Environmental Standard Operating Procedures (SOPs) provided in Volume II of the Master Work Plan, except where noted. All well installation activities will be performed under the direction of a state-certified Professional Geologist familiar with all state, federal, and local laws, regulations, and requirements pertaining to the geologist's duties and responsibilities. Additionally, a state-certified driller will be used.

6.1 MOBILIZATION/DEMOBILIZATION

Mobilization activities will be performed in accordance with the procedures outlined in the Master FSP. If additional field investigations are occurring at other sites at MCRD, field activities at Site 12/SWMU 10 will be coordinated accordingly with the other field activities.

6.2 SITE RESTORATION

If investigation activities (e.g., monitoring well installation) disturb or alter the landscape, vegetation, or other features of Site 12/SWMU 10, the site may require restoration to conditions prior to the investigation. Portions of Site 12/SWMU 10 will be regraded if investigation activities alter the natural contour of the site. Additionally, all equipment used during the investigation and investigative-derived waste (IDW) will be removed from the site.

6.3 SOIL BORING DRILLING

Fourteen soil borings will be drilled at Site 12/SWMU 10. Soil samples will be collected from each boring that will be converted to a deep surficial well. In addition, the soil borings will be converted to monitoring wells. At high tide, the soil borings will be installed as far from the landfill boundary as possible, without entering surface water. Seven of the soil borings will be converted to shallow surficial aquifer wells and seven will be converted to deep surficial aquifer wells. Two soil samples will be collected at each of the deep well boring locations; one in the vadose zone and one within the aquifer. Soil samples will not be collected from the shallow surificial wells. The mud-rotary drilling method will be used for advancing the soil borings. The mud-rotary drilling technique involves the downward advancement of 5 to 10 foot sections of hollow, heavy-gauge steel rods. Hollow rods of sufficient diameter will be used to produce a 2-inch annular space between the casing and the borehole wall. The drilling fluids used must be adequately thinned to allow proper installation of well materials

Split-spoon samples will be collected continuously from the ground surface to the termination depth of the borings in accordance with ASTM Standard Method D 1586-84. The split-spoon samplers will have a minimum inside diameter (I.D.) of 2 inches and a length of 2 feet to fulfill sample volume requirements for chemical analysis. Each split-spoon sample will be field screened with a flameionization detector (FID) or photoionization detector (PID) upon collection. The head-space field analysis shall be performed to prejudice the selection of the sample to be submitted for fixed-base laboratory analysis. Split-spoon samples will be divided and placed in chemical sample jars and 8-oz. lithologic sample jars. Selected chemical sample jars will be labeled, packed, and shipped to the laboratory. Lithologic sample jars will be labeled as described in the Master FSP and retained on site until completion of the investigation, at which time all lithologic samples will be properly disposed. Lithologic samples will provide information relevant to contaminant fate and transport modeling.

At one soil boring location, PAI-10-SB03, a Shelby Tube sample will be collected from the Hawthorn Formation (confining layer) in accordance with the methodologies described in B&R Environmental SOP SA-1.3, "Soil Sampling." Because the thickness and consistency of the Hawthorn Formation has not been verified during previous investigations, the following steps will be taken to prevent the possibility of compromising the integrity of the confining layer. Initially, a soil boring will be installed as described previously. Once the top of the Hawthorn Formation is encountered, any material removed from the confining unit will be replaced with a bentonite/cement mixture. Then, an additional soil boring will be installed a few feet upgradient of the initial boring. The boring will be installed to the depth of the top of the Hawthorn Formation and from this depth, a Shelby Tube sample will be collected, and removed material will be replaced with the bentonite/cement mixture. This procedure will ensure that no more than 2 feet of

material will be removed from the confining layer, thus minimizing the potential to contaminate the underlying Floridan Aquifer.

A boring log will be maintained as described in the Master FSP for each soil boring by the state-certified field geologist. Field screening and head-space analysis results and a lithologic description of each split-spoon sample will be recorded on the boring log. At a minimum, the information outlined in the Master FSP will be recorded on the boring log for each boring.

6.4 MONITORING WELL INSTALLATION AND CONSTRUCTION

Monitoring wells will be installed and constructed in accordance with all applicable State of South Carolina regulations (e.g., Code of Laws of South Carolina 1976, Regulation 61-71 Well Standards) and Volume II of the Master Work Plan (B&R Environmental, 1998). Prior to the construction of any monitoring well, a formal request will be submitted to the South Carolina Department of Health and Environmental Control (SCDHEC) for approval. The request will contain the following information:

- Proposed location(s) on a scaled map or plate
- Proposed construction detail
- Intended purpose of the monitoring well(s)

The state also requires a formal submission detailing the activity performed during the installation of the monitoring well(s). A monitoring well record form or other form provided and/or approved by the state shall be completed and submitted within 30 days after completion of each monitoring well. The form shall contain the following information:

(a) Name and address of facility/owner
(b) Location of monitoring well(s) on a scaled map or plate
(c) Driller and certification number
(d) Date drilled
(e) Driller's or geologist's log
(f) Total depth
(g) Screened interval
(h) Diameter and construction details
(i) Depth to water table with date and time measured
(j) Surveyed elevation of measuring point with respect to an established benchmark
(k) State-certified professional geologist's seal and certification number

Seven shallow monitoring wells and seven deep monitoring wells will be installed during this investigation. All wells will be constructed with certified-clean well construction material. The shallow wells will monitor the top of the surficial aquifer, whereas the deep wells will monitor the bottom of the surficial aquifer. The top of the screened interval for the shallow monitoring wells will be placed approximately 2 feet above the high tide water table, assuming sufficient water remains in the well during low tide to obtain a groundwater sample. Shallow monitoring wells will be constructed of 2-inch I.D., flush-threaded PVC well screen and compatibly-threaded PVC well casing riser. PVC shall meet National Sanitation Foundation (NSF) Standard 14 as specified in U.S. EPA Region 4 Environmental Investigations Standard Operating Procedure and Quality Assurance Manual (EISOPQAM) (U.S. EPA, 1996b). PVC is appropriate for the application because sorption and leaching are not expected to affect well material. Consequently, the well material is expected to function properly for the expected duration of this project.

Boreholes for deep monitoring wells will be advanced to the top of the confining unit (Hawthorn Formation) underlying the surficial aquifer. The bottom of the screened interval for the deep monitoring wells will be placed even with, or slightly below, the top of the confining unit. Deep monitoring wells will be constructed of 2-inch I.D., flush-threaded PVC well screen and PVC well casing riser. PVC well screens and well casing risers will be used and will meet the requirements as stated previously.

Well screens for shallow monitoring wells will be 10 feet long with 0.010-inch openings. Deep well screens will be 5 feet long with 0.020-inch openings. There is sufficient history from existing wells at other sites within MCRD Parris Island to conclude that the upper wells will be screened in fine-grained material (silt and fine sand) and the deeper wells will be screened in more coarse-grained sands. Therefore, the anticipated slot size for the shallow and deep well screens is determined to be 0.010 and 0.020 inches accordingly.

For both shallow and deep monitoring wells, a primary filter pack of clean, silica sand will be installed flush with the bottom of the well to a minimum of 2 feet above the top of the well screen. A sand passing U.S. Standard Sieve No. 20-30 will be used for finer formations (0.010 slot size), and sand passing U.S. Standard Sieve No. 10-20 will be used for coarser formations (0.020 slot size), as determined by the site geologist. A minimum 2-foot-thick seal of 100 percent sodium bentonite pellets will be installed above the primary filter pack and allowed to hydrate in accordance with the manufacturer's recommendations. The annular space above the bentonite seal will be grouted with neat cement or a bentonite/cement mixture from the top of the bentonite seal to a point below the frost line or at least 2 feet below ground surface. The concrete used to form the pad will fill the remaining annular space. Figure 6-1 illustrates a typical monitoring well construction.

All monitoring wells will be completed with a 4-inch diameter, protective aluminum casing with a locking cap, as described in the Master FSP. A 4-foot- by 4-foot-wide by 6-inch-thick concrete surface seal shall be placed flush with the ground surface. A minimum of three bumper guards consisting of steel pipes filled with cement slurry will be installed equidistant around each monitoring well. Additionally, a 4-inch by 4-inch aluminum tag identification plate will be affixed to each well and will contain the following information.

(a) Well identification number
(b) Date of construction
(c) Drilling contractor and certification number
(d) Depth of well
(e) Screened interval
(f) Static water level
(g) Casing depth and inside diameter
(h) Latitude and longitude of well location

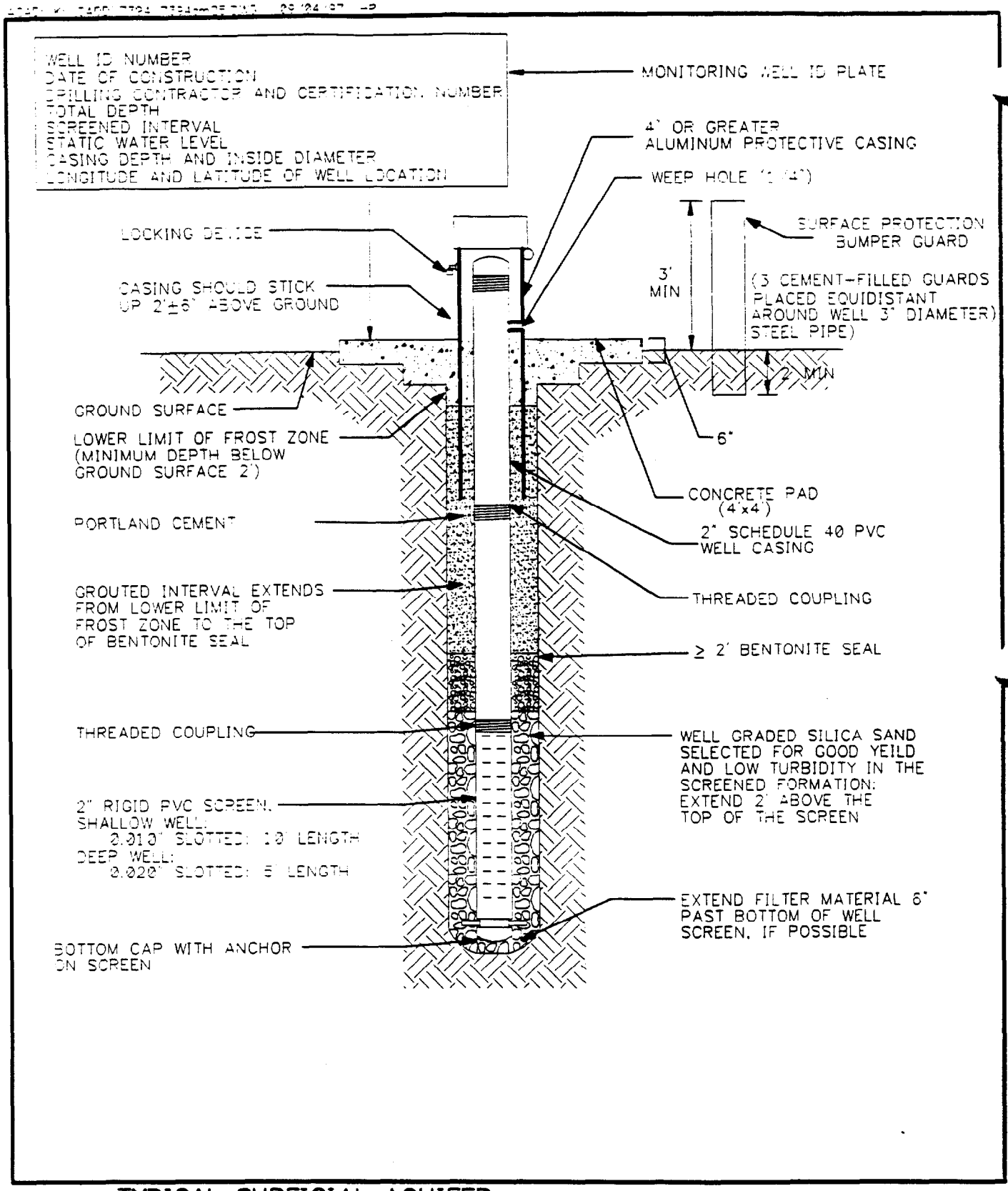
Prior to sampling, all monitoring wells will be developed to remove formation cuttings (as well as any residual drilling fluids), as described in the Master FSP, Volume II (B&R Environmental, 1998).

6.5 HYDRAULIC CONDUCTIVITY

Slug tests will be performed at each proposed monitoring well to determine the hydraulic conductivity of the aquifer. The slug tests will be conducted according to the procedures described in Section 2.7.1 of the Master FSP, Volume II (B&R Environmental, 1998).

6.6 SURVEYING

All proposed surface soil samples, groundwater monitoring wells, surface water and sediment, and staff gauge locations will be surveyed. A third-order survey will be conducted by a professional surveyor licensed in the State of South Carolina according to the requirements described in the Master FSP of the Master Work Plan, Volume II (B&R Environmental, 1998).



TYPICAL SURFICIAL AQUIFER
MONITORING WELL DETAIL
MCRD
PARRIS ISLAND, SOUTH CAROLINA
NOT TO SCALE

FIGURE 6-1

Brown & Root Environmental

6.7 WATER-LEVEL MEASUREMENTS

Two synoptic rounds of water-level measurements of proposed monitoring wells at Site 12/SWMU 10 will be conducted for this investigation. One round will be collected during high tide, and the second round will be collected during low tide, based on Naval tidal charts for MCRD Parris Island. This will be incorporated with the tidal influence study in which water levels are recorded every 30 minutes over a 24-hour period at each monitoring well (see Section 4.2.3.5). Surface water levels will also be collected over a 24-hour period to evaluate tidal influences. A standard USGS staff gauge (National Oceanic Survey) or permanent feature will be used as a reference point for measurements.

All instrumentation should be checked for damage, warpage, legibility, etc., before use. It must also be cleaned before and after use. The staff gauge and wells will be permanently marked by the Field Operations Leader (FOL) indicating the referenced points of measurement. The reference points will be subsequently surveyed for location and elevation.

Procedures for conducting surface water stage/tape downs will be conducted in accordance with the procedures identified in Section 15.5 of the U.S. EPA Region 4 EISOPQAM (U.S. EPA, 1996b).

All water-level measurements will be noted with the time and recorded to the nearest 0.01 foot.

6.8 DECONTAMINATION

Decontamination of major equipment and sampling equipment will be in accordance with the Master FSP and SOP SA-7.1, "Decontamination of Field Equipment and Waste Handling." An area for the decontamination pad for major equipment and a source of potable water for steam washing will be arranged by the FOL through MCRD personnel.

6.9 WASTE HANDLING

All solid and liquid wastes generated as a result of this investigation will be handled in accordance with the procedures described in Section 2.11 of the Master FSP and SOP SA-7.1, "Decontamination of Field Equipment and Waste Handling" (B&R Environmental, 1998).

7.0 ENVIRONMENTAL SAMPLING

This section outlines the environmental sampling program and describes the sampling procedures for the field investigation at Site 12/SWMU 10 - Jericho Island Disposal Area.

7.1 SUMMARY OF ENVIRONMENTAL SAMPLING

Tables 7-1 summarizes the sampling program for the field investigation at Site 12/SWMU 10. Figure 7-1 illustrates the proposed surface water and sediment sampling locations for Site 12/SWMU 10. Likewise, Figure 7-2 depicts the proposed soil sampling locations, and Figure 7-3 shows the proposed groundwater sampling locations. Proposed sampling locations are contingent upon utility location and clearance with MCRD personnel.

7.2 SAMPLING PROCEDURES

The following sections describe sampling procedures that will be followed during surface water, sediment, surface soil, and groundwater sample collection. Additionally, the following sections present the proposed sampling locations for field activities. If during field activities, the FOL deems that an area not contained in the Work Plan should be sampled because of surface features (e.g., depressions) that would cause preferential accumulation of contaminants, the location of samples presented in the sampling plan will be altered to include such areas. Additionally, the rationale for the deviation will be documented in the RI/RFI report.

7.2.1 Surface Water and Sediment Sampling

A total of 13 surface water and 15 sediment samples will be collected for this investigation at locations indicated on Figure 7-1. In addition, three background samples will be collected for surface water and sediment at Goat Island. All samples, except for sample PAI-10-SD-014-02, will be collected at a depth of zero to six inches. Sample PAI-10-SD-014-02 will be collected at a 6- to 12-inch depth. The surface water and sediment samples will be collected in accordance with the sampling methodologies described in the Master Field Sampling Plan (FSP) and SOP Number SA-1.2, "Surface Water and Sediment Sampling". Each set of surface water and sediment samples will be collected at the same location. The surface water sample will be collected prior to the sediment sample. Surface water samples will be filtered in the field for dissolved metals analysis in addition to the unfiltered samples collected for total metals analysis. The surface water samples and sediment samples will be collected at low tide as the surface water recedes.

TABLE 7-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 6

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	Sample Analysis									
			TCL VOCs	TCL SVOCs	TAL Metals (Total) and Cyanide	TAL Metals (Filtered)	TCL Pest/ PCBs	TOC, pH, Hardness ($CaCO_3$)	AVS/SEM	Appendix IX	Hexavalent Chromium	Additional Analysis
SURFACE WATER												
PAI-10-SW01	PAI-10-SW-001-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW02	PAI-10-SW-002-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW03	PAI-10-SW-003-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW04	PAI-10-SW-004-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW05	PAI-10-SW-005-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW06	PAI-10-SW-006-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW07	PAI-10-SW-007-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW08	PAI-10-SW-008-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW09	PAI-10-SW-009-00	Surface	•	•	•	•	•	•			•	Ecological Parameters (1)
PAI-10-SW10	PAI-10-SW-010-00	Surface	•	•	•	•	•	•			•	Ecological Parameters (1)
PAI-10-SW11	PAI-10-SW-011-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW12	PAI-10-SW-012-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW13	PAI-10-SW-013-00	Surface	•	•	•	•	•	•			•	Ecological Parameters (1)
PAI-10-SW14	PAI-10-SW-014-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)

TABLE 7-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 6

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	Sample Analysis									
			TCL VOCs	TCL SVOCs	TAL Metals (Total) and Cyanide	TAL Metals (Filtered)	TCL Pest/ PCBs	TOC, pH, Hardness ($CaCO_3$)	AVS/SEM	Appendix IX	Hexavalent Chromium	Additional Analysis
PAI-10-SW15	PAI-10-SW-015-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
PAI-10-SW16	PAI-10-SW-016-00	Surface	•	•	•	•	•	•				Ecological Parameters (1)
SEDIMENT												
PAI-10-SD01	PAI-10-SD-001-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD02	PAI-10-SD-002-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD03	PAI-10-SD-003-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD04	PAI-10-SD-004-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD05	PAI-10-SD-005-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD06	PAI-10-SD-006-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD07	PAI-10-SD-007-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD08	PAI-10-SD-008-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD09	PAI-10-SD-009-01	0 - 0.5	•	•	•		•	•(2)	•		•	Ecological Parameters (3)
PAI-10-SD10	PAI-10-SD-010-01	0 - 0.5	•	•	•		•	•(2)	•		•	Ecological Parameters (3)
PAI-10-SD11	PAI-10-SD-011-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD12	PAI-10-SD-012-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)

TABLE 7-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 3 OF 6

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	Sample Analysis									
			TCL VOCs	TCL SVOCs	TAL Metals (Total) and Cyanide	TAL Metals (Filtered)	TCL Pest/ PCBs	TOC, pH, Hardness ($CaCO_3$)	AVS/SEM	Appendix IX	Hexavalent Chromium	Additional Analysis
PAI-10-SD13	PAI-10-SD-013-01	0 - 0.5	•	•	•		•	•(2)	•		•	Ecological Parameters (3)
PAI-10-SD14	PAI-10-SD-014-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD14	PAI-10-SD-014-02	0.5 - 1.0	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD15	PAI-10-SD-015-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD16	PAI-10-SD-016-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD17	PAI-10-SD-017-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
PAI-10-SD18	PAI-10-SD-018-01	0 - 0.5	•	•	•		•	•(2)	•			Ecological Parameters (3)
SOIL												
PAI-10-SS01	PAI-10-SS-001-01	0-1	•	•	•		•		•			
PAI-10-SS02	PAI-10-SS-002-01	0-1	•	•	•		•		•			
PAI-10-SS03	PAI-10-SS-003-01	0-1	•	•	•		•		•			
PAI-10-SS04	PAI-10-SS-004-01	0-1	•	•	•		•		•			
PAI-10-SS05	PAI-10-SS-005-01	0-1	•	•	•		•		•		•	
PAI-10-SS06	PAI-10-SS-006-01	0-1	•	•	•		•		•			
PAI-10-SS07	PAI-10-SS-007-01	0-1	•	•	•		•	TOC & pH only	•			•(10)
PAI-10-SS08	PAI-10-SS-008-01	0-1	•	•	•		•		•			

TABLE 7-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 4 OF 6

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	Sample Analysis									
			TCL VOCs	TCL SVOCs	TAL Metals (Total) and Cyanide	TAL Metals (Filtered)	TCL Pest/ PCBs	TOC, pH, Hardness ($CaCO_3$)	AVS/SEM	Appendix IX	Hexavalent Chromium	Additional Analysis
PAI-10-SS09	PAI-10-SS-009-01	0-1	•	•	•		•		•			
PAI-10-SS10	PAI-10-SS-010-01	0-1	•	•	•		•	TOC & pH only	•			•(4)(10)
PAI-10-SS11	PAI-10-SS-011-01	0-1	•	•	•		•		•			
PAI-10-SS12	PAI-10-SS-012-01	0-1	•	•	•		•		•			
PAI-10-SS13	PAI-10-SS-013-01	0-1	•	•	•		•		•		•	
PAI-10-SS14	PAI-10-SS-014-01	0-1	•	•	•		•		•		•	
PAI-10-SS15	PAI-10-SS-015-01	0-1	•	•	•		•		•			
PAI-10-SS16	PAI-10-SS-016-01	0-1	•	•	•		•		•			
PAI-10-SS17	PAI-10-SS-017-01	0-1	•	•	•		•		•			
PAI-10-SB01	PAI-10-SB-001-xx(5)	TBD(11)										•(4)
PAI-10-SB01	PAI-10-SB-001-xx(5)	TBD(7)						TOC & pH only				•(4)(10)
PAI-10-SB02	PAI-10-SB-002-xx(5)	TBD(11)										•(4)
PAI-10-SB02	PAI-10-SB-002-xx(5)	TBD(7)						TOC & pH only				•(4)(10)
PAI-10-SB03	PAI-10-SB-003-xx(5)	TBD(11)										•(4)
PAI-10-SB03	PAI-10-SB-003-xx(5)	TBD(7)						TOC & pH only				•(4)(10)
PAI-10-SB03	PAI-10-SB-003-xx(5)	TBD(12)										•(6)

TABLE 7-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 5 OF 6

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	Sample Analysis									
			TCL VOCs	TCL SVOCs	TAL Metals (Total) and Cyanide	TAL Metals (Filtered)	TCL Pest/ PCBs	TOC, pH, Hardness ($CaCO_3$)	AVS/SEM	Appendix IX	Hexavalent Chromium	Additional Analysis
PAI-10-SB04	PAI-10-SB-004-xx(5)	TBD(11)										•(4)
PAI-10-SB04	PAI-10-SB-004-xx(5)	TBD(7)						TOC & pH only				•(4)(10)
PAI-10-SB05	PAI-10-SB-005-xx(5)	TBD(11)										•(4)
PAI-10-SB05	PAI-10-SB-005-xx(5)	TBD(7)						TOC & pH only				•(4)(10)
PAI-10-SB06	PAI-10-SB-006-xx(5)	TBD(11)										•(4)
PAI-10-SB06	PAI-10-SB-006-xx(5)	TBD(7)						TOC & pH only				•(4)(10)
PAI-10-SB07	PAI-10-SB-007-xx(5)	TBD(11)										•(4)
PAI-10-SB07	PAI-10-SB-007-xx(5)	TBD(7)						TOC & pH only				•(4)(10)
GROUNDWATER												
PAI-10-GW01	PAI-10-GW-001-01	Deep Surficial	•	•	•	•	•	•			•	•(8)(9)
PAI-10-GW02	PAI-10-GW-002-01	Shallow Surficial	•	•	•	•	•	•			•	•(8)(9)
PAI-10-GW03	PAI-10-GW-003-01	Deep Surficial	•	•	•	•	•	•				•(8)(9)
PAI-10-GW04	PAI-10-GW-004-01	Shallow Surficial	•	•	•	•	•	•				•(8)(9)
PAI-10-GW05	PAI-10-GW-005-01	Deep Surficial	•	•	•	•	•	•				•(8)(9)
PAI-10-GW06	PAI-10-GW-006-01	Shallow Surficial	•	•	•	•	•	•				•(8)(9)

TABLE 7-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 6 OF 6

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	Sample Analysis									
			TCL VOCs	TCL SVOCs	TAL Metals (Total) and Cyanide	TAL Metals (Filtered)	TCL Pest/ PCBs	TOC, pH, Hardness ($CaCO_3$)	AVS/SEM	Appendix IX	Hexavalent Chromium	Additional Analysis
PAI-10-GW07	PAI-10-GW-007-01	Deep Surficial	•	•	•	•	•	•				•(8)(9)
PAI-10-GW08	PAI-10-GW-008-01	Shallow Surficial	•	•	•	•	•	•				•(8)(9)
PAI-10-GW09	PAI-10-GW-009-01	Deep Surficial	•	•	•	•	•	•		•		•(8)(9)
PAI-10-GW10	PAI-10-GW-010-01	Shallow Surficial	•	•	•	•	•	•				•(8)(9)
PAI-10-GW11	PAI-10-GW-011-01	Deep Surficial						•		•	•	•(8)(9)
PAI-10-GW12	PAI-10-GW-012-01	Shallow Surficial	•	•	•	•	•	•				•(8)(9)
PAI-10-GW13	PAI-10-GW-013-01	Deep Surficial	•	•	•	•	•	•				•(8)(9)
PAI-10-GW14	PAI-10-GW-014-01	Shallow Surficial	•	•	•	•	•	•				•(8)(9)

1 Dissolved oxygen, salinity, temperature, and Secchi Disk readings.
2 TOC and pH, only.
3 Grain-size analysis, and bulk density.
4 Natural moisture content, grain-size analysis, and Atterberg Limits.
5 XX = Sample depth determined in field.
6 A Shelby Tube will be collected from the Hawthorn Formation to determine vertical conductivity.
7 Sample to be collected from the saturated zone.
8 Turbidity, TDS, TSS, chloride, fluoride, nitrate/nitrite, sulfate, salinity, and dissolved oxygen.
9 Perform slug test, water-level measurements, and tidal influence study.
10 Porosity, grain-size analysis, bulk density, and specific gravity.
11 Sample to be collected from the vadose zone.
12 Sample to be collected from the Hawthorn Formation.

TBD = To Be Determined.

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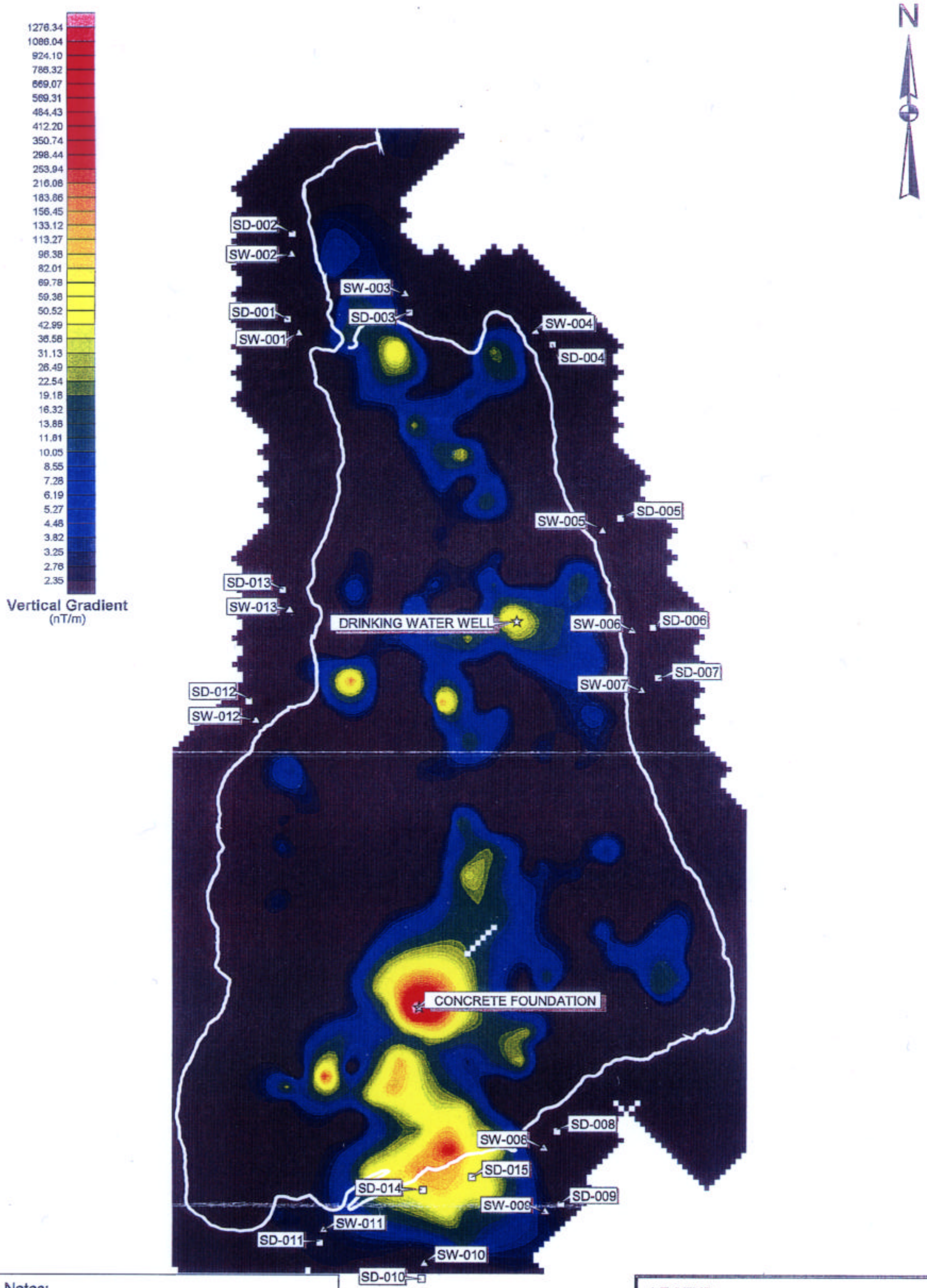
P:\GIS\PARRIS\JERICHO.APR 3/20/98 SMT SURFACE WATER/SEDIMENT SAMPLE LAYOUT



Notes:

1. PAI-10-016 through PAI-10-018 samples are to be collected for use as background samples.
2. All samples have the prefix PAI-10-__
3. Based on consultation with the Parris Island Partnering Team, three background samples for surface water and sediment will be collected at Goat Island.

LEGEND

- △ Proposed Surface Water Sample Locations
- □ Proposed Sediment Sample Locations
- ☆ Structures
- Approximate limits of island (Low Tide) as determined by GPS survey

200 0 200 Feet

DRAWN BY S. TABLER DATE 3/20/98	Brown & Root Environmental	CONTRACT NUMBER 7803	OWNER NUMBER 0053
CHECKED BY S. RUSHE DATE 4/23/98	FIGURE 7-1 PROPOSED SURFACE WATER/SEDIMENT SAMPLE LOCATIONS SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA MCRD, PARRIS ISLAND, SOUTH CAROLINA	APPROVED BY — DATE —	
COST/SCHEDULE-AREA		APPROVED BY — DATE —	
SCALE AS NOTED		DRAWING NO. FIGURE 7-1	REV 0

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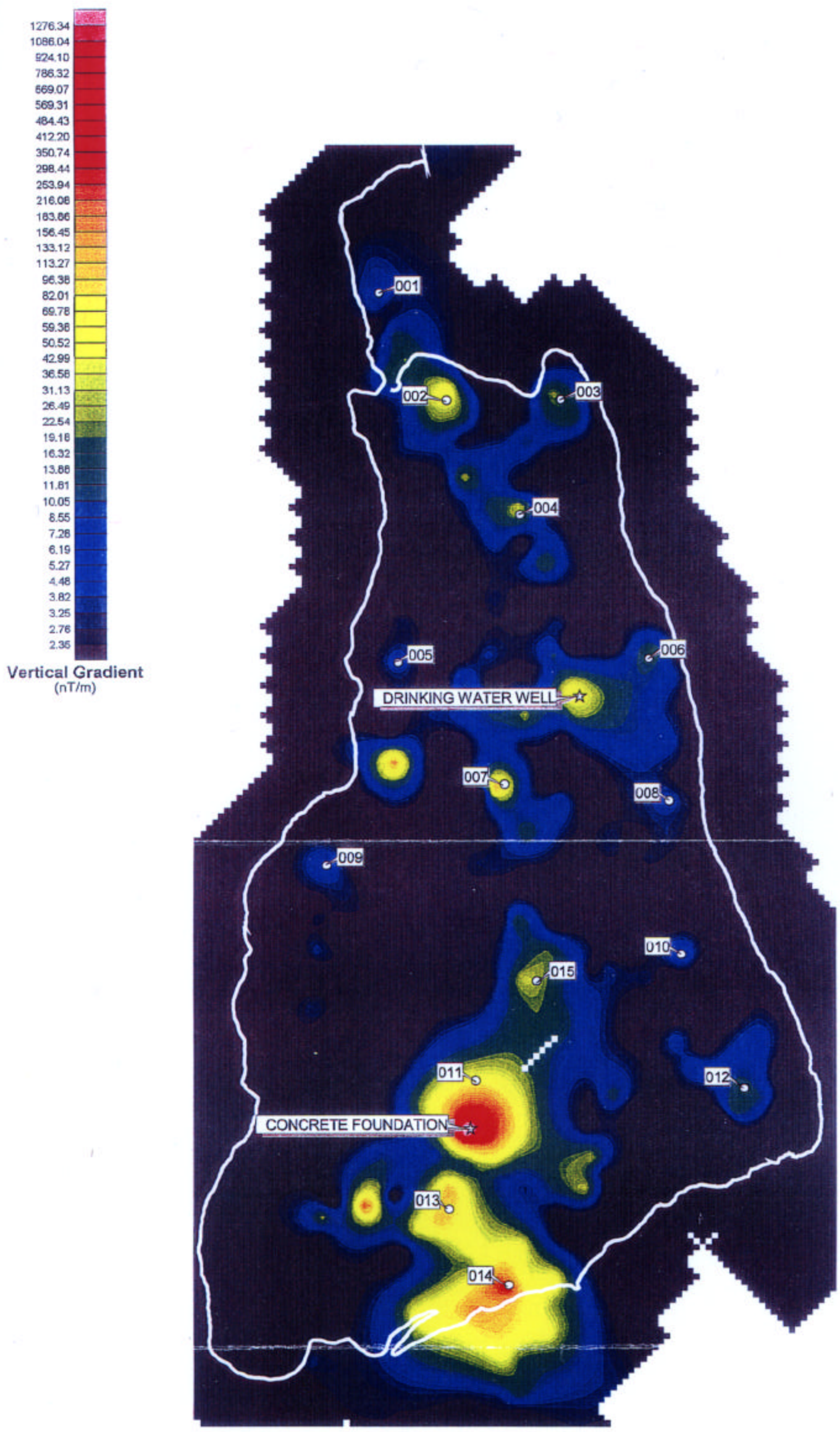
P:\GIS\PARRIS\JERICHO.APR 3/20/98 SMT SURFACE SOIL SAMPLE LAYOUT



Notes:

1. PAI-10-SS-015 through PAI-10-SS-017 samples are to be collected for use as background samples.
2. All surface soil samples have the prefix PAI-10-SS-0__
3. Based on consultation with the Parris Island Partnering Team, three background samples for surface soil will be collected at Goat Island.

LEGEND

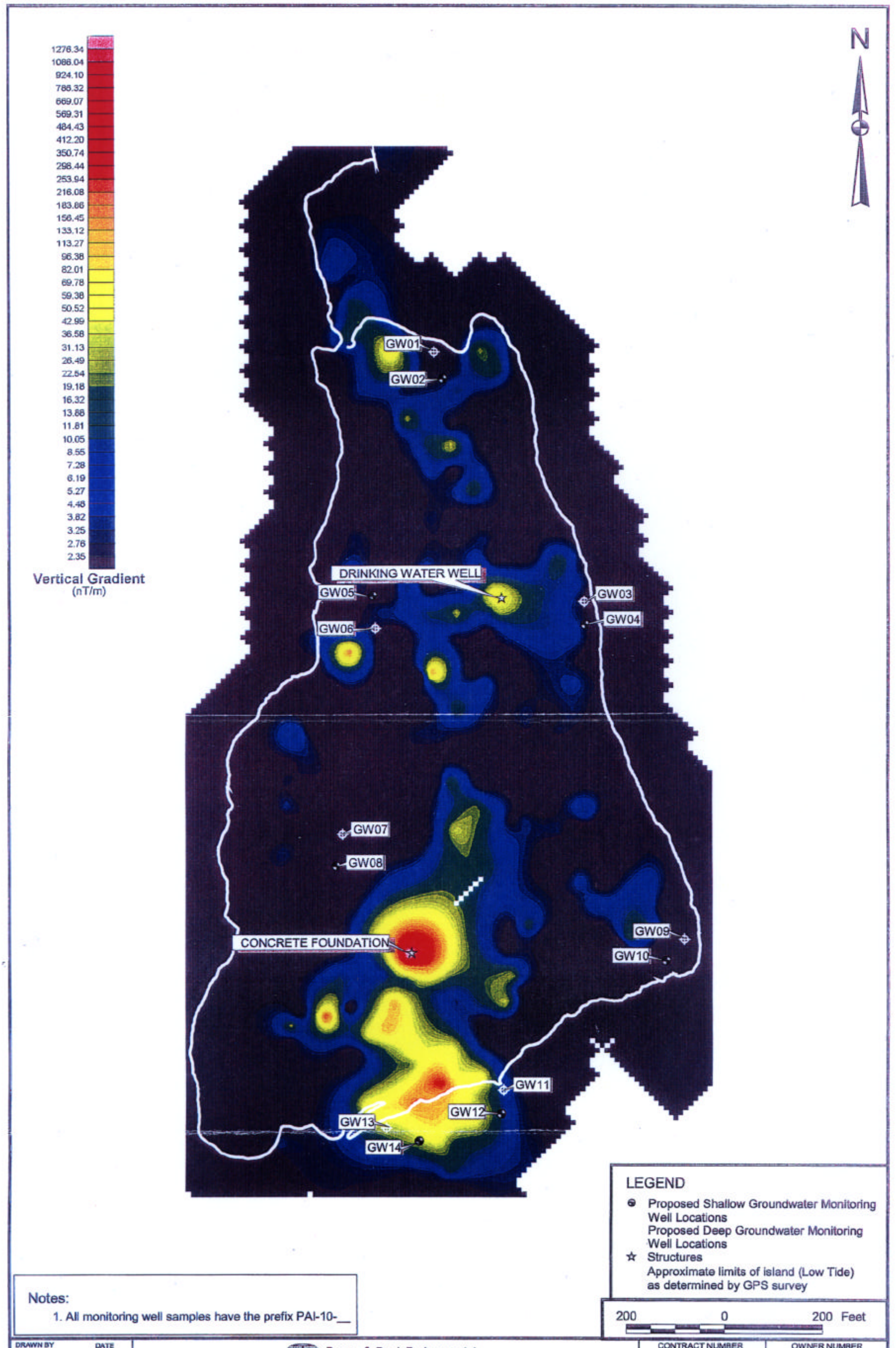
- O Proposed Surface Soil Sample Locations
- ☆ Structures
- Approximate limits of island (Low Tide) as determined by GPS survey

200 0 200 Feet

DRAWN BY S. TASLER	DATE 3/20/98	Brown & Root Environmental	CONTRACT NUMBER 7803 / OWNER NUMBER 0053
CHECKED BY S. RUSHE	DATE 4/23/98	FIGURE 7-2 PROPOSED SURFACE SOIL SAMPLE LOCATIONS SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA MCRD, PARRIS ISLAND, SOUTH CAROLINA	APPROVED BY — / DATE —
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 7-2 / REV 0

Rev. 0 04/24/98

P:\GIS\PARRIS\JERICHO.APR 3/20/98 SMT MONITORING WELL LOCATIONS LAYOUT



Notes:

1. All monitoring well samples have the prefix PAI-10-__

DRAWN BY S. TABLER DATE 3/20/98	Brown & Root Environmental	CONTRACT NUMBER 7803	OWNER NUMBER 0053
CHECKED BY B. RUSHE DATE 4/23/98	FIGURE 7-3 PROPOSED MONITORING WELL LOCATIONS SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA MCRD, PARRIS ISLAND, SOUTH CAROLINA	APPROVED BY —	DATE —
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING NO. FIGURE 7-3	REV 0

049809/P

Rev. 0 04/24/98

7.2.2 Surface Soil Sampling

A total of 14 soil samples (plus three background samples) will be collected for this investigation at the locations shown on Figure 7-2. All samples will be collected at a depth of zero to one foot. The location of the three background samples will be determined in the field. The surface soil samples will be collected in accordance with the methodologies described in the Master FSP and SOP Number SA-1.3, "Soil Sampling." Samples will be collected from the most likely areas of contamination (based upon visual and field instrumentation evaluation).

7.2.3 Subsurface Soil Sampling

Fourteen subsurface soil samples will be collected for this investigation in accordance with the methodologies described in the Master FSP and B&R Environmental SOP Numbers GH-1.5, "Borehole and Sample Logging" and GH-1.3, "Soil and Rock Drilling Methods." Two subsurface soil samples will be collected from each of the seven proposed boring locations that will be converted to a deep surficial aquifer monitoring well, resulting in the collection of fourteen subsurface soil samples. The subsurface soil samples will include one from the vadose zone and one within the aquifer. Soil classification will be conducted on both samples. Groundwater modeling parameters will be determined for the sample taken within the aquifer. Also, a Shelby Tube sample will be collected during the installation of a monitoring well to be determined in the field in accordance with the methodologies described in B&R Environmental SOP SA-1.3, Section 5.2.3, "Procedure for Collecting Undisturbed Samples" and Section 6.3 of this Work Plan.

7.2.4 Groundwater Sampling

A total of seven shallow and seven deep monitoring wells will be installed during this investigation at the locations shown on Figure 7-3. The monitoring wells will be sampled during this investigation in accordance with the U.S. EPA Region IV EISOPQAM and SOP SA-1.1, Section 5.7, "Low Flow Purge and Sampling". Samples will be collected at low tide because it is anticipated that groundwater concentrations will be at their highest levels. A portion of each sample will be filtered in the field for dissolved metals analysis. Background groundwater samples will not be taken.

7.3 SAMPLE HANDLING

7.3.1 Sample Containers, Preservation, Holding Times, and Analyses

Sample handling includes proper selection of sample containers, preservation, allowable holding times, and analyses. The Master QAP (B&R Environmental, 1998) summarizes the sample handling requirements for this investigation.

7.3.2 Sample Nomenclature

Each sample will be assigned a unique codified sample identification number. The sample nomenclature format described in the Master FSP and B&R Environmental SOP Number CT-04, "Sample Nomenclature," will be used for this investigation. The unique label system established for this sampling event is as follows.

1		2		3		4
AAA-NN	-	AA	-	NNN	-	NN
Site Location and Site Number		Media		Sample Number		Sample Depth

1	PAI - Parris Island 10 - Site 12/SWMU 10	3	An ascending sequential number of samples collected
2	SW - Surface Water SD - Sediment SS - Surface Soil SB - Soil Boring/Subsurface Soil GW - Groundwater	4	Bottom of sample interval or sample round.

7.3.3 Sample Documentation, Packaging, and Shipping

Matrix-specific sample logsheets will be maintained for each sample collected. In addition, sample collection information will be recorded in field notebooks and the Site Logbook. Further description of sample documentation is provided in the Master FSP and B&R Environmental SOP Number SA-6.3, "Field Documentation."

Samples will be packaged and shipped according to the Master FSP and B&R Environmental SOP Number SA-6.1, "Non-Radiological Sample Handling."

7.3.4 Sample Custody

Sample custody will be maintained and documented at all times. Custody begins at the time of collection and ends at the time of disposal by the laboratory. The procedures for custody described in the Master FSP and B&R Environmental SOP Number SA-6.1 will be implemented for this investigation.

8.0 QUALITY ASSURANCE PLAN

A general discussion of the Data Quality Process is provided in the Master Work Plan (B&R Environmental, 1998). Site-specific data quality objectives are provided in Section 4.0 of this document, and the laboratory DQOs are discussed in Section 10.0 of this document.

9.0 PROJECT MANAGEMENT ORGANIZATION

B&R Environmental will be responsible for management, implementation, and inspection of the field investigation for MCRD Parris Island Site 12/SWMU 10. B&R Environmental will coordinate activities with program personnel and MCRD Navy personnel when appropriate.

9.1 PROJECT ORGANIZATION

An organizational chart of the site-specific project personnel for this investigation is provided in Figure 9-1.

9.2 PROJECT PERSONNEL RESPONSIBILITIES

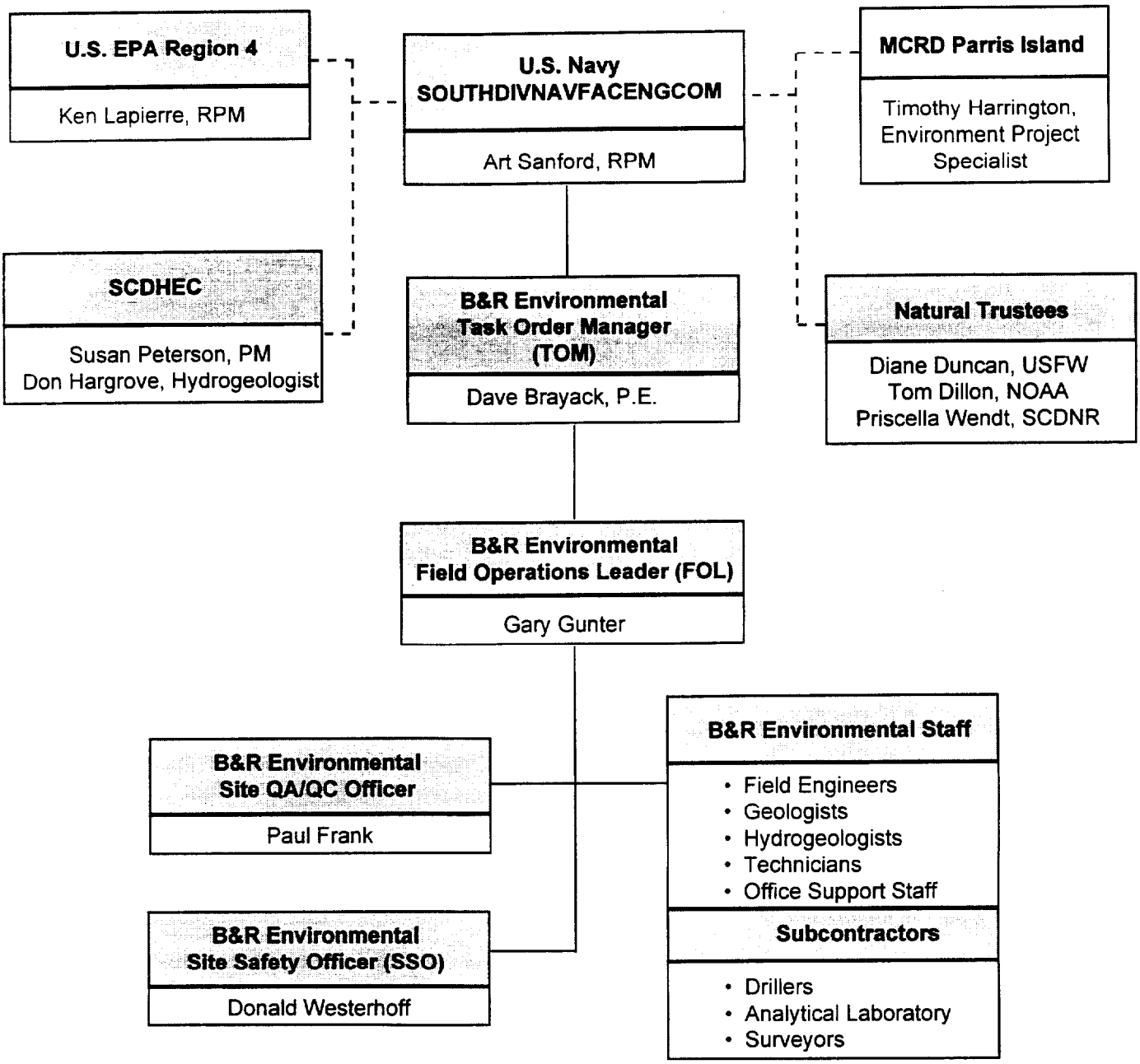
A description of responsibilities of individual project team members is provided below.

The responsibilities of the Task Order Manager (TOM) are provided in the Master Work Plan. The FOL will be responsible for coordinating all site personnel and field activities. The FOL will:

- Act as liaison between the TOM, field team members, Site Safety Officer (SSO), and Site QA/QC officer.
- Supervise all subcontractors.
- Oversee the mobilization and demobilization of all equipment, personnel, and subcontractors, and ensure the availability and maintenance of all field sampling and monitoring equipment and materials.
- Oversee the completion of all site documentation.
- Assume custody of all samples and ensure the proper handling and shipment of all samples.
- Resolve all logistical, weather, personnel, and equipment problems that may arise and initiate field change requests after consultation with the TOM, when necessary.

FIGURE 9-1

PROJECT PERSONNEL ORGANIZATION
SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA



NOAA: National Oceanic and Atmospheric Administration
PM: Project Manager
RPM: Remedial Project Manager
SCNDR: South Carolina Department of Natural Resources
TBA: To Be Assigned
USFW: U.S. Fish and Wildlife Service

A Professional Geologist certified in the State of South Carolina will provide direction for the well installation activities and review of boring logs.

The Site QA/QC Officer will be responsible for ensuring all site activities are performed according to the QA/QC guidelines outlined in the Master QAP. The Site QA/QC officer will:

- Act as liaison between the B&R Environmental Quality Assurance Manager (QAM), laboratory, and site personnel.
- Ensure that field duplicates and quality control blanks are collected at the proper frequency and volume.
- Ensure that all measuring and testing equipment is calibrated, used, and maintained in accordance with applicable procedures.
- Manage bottleware procurement and oversee field preservation and filtration activities.

The SSO will advise the FOL on issues of site health and safety. The duties of the SSO are described in the Master Health and Safety Plan (HASP) of the Master Work Plan, Volume II (B&R Environmental, 1998c).

10.0 DATA QUALITY REQUIREMENTS

The purpose of this section is to relate the site-specific laboratory analyses and field QA/QC samples to the DQO statements established for this investigation. The Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998) is referenced where appropriate.

10.1 LABORATORY ANALYSES

Section 5.0 of the Master QAP (B&R Environmental, 1998) describes the laboratory and methodology requirements for the sample analyses for this investigation. Section 5.5 of the Master QAP (B&R Environmental, 1998) describes the data reporting requirements for this investigation. Section 5.6 of the Master QAP (B&R Environmental, 1998) describes the criteria for laboratory selection. The laboratory selected to perform work at this site must be South Carolina state certified.

10.2 EXTERNAL (FIELD) QC SAMPLES

Section 3.3 of the Master QAP (B&R Environmental, 1998) contains a general description of external quality control measures.

10.2.1 Field QC Sample Types and Frequencies

Table 10-1 summarizes the frequency and type of field QA/QC samples to be collected for this investigation.

TABLE 10-1

FREQUENCY OF FIELD QC SAMPLES
SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA

Type Of Sample	Organics	Inorganics
Field Duplicate/ Split Samples	1/10 samples/media	1/10 samples/media
Source Water Blank	1/source/sampling event	1/source/sampling event
Trip Blank (VOCs only)	1/cooler containing VOCs samples	NA
Equipment Rinsate Blank	1/day/matrix	1/day/matrix
Field Blank	As needed; Depends on site conditions	As needed; Depends on site conditions

QA/QC blanks for grout, sand, and bentonite will be collected and held for analysis pending the analytical results of the field investigation. If it is suspected that inorganic contaminants have been introduced by well installation materials, the samples will be sent to the laboratory for analysis.

Detailed descriptions of QC sample types are provided in Sections 3.3.1 through 3.3.5 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998).

10.2.2 Matrix Spike/Duplicate Sample Aliquots

Laboratory duplicate and matrix spike samples will be analyzed as described in Section 3.4 of the Master QAP of the Master WP (Volume II) (B&R Environmental, 1998). The field sampling team will provide the appropriate additional sample volume as prescribed by the laboratory requirements. The additional sample aliquots required for analysis of matrix spike/duplicates will be collected with a frequency of 1 per 20 samples per matrix.

10.3 BOTTLEWARE REQUIREMENTS

The bottleware, preservation requirements, and holding times for the analyses proposed for this investigation are provided in Table 10-2. Pre-preserved, certified clean bottleware will be supplied by the laboratory subcontractor.

10.4 SAMPLE CUSTODY AND SHIPMENT

Sample custody procedures are designed to provide proper documentation of sample acquisition and integrity. Sample custody and shipment procedures for this investigation are described in Section 4.0 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998).

10.5 INTERNAL (LABORATORY) QC CHECKS

Descriptions of the internal (laboratory) QC check types are provided in Section 6.0 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998).

10.5.1 Laboratory Duplicate, Spike, and Method Blank Analyses

Table 10-3 summarizes the frequency and type of laboratory QC checks to be performed for this investigation.

TABLE 10-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 4

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
AQUEOUS (SURFACE WATER & GROUNDWATER)					
TCL and Appendix IX VOCs	SW-846 8260B	2 x 40 mL	Glass; Teflon-lined septum cap	HCl to pH<2; Cool to 4°C; zero headspace	14 days to analysis
TCL and Appendix IX SVOCs	SW-846 8270C	2 x1 L	Amber glass; Teflon-lined cap	Cool to 4°C; dark	7 days to extraction; 40 days from extraction to analysis
Total TAL and Appendix IX Metals	SW-846 6010B/ 7000A Series	1 L	High-Density Polyethylene (HDPE)	HNO_3 to pH<2	6 months, except Hg (28 days)
Dissolved TAL Metals	SW-846 6010B/ 7000A Series	1 L	HDPE	HNO_3 to pH<2	6 months, except Hg (28 days)
Cyanide	SW-864 9010B/9012A	500 mL	Glass or HDPE	NaOH to pH>12; Cool to 4°C	14 days to analysis
Hexavalent Chromium	SW-846 7196A	250 mL	Glass of HDPE	Cool to 4°C	24 hours to analysis
TCL and Appendix IX Pesticides	SW-846 8081A	2 x 1 L[4]	Amber glass; Teflon-lined cap	Cool to 4°C; dark	7 days to extraction; 40 days from extraction to analysis
TCL and Appendix IX PCBs	SW-46 8082	2 x 1 L[4]	Amber glass; Teflon-lined cap	Cool to 4°C; dark	7 days to extraction; 40 days from extraction to analysis
TOC	EPA 415.1	60 mL	Glass orHDPE	HCl or H_2SO_4 to pH <2; Cool to 4°C	28 days to analysis
pH	EPA 150.1	60 mL	Glass or HDPE	None Required	Analyze immediately
Turbidity	EPA 180.1	250 mL	Glass or HDPE	Cool to 4°C	48 hours to analysis
Total Dissolved Solids (TDS)	EPA 160.1	250 mL	Glass or HDPE	Cool to 4°C	7 days to analysis

TABLE 10-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 4

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
AQUEOUS (SURFACE WATER & GROUNDWATER) (Continued)					
Total Suspended Solids (TSS)	EPA 160.2	250 mL	Glass or HDPE	Cool to 4°C	7 days to analysis
Chloride	EPA 325.2	250 mL	Glass or HDPE	None required	28 days to analysis
Fluoride	EPA 340.2	500 mL	HDPE	None required	28 days to analysis
Nitrate/Nitrite	EPA 353.3	250 mL	Glass or HDPE	H_2SO_4 to pH <2; Cool to 4°C	28 days to analysis
Sulfate	EPA 375.4	250 mL	Glass or HDPE	Cool to 4°C	28 days to analysis
Salinity	SM2520B	250 mL	Glass or HDPE	Cool to 4°C	Analyze immediately
Hardness	EPA 130.2	250 mL	Glass or HDPE	HNO_3 to pH<2;Cool to 4°C	6 months to analyze
Appendix IX Organophosphorous Pesticides	SW-846 8141A	2 x 1L	Amber Glass; Teflon-lined cap	Cool to 4°C; dark	7 days to extraction; 40 days from extraction to analysis
Appendix IX Herbicides	SW-846 8151A	2 x 1L	Amber Glass; Teflon-lined cap	Cool to 4°C; dark	7 days to extraction; 40 days from extraction to analysis
Appendix IX Nonhalogenated Organic Compounds (Isobutyl alcohol, propionitrile, Acetonitrile, 1,4-Dioxane, and Methacrylonitrile)	SW-846 8015B Modified	2 x 40 mL	Glass; Teflon-lined septum cap	HCl to pH <2; Cool to 4°C	14 days to analysis

TABLE 10-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 3 OF 4

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
SOLID (SURFACE & SUBSURFACE SOIL & SEDIMENT)					
TCL VOCs	SW-846 8260B	5 X 5 g	Glass EnCore™ Samplers; Teflon-lined cap; volatiles vial	Cool to 4°C; At lab add sample to be preserved with either sodium bisulfate solution or by adding to 5 ml reagent water and then freezing at -10°C	Extract within 48 hours; 14 days to analysis
TCL SVOCs	SW-846 8270C	8 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Total TAL Metals and Cyanide	SW-846 6010B/7000A Series and 9010B/9012A	8 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	6 months, except Hg (28 days); cyanide 14 days
Hexavalent Chromium	SW-846 3060A/7196A	4 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	7 days to extraction; 24 hours from extraction to analysis
TCL Pesticides	SW-846 8081A	4 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
TCL PCBs	SW-846 8082	4 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Acid Volatile Sulfides/Simultaneously Extracted Metals (AVS/SEM)	SW-846 8310	8 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to analysis
TOC	SW-846 9060	4 oz.	Glass; Wide-mouth	Cool to 4°C	28 days to analysis
Grain-Size Analysis	ASTM D 421/ 422	1 qt.	Glass; Wide-mouth	None	None
Atterberg Limits	ASTM D 4318	NA[5]	Shelby Tube	None	None

TABLE 10-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SITE 12/SWMU 10- JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 4 OF 4

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
SOLID (SURFACE & SUBSURFACE SOIL & SEDIMENT (Continued)					
Permeability	ASTM Method D5084-90/ SW-846 9100	NA	Shelby Tube	None	None
pH	SW-846-9045C	4 oz.	Glass; Wide-mouth	Cool to 4°C	Analyze immediately
Bulk Density	MSA	NA	Shelby Tube	None	None
Specific Gravity	ASTM D854	NA	Shelby Tube	None	None
Porosity	Calculation	NA	NA	None	None

1 Sample volume may vary based on the laboratory.
2 HCl - Hydrochloric acid; HNO_3 - Nitric acid; NaOH - Sodium hydroxide; H_2SO_4 - Sulfuric acid.
3 Holding times are measured from the date of sample collection.
4 Two 1L bottles of samples are sufficient for pesticides and PCB analyses if both are performed for the same sample.
5 NA - Not applicable.

TABLE 10-3

**FREQUENCY OF LABORATORY QC CHECKS
SITE 12/SWMU 10 - JERICHO ISLAND DISPOSAL AREA
MCRD PARRIS ISLAND, SOUTH CAROLINA**

Type Of Sample	Organics	Inorganics
Laboratory Duplicate	NA	1/20 samples/media
Matrix Spike	1/20 samples/media	1/20 samples/media
Matrix Spike Duplicate	1/20 samples/media	NA
Surrogate Spike	Each sample for chromatographic analyses	NA
Method Blank	Based on method requirements with a minimum of 1/batch of 20 samples	Based on method requirements with a minimum of 1/batch of 20 samples

10.5.2 Other Laboratory QC Checks

Calibration and preventive maintenance of laboratory instruments are described in Section 6.6 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998). Handling and storage of samples, use of qualified technicians, and independent confirmation of data computations and deliverables are described in the Laboratory Quality Assurance Plan (LQAP).

10.6 PROJECT RECORDS

Record keeping and evidentiary file concerns are described in Section 7.0 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998). All protocols described therein will be strictly observed.

10.7 DATA REDUCTION, VALIDATION, AND REPORTING

The data generated from this investigation shall be validated in accordance with the U.S. EPA National Functional Guidelines for Organic and Inorganic Data Review. The corresponding requirements as discussed in Section 8.0 of the Master QAP , Volume II, (B&R Environmental, 1998) for data validation, data assessment, electronic deliverables, and data interpretation and reporting will be followed.

10.8 PERFORMANCE AND SYSTEM AUDITS

The protocol for conducting audits as outlined in Section 10.0 of the Master QAP, Volume II, (B&R Environmental, 1998) shall be followed.

10.9 CORRECTIVE ACTIONS

In the event there are discrepancies in field activities from the established procedures and/or requirements or modifications to the proposed Work Plan, the procedures established in Section 10 of the Master QAP, Volume II, (B&R Environmental, 1998) for documenting nonconformances shall be implemented and, if appropriate, a "Field Task Modification Request Form" completed.

10.10 TRAINING AND QUALITY PLANNING

Training requirements and pro-active management practices are provided in the Master Work Plan, Volume II (B&R Environmental, 1998).

REFERENCES

Brown & Root Environmental, 1996, Relative Risk Evaluation.

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APPENDIX A

GEOPHYSICAL SURVEY

GEOPHYSICAL SURVEY

1.0 INTRODUCTION

On March 9, 1998 Brown & Root Environmental (B&R Environmental) mobilized a geophysicist and field technician to MCRD Parris Island, South Carolina for the purpose of conducting a geophysical survey at Jericho Island. A high resolution vertical magnetic gradient survey and global positioning system (GPS) survey was performed at the Jericho Island Site on March 9 through 12, 1997. The purpose of the vertical magnetic gradient survey was to delineate the lateral extent of the suspected disposal area. The purpose of the GPS survey was to provide station position information for the vertical magnetic gradient data. The GPS was also used to map the perimeter of the island for future planning activities. Staff and equipment were demobilized from the site on March 12, 1998.

2.0 GPS SURVEY

Two Magellan X-CP differential GPS (DGPS) receivers were used to provide position data for the vertical magnetic gradient survey and to provide information on the perimeter of the island. The Magellan X-CP DGPS is capable of 0.7-foot (20-centimeters) horizontal resolution when operated in the stationary mode and approximately 3.3 foot (1-meter) horizontal resolution when operated in the mobile mode. All position data were collected with the DGPS operating in the mobile mode.

A high accuracy GPS quality benchmark was located on site. This benchmark was established by the National Geodetic Survey (NGS) in 1985 and was labeled Horizontal Control Mark 7207. Data regarding the accuracy, description and location of this benchmark were obtained prior to the survey by conducting a search of NGS's data base archives. This benchmark is located at 32° 21' 47.67383" North and 080° 42' 49.38527" West. Its elevation is reported as 11.811 feet above mean sea level. The base station GPS was set up 7.80-feet over this benchmark and configured to collect a data point every second.

The mobile GPS was attached to a range pole and was carried by a field technician during data collection. GPS data were collected by following the magnetometer at a distance of approximately 6-feet. This distance was maintained to minimize signal interference to the magnetometer. All GPS data were preliminary processed on site using the manufacturers software MSTAR. This processing was necessary to examine data quality and examine areas where loss of satellite lock occurred due to tree canopy affects. Data were re-collected in areas where data quality were poor or areas where satellite lock was lost. All data were archived onto the portable computers hard drive and onto floppy disks. Final DGPS processing was performed in the office using MSTAR. GPS data are presented in units of feet and in the South Carolina State Plane Coordinate System (SPCS). All DGPS data are referenced to North American Datum 1983 (NAD83).

2.1 High Resolution Magnetometer Survey

It was anticipated that the disposed waste contained metallic objects and debris. For this reason, a vertical magnetic gradient survey was performed at this site to assist in determining the lateral limits of the disposal area. A magnetometer was recommended because the magnetic contrast between the disposed waste and the natural soils of the site was suspected to be significant.

A high resolution Geometrics G-858 cesium vapor magnetometer and gradiometer was used at this site to map the presence of buried metallic debris and objects associated with the historic disposal area. The G-858 was equipped with two magnetic field sensors located on the end of an aluminum pole that positioned it approximately 6.5 ft (2.0 m) ahead of the operator. The data were collecting using two total magnetic field sensors separated vertically by a distance of approximately 3.3-feet (1-meter). One sensor was located approximately 1-foot (0.3 m) off of the ground and the second sensor was located approximately 4-feet (1.2-meters) off the ground. Both sensors were vertically oriented. Total magnetic field data are measured in units of nanoTeslas (nT). These data are susceptible to diurnal drift of the earth's magnetic field which is often the result of solar storm activity. Background total field magnetic data for this site was approximately 50,400 nT.

The vertical magnetic gradient was calculated by taking the difference of the two total field magnetic sensors and dividing them by their separation distance. Vertical gradient data are not susceptible to diurnal drift as it should be equal at both sensors. Vertical gradient data can be either positive or negative. Positive vertical gradient data represents buried features that have a constructive remanent magnetization signal in the ambient field and negative values represent buried features that have a destructive signal in the ambient field. Areas representative of background conditions have vertical gradients of 0 nT/m.

Approximately 18,500 magnetic data points were collected during this investigation. All magnetic data were time synchronized to the DGPS receivers. All magnetic data were downloaded daily to a laptop computer and archived onto floppy disks. The data were preliminary processed on site using the manufacturers software MAGMAP96. The data were reviewed for accuracy and quality.

The absolute value of all vertical gradient data were calculated and gridded using the software OASIS. Data were gridded using a kriging algorithm with a cell size of 5-feet. The data were gridded in log space due to its large dynamic range. The observed data were matched to a using a spherical variogram model prior to final gridding. Final data are presented as color contours of vertical magnetic gradient in units of nT. The data were gridded such that areas that do not contain ferrous metals are shown in shades of deep blue. Areas where metallic debris, metallic objects or other metallic features are buried are shown in shades of green, yellow, red and purple.

2.2 Magnetic Survey Diurnal Corrections

Magnetic storms due to solar activity can render magnetometer data useless for environmental surveys. Forecasting and identifying a magnetic storm is critical when collecting magnetic data. The Space Environmental Agency was contacted each day prior to the initiation of the magnetic survey. The Space Environmental Agency provides magnetic forecast data for military and civilian purposes that indicate the presence or projects the potential for magnetic storms. Magnetic storms can result in rapid and significant localized changes in the earth's magnetic field that can equal or exceed several hundred nTs.

Diurnal drift data were also monitored and collected in the field using a Geometrics 856AX proton precession base station magnetometer. The Geometrics 856AX was set up along the northern extent of the causeway to Jericho island. This area was believed to be free of buried metallic objects or other anthropogenic features that may cause signal interference. The proton precession magnetometer device was designated the base station magnetometer and was programmed to collect a data value every 30 seconds during the field operations. The use of a proton precession magnetometer was acceptable as the dynamic range of the base station was anticipated to be small.

The daily initial and final readings of the base station magnetometer were recorded in the field log book to identify any potential problems with unforecasted solar storms or instrument failure. Base station data were downloaded daily to a laptop computer using the manufacturer's software Magloc. The total field magnetic data were corrected for diurnal drift by utilizing the manufacturer's software Magmap96. This software was used to automatically correct the cesium vapor magnetometer's total field magnetic data based upon the trends of the proton precession base station data.

3.0 RESULTS

The GPS was used to trace out the boundary of the island. This was performed during low tide. The area that was walked marks the boundary where the marsh vegetation and the land vegetation meet or where at the base of the defined topographic difference between marsh and the island. The GPS indicated that Jericho is presently approximately 25 acres in area.

The vertical magnetic gradient results indicate that four areas of disposed ferrous metals appear to be present at Jericho Island. The first area of disposal was observed in the northern extreme of the island near where the access causeway intersects the island, as shown on Figure 7-1. This area is defined by shades of green and yellow. This area was observed to be hummocky during data collection suggesting that it has received fill materials.

The second suspected disposal area was observed in the central and eastern area of the site. This area is shown in color contour shades of green and green-yellow. A galvanized vertical pipe was observed in this area and is shown in color contour shades of yellow and orange. The former property owner informed us that a family lived on this island from approximately 1900 to

the late 1920's. The former property owner informed the field crew that these individuals operated a small farm on the island during this time period. The anomalous response at this area may represent a disturbed area where a house or barn was located during 1900 through the late 1920's or may represent landfill. A surface metal response was also observed in the central western area of the site and is shown in shades of green, yellow and red. Surface metals including cans, wire and a washing machine drum were observed at this location.

A steel reinforced concrete foundation was observed as shown on the figures. This anomaly is shown in shades of red and purple. The former property owner informed the field crew that this foundation was used by the marine corps as a foundation for a landing light for a run-way to a near-by air field. A suspected disposal area was observed around this foundation. Metallic debris composed mostly of metal cans and a large volume of broken glass from bottles was observed in this area. The metallic debris extended into the marsh to the south of the island. A causeway connecting Jericho island to a small island to the south was observed to have been constructed of the same disposal material. The magnetometer survey was extended onto the northern extent of this other island to help define the extent of the disposal area. It appears that the northern extent of this other island has also received disposed material. In speaking with the former property, he informed the field crew that the entire island that was located south of Jericho was created from disposed waste.

Another anomaly was observed east of the foundation and surrounding landfilled area. This anomaly may also represent a small landfilled area.

APPENDIX B

PROJECT HEALTH & SAFETY PLAN

Health and Safety Plan
for
Site 12/SWMU 10
Jericho Island Disposal Area

Marine Corps Recruit Depot
Parris Island, South Carolina
U.S. EPA Identification No.
SC6 170 022 762

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0053

February 1998

HEALTH AND SAFETY PLAN
FOR
SITE 12/SWMU 10
JERICHO ISLAND DISPOSAL AREA

MARINE CORPS RECRUIT DEPOT
PARRIS ISLAND, SOUTH CAROLINA
U.S. EPA IDENTIFICATION NO.
SC6 170 022 762

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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

Submitted by:
Brown & Root Environmental
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0053

FEBRUARY 1998

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1.0 INTRODUCTION

The objective of this Health and Safety Plan (HASP) is to provide the minimum safety practices and procedures for Brown & Root Environmental (B&R Environmental) and subcontractor personnel engaged in various investigation activities that are to be conducted at the Marine Corps Recruit Depot (MCRD) Parris Island, South Carolina. Specifically, this HASP addresses the planned geophysical survey and RCRA Facility Investigation (RFI)/Remedial Investigation (RI) activities to be conducted at Site 12/Solid Waste Management Unit (SWMU) 10 - Jericho Island Disposal Site.

This HASP has been prepared using the latest available information regarding known or suspected chemical contaminants and potential and foreseeable physical hazards associated with the proposed work at the site. This HASP has been designed to be used in accordance with the Brown & Root Environmental Health and Safety Guidance Manual. The Guidance Manual provides detailed information pertaining to procedures to be performed on site as directed by the HASP, as well as B&R Environmental standard operating procedures. The Health and Safety Guidance Manual and this HASP must both be present at the site to comply with the requirements stipulated in the Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.120.

This HASP has been written to support proposed tasks and techniques associated with the scope of work as presented in Section 3.0. Should the proposed work site conditions and/or suspected hazards or if new information becomes available this document will be modified. All changes to the HASP will be made with the approval of the B&R Environmental CLEAN Health and Safety Manager (HSM) and the Project Manager (PM). The PM will notify all affected personnel of all changes. Revision indicators within the plan and Section 14.0 Document Status will record all changes to this plan.

The elements of this HASP are in compliance with the requirements established by OSHA 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (HAZWOPER) and sections of 29 CFR 1926, "Safety and Health Regulations for Construction." The information contained in this plan, as well as policies on conducting site operations, are in accordance with the B&R Environmental Health and Safety Program and MCRD policies and procedures.

1.1 AUTHORITY

This Contract Task Order (CTO) 0053 and the requirements established represent an integral part of an overall effort conducted under the Comprehensive Long - Term Environmental Action Navy (CLEAN)

contract, administered through the U.S. Navy Southern Division Naval Facilities Engineering Command, as defined under Contract No. N62467-94-D-0888.

1.2 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibility for site safety and health for B&R Environmental and subcontractor employees engaged in on site activities. Personnel assigned to these positions shall exercise the primary responsibility for all on site health and safety. These persons will be the primary point of contact for any questions regarding the safety and health procedures and the selected control measures.

- The B&R Environmental Task Order Manager (TOM) is responsible for the overall direction and implementation of health and safety for this project.

- The B&R Environmental Field Operations Leader (FOL) is responsible for implementation of this HASP with the assistance of an appointed Site Safety Officer (SSO). The FOL manages field activities, executes the work plan, and enforces safety procedures, as applicable to the work plan.

- The SSO supports site activities by advising the FOL on all aspects of health and safety on site. These duties may include the following:

  - Coordinates all health and safety activities with the FOL.
  - Selects, inspects, implements, and maintains personal protective equipment.
  - Establishes work zones and control points.
  - Directs and assists in the development of decontamination areas and procedures.
  - Implements air monitoring program in support of on site activities.
  - Verifies training and medical status of on site personnel status in relation to site activities.
  - Implements hazard communication, respiratory protection, and other associated safety and health programs, as necessary.
  - Coordinates emergency services.
  - Provides site-specific training for all on site personnel.

- Compliance with these requirements is monitored by the Project Health and Safety Officer (PHSO) and is coordinated through the Health and Safety Manager.

1.3 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: Marine Corps Recruit Depot **Address:** Parris Island, South Carolina

Site Point of Contact: Tim Harrington **Phone Number:** (803)525-2630

Purpose of Site Visit: This activity will be divided into a multi-task operation, including a geophysical survey and RCRA Facility Investigation (RFI)/Remedial Investigation (RI) activities (see the Scope of Work - Section 4.0).

Proposed Dates of Work: February - May, 1998

Project Team:

B&R Environmental Personnel:	Discipline/Tasks Assigned:
Mark Speranza, PE	Task Order Manager (TOM)
TBD	Field Geologist
Matthew M. Soltis, CIH, CSP	Health and Safety Manager (HSM)
TBD	Site Safety Officer (SSO)
Delwyn E. Kubeldis, CIH, CSP	Project Health and Safety Officer (PHSO)

Non-B&R Environmental Personnel	Affiliation/Discipline/Tasks Assigned
TBD	
TBD	

Prepared by: Delwyn E. Kubeldis, CIH, CSP

Reviewed and Approved by:

Mark P. Speranza

Mark Speranza, PE
Project Manager

Matthew M. Soltis

Matthew M. Soltis, CIH, CSP
CLEAN Health & Safety Manager

2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

This section has been developed as part of a preplanning effort to direct and guide field personnel in the event of an emergency. Since a majority of potential emergency situations will require assistance from outside emergency responders, B&R Environmental and subcontractor personnel will not provide emergency response support for emergency events beyond the capabilities of on site personnel. In the event of emergencies that cannot be handled by on site personnel, an evacuation will be initiated. In an evacuation, site personnel will move to a safe place of refuge and the appropriate emergency response agencies will be notified. The emergency response agencies listed in this plan are capable of providing the most effective response, and as such, will be designated as the primary responders. These agencies are located within a reasonable distance from the area of operations, which ensures adequate emergency response time. This emergency action plan conforms to the requirements of OSHA Standard 29 CFR 1910.38(a), as allowed in OSHA 29 CFR 1910.120(l)(1)(ii).

B&R Environmental personnel will through the necessary actions provide incidental response measures for incidents such as:

- Incipient spill control and containment measures and prevention
- Removal of personnel from emergency situations
- Provision of initial medical support for injury/illnesses requiring only first-aid level support
- Provision of site control and security measures, as necessary

2.2 PRE-EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, injury or illnesses resulting from exposure to chemical or physical hazards or fire are the most probable emergencies that could be encountered during site activities. To minimize and eliminate these potential emergency situations, pre-emergency planning activities associated with this project shall be implemented. The SSO and/or the FOL are responsible for:

- Coordinating response actions with MCRD, Parris Island Emergency Services personnel to ensure that B&R Environmental emergency action activities are compatible with existing facility emergency response procedures.

- Initial site inspection and preparation of investigation areas prior to sending equipment and personnel in to initiate proposed activities. In this manner potential physical hazards can be identified, blocked or barricaded, or removed prior to exposing field personnel.

- Periodic site safety surveys of work activities performed by B&R Environmental FOL and/or the SSO, and subcontractor supervisory representative to identify potential hazards and emergency situations.

- Establishing and maintaining information at the project staging area (support zone) for easy access in the event of an emergency. This information will include the following:

  - Chemical Inventory List (for substances used on site), with Material Safety Data Sheets.
  - On site personnel medical records (medical data sheets).
  - A logbook identifying personnel on site each day.
  - A copy of this HASP.
  - A copy of the B&R Environmental Health and Safety Guidance Manual.

- Identifying a chain of command for emergency action.

- Educating site workers to the hazards and control measures associated with planned activities at the site, and providing early recognition and prevention, where possible.

- Drilling and practicing incidental response measures periodically.

2.3 EMERGENCY RECOGNITION AND PREVENTION

2.3.1 Recognition

Foreseeable emergency situations that may be encountered during site activities will generally be recognizable by visual observation. Visual observation will be the principal method of identifying physical hazards that may be associated with the proposed scope of work. Visual observation may also play a role in detecting some chemical exposures. A clear knowledge of signs and symptoms of chemical overexposures will provide the information to on site personnel of what to expect and what symptoms may be evident in the event an overexposure takes place. These potential hazards, the activities with which they have been associated, and the recommended control methods are discussed in

detail in Sections 5.0 and 6.0 of this document. Additionally, as stated above, early recognition will be supported by periodic site surveys to eliminate any situation predisposed to an emergency. The FOL, SSO, and subcontractor supervisory personnel will constitute the site evaluation team responsible for these periodic surveys. Site surveys will be conducted at least once a week during the initiation of this effort.

The above actions will provide for the early recognition of potential emergency situations. B&R Environmental will only provide incipient stage (i.e., early stage spill response) support. Should an incident take place, B&R Environmental may take defensive measures to control these situations depending on the nature and extent of the incident. However, if the FOL and the SSO determine that an incident has progressed to a serious emergency situation, B&R Environmental will withdraw, and notify the appropriate response agencies using Table 2-1.

2.3.2 Prevention

B&R Environmental and subcontractor personnel will minimize the potential for emergencies by ensuring compliance with the HASP, the Health and Safety Guidance Manual, applicable OSHA regulations, and by following directions given by those persons responsible for the health, safety, and welfare of the field crews.

2.4 SAFE DISTANCES AND PLACES OF REFUGE

In the event that the site must be evacuated, all personnel will immediately stop activities and report to a safe place of refuge at the support zone area. The safe place of refuge may also serve as the telephone communication point, as communication with emergency response agencies may be necessary. Telephone communication points and safe places of refuge will be determined prior to the commencement of site activities and will be conveyed to personnel as part of issuing the Safe Work Permits to be issued for all exclusion zones activities on a daily basis. Places of refuge and evacuation routes are identified in Section VII, of the Safe Work Permit (See Section 9.4). Upon reporting to the refuge location, personnel will remain there until directed otherwise by the B&R Environmental FOL, SSO, or the On-Scene Incident Commander. The FOL or the SSO will take a head count at this location to confirm the presence of all site personnel. The site logbook will be used to take the head count. Emergency response agencies will be notified of any unaccounted for personnel.

TABLE 2-1
EMERGENCY REFERENCE
MCRD PARRIS ISLAND, SOUTH CAROLINA

AGENCY	TELEPHONE
EMERGENCY (Fire, Police, and Ambulance)	911
Hospital: Beaufort Memorial Hospital	(803) 522-5200
Provost Marshall's Office	(803) 525-2478
Facility Point of Contact Harold (Dean) Bradley, NREAO	(803) 525-2630
Chemtrec National Response Center	(800) 424-9300 (800) 424-8802
B&R Environmental, Pittsburgh Office	(412) 921-7090
Health and Safety Manager Matthew M. Soltis, CIH, CSP	(412) 921-8912
Project Health and Safety Officer Delwyn E. Kubeldis, CIH, CSP	(412) 921-8529
Task Order Manager, Mark Speranza, PE	(412) 921-8916
Maintenance (Emergency) Maintenance Division, Utilities Branch	(803) 525-3145 (803) 525-3405
Navy Remedial Project Manager, Art Sanford	(803) 820-7482

2.5 EVACUATION ROUTES AND PROCEDURES

Once an evacuation is initiated, personnel will terminate site activities and proceed immediately to the designated place of refuge as identified on the Safe Work Permit for activities conducted within that area, unless doing so would further jeopardize the welfare of workers. In such an event, personnel will proceed to a designated alternate location and remain there until further notification from the FOL. The use of these locations as assembly points provides communication and a direction point for emergency services, should they be needed.

Evacuation procedures will be discussed prior to the initiation of any work at the site. Primary and secondary evacuation routes will be conveyed to site personnel each day as part of issuing the Safe Work Permits for a particular task and area. Evacuation routes from the site are dependent upon the location at which work is being performed and the circumstances under which an evacuation is required. Additionally, site location and meteorological conditions (i.e., wind speed and direction) will influence the designation of evacuation routes. As a result, assembly points will be selected, and will be proceeded to by field personnel in the event of an emergency by the most direct route possible without further endangering themselves.

2.6 DECONTAMINATION PROCEDURES/EMERGENCY MEDICAL TREATMENT

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

2.7 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

Since B&R Environmental personnel will not always be working in close proximity to each other, hand signals, voice commands, air horns, and two-way radios will comprise the mechanisms to alert site personnel of an emergency.

If an incident occurs, site personnel will initiate the following procedures:

- Initiate incident alerting procedures (if needed) verbally, by air horn, or using two-way radios.

- Describe to the FOL (who will serve as the Incident Coordinator) what has occurred and as many details as possible. Once all personnel are evacuated, incipient response procedures will be enacted to control the situation.

- If the FOL and/or the SSO determine that the situation is beyond the capabilities of the site personnel emergency services will be contact using the emergency reference information listed in Table 2-1. Explain the situation and the appropriate emergency services will be dispatched. **Stay on the phone follow the instructions of the emergency dispatcher.**

2.8 PERSONAL PROTECTIVE EQUIPMENT (PPE) AND EMERGENCY EQUIPMENT

A first-aid kit, stretcher, fire extinguishers (strategically placed), and fire blanket will be maintained on site and shall be immediately available for use in the event of an incident. The PPE used in support of everyday activities will serve as the first line of defense in an emergency. This PPE will be required in all work areas of the site and will be accessible to authorized personnel.

2.9 EMERGENCY CONTACTS

Prior to performing work at the site, all personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. A mobile phone shall be available on site, if a telephone communications point near the area of operation is not available or if telephone service to the site trailer is not provided. As indicated earlier, Table 2-1 provides a list of emergency contacts and their corresponding telephone numbers. This table must be posted on site where it is readily available to all site personnel.

2.10 EMERGENCY ROUTE TO HOSPITAL

The closest hospital to MCRD is Beaufort Memorial Hospital in Beaufort, South Carolina. Area maps showing the proximity of the MCRD to the hospital shall be incorporated into this HASP as in Figure 2-1. Directions to the hospital is provided below:

Beaufort Memorial Hospital:

- Leave the island by way of Malecon Drive, over Archers Creek and across the Causeway.
- Exit the Main Gate and proceed east over Battery Creek (Bell Memorial Bridge) onto Ribaut Road.
- Proceed approximately three (3) miles north on Ribaut Road to the hospital.
- Follow signs to entrance of Beaufort Memorial Hospital.

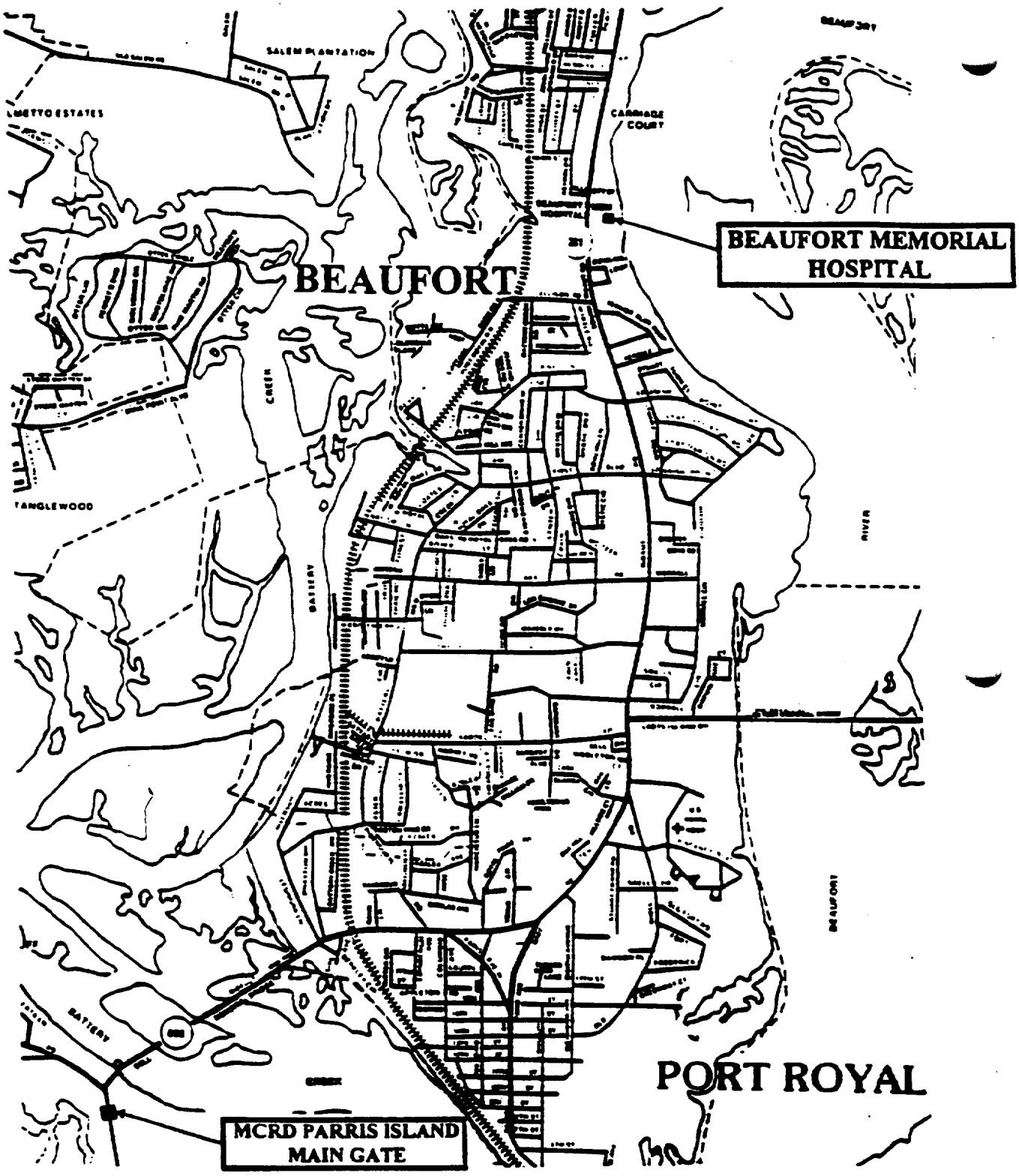


FIGURE 2-1

EMERGENCY ROUTE

MCRD PARRIS ISLAND

3.0 SITE BACKGROUND

3.1 FACILITY HISTORY

The MCRD Parris Island is located approximately 3 miles south of the city of Beaufort, South Carolina. MCRD Parris Island was placed on the United Sates Environmental Protection Agency's (U.S. EPA's) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) in January of 1995, primarily due to the presence of unlined landfills placed in direct contact with surrounding wetlands. Additional information regarding site background is contained in the Volume I Master Work Plan (Master Project Plan).

3.2 SITE DESCRIPTIONS/SITE ACTIVITIES

Site 12/SWMU 10, Jericho Island Disposal Area, covers an area approximately 100 feet by 250 feet along the central part of the southern edge of Jericho Island in the northwest section of the Depot. The Site/SWMU extends from the island's edge southward onto the marsh. The island was acquired by the Depot to enable the facility to comply with the limited distance arc required for weapons ranges.

It has been reported that wastes were brought to the island by local residents and no organized landfill operations occurred. Disposal of waste at this site occurred from about 1955 to 1968. The disposal area received routine domestic trash including: small metal cans, beer and soda bottles, hubcaps, tires, buckets, cinder blocks, metal five-gallon cans, sheet metal, paper, plastic, and wood. Analytical results from prior investigations identified various metals, phthalates, pesticides, polynuclear aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). The magnitude of the concentrations of these contaminants is discussed further in Section 6.0 - Hazard Assessment. The area has an irregular, undulating surface due to the random scattering of waste piles, ranging up to approximately 30 feet in diameter and 5 feet in height (Kearney, 1990).

4.0 SCOPE OF WORK

This section of the HASP addresses all proposed site activities that are to be conducted at the MCRD, Parris Island facility. This site-specific HASP, particularly Table 5-1, provides information related to each of those tasks to be performed as part of the scope of work. If other tasks, other than those identified, are to be performed at this site this HASP will have to be modified.

The activities to be conducted as part of the scope of work include:

- Mobilization and demobilization
- Decontamination
- IDW Management (including waste handling)
- Surface water, sediment, groundwater, soil and subsurface sampling
- Soil boring and monitoring well installations
- Groundwater-level measurements
- Slug tests (hydraulic conductivity testing)
- Surveying (Global Positioning System and High Resolution Cesium Vapor Magnetometer/Gradiometer)

The above listings represent a summary of the identified tasks as they apply to the scope and application of this HASP. For a more detailed description of associated tasks see the Work Plan (WP) or the Implementation Plan.

5.0 TASKS/HAZARDS/ASSOCIATED CONTROL MEASURES SUMMARIZATION

Table 5-1 of this section serves as the primary portion of this site-specific HASP, addressing the tasks that are to be performed. The anticipated hazards, recommended control measures, air monitoring recommendations, required PPE, and decontamination measures for each site task are discussed in detail in this table. This table and the associated control measures shall be changed if the scope of work, contaminants of concern, or site conditions change. Through using the table, the FOL and field personnel can determine which hazards are associated with each task, what hazards are present at each site area, and what associated control measures are necessary to minimize potentials for personnel exposure or injuries. **The contents of this table are to be used as the primary reference for the SSO in the completion of the daily Safe Work Permits.**

TABLE 5-1

TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR JERICHO ISLAND DISPOSAL SITE MARINE CORPS RECRUIT DEPOT, PARRIS ISLAND, SOUTH CAROLINA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Soil borings and monitoring wells installation. (mud rotary, hollow-stem augers, and geoprobe methods)	*Chemical Hazards* 1) General contaminants of concern associated with this site includes various metals (primarily arsenic and lead), phthalates (represented as bis[2-ethylhexyl]phthalate), pesticides (primarily chlordane, DDT, DDE, and DDD), PAHs, and PCBs (primarily Aroclor 1260). None of the contaminants, however, are present in significant concentrations to represent an inhalation hazard. Nonetheless, it is recommended that exposure (via inhalation, ingestion, or skin contact) to these contaminants be minimized. Further information on these contaminants and other potential contaminants is presented in Table 6-1. 2) Transfer of contamination into clean areas or onto persons *Physical hazards* 3) Heavy equipment hazards (pinch/compression points, rotating equipment, hydraulic lines, etc.) 4) Noise 5) Energized systems 6) Lifting 7) Natural Hazards 8) Slip, trips, and falls 9) Vehicular and foot traffic 10) Ambient temperature extremes (heat stress)	1) Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (e.g. air, water, soils, etc.). Generation of dusts should be minimized to the greatest extent possible. If airborne dusts are observed, area wetting methods will be used. If area wetting methods are not feasible, upgraded levels of protection or termination of activities will be used to minimize exposure to excessive airborne dusts. 2) Decontaminate all equipment and supplies between boreholes and prior to leaving the site. 3) All equipment to be used will be - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600,.601,.602), and manufacturers design and documented as such using the Equipment Record Sheet (See Section 10.0 of the B&R Environmental Health and Safety Guidance Manual). - Operated by knowledgeable operators, and knowledgeable ground crew. - Used within establish safe zones and routes of approach - Only manufacturer approved equipment may be used in conjunction with equipment repair procedures (i.e. pins, etc.). In addition, to equipment considerations the following safe operating procedures will be incorporated: - All personnel not directly supporting the subsurface investigation will remain at least 15 feet from the point of operation. - Hydraulic masts or other projecting devices shall be at least 20 feet from overhead power lines unless they are shielded and a minimum of 3 feet from underground utilities unless the exact location of the underground utility is known. - Work areas will be kept clear of clutter. - Secure all loose articles, PPE and clothing to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - All personnel working in high equipment traffic areas are required to wear reflective vests for high visibility. - Hand signals will be established prior to the commencement of drilling activities. - The driller and helper can simultaneously handle moving augers or flights only when there is a stand by person to activate the emergency stop device. - The driller must never leave the controls while tools are rotating unless all personnel are clear of rotating equipment. - A long handled shovel or equivalent shall be used to clear away drill cuttings from the hole and rotating equipment. Hands or feet shall not be used for this purpose. - Never climb a drill mast while equipment is rotating. - Use ANSI approved fall protection (i.e., belts, lanyards and a fall protection slide rail) or portable ladders which meet OSHA's requirements when climbing drill masts. - All personnel will be instructed in the location and operations of the emergency shut off device(s). This device will be tested initially (and then periodically) to insure its operational status. - The drilling and support vehicles will be moved no closer than 3 feet to banks or excavations unless the sidewalls are supported. 4) Hearing protection will be used during all subsurface activities. 5) All utility clearances shall be obtained prior to subsurface activities. Prior to any subsurface investigations, the locations of all underground utilities will be identified and marked. Obtain written permit clearance prior to all subsurface investigations. 6) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 7) Avoid nesting areas, employ repellents. Report potential hazards to the SSO. 8) Preview work locations for unstable/uneven terrain. 9) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - Use safety belts and follow the site traffic rules. 10) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat stress concerns is provided in section 4 of the Brown & Root Environmental Health and Safety Guidance Manual.	**It is anticipated that potential contaminant concentrations at outdoor sample locations will not represent an inhalation hazard.** Photoionization Detector w/ 10.2 eV UV lamp source, or a Flame Ionization Detector, will be used as follows:. Source (borehole and geoprobe sampler) monitoring will be conducted at regular intervals determined by the SSO. The SSO will also monitor the breathing zone (BZ) of all potentially affected employees, with the following guidance: - Workers must don Level C PPE if sustained BZ concentrations are above 50 ppm. - Workers must evacuate to a safe area if sustained BZ concentrations exceed 500 ppm. Some of the contaminants of concern are solids, and are non-detectable using PID/FID direct reading instruments. Also, other site contaminants may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to the greatest extent possible to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be performed by observing work conditions for visible dust clouds. Potential exposure to contaminated dust will be controlled using water suppression, by avoiding dust plumes, or by upgrading the level of protection. Upgrade to Level C protection shall occur anytime sustained visible dust is present in a worker's breathing zone. The SSO may perform noise dosimetry to ensure that noise levels are not excessive. Where the utility clearance cannot be obtained in a reasonable period, or not located, drilling shall proceed with extreme caution using a magnetometer for periodic downhole surveys every 2 feet to a depth of at least 6 feet.	All subsurface operations are to be initiated in Level D protection. Level D protection constitutes the following minimum protection - Standard field attire (Long sleeve shirt; long pants) - Tyvek coveralls and disposable boot covers if surface contamination is present or if the potential exists for soiling work attire. - Nitrile gloves or leather gloves with surgical style inner gloves - Safety shoes (Steel toe/shank) - Safety glasses - Hardhat - Reflective vest for high traffic areas - Hearing protection for high noise areas, as directed by the SSO. **Level C** Upgrade to Level C protection, defined as follows, may be necessary as discussed under Hazard Monitoring. - Full-face Air-Purifying Respirator (APR) with a combination High Efficiency Particulate Air (HEPA) filter and organic vapor (OV) cartridge. - Standard field attire (long sleeve shirt; long pants) - Tyvek coveralls and disposable boot covers. Note: PVC splash suit and impermeable boot covers required if a potential for splashes or contact with pesticides exists. All joints in the ensemble (wrists, ankles, etc.) must be securely taped. Personnel must closely inspect all PPE prior to beginning any on-site activities. - Nitrile gloves or leather gloves with surgical style inner gloves - Safety shoes (Steel toe/shank) - Hardhat (when overhead hazards exists, or identified as an operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, as directed by the SSO.	**Personnel Decontamination** will consist of a soap/water wash and rinse for outer protective equipment (boots, gloves, PVC splash suits, etc.). This function will take place at an area adjacent to the site activities. This procedure will consist of: - Equipment drop - Soap/water wash and rinse of outer boots and gloves **Note:** For PPE Level C, cartridge change out would take place at this point, if necessary. - Soap/water wash and rinse of the outer splash suit, as applicable - Outer suit, boot covers, outer glove removal - Respiratory (face mask) protection removal - Wash hands and face, leave contamination reduction zone

TABLE 5-1

TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR JERICHO ISLAND DISPOSAL SITE MARINE CORPS RECRUIT DEPOT, PARRIS ISLAND, SOUTH CAROLINA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Multi-media sampling including soils (surface, subsurface); water (groundwater, sediment, and surface water) This task also includes groundwater-level measurements and slug tests (*hydraulic conductivity* testing)	*Chemical Hazards* 1) General contaminants of concern associated with this site includes various metals (primarily arsenic and lead), phthalates (represented as bis[2-ethylhexyl]phthalate), pesticides (primarily chlordane, DDT, DDE, and DDD), PAHs, and PCBs (primarily Aroclor 1260). None of the contaminants, however, are present in significant concentrations to represent an *inhalation hazard. Nonetheless, it is recommended* that exposure (via inhalation, ingestion, or skin contact) to these contaminants be minimized. Further information on these contaminants and other potential contaminants is presented in Table 6-1. 2) Transfer of contamination into clean areas *Physical hazards* 3) Noise 4) Lifting (muscle strains and pulls) 5) Pinches and compressions 6) Slip, trips, and falls 7) Natural hazards (Insect/animal bites and stings) 8) Contact with sharp objects (glass, metal, etc.) 9) Vehicular and foot traffic 10) Ambient temperature extremes (heat stress)	1) Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (e.g. air, water, soils). Generation of dusts should be minimized to the greatest extent possible. If airborne dusts are observed, area wetting methods will be used. If area wetting methods are not feasible, upgraded levels of protection or termination of activities will be used to minimize exposure to observed airborne dusts. 2) Decontaminate all equipment and supplies between sampling locations *and prior to leaving the site.* 3) When sampling at the drill rig use hearing protection. The use of hearing protection outside of 25 feet from the drill rig should be incorporated under the following condition: If you have to raise your voice to talk to someone who is within 2 feet *of your location, hearing protection must be worn.* 4) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 5) Use pinch bars or other equipment to keep hands from the point of operation. - *A remote sampling device must be used to sample drill cuttings near* rotating tools. The equipment operator shall shutdown machinery if the sampler is near moving machinery parts. 6) Preview work locations for unstable/uneven terrain. 7) Avoid nesting areas, employ repellents. Report potential hazards to the SSO. 8) Avoid contacting sharp objects by observing sampling media for objects. Wear appropriate PPE (e.g., leather gloves and safety shoes) if objects must be touched. 9) Traffic and equipment considerations are to include the following: - *Establish safe zones of approach (i.e. Boom + 3 feet).* - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - Use safety belts and follow the site traffic rules. 10) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat *stress concerns is provided in section 4 of the Brown & Root Environmental* Health and Safety Guidance Manual.	**It is anticipated that potential contaminant concentrations at outdoor sample locations will not represent an inhalation hazard.** A Photoionization Detector w/ 10.2 eV UV lamp source, *or a Flame Ionization Detector, will be used to monitor* for applicable site contaminants. Source (borehole and geoprobe sampler) monitoring will be conducted at regular intervals determined by the SSO. The SSO will also monitor the breathing zone (BZ) of all potentially affected employees, with the *following guidance:* - Workers must don Level C PPE if sustained BZ concentrations are above 50 ppm. - Workers must evacuate to a safe area if sustained BZ concentrations exceed 500 ppm. Some of the contaminants of concern are solids, and are non-detectable using PID/FID direct reading instruments. *Also, other site contaminants may adhere to or be part of* airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to the greatest extent possible to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be performed by observing work conditions for visible dust clouds. Potential exposure to *contaminated dust will be controlled using water* suppression, by avoiding dust plumes, or by upgrading the level of protection. Upgrade to Level C protection shall occur anytime sustained visible dust is present in a worker's breathing zone.	Level D protection will be utilized for the initiation of all sampling activities. Level D - (Minimum Requirements) - Standard field attire (long sleeve shirt; long pants) - Tyvek coveralls and disposable boot covers if surface contamination is present or if the potential for soiling work attire exists. - Nitrile gloves with surgical style inner gloves for soil and groundwater sampling - Safety shoes (steel toe/shank) - Safety glasses - *Hardhat (when overhead hazards exists, or identified* as a operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, or as directed on an operation by operation scenario. - Leather or suitable glove if contacting sharp objects ***Excessive chemical contaminant concentrations impacting field crews during this task are not anticipated. The following information is based on a contingency action only.*** **Level C** *Upgrade to Level C protection, defined as follows, may* be necessary as discussed under Hazard Monitoring. - Full-face Air-Purifying Respirator (APR) with a combination High Efficiency Particulate Air (HEPA) filter and organic vapor (OV) cartridge. - Standard field attire (long sleeve shirt; long pants) - Tyvek coveralls and disposable boot covers. Note: *PVC splash suit and impermeable boot covers required if* a potential for splashes or contact with pesticides exists. All joints in the ensemble (wrists, ankles, etc.) must be securely taped. Personnel must closely inspect all PPE prior to beginning any on-site activities. - Nitrile gloves or leather gloves with surgical style inner gloves - Safety shoes (Steel toe/shank) - Hardhat (when overhead hazards exists, or identified as an operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, as directed by the SSO.	**Personnel Decontamination** will consist of a soap/water wash and rinse for outer protective equipment (e.g. boots, gloves, PVC splash suits, etc.). This function will take place at a satellite location. Disposable PPE will be bagged between sampling events. This decontamination procedure for **Level D** protection will consist of - Equipment drop - Soap/water wash and rinse of outer boots and outer gloves, as applicable - Soap/water wash and rinse of the outer splash suit, as applicable *APR cartridge change out would take place at this point, if applicable.* - Outer suit, boot covers, outer glove removal - Respiratory (face mask) protection removal, if applicable - Wash hands and face, leave contamination reduction zone **Equipment Decontamination** - Sampling equipment will be decontaminated as per the requirements in the Sampling and Analysis Plan and/or Work Plan. MSDS for any decon solutions (Alconox, methanol, isopropanol, hexane, etc.) will be obtained and used to *determine proper handling / disposal methods and* protective measures (PPE, first-aid, etc.). All equipment used in the exclusion zone will require a complete decontamination between locations and prior to removal from the site. The FOL or the SSO will be responsible for evaluating equipment arriving onsite and that which is to leave the site. No equipment will be authorized access or exit without this evaluation.

TABLE 5-1

TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR JERICHO ISLAND DISPOSAL SITE MARINE CORPS RECRUIT DEPOT, PARRIS ISLAND, SOUTH CAROLINA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Mobilization/ Demobilization	*Physical Hazards* 1) Lifting (muscle strains and pulls) 2) Pinches and compressions 3) Slip, trips, and falls 4) Heavy equipment hazards (rotating equipment, hydraulic lines, etc.) 5) Natural hazards (Insect/animal bites and stings) 6) Vehicular and foot traffic 7) Ambient temperature extremes (heat stress)	1) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 2) Use pinch bars or other equipment to keep hands from the machine point of operation. 3) Preview work locations for unstable/uneven terrain. 4) All equipment will be - Inspected in accordance with OSHA, and manufacturers design. - Operated by knowledgeable operators, and knowledgeable ground crew. 5) Avoid nesting areas, use repellents. Report potential hazards to the SSO. 6) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - Use safety belts and follow the site traffic rules. 7) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat stress concerns is provided in section 4 of the Brown & Root Environmental Health and Safety Guidance Manual.	Not required	Level D - (Minimum Requirements) - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - *Safety glasses* - *Hardhat (when overhead hazards exists, or identified as a operation requirement)* - *Reflective vest for high traffic areas* - *Hearing protection for high noise areas, or as directed on an operation by operation scenario.* *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Not required
Decontamination of Sampling and Heavy Equipment	*Chemical Hazards* 1) General contaminants of concern associated with this site includes various metals (primarily arsenic and lead), phthalates (represented as bis[2-ethylhexyl]phthalate), pesticides (primarily chlordane, DDT, DDE, and DDD), PAHs, and PCBs (primarily Arcolor 1260). None of the contaminants, however, are present in significant concentrations to represent an inhalation hazard. Nonetheless, it is recommended that exposure (via inhalation, ingestion, or skin contact) to these contaminants be minimized. Further information on these contaminants and other potential contaminants is presented in Table 6-1. 2) Decontamination fluids - Liquinox (detergent), acetone or methanol, and hexane *Physical Hazards* 3) Lifting (muscle strains and pulls) 4) Noise 5) Flying projectiles 6) Vehicular and foot traffic 7) Ambient temperature extremes (heat stress) 8) Slips, trips, and falls	1) and 2) Employ protective equipment to minimize contact with site contaminants and hazardous decontamination fluids. Obtain manufacturer's MSDS for any decontamination solvents used onsite. Use appropriate PPE as identified on MSDS. All chemicals used must be listed on the Chemical Inventory for the site, and site activities must be consistent with the Hazard Communication section of the Health and Safety Guidance Manual (Section 5). 3) Use multiple persons where necessary for lifting and handling sampling equipment for decontamination purposes. 4) Wear hearing protection when operating pressure washer. 5) Use eye and face protective equipment when operating pressure washer. All other personnel must be restricted from the area. 6) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - Use safety belts and follow the site traffic rules. 7) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat stress concerns is provided in section 4 of the Brown & Root Environmental Health and Safety Guidance Manual. 8) Preview work locations for unstable/uneven terrain.	Use visual observation, and real-time monitoring instrumentation to ensure all equipment has been properly cleaned of contamination and dried. After decon is completed, screen equipment with a PID/FID. If any elevated readings (i.e., above background) are observed, perform decon again and rescreen. Repeat until no elevated PID/FID readings are noted.	*For Heavy Equipment* This applies to high pressure soap/water, steam cleaning wash and rinse procedures. Level D Minimum requirements - - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Chemical resistant boot covers - Nitrile outer gloves, cotton liners - PVC Rainsuits or PE or PVC coated Tyvek - Safety glasses underneath a splash shield - Hearing protection (plugs or muffs) Respiratory protection is not anticipated for this activity. *For sampling equipment (trowels, MacroCore Samplers, bailers, etc.)*, the following PPE is required Level D Minimum requirements - - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Nitrile outer gloves, cotton liners - Safety glasses underneath a splash shield In the event of overspray of chemical decontamination fluids employ PVC Rainsuits or PE or PVC coated Tyvek as necessary.	This decontamination procedure for **Level D** protection will consist of - Soap/water wash and rinse of outer gloves - Soap/water wash and rinse of the outer splash suit, as applicable - Remove PPE, dispose of as appropriate - Wash hands and face, leave contamination reduction zone **Equipment Decontamination** - All heavy equipment decontamination will take place at a centralized decontamination pad utilizing steam or pressure washers. Heavy equipment such as geoprobe, will have the wheels and tires cleaned along with any loose debris removed, prior to transporting to the central decontamination area. All site vehicles will be restricted access to exclusion zones, or also have their wheels/tires sprayed off as not to track mud onto the roadways servicing this installation. Roadways shall be cleared of any debris resulting from the onsite activity. All equipment used in the exclusion zone will require a complete decontamination between locations and prior to removal from the site. The FOL or the SSO will be responsible for evaluating equipment arriving onsite and that which is to leave the site. No equipment will be authorized access or exit without this authorization. Evaluation will consist of - Visual inspection - Scanning equipment with monitoring instruments

IDW management and moving IDW drums to storage areas	*Chemical Hazards* 1) General contaminants of concern associated with this site includes various metals (primarily arsenic and lead), phthalates (represented as bis[2-ethylhexyl]phthalate), pesticides (primarily chlordane, DDT, DDE, and DDD), PAHs, and PCBs (primarily Aroclor 1260). None of the contaminants, however, are present in significant concentrations to represent an inhalation hazard. Nonetheless, it is recommended that exposure (via inhalation, ingestion, or skin contact) to these contaminants be minimized. Further information on these contaminants and other potential contaminants is presented in Table 6-1. 2) Transfer of contamination into clean areas *Physical hazards* 3) Noise 4) Lifting (muscle strains and pulls) 5) Pinches and compressions 6) Slip, trips, and falls 7) Natural hazards (Insect/animal bites and stings) 8) Vehicular and foot traffic 9) Ambient temperature extremes (heat stress)	1) Employ real-time monitoring instrumentation, action levels, and identify PPE to control exposures to potentially contaminated medias (e.g. air, water, soils). 2) Decontaminate all equipment and supplies, if they become contaminated, between locations and prior to leaving the site. 3) When using heavy equipment to move IDW drums employ hearing protection. 4) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 5) Use pinch bars or other equipment to keep hands from the point of operation. 6) Preview work locations for unstable/uneven terrain. 7) Avoid nesting areas, employ repellents. Report potential hazards to the SSO. 8) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - Use safety belts and follow the site traffic rules. 9) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat stress concerns is provided in section 4 of the Brown & Root Environmental Health and Safety Guidance Manual.	**It is anticipated that potential contaminant concentrations at outdoor sample locations will not represent an inhalation hazard.** A Photoionization Detector w/ 10.2 eV UV lamp source, or a Flame Ionization Detector, will be used to monitor for applicable site contaminants. Source (borehole and geoprobe sampler) monitoring will be conducted at regular intervals determined by the SSO. The SSO will also monitor the breathing zone (BZ) of all potentially affected employees, with the following guidance: - Workers must don Level C PPE if sustained BZ concentrations are above 50 ppm. - Workers must evacuate to a safe area if sustained BZ concentrations exceed 500 ppm. Some of the contaminants of concern are solids, and are non-detectable using PID/FID direct reading instruments. Also, other site contaminants may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to the greatest extent possible to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be by observing work conditions for visible dust clouds. Potential exposure to contaminated dust will be controlled by using water suppression, by avoiding dust plumes, or by upgrading the level of protection. Upgrade to Level C protection shall occur anytime sustained visible dust is present in a worker's breathing zone.	Level D protection will be utilized for the initiation of all sampling activities. Level D - (Minimum Requirements) - Standard field attire (long sleeve shirt; long pants) - Tyvek coveralls and disposable boot covers if surface contamination is present or if the potential for soiling work attire exists. - Nitrile gloves with surgical style inner gloves for soil and groundwater sampling - Safety shoes (steel toe/shank) - Safety glasses - Hardhat (when overhead hazards exists, or identified as a operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, or as directed on an operation by operation scenario. **Excessive chemical contaminant concentrations impacting field crews during this task are not anticipated. The following information is based on a contingency action only.** **Level C** Upgrade to Level C protection, defined as follows, may be necessary as discussed under Hazard Monitoring. - Full-face Air-Purifying Respirator (APR) with a combination High Efficiency Particulate Air (HEPA) filter and organic vapor (OV) cartridge. - Standard field attire (long sleeve shirt; long pants) - Tyvek coveralls and disposable boot covers. Note: PVC splash suit and impermeable boot covers required if a potential for splashes or contact with pesticides exists. All joints in the ensemble (wrists, ankles, etc.) must be securely taped. Personnel must closely inspect all PPE prior to beginning any on-site activities. - Nitrile gloves or leather gloves with surgical style inner gloves - Safety shoes (Steel toe/shank) - Hardhat (when overhead hazards exists, or identified as an operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, as directed by the SSO.	**Personnel Decontamination** will consist of a soap/water wash and rinse for outer protective equipment (boots, gloves, PVC splash suits, etc.). This function will take place at an area adjacent to the site activities. This procedure will consist of: - Equipment drop - Soap/water wash and rinse of outer boots and gloves **Note:** For PPE Level C, cartridge change out would take place at this point, if necessary. - Soap/water wash and rinse of the outer splash suit, as applicable - Outer suit, boot covers, outer glove removal - Respiratory (face mask) protection removal - Wash hands and face, leave contamination reduction zone
Surveying (including Global Positioning System and High Resolution Cesium Vapor Magnetometer/Gradiometer)	*Physical Hazards* 1) Slip, trips, and falls 2) Natural hazards (Insect/animal bites and stings) 3) Vehicular and foot traffic 4) Ambient temperature extremes (heat stress)	1) Preview work locations for unstable/uneven terrain. Barricade all excavations from access closer than two feet from the edge. 2) Avoid nesting areas, use repellents. Report potential hazards to the SSO. 3) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - Use safety belts and follow the site traffic rules. 4) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat stress concerns is provided in section 4 of the Brown & Root Environmental Health and Safety Guidance Manual.	Not required	Level D - (Minimum Requirements) - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - *Safety glasses* - *Hardhat (when overhead hazards exists, or identified as a operation requirement)* - *Reflective vest for high traffic areas* *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Not anticipated given nature of task.

6.0 HAZARD ASSESSMENT

This section provides information regarding the chemical and physical hazards associated with the MCRD Parris Island site and the activities that are to be conducted as part of the scope of work. Table 6-1 provides various information related to the chemical hazards that may be present at the site. Specifically, toxicological information, exposure limits, symptoms of exposure, physical properties, and air monitoring and sampling data are also discussed in that table.

6.1 CHEMICAL HAZARDS

Potential chemical hazards associated with the site is based on information regarding previous disposal practices and landfill operations, including reported burning of municipal trash. Based on the results of analytical testing of soil samples, contaminants of concern include various metals (primarily lead and arsenic), phthalates (represented as bis[2-ethylhexyl]phthalate), pesticides (primarily chlordane, DDT, DDE, and DDD), PAHs, and PCBs (primarily Aroclor 1260). None of the contaminants, however, are present in significant concentrations to represent an inhalation hazard. Nonetheless, it is recommended that exposure (via inhalation, ingestion, or skin contact) to these contaminants be minimized where feasible. Information on the toxicological, chemical, and physical properties of several potential contaminants of concern are addressed in Table 6-1 of this HASP. It is anticipated that the greatest potential for exposure to site contaminants is during intrusive activities (drilling, monitoring well installations, sampling, etc.).

6.2 PHYSICAL HAZARDS

In addition to the chemical hazards discussed above, the following physical hazards may be present during the performance of site activities.

- Heavy equipment hazards (contact / entanglement with rotating equipment, hydraulic line hazards, etc.)
- Slips, trips, and falls.
- Contact with sharp objects (glass, metal, etc.)
- Energized systems (electric lines, gas lines, water lines, etc.).
- Strain from heavy lifting.
- Pinch / compression points.
- Noise in excess of 85 decibels (dBA).

- Ambient temperature extremes (heat stress)
- Vehicular and foot traffic
- Natural hazards (Contact with poisonous plants, insects, etc.).

These physical hazards and their applicability to each site task are discussed in detail in Table 5-1. Additionally, each of these physical hazards is discussed in greater detail in the B&R Environmental Health and Safety Guidance Manual.

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
MCRD, PARRIS ISLAND, SOUTH CAROLINA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Benzo(a)pyrene	50-32-8	Particulate form - This substance is not detectable using a PID or FID.	Air sample using a glass fiber or silver membrane filter; analysis by gas chromatography/infrared or other spectrophotometric method or colorimeter. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #1(186).	OSHA: 0.2 mg/m³ NIOSH: 0.1 mg/m³	Adequate - use a full-face air-purifying respirator with dust/mist cartridge up to 10 mg/m³. Recommended glove: Nitrile	**Boiling Pt:** 594°F; 312°C **Melting Pt:** 354°F; 179°C **Solubility:** Insoluble **Flash Pt:** Not available **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** 10 mmHg @ 594°F; 312°C **Specific Gravity:** Not available **Incompatibilities:** Not available **Appearance and Odor:** Yellow odorless crystals.	Regulated primarily as a result of potential carcinogenic properties. Listed by NTP, IARC, and ACGIH as carcinogenic.
General PAHs (Fluoranthene, pyrene, benzo(a) anthracene, benzo(a) pyrene, benzo(f)fluoranthene, benzo(k)fluoranthene), etc.)	(CAS Numbers vary depending on specific compound)	PID: I.P. of 8.97 eV, relative response ratio unknown. FID: Response factor unknown but given the substances flammability, detection by FID can be anticipated.	Refer to NIOSH methods for each specific compound for appropriate air sampling protocols. Many PAHs can be sampled using <u>NIOSH Method 5506 or 5515</u> - Teflon filter with support ring - High pressure liquid chromatography with UV detector. For cresol (a major constituent of creosote) by silica gel or xad-7 sorbent tube; Acetone desorption and analysis by gas chromatography - flame ionization detector or high-pressure liquid chromatography. (NIOSH Method #2001, or OSHA Method #32)	**General PAHs:** Most PAHs have no established exposure limits. Other Coal Tar Pitch Volatiles / PAHs such as chrysene and benzo(a)pyrene have an exposure limit of 0.2 mg/m³ (OSHA and ACGIH). 0.1 mg/m³ - (NIOSH) **Creosote / Cresol:** OSHA; ACGIH: 5 ppm NIOSH: 2.3 ppm IDLH: 80 mg/m³	Adequate - use a full-face air-purifying respirator with organic vapor / dust/mist cartridge up to 250 ppm. Cresol has an Odor Threshold of 0.00005-0.0079 ppm. Recommended gloves: Viton >96.00 hrs; butyl rubber >90.00 hrs; neoprene >4.50 hrs	Properties of various PAHs/Coal Tar Pitch Volatiles vary depending upon the specific compound. *<u>For Creosote/Cresol:</u>* **Boiling Pt:** 376-397°F; 191-203°C **Melting Pt:** 52-96°F; 10.9-35.5°C **Solubility:** Insoluble **Flash Pt:** 178°F; 81°C **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** 3.72 **Vapor Pressure:** 1 mmHg @ 100-127° F; 38-53°C **Specific Gravity:** 1.030-1.038 **Incompatibilities:** Nitric acid, oleum, chlorosulfonic acid, oxidizers **Appearance and Odor:** *Yellowish or colorless, flammable, oily* liquid (often brownish because of impurities or oxidation)	Regulated based on effects on respiratory tract and skin irritation Other effects may include eye irritation and central nervous system, disturbances. Acute exposures may result in difficulty breathing, respiratory failure and skin and eye irritation and burns. Chronic exposure may damage the liver, kidneys, lungs and skin and cause photosensitivity. IARC, NTP, NIOSH, ACGIH, and the EPA list some PAHs such as benzo(a)pyrene as a potential carcinogen (ARC 2A, NTP-2, ACGIH TLV-A2, NIOSH-X, EPA-B2).

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
MCRD PARRIS ISLAND, SOUTH CAROLINA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Arsenic	7440-38-2	Particulate form - This substance is unable to be detected by PID/FID.	Air sample using a particulate filter; acid desorption; AAS detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7900.	OSHA: Organic compounds 0.5 mg/m³ Inorganic compounds 0.01 mg/m³ NIOSH: (Ceiling) 0.002 mg/m³ ACGIH: 0.2 mg/m³ IDLH: 5 mg/m³ as arsenic	No identifiable warning properties to indicate presence and thereby detection. **Recommended APR Cartridge:** Suitable for dust and fume. Organic vapor acid gases with HEPA filter. This substance may be presented as a pesticide, therefore a cartridge suitable for pesticides (MSA-GMP). **Recommended Gloves:** This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	**Boiling Pt:** sublimation @ 1134°F; 612° C **Melting Pt:** 1497°F; 814°C @ 36 atm **Solubility:** Insoluble in water;soluble in nitric acid **Flash Pt:** Nonflammable, however, airborne in the form of a dust this substance will support combustion **LEL/LFL:** Nonflammable **UEL/UFL:** Nonflammable **Vapor Density:** Not available **Vapor Pressure:** 1 mmHg @ 372°C (sublimes) **Specific Gravity:** 5.73 **Incompatibilities:** Oxidizers, halogens,zinc, lithium, azides, and acetylides **Appearance and odor:** Gray to black, brittle, crystalline, amorphous, odorless.	Overexposure to this substance through inhalation or ingestion may result in ulceration of the nasal septum, GI disturbances resulting in violent purging and vomiting, hoarse voice, sore throat, excessive salivation, peripheral neuropathy (numbness and burning sensations beginning at the extremities followed by motor weakness), respiratory irritation leading to possible pulmonary edema. Skin or eye contact may result in irritation, conjunctiva, dermatitis, and hyperpigmentation (darkening of the areas exposed) of the skin. This substance has been judged to be a Human carcinogen by NTP, and IARC.
Lead	7439-92-1	Particulate form - Unable to be detected by either PID or FID.	Air sample using a mixed cellulose ester filter; or HNO_3 or H_2O_2 desorption; or Atomic absorption detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7082 or #7300.	OSHA: 0.05 mg/m³ ACGIH: 0.15 mg/m³ NIOSH: 0.10 mg/m³ IDLH: 100 mg/m³ as lead	The use of a air purifying, full-face respirator with high efficiency particulate air filter for up to 2.5 mg/m³. **Recommended gloves:** This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	**Boiling Pt:** 3164°F; 1740°C **Melting Pt:** 621°F; 327°C **Solubility:** Insoluble **Flash Pt:** Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) **LEL/LFL:** Not applicable **UEL/UFL:** Not applicable **Vapor Density:** Not available **Vapor Pressure:** 0 mmHg **Specific Gravity:** 11.34 **Incompatibilities:** Strong oxidizers, peroxides, sodium acetylide, zirconium, and acids **Appearance and Odor:** Metal: A heavy ductile, soft gray solid.	Overexposure to this substance via ingestion or inhalation may result in metallic taste in the mouth, dry throat, thirst, Gastrointestinal disorders (burning stomach pain, nausea, vomiting, possible diarrhea sometimes bloody or black, accompanied by severe bouts of colic), CNS effects (muscular weakness, pain, cramps, headaches, insomnia, depression, partial paralysis possibly coma and death. Extended exposure may result in damage to the kidneys, gingival lead line, brain, and anemia.

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
MCRD PARRIS ISLAND, SOUTH CAROLINA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Chlordane	57-74-9	Substance is not volatile (VP=.00001 mmHg) I.P. is unknown, therefore detection by PID is unknown. Substance is non-combustible, therefore a FID is not expected to have a response to chlordane.	Air sample using Chromosorb-102 sorbent tube with mixed cellulose-ester filter or a xad-2 sorbent tube with filter. Toluene desorption and analysis by gas chromatography-electron capture detector. Sampling and analytical protocol will proceed in accordance with NIOSH Method #5510 or OSHA Method #67.	OSHA; NIOSH; ACGIH: 0.5 mg/m³	Adequate - can use an air purifying respirator with an organic vapor & high efficiency air filter cartridges. *Recommended gloves:* PTFE Teflon for pure product. Nitrile acceptable for incidental contact.	**Boiling Pt:** 347°F; 175°C **Melting Pt:** Not available **Solubility:** Insoluble **Flash Pt:** Not available **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** 0.00001 mmHg **Specific Gravity:** 1.56 @ 60°F; 15.5°C **Incompatibilities:** Strong oxidizers and alkaline reagents **Appearance and Odor:** Amber-colored, viscous liquid with a pungent, chlorine like odor.	Earliest signs of overexposure manifest as hypersensitivity of the central nervous system characterized by hyperactive reflexes, muscle twitching, tremors, incoordination, ataxia, and clonic convulsions. Cycles of excitement and depression may be repeated over and over. Chronic health hazard information similar to those for DDT.
DDT and the major metabolites; DDD and DDE.	50-29-3 72-54-8 72-55-9	Substance is not volatile, I.P. is unknown, detection by PID is unknown. Substance non-combustible, therefore a FID is anticipated to have reduced response to DDT.	Air sample using a binder free, glass fiber filter; isoctane desorption; gas chromatography-electron capture detector. Sampling and analytical protocol will proceed in accordance with NIOSH Method #3(S274).	OSHA; ACGIH: 1 mg/m³ NIOSH: 0.5 mg/m³	Adequate - Can use air purifying respirator with high efficiency particulate air filter (HEPA). **Recommended glove:** Nitrile acceptable for incidental contact.	**Boiling Pt:** 230°F; 110°C **Melting Pt:** 226°F; 108°C **Solubility:** Insoluble **Flash Pt:** 162-171°F; 72-77°C **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** Low **Specific Gravity:** 0.99 **Incompatibilities:** Strong oxidizers and alkalis **Appearance and Odor:** Colorless crystals or off-white powder with a slight aromatic odor	Large doses are followed by vomiting due to gastric irritation, diarrhea may follow. Numbness and parethesias of the lips tongue and face associated with malaise, headache, sorethroat, fatigue and weakness. Coarse tremors (usually first of the neck, head, and eyelids). This may be accompanied by confusion, apprehension, and depression. Convulsions may result and death may occur from respiratory failure. DDT is absorbed and retained in the fat of humans. Chronic exposure may result in damage to the liver, kidneys and Peripheral Nervous System. DDT is recognized as possessing carcinogenic properties by IARC and NTP.

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
MCRD PARRIS ISLAND, SOUTH CAROLINA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Bis(2-ethylhexyl) phthalate	117-81-7	No information found This is a combustible liquid therefore the FID should detect it however the relative response ratio is unknown.	Particulate filter; carbon disulfide desorption; GC/FID detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #5020.	NIOSH; ACGIH: 5 mg/m³, STEL 10 mg/m³ OSHA: 6 mg/m³ IDLH: 5000 mg/m³	Irritating, tingling sensation. **Recommended APR Cartridge:** Organic vapor acid gases with HEPA filter. **Recommended gloves:** Nitrile >6.00 hrs has been the one most widely used for the other substances and is acceptable for this substance. Other options include butyl rubber >8.00 hrs or neoprene >6.00 hrs	**Boiling Pt:** 680°F; 386°C **Melting Pt:** freezes 6.8°F; -14°C **Solubility:** Insoluble **Flash Pt:** 419°F; 215°C **LEL/LFL:** 0.3% @ 473°F; 245°C **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** <0.01 mm **Specific Gravity:** 0.99 **Incompatibilities:** Nitrates, strong oxidizers, acids, and caustics. **Appearance and odor:** Colorless, oily liquid, odorless	This substance is a mild skin, eye, mucous membrane irritant, and mild gastric disturbance. In test animals liver damage and teratogenic effects have been noted.
Aroclor-1260 (Polychlorinated Biphenyl, PCB) It should be noted that this substance is representative of the more common isomers Aroclor - 1242, 1254, which may be encountered.	11096-82-5 53469-21-9 (42%) 11097-69-1 (54%)	Substance is not volatile (VP=0.00006 mmHg), I.P. is unknown however is anticipated to be elevated, therefore, PID is not anticipated to detect this substance. Substance is non combustible and as a result will not be detected by FID.	Air sample using a particulate filter, Florisil sorbent tube with glass fiber filter; hexane desorption; gas chromatography-electron capture detector. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #5503 (PCBs).	OSHA; ACGIH: 0.5 mg/m³ (skin) NIOSH: 0.001 mg/m³ IDLH: 5 mg/m³	Inadequate - However due to the low volatility it is assumed unless agitated this substance does not present a volatile vapor or gas respiratory threat. For dusty conditions where this material may cling to particulates, use a HEPA filter. APRs are approved for escape only when concentrations exceed the exposure limits. Concentrations greater than the exposure limits require PAPR or supplied air respirators. **Recommended glove:** Butyl rubber >24 hrs; Neoprene rubber >24.00 hrs; Silver shield or Viton (for pure product).	**Boiling Pt:** distillation range 689- 734° F; 365-390°C **Melting Pt:** -2 to 50°F; -19 to 10°C **Solubility:** Insoluble **Flash Pt:** Not applicable **LEL/LFL:** Not applicable **UEL/UFL:** Not applicable Nonflammable liquid, however, exposure to fire results in black soot containing PCBs, dibenzofurans, & chlorinated dibenzo-p-dioxins **Vapor Density:** Not available **Vapor Pressure:** 0.00006 - 0.001 mmHg **Specific Gravity:** 1.566 @ 60°F; 15.5° C **Incompatibilities:** Strong oxidizers **Appearance and Odor:** Colorless to pale yellow, viscous liquid or solid (Aroclor 54 below 50°F) with a mild, hydrocarbon odor	This substance is irritating to the eyes and skin. Chronic effects of overexposure may include potential to cause liver damage, chloracne, and reproductive effects. Recognized as possessing carcinogenic properties by NIOSH, and NTP.

7.0 AIR MONITORING

This section presents requirements for the use of real-time air monitoring instruments during site activities. It establishes the types of instruments to be used. Information on instrumentation for specific tasks, the frequency of which they are to be used, techniques for their use, action levels for upgrading/downgrading levels of protection, and contaminants, can be found in Table 5-1 of this document. Methods for instrument maintenance and calibration are presented in Section 1.0 of the Health and Safety Guidance Manual.

Many of the contaminants of concern are unable to be detected or are difficult to detect with the use of direct reading instruments used for site operations. In particular, metals, PCBs, and some PAHs exhibit poor detection characteristics (i.e., the non photoionizable or non combustible nature of the contaminant). The greatest potential for exposure to these contaminants generally would be as a result of inhalation or ingestion of contaminant laden particulates (dusts). As a result, any observations of airborne particulates will indicate a potential for exposure and require control measures such as area wetting. Given the proposed activities, it is not anticipated that contaminants identified in this HASP will be encountered in any appreciable concentrations. However, as a precaution, monitoring instruments will be used in an attempt to identify and quantify any potential site contaminants capable of being detected. Additionally, potential exposures and hazards associated with site contaminants will be minimized through adherence to the requirements of this HASP (site control measures, decontamination efforts, safe work practices, etc.).

7.1 INSTRUMENTS AND USE

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

7.1.1 Photoionization Detector

In order to accurately monitor for any substances which may present an exposure potential to site personnel, a photoionization detector (PID) using a lamp energy of 10.6 or higher will be used. This instrument will be used to monitor potential source areas and to screen the breathing zones of employees during site activities including confined space operations. The PID has been selected because it is capable of detecting organic gases and vapors and some inorganic gases and vapors. It has been recognized that many of the chemicals of concern will not be effectively detected by the PID, so emphasis will be placed on engineering controls and PPE to control airborne particulate hazards. (**NOTE:** A flame ionization detector may be used as an alternative to the PID.)

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

7.1.2 Hazard Monitoring Frequency

Table 5-1 presents the frequencies that hazard monitoring will be performed as well as the action levels which will initiate the use of elevated levels of protection. The SSO may decide to increases these frequencies based on instrument responses and site observations. The frequency at which monitoring is performed will not be reduced without the prior consent of the PHSO and the CLEAN HSM.

7.2 INSTRUMENT MAINTENANCE AND CALIBRATION

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

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

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: _____ PROJECT NO.: _____

Date of Calibration	Instrument Name and Model	B & R Environmental Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		

8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section is included to specify health and safety training and medical surveillance requirements for both B&R Environmental and subcontractor personnel participating in on site activities.

8.1.1 Requirements for B&R Environmental Personnel

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

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

B&R Environmental will conduct a brief meeting daily to discuss operations planned for that day and to issue Safe Work Permits (See Section 9.4) for those operations.

8.1.2 Requirements for Subcontractors

Identified B&R Environmental subcontractor personnel must have completed introductory hazardous waste site training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e) and 8 hours of refresher training meeting the requirements of 29 CFR 1910.120(e)(8) prior to performing field work at the MCRD facility. B&R Environmental subcontractors must certify that each employee has had such training by sending B&R Environmental a letter, on company letterhead, containing the information in the example letter provided in Figure 8-1. This letter will be accompanied by training certificates or some other form of official documentation for all subcontractor personnel participating in site activities.

FIGURE 8-1

OSHA COMPLIANCE/TRAINING LETTER

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

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

Month, day, year

Mr. Mark Speranza, P.E.
Task Order Manager
B&R Environmental
Foster Plaza 7, 661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: HAZWOPER Training for Marine Corps Recruit Depot, Parris Island, South Carolina

Dear Mr. Speranza:

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

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

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

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

Sincerely,

(Name and Title of Company Officer)

Enc. Copies of training certificates

8.2 SITE-SPECIFIC TRAINING

B&R Environmental will provide site-specific training to all B&R Environmental and subcontractor personnel who will perform work on this project. Site-specific training will also be provided to all personnel (DOD, OSHA, EPA, SouthDiv Navy personnel, and other authorized visitors) who may enter the site to perform functions that may or may not be directly related to site operations. Site-specific training will include:

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

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

8.3 MEDICAL SURVEILLANCE

8.3.1 Medical Surveillance Requirements for B&R Environmental Personnel

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

Documentation for medical clearances will be maintained in the B&R Environmental Pittsburgh office and made available, as necessary.

FIGURE 8-2

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing remedial activities at Marine Corps Recruit Depot, Parris Island, South Carolina, and that I have received site-specific training which included the elements presented below:

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

I further state that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction.

I further state, by the presence of my signature below that, the date of my training (introductory, refresher, and supervisory, as applicable) and my medical surveillance requirements are accurate and correct to the best of my knowledge.

Name	40-Hour General Site Worker Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Date of Medical Surveillance	SIGNATURE

8.3.2 Medical Surveillance Requirements for Subcontractors

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

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

8.3.3 Requirements for All Field Personnel

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

8.4 SUBCONTRACTOR EXCEPTIONS

In situations in which the exclusion zone is not entered or when there is no potential for exposure to site contaminants, subcontractor personnel may be exempt from some of the training and medical surveillance requirements. All subcontractors and visiting personnel are required to receive site-specific training (as discussed in Section 8.2) regarding information provided in this HASP. Examples of subcontractors who may be exempt from training and medical surveillance requirements may include surveyors who perform surveying activities at the site perimeter, or in areas were there is no potential for exposure to site contaminants.

FIGURE 8-3

SUBCONTRACTOR MEDICAL APPROVAL FORM

For employees of _____
Company Name

Participant Name: _____ Date of Exam: _____

Part A

The above-named individual has:

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

   ( ) qualified to perform work at the Marine Corps Recruit Depot, Parris Island work site
   ( ) not qualified to perform work at the Marine Corps Recruit Depot, Parris Island Center work site

and,

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

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

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

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

Part B

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

and have determined the following information:

FIGURE 8-3
SUBCONTRACTOR MEDICAL APPROVAL FORM
PAGE TWO

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

   _____
   _____
   _____

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

   _____
   _____
   _____

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

   _____
   _____
   _____

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

Based on the information provided to me, and in view of the activities and hazard potentials involved at the Marine Corps Recruit Depot, Parris Island work site, this participant

( ) may
( ) may not

perform his/her assigned task.

Physician's Signature _____

Address _____

Phone Number _____

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

_____
Address

FIGURE 8-4

MEDICAL SURVEILLANCE LETTER

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

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

Month, day, year

Mr. Mark Speranza, P.E.
Task Order Manager
B&R Environmental Corp.
Foster Plaza 7, 661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: Medical Surveillance for Marine Corps Recruit Depot, Parris Island, South Carolina

Dear Mr. Speranza:

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

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

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

Sincerely,

(Name and Title of Company Officer)

9.0 SITE CONTROL

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

9.1 EXCLUSION ZONE

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

9.1.1 Exclusion Zone Clearance

A pre-startup site visit will be conducted by members of the identified field team in an effort to identify proposed subsurface investigation locations, obtain utility clearances, and provide upfront notices concerning scheduled activities within the facility.

In all cases, no subsurface activities will proceed without utility clearance. In the event that a utility is struck during a subsurface investigative activity, the emergency numbers provided in Section 2.9, Table 2-1 will be notified.

When base personnel are working within the proximity of this investigation, they will be moved or their operation temporarily discontinued to remove them from potential hazards associated with this operation.

9.2 CONTAMINATION REDUCTION ZONE

The contamination reduction zone (CRZ) will be a buffer area between the exclusion zone and any area of the site where contamination is not suspected. A limited personnel and equipment decontamination may take place in this area, to the extent required to move equipment or personnel as necessary to a central decontamination location. This area will also serve as a focal point in supporting exclusion zone activities. This area will be delineated using barrier tape, cones and/or drive poles, and postings to inform and direct facility personnel.

9.3 SUPPORT ZONE

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

9.4 SAFE WORK PERMITS

All exclusion zone activities conducted in support of this project will be done so using this HASP as a reference guide and Safe Work Permits to incorporate site-specific information to guide and direct field crews on a task by task basis. An example of the Safe Work Permit to be used during site activities is illustrated in Figure 9-1.

All permits will be issued by the SSO or his/her on site representative in the morning prior to the commencement of on site activities. The Safe Work Permits are to be completed in accordance with the specifications contained in Table 5-1 and the other sections of this HASP as appropriate.

All personnel identified on the permit as participating in the task will be made aware of its contents by the supervisor accepting the permit. Any problems which occurred throughout the task will be documented by the supervisor on the permit.

All permits will be returned to the FOL or the SSO at the end of the day.

FIGURE 9-1
SAFE WORK PERMIT

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

SECTION I: General Job Scope (To be filled in by person performing work)

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

_____

_____

II. Names: _____

_____

III. Onsite Inspection conducted ☐ Yes ☐ No Initials of Inspector _____ _____
B&RE

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

IV. Protective equipment required

Level D ☐ Level B ☐
Level C ☐ Level A ☐
Detailed on Reverse

Respiratory equipment required

Full face APR	☐	Escape Pack	☐
Half face APR	☐	SCBA	☐
SKA-PAC SAR	☐	Bottle Trailer	☐
Skid Rig	☐	None	☐

Modifications/Exceptions: _____

_____

V.

Chemicals of Concern	Action Level(s)	Response Measures
_____	_____	_____
_____	_____	_____

VI. Additional Safety Equipment/Procedures

Hardhat	☐ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☐ Yes	☐ No
Safety Glasses	☐ Yes	☐ No	Safety belt/harness	☐ Yes	☐ No
Chemical/splash goggles	☐ Yes	☐ No	Radio	☐ Yes	☐ No
Splash Shield	☐ Yes	☐ No	Barricades	☐ Yes	☐ No
Splash suits/coveralls	☐ Yes	☐ No	Gloves (Type)	☐ Yes	☐ No
Steel toe/shank Workboots	☐ Yes	☐ No	Work/rest regimen	☐ Yes	☐ No

Modifications/Exceptions: _____

VII.

Procedure review with permit acceptors	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☐	Emergency alarms	☐	☐
Procedure for safe job completion	☐	☐	Evacuation routes	☐	☐
Contractor tools/equipment inspected	☐	☐	Assembly points	☐	☐

VIII.

Equipment Preparation	Yes	NA
Equipment drained/depressured	☐	☐
Equipment purged/cleaned	☐	☐
Isolation checklist completed	☐	☐
Electrical lockout required/field switch tested	☐	☐
Blinds/misalignments/blocks & bleeds in place	☐	☐
Hazardous materials on walls/behind liners considered	☐	☐

IX. Additional Permits required (Hot work, confined space entry, excavation etc.). ☐ Yes ☐ No
If yes, fill out appropriate section(s) on safety work permit addendum

X. Special instructions, precautions: _____

_____

Permit Issued by: _____ Permit Accepted by: _____
Job Completed by: _____ Date: _____

9.5 SITE VISITORS

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

- Personnel invited to observe or participate in operations by B&R Environmental
- Regulatory personnel (i.e., DOD, EPA, OSHA)
- Southern Division Navy Personnel
- Other authorized visitors

All non-DOD personnel working on this project are required to gain initial access to the base by coordinating with the B&R Environmental FOL or designee and following established base access procedures.

Once access to the base is obtained, all personnel who require site access into areas of ongoing operations will be required to obtain permission from the FOL and the Base Contact. Upon gaining access to the site, all site visitors wishing to observe operations in progress will be escorted by a B&R Environmental representative and shall be required to meet the minimum requirements discussed below:

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

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

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

accomplished with support from the Base Contact. If necessary, the Base Contact will be notified of any unauthorized visitors.

9.6 SITE SECURITY

Site security will be accomplished using B&R Environmental field personnel. B&R Environmental will retain complete control over active operational areas. As this activity takes place at a Navy facility, the first line of security restricting the general public will take place at the site entrance. The second line of security will take place at the work site, referring interested parties to the Base Contact. The Base Contact will serve as a focal point for base personnel, interested parties, and serve and the final line of security and the primary enforcement contact.

9.7 SITE MAP

Once the areas of contamination, access routes, topography, and dispersion routes are determined, a site map will be generated and adjusted as site conditions change. These maps will be posted to illustrate up-to-date collection of contaminants and adjustment of zones and access points.

9.8 BUDDY SYSTEM

Personnel engaged in on site activities will practice the "buddy system" to ensure the safety of all personnel involved in this operation.

9.9 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS

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

9.10 COMMUNICATION

As personnel may not always be working in proximity to one another during field activities, a supported means of communication between field crews will be used as necessary. Two-way radio communication

10.0 SPILL CONTAINMENT PROGRAM

10.1 SCOPE AND APPLICATION

It is not anticipated that bulk hazardous materials (over 55-gallons) will be handled at any given time as part of this scope of work. It is also not anticipated that any spillage would constitute a danger to human health or the environment. However, as the job progresses, the potential for accumulating Investigative Derived Wastes (IDW), such as decontamination fluids, soil cuttings, purge waters from well development, etc. in a central staging area does exist. Once these materials are characterized, they can be removed from this area and be properly disposed of. Because these IDW remain uncharacterized while in the staging area, a spill containment program will be developed and instituted as part of this HASP.

10.2 POTENTIAL SPILL AREAS

Potential spill areas will be periodically monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, limited areas are vulnerable to this hazard including:

- Resource deployment
- Waste transfer
- Central staging

It is anticipated all IDW generated as a result of this scope of work will be containerized, labeled, and staged to await further analyses. The results of this analysis will determine the method of disposal.

10.3 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, a periodic walk-around by the personnel staging or disposing of drums will be conducted during working hours to visually determine that storage vessels are not leaking. If a liquid leak is detected, the contents will be transferred into a new vessel using a hand pump. The leak will then be collected and contained using absorbents such as Oil-dry, vermiculite, or sand. The absorbents will be stored at the vulnerable areas in a conspicuously marked drum. This used absorbent material will also be containerized for disposal pending analysis. All inspections will be documented in the project logbook.

10.4 PERSONNEL TRAINING AND SPILL PREVENTION

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

10.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the minimum equipment that will be maintained at the staging area at all times for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other non combustible absorbent (Oil-dry);
- Drums (55-gallon U.S. DOT 17-E or 17-H)
- Shovels, rakes, and brooms
- Container labels

10.6 SPILL CONTROL PLAN

This section describes the procedures the B&R Environmental field crew members will employ upon the detection of a spill or leak.

1. Notify the SSO or FOL immediately upon the detection of a leak or spill.

2. Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.

3. Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment or disposal options.

4. Re-containerize spills, including 2-inches of top cover affected by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crews cannot handle. Should this occur, notification of the appropriate emergency response agencies will be carried out by the FOL or SSO in accordance with the procedures discussed in Section 2.0 of this HASP.

11.0 CONFINED-SPACE ENTRY

Personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces. A confined space is defined as an area that has one or more of the following characteristics:

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

Additionally, a Permit-Required Confined Space may also have one or more of the following characteristics:

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

For further information on confined space operations, consult the Health and Safety Guidance Manual or call the HSM. Any activity that may be considered a confined-space entry shall require modifications of this HASP and shall result in the immediate notification of the Project Health and Safety Officer. This determination shall be made by the FOL and SSO.

12.0 MATERIALS AND DOCUMENTATION

The B&R Environmental Field Operations Leader (FOL) shall ensure the following materials/documents are taken to the project site and used when required.

- A complete copy of this HASP
- Health and Safety Guidance Manual
- Incident Reports
- Medical Data Sheets
- Material Safety Data Sheets for all chemicals brought on site, including decontamination solutions, fuels, sample preservatives, calibration gases, etc.
- Follow-up Reports (to be completed by the FOL)
- A full-size OSHA Job Safety and Health Poster (posted in the site trailer)
- Training/Medical Surveillance Documentation Form (Blank)
- First-Aid Supply Usage Form
- Emergency Reference Form (Section 2.0, extra copy for posting)
- Drilling Log Forms

12.1 MATERIALS TO BE POSTED AT THE SITE

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

Chemical Inventory Listing - This list represents all chemicals brought on site, including decontamination solutions, sample preservatives, fuel, calibration gases, etc.. This list should be posted in a central area.

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

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

Site Clearance Posting - This listing is found within the training section of the HASP (See Figure 8-1). This list identifies all site personnel, dates of training (including site-specific training), and medical surveillance. This lists indicates not only clearance but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.

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

Medical Data Sheets/Cards - Medical Data Sheets will be filled out by all on site personnel and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring medical attention to the medical facility. A copy of this sheet or a wallet card will be given to all personnel to be carried on their person.

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

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

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

13.0 ACRONYMS / ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
APR	Air-Purifying Respirator
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CNS	Central Nervous System
CRZ	Contamination Reduction Zone
CSP	Certified Safety Professional
CQP	Construction Quality Plan
dBA	Decibels measured on the A-scale
DRI	Direct Reading Instrument
eV	electron Volts
FID	Flame Ionization Detector
FOL	Field Operations Leader
FTL	Field Team Leader
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HSM	Health and Safety Manager
IDLH	Immediately Dangerous to Life and Health
IDW	Investigative Derived Wastes
MCRD	Marine Corps Recruit Depot
MSDS	Material Safety Data Sheet
N/A	Not Available
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollution Discharge Elimination System
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PAH	Polyaromatic Hydrocarbons
PCB	Polychlorinated Byphenyls
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
PID	Photoionization Detector
PPE	Personal Protective Equipment

PPM	parts per million
PVC	poly vinyl chloride
SAP	Sampling and Analyses Plan
SCBA	Self-Contained Breathing Apparatus
SOPs	Standard Operating Procedures
SSO	Site Safety Officer
STEL	Short Term Exposure Limit
TBD	To be determined
TOM	Task Order Manager
TSD	Treatment Storage and Disposal Facility
TWA	Time-Weighted Average
UV	Ultra violet
WP	Work Plan

14.0 DOCUMENT STATUS REPORT

Revision Requested:	By Whom:	Date:
Revisions Made:	Approval: PM: HSM	

APPENDIX C

WORK PLAN ADDENDUM 1
SUPPLEMENTAL SEDIMENT SAMPLING AT SITE 12/SWMU 10 – JERICHO ISLAND
MCRD PARRIS ISLAND, SOUTH CAROLINA

Objective

The purpose of this Work Plan Addendum is to propose field activities to further investigate the nature and extent of contamination of sediment at the southern end of Site 12/SWMU 10 (Jericho Island) at MCRD Parris Island, South Carolina.

Background

A RI/RFI was conducted at Jericho Island from May to September 1998. During the 1998 RI/RFI, sediment samples were collected at 15 locations on Jericho Island and analyzed for TCL VOCs, SVOCs, PCBs and pesticides, TAL inorganics, cyanide, total organic carbon, and acid volatile sulfide/simultaneously extracted metals (AVS/SEM).

RI/RFI Soil Results

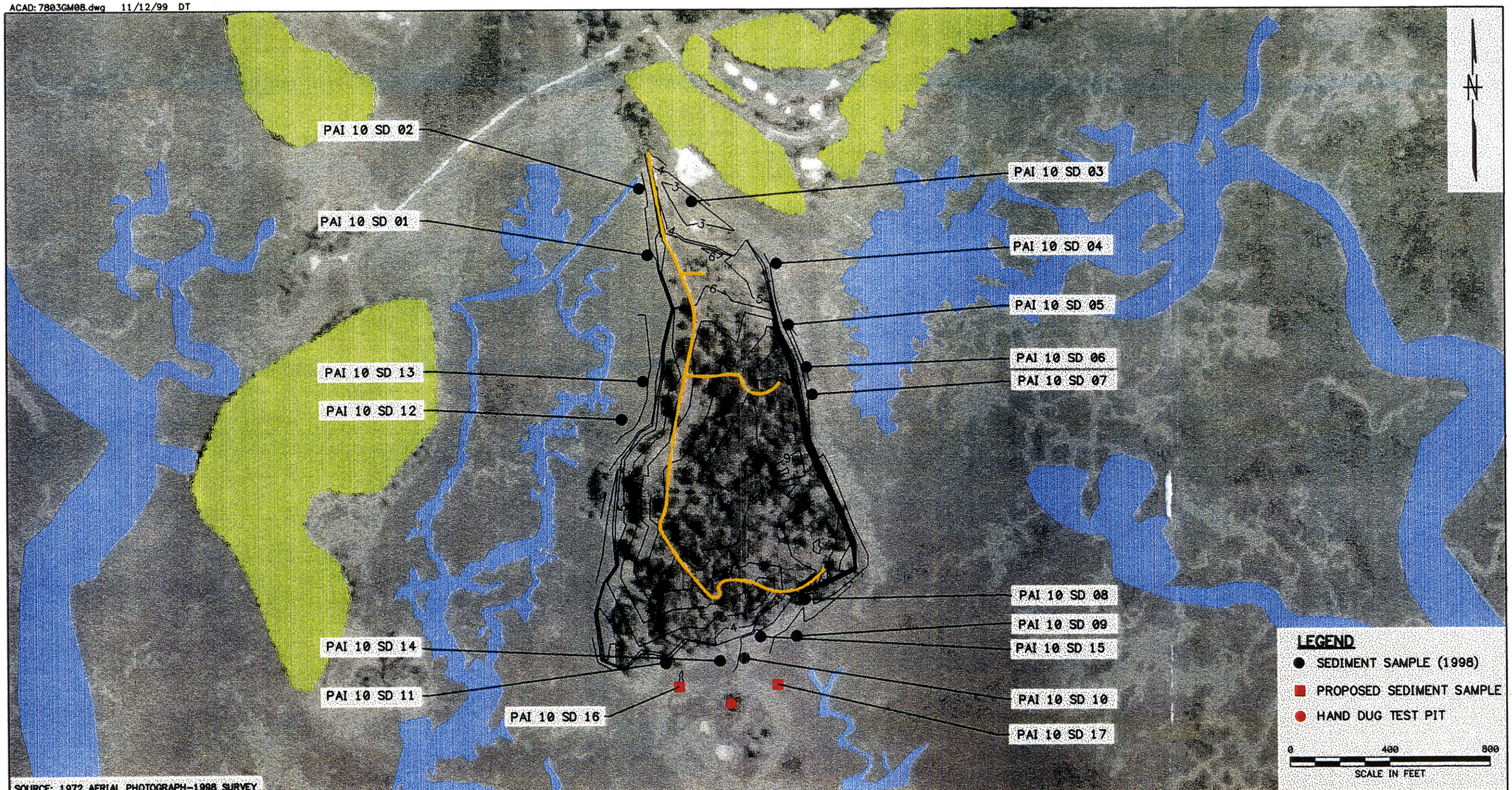
The sample results were relatively clean except for where wastes were visibly present. The majority of the wastes are observed along the southern edge of the island. However, the sediment sample results in this area do not bound the extent of contaminated sediments.

Also, during the RI/RFI, a mound of earth (hummock) was observed approximately 250 feet south of Jericho Island. It is unknown whether this hummock is of natural origin.

Proposed Field Activities

A simple test pitting (hand dug) program will be conducted to determine whether the hummock is of natural origin. Additionally, two sediment samples will be collected between the hummock and the Island in downstream areas of the exposed waste. Depositional areas will be selected if present. The test pit location and sediment sample locations are illustrated on Figure 1. The sediment samples will be analyzed for TCL SVOCs (SW-846 8270C), PAHs (SW-846 8310), PCBs (SW-846 8082), and pesticides (SW-846 8081A) and TAL metals (SW-846 6010B/7000A Series). No duplicate samples or QA/QC samples are proposed.

ACAD: 7803GM08.dwg 11/12/99 DT



SOURCE: 1972 AERIAL PHOTOGRAPH-1998 SURVEY

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY DLT DATE 11/11/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

PROPOSED SEDIMENT SAMPLE LOCATIONS
SAMPLE LOCATION MAP
SITE 12/SWMU 10 - JERICHO ISLAND
MCRD PARRIS ISLAND, SOUTH CAROLINA

CONTRACT NO. 7803
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 1
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

079A014