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Work Plan
Teepee Incinerator (Site 29) and Building 238 (Site 10)

for

Portsmouth Naval Shipyard

Kittery, Maine

Northern Division
Naval Facilities Engineering Command

Contract Number N62472-90-D-1298
Contract Task Order 0232

March 1998

Brown & Root Environmental

A Division of Halliburton NUS Corporation

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WORK PLAN
TEEPEE INCINERATOR (SITE 29)
AND BUILDING 238 (SITE 10)
FOR
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Naval Facilities Engineering Command
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Submitted by:
Brown & Root Environmental
600 Clark Avenue, Suite 3
King of Prussia, Pennsylvania 19406-1433

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MARCH 1998

PREPARED BY:

MARK L. MENGEL
PROJECT MANAGER
BROWN & ROOT ENVIRONMENTAL
PITTSBURGH, PENNSYLVANIA

APPROVED BY:

JOHN J. TREPANOWSKI, P.E.
PROGRAM MANAGER
BROWN & ROOT ENVIRONMENTAL
WAYNE, PENNSYLVANIA

A report entitled "Work Plan Teepee Incinerator (Site 29) and Building 238 (Site 10) for Portsmouth Naval Shipyard Kittery, Maine" dated November 1997, produced by Brown & Root Environmental has been reviewed and found to be complete.

STATE OF MAINE
CHARLES D. RACE 243
CERTIFIED GEOLOGIST

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ACRONYMS AND ABBREVIATIONS

B&R Environmental	Brown & Root Environmental
CIA	Controlled Industrial Area
CLEAN	Comprehensive Long-term Environmental Action Navy
CTO	Contract Task Order
DOT	U.S. Department of Transportation
DQO	Data Quality Objectives
DRMO	Defense Reutilization and Marketing Office
FOL	Field Operations Leader
FS	Feasibility Study
GIS	Geographic Information Systems
IAS	Initial Assessment Study
LIMS	Laboratory Information Management System
MEDEP	Maine Department of Environmental Protection
MPS	Media Protection Standard
MSL	mean sea level
MS/MSD	Matrix Spike and Matrix Spike Duplicate
NAVFAC	Naval Facilities Engineering Command
NOAA	National Oceanic and Atmospheric Administration
NORTHDIV	Northern Division
NTU	Nephelometric Turbidity Units
PCBs	polychlorinated biphenyls
PHERE	Public Health and Environmental Risk Evaluation
PID	Photoionization Dectector
PNS	Portsmouth Naval Shipyard
PPE	Personal Protective Equipment
PRG	Preliminary Remediation Goal
QA/QC	Quality Assurance/Quality Control
RAB	Restoration Advisory Board
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
ROD	Record of Decision
RPD	Range and Relative Percent Difference
SDG	Sample Delivery Group
SOP	Standard Operating Procedures

TAL	Target Analyte List
TCL	Target Compound List
TOC	total organic carbon
U.S. EPA	U.S. Environmental Protection Agency
UST	underground storage tank

1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

This Work Plan for the Portsmouth Naval Shipyard (PNS) in Kittery, Maine, was prepared for the Northern Division (NORTHDIV) Naval Facilities Engineering Command (NAVFAC) by Brown & Root Environmental (B&R Environmental) under the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62472-90-D-1298, Contract Task Order (CTO) 232. This Work Plan outlines the requirements and describes the procedures for performing investigations at the Defense Reutilization and Marketing Office (DRMO) Teepee Incinerator (Site 29) and Building 238 (Site 10).

This document has been prepared in accordance with the Navy Installation Restoration Laboratory Quality Assurance Guide (Interim Guidance) (NFESC, 1996).

1.2 PURPOSE

Sites 29 and 10 are in the Remedial Investigation (RI)/Feasibility Study (FS) process. They will be carried through the proposed plan and Record of Decision (ROD) process. The purpose of the investigation discussed in this Work Plan and Field Sampling Plan is to provide additional information to further characterize the sites to make remedial decisions.

- Additional investigation is required at Site 10 because new information indicates the pipes below Building 238 may have leaked, in addition to the underground storage tank (UST).

- Additional investigation is required at Site 29 because no dioxin sampling was performed in the location where open burning occurred or where the teepee incinerator was located.

1.3 PROJECT ORGANIZATION AND RESPONSIBILITIES

B&R Environmental will be responsible for the overall management of the project, including the field inspection and implementation of all field activities. Personnel from the Navy will be actively involved in the investigation and will coordinate with personnel from B&R Environmental in a number of areas.

1.3.1 Project Organization

The key firms and personnel involved in the investigation, as well as the chain of communication and responsibility of the project personnel, are as follows:

- Navy Remedial Project Manager (RPM):

  Fred Evans
  Northern Division
  Naval Facilities Engineering Command
  10 Industrial Highway, Mail Stop #82
  Lester, PA 19113
  Phone: (610) 595-0567
  Fax: (610) 595-0555

- PNS Point of Contact:

  Marty Raymond
  Portsmouth Naval Shipyard
  Portsmouth, NH 03804-5000
  Attn: Code 106.3R
  Phone: (207) 438-2536
  Fax: (207) 438-1535

- B&R Environmental personnel are as follows:

  Brown & Root Environmental
  Foster Plaza 7
  661 Andersen Drive
  Pittsburgh, Pennsylvania 15220
  (412) 921-7090

  Mark L. Mengel
  Project Manager

  Paul Frank
  Quality Assurance/Quality Control (QA/QC) Manager

  Matt Soltis
  Health and Safety Manager

John Trepanowski
Program Manager
600 Clark Avenue, Suite 3
King of Prussia, Pennsylvania 19406-1433
(610) 491-9688

The B&R Environmental Project Manager has the primary responsibility for project and technical management of this project. He is responsible for the coordination of all onsite personnel and for providing technical assistance for all activities that are directly related to the determination of the hydrogeologic conditions and the environmental quality of the site. The review of all environmental and hydrogeologic data will also be conducted by the Project Manager. If quality assurance problems or deficiencies requiring special action are identified, the Project Manager and project QA/QC advisor will identify the appropriate corrective action.

1.3.2 Field Organization

The B&R Environmental field investigation team will be organized according to the activities planned. For onsite sampling, the sampling team members will be selected based upon the type and extent of effort required. The team will consist of a combination of the following personnel:

- Field Operations Leader (FOL)
- Field hydrogeologist/geologist
- Health and Safety specialist

The FOL will be responsible for the coordination of all onsite personnel and for providing technical assistance when required. The FOL, or his or her designee, will coordinate and be present during all sampling activities and will ensure the availability and maintenance of all sampling materials/equipment. The FOL will be responsible for the completion of all sampling and chain-of-custody documentation, assume custody of all samples, and ensure the proper handling and shipping of samples.

The site hydrogeologist/geologist is responsible for soil boring drilling and monitoring well installation as well as generating boring logs from each borehole. Additionally, this person may be responsible for sample collection and shipment. The Health and Safety specialist and the site safety officer are one in the same in regards to duties. The site safety officer will be designated prior to field activities and will be responsible for ensuring that all team members adhere to the designated health and safety requirements.

The QA/QC Manager, although not formally part of the field team, will be responsible for the adherence of all guidelines as defined in the Work Plan. Strict adherence to these procedures is critical to the collection of acceptable and representative data. Additional support staff also not formally part of the field team include the Maine Certified Geologist (duties are discussed in Section 14.4) and the equipment manager (duties are discussed in Section 13).

2.0 BACKGROUND INFORMATION

2.1 GENERAL SITE BACKGROUND

The following sections describe general background conditions at PNS followed by specific background information for each of the sites to be investigated.

2.1.1 Facility Location and Mission

Situated within the town limits of Kittery, Maine, PNS is located on an island in the Piscataqua River referred to on National Oceanic and Atmospheric Administration (NOAA) nautical charts as Seavey Island, with the eastern tip given the name Jamaica Island. Attached by a rock causeway is Clarks Island which is not industrialized. The Piscataqua River is a tidal estuary which forms the southern boundary between New Hampshire and Maine. PNS is located at the mouth of the Great Bay estuary (commonly referred to as Portsmouth Harbor). The Great Bay Estuary and site location are shown on Figure 2-1.

PNS is engaged in the conversion, overhaul, and repair of submarines for the Navy. PNS has a history dating back to 1800 when the facility was established. The first government-built submarine was designed and constructed at PNS during World War I. A large number of submarines have been designed, constructed, and repaired at this facility from 1917 to present. PNS continues to service submarines as its primary military focus.

2.1.2 Physiography

The PNS is located on Seavey Island in the Piscataqua River immediately south of the town of Kittery, Maine. The location of the shipyard is shown in Figure 2-1. Figure 2-2 shows the location of each of the sites under investigation. PNS is built on an area comprising Dennett's, Seavey, Jamaica, and Pumpkin Islands, as well as man-made land between these islands. Approximate elevations on site range from sea level to a maximum of 60 feet above mean sea level (MSL). Two-thirds of the site is a high-density industrial area containing 376 buildings, whereas the remaining areas are flat-lying to gently sloping, grass-covered fields. Minor wooded areas exist on the east side of Jamaica Island.

The shoreline in the Portsmouth area is described as an embayed coast produced by partial submergence of a fluvially eroded land mass. This type of shoreline is closely associated with the drowned river-valley type estuary. Geomorphically, the Great Bay Estuary would be classified as a drowned river valley. Valleys show

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CHECKED BY MLM DATE 10/30/97	VICINITY MAP PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY Mark L. Mingel DATE 10/30/97	
COST/SCHED-AREA		APPROVED BY DATE	
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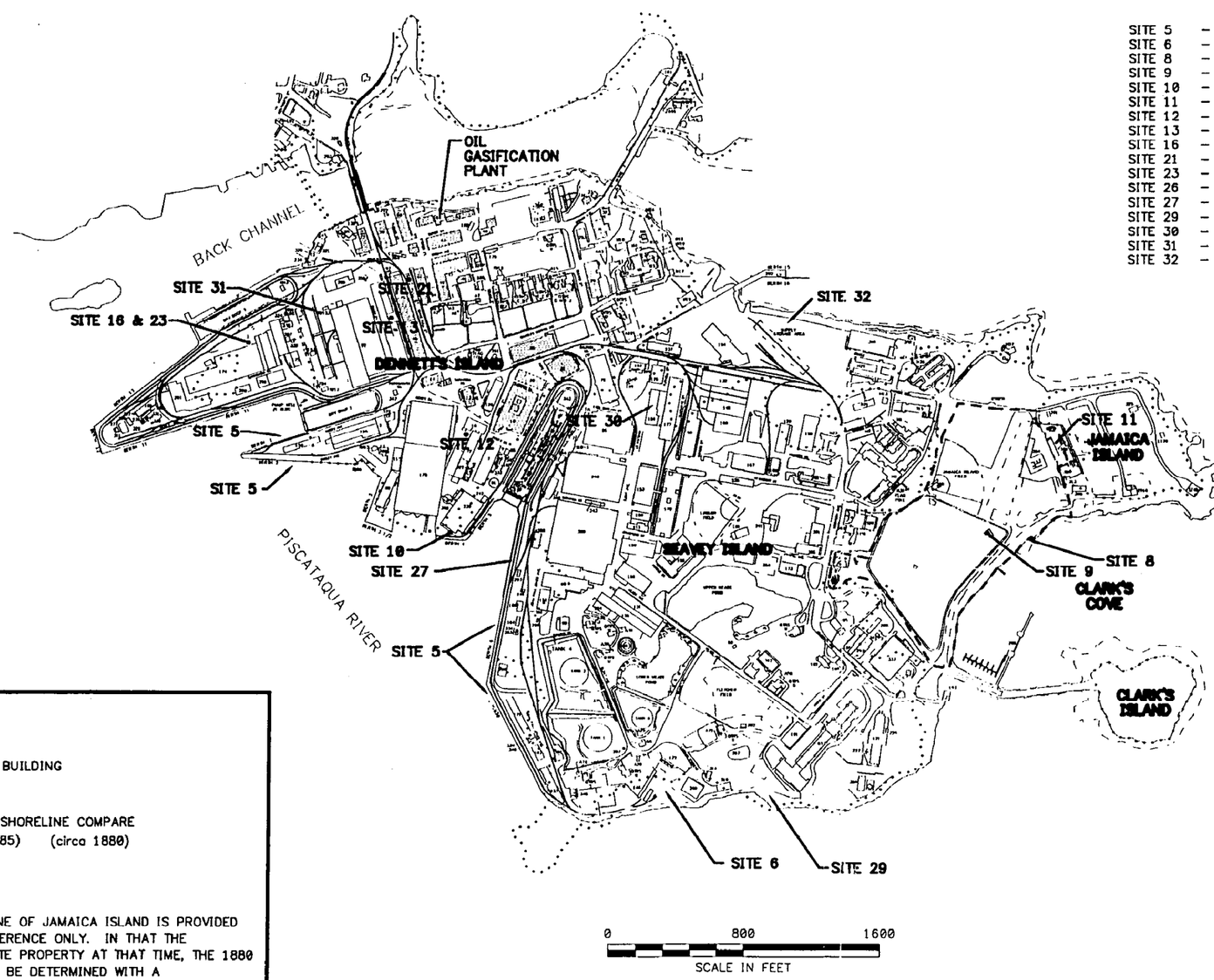

SITE 5 – INDUSTRIAL WASTE OUTFALLS
SITE 6 – DRMO SALVAGE YARD
SITE 8 – JAMAICA ISLAND LANDFILL (JILF)
SITE 9 – MERCURY BURIAL SITE I (MERCURY BURIAL SITE II NOT LOCATED)
SITE 10 – BLDG. 238 BATTERY ACID TANK (TANK No. 24)
SITE 11 – JAMAICA ISLAND WASTE OIL TANKS (TANKS Nos. 6 & 7) (PULLED)
SITE 12 – BLDG. 76 BOILER BLOW-DOWN TANK (TANK No. 25)
SITE 13 – BLDG. 76 RINSE WATER TANK (TANK No. 27)
SITE 16 – BLDG. 174 RINSE WATER TANK (TANK No. 34)
SITE 21 – BLDG. 75 RINSE WATER TANK (TANK No. 28)
SITE 23 – BLDG. 174 CHEMICAL CLEANING FACILITY FLOOR DRAIN TANK (TANK No. 26)
SITE 26 – OIL/WATER DUMPSTERS (MOBILE)
SITE 27 – FUEL OIL SPILL BERTH No. 6
SITE 29 – INCINERATOR SITE
SITE 30 – GALVANIZING PLANT
SITE 31 – WEST TIMBER BASIN LANDFILL
SITE 32 – TOPEIKA PIER

LEGEND:

HISTORICAL BUILDING

HISTORICAL SHORELINE COMPARE TO INTB (1985) (circa 1880)

NOTES:

1. THE 1880 SHORELINE OF JAMAICA ISLAND IS PROVIDED AS A GENERAL REFERENCE ONLY. IN THAT THE ISLAND WAS PRIVATE PROPERTY AT THAT TIME, THE 1880 SHORELINE CANNOT BE DETERMINED WITH A HIGH DEGREE OF PRECISION.

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY DLT DATE 2/11/97
CHECKED BY MLM DATE 10/30/97
COST/SCHED-AREA
SCALE AS NOTED

Brown & Root Environmental

FACILITY MAP
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

CONTRACT NO. 6515
OWNER NO. 0232
APPROVED BY Mark L. Mengel DATE 10/30/97
APPROVED BY DATE
DRAWING NO. FIGURE 2-2
REV. 0

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some degree of straightening and deepening by ice which carved the land surface during past glacial periods; hilltops are blunted by ice erosion and deposits of glacial till block smaller valleys.

2.1.3 Surface Water

The Piscataqua River hydrology is not characteristic of traditional inland fluvial hydrology. The Piscataqua River, Little Bay and Great Bay, and seven converging rivers form the Great Bay Estuary. Seavey Island is located in the mouth of the Great Bay Estuary, commonly referred to as the Portsmouth Harbor. The harbor's main channel is approximately 75 feet deep (mean low water), and the back channel is approximately 20 feet deep (mean low water) in the vicinity of Seavey Island.

Additional surface water information can be found in the RCRA Facilities Investigation Report (McLaren/Hart, 1992).

2.1.4 Geology and Stratigraphy

The islands composing the PNS are formed on bedrock highs covered with thin veneers of glacial till, recent alluvium, and/or fill materials. Bedrock consists of tectonically deformed volcanic rocks and highly fractured, metamorphosed sandstones, shales, and siltstone of the Kittery Formation, ranging from Middle Ordovician to Precambrian in age (Osberg and Others, 1985). Mesozoic dikes occupy fault traces, fracture zones, bed planes and fold hinges (Brooks and Rickerich, 1996). Metamorphism (biotite grade) has destroyed original interparticle porosity in the sedimentary rocks. Most groundwater flow is, therefore, controlled by fractures.

The bedrock of this area has undergone at least three periods of deformation: the Taconic Orogeny (440 million years before present [mybp]), Acadian (360 mybp), and the Appalachian (260 mybp), resulting in multiple rock cleavages, planes of foliation, faults of various ages and types, and varied fold orientations and geometries. Fold types observed in the vicinity of the PNS include post-depositional, soft-sediment folds; early recumbant folds; upright, tight asymmetrical folds; open folds; kink folds related to faulting; and introafolial folds near the Kittery/Rye contact (Brooks and Rickerich, 1996). Faults observed in outcrops along the Piscataqua River are largely sinistral strike-slip faults with near-vertical, north-south fault planes with less than one-meter displacement. The Portsmouth Fault Zone was mapped as a narrow (1/8th mile wide) zone, oriented east-northeast between Seavey Island and New Castle Island to the south (Hussey and Bothner, 1995). The resulting bedrock fracture pattern, therefore, is highly complex.

Additional geologic information can be found in the RCRA Facilities Investigation Report (McLaren/Hart, 1992) and the RFI Data Gap Report (Halliburton NUS, 1995a).

2.1.5 Hydrogeology

Groundwater is encountered within both the unconsolidated materials and bedrock at the facility. In general, the unconsolidated materials appear to be moderately to highly permeable. Bedrock permeability is generally less than that of the unconsolidated materials.

Groundwater levels at the PNS are shallow and appear to be controlled by the bedrock surface topography and by the thickness of glacial till and fill material overlying bedrock or former tidal flat areas. Groundwater flow directions onsite vary depending on ground surface topography, the thickness and composition of overburden, bedrock-overburden contact-surface dip, and tidal influence, but overall groundwater flow directions are from the original island interiors toward the island coastline producing a radial pattern. Recharge to groundwater is derived from precipitation infiltration and tidal effects.

Kittery's potable water supply originates from surface reservoirs located in the vicinity of York, Maine. The shipyard is not currently using onsite groundwater.

Additional hydrogeologic information can be found in the RFI Data Gap Report (Halliburton NUS, 1995a).

2.1.6 Climatology

Precipitation is fairly evenly distributed over the year, with 2.7 to 4.6 inches falling per month for a 42.6-inch annual total. On average, approximately 130 days each year have more than a trace of precipitation. Most summer precipitation results from showers and, infrequently, thunderstorms. Winter precipitation is generally associated with stormy conditions caused by air masses moving up along the coast. Heavy precipitation events are usually caused by storm centers that form along the East Coast and move northeastward through the New England area.

2.2 SITE-SPECIFIC BACKGROUND

2.2.1 Site 29 (Teepee Incinerator)

The area described as the Teepee Incinerator was at one time part of the DRMO Area. The DRMO was established in 1920 and is located near the area originally known as Henderson's Point. The point was excavated in 1905 to widen the channel to allow naval vessels access to the shipyard. The excavated fill was deposited along the shoreline adjacent to the point. The location of the incinerator was along the

shoreline near the boundaries of the fill and natural material where Building 314 is currently located as shown on Figure 2-3.

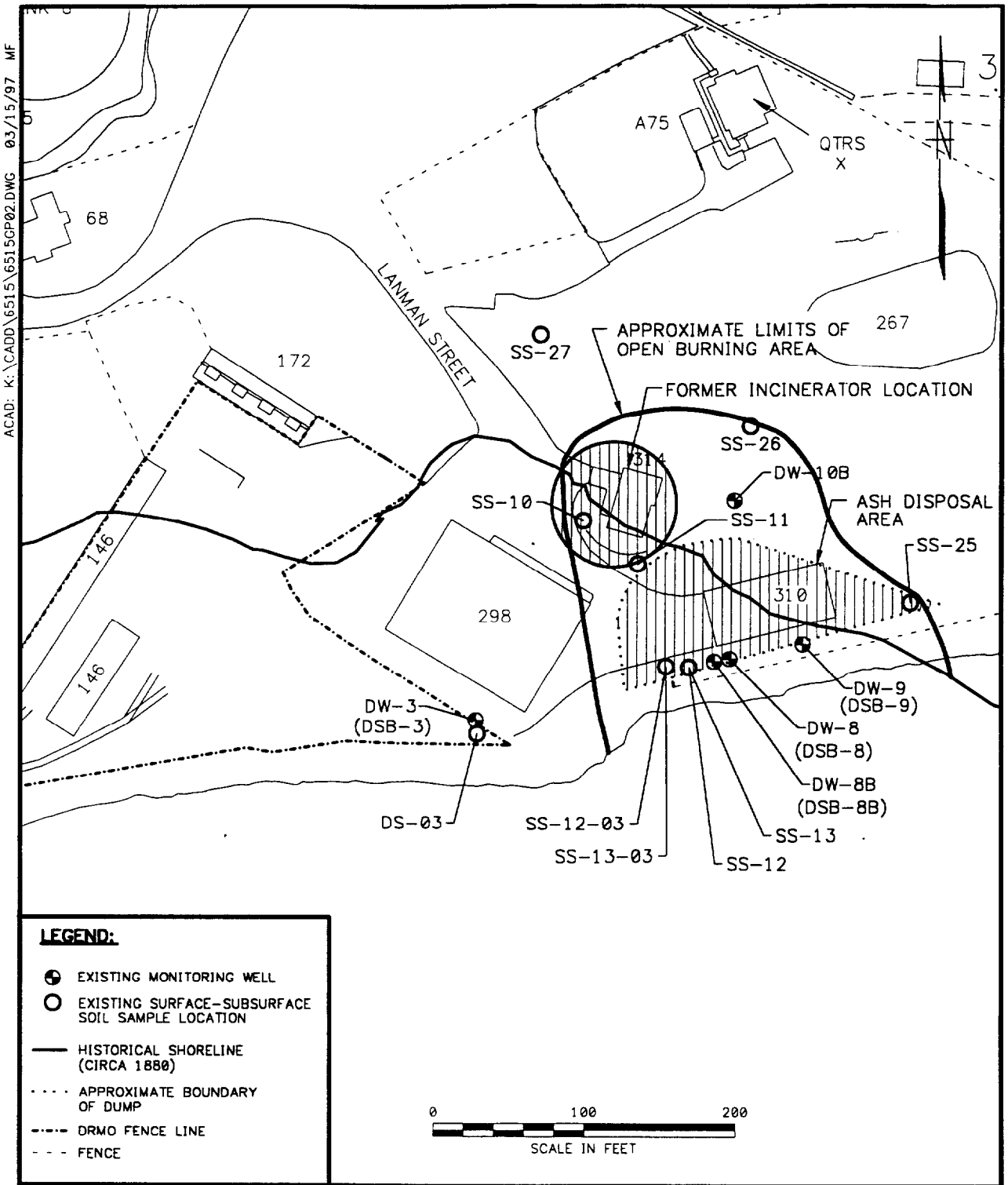
It has been reported that open burning took place in the area now occupied by Building 310 and the surrounding area between 1918 and the time leading up to the construction of the incinerator. The approximate limits of the open burning are shown on Figure 2-3. The open burning area was reportedly used for the purpose of burning shipyard solid waste and a dumping area for residual waste (i.e., paper, wood, and rubbish). The ash disposal area (Figure 2-3) was used as a dumping area for residual waste generated from the open burning. General estimates of the yearly quantities of materials burned leading up to the construction of the incinerator were 75,000 cubic-yards of refuse and garbage. For additional information concerning documentation of handling and disposal activities, as well as the nature of the waste stream, please refer to the Department of the Navy, 1996.

The incinerator was constructed in 1965 and was operated until June 1975. It was a teepee-type steel frame with a metal-covered refuse burner complete with top catwalk, access ladder, steel inner liner, entrance and clean-out doors, forced draft blowers and piping, stainless-steel fire screen and foundation, and bucket slip rails. When fully operable it was reported that in addition to the solid waste and refuse burned at the incinerator, occasional paint cans and solvents were disposed of at the incinerator (Department of Navy, 1996).

There are currently five monitoring wells located in the vicinity of the incinerator. Additionally, eight surface soil samples have previously been collected.

2.2.2 Site 10 (Building 238)

The investigation at Building 238 centers around a former leaking 9,680-gallon underground storage tank. The tank was located outside Building 238 within the Controlled Industrial Area (CIA), as shown on Figure 2-4 and was used for waste battery acid storage. During an investigation of tank volume fluctuations in 1984, a leak was evident because the water level in the tank would rise and fall with the apparent tide. The period of potential release is unknown. The tank was taken out of service and removed in 1986 according to a closure plan approved by the Maine Department of Environmental Protection (MEDEP). An approximate 2-inch hole was discovered at the bottom of the tank. Subsurface soils were sampled at the time of the tank removal (Appendix B), and no clean-up action was required by the MEDEP. According to information contained in the On-Shore Feasibility Report (Halliburton NUS, 1995b), Section 2.1.4, page 2-8, "bedrock was encountered around 7.5 to 9 feet below ground level. The tank bottom was reported to be approximately 13.5 feet below grade, and the top approximately 3.5 feet below grade." The area is



DRAWN BY HJP DATE 3/11/97	Brown & Root Environmental	CONTRACT NO. 6515	OWNER NO. 0232
CHECKED BY MLM DATE 10/30/97	GENERAL SITE PLAN TEEPEE INCINERATOR/SITE 29 PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY Mark L. Mengel DATE 10/30/97	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 2-3	REV. 0

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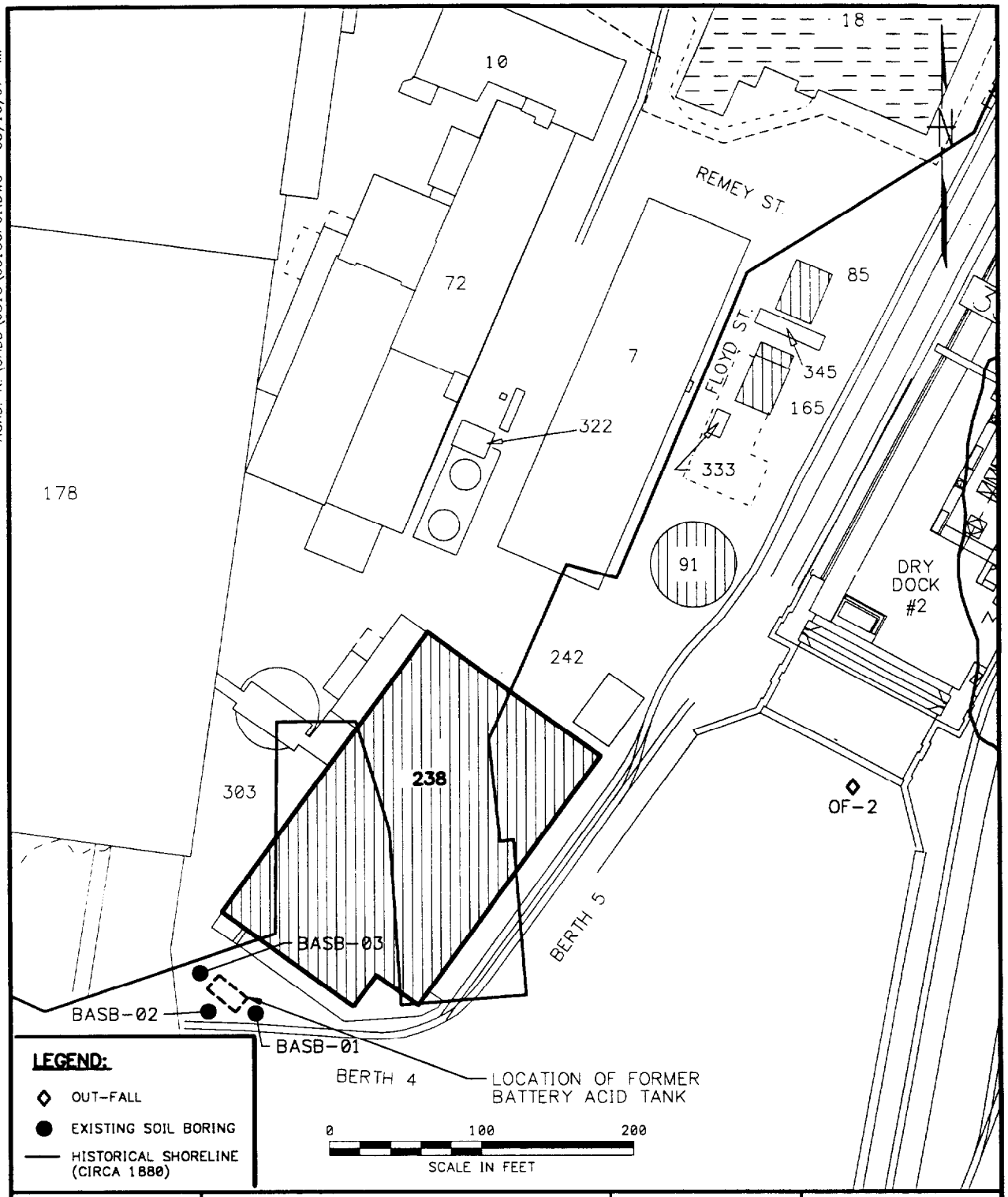

DRAWN BY HJP DATE 3/11/97	Brown & Root Environmental	CONTRACT NO. 6515	OWNER NO. 0232
CHECKED BY MLM DATE 10/30/97	GENERAL SITE PLAN SITE 10 (BUILDING 238) PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY Mark L. Mangel DATE 10/30/97	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 2-4	REV. 0

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currently covered by asphalt. The associated piping from the tank to the original point of generation was never removed and is located overhead within a basement area of Building 238. The area will require a confined-space entry to investigate.

3.0 SCOPE OF WORK

As part of the Data Quality Objectives process, a background review of all existing information was performed in conjunction with the preparation of this work plan. The primary sources of information that were examined included historical reports prepared by the PNS for the DRMO, as well as other areas of the shipyard, remedial investigation reports (McLaren/Hart, and B&R Environmental), a Feasibility Report (B&R Environmental) and historical data contained in an electronic data base.

3.1 SAMPLING RATIONALE

The following sections detail the previous activities performed at the sites to be investigated as well as rationale for the sampling to be performed.

3.1.1 Site 29 (Teepee Incinerator)

No previous investigations have been performed at the Teepee Incinerator site; however, several monitoring wells have been installed and surface soil samples have been collected in the area as part of the RI-I investigation for the DRMO (McLaren/Hart, 1992). Groundwater monitoring wells installed in the area include DW-3, DW-08, DW-08B, DW-09 and DW-10B (see Figure 2-3). Previous groundwater sampling data from these wells indicated elevated metals in excess of Media Protection Standards (MPSs). During the most recent groundwater sampling (Round 7, December 1996 and Round 8, April 1997), significantly lower levels of metals were detected as shown on Table 3-1. This was likely due to the low-flow purging and sampling procedures utilized to collect more representative groundwater samples. It should be noted that Table 3-1 draws comparisons of groundwater data from tidally influenced monitoring wells (sea water) to MPSs that have been established for onshore concerns. Preliminary Remediation Goals (PRGs) will be established in the future as part of the CERCLA process. Based on the most recent analytical data (Table 3-1), the locations of the existing wells, the known boundaries of the fill (Figure 2-3), (Department of the Navy, 1996), and the expected groundwater flow direction (RFI Data Gap Report, Halliburton NUS, 1995a), it is not anticipated that any monitoring wells are necessary to further define the horizontal or vertical limits of site related contaminants in groundwater.

Surface soil samples previously collected as shown on Figure 2-3 indicate positive detections of some metals (see Table 3-2). These sample location provide data around the perimeter of the incinerator site. Additional surface soil samples will be collected in conjunction with the soil borings to be drilled as shown on Figure 3-1. Previous sampling in the area of the site has not included subsurface soil sampling. To better define the limits of any potential contamination that may have originated from the incinerator, soil

TABLE 3-1

POSITIVE DETECTION SAMPLE SUMMARY - GROUNDWATER
TEEPEE INCINERATOR (SITE 29)
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Sample Number		DW-03-4 (ug/L)	DW-03-7[2] (ug/L)	DW-08-4 (ug/L)	DW-08-7[2] (ug/L)	DW-08B-4 (ug/L)	DW-08B-7[2] (ug/L)	DW-09-4 (ug/L)	DW-09-7[2] (ug/L)	DW-10B-4 (ug/L)	DW-10B-7[2] (ug/L)
Analyte	MPS[1] (ug/L)	Jul/Sep 1991	Dec 1996	Jul/Sep 1991	Dec 1996	Jul/Sep 1991	Dec 1996	Jul/Sep 1991	Dec 1996	Jul/Sep 1991	Dec 1996
VOLATILES											
Carbon Disulfide	-	NA	NA	1 J	NA	90	NA	2 J	NA	5 U	NA
Chloroform	-	NA	NA	5 U	NA	6	NA	5 U	NA	5 U	NA
Ethylbenzene	-	NA	NA	2 J	NA	5 U	NA	5 U	NA	5 U	NA
Toluene	-	NA	NA	2 J	NA	5 U	NA	5 U	NA	5 U	NA
Total Xylenes	-	NA	NA	21	NA	5 U	NA	5 U	NA	5 U	NA
SEMI-VOLATILES											
Bis(2-ethylhexyl)phthalate	**8**	NA	NA	1 J	NA	1 J	NA	5.5 J	NA	1 J	NA
Naphthalene	-	NA	NA	1 J	NA	10 U	NA	10 U	NA	10	NA
PCB/PESTICIDES											
Arochlor - 1260	-	NA	NA	12	NA	1 U	NA	1 U	NA	1 U	NA
INORGANICS											
Aluminum	**1,430**	593	94.9 B	25,900 J	274 B	173 R	131 B	1,063.5 J	10 U	5,500 J	11.6 B
Antimony	**6**	32 U	6.2 U	609	6.2 U	32 U	6.2 U	261	15 B	32 U	2.7 B
Arsenic	**50**	4 U	6.3 U	66.6	6.3 U	4 U	7.4 B	18.5	2.1 U	5.8 J	2.1 U
Barium	**4**	6 J	6.8 B	1,650	25 B	52 J	34.8 B	147.5 J	63 B	99 J	8.4 B
Beryllium	-	1 U	0.39 U	1.1 J	0.39 U	1 U	0.39 U	0.1 J	0.13 U	0.5 J	0.13 U
Cadmium	**5**	4 U	0.82 U	56	0.82 U	4 U	0.82 U	4.5 J	0.27 U	4 U	0.27 U
Calcium	-	286,000	255,000	284,000 J	203,000	167,000 J	276,000	199,500 J	144,000	226,000 J	61,200
Chromium	**100**	12 U	2.5 U	443	2.5 U	7 J	2.8 B	46	0.83 U	22	0.83 U
Cobalt	-	17 U	2.4 U	61	2.4 U	17 U	2.4 U	17 U	0.79 U	17 U	1.4 B
Copper	**1,300**	16 U	14.8 B	7,080	120	16 U	4.8 B	673.5	3.2 B	59	4.6 B
Iron	-	707	35 U	343,000 J	35 J	1,670 J	1,640	37,650 J	285	9,310 J	14.1 B
Lead	**15**	446 J	9.7	6,560 J	28.4	1 J	3.9 U	759 J	1.3 U	33.3	1.3 U
Magnesium	-	999,000 J	803,000	853,000 J	741,000	477,000 J	810,000	759,000 J	568,000	570,000 J	190,000
Manganese	**200**	55	7 B	3,560	81.4	1,840	2,140	834	357	69	2.3 B
Mercury	-	0.2 U	NA	7.7	0.14 B	0.2 U	0.0078 U	9.1	0.023 B	0.2 U	0.040 B
Nickel	**100**	27 U	2.6 U	1,340	71.8 B	27 U	3.6 B	55	9.7 B	59	7.6 B
Potassium	-	302,000 J	271,000	254,000	257,000	138,000	257,000	240,000	224,000	168,000	98,000
Selenium	-	5 U	9.4 U	50 U	9.4 U	5 U	9.4 U	5.95	3.1 U	5 U	3.1 U
Silver	-	7 U	4.2 B	23	5.7 B	7 U	5 B	7 U	1.7 B	7 U	1.2 U
Sodium	-	10,000,000	5,900,000	6,670,000	5,950,000	3,880,000	5,710,000	7,210,000	4,730,000	5,390,000	1,820,000
Thallium	-	13 J	11 U	10 U	23 B	1 J	17.8 B	10 U	3.7 U	1 U	3.7 U
Vanadium	**256**	7 U	1.7 U	125	1.7 U	7 U	1.7 U	7 U	0.58 U	8 J	0.58 U
Zinc	**7,290**	12 U	2.1 U	9,250	71.6	43	2.1 U	932	0.72 U	128	63.6

1 On-shore Media Protection Standards (MPS) for future residential use of fresh groundwater.
2 The inorganics data collected during Round 7 have not been validated as yet.
J Result reported below detection limit.
B Blank contaminant.
R Rejected.
NA Not Analyzed

TABLE 3-2

POSITIVE DETECTION SAMPLE SUMMARY - SURFACE SOILS
TEEPEE INCINERATOR (SITE 29)
PORTSMOUTH NAVAL SHIPYARD
PAGE 1 OF 2

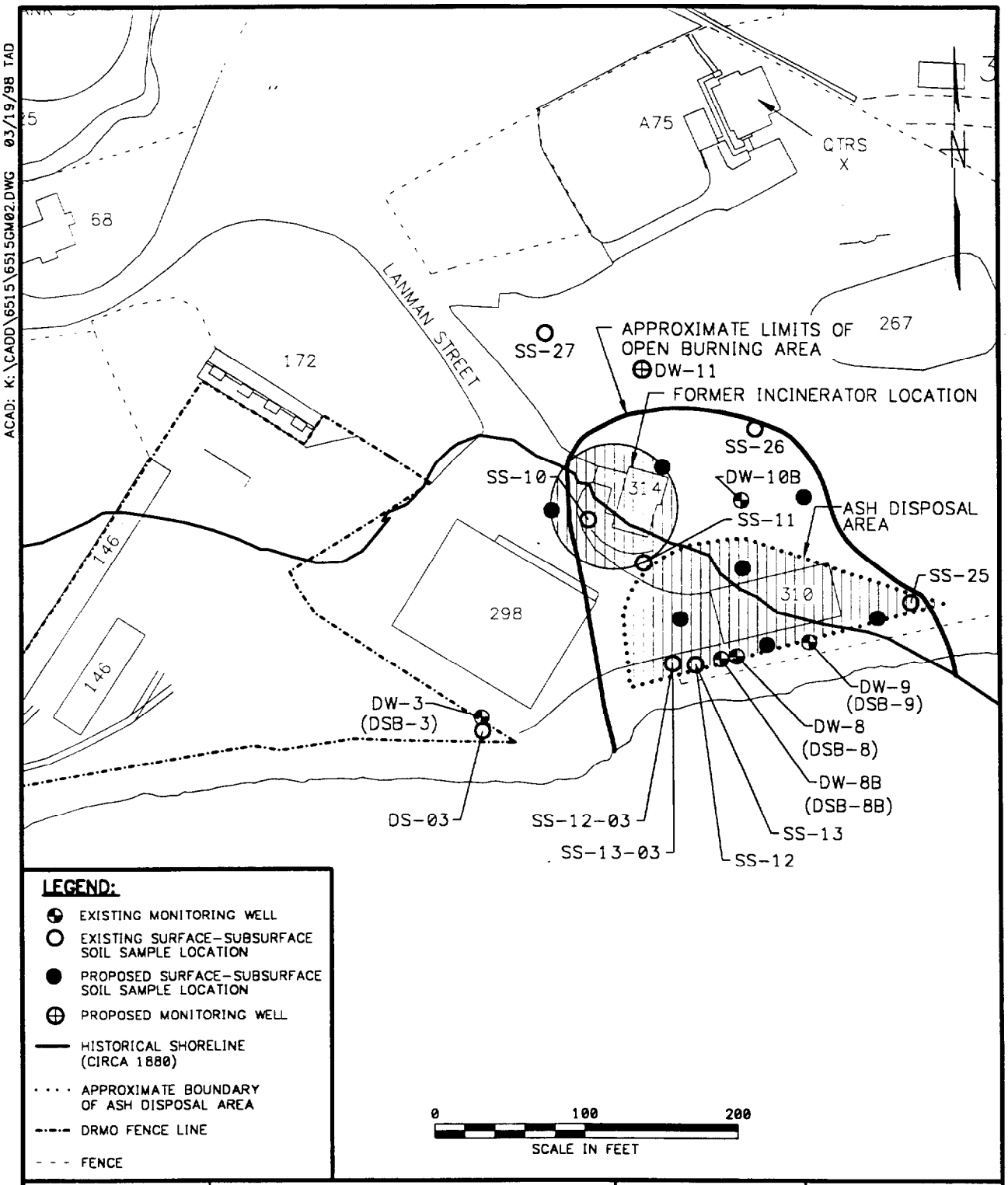
Sample Number		DS-3 (0-0.5) (mg/kg)	SS-10 (0-1) (mg/kg)	SS-11 (0-1) (mg/kg)	SS-12-03 (mg/kg)	SS-13-03 (mg/kg)	SS-12 (0-1) (mg/kg)	SS-13 (0-1) (mg/kg)	SS-25 (0-1) (mg/kg)	SS-26 (0-1) (mg/kg)	SS-27 (0-1) (mg/kg)
Analyte	MPS[1] (mg/kg)	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991
SEMI-VOLATILES											
2-Methylnaphthalene	-	0.220	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)anthracene	0.6275	0.350 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)pyrene	0.919	0.340 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(B)fluoranthene	1.33	0.600 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(K)fluoranthene	0.967	0.530 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	44.5	0.680 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	1.29	0.570 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate	-	0.810 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	-	0.580 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-CD)pyrene	0.488	0.200 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	-	0.300 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	-	0.470 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB/PESTICIDES											
4,4' - DDE	4.3	0.180	NA	NA	NA	NA	NA	NA	NA	0.071	2.5 J
4,4' - DDT	3.09	0.026 U	NA	NA	NA	NA	NA	NA	NA	0.140	3 J
Arochlor - 1254	0.0625	6	NA	NA	NA	NA	NA	NA	NA	0.340 U	2 U
Arochlor - 1260	-	0.26 U	NA	NA	NA	NA	NA	NA	NA	0.760	2 U
Dieldrin	0.0389	0.170	NA	NA	NA	NA	NA	NA	NA	0.034 U	0.2 U
Endosulfan I	-	0.100	NA	NA	NA	NA	NA	NA	NA	0.017 U	0.1 U
Endosulfan II	-	0.045	NA	NA	NA	NA	NA	NA	NA	0.034 U	0.2 U
Endrin	-	0.044	NA	NA	NA	NA	NA	NA	NA	0.034 U	0.2 U
Heptachlor Epoxide	-	0.037	NA	NA	NA	NA	NA	NA	NA	0.017 U	0.1 U
INORGANICS											
Aluminum	-	6,110	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	31.3	580 J	8.3 J	7.4 J	5.6 U	5.6 U	3 B	1.9 B	2.9 U	6.1 J	8 J
Arsenic	48.9	20.6 J	13.0 J	13.3 J	10.5	8.5	9.20	9.50	6.5 J	20.1	11.2
Barium	-	245	NA	NA	28.3 J	26.9 J	NA	NA	NA	NA	NA

TABLE 3-2

POSITIVE DETECTION SAMPLE SUMMARY - SURFACE SOILS
TEEPEE INCINERATOR (SITE 29)
PORTSMOUTH NAVAL SHIPYARD
PAGE 2 OF 2

Sample Number		DS-3 (0-0.5) (mg/kg)	SS-10 (0-1) (mg/kg)	SS-11 (0-1) (mg/kg)	SS-12-03 (mg/kg)	SS-13-03 (mg/kg)	SS-12 (0-1) (mg/kg)	SS-13 (0-1) (mg/kg)	SS-25 (0-1) (mg/kg)	SS-26 (0-1) (mg/kg)	SS-27 (0-1) (mg/kg)
Analyte	MPS[1] (mg/kg)	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991	Jul/Sep 1991
Beryllium	1.57	0.5 J	0.7 J	0.5 J	0.21 U	0.21 U	0.33 U	0.41 U	0.3 J	0.2 J	2.1
Cadmium	4.95	4.3	2.6 J	2.5 J	2.7	2.3	0.99	1	0.6 U	1.9	2.1
Calcium	-	1,620	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	-	66 J	54.5 J	95.3 J	12.3	9.6	19.7	12.9	18.8	98	59.4
Cobalt	-	15.2	NA	NA	2.5 J	2.5 J	NA	NA	NA	NA	NA
Copper	2,610	568	5,740 J	4,550 J	30.6 U	28.95 U	83.8	66.6	9.2	179	334
Iron	-	25,200	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	500	255,000 J	3,490	221	47.4	67.4	301	190	9.8	230	909
Magnesium	-	3,990	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	-	467	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	5.5	0.7	0.3	0.8	0.11 U	0.11 U	0.03 B	0.05 U	0.0 U	0.8 J	0.2 J
Nickel	1,560	235	152 J	4,970 J	16 U	14.25 U	27.8	17.5	11.5	93.2	91.6
Potassium	-	1,230	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	-	10.6 R	0.4 J	0.2 J	0.18 U	0.2 U	0.53 B	0.32 B	0.2 U	NA	NA
Silver	-	6.7 J	2.4	8.1	0.83 J	0.83 U	1.6 U	2.1 U	0.4 U	0.9 J	3.5 J
Sodium	-	919 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	-	0.4 J	2.1 R	NA	0.18 U	0.2 U	2.4 U	0.49 U	0.2 U	0.3 J	0.3 J
Vanadium	-	28.9	NA	NA	20.2	18.1	NA	NA	NA	NA	NA
Zinc	1,068	972 J	1,030 J	805 J	446	422	250	399	25	360	934

1 On-shore Media Protection Standards (MPS) for future Residential Land use for soils.
J Result reported below detection limit.
B Blank contaminant.
R Rejected.
NA Not Analyzed.



DRAWN BY / DATE	Brown & Root Environmental	CONTRACT NO.	OWNER NO.
HJP 3/11/97		6515	0232
CHECKED BY / DATE: MLM 3/23/98	PROPOSED SAMPLING LOCATIONS TEEPEE INCINERATOR/SITE 29 PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY: Mark R. Mungel	DATE: 3/23/98
COST/SCHED-AREA		APPROVED BY	DATE
SCALE: AS NOTED		DRAWING NO. FIGURE 3-1	REV. 1

FORM CADD NO. SOUTH_AV.DWG - REV 0 - 02/07/97

borings will be drilled and sampled. Based on the limits of the open burning area shown on Figure 3-1, six soil brings will be drilled in the area reported to be used for open burning and should adequately address the area of concern. Samples will be collected for chemical analyses from the surface and from various depths, as described in Section 4.0. Additionally, one soil boring will be drilled and sampled near the location of the former incinerator as shown on Figure 3-1. One monitoring well will also be installed upgradient of the site to evaluate upgradient water quality.

3.1.2 Site 10 (Building 238)

The previous work performed at Building 238 addressed the removal of a nearby underground storage tank used for the storage of waste battery acid. This tank was located outside the building along the southern side, between the building and Berth 4 (refer to Figure 2-4). Three soil borings (BASB-01 through BASB-03) were later drilled around the perimeter of the excavation and sampled. The results are shown on Table 3-3. At the time of the removal, not all of the associated piping was removed. The piping from the tank extends into a basement area of Building 238. Interview sheets used in developing the Initial Assessment Study (IAS) (Weston, 1983) suggest the lines may have leaked. It is anticipated that a confined-space entry activity will be necessary to evaluate and document the location, size, destination, and potential leak locations along the piping. After identifying the locations of all pipes and their destination, surface soil samples will be obtained from the floor in areas of suspected contamination.

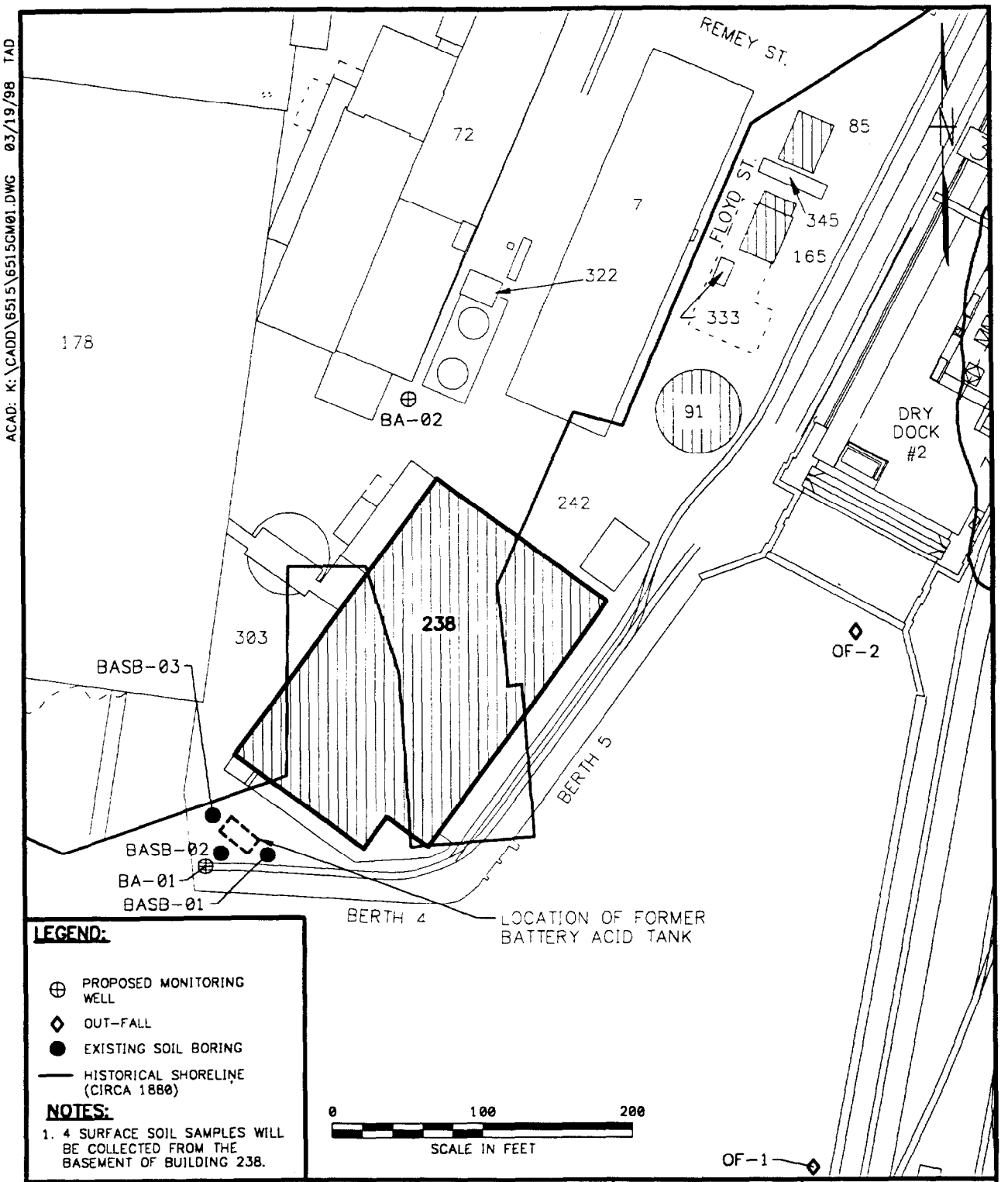
Two soil boring/monitoring wells will also be installed; of which, one soil boring/monitoring well will be installed near the source area of the former UST removal (Figure 3-2). At the time of the tank removal (1986), a composite sample was collected from the excavation, split into two separate samples and analyzed for EP Toxic metals and nickel. The results of the sampling (which were only recently discovered by the Navy) are attached as Appendix B. A review of the results indicated no positive results in excess of any of any of the maximum concentrations of contaminants for toxicity characteristics. The three previous soil borings (BASB-01 through BASB-03) were drilled and sampled to the top of bedrock (approximately 7 feet). The new boring will be drilled to a depth that will allow for the placement of the middle of the well screen to be positioned at a depth equal to the bottom of the former tank (approximately 13.5 feet). Subsurface soil samples collected from the boring will evaluate current conditions while groundwater will be monitored at the source as well as downgradient of the piping. Additionally, a soil boring/monitoring well will be installed north of Building 238 to evaluate upgradient groundwater conditions.

TABLE 3-3

POSITIVE DETECTION SAMPLE SUMMARY - SOILS
BUILDING 238 (SITE 10)
PORTSMOUTH NAVAL SHIPYARD

Sample Number		BASB-01 (5-7) (mg/kg)	BASB-02 (1-5) (mg/kg)	BASB-03 (1-3) (mg/kg)	BASB-03-D (1-3) (mg/kg)
Analyte	**MPS[1] (mg/kg)**	**Jul/Sept 1991**	**Jul/Sep 1991**	**Jul/Sep 1991**	**Jul/Sep 1991**
VOLATILES					
Methylene Chloride	-	5 U	5 U	.002 J	5 U
Trichloroethene	-	5 U	5 U	.003 J	5 U
SEMI-VOLATILES					
Anthracene	-	1.9 U	3.9 U	0.28 J	0.55 J
Benzo(A)anthracene	0.6275	0.67 J	3.9 U	0.87 J	1.2 J
Benzo(A)pyrene	0.919	0.69 J	3.9 U	0.83 J	1.1 J
Benzo(B)fluoranthene	1.33	0.74 J	3.9 U	0.76 J	1.4 J
Benzo(G,H,I)perylene	-	0.38 J	3.9 U	0.44 J	0.42 J
Benzo(K)fluoranthene	0.967	0.51 J	3.9 U	0.76 J	0.80 J
Chrysene	1.29	0.82 J	0.47 J	0.97 J	1.5 J
Fluoranthene	-	1.1 J	3.9 U	1.7 J	2.7 J
Indeno(1,2,3-CD)pyrene	0.488	0.41 J	3.9 U	0.44 J	0.54 J
Phenanthrene	-	0.77 J	0.43 J	1.3 J	2.6 J
Pyrene	-	1.2 J	3.9 U	1.6 J	2.2 J
PCB/PESTICIDES					
4,4' - DDT	3.09	0.068	0.037 U	0.018 U	0.018 U
INORGANICS					
Aluminum	-	7,090	8,390	8,310	8,960
Antimony	31.3	5.5 U	6.4 U	4.6 U	6.4 J
Arsenic	48.9	12.8 J	34.6 J	9.7 J	11.8 J
Barium	-	96.9	124	127	135
Beryllium	1.57	0.48 J	0.91 J	0.48 J	0.55 J
Cadmium	4.95	2.1	2	2.8	4.1
Calcium	-	3,370	6,630	11,700	11,500
Chromium	-	38.7	38.2	31.1	38.3
Cobalt	-	6.6 J	9.7 J	10.2	10.8
Copper	2,610	166	128	619	1,130
Iron	-	19,700	17,400	22,400	31,200
Lead	500	1,350	785	680	1,330
Magnesium	-	5,180	5,570	6,500	6,470
Manganese	-	187 J	246 J	264 J	334 J
Mercury	5.5	1.6 J	1 J	1.2 J	2.4 J
Nickel	1,560	26.1	31.6	32.8	43.3
Potassium	-	2,670	2,050	2,770	2,610
Sodium	-	2,480	1,390	997	1,440
Thallium	-	0.37 J	0.58 J	0.23 J	0.25 J
Vanadium	-	176	30.8	33.5	31.8
Zinc	1,068	218 J	444 J	428 J	1,010 J

1 On-shore Media Protection Standards (MPS) for future Residential Land use for soils.



DRAWN BY HJP DATE 3/11/97	Brown & Root Environmental	CONTRACT NO. 6515	OWNER NO. 0232
CHECKED BY MLM DATE 3/23/98	PROPOSED SAMPLING LOCATION SITE 10 (BUILDING 238) PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY Mark R. Mangel DATE 3/23/98	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 3-2	REV. 0

FORM CADD NO. SOUTH_AV.DWG - REV 0 - 02/07/97

3.2 FIELD ACTIVITIES

Field activities to be performed at the Teepee Incinerator site will consist of the following:

- Surface soil sampling
- Subsurface soil borings and subsurface soil sampling
- Monitoring well installation and sampling

Seven soil borings (Figure 3-1) will be drilled and sampled until refusal. Continuous subsurface soil samples will be collected for lithology to the total depth of each boring. It is expected that refusal (or bedrock) will be encountered at shallow depths (4 to 6 feet) in the four soil borings to be drilled in natural material. Subsurface soil samples for chemical analyses from these borings are anticipated to be collected at depths of 1 to 3 feet and 3 to 5 feet. Should refusal exceed the expected 4 to 6-foot depth, sampling intervals will be added at 2-foot intervals. Borings drilled in the fill area will be sampled for chemical analyses at the following intervals: 1 to 3 feet, 3 to 5 feet, 5 to 7 feet, and at the groundwater table interface. It is expected that the groundwater table will be around 12 feet at these locations. Additionally in borings drilled in the fill, one sample will be collected for chemical analyses from below the groundwater table based on the highest PID reading or, in the absence of PID readings above background, visual observation of contamination. Split-spoon samples will also be collected until refusal for lithologic description.

A surface soil sample will be collected from each of the soil boring locations prior to drilling. Surface soil samples will be obtained from an approximate depth of 0 to 1 foot after first removing the first several inches of soil. In areas where asphalt may be present the pavement and affected subbase will be removed and discarded prior to sample collection. Specific field operations will be discussed in Section 4.0.

Each soil sample will be analyzed for Target Compound List (TCL) volatiles, semivolatiles, phenolics, pesticides/polychlorinated biphenyls (PCBs), Target Analyte List (TAL) metals, cyanide, pH, and based on a review of data from the DRMO as a whole and the area of concern in particular, dioxins, which are associated with incineration activities. A single monitoring well (DW-11) will be drilled upgradient of the approximate limits of the open burning area to evaluate upgradient groundwater quality. The groundwater sample will be analyzed for the same constituents with the exception of dioxin. Additionally, the groundwater sample will be analyzed for total organic carbon (TOC), chloride, nitrate, bromide, sulfate, alkalinity, and salinity to aid in the site evaluation (e.g., future fate and transport modeling). The field activities and analytical testing are summarized in Table 3-4.

TABLE 3-4

FIELD ACTIVITIES
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Site	Description Of Activities	Analysis
Teepee Incinerator	7 Surface soil samples plus 7 Subsurface soil borings plus 1 Monitoring well boring	TCL Volatiles TCL Semivolatiles Phenolics TCL Pesticides/PCBs TAL Metals Cyanide Dioxin, where indicated pH
	1 Groundwater sample	TCL Volatiles TCL Semivolatiles Phenolics TCL Pesticides/PCBs TAL Metals (total) Cyanide Total Organic Carbon (TOC) Chloride Nitrate Bromide Sulfate Alkalinity Salinity pH
	3 Background soil samples	Dioxin pH
Building 238	2 Groundwater samples	TCL Volatiles TCL Semivolatiles TCL Pesticides/PCBs TAL Metals (total) Cyanide Total Organic Carbon (TOC) Chloride Nitrate Bromide Sulfate Alkalinity Salinity pH
	2 Monitoring well borings	TCL Volatiles TCL Semivolatiles TCL Pesticides/PCBs TAL Metals Cyanide pH
	4 Surface soil samples	TAL Metals Cyanide pH

Three surface soil samples will also be collected from previously identified background soil sampling locations (BGS-02, BGS-19, and BGS-22) as discussed in Section 4.0. These samples will be analyzed for dioxin and pH only, as background data is available for the other analytes.

The field activities to be performed at Site 10 are as follows:

- Surface soil sampling
- Subsurface soil sampling
- Monitoring well installation and sampling

Two soil boring/monitoring wells will be drilled and installed. One monitoring well (BA-01) will be located downgradient of the previously installed borings to monitor local groundwater conditions. It is expected that the well will be drilled to a depth which allows for the placement of the middle of the screen at a depth of approximately 13.5 feet (the approximate bottom of the tank). It is expected that bedrock will be encountered at a depth between 7 to 9 feet. If necessary, a 15-foot screen will be installed. An additional soil boring/monitoring well (BA-02) will be installed north of Building 238 as noted on Figure 3-2 to evaluate upgradient groundwater conditions.

Split-barrel samples will be collected continuously to the water table for lithologic descriptions. Two subsurface soil samples from each boring will be retained for chemical analyses. One sample will be collected from just above the groundwater interface, and the other sample will be collected from a depth equal to the bottom of the former UST (approximately 13.5 feet). The samples will be analyzed for TCL volatiles, semivolatiles, pesticides/PCBs, TAL metals, cyanide, and pH. Groundwater samples will be obtained from the monitoring wells and analyzed for the same constituents (TCL volatiles, semivolatiles,. pesticides/PCBs, TAL metals, cyanide, and pH). Although only TAL metals are the expected concern based on battery acid components, TCL volatiles, TCL semivolatile, and TCL pesticides/PCBs samples are being collected since no other monitoring wells exist in the given area. Additionally, groundwater samples will be analyzed for TOC, chloride, nitrate, bromide, sulfate, alkalinity, and salinity to aid in site evaluation. Four surface soil samples will be collected from the basement area of Building 238 and analyzed for TAL metals, cyanide, and pH. Confined space entry will be necessary for this activity.

The field activities and analytical testing are summarized in Table 3-4. Specific field operations will be discussed in Section 4.0.

4.0 FIELD SAMPLING PLAN

4.1 FIELD OPERATIONS

The following sections detail the field activities to be performed during this investigation. Specific Standard Operating Procedures (SOPs) will be referenced where applicable (SOP Reference Manual, B&R Environmental, 1996a). The analytical laboratory selected to perform chemical analyses has not been identified as yet. The dioxin analyses will be performed by Triangle Labs. Laboratory SOPs for Triangle Labs will be provided under separate correspondence and maintained as part of the administrative record.

4.1.1 Subsurface Soil Boring and Monitoring Well Drilling

Seven subsurface soil borings and one monitoring well will be drilled at the Teepee Incinerator Site and two monitoring wells will be drilled at Site 10. It is expected that four of the soil boring locations and the monitoring well location at the Teepee Incinerator Site will be drilled into natural material, whereas the other three will be drilled through fill deposits. All of the borings will be advanced to refusal or bedrock. The soil borings will be drilled using hollow-stem auger (HSA) drilling methodologies. The monitoring wells will also be drilled using HSA drilling methodologies; however, if bedrock is encountered before the water table, an alternate methodology of drilling will be used to advance the well boring into the bedrock to allow for the installation of a monitoring well.

The monitoring wells at Site 10 will be drilled using the same methodologies, as described above. Split-spoon samples will be collected to the water table for lithology. Two samples will be retained for chemical analysis from each of the monitoring well borings. Subsurface soil samples from the upgradient monitoring well will be obtained from above and at the water table interface. Subsurface soil samples from the downgradient well will be obtained from the water table interface and from a depth equal to the bottom of the former UST (approximately 13.5 feet).

During drilling operations, standard penetration tests and split-spoon sampling will be performed continuously to the bottom of the boring. All split-spoon samples will be monitored with a Photoionization Detector (PID) and will be visually inspected for lithology. Soil borings will be backfilled with cuttings, then to the surface, with a cement/bentonite grout.

Samples will be collected from the borings for chemical analysis at the following intervals:

Sample Location	Sample Interval
Teepee Incinerator (Site 29)	
4 Borings drilled in natural material	0-1 foot (surface soil), 1-3 feet, 3-5 feet.
3 Borings drilled in fill area	0-1 foot (surface soil), 1-3 feet, 3-5 feet, 5-7 feet, groundwater interface, and below the water table based on highest PID/visual observation.
1 monitoring well boring	0-1 foot (surface soil), 1-3 feet, 3-5 feet
Building 238 (Site 10)	
1 upgradient monitoring well boring	One sample above the groundwater interface and one sample at the groundwater interface.
1 downgradient monitoring well boring	Water table interface and from a depth equal to the bottom of the former UST (approximately 13.5 feet).

The samples for analysis will be collected by opening the split-spoon and homogenizing the samples before distributing to the appropriate sample jars. A stainless-steel mixing bowl and trowel will be used to homogenize and handle the sample. Samples collected for volatile organics will be placed directly into sample containers and not homogenized.

A complete log of each boring will be maintained by the field geologist. The SOP Reference Manual, (B&R Environmental, 1996a) contains an example of the boring log form. At a minimum, the boring log will contain the following information, when applicable, for each boring:

- Boring or well identification
- Name of drilling contractor
- Sample number and types
- Sample depth
- Standard Penetration Test Data
- Sample recovery / sample interval
- Soil density or cohesiveness
- Soil color
- Unified Soil Classification System (USCS) material description and symbol

In addition, depth of changes in lithology, sample moisture observations, depth to water, drilling methods, and total depth of each borehole shall be included on each log, as well as any other visual observations of contamination and fill materials (e.g., metal fragments, wood, screws, etc.).

Drilling and sampling will be performed in accordance with B&R Environmental SOPs GH-1.3 and GH-1.5 (B&R Environmental, 1996a). Decontamination of drilling and sampling equipment will be performed as described in Section 4.4.

4.1.2 Monitoring Well Installation

The monitoring well will be constructed of 2-inch diameter schedule 40 flush-threaded PVC well screen and riser pipe. Well screens will be 10-feet in length with 0.020-inch slot openings except for the Site 10 screens which may be 15 feet. The top of the screened interval will be placed approximately two feet above the high tidal water table, assuming sufficient water remains in the well during low tide to obtain groundwater samples.

A primary sand filter pack (standard sieve size No. 10-20 or No. 20-30) will be installed around the well to a minimum of two feet above the top of the well screen. A minimum 2-foot thick seal of 100 percent sodium bentonite chips or pellets will be installed above the primary filter pack and allowed to hydrate as per the manufacturers recommendations. The annular space above the bentonite seal will be grouted with a cement/bentonite grout (containing no additives) from the top of the bentonite seal to the surface. The cement/bentonite grout will be allowed to cure for a minimum of 14 days before development. The monitoring wells will be completed as flush-mounted installations. The well riser pipe will be cut off immediately below the ground surface and a packer-type cap will be installed. A steel flush-mounted protective casing will be cemented in place over the riser pipe. A flush-mounted protective casing will identify the location as a "Monitoring Well." The location will be secured with a keyed-alike Master Lock. Well keys will be turned over to the PNS Point of Contact. Monitoring well installation will be performed in accordance with B&R Environmental SOP GH-2.8 (B&R Environmental, 1996a). A typical flush-mount monitoring well construction diagram is shown on Figure 4-1.

Monitoring wells will be developed no sooner than 24-hours after completion to remove fines from the area around the monitored interval of the well. Wells will be developed by the use of a submersible pump. Wells will be developed until the water is visibly clear of sediment and turbidity measurements using a Lamotte turbidity sensor are less than 10 Nephelometric Turbidity Units (NTUs); however, development will not exceed two hours.

4.1.3 Monitoring Well Purging and Sampling

Upon completion of development, a dedicated 1.66-inch diameter, low-flow bladder type pump (teflon-lined, PVC) will be installed in the well for purging and sampling. The pump will be placed at the midpoint of the low tide saturated well screen and if possible, no less than 2 feet above the bottom of the well so as not to disturb any sediment that may be located near the bottom of the well. Purging and sampling will occur no

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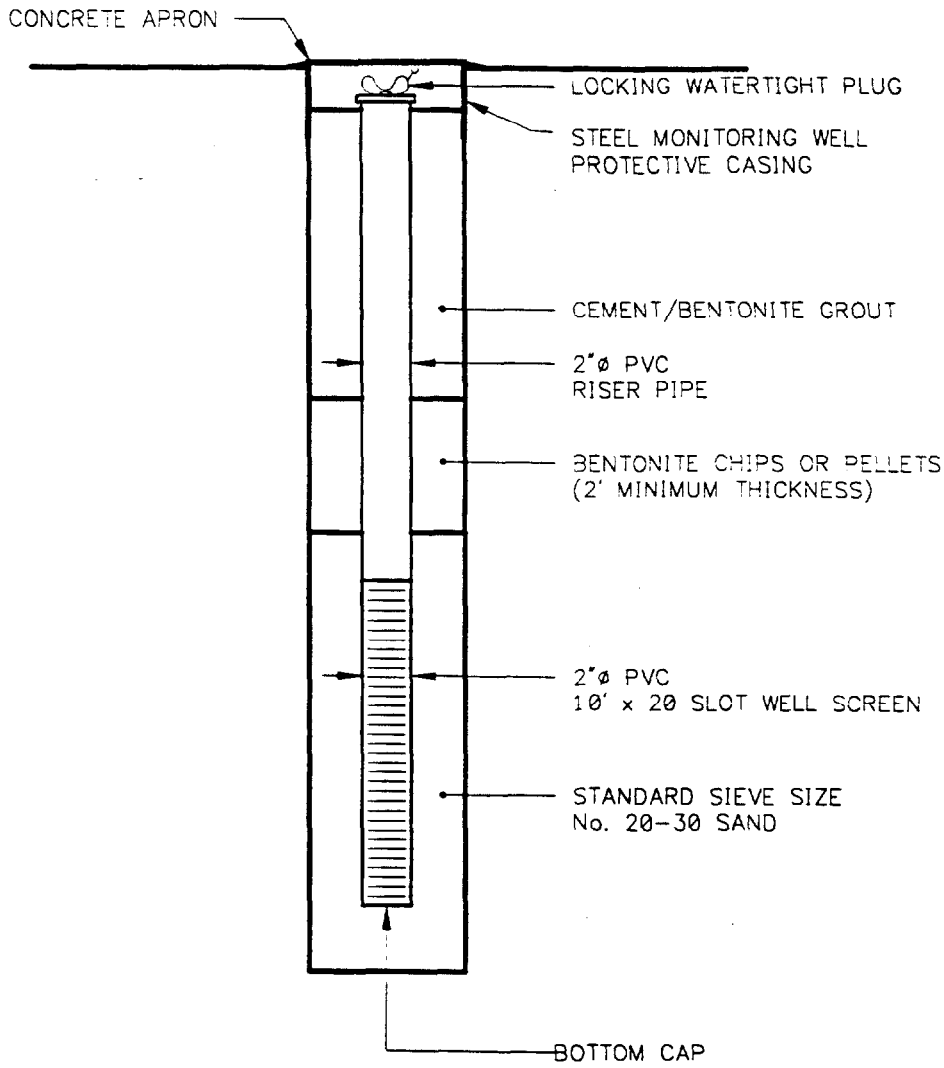

DRAWN BY DLT DATE 2/12/97	Brown & Root Environmental	CONTRACT NO. 6515	OWNER NO. 0232
CHECKED BY MLM DATE 5/7/97	TYPICAL FLUSH MOUNT MONITORING WELL CONSTRUCTION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY Mark L. Mungal DATE 5/7/97	
COST/SCHED-AREA		APPROVED BY	DATE
SCALE NOT TO SCALE		DRAWING NO. FIGURE 4-1	REV. 0

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earlier than 5 days after pump installation and will be accomplished by using low-flow purging techniques in accordance with B&R Environmental SOP SA-1.1 (Groundwater Sample Acquisition) and U.S. Environmental Protection Agency (U.S. EPA) Region I Low-Flow Purging and Sampling Procedure (B&R Environmental, 1996a). Low-flow purging and sampling is being implemented because this method will provide the least disturbance to the surrounding formation (i.e., less turbulence in sampling and hence less turbidity) allowing for a more representative sample to be collected.

Prior to purging and sampling the newly installed monitoring wells, water levels will be measured using an electric water-level indicator (M-Scope) capable of 0.01-foot accuracy. Water-levels will be obtained through the top of the well cap assembly used for installing the sampling pump and recorded in the field logbook. Water-level readings will be performed in accordance with B&R Environmental SOP GH-1.2.

For monitoring wells that are tidally influenced, groundwater samples will be collected at low tide. At low tide, contaminant concentrations are expected to be at maximum concentration, therefore, providing conservative data (at high tide, inflow of "clean" water would potentially dilute the contaminants in tidally influenced wells). Wells that are not tidally influenced will be sampled independent of the tide. Monitoring wells will be considered tidally influenced by measuring the water elevation in the well at high and low tides. If the difference in water elevation between high and low tide is greater than 1 foot, then the well will be considered tidally influenced. This definition is for the purpose of sampling the tidally influenced wells at low tide in order to avoid significant dilution of contaminants which may occur as the tide rises and impacts the water level in the well. The high and low tides will be determined based upon the Table of Tides, Sunrise, and Sunset provided by the shipyard.

Water levels will be monitored every 3 to 5 minutes as purging occurs. Initially, the pumping rate will be set at approximately 0.2 liters per minute, or lower if possible. The pumping rate will be reduced if turbidity is greater than 5 NTUs after all other field parameters have stabilized.

Water quality parameters of pH, turbidity, specific conductance, temperature, Eh, salinity, and dissolved oxygen will be measured during purging using a YSI Model 6820 water quality meter and flow-through cell. Turbidity measurements will be taken with a Lamotte Turbidity Meter or similar visible light source turbidity meter from water collected from the discharge of the pump prior to entering the flow-through cell. Measurements will be recorded every 5 minutes. Purging will continue until all of the parameters have stabilized to the criteria listed below, and the minimum purge volume (stabilized purge volume plus the extraction tubing volume) has been removed. Stabilization criteria for the parameters above are as follows:

- pH ± 0.1 standard units
- turbidity ± 10 percent for value greater than 1 NTU
- specific conductance ± 3 percent
- temperature ± 3 percent
- Eh ± 10 millivolts
- dissolved oxygen ± 10 percent

For tidally influenced wells, purging will begin 2-1/2 hours prior to low tide. If the parameters have not stabilized within 1-1/2 hours, then sampling will be initiated. Samples will be collected between 1 hour before low tide of the well and the end of the slack tide for the well.

Calibration and standards checks will be conducted on the water quality meter in accordance with the manufacturer's recommendations. The flow-through cell will be cleaned at each well prior to purging and during purging as needed (e.g., when fluctuating turbidity readings are observed and confirmed by collection of a turbidity sample before the cell for comparison). A tee connector with a valve will be inserted in the pump discharge tubing prior to the cell for collection of the turbidity sample. If the cell requires cleaning during purging operations, pumping will continue and the cell will be disconnected, cleaned, and reconnected after cleaning and monitoring activities continued. The cell will be cleaned by rinsing with deionized water.

Precautions will be taken to prevent air entrapment and/or air leaks in the purging system so that potential problems with stabilizing dissolved oxygen are minimized. Precautions will include: (1) taking care to fill the entire cell with water, while minimizing air entrapment, prior to initiating purging and (2) maintaining a full cell of water by pinching the discharge line shut and elevating the discharge at the end of the tubing from the pump, above the cell.

Purge water will be containerized and labeled by a B&R Environmental field technician. The empty containers will be provided by PNS. The containerized water will be turned over to PNS for disposal. Refer to Section 4.5 concerning residue management.

After purging is completed, the flow-through cell will be disconnected and samples will be collected directly from the discharge of the pump. All sample containers should be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Samples to be analyzed for volatile constituents will be taken first and immediately sealed in a pre-preserved container so that no headspace exists. The field crew will verify the preservation of each sample except volatiles using pH paper. Additional pre-preserved volatiles bottles will be supplied from the laboratory so that an additional bottle can be

checked. Should the laboratory receive a sample not preserved to a pH less than two, then the sample will be analyzed within seven days instead of the normal 14 days.

4.1.4 Building 238 Sampling

Four samples will be collected from the basement area of Building 238, where overhead piping still exists leading to the previously excavated underground storage tank. This activity will be performed as a confined space entry task. Specific procedures regarding the confined space entry are addressed in the Health and Safety Plan found in Appendix A. The samples will be collected from the floor of the basement beneath the overhead piping. The piping will first be examined in an effort to determine areas where leaks or cracks in the piping could be present. Samples will then be collected from the basement floor beneath these areas at a depth of approximately 0 to 1 foot using stainless-steel trowels. The samples will be placed directly into the appropriate sample containers and analyzed for TAL metals and pH. In addition, the number of pipes will be documented as well as their condition, size, and destination to the extent possible.

4.1.5 Background Soil Sampling

Three background surface soil samples will be collected and analyzed for dioxin to provide additional background data and to eliminate false-positive results. The sample locations are shown on Figure 4-2. Previously sampled background sample locations BGS-02, BGS-19 and BGS-22 were selected because previous background data for other contaminants appear indicative of background conditions. Samples will be collected using a stainless-steel trowel and placed directly into sample jars.

4.1.6 Surveying

The vertical and horizontal locations of all monitoring wells and soil boring locations will be surveyed at the completion of the field investigation at a time to be agreed on between B&R Environmental and the Navy. Existing benchmarks established during the previous surveying activity will be used.

All horizontal locations will be surveyed to the nearest 0.10 foot. Monitoring well elevations will be surveyed to the nearest 0.01 foot at the ground surface protective casing and the top of the inner well casing and marked with a notch by the surveyor.

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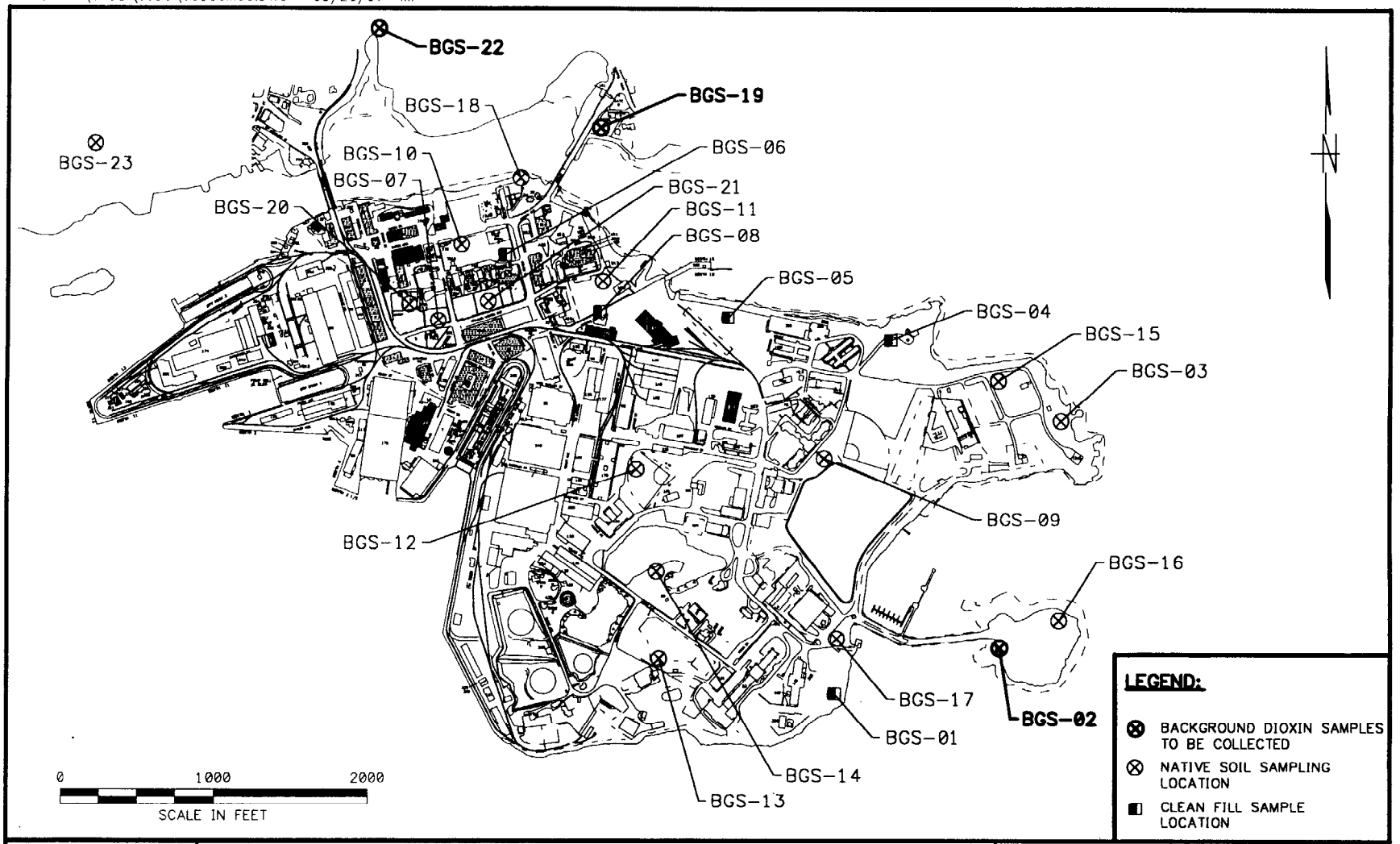

DRAWN BY HJP DATE 3/11/97	Brown & Root Environmental	CONTRACT NO. 6515	OWNER NO. 0232
CHECKED BY MLM DATE 10/30/97	BACKGROUND SOIL LOCATIONS	APPROVED BY Mark L. Mangel	DATE 10/30/97
COST/SCHED-AREA	PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY	DATE
SCALE AS NOTED		DRAWING NO. FIGURE 4-2	REV. 0

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4.2 SAMPLE IDENTIFICATION SYSTEM

Each sample collected will be assigned a unique sample tracking number. The sample tracking number will consist of a alpha-numeric code that identifies the site, sample medium, location, depth if necessary, and sample round identifier (in the case of groundwater samples). Any other pertinent information regarding sample identification will be recorded in the field log books.

The alpha-numeric coding to be used in the sample system is explained in the diagram and the subsequent definitions:

(AAA)	-	**(AA)**	-	**(NN)**	-	**([A]NN)**	-	**(NN)**
(Site ID)		(Media)		(Location)		(Depth)		(Round Identifier)

Character Type:

A = Alpha

N = Numeric

Site ID:

BA = Battery Acid

TPI = Teepee Incinerator Site

Media:

MW = Groundwater from monitoring well

SU = Subsurface Soil

SB = Soil Boring

SS = Surface Soil

Sample Location:

Subsurface soil sample = Soil boring number

Groundwater sample = Monitoring well number

Surface soil sample = Sample location number

Sample Depth:

Split-spoon sample number

Sample Round Identifier:

For soil samples = current year (97)

For groundwater samples = sampling round

For example, a subsurface soil sample collected in 1997 from monitoring well 1 at a depth of 1 to 3 feet, at Building 238 (Battery Acid Site) would be designated as: BA-SB01-0103-97. A groundwater sample from round 10 collected form the same location would be designated as: BA-MW-01-10.

Field quality control (QC) samples are described in Section 6.3. They will be designated using a different coding system. The QC code will consist of a two-segment, alpha-numeric code that identifies the sample medium (for duplicates only), QC type, and date. The same sample medium codes will be used for the standard environmental samples (i.e., GW). The QC types are identified as:

RB = Rinsate Blanks

TB = Trip Blanks

FB = Field Blanks

FD = Field Duplicates

For example, a duplicate of a groundwater sample obtained on April 1, 1997 would be designated as: GWFD-040197. This allows duplicates to be submitted as "blind" samples to the analytical laboratory. Sample log sheets, not received by the analytical laboratory, will document duplicate sample location.

Matrix Spike and Matrix Spike Duplicate (MS/MSD) samples will be designated on the field documentation forms and sample labels. MS/MSDS are collected at a frequency of 1 per 20 samples per matrix and double (soils) or triple (aqueous) volumes of sample are required for analytical purposes. Because of the large volume of sample required for MS/MSDS samples, only those wells exhibiting high hydraulic conductivities will be selected whenever possible.

The sampling time recorded on the chain-of-custody form for duplicate and matrix spike/matrix spike duplicate samples will be 00:00 so that the samples are "blind" to the laboratory. Notes detailing the sample number, time, date, and type will be recorded in the field log book and on sample log sheets. A separate sample log sheet will be completed for duplicate samples sent blind to the laboratory.

4.3 SAMPLE HANDLING

Sample handling includes the field-related considerations connected with the selection of sample containers, preservatives, allowable holding times, and analyses requested. Table 5-2 provides a summary of all sample handling considerations. Sample preservation requirements will be in accordance with the selected laboratory's SOPs.

4.4 DECONTAMINATION

The equipment in the field activities will be decontaminated prior to and during drilling and sampling activities. This equipment includes drilling rigs, downhole tools, well casing and screen, and soil sampling equipment.

4.4.1 Major Equipment

All downhole equipment, including downhole drilling tools shall be steam cleaned prior to beginning work, between boreholes, any time the drilling rig leaves the drill site prior to completing a boring, and at the conclusion of the drilling program.

Well casing and screens shall be steam cleaned prior to being installed in a borehole. This operation will consist of using a high-pressure steam wash from a portable water supply. All decontamination activities will take place at a predetermined area designated by the field representative. Additional requirements for drilling equipment decontamination are found in SOP SA-7.1 (B&R Environmental, 1996a).

4.4.2 Sampling Equipment

Nondedicated equipment involved in field sampling activities will be decontaminated prior to and during sampling activities. Since dedicated sampling equipment will be used at each well location to the extent possible, little to no decontamination water will be generated. Any decontamination water that is generated will be handled in the same manner as purge water, described in Section 4.5.

For any nondedicated sampling equipment used (i.e., split spoons, stainless steel trowels, bowls), the equipment will be decontaminated both prior to beginning field sampling and between samples. The following decontamination steps will be conducted.

- Potable water rinse
- Alconox or Liquinox detergent wash
- Potable water rinse

- Analyte-free water rinse
- Isopropanol rinse
- Analyte-free water rinse
- Air dry

Additional requirements for sampling equipment decontamination can be found in SOP SA-7.1 (B&R Environmental, 1996a).

4.5 RESIDUE MANAGEMENT

Five types of potentially contaminated residues are expected to be generated during this field investigation: Personal Protective Equipment (PPE), drill rig decontamination fluids, sampling equipment decontamination fluids, soil cuttings, and purge water and development water. Based on the activities and types of contaminants present, none of these residues are expected to represent a significant risk to human health or the environment if properly managed. Planned management of each of these residues is provided below:

PPE - B&R Environmental will place uncontaminated PPE in the trash receptacles at the facility. If contaminated, PPE will be containerized, labeled, and disposed of by PNS.

Drill Rig Decontamination Fluids - Drill rig decontamination fluids will be containerized in 55-gallon drums (as per Department of Transportation [DOT] Specification 17-C) and stored at a designated location specified by PNS personnel. Pending the results of testing, these decontamination fluids will be properly disposed of by PNS.

Sampling Equipment Decontamination Fluids - Equipment decontamination fluids will be containerized and handled similar to drill rig decontamination fluids.

Soil Cuttings - Contaminated soil cuttings as determined by visual observations and field screening, will be containerized in 55-gallon drums (as per DOT Specification 17-C) provided by PNS. Non-contaminated soil cuttings will be spread on the ground near the point of origin.

Purge and Development Water - It is recommended that purge and development water be containerized in large plastic/polyethylene tanks staged near the hazardous waste storage building or containerized in 55-gallon drums provided by PNS. Purge water generated during monitoring well sampling will be containerized and stored until analytical results are received.

5.0 SAMPLE MATRICES, PARAMETERS, AND FREQUENCY OF COLLECTION

As part of this investigation, environmental samples will be collected from the following matrices; surface and subsurface soil and groundwater. A listing of the sample matrices, parameters, and frequency of collection including QA/QC samples is found in Table 5-1. Sampling procedures to be used during this study are provided in Section 4.0. Table 5-2 provides sample container requirements, preservation requirements, and holding times.

TABLE 5-1

ANALYTICAL PROGRAM SUMMARY (INCLUDING QA/QC SAMPLES)
TEEPEE INCINERATOR AND BUILDING 238 SAMPLING
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Media	Analysis	Method	No. Samples	Trip Blank(1)	Rinsate Blank(2)	Field Blank(3)	Duplicate(4)	Total Samples
Groundwater	TCL Volatiles	CLP OLM03.1	3	1	-	-	1	5
	TCL Semivolatiles	CLP OLM03.1	3	-	-	-	1	4
	Phenolics	EPA 420.1	1	-	-	-	1	2
	TCL Pesticide/PCBs	CLP OLM03.1	3	-	-	-	1	2
	TAL Inorganics(5)	CLP ILM04.0	3	-	-	-	1	4
	Cyanide	CLP ILM04.0	3	-	-	-	1	4
	Total Organic Carbon (TOC)	EPA 415.1	3	-	-	-	1	4
	Chloride	EPA 325.3	3	-	-	-	1	4
	Nitrate	EPA 352.1	3	-	-	-	1	4
	Bromide	EPA 320.1	3	-	-	-	1	4
	Sulfate	EPA 375.4	3	-	-	-	1	4
	Alkalinity	EPA 310.1	3	-	-	-	1	4
	Salinity	SM 2520 A	3	-	-	-	1	4
	pH	EPA 150.1	3	-	-	-	1	4
Soils	TCL Volatiles	CLP OLM03.1	37	3	3	1	4	48
	TCL Semivolatiles	CLP OLM03.1	37	-	3	1	4	45
	Phenolics	EPA-420.1	33	-	3	1	4	41
	TCL Pesticide/PCBs	CLP OLM03.1	37	-	3	1	4	45
	TAL Inorganics	CLP ILM04.0	41	-	3	1	5	50
	Cyanide	CLP ILM04.0	41		3	1	5	50
	Dioxin	SW-846 8290	36	-	3	1	4	44
	pH	SW-846 9045	44	-	4	1	5	54

1 Trip Blanks - Samples which originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory with the volatile organic (VOA) samples. One trip blank per each cooler containing volatile organics.

2 Rinsate Blank - Samples obtained by pouring analyte-free water over sample collection equipment (bailer, etc.) after decontamination. Assesses the effectiveness of field decontamination procedure. Obtained at a frequency of 1/day/media/analysis unless dedicated or precleaned equipment is used. Number of samples reflects the number of actual laboratory analyses performed. Only samples from every other day will be analyzed.

3 Field Blank - Samples consisting of the source water used in (1) steam cleaning and/or (2) decontamination. Obtained at a frequency of 1/event/media.

4 Duplicates - A single sample split into two portions during a single act of sampling. Assess the overall precision of the sampling and analysis program. Obtained at a frequency of 10 percent of the number of samples.

5 Total Metals - For the determination of total metals the sample is not filtered before acidification.

Note: Additionally, specific conductance, pH, salinity, turbidity, temperature, Eh, dissolved oxygen (DO), and Oxidation Reduction Potential (ORP) will be measured in the field.

TABLE 5-2

SAMPLE CONTAINERS, PRESERVATION METHODS, AND HOLDING TIMES
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Method	Parameter	Container Material	Sample Volume	Preservation	Holding Time (a)
GROUNDWATER					
CLP OLM03.1	TCL Volatiles	Glass, Teflon-lined septa	(2) 40 ml	4 C; 4 drops HCl, pH < 2	14 days
CLP OLM03.1	TCL Semivolatiles	Glass, Teflon-lined septum	2,500 ml	Cool, 4 C	Extract 7 days; Analyze 40 days
CLP OLM03.1	Pesticides/PCBs	Glass, Teflon-lined septum	2,500 ml	Cool, 4 C	Extract 7 days; Analyze 40 days
CLP ILM04.0	TAL Inorganics (Total)	Plastic, glass	1 liter	4 C; HNO_3 to pH < 2	6 months; Hg - 28 days
CLP ILM04.0	Cyanide (Total)	Plastic	1 liter	4 C, NaOH to pH>12	14 days
EPA 420.1	Phenolics	Amber glass	1 liter	Cupric sulfate (1g/1L); H_3PO_4 to pH<4-5	24 hours
EPA 415.1	Total Organic Carbon (TOC)	Polyethylene	500 ml	H_2SO_4 to pH<2	28 days
EPA 325.3 EPA 320.1 EPA 375.4 EPA 310.1 EPA 150.1	Chloride Bromide Sulfate Alkalinity pH	Polyethylene	1 liter	Cool, 4 C	28 days (Bromide, Chloride, Sulfate) pH - Analyze immediately 14 days (Alkalinity)
EPA 352.1	Nitrate	Polyethylene	500 ml	Cool, 4 C	48 hours
SM 2520A	Salinity	Polyethylene	500 ml	Cool, 4 C	28 days
SOILS					
CLP OLM03.1	TCL Volatiles	Wide-mouth glass jar with Teflon-lined lid	240 ml (8 oz.)	Cool to 4 C	14 Days
CLP OLM03.1	TCL Semivolatiles	Wide-mouth glass jar with Teflon-lined lid	240 ml (8 oz.)	Cool to 4 C	Extract 7 days; Analyze 40 days
CLP OLM03.1	Pesticides/PCBs	Wide-mouth glass jar with Teflon-lined lid	240 ml (8 oz.)	Cool to 4 C	Extract 7 days; Analyze 40 days
CLP ILM04.0	TAL Inorganics	Wide-mouth glass jar	240 ml (8 oz.)	Cool to 4 C	6 Months
CLP ILM04.0	Cyanide	Wide-mouth glass jar	240 ml (8 oz.)	Cool to 4 C	6 Months
EPA-420.1	Phenolics	Wide-mouth glass jar with Teflon-lined lid	240 ml (8 oz.)	Cool to 4 C	Extract 7 days; Analyze 40 days
SW-846 8290	Dioxin	Wide-mouth amber glass jar	4 oz.	Cool to 4 C	Extract 30 days; Analyze 45 days
SW-846 9045	pH	Wide-mouth glass jar	4 oz.	Cool to 4 C	Analyze immediately

a Holding times are measured from time of collection.

Notes:

1 Additionally Oxidation Reduction Potential (ORP), pH, specific conductance, temperature, dissolved oxygen (DO), turbidity, salinity, and Eh will be measured in the field.

6.0 QUALITY ASSURANCE OBJECTIVES

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide environmental monitoring data of known and acceptable quality. Specific procedures to be used for sampling, chain-of-custody, calibration of field instruments, laboratory analysis, reporting, internal quality control, audits, preventative maintenance, and corrective actions are described in later sections of this plan. The purpose of this section is to address the data quality objectives in terms of the PARCC parameters (precision, accuracy, representativeness, comparability, completeness), quality control samples (field blanks, rinsate blanks, duplicates), and bottleware.

6.1 LABORATORY DATA QUALITY OBJECTIVES

Laboratory Data Quality Objectives (DQOs) are qualitative and/or quantitative statements regarding the quality of data needed to support the field activities. The sampling rationale provided in the Section 3.0 explains the choice of sample locations and media that will supply information needed for the site investigation. Section 14.0 provides an explanation of the procedure that will be used to determine if data quality objectives have been met.

6.2 PARCC PARAMETERS

The quality of the data set is measured by certain characteristics of the data, namely the PARCC parameters. Some of the parameters are expressed quantitatively, whereas others are expressed qualitatively. The objectives of the investigation and the intended use of the data define the PARCC goals.

6.2.1 Precision

Precision characterizes the amount of variability and bias inherent in a data set. Precision describes the reproducibility of measurements of the same parameter for a sample under the same or similar conditions. Precision is expressed as a range (the difference between two measurements of the same parameter) or as a relative percent difference (the range relative to the mean, expressed as a percent). Range and Relative Percent Difference (RPD) values are calculated as follows:

$$\text{Range} = OR - DR$$

$$RPD = \frac{[OR - DR]}{1/2\,(OR + DR)} \times 100\%$$

where: OR = original sample result

DR = duplicate sample result

The internal laboratory control limits for precision are three times the standard deviation of a series of RPD or range values. RPD values may be calculated for both laboratory and field duplicates and can be compared to the control limits as a QA check. Laboratory duplicates will be analyzed at the rate required by NFESC. Field duplicates will be collected for 10 percent of all samples collected.

6.2.2 Accuracy

Accuracy is the comparison between experimental and known or calculated values expressed as a percent recovery (%R). Percent recoveries are derived from analysis of standards spiked into deionized water (standard recovery) or into actual samples (matrix spike or surrogate spike recovery). Recovery is calculated as follows:

$$\%R = E / T \times 100\%$$

where: E = experimental result

T = true value (theoretical result)

and

$$T = \frac{(\text{Sample Aliquot})\,(\text{Sample Conc.}) + (\text{Spike Aliquot})\,(\text{Spike Conc.})}{\text{Sample Alquot} + \text{Spike Aliquot}}$$

Control limits for accuracy are set at the mean plus or minus three times the standard deviation of a series or %R values.

Accuracy for aqueous and solid samples will be evaluated by use of surrogate and matrix spikes. Out-of-criteria results will be reviewed for data applicability as a part of data validation.

6.2.3 Representativeness

All data obtained should be representative of actual conditions at the sampling location. The Work Plan for the PNS is designed so that the samples taken will present an accurate representation of actual site conditions. The rationales discussed in the Work Plan are designed to ensure this. All sampling activities will conform to the protocols provided in Section 4.0 of this Work Plan. The use of NFESC-approved analytical protocols and data deliverables will ensure that analytical results and deliverables are representative, and are both consistently performed and reported.

6.2.4 Comparability

Comparability will be achieved by utilizing standardized sampling and analysis methods and data reporting format. Both analytical procedures and sample collection techniques will maximize the comparability of this new data to previous data. Additionally, consideration will be given to seasonal conditions and other environmental conditions that could influence analytical results.

6.2.5 Completeness

Completeness is a measure of the amount of valid data obtained from the measurement program, compared to the total amount collected. For relatively clean, homogeneous matrices, 100 percent completeness is expected. However, as matrix complexity and heterogenicity increase, completeness may decrease. Where analysis is precluded or where DQOs are compromised, effects on the overall investigation must be considered. Whether any particular sample is critical to the investigation will be evaluated in terms of the sample location, the parameter in question, the intended data use, and the risk associated with the error.

Critical data points may not be evaluated until all the analytical results are evaluated. If in the evaluation of results it becomes apparent that the data for a specific medium are of insufficient quality (95 percent), either with respect to the number of samples or an individual analysis, resampling of the deficient data points may be necessary.

6.3 QUALITY CONTROL SAMPLES

Several types of quality control samples will be collected during the field investigation. Each type of quality control sample is described below.

6.3.1 Field Blanks

Field blanks are obtained by sampling the water(s) used in decontamination during the field investigation activities. Samples consist of the source water used in (1) steam cleaning of large equipment and (2) analyte-free water used for decontamination of sampling equipment. Field blanks will be used to confirm the effectiveness of decontamination procedures and to determine whether the analyte-free water or the potable water (used for steam cleaning) may be contributing to sample contamination. Field blanks will be collected for each type of water used for decontamination and will be submitted at a frequency of one per sampling event. Field blanks will be obtained during the early days of the sampling activities.

6.3.2 Rinsate Blanks

Minimal equipment rinsate blanks are anticipated for the interim monitoring program unless new monitoring wells are installed or nondedicated bailers are used for sampling. Equipment rinsate blanks are obtained under representative field conditions by running analyte-free water through sample collection equipment (bailer, split-spoon, corer, etc.) after decontamination and placing it in the appropriate sample containers for analysis. Equipment rinsate blanks will be used to assess the effectiveness of decontamination procedures. Equipment rinsate blanks will be collected for each type of nondedicated sampling equipment used and will be submitted at a frequency of one per day per media. Equipment rinsate blanks, however, will only be analyzed every other day unless positive detections are recorded in the prior rinsate blank. Rinsate blanks are collected on a daily basis and are analyzed at a frequency of every other day in accordance with NFESC requirements (NFESC, 1996). The analytical laboratory will receive all rinsate blanks. If contamination is encountered in the rinsate blanks and the contamination is not attributed to internal laboratory contamination, the laboratory must notify the project manager and analyze the remaining rinsate blanks. For dedicated or precleaned equipment, rinsate blanks will be collected and analyzed at a frequency of one per lot for a specific equipment type. It will be the responsibility of the FOL to communicate to the laboratory whether an equipment blank is, or is not, to be analyzed as stated above.

6.3.3 Field Duplicates

Field duplicates are two samples collected: (1) independently at a single sampling location in the case of groundwater or surface water, or (2) a single sample split into two portions in the case of soil or sediment. Duplicates are obtained during a single act of sampling and are used to assess the overall precision of the sampling and analysis program. Ten percent of all samples for each media will be field duplicates. Duplicates will be analyzed for the same parameters in the laboratory and will be labeled so as to make the identity of the duplicate unknown to the laboratory.

6.3.4 Trip Blanks

Trip blanks are samples which originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory with the volatile organic analysis samples (such as TCL volatiles). One trip blank will be collected per each cooler containing volatile organics. Trip blanks are analyzed only for the volatile constituents that are being shipped in a given cooler.

6.3.5 Temperature Blanks

Temperature blanks are samples originated at the laboratory, are placed in each sample cooler, and accompany the samples to the laboratory. The temperature blank checks the temperature inside of the cooler during transport from the site to the laboratory. One temperature blank will be provided for each cooler sent to the laboratory.

6.4 BOTTLEWARE

NFESC requires specific bottleware cleaning procedures. Precleaned, certified-clean bottles will be used during this study. Precleaned bottles will be provided by the subcontracted laboratory who will also be responsible for providing the required certification. All bottles must meet ICHEM Series 300 cleanliness criteria or equivalent.

7.0 DOCUMENTATION AND CHAIN OF CUSTODY

Sample custody procedures are designed to provide documentation of preparation, handling, storage, and shipping of all samples collected. Chain of Custody procedures are described in B&R Environmental SOP SA-6.1, (B&R Environmental, 1996a).

Integrity of the samples collected during the site investigation will be the responsibility of identified persons from the time the samples are collected until they, or their derived data, are incorporated into the final report. Stringent chain-of-custody procedures will be followed to document sample possession.

7.1 FIELD CUSTODY

- The FOL is responsible for the care and custody of the samples collected until they are delivered to the analyzing laboratory or entrusted to a carrier.

- Sample logs or other records will be signed and dated.

- Chain-of-custody sample forms will be completed to the fullest extent possible prior to sample shipment. They will include the following information: project name, sample number, date and time collected, source of sample and location, sample salinity in the case of groundwater, description of sample location, matrix, type of sample, grab or composite designation, preservative, and name of sampler. Sample salinities are included to aid the analytical laboratory in establishing dilution requirements for metals analyses where salinity could present an interference concern.

  These forms will be filled out in a legible manner, using waterproof ink, and will be signed by the sampler. Similar information will be provided on the sample label, which will be securely attached to the sample bottle. The label will also include the general analyses to be conducted. In addition, sampling forms will be used to document collection, filtration, and preparation procedures. Copies of all forms used during field activities are provided in the SOP Reference Manual (B&R Environmental, 1996a).

7.2 TRANSFER OF CUSTODY AND SHIPMENT

The following procedures will be used when transferring custody of samples:

- Samples will be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them will sign, date, and note the time on the chain-of-custody record. This

record documents the sample custody transfer from the sampler to the laboratory, often through another person or agency (common carrier). Upon arrival at the laboratory, internal sample custody procedures will be followed, as defined in the laboratory SOPs.

- Prior to shipment to the laboratory for analysis, samples will be properly packaged. Individual custody records will accompany each shipment. Shipping containers will then be sealed for shipment to the laboratory. The methods of shipment, courier name, and other pertinent information will be entered in the "remarks" section of the custody record.

- All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment; and a copy will be retained by the field sampler.

- Proper documentation will be maintained for shipments by common carrier.

7.3 SAMPLE SHIPMENT PROCEDURES

The following procedures will be followed when shipping samples for laboratory analysis:

- Samples requiring cooling to 4°C will be promptly chilled with ice or Blue Ice and will be packaged in an insulated cooler for transport to the laboratory. A temperature blank will be included in each cooler to be used as a temperature indicator. Each temperature blank will be clearly identified by the field sampling team. Ice will be sealed in containers to prevent leakage of water. Samples will not be frozen.

- Only shipping containers that meet all applicable state and federal standards for safe shipment will be used.

- Shipping containers will be sealed with nylon strapping tape, and custody seals will be signed, dated, and affixed, in a manner that will allow the receiver to quickly identify any tampering that may have occurred during transport to the laboratory.

- The field chain-of-custody document will be placed inside the shipping container in a sealed, plastic envelope.

- Samples to be delivered to the laboratory will be hand delivered or made by a public courier. Dioxin shipments will be made by a public courier. After samples have been taken, they will be sent to the laboratory within 24 hours.

7.4 FIELD DOCUMENTATION RESPONSIBILITIES

It will be the responsibility of the FOL to secure all documents produced in the field (e.g., sampling logs, calibration forms) at the end of each work day. Copies of all forms used during field activities are included in the B&R Environmental SOPs (B&R Environmental, 1996a). Copies of all field logbooks will be sent to NORTHDIV monthly, to the attention of Fred Evans (Navy Remedial Project Manager). Additionally, field notes will be included as an appendix to the report.

At the completion of field activities, the FOL will send the B&R Environmental Project Manager all field records, data, field notebooks, logbooks, chain-of-custody receipts, sample log sheets, daily logs, etc. The Project Manager will ensure that these materials are entered into the B&R Environmental document control system in accordance with appropriate administrative guidelines.

Changes in project operating procedures may be necessary as a result of changed field conditions or unanticipated events. A summary of the sequence of events associated with field changes is as follows:

- The FOL will notify the Project Manager of the need for the change.

- If necessary, the Project Manager will discuss the change with the pertinent individuals (e.g., Navy Remedial Project Manager, B&R Environmental Quality Assurance Manager) and will provide a verbal approval or denial to the FOL for the proposed change. The U.S. EPA and MEDEP will be consulted by the Navy of any major scope changes that may occur while fieldwork is ongoing. Communications and correspondences to the Restoration Advisory Board (RAB) will be handled through inclusion on the distribution list or written correspondence and updates at RAB meetings.

- The FOL will document the change on a Task Modification Request form and forward the form to the B&R Environmental Project Manager at the earliest convenient time (e.g., end of the workweek).

- The B&R Environmental Project Manager will sign the form and distribute copies to the Navy Remedial Project Manager, Quality Assurance Manager, FOL, and project file.

- A copy of the completed Task Modification Request form will be attached to the field copy of the affected document.

The possession of all records will be documented; however, only the project FOL or designee may remove field data from the site for reduction and evaluation.

7.5 LABORATORY SAMPLE CUSTODY

To ensure the integrity of a sample from collection through analysis, it is necessary to have an accurate, written record that traces the possession and handling of the sample. This documentation is referred to as the sample chain-of-custody.

A sample is under custody if:

- The sample is in the physical possession of an authorized person.
- The sample is in view of an authorized person after being in his/her possession.
- The sample is placed in a secure area by an authorized person after being in his/her possession.
- The sample is in a secure area, restricted to authorized personnel only.

Sample custody during collection and shipping is discussed in Section 5.3 of SOP SA-6.1, (B&R Environmental, 1996a). Laboratory sample custody is discussed in the following sections.

When samples are received, the shipping manifest is signed and dated to acknowledge sample receipt. The sample custodian must examine the shipping containers and verify that the correct number of containers was received. The shipping containers are then opened and the enclosed sample paperwork is removed. Samples are removed from the shipping containers and the bottle condition, cooler temperature, and sample salinity must be noted. The information on the chain-of-custody, the airbill, the containers, and the laboratory request is reviewed to note any discrepancies.

All samples received by the laboratory must be stored at 4°C until analysis. Laboratory holding times are specified by the contract and are presented in Table 5-2.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

Instruments used in the field and in the laboratory will be calibrated according to the procedures described below. Several monitoring instruments may be used during this study, including:

- In-line flow through cell and water-quality meter capable of measuring temperature, pH, specific conductivity, dissolved oxygen, turbidity, Eh, and salinity.
- Electronic water-level indicator
- Lamotte turbidity meter
- Horiba Water Quality Meter
- PID/FID

The electronic water-level meter will be calibrated prior to field use and periodically at the discretion of the FOL. The remaining instruments will be calibrated daily or according to the manufacturer's operating manual.

Calibration of each instrument will be documented on an Equipment Calibration Log. During calibration, an appropriate maintenance check will be performed on each piece of equipment. If damaged or defective parts are identified during the maintenance check and it is determined that the damage could have an impact on the instrument's performance, the instrument will be removed from service until the defective parts are repaired or replaced.

Calibration of equipment at the analytical laboratory will comply with the specified analytical method.

9.0 ANALYTICAL PROCEDURES

Environmental samples collected during this study for chemical analyses will be analyzed using the appropriate analytical procedures as outlined in Table 5-1 of this work plan. Laboratory Standard Operating Procedures provided as part of the *Groundwater Monitoring Plan* (B&R Environmental, 1996c) will be utilized for this project. Laboratory Standard Operating Procedures for dioxin analyses will be provided under separate correspondence and maintained as part of the administrative record.

10.0 DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction, validation, and reporting are basic steps in the control and processing of field and laboratory project-generated data. Data validation procedures are described below.

Data validation is a stringent review of an analytical chemical data package with respect to sample receipt and handling, analytical methods, data reporting and deliverables, and document control. The quality of data generated by a laboratory is extremely important; it is an integral part of the investigation and should be clearly tied to the project goals. data used to develop qualitative trends, for example, will not have the same data validation requirements as data used for litigation purposes.

A qualified B&R Environmental chemist (or a qualified subcontracted data validation firm, if requested by the Navy) will review the analytical data packages using EPA procedures. One hundred percent of the total number of environmental samples will be validated. Data validation will not be conducted on common water-quality parameters or other parameters such as salinity.

After receipt of analytical results, B&R Environmental will perform data validation according to the most recent Region I guidelines to ensure that the analytical results meet the data quality objectives for risk assessment. Data results from the volatile and semivolatile analyses will be validated following the "Region I EPA New England Data Validation Functional Guidelines for Evaluating Environmental Analyses", December 1996. The pesticide/PCBs results will be validated according to the "Region I Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses", November 1988 and the metal results will be validated according to the "Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", February 1989.

After the data are validated, a listing of nonconformities will be generated and used to determine whether the data can be used for its intended purpose. Nonconformities require data qualifiers, which are used to alert the data user to inaccurate or imprecise data. For example, if holding times are exceeded, the data reviewer must qualify all positive results as estimated and all sample quantitation limits as estimated. For situations in which there are several quality control criteria out of specification (with regard to the limits specified in the Navy Installation Restoration Laboratory Quality Assurance Guide (Interim Guidance), (NFESC, 1996) the data validator may make professional judgments and/or comments on the validity of the overall data package. In situations where the validity of an entire data package is in question, it may be necessary for the sample(s) to be reanalyzed. The reviewer will then prepare a technical memorandum presenting changes in the data, if necessary, and the rationale for making such changes.

The net result is a data package that has been carefully reviewed for its adherence to prescribed requirements and is suitable for its intended use. Data validation thus plays a major role in determining the confidence with which key technical evaluations may be made.

The data validation reports for Tier III will be generated according tot he requirements described in "Region I Tiered Organic and Inorganic Data Validation Guidelines", July 1, 1993. The final data validation report will include a data summary. The summary of analytical data will exclude nondedicated compounds. No subtraction of blanks will be allowed. Data will be flagged if blank contamination occurs. All data flags will follow the result in the summary.

11.0 INTERNAL QUALITY CONTROL CHECKS

Quality control samples generated by B&R Environmental will include the collection of field duplicates, and the preparation of field blanks, trip blanks, and equipment/rinsate blanks. An approximate 10 percent duplication (1 per 10 samples or 1 per sample matrix if less than 10 samples) will be collected. See Table 5-1 for the required number of sample duplicates.

Trip blanks will be prepared at a frequency of one-per-day for each cooler containing volatile organics. Rinsates, prepared by running distilled water through the sampling equipment, will be analyzed to determine whether the sampling procedures may be biasing the data. Field blanks will be prepared at a rate of one per source per event. Procedures for collecting these samples are contained in the Section 4.0 of this Work Plan.

Two types of quality assurance mechanisms are used to ensure the production of analytical data of known and documented quality. The internal quality control procedures for the analytical services are specified under NFESC guidelines (1996). These specifications include the types of control samples required (sample spikes, surrogate spikes, controls, and blanks), the frequency of each control, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria. It will be the laboratory's responsibility to document, in each package, that both initial and ongoing instrument and analytical QC criteria are met. This documentation will be included in the data packages generated by the contract laboratory.

Analytical results of field-collected quality control samples will also be compared to acceptance criteria, and documentation will be performed showing that criteria have been met. Any samples in nonconformance with the QC criteria will be identified and reanalyzed by the laboratory, if possible. The following procedures will be employed for the samples:

- Proper storage of samples.
- Use of qualified and/or certified technicians.
- Use of calibrated equipment.
- Formal independent confirmation of all computation and reduction of laboratory data and results.
- Use of standardized test procedures.
- Inclusion of replicate samples at a frequency of 1 replicate per 10 samples or 1 per sample matrix if less than 10 samples are collected.

12.0 PERFORMANCE AND SYSTEMS AUDITS

System audits will be performed as appropriate, to ensure that the work is being implemented in accordance with the approved project SOPs and in an overall satisfactory manner. These audits will be performed in the following manner.

- The FOL will supervise and check on a daily basis that the monitoring wells are installed and developed correctly, field measurements are made accurately, equipment is thoroughly decontaminated, samples are collected and handled property, and the field work is accurately and neatly documented.

- The data validator will review (on a timely basis) the data packages submitted by the laboratory. The data validator will check that the data were obtained through the approved methodology, that the appropriate level of QC effort and reporting was conducted, that holding times were met, and that the results are in conformance with the QC criteria. On the basis of these factors, the data validator will evaluate the data quality and limitations.

- The project manager will oversee the FOL and data validator, and will check that management of the acquired data proceeds in an organized and expeditious manner.

- System audits for the laboratory are conducted by NFESC on a regular basis as required.

- A formal audit of the field sampling procedures may be conducted in addition to the auditing that is an inherent part of the daily project activities.

- The auditors will check that sample collection, sample handling, decontamination protocols, and instrument calibration and use are in accordance with the approved project SOPs. The auditors will also check that the field documentation logs and chain-of-custody forms are being filled out properly. Formal audits may be conducted by the Quality Assurance Manager and the Health and Safety Manager of field procedures and health and safety procedures.

The subcontracted analytical laboratory must be approved by NFESC, must be eligible to perform the required analysis under NFESC protocols, and must have site-specific approval prior to commencement of work.

13.0 PREVENTIVE MAINTENANCE

B&R Environmental has established a program for the maintenance of field equipment to ensure the availability of equipment in good working order when and where it is needed. This program consists of the following elements.:

- The equipment manager keeps an inventory of the equipment in terms of items (model and serial number), quantity and condition. Each item of equipment is signed out when in use, and its operating condition and cleanliness checked upon return.

- The equipment manager conducts routine checks on the status of equipment and is responsible for the stocking of spare parts and equipment readiness.

- The equipment manager maintains the equipment manual library and trains field personnel in the proper use and care of equipment.

- The FOL is responsible for working with the equipment manager to make sure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions and the B&R Environmental SOPs before being taken to the job site and during field activities.

14.0 DATA MANAGEMENT, EVALUATION, AND REPORTING

The purpose of the Data Management is to track investigation data including field samples and survey data and to provide adequate levels of validation and quality assurance. Reporting of the data will be performed so as to identify whether the data needs have been met and whether a need for any additional work is necessary.

14.1 DATA MANAGEMENT

All analytical and field data will be managed by the B&R Environmental Information Management Solutions Group, who will be responsible for compiling and maintaining project files that will contain hard copies of the chains-of-custody, sample log forms, boring logs, sample location maps, and documentation of quality assurance of data manipulation. Removal of any files will require the initial and date of the requestee. Microsoft Visual FoxPro 3.0 will be the primary software for all data management and data manipulation activities.

All electronic data will be managed on the B&R Environmental Network System under the CTO 232 directory. The security of the database will be maintained by the network backup system which occurs on a daily basis.

14.1.1 Sample Tracking

A "Cradle-to-Grave" sample tracking system will be employed beginning prior to the field effort. All sample numbers, requested laboratory analyses, and field duplicate information will be entered into a database from the approved Work Plan. The sample tracking database will then be used to generate both sample jar labels and sample log forms to be completed in the field. Chains-of-Custody will be faxed to B&R Environmental's Pittsburgh office at the end of each sampling day to be compared against the sample tracking database. This will allow for early detection of errors made in the field so that any necessary adjustments can be made while the crew is mobilized. An electronic copy of the sample tracking database will be sent to the laboratory to avoid manual entry of sample numbers into the Laboratory Information Management System (LIMS). After successful completion of all requested analyses, the laboratory will submit an electronic deliverable to B&R Environmental for every Sample Delivery Group (SDG). Once all electronic deliverables have been received from the laboratory, queries will be run versus the pre-field effort database to ensure that the laboratory performed all of the requested analyses. The Project Manager will be notified as to any discrepancies. Ideally, discrepancies can be noted early enough so that resampling does not have to take place.

14.1.2 Sample Information

Before electronic files are received from the laboratory, all sample-specific information will be entered into the data management system. This information will include the depth at which the sample was collected, the area of concern with which the sample is associated, the aquifer in which the well was screened, etc. The sample information file will allow for the analytical results to be grouped together properly for statistical purposes.

14.1.3 Survey Data

All survey data will be delivered in Excel spreadsheet format. The files will contain a minimum of northing, easting, ground surface elevation, elevation of top of casing, and the elevation of top of riser. All coordinates will be submitted as state plane 1983 datum. Survey data will then be imported into the data management system.

14.1.4 Data Validation

Once all samples and analyses have been accounted for, the electronic data files are printed for each SDG and analytical fraction and submitted for data validation. Validators will incorporate data qualifiers into the electronic database and resubmit to the Information Management Solutions Group.

14.1.5 Project Data Compilation

The new data generated under this task order will be incorporated with all previous data generated at the PNS. All data such as units of measure and chemical nomenclature will be manipulated to maintain consistency with the project database. The project database is a relational database that ensures data structure integrity and data quality for all PNS data.

The project database will be used to generate all statistical tables for the various sections of the RI Report such as Nature and Extent of Contamination, Human Health Risk Assessment, Ecological Risk Assessment and Data Evaluation. Programs have been written to pull data directly from the database for statistics in order to preserve data integrity and consistency. Report formats have been written in Visual FoxPro to present analytical results in Excel Spreadsheet style format that are typically included as appendices.

Field duplicates will be averaged for statistical purposes for all aqueous data (i.e. groundwater and surface water). The maximum concentration will be used to represent field duplicate concentrations in solid media (i.e. soil and sediment). The normal, duplicate and average/maximum concentrations will all be presented in the analytical results appendix.

14.1.6 Geographic Information Systems (GIS)

Upon compilation of all sample, chemical and positional data, the data are incorporated into the PNS GIS. The GIS system can be used to generate site location maps, sample location maps, contaminant iso-contour maps, potentiometric surface maps and contaminant tag maps as needed.

14.2 SAMPLE EFFECTIVENESS

To determine the effectiveness of the data collected during the field investigation, the following strategy is applied to the site for determining the appropriate sample size.

Once the samples are collected from the incinerator area, the sample size needed to characterize each tested parameter relative to its action level will be determined by using the sample size formula for testing mean of normal distribution versus an action level [Equation (7) from Appendix C of U.S. EPA QA / G-4 (Guidance for the Data Quality Objectives Process); September 1994].

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})\sigma^2}{\Delta^2}$$

- where n = sample size; Z_p = p^{th} percentile of the standard normal distribution
- α = The false positive (Type I) error rate [deciding the site is contaminated when it truly is not]
- β = The false negative (Type II) error rate [deciding the site is not contaminated when it truly is]
- σ^2 = variance; and Δ = (U - AL); U is a constant value greater than the action level (AL)

The null hypothesis (H_0) for this situation, where previous testing has suggested that none of the parameters of interest are above their action level, is :

H_0: $\mu \leq AL$ (The average concentration within the soil of the incinerator area is less than the action level)

The consequence of a Type I error [rejecting H_0 when it is true] is incomplete remediation which could possibly endanger human health and the environment. The consequence of a Type II error [accepting H_0 when it is false] is unnecessary remediation and the associated expenses. Values are assigned to α, β, and U to reflect the tolerable probability for the occurrence of decision errors.

Since this equation assumes a normal (or lognormal distribution), the Shapiro-Wilk W test will be performed on the data to test for normal (or lognormal distribution) then the data (or natural log of the data) will be used in the equation.

An optimal sample size will be determined for each parameter and the maximum value of n will be used to assure that all parameters exceed their required sample size. If this maximum n is greater than the number of samples taken, more sampling might be considered necessary. Otherwise, the number of samples will be deemed sufficient.

14.3 EVALUATION OF DATA AND PERFORMANCE OF RISK SCREENING

After the completion of field work, the data will be evaluated to determine whether there are any additional potential contaminants of concern at the site which would require a rerun of the risk assessment and whether any data gaps shall exist. The method to be used to evaluate and screen the sites are discussed in this section and include a comparison of data to Preliminary Remediation Goals (PRGs) (referred to as Media Protection Standards [MPSs] under Resource Conservation and Recovery Act [RCRA]), PNS-specific background, U.S. EPA Risk Based Concentrations (RBCs) and other criteria, and/or risk assessment, and conduct modeling, if necessary.

14.3.1 Comparison with PRGs and Other Criteria

As a first step in, the analytical data will be compared to applicable PRGs and other criteria. Potential risk screening criteria include PRGs for soil and groundwater and U.S. EPA RBCs for soil and groundwater.

PRGs for soil and fresh groundwater were developed from MPSs established by the U.S. EPA (1994). Human health risk, as determined in the Public Health and Environmental Risk Evaluation (PHERE) (McLaren/Hart, 1994a), background concentration, and pertinent regulatory guidance were used to establish proposed MPSs. The development of the proposed MPSs is presented in the MPS Proposal (McLaren/Hart, 1994b). Based on the proposed MPSs, final MPSs were established for soil and fresh groundwater. With the transition from RCRA-driven remedial activities to CERCLA-driven remedial activities at PNS, the MPSs for soil and fresh groundwater are now referred to as PRGs for these media.

PRGs for future industrial land use and future residential land use for soil and future residential land use for fresh groundwater have been developed for PNS.

Note that the PRGs for soil do not take into consideration the leaching from soil to groundwater. However, the leaching of chemicals from soil to groundwater would be accounted for by evaluating chemical concentrations in groundwater and the modeling of contaminant migration from onshore to offshore environment (discussed in Section 14.3.3). This is based on the assumption that the sites are not newly contaminated sites and that if there is a potential for contaminants to migrate from soil to groundwater, it would be apparent based on the chemical concentration in groundwater. It should be noted that the monitoring wells to be installed at Site 10 will be tidally influenced and therefore the water may be saline or brackish and not fresh water.

The PRGs for fresh groundwater are based on groundwater being used for drinking. Although there is no future anticipated use of groundwater at PNS, the State of Maine considers all groundwater, except those which have been petitioned to be reclassified, as potential for public water. Therefore, PRGs for fresh water (as well as RBCs for tap water) will be used for screening groundwater data. However, the major migration pathway of concern for groundwater at PNS is to the offshore environment and PRGs developed to prevent impacts to the offshore environment would be more appropriate. If such PRGs are developed for groundwater, these PRGs will be used rather than fresh groundwater PRGs.

U.S. EPA Region III RBCs (1996, or most current update) for tap water and soil (based on industrial or residential land use) may be used for evaluation.

The comparison of data will be conducted as follows:

1. Potential future land use of the site will be identified. Sites in undeveloped areas outside of the Controlled Industrial Area (CIA) (e.g., Site 29) are considered to have the potential for future residential land use. Sites in industrially developed areas (e.g., Site 10) are considered to have the potential for future industrial land use.

2. <u>For Site 10</u>, all chemical concentrations in soil will be compared to PRGs and other criteria as follows:

   Soil: Compare to industrial soil PRG. If PRG not available, compare to PNS-specific background or, if background is not available, RBC for industrial land use.

3. For Site 29, all chemical concentrations in soil and groundwater will be compared to PRGs and other criteria as follows:

   Soil: Compare to residential soil PRG. If PRG not available, compare to PNS-specific background or, if background is not available, RBC for residential land use. If dioxin is detected, additional risk assessment will be necessary to determine additional risks imposed.

   Groundwater: Compare to MPSs developed through groundwater modeling and previous analytical results to determine whether recalculation of risks need to be performed

4. If neither PRG nor other criteria exists for a contaminant, a risk assessment (as discussed in Section 14.3.2), modeling (as discussed in Section 14.3.3), or further evaluation of data and/or site conditions (as Section 14.4) will be conducted for each media.

14.3.2 Risk Assessment

For chemicals in soil or groundwater which there are 1) no PRGs and are at concentrations greater than the other criteria (background or RBCs) or 2) no PRGs or other screening criteria, a risk assessment to determine chemical-specific risk will be conducted in accordance with the appropriate U.S. EPA risk assessment guidance. The risk assessment may include exposure assessment, toxicity assessment, risk characterization (human health effects), and uncertainty analysis. In the risk assessment, chemical-specific carcinogenic or noncarcinogenic risk and chemical-specific ecological risk will be calculated.

An ecological risk assessment for onshore media is not anticipated as this is not an exposure pathway of concern at Sites 10 and 29. The ecological exposure pathway of concern, the offshore environment, is being addressed as part of the offshore risk assessment.

Modeling (as discussed in Section 14.3.3) or further evaluation/recommendation (as discussed in Section 14.4) will be conducted based on the results of the risk assessment as follows:

- Individual chemicals which have estimated risks exceeding an incremental carcinogenic risk of 10^{-6} or a hazard quotient of 1.0, or chemicals for which a risk assessment cannot be conducted (e.g., no toxicity criteria):

Soil	= ⇒	Conduct further evaluation
Groundwater	= ⇒	Conduct modeling

- Individual chemicals which do not have estimated risks exceeding an incremental carcinogenic risk of 10^{-6} or a hazard quotient of 1.0:

Soils and Groundwater	= ⇒	Make recommendation

14.3.3 Modeling and Comparison with Offshore PRGs

If there are exceedances of PRGs and/or if the risk assessment indicates potential risks as a result of contaminated groundwater at the site, modeling may be conducted to determine the migration potential of the contaminants to the offshore environment. Modeling will be conducted by the method provided in the On-shore/Off-shore Contaminant Fate and Transport Modeling Work Plan (B&R Environmental, 1996b), the Draft On-shore/Off-shore Contaminant Fate and Transport Modeling Phase I Report (B&R Environmental, 1997a) (including response to comments), and the On-shore/Off-shore Contaminant Fate and Transport Modeling Phase II Work Plan (currently under preparation by B&R Environmental). Modeling would be used to indicate if concentrations in the groundwater represent a continuing significant source of contamination to off-shore receptors.

14.4 REPORTING

The report will include a discussion on each of the sites and include the following information:

- A summary of site activities including an interpretation of hydrogeologic conditions
- A summary of analytical results including an interpretation of the chemical data
- A comparison to previous analytical results
- Conclusions and recommendations

Appendices will be included as part of the report and will include field investigation forms, chain of custody, field notes, statistical calculations, and analytical data base.

The conclusions and recommendations will be made with regard to whether additional data is needed and whether the risk assessment must be rerun for these sites. The report will subsequently be used during the feasibility study for each site.

The reports will be signed and stamped by a Maine Certified Geologist. His involvement includes input on geological interpretations/geological data evaluation, as well as review and comment on B&RE Environmental documents on the draft phase of preparation. To expedite submittal of information to the regulatory agencies, concurrent review by the regulatory agencies and the Maine Certified Geologist will be conducted. The Maine Certified Geologist is involved in project tasks from the planning stage to the report stage by assisting with work plan and subsequent report review and with issues that may arise during field work effort.

15.0 CORRECTIVE ACTIONS

The QA program will enable problems to be identified, controlled, and corrected. Potential problems may involved nonconformance with the SOPs and/or analytical procedures established for the project or other unforeseen difficulties. Any person identifying an unacceptable condition will notify the Project Manager. The Project Manager with the assistance of the Project QA/QC Officer, will be responsible for developing and initiating appropriate corrective action and verifying that the corrective action has been effective. Corrective actions may include the following: resampling and/or reanalysis of a sample, or amending or adjusting project procedures. If warranted by the severity of the problem (for example, if a change in the approved Work Plan is required), the Navy will be notified in writing and their approval will be obtained prior to implementing any change. The EPA and MEDEP will be consulted of any scope changes that may occur while fieldwork is ongoing. Communications and correspondences to the RAB will be handled through inclusion on the distribution list or written correspondence and updates at RAB meetings. Minor changes will be documented for the main file by the B&R Environmental Project Manager. Additional work that is dependent on a nonconforming activity will not be performed until the problem has been eliminated.

For QA issues involving the analytical laboratory to be used for the project, the laboratory maintains an internal closed-loop corrective action system that operates under the direction of the laboratory QA coordinator.

16.0 QUALITY ASSURANCE REPORTS

The QA/QC advisor will review all aspects of the implementation of the Work Plan on a regular basis and will prepare a summary report. Also, monthly progress reports will be sent to NFESC's subcontractor for QA/QC review. Reviews will be performed at the completion of each field activity, and reports will be completed at that time. These reports will include an assessment of data quality and the results of system and/or performance audits. Any significant QA deficiencies will be reported and identified, and corrective action possibilities discussed. The laboratory will issue monthly progress reports updating laboratory progress.

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APPENDIX A

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN
TEEPEE INCINERATOR (SITE 29)
AND BUILDING 238 (SITE 10)

FOR

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) PROGRAM

Submitted to:
Northern Division
Environmental Branch, Code 18
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Submitted by:
Brown & Root Environmental
600 Clark Avenue, Suite 3
King of Prussia, Pennsylvania 19406-1433

CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0232

MARCH 1998

APPROVED BY:

Mark L. Mengel

MARK L. MENGEL
PROJECT MANAGER
BROWN & ROOT ENVIRONMENTAL
PITTSBURGH, PENNSYLVANIA

APPROVED FOR SUBMISSION BY:

FOR: MMS

MATTHEW M. SOLTIS, CIH, CSP
CLEAN HEALTH & SAFETY MANAGER
BROWN & ROOT ENVIRONMENTAL
PITTSBURGH, PENNSYLVANIA

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1.0 INTRODUCTION AND ORGANIZATION

1.1 PURPOSE

The purpose of this Health and Safety Plan (HASP) is to provide for the protection of personnel performing activities planned, specifically surface and subsurface soil monitoring, monitoring well installation, and a confined space procedure at the Portsmouth Naval Shipyard (PNS) site. This HASP specifies personnel responsibilities and restrictions, establishes requirements (such as the use of personal protective equipment, adherence to standard work practices, etc.), and the use of evaluation techniques that will be incorporated during the planned site activities.

This HASP has been prepared to satisfy the requirements of applicable OSHA standards, most specifically standards 29 CFR §1910.120, entitled "Hazardous Waste Operations and Emergency Response", and 29 CFR 1910.146 entitled "Permit Required Confined Spaces". This HASP has been developed based on available information regarding potential chemical and physical hazards which may be encountered by field personnel during the performance of the planned site activities. If additional or revised information becomes available, this HASP will be modified accordingly. It is the responsibility of the Brown & Root Environmental (B&R Environmental) Project Manager to communicate any such information to the CLEAN Health and Safety Manager (HSM), Matthew M. Soltis, CIH, CSP, who will determine any HASP modification needs.

1.2 KEY PROJECT PERSONNEL AND ORGANIZATION

Key project personnel and their associated project positions (responsibilities), including identifying safety and health responsibilities are identified in Figure 1-1. The B&R Environmental Project Manager (PM) has overall responsibility for the direction and implementation of health and safety for this project. The B&R Environmental Field Operations Leader (FOL) is responsible for the implementation of this HASP, with technical assistance and support from the Site Safety Officer (SSO). The SSO is the individual assigned the responsibility of overseeing the implementation of this HASP throughout all site activities and is a member of the onsite field team. The Project Health and Safety Officer is a member of the B&R Environmental Health Sciences staff and is the primary contact for technical health and safety support for this project. The CLEAN HSM is responsible for providing health and safety technical oversight, review and approval duties for all CLEAN projects, and for monitoring compliance with this HASP and the CLEAN Health and Safety Management Plan.

FIGURE 1-1

KEY PROJECT PERSONNEL AND RESPONSIBILITIES

NAME	RESPONSIBILITY
Mark L. Mengel	Project Manager
Tim Evans	Field Operations Leader
Clyde Snyder	Project Health and Safety Officer (HSO)
Clyde Snyder	Site Safety Officer (SSO)
TBD	Field Technicians/Geologists
Matthew M. Soltis, CIH, CSP	CLEAN Health and Safety Manager (HSM)

TBD: To be determined. Assignments have not yet been made.

1.3 SITE BACKGROUND

A detailed discussion of the history and background of the PNS is presented in Section 2.0 of the Project Work Plan and is not repeated here. However background information pertaining to each of the sites under investigation is presented in this section.

The areas involved in this investigation are:

- Teepee Incinerator (Site 29)

  The area described as the Teepee Incinerator was at one time part of the Defense Reutilization and Marketing Office (DRMO) Area. The DRMO was established in 1920 and is located near the area originally known as Henderson's Point. The point was excavated in 1905 to widen the channel to allow naval vessels access to the shipyard. The excavated fill was deposited along the shoreline adjacent to the point. The location of the incinerator was along the shoreline near the boundaries of the fill and natural material where Building 314 is currently located as shown on Figure 2-3 of the Work Plan.

  It has been reported that open burning took place in the area now occupied by Building 310 and the surrounding area between 1918 and the time leading up to the construction of the incinerator. The approximate limits of the open burning are shown on Figure 2-3. The open burning area was reportedly used for the purpose of burning shipyard solid waste and a dumping area for residual waste (i.e., paper, wood, and rubbish). The ash disposal area (also shown on Figure 2-3) was used as a

dumping area for residual waste generated from the open burning. General estimates of the yearly quantities of materials burned leading up to the construction of the incinerator were 75,000 cubic-yards of refuse and garbage.

The incinerator was constructed in 1965 and was operated until June 1975. It was a teepee-type steel frame with a metal-covered refuse burner complete with top catwalk, access ladder, steel inner liner, entrance and clean-out doors, forced draft blowers and piping, stainless-steel fire screen and foundation, and bucket slip rails. When fully operable it was reported that in addition to the solid waste and refuse burned at the incinerator, occasional paint cans and solvents were disposed of at the incinerator (Department of Navy, 1996).

There are currently five monitoring wells located in the vicinity of the incinerator. Additionally, eight surface soil samples have previously been collected.

- Building 238 (Site 10)

The investigation at Building 238 centers around a former leaking 9,680-gallon underground storage tank. The tank was located outside Building 238 within the Controlled Industrial Area (CIA), as shown on Figure 2-4 of the Work Plan and was used for waste battery acid storage. During an investigation of tank volume fluctuations in 1984, a leak was evident because the water level in the tank would rise and fall with the apparent tide. The period of potential release is unknown. The tank was taken out of service and removed in 1986 according to a closure plan approved by the MEDEP. An approximate 2-inch hole was discovered at the bottom of the tank. Subsurface soils were sampled at the time of the tank removal and no clean-up action was required by the MEDEP. According to information contained in the On-Shore Feasibility Report, Section 2.1.4, page 2-8, "bedrock was encountered around 7.5 to 9 feet below ground level. The tank bottom was reported to be approximately 13.5 feet below grade, and the top approximately 3.5 feet below grade." The area is currently covered by asphalt. The associated piping from the tank to the original point of generation was never removed and is located overhead within a basement area of Building 238. The area will require a confined-space entry to investigate.

2.0 SCOPE OF WORK

Detailed discussions on the planned activities, methods, and equipment for this effort are presented in Section 3.0 of the Work Plan. The primary action to be carried out as part of this scope is summarized as follows:

2.1 TEEPEE INCINERATOR (SITE 29)

No previous investigations have been performed at the Teepee Incinerator site; however, several monitoring wells have been installed and surface soil samples have been collected in the area as part of the RFI investigation for the DRMO (McLaren/Hart, 1992). Groundwater monitoring wells installed in the area include DW-3, DW-08, DW-08B, DW-09 and DW-10B (see Figure 2-3 of Work Plan). Previous groundwater sampling data from these wells indicated elevated metals in excess of Media Protection Standards (MPSs). During the most recent groundwater sampling (Round 7, December 1996 and Round 8, April 1997), significantly lower levels of metals were detected as shown on Table 3-1 of the Work Plan. This was likely due to the low-flow purging and sampling procedures utilized to collect more representative groundwater samples. It should be noted that Table 3-1 draws comparisons of groundwater data from tidally influenced monitoring wells (sea water) to MPSs that have been established for onshore concerns. Preliminary Remediation Goals (PRGs) will be established in the future as part of the CERCLA process. Based on the most recent analytical data (Table 3-1), the locations of the existing wells, the known boundaries of the fill (Figure 2-3), (Department of the Navy, 1996), and the expected groundwater flow direction (RFI Data Gap Report, Halliburton NUS, 1995a), it is not anticipated that any monitoring wells are necessary to further define the horizontal or vertical limits of site related contaminants in groundwater.

Surface soil samples previously collected indicate positive detections of some metals. These sample location provide data around the perimeter of the incinerator site. Additional surface soil samples will be collected in conjunction with the soil borings to be drilled as shown on Figure 3-1 of the Work Plan. Previous sampling in the area of the site has not included subsurface soil sampling. To better define the limits of any potential contamination that may have originated from the incinerator, soil borings will be drilled and sampled. Based on the limits of the open burning area shown on Figure 3-1, six soil brings will be drilled in the area reported to be used for open burning and should adequately address the area of concern. Samples will be collected for chemical analyses from the surface and from various depths, as described in Section 4.0 of the Work Plan. Additionally, one soil boring will be drilled and sampled near the location of the former incinerator. Also a monitoring well will be installed upgradient of the site to evaluate upgradient water quality.

2.2 BUILDING 238 (SITE 10)

The previous work performed at Building 238 addressed the removal of a nearby underground storage tank used for the storage of waste battery acid. This tank was located outside the building along the southern side, between the building and Berth 4 (refer to Figure 2-4 of the Work Plan). Three soil borings (BASB-01 through BASB-03) were later drilled around the perimeter of the excavation and sampled. The results are shown on Table 3-3 in the Work Plan. At the time of the removal, not all of the associated piping was removed. The piping from the tank extends into a basement area of Building 238. Interview sheets used in developing the Initial Assessment Study (IAS) (Weston, 1983) suggest the lines may have leaked. It is anticipated that a confined-space entry activity will be necessary to evaluate and document the location, size, destination, and potential leak locations along the piping. After identifying the locations of all pipes and their destination, surface soil samples will be obtained from the floor in areas of suspected contamination.

Two soil boring/monitoring wells will also be installed. One soil boring/monitoring well will be installed near the source area of the former UST removal (Figure 3-2 in the Work Plan). At the time of the tank removal (1986), a composite sample was collected from the excavation, split into two separate samples and analyzed for EP Toxic metals and nickel. The results of the sampling are attached as part of the follow-up comment response letter found in Appendix B. A review of the results indicated no positive results in excess of any of any of the maximum concentrations of contaminants for toxicity characteristics. The three previous soil borings (BASB-01 through BASB-03) were drilled and sampled to the top of bedrock (approximately 7 feet). The new boring will be drilled to a depth equal to the bottom of the tank to evaluate current conditions downgradient of the source. Subsurface soil samples collected from the boring will evaluate current conditions while groundwater will be monitored at the source as well downgradient of the piping. Additionally, a soil boring/monitoring well will be installed north of Building 238 to evaluate upgradient groundwater conditions.

3.0 RISK ASSESSMENT

This section of this HASP presents information regarding the known and suspected chemical and physical hazards which may be encountered in, or associated with, the planned activities, schedules, and work areas as described in this HASP. This assessment is based on the information available at the time of the preparation of this HASP. If new or revised information becomes available, it will be promptly reviewed to determine any needs to modify this risk assessment.

The potential hazards recognized for the planned site activities are summarized and presented (by task) in Table 3-1 of this HASP. In general, these potential hazards include personnel exposure to site contaminants via inhalation (gas/vapor form), dermal contact, and (to a much lesser extent) ingestion. Other hazards include those of a physical nature. The chemical hazards, physical hazards, and toxicological data is presented in Table 3-1 of this plan.

3.1 TASK-SPECIFIC RISK ASSESSMENT

In accordance with the requirements of OSHA standard 29 CFR 1910.120 (b) (4) (A), a task-specific risk assessment for the planned activities at this site. Of the tasks being performed during this investigation, the confined space entry at Building 238 presents the greatest hazard. B&R Environmental recognizes the inherent dangers involved with confined space entry. For this reason, we have developed the attached program (Attachment 2 of this document). All confined space entries will strictly adhere to the procedures outlined in the program. The remaining tasks, sampling both surface and subsurface, will be performed according to the control measures as outlined in this plan.

Site 10 (Building 238) Basement Investigation and Surface Sampling

This task will consist of entry into basement area not designed for human occupancy requiring a confined space entry. This task presents hazards related to confined spaces as outlined in Table 3-1. The primary hazards expected to be encountered are:

- Physical Hazards that are associated with entry into Bldg. 238 are trip hazards and illumination problems due to the lack of sufficient lighting in the basement areas.

TABLE 3-1
TASKS/HAZARDS/CONTROL MEASURES
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment*	Decontamination Procedures
Soil boring/monitoring well installation	*Chemical Hazards* 1) Air/particulate/water borne contaminants primarily consisting of various metals and pesticides. Polychlorinated biphenyls (PCBs), dioxins, and semivolatile organic compounds (SVOC) have also been detected at low concentrations at this site. Volatile organic compounds (VOCs) are not anticipated to be present at the site. However, air monitoring will be performed as a precaution to detect any potential airborne concentrations of VOCs. See Table 3-1 for more information on the chemicals of concern. 2) Transfer of contamination into clean areas and onto other personnel *Physical hazards* 3) Rotating machinery 4) Noise 5) Energized systems 6) Biological hazards	1) Use real-time monitoring instrumentation, observe specified action levels, and use identified PPE to control exposures to potentially contaminated medias (e.g. air, water, soils, etc.). 2) Decontaminate all equipment and supplies between drilling events 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 manufacturer's design. - Operated by certified operators, and knowledgeable ground crew. - Used within established safe zones and with clearly marked routes of approach In addition to equipment considerations, the following safe operating procedures will be incorporated: - All personnel not directly supporting the drilling operation will remain at least 33 feet from the point of operation. - Drilling, drill masts, or other projecting devices shall be at least 20 feet from overhead power sources and a minimum of 3 feet from underground utilities. - Hand signals will be established prior to the commencement of drilling. - The driller and helper can simultaneously handle moving augers or flights only when there is a standby person to activate the emergency stop device. - The driller must never leave the controls while tools are rotating unless all personnel are clear of the 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. - A remote sampling device must be used to sample drill cuttings near rotating tools. The driller shall shutdown operations if the sampler is near the tools. - Only manufacturer-approved equipment may be used in conjunction with equipment repair procedures (i.e. pins for auger flights etc.). - Never climb a drill mast while equipment is rotating. - Use ANSI-approved fall protection (i.e., belts, lanyards) or portable ladders which meet OSHA's requirements when climbing drill masts. - Work areas will be kept clear of clutter. - Secure all loose articles 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. - 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 ensure its operational status. - Areas will be inspected prior to the movement of drill rigs and support vehicles to eliminate any physical hazards. This will be the responsibility of the FOL and/or SSO. - Drill rigs and support vehicles will be moved no closer than 3 feet to manhole openings, pits, etc. 4) Hearing protection will be used during all drilling activities unless the SSO quantifies associated noise levels. 5) All utility clearances shall be obtained prior to drilling. 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) Avoid potential nesting areas of biting/stinging insects and animals. Use commercially available insect repellents and snake bite kits. Avoid contact with poisonous vegetation. Wear appropriate clothing. Tape ankle and wrists areas to prevent ticks, chiggers, etc. from attaching themselves to you skin. Wear light colored clothing so that ticks and other biting insects can be easily visible.	**Based on previous analytical data from the site, and the dispersion of potential vapors by natural wind currents and dilution, airborne concentrations are not anticipated to be present in worker breathing zones. Additionally, potential site contaminants are anticipated to be in the form of particulates or bound to particulates. However, the following information is provided as a contingency.** Photoionization Detector w/ 10.6 eV UV lamp source will be used as described below. 1) Source (borehole and split spoon) monitoring will be conducted at regular intervals determined by the SSO. Positive sustained (above background) results which may affect operations crew will require the following actions. A) Monitor the breathing zone of high-risk employees. Any sustained readings above background levels in the worker breathing zone requires site activities to be suspended and all workers will retreat to an unaffected area until breathing zone readings subside to background levels. B) If airborne dusts are generated as a result of site activities, field crews will employ area wetting methods to minimize dust generation. If area wetting methods are inadequate, the level of protection will be upgraded to Level C. 2) Hearing protection will be required whenever excessive noise levels are experienced. Noise levels may be considered excessive if workers must raise their voice in order to communicate when standing within 2 feet of each other. 3) 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 10 feet.	All drilling operations are to be initiated in level D protection. Level D protection constitutes the following minimum protection - Standard field dress (long pants, long-sleeve shirts - Steel-toe/shank safety shoes These following items will be incorporated during drilling operations: - Nitrile gloves (leather work gloves with surgical style inner gloves may be substituted for Nitrile gloves). - Hardhat, safety glasses, impermeable boot covers, and earplugs or muffs. - Tyvek coveralls will be worn if there is a possibility of soiling work attire. *- PVC or PE coated Tyvek will be incorporated if there is a potential for saturation of work attire.* The need for upgraded levels of protection will be based on air monitoring activities with the PID or observations of airborne dusts. Level C protection (full-face air-purifying respirator with combination GMC-H filter cartridges) will be required whenever airborne dusts are observed and they cannot be controlled with area wetting methods. Any PID readings greater than background levels in worker breathing zones will require site activities to be suspended until breathing zone readings subside or the source of the reading is identified. Chemical protective clothing for Level C protection will consist of impermeable boot covers, nitrile gloves with surgical style inner gloves, and Tyvek coveralls (unless free-phase product is encountered). If free-phase product or a splash potential exists, polyvinyl chloride (PVC) or polyethylene (PE) splash suits will be used in place of Tyvek coveralls. Because contaminant concentrations and conditions may change radically, the following equipment will be maintained during all onsite activities: • Fire extinguishers (strategically placed) • Stretcher, blankets, and first-aid kit	**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 an area adjacent to the drilling operations bordering the support zone. This decontamination procedure for **Level D** protection will consist of - Equipment drop - Soap/water wash and rinse of outer boots and outer gloves. Remove outer gloves and dispose. - Soap/water wash and rinse of the outer splash suit, as applicable. Remove coveralls and dispose. - Remove boot covers. Dispose if grossly contaminated. For **Level C** in addition to that described above: **Note:** APR cartridge change-out would take place at this point. - Respiratory (face mask) protection removal - Remove inner gloves and dispose - 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 drill rigs, 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 will have their wheels/tires sprayed off so 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

*Items of PPE in italics are optional, as specified by the SSO based on ongoing operations and conditions.

TABLE 3-1
TASKS/HAZARDS/CONTROL MEASURES
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE
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Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment*	Decontamination Procedures
Multi-media sampling including soils (surface and subsurface); air (personal and area)	1) Air/particulate/water borne contaminants primarily consisting of various metals and pesticides. Polychlorinated biphenyls (PCBs), dioxins, and semivolatile organic compounds (SVOC) have also been detected at low concentrations at this site. Volatile organic compounds (VOCs) are not anticipated to be present at the site. However, air monitoring will be performed to detect any potential airborne concentrations of VOCs. See Table 3-1 for more information on the chemicals of concern. 2) Cross contamination Physical hazards 3) Noise 4) Lifting (muscle strains and pulls) 5) Pinches and compressions 6) Slip, trips, and falls 7) Biological hazards (Insect/animal bites and stings) 8) Confined space operations when collecting samples in Building 238. Refer to the permit required confined space operation task provided in this table for additional information.	1) Employ real-time monitoring instrumentation, action levels, personal sampling, and identified PPE to control exposures to potentially contaminated medias (e.g. air, water, soils). 2) Restrict the cross use of equipment and supplies from location to location without first going through a suitable decontamination. 3) Hearing protection will be required if surrounding operations create excessive noise levels. As a general rule, if a person two feet away must raise their voice to be heard, noise levels are excessive. 4) Employ machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 5) Use tools or other equipment to keep hands away from moving machine parts. 6) Preview work locations for unstable/uneven terrain. Barricade all excavations deeper than two feet from access closer than two feet from the edge. 7) Avoid potential nesting areas, employ repellents. Report potential hazards to the SSO. Identify all access/egress routes and locations, hours of clearance, and base contacts, in addition to the badge clearance and associated requirements for base clearance. 8) Utilize confined space entry procedures as per Attachment 2 of this Health and Safety Plan.	Monitoring instrumentation will be employed as specified in the Sampling and Analyses Plan to bias samples. Wells to be sampled will require opening to allow venting and equilibration prior to sampling. **It is anticipated that potential contaminant concentrations at source areas will be dispersed via natural wind currents and dilution prior to reaching worker breathing zones. As a result, airborne concentrations of site contaminants are not anticipated to be present in worker breathing zones.** A photoionization detector (PID) w/ a 10.6 eV UV lamp source will be used to monitor potential source areas. Source areas such as boreholes and general work locations will be monitored at regular intervals to be determined by the SSO. Positive sustained results at a source location which may impact field crew members will require the actions discussed below. Monitor the breathing zone of at risk employees. Any sustained readings above background in the breathing zone of the at risk employee requires site activities to be suspended until readings return to background levels. Immediate notification of SSO is required. The SSO will determine when operations can resume, and if an upgrade in protection is required Significant dust emissions are not anticipated to be generated as a result of this task. However, if such dusts are observed, area wetting methods must be employed. If airborne dust cannot be controlled, Level C protection will be required. A PhD plus and Ultra 4-gas meters will be used to monitor areas considered confined spaces within Building 238 and 7.	Level D - (Minimum Requirements) - Standard field attire (long sleeve shirt; long pants) - Tyvek coveralls - Nitrile gloves with surgical style inner gloves - Safety shoes (steel toe/shank) - Impermeable boot covers - 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 by the SSO. Level C protection consisting will be required whenever airborne dusts cannot be controlled with area wetting methods. Level C protection consists of the following PPE in addition to Level D requirements discussed above - Air-Purifying Respirator (APR) with combination GMC-H filter cartridges. - Tyvek coveralls (unless free phase product is encountered). Free phase product or splash potential will require the use of PVC splash suit - Impermeable boot covers - Nitrile outer gloves with surgical style inner gloves Level B protection (SCBA) will be required during confined space operations in the following situations - if additional monitoring activities determine excessive concentrations or the presence of airborne contaminants which cannot be adequately removed by APRs - IDLH concentrations of the indicator compounds - O_2 readings <19.5; >23.5 Dermal PPE for Level B will be the same as that specified above for Level C. Ascension to Level B protection requires immediate notification of the PM, and Manager of Health Sciences (Pgh. Office) As contaminant concentrations and conditions may change radically, the following equipment will be maintained during all on site activities • Fire Extinguishers (Strategically placed) • Basket stretcher, blankets, and first-aid kit • SCBA, lifelines	**Personnel Decontamination** - 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 an area adjacent to the drilling operations bordering the support zone. This decontamination procedure will consist of - Equipment drop - Soap/water wash and rinse of outer boots and gloves. Remove outer gloves and dispose. - Soap/water wash and rinse of the outer splash suit, as applicable. Remove coveralls and dispose. **Note:** APR cartridge change out would take place at this point. - Respiratory (face mask) protection removal - Remove inner gloves and dispose - 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 **Note:** Decontaminating samples with isopropanol will be done out doors, wearing chemical splash eye protection and nitrile surgeon's-style gloves. Personnel will review the appropriate MSDS and adhere to its contents. MSDS for isopropanol will be obtained and used to determine proper handling and disposal methods. 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.

*Items of PPE in italics are optional, as specified by the SSO based on ongoing operations and conditions.

TABLE 3-1
TASKS/HAZARDS/CONTROL MEASURES
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE
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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) Moving machinery 5) Vehicular and foot traffic	1) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 2) Use pinch bars or other equipment to keep hands from point of operation or other associated pinch points. 3) Preview work locations for unstable/uneven terrain. Barricade all floor openings from access closer than 3 feet from the edge. 4) All equipment will be - Inspected in accordance with OSHA, and manufacturer's design. - Operated by certified operators, and knowledgeable ground crew. 5) Establish safe zones of approach (Boom + 3 feet).	Not required since site contaminants are not anticipated to be present during this task.	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.*	Not required
Decontamination of sampling and heavy equipment	*Chemical Hazards* 1) Air/particulate/water borne contaminants primarily consisting of various metals and pesticides. Polychlorinated biphenyls (PCBs), dioxins, and semivolatile organic compounds (SVOC) have also been detected at low concentrations at this site. Volatile organic compounds (VOCs) are not anticipated to be present at the site. However, air monitoring will be performed to detect any potential airborne concentrations of VOCs. See Table 3-1 for more information on the chemicals of concern. 2) Decontamination fluids - Liquinox (detergent), acetone or methanol, and hexane *Physical Hazards* 2) Lifting (muscle strains and pulls) 3) Pinches and compressions	1) Employ protective equipment to minimize contact with site contaminants and hazardous decontamination fluids. 2) Use multiple persons where necessary for lifting and handling heavier pieces of equipment for decontamination purposes.	1) Use visual observation, and real-time monitoring instrumentation specified for the activity that the equipment was used for, to ensure that all equipment has been appropriately cleaned of potentially contaminated medias (e.g. water, soils).	*For Heavy Equipment (i.e., auger flights, etc.):* 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 if the* potential for saturation of work clothes exists. - Safety glasses underneath a splash shield Respiratory protection is not anticipated for this activity. *For sampling equipment including trowels, split spoons, 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 - Chemical splash eye protection 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 and boot covers - Soap/water wash and rinse of the outer splash suit, as applicable - Remove PPE, dispose - Wash hands and face; leave contamination *reduction zone*

*Items of PPE in italics are optional, as specified by the SSO based on ongoing operations and conditions.

TABLE 3-1
TASKS/HAZARDS/CONTROL MEASURES
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE
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Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment*	Decontamination Procedures
General surveying activities	*Chemical Hazards* 1) The degree of potential exposure to chemical contaminants is dependent upon when the surveying is performed. Many surveying activities are performed after all intrusive activities have been completed. As a result exposure to site contaminants is unlikely. However, exposure concerns may exist during surveying activities conducted at spill sites or in areas where surface contamination is known to exist It is anticipated that surveying activities at PNS will be performed after all intrusive tasks are completed. Exposure to site contaminants is anticipated to be unlikely. *Physical hazards* 2) Slip, trips, and falls 3) Biological hazards (Insect/animal bites and stings, poisonous plants) 4) Ambient temperature extremes	1) Monitoring instrumentation may be used for surveying activities conducted in areas where contamination is anticipated to exist. Generally, monitoring instrumentation is not needed during surveying activities recognizing that contact with potentially contaminated media is limited. The need for monitoring instrumentation will be made on a case by case basis. 2) Minimize contact with potentially contaminated soils, water, debris, etc. 3) Avoid potential nesting areas of biting/stinging insects and animals. Use commercially available insect repellents and snake bite kits. Avoid contact with poisonous vegetation. Wear appropriate clothing. Tape ankle and wrists areas to prevent ticks, chiggers, etc. from attaching themselves to you skin. Wear light colored clothing so that ticks and other biting insects can be easily visible. 4) Obtain help when handling heavy or cumbersome loads. Avoid areas of rocky or uneven terrain. Use appropriate equipment (rope ladders, harnesses, ladders, etc.) when needed. 5) Observe workers for symptoms of heat/cold stress. Wear appropriate clothing for seasonal conditions. Institute work/rest regimens when necessary. In extreme cases, biological monitoring can be performed.	No air monitoring is needed in most cases given the unlikelihood that volatile contaminants are present. The potential for exposure to site contaminants during this activity is considered minimal. Minimize the generation of airborne dusts since many site contaminants are in the form or a particulate or may be bound to particulates.	Surveying activities shall be performed in Level D protection **Level D Protection** consists of the following: Steel-toe / shank boots, safety glasses, hard hats (if working near machinery), and standard field dress including long sleeved shirts, long pants. Tyvek coveralls may be worn to provide additional protection against poisonous plants and insects, particularly ticks. Disposable boot covers are required in any areas identified as having containing surface contamination. Work gloves may be worn if desired. Surgical style nitrile gloves must be worn if the potential for contact with contaminated media exists.	**Personnel Decontamination** - Will consist of a soap/water wash and rinse for outer protective clothing (disposable boots covers, gloves, etc.), if worn. This function will take place at an area adjacent to the surveying operations. The decontamination procedure will consist of: - An equipment drop - Soap/water wash and rinse of boot covers and gloves. - Removal and disposal of disposable PPE - Wash hands and face, leave contamination reduction zone
Permit Required Confined Space Operations in Building 238	*Chemical Hazards* 1) Potential exposure to chemical contaminants is minimal due to the nature of the two spaces being investigated at PNS. Contaminants of concern, oxygen deficiency, carbon monoxide, SVOC"s, sulfuric acid, metals. The potential for exposure to these contaminants is anticipated to be minimal. *Physical Hazards* 2) Slip, trips, and falls 3) Entrapment	1) Confined space operations will be performed in accordance with OSHA 29 CFR 1910.146. • Confined Space Permit listing hazards, control measures, and personal protective equipment. • Continuous monitoring of the space to identify a dangerous or toxic atmosphere. • Procedure using an authorized attendant and two authorized entrants. • 2-way radio communications between entrants and attendant 2) Preview work locations for unstable/uneven terrain. Barricade all floor openings from access closer than 3 feet from the edge. 3) Visual inspection of space prior to entry, and the use of non-entry rescue equipment (body harness, lifelines, retrieval equipment, etc.)	**Acceptable Entry Conditions** Initial and continuous air monitoring using the PID and a 4 gas PhD meter equipped with sensors for combustible gas, oxygen, carbon monoxide, employing the following action levels: • Oxygen content in air ≥19.5% and ≤23.5%. • Flammable or explosive conditions: ≤10% of an LEL or gases, vapors, or mists. • Carbon monoxide concentration ≤25 ppm. • Detection of any unidentified volatile/gaseous substances in the space. If these parameters are exceeded entry will be prohibited. If these levels are approached during the entry, the activity will be discontinued and entrants will evacuate the space immediately. The task may continue only when acceptable entry conditions are regained and stabilized, or if the permit is amended and the task is performed in Level B.	Entry procedures will be conducted in: Building 238 - Level D protection consisting of Tyvek, coveralls, steel toe/shank boots, hard hats, hand-held flashlight, nitrile surgical inner and outer gloves. If necessary due to observed and monitored conditions in the space, protection will be upgraded to Level B by adding a self contained breathing apparatus.	**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 an area adjacent to the work space. This decontamination procedure for **Level D** protection will consist of - Equipment drop - Soap/water wash and rinse of outer boots and outer gloves. Remove outer gloves and dispose. - Soap/water wash and rinse of the outer splash suit, as applicable. Remove coveralls and dispose. For **Level B** in addition to that described above: **Note:** SCBA air tank change-out would take place at this point. - Respiratory (face mask) protection removal - Remove inner gloves and dispose - Wash hands and face; leave contamination reduction zone

*Items of PPE in italics are optional, as specified by the SSO based on ongoing operations and conditions.

- Chemical Hazard exposure due to abandoned sulfuric acid pipelines in Building 238 that may have leaked during use. The waste acid tank was removed some time ago; an initial site visit indicated that no visual evidence of contamination was observed. Monitoring instrument readings were acceptable for O_2, CO, and combustibility. The risk of being overexposed to sulfuric acid is anticipated to be minimal due to the long period since the pipelines were in use. Particulate hazards may exist due to the nature of other known/suspected contaminants and the dry sandy nature of the flooring.

Teepee Incinerator/ Site 29

This task will require the use of a hollow stem auger drill rig to obtain subsurface soil samples. The hazards associated with this activity are primarily physical in nature and are addressed in Table 3-1 of this plan. Potential chemical contaminants expected to be encountered at this site are poly-chlorinated biphenyls (PCBs), pesticides, metals, and dioxins. From an occupational exposure standpoint, the greatest potential for exposure to these site contaminants is through inhalation of dust and ingestion by incidental hand to mouth activities. This observation is based on the fact that most of these contaminants will be in the form of particulates or bound to particulates. However, control measures (addressed in Table 3-2 of this HASP) will be initiated to evaluate and control potential exposures to site contaminants.

3.2 CHEMICAL HAZARDS

The chemical contaminants which may be present and encountered in the performance of site activities have been identified based on information such as the histories of the site areas and the results of previous investigatory activities. Information regarding these substances is presented in Table 3-2 of this HASP.

The potential for worker exposure to hazardous concentrations of site chemical contaminants is generally considered to be low. This assumption is based on overall levels identified within the previous sampling results obtained at the various sites.

TABLE 3-2

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
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Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Carbon monoxide	630-08-0	PID: Ionization potential 14.01 eV, relative response is unknown. FID: Relative response ratio is unknown however is considered detectable. For this operation an Ultra PhD 4 Gas meter will be used to identify and quantify levels of carbon monoxide generated within the area of operation.	Air sample using bag collection; Electrochemical analysis. Sampling and analytical protocol in accordance with NIOSH Method #S340.	NIOSH/OSHA: 35 ppm; 200 ppm (Ceiling) ACGIH: 25 ppm IDLH: 1200 ppm	This material is a colorless, odorless gas - Warning properties are considered poor (Odor threshold: 100,000 ppm). Carbon monoxide canister with a window-cator can be used for concentrations not to exceed 1,500 ppm. This material exhibits no associated skin hazard unless in its cryogenic form which is not the case. Therefore any gloves suitable for the operations identified.	**Boiling Pt:** -313°F; -192°C **Melting Pt:** <-337°F; <-205°C **Solubility:** 2% **Flash Pt:** Not applicable (Gas) **LEL/LFL:** 12.5% **UEL/UFL:** 74% **Vapor Density:** RGasD 0.97 **Vapor Pressure:** >35 atm **Specific Gravity:** 0.97 **Incompatibilities:** Strong oxidizers, bromine trifluoride, chlorine trifluoride, lithium **Appearance and Odor:** Colorless odorless gas.	Signs and symptoms associated with overexposure to carbon monoxide are typically associated with its oxygen depriving capabilities to the cells of the body. As with other chemical asphyxiants most signs and symptoms are associated with the brain and heart which are most sensitive to the affects brought on by deprivation of oxygen. Some signs and symptoms may include cherry red color of the skin or possible pallor and cyanosis, mild headache with increasing severity as carboxyhemoglobin concentrations build, irritability, impaired judgment, rapid fatigue, dizziness, confusion, severe ataxia, possible coma, and respiratory failure and death.
Aluminum	7429-90-5	Particulate form - unable to be detected by PID/FID.	Air sample using a cellulose ester membrane filter (particulate filter); atomic absorption (Method #7013) or ICP (Method #7300). Sampling and analytical protocol shall proceed in accordance with NIOSH Methods #7013 and #7300 as applicable.	OSHA: 15 mg/m³ Total dust, 5 mg/m³ Respirable fraction NIOSH: 10 mg/m³ Total dust, 5 mg/m³ Respirable fraction ACGIH: 10 mg/m³	Particulate form - No identifiable warning properties to indicate presence and thereby detection. Employ air purifying respiratory protection suitable for dust and fume. Organic vapor acid gases with HEPA filter. **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:** 4452°F; 2450°C **Melting Pt:** 1220°F; 660°C **Solubility:** Insoluble **Flash Pt:** Nonflammable **LEL/LFL:** Nonflammable **UEL/UFL:** Nonflammable It should be noted that finely divided powders or dust when airborne becomes moderately flammable/explosive when exposed to heat, flame, or powerful oxidizers **Vapor Density:** Not available **Vapor Pressure:** 1 mmHg @ 2343°F; 1284°C **Specific Gravity:** 2.702 @ 77°F; 25°C **Incompatibles:** Acids, alkalis, oxidizers, halogens and halocarbons, alcohols **Appearance and odor:** silvery gray ductile, lustrous metal	Inhalation of finely divided powders or dusts may result in difficulty in breathing, coughing, and has been reported to cause pulmonary fibrosis. This malady known as "Shavers disease" is a form of benign pneumoconiosis.

TABLE 3-2

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
PAGE 2 OF 8

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
DDT and the major metabolites; DDD and DDE.	50-29-3 72-54-8 72-55-9	Substance is not volatile, I.P. is unknown, detection by PID is unknown. Substance non-combustible, therefore a FID is anticipated to have reduced response to DDT.	Air sample using a binder free, glass fiber filter; 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.
Antimony	7440-36-0	Particulate form - unable to be detected by PID/FID.	Air sample using particulate filter; acid desorption; atomic absorption spectrometry PeCam Sampling and analytical protocol shall proceed in accordance with NIOSH Method #261.	OSHA/NIOSH/ACGIH: 0.5 mg/m³ IDLH: 50 mg/m³	Metallic taste resulting from exposure. **Recommended Air Purifying Cartridges:** Protect from dusts, fumes, and mists use HEPA filters. **Recommended gloves:** This is in the particulate form. Therefore any glove suitable to prevent skin contact.	**Boiling Pt:** 2975°F; 1635°C **Melting Pt:** 1166°F; 630°C **Solubility:** Insoluble **Flash Pt:** Nonflammable **LEL/LFL:** Nonflammable **UEL/UFL:** Nonflammable NOTE: This substance is nonflammable but may present a moderate explosion hazard when airborne dusts of an adequate concentration are exposed to flames. **Vapor Density:** Not available **Vapor Pressure:** 1 mmHg @ 1627°F; 886°C **Specific Gravity:** 6.684 @ 77°F; 25°C **Incompatibles:** Acids, oxidizers, halogens **Appearance and odor:** silvery gray, lustrous metal	This substance is considered a poison by ingestion, irritating to the skin and mucous membranes causing inflammation to the nose, mouth, and throat. Chronic exposure may result in some forms of dermatitis. Ingestion may result in a metallic taste, vomiting, colic, and diarrhea. Chronic exposure may result in addition to those stated above indigestion, loss of appetite and weight, and diarrhea. Sores in the mouth along with a sore throat help distinguish this form of poisoning from other forms of metallic poisoning such as lead and arsenic. Inhalation at excessive concentrations may result in difficulty in breathing, headaches and a bloody discharge from the nose, and chemical pneumonitis.

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CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
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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.
Cadmium	7440-43-9	Particulate Form - Unable to be easily detected by PID or FID.	Air sample using a mixed cellulose-ester filter / acid desorption and analysis by atomic absorption-flame. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7300 or #7048.	OSHA: 2 µg/m³ (0.002 mg/m³) ACGIH: 0.01 mg/m³ (total particulate); 0.002 mg/m³ (respirable particulate) IDLH: 9 mg/m3 (as cd)	The use of an air purifying, full face-piece respirator with a high efficiency particulate air filter for concentrations up to 0.25 mg/m³. **Recommended Gloves:** This is in particulate form. Therefore any glove suitable to prevent skin contact.	**Boiling Pt:** 1412°F; 767°C **Melting Pt:** 610°F; 321°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:** 1 mmHg @ 741°F; 394° C **Specific Gravity:** 8.65 @ 90°F; 32°C **Incompatibilities:** Strong oxidizers, elemental sulfur, selenium, tellurium, zinc, nitric acid, and hydrazoic acid **Appearance and Odor:** Metal: Silver-white, blue-tinged lustrous, odorless solid. Fume: yellow-brown, finely divided particulate dispersed in air.	Overexposure to this substance may result in irritation to the respiratory tract, dyspnea, tightness in the chest, coughing, possibly pulmonary edema. Overexposure to fumes causes symptoms characteristic of the flu (headaches, chills, muscle aches, nausea, vomiting, diarrhea). Chronic exposure may result in damage to the lungs, kidneys and liver. This substance has been identified as a confirmed animal; potential human carcinogen by IARC and NTP.

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Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Chromium Compounds	7440-47-3 (Element)	Not detectable by PID. Not detectable by FID.	Air sample using mixed cellulose -ester filter; acid desorption and analysis by atomic absorption. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7024.	OSHA & NIOSH: (Chromium II, III) 0.5 mg/m³ (Chromium VI) 0.1 mg/m³ (Ceiling) ACGIH: 0.5 mg/m³ (Chromium II, III compounds), 0.05 mg/m³ (Chromium VI compounds) IDLH: 30 mg/m³ (Chromium VI compounds)	The use of a air purifying, full face-piece respirator with a high efficiency particulate filter for concentrations up to 0.1 mg/m³. **Recommended Gloves:** This is in particulate form. Therefore any glove suitable to prevent skin contact.	**Boiling Pt:** 4788°F; 2642°C **Melting Pt:** 3452°F; 1900°C **Solubility:** Insoluble **Flash Pt:** Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) **LEL/LFL:** Not applicable **UEL/UFL:** Not applicable **Vapor Density:** Not available **Vapor Pressure:** 0 mmHg **Specific Gravity:** 7.14 **Incompatibilities:** Strong oxidizers, peroxides, and alkalis **Appearance and Odor:** Appearance and odor vary depending upon the specific compound.	Health hazards are characterized normally through chronic exposure manifesting as histologic fibrosis of the lungs and ulceration of the nasal septum and skin. IARC, NTP and ACGIH list various chromium compounds as possessing carcinogenic properties.
Copper	7440-50-8 (Cu) 1317-38-0 (CuO)	Substance is not volatile. Unable to be detected by PID or FID.	Air sample using a mixed cellulose ester filter; inductively coupled plasma/atomic emission spectroscopy. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7300.	NIOSH; OSHA: 0.10 mg/m³ ACGIH: 0.2 mg/m³	The use of an air-purifying full-face respirator with a high efficiency particulate air filter. **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:** 4215°F; 2324°C **Melting Pt:** 1981°F; 1083°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:** 1 mmHg @ 2962°F; 1628°C **Specific Gravity:** 8.94 **Incompatibilities:** Oxidizers, alkalis, sodium azide, acetylene, bromates, chlorates, iodates, and acids. **Appearance and Odor:** Metal: Reddish, lustrous malleable, odorless solid. Fume: Finely divided black particulate dispersed in air.	Irritation to the nose, throat, and respiratory tract. Metallic taste Discoloration of skin (potential dermatitis) and hair. Chronic exposure may result in dermatitis and damage to the liver and kidneys. Overexposure to fumes causes symptoms characteristic of the flu (headaches, chills, muscle aches, nausea, vomiting, diarrhea). Ingestion may cause burning in the mouth, throat, and stomach. Metallic taste with colicky abdominal pain. Individuals with Wilson's disease are at greater risk of chronic exposure as a result of the bodies tendency to absorb and retain copper.

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Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Dieldrin	60-57-1	This substance is anticipated to be in the form of a particulate or bound to particulate. It is not detectable by FID or PID	Gas chromatography with electron capture detection	OSHA & NIOSH : 0.25 mg/m^3 ACGIH: 0.25 mg/m^3 IDLH: 450 mg/m^3	Particulate form - Recommended Gloves: This is in particulate form. Therefore any glove suitable to prevent skin contact. The use of an air purifying full face-piece respirator with an organic vapor cartridge with HEPA filter.	**Boiling Pt:** Decomposes **Melting Pt:** 348.8°F 176°C **Solubility:** 0.02% **Flashpoint:** Noncombustible **LEL/LFL:** Non Reported **UEL/UFL:** Non Reported **Vapor Density:** Not available **Vapor Pressure:** 77°F 1.8 x 10^{-7} mmg Hg **Specific Gravity:** 1.75 **Incompatibilities:** Strong oxidizers active metals such as sodium, mineral acids, acid catalysts and phenols. **Appearance and Odor:** Colorless to light tan crystals with a mild chemical odor.	Health effects include central nervous system, possible liver and kidney damage. Symptoms include: hyperirritability, nausea, headache, fatigue, dizziness, blurred vision, tremors, convulsions, coma, respiratory failure. Listed as a NIOSH Class X and EPA Class 2B carcinogen.
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/m^3 ACGIH: 0 15 mg/m^3 NIOSH: 0.10 mg/m^3 IDLH: 100 mg/m^3 as lead	The use of a air purifying, full-face respirator with high efficiency particulate air filter for up to 2.5 mg/m^3. **Recommended gloves:** This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	**Boiling Pt:** 3164°F; 1740°C **Melting Pt:** 621°F; 327°C **Solubility:** Insoluble **Flash Pt:** Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) **LEL/LFL:** Not applicable **UEL/UFL:** Not applicable **Vapor Density:** Not available **Vapor Pressure:** 0 mmHg **Specific Gravity:** 11.34 **Incompatibilities:** Strong oxidizers, peroxides, sodium acetylide, zirconium, and acids **Appearance and Odor:** Metal: A heavy ductile, soft gray solid.	Overexposure to this substance via ingestion or inhalation may result in metallic taste in the mouth, dry throat, thirst, Gastrointestinal disorders (burning stomach pain, nausea, vomiting, possible diarrhea sometimes bloody or black, accompanied by severe bouts of colic), CNS effects (muscular weakness, pain, cramps, headaches, insomnia, depression, partial paralysis possibly coma and death. Extended exposure may result in damage to the kidneys, gingival lead line, brain, and anemia.

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Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Manganese	7439-96-5 as Mn	Particulate form - This substance is unable to be detected by PID/FID.	Air sample using particulate filter; acid desorption, ICP detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7300.	OSHA: Ceiling 5 mg/m³ as a fume 1 mg/m³ NIOSH: 1 mg/m³ for dust and fume; 3 mg/m³ as a STEL ACGIH: 5 mg/m³ for dust; 1 mg/m³ for fume IDLH: 500 mg/m³	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. **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:** 3452°F; 1900°C **Melting Pt:** 2300°F; 1260°C **Solubility:** Insoluble **Flash Pt:** Not available (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals. This substance is considered a combustible solid.) **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** 1 mmHg @ 2358°F; 1292°C **Specific Gravity:** 7.20 **Incompatibilities:** Strong oxidizers, halogens, and nitrates. Will react with water to produce hydrogen gas. **Appearance and odor:** Silvery solid or reddish-gray, odorless	Overexposure to this product may result in Central Nervous System and pulmonary effects by inhalation. Symptoms may include disturbances in gait and speech, sleepiness, mental confusion, stolid, masklike face, muscular twitching varying from tremors to coarse rhythmical movements of the extremities accompanied by cramps. Symptoms are described as postencephalitic Parkinsonism. Additionally dry throat, tightness in the chest, dyspnea, rales, flu-like symptoms low back pain, and vomiting.
Nickel	7440-02-0	Particulate form - This substance is unable to be detected by PID/FID.	Air sample using particulate filter; acid desorption; ICP detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7300.	OSHA: as Ni metal and insoluble compounds 1 mg/m³ NIOSH: 0.015 mg/m³ ACGIH: 0.05 mg/m³ IDLH: 10 mg/m³	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. **Recommended gloves:** This material 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:** 4946°F; 2730°C **Melting Pt:** 2651°F; 1455°C **Solubility:** Insoluble acid **Flash Pt:** Not available(Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** 1 mmHg @ 3290°F; 1810°C **Specific Gravity:** 8.90 **Incompatibilities:** Strong acids, halogens, sulfur, wood and other combustibles, nickel nitrate, and oxidizers **Appearance and odor:** Silvery white, hard, malleable ductile metal, odorless	Symptoms of overexposure to this product may include headaches, vertigo, delirium, extreme weakness, GI disturbance and pain including nausea vomiting and diarrhea, coughing, hyperpnea, cyanosis, weakness, allergic dermatitis, nickel itch, pulmonary asthma, chest pains tightness, dyspnea, dry cough, and conjunctivitis. This substances has been identified as a Human carcinogen by NTP and IARC.

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Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Zinc	7440-66-6	Particulate form - This substance is not detectable using a PID or FID.	Air sample using a particulate filter; acid desorption; AAS detection. Sampling and analytical protocol will proceed in accordance with NIOSH Method #7300.	OSHA: 10 mg/m³ Total dust, 5 mg/m³ Respirable fraction NIOSH: 5 mg/m³, 15 mg/m³ (Ceiling) ACGIH: 10 mg/m³	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. **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:** 1666°F; 908°C **Melting Pt:** 788°F; 419.8°C **Solubility:** Insoluble **Flash Pt:** Not available (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** 0 mmHg **Specific Gravity:** 7.14 **Incompatibilities:** Strong acids, halogens, catalytic metals, combustibles, oxidizers, nitryl fluoride **Appearance and odor:** Bluish-white, lustrous metal, odorless	Inhalation of fumes may result in metal fume fever. This condition is characterized by metallic taste, dryness of the throat, coughing with generalized aching and flu-like symptoms. Effects through ingestion may include coughing, difficulty in breathing, and sweating. A human skin irritant. Irritation to the eyes may result from mechanical action.
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.

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Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Sulfuric Acid	7664-93-9	This substance is unable to be detected by PID/FID.	Sampling and analytical protocol shall be in accordance with NIOSH Method #7903.	OSHA; NIOSH: 1 mg/m³ ACGIH: 1 mg/m³, 3 mg/m³ (Ceiling) NIOSH: 1 mg/m³ IDLH: 15 mg/m³	Adequate - Irritating, tingling sensation. Odor threshold 0.15 ppm. Suitable for acid gases and dusts and mists for concentrations less than 15 mg/m³. **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; silver shield 6.00 hrs; neoprene 1-3 hrs; and Viton >8.00 hrs.	**Boiling Pt:** 554°F; 290°C **Melting Pt:** 51°F; 10°C **Solubility:** Miscible **Flash Pt:** Not available **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** 1 mmHg @ 295°F; 146° C **Specific Gravity:** 1.84 **Incompatibilities:** Organic materials, chlorates, carbides, fulminates, water, and powdered metals. Liberates excessive heat when mixed with water. **Appearance and odor:** Colorless, oily liquid, odorless	This substance is corrosive at all points of contact. Severe exposure may result in burns, chemical pneumonitis, conjunctivitis, stomatitis, and erosion of the teeth. Depending on the severity, shock and collapse may result.
Waste Oils All information is based on mineral oil	N.E. 8012-95-1 for mineral oil	Varies between fractions however waste oils tend to be less volatile. The FID tends to handle the longer chained aliphatic hydrocarbons more efficiently than its PID counterpart and would be selected as the instrument of choice.	Sampling and analytical protocol shall be in accordance with NIOSH Method #5026 is the recommended method for mineral oil mist.	ACGIH; NIOSH: 5 mg/m³ (Oil mists); 10 mg/m³ STEL OSHA: 5 mg/m³ (Oil mists)	Non-volatile substance, therefore no respiratory protection is required. In an aerosol form dust and mist respirator would be considered acceptable for up to 500 mg/m³. **Recommended gloves:** Any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances, and will be acceptable).	**Boiling Pt:** 680°F; 360°C **Melting Pt:** Not available **Solubility:** Insoluble **Flash Pt:** 275-500°F; 135-260°C depends on the distillation fraction **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** <0.5 mmHg **Specific Gravity:** 0.90 **Incompatibilities:** None reported **Appearance and odor:** Colorless, oily, with an odor of burned lubricating oil.	Minor irritation to the eyes, skin, and respiratory system.

3.3 PHYSICAL HAZARDS

Certain physical hazards may also be presented to site personnel involved with field activities. These may be intrinsic to the nature of the operation being performed or the result of factors such as the work location or schedule. These potential risks include the following:

- Uneven or unstable terrain (Slip/trip hazards)
- Strain/muscle pulls from manual lifting.
- Inclement weather
- Low ceilings
- Natural hazards (e.g. snakes, ticks, mosquitoes, poisonous plants, etc.)

Each of the above mentioned items are further detailed below.

3.3.1 Uneven/Unstable Terrain

Planned activities described in the scope of work for this remedial action will bring field personnel into areas where this potential hazard exists. It will be the FOL's responsibility to inspect the work areas, and implement necessary controls or restrictions prior to placing heavy equipment or personnel at risk. As planned activities move from one area to another, this hazard (and others associated with that area or task) will be discussed as part of the safety briefing prior to the commencement of activities.

3.3.2 Strain/Muscle Pulls

The potential exists for workers to be injured while lifting or maneuvering cumbersome and/or heavy objects during the execution of this ground water monitoring plan. During labor intensive activities such as loading/hanging pumps, workers have the potential to over-exert themselves. In addition, various tasks may require lifting heavy pieces of equipment. If objects are improperly lifted, debilitating back strain and/or other injuries can result. Workers shall obtain help from others when necessary, employ proper lifting techniques, and use machinery, where possible, to assist when handling heavy objects.

3.3.3 Pinch/Compression Points

Pinch and compression points of sampling equipment may result in injury. All equipment must be maintained in proper working order, with machine guarding devices in place. Any equipment found to be lacking in these areas shall be removed from service. Additionally, all personnel shall be properly trained in the use and function of all equipment used within the investigating activity.

3.3.4 Inclement Weather

As all work will be conducted outdoors, inclement weather may be encountered. As conditions may vary, it will be at the discretion of the FOL and the SSO representative to temporarily suspend or terminate activities as conditions dictate. All activities will be terminated in the advent of electrical storms.

3.3.5 Natural Hazards (ticks, snakes, and other indigenous creatures)

Natural hazards such as poisonous plants, bites from poisonous or disease carrying animals or insects (e.g. snakes, ticks, mosquitoes) cannot be avoided in this type of environment. However in an effort to offset the impact of this hazard, field personnel will have access to commercially available snake bite kits and insect repellents. Potential nesting areas in and about work areas shall be avoided to the greatest extent possible. Lastly, within recent years a marked increase in Lyme's Disease has been reported. Ticks have been shown to be the primary vector in the transmission of this disease. In an effort to control this hazard, close attention will be given during operations and decontamination with regard to personal hygiene to detect and remove any ticks from personnel. The information provided in Attachment I will be reviewed with site personnel to aid in the recognition and control of this threat.

3.4 GENERAL REQUIREMENTS

- Head protection (hard hats) will be required whenever and wherever potential overhead hazards are recognized, including when in the vicinity of any operating heavy machinery

- Loose items of clothing will be secured when working around items of moving machinery. Also, personal items such as jewelry which can become caught or entangled will be prohibited around such operations.

- Electrical cords (such as on hand tools or electrical extension cords) shall be inspected prior to being put in use, and periodically thereafter. Also, these devices will be used and stored in a manner that protects them from damage. Cords found to be defective (i.e. plug damaged, ground prong removed, insulation damaged, etc.) will be immediately removed from service and either effectively repaired or replaced.

- Eye protection will be required wherever potential eye hazards are recognized.

- Any use or storage of compressed gas cylinders on site will be will be done in a manner that complies with applicable OSHA standards and Compressed Gas Association specifications. This includes (but is not limited to) proper labeling of container contents, marking and segregating containers as "full" or "empty", securing in an upright position, placing valve end caps in place when cylinders are not in use, etc.

- Incidents of inclement weather will be evaluated by the FOL, with input from the SSO, in regard to limiting or interrupting site operations. At a minimum, however, site operations will be interrupted in the event of electrical storms.

- The "buddy system" will be required throughout all onsite operations, intrusive and non intrusive.

4.0 CONFINED SPACE ENTRY OPERATIONS

The work in Building 238 involves work in a basement area not designed for human occupancy. For this reason it will be considered permit required confined spaces. The basement area will be permitted according to the B&R Environmental Unit Confined Space Operations Program (Attachment 2). All entries into this space will be conducted according to the provisions of this program.

The site safety officer will evaluate the confined space, determine the hazards of the space and develop a permit that determines if:

- The space contains (or have the potential to contain) a hazardous atmosphere (as defined in that OSHA regulation).
- The space contains a material that has the potential to engulf or entrap an entrant.
- Must be so that the configuration is such that an entrant could be trapped or asphyxiated by inwardly converging sides or by a floor which slopes downward in the work area and tapers to a smaller cross-section.
- Space contains any other recognized serious safety or health threat.

Because conditions of this nature may exist in the Building 238, absolutely no entry will be permitted without a confined space permit and the appropriate protective equipment. All entries will be conducted with the approval of the PNS Health and Safety Department. A copy of all Confined Space Permits will be presented to the appropriate PNS H&S Officer before an entry is conducted. The PNS Fire Department will also be presented with a copy of the permit, again before the entry is conducted. The SSO will coordinate with the PNS Fire Department to provide for space entry rescue services. **Brown & Root personnel will not participate in, or conduct any confined space rescue requiring entry into the space.** If an entry rescue is required, the authorized attendant will immediately notify the PNS Fire Department.

4.1 CONFINED SPACE ENTRY PROCEDURE

The following procedure conforms to the B&R Environmental Unit Confined Space Entry Operations Program (Attachment 2). All necessary forms and guidance can be found in Attachment 2. The SSO will

be primarily responsible for ensuring that the following program is properly implemented. The SSO will serve as Entry Supervisor.

1. Confined space area in Building 238 will be labeled before the commencement of confined space operations.
2. Arrangements will be made to limit any work of concern in the immediate areas around Building 238 during confined space operations.
3. Confined Space Entry Permits will be completed by the SSO and approved prior to entry by the:
   - B &R Environmental Health & Safety Manager
   - PNS Health & Safety Officer
   - B&R Environmental Entry Supervisor (SSO)
4. All personnel will be trained in their job function (ex. Entry Supervisor, Attendant, Authorized Entrant) prior to the commencement of the confined space entry procedure. This training must be documented and kept on file, and returned to the B&R Environmental HSM..
5. Required entry and PPE equipment will be specified on the entry permit and kept on hand ready for use when the entry operation commences.
6. The entry permit will be posted at the entry point prior to the start of operations.
7. Entry will be conducted using the buddy-system and only when entrants are wearing required personnel protective equipment as specified on the entry permit.
8. Air Monitoring will be performed prior to and continuously by the entrants during the entry procedure. Equipment and action levels will be based on the potential contaminants expected to be encountered in the entry space outlined on Tables 3-1, and 3-2 of this document and will be specified on the entry permit.
9. Radio communications will be established between the attendant and the entrants to maintain continuous communications during the entry procedure. A signal word for immediate evacuation will be established to alert entrants of potentially harmful situations. The attendant will also have a ready means of communication (i.e., telephone, radio) in the case that the PNS Fire Department must be summoned to the scene.
10. At the conclusion of entry operations, the HSO will ensure that all personnel and equipment have been removed from the space, that a final space evaluation is performed, and the permit is removed, canceled, and submitted to the B&R Environmental HSM.

5.0 AIR MONITORING

This section presents requirements for the use of real-time air monitoring instruments during site activities involving potential for exposure to site contaminants. It establishes the types of instruments to be used, the frequency of which they are to be used, techniques for their use, action levels for upgrading/downgrading levels of protection, and methods for instrument maintenance and calibration. Information on instrumentation for specific tasks and contaminants can be found in Tables 3.1 and 3.2 of this document.

NOTE: Exposure to any of the suspected contaminants at concentrations that could present a health hazard is unlikely, given the low percentage detected in previous samples, and the particulate nature of the contaminants expected to be encountered at these sites.

5.1 INSTRUMENTS AND USE

The information provided in this section addresses the use of real-time monitoring instrumentation during onsite activities. These instruments will be used primarily to monitor source points and worker breathing zone areas, while observing instrument action levels. This approach (coupled with the use of personal protective equipment and the observance of the other control requirements presented in this Health and Safety Plan) has been selected to minimize potentials for personnel exposures to hazardous concentrations of airborne contaminants. These instruments will be utilized as screening tools to detect the presence of some of the site contaminants identified within Table 3-2 in the air. It is not anticipated that personnel air sampling/analyses efforts will be necessary during the planned activities.

5.1.1 PhD Plus and Ultra

The PhD Plus and Ultra is a personal, portable, microprocessor controlled datalogging gas detector that can monitor four atmospheric hazards simultaneously. For this operation the PhD will be used to screen breathing zone areas for oxygen, combustible gas, and carbon monoxide during confined space entry activities. The PhD has been selected because it is capable of detecting these multiple parameters, it is portable, and easy to operate. Prior to the commencement of any field activities, the background levels of the site will be determined and noted on Figure 5-1. Continuous readings will be taken by the entrants during the entry procedure. Action levels for the above contaminants will follow the guidelines as presented in the B&R Environmental Unit Confined Space Entry Operations Program (Attachment 2) Table 1 on Page 5. These readings, any influencing conditions (i.e., weather, temperature, humidity), location, and the other information specified on the form included as Figure 5-1 of this HASP must be

documented throughout the performance of site activities (documenting the information on Figure 5-1 or in a field Health and Safety Logbook is a suitable record keeping alternative).

5.1.2 Photoionization Detector

Recognizing that the history of this site included the use of waste oils, a photoionization detector (PID) with a 10.6 eV lamp will be used to monitor potential source areas and to screen the breathing zones of employees during the confined space entries, the monitoring well installation and the subsurface sampling procedures. The PID has been selected because it is capable of detecting organic gases and vapors and some inorganic gases and vapors. In most cases the contaminants of concern will not be 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 on the form included as Figure 5-1 of this HASP must be documented throughout the performance of site activities (documenting the information on Figure 5-1 in a field Health and Safety Logbook is a suitable record keeping alternative).

5.1.3 Air Monitoring Frequency

As previously specified, all site readings must be recorded using Figure 5-1. Recording this information in a site Health and Safety Logbook is an acceptable alternative to using Figure 5-1, provided that all of the specified information is recorded. Other relevant influencing factors (e.g. weather conditions, wind direction and speed, humidity, etc.) should also be recorded. For the confined space entry procedures, all readings will be recorded on the written entry permit.

In general, during all non intrusive efforts, initial and periodic monitoring frequencies will be considered to be adequate. However, based on instrument responses and site observations, the SSO may decide to increases these frequencies. During the confined space procedures monitoring will be conducted continuously by the entrants. Reduction in monitoring frequencies will not be permitted without obtaining the prior consent of the Project Health and Safety Officer and the CLEAN HSM.

Table 3-1 presents the frequencies that air monitoring instruments are to be utilized, along with the corresponding potential hazards, on a task-specific basis for this project.

FIGURE 5-1
DIRECT-READING INSTRUMENT RESPONSE DATA

SITE NAME: Portsmouth Naval Shipyard (PNS)

PROJECT NO.: 6515

PAGE 1 OF

Date and Time(s)	Instrument Operator Name	Instrument Used	Instrument Reading and Duration	Location (e.g., borehole vs breathing zone)	Operation(s) Being Performed	Personnel in Vicinity at Time of Readings and Level of PPE Worn
Example 12-12-91/14:30	Joe Field	HNU 101	15 ppm/15 min.	breathing zone	sample location no. 12	Jim Technician/Level B George Grunt/Level B

SITE NAME: Portsmouth

PROJECT NO.: 6515

PAGE OF

Date and Time(s)	Instrument Operator Name	Instrument Used	Instrument Reading and Duration	Location (e.g., borehole vs breathing zone)	Operation(s) Being Performed	Personnel in Vicinity at Time of Readings and Level of PPE Worn

5.2 INSTRUMENT MAINTENANCE AND CALIBRATION

Air 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 must be field calibrated daily. An additional field calibration must be done 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 Brown & Root Health & Safety Guidance Manual which will be maintained on site for reference). All calibration efforts must be documented. Figure 5-2 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 5-2 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

Field maintenance will consist of daily cleaning of the instruments using a damp towel or rag to wipe off the instrument's outer casing and overnight battery recharging.

5.3 RECORD KEEPING

All instrument readings above and including background levels must be recorded using Figure 5-1, or in a field book or field Health and Safety Logbook. For Confined Space Entry activities all readings will be recorded on the entry permit. This record keeping should also indicate any corrective actions taken. Instrument calibration efforts and results must also be recorded, as specified in section 5.5. Lastly, information concerning potential influencing factors on instrument responses (i.e. weather, activities, interferences) shall also be recorded.

FIGURE 5-2

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: Portsmouth Naval Shipyard

PROJECT NO.: 6515

Date of Calibration	Instrument Name and Model	B&R Environmental Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

This section presents requirements for the use of personal protective equipment for each of the activities being conducted as defined in this HASP. This section includes anticipated levels of protection for each of the activities, the criteria used for selecting various levels of protection, and criteria for modifying levels of protection based on monitoring instrument readings and personal observations.

6.1 ANTICIPATED LEVELS OF PROTECTION

The levels of protection which is anticipated to be used for the tasks identified within the scope of work is levels D, and B (as defined in Appendix B of OSHA Standard 29 CFR 1910.120 - "Hazardous Waste Operations and Emergency Response"). It is anticipated that Level D will be appropriate for the majority of work in this effort. This level of protection is only anticipated to be modified to Level B (the use of Self Contained Breathing Apparatus [SCBA]) if indicated by sustained monitoring instrument readings in worker breathing zone areas. The confined space entry procedure may require Level B protection if during the permit preparation process it is deemed necessary. Dermal protection for the identified tasks will include Tyvek, inner nitrile gloves for sampling purposes, and outer nitrile gloves for the purpose of Confined Space Entry

6.1.1 Surface and Subsurface Sampling, Well Installation

Minimum requirements for these tasks include steel-toe and steel shank work boots, chemical resistant boot covers (as necessary for climatic conditions), with standard field dress consisting of long pants and long-sleeved shirts. Hard hats and safety glasses will be worn when overhead or eye hazards exist based on the task, or if working in and around operating machinery that could present or contribute to these threats. The use of protective equipment specified as optional will be at the discretion of the FOL or the SSO based on tasks, site conditions, and other influencing factors. This is of course providing that action levels or the requirements of this plan are not compromised, indicating a need for additional elements of personal protection. It is not anticipated that protection will be upgraded, but Table 3-1 includes procedures for upgrading protection to Level C if necessary.

6.1.2 Confined Space Entry Operation

Minimum requirements as stipulated in Section 6.1.1 will apply for this task. If the potential for saturation of work clothes exists, the use of PVC or PE-coated Tyvek® will be incorporated into this protective measure.

If an upgrade to Level B is required, a SCBA will be added to the equipment list. The level of protection will be specified on the Confined Space Entry Permit.

6.1.3 Mobilization/Demobilization

As mobilization and demobilization present limited potential for contacting any hazardous materials that could adversely effect site personnel, the minimum requirements specified in 6.1, above, will be adhered to for these efforts.

6.1.4 Decontamination Activities

The requirements for decontamination activities will include the minimum requirements for all tasks (See Section 7.1.1 of this HASP) and the use of PE-coated Tyvek® or PVC with nitrile outer and inner gloves when the potential for saturation of work clothing exists, and splash shield as necessary or as directed by the FOL or SSO. This will be the required level of protection when performing large scale decontamination activities. The general rule of thumb for respiratory protection will be to use the same level as, or one level below, that of the field personnel who were using the equipment. This will be determined by the SSO for specific decontamination activities.

6.2 PPE SELECTION CRITERIA

Based on the relatively low volatility and anticipated low concentrations of the identified contaminants of concern, as well as the probabilities for dispersion of any potential releases via natural ventilation (i.e. wind currents), vapor concentrations in worker breathing zones are not anticipated to be at levels which would warrant a respiratory hazard protection. Monitoring instruments may indicate an upgrade to Level B for the Confined Space Entry Procedure.

Nitrile gloves were selected to provide protection against the potential site contaminants that could be encountered, and to help reduce the potential for the ingestion of contaminants as a result of incidental hand-to-mouth contact. Nitrile was selected as the glove construction material based on available research data on permeation characteristics of the contaminants of concern. Hard hats, safety glasses, and work boots were selected to provide protection against some of the physical hazards associated with the proposed operations. PVC/PE coated coveralls were selected for use in the event that activities could have the potential to result in the saturation of work clothes.

6.3 PPE MODIFICATION CRITERIA

This section presents criteria for upgrading and downgrading chemical protective clothing and/or respiratory protection. Where uncertainties arise, the more protective requirement will apply.

6.3.1 Chemical Protective Clothing Modification Criteria

Polyvinyl chloride (PVC) or PE-coated Tyvek® coveralls must be worn anytime there is a reasonable potential for saturation of work clothes. Nitrile gloves (inner and outer) must be worn anytime there is a reasonable potential for hand contact with site contaminants.

6.3.2 Respiratory Protection Modification Criteria

The use of Level B protection incorporating a SCBA will be incorporated should elevated levels of contaminants during the confined space entry procedure present an inhalation hazard as determined through the use of screening instruments. This level of protection is not anticipated and listed only as a contingency. The use of respiratory protective equipment will require the documentation of use as specified in Figure 6-1. Sections 8 and 9 of the Brown & Root Health and Safety Guidance Manual (GM) contain further information on PPE and respiratory protection procedures and requirements. A copy of the Guidance Manual will be maintained at the work area.

FIGURE 6-1
SCBA AND
AIR PURIFYING
RESPIRATOR USE LOG

Site_____

Location_____

Dates of Investigation:_____

User	Date of Use	Cleaned and Inspected Prior to Use (Initials)	Type of Equipment Used	SCBA Bottle Refilled or Cartridges Changed Prior to and after Use (Yes/No)	Total Hours on Cartridge

SUBMIT TO HEALTH SCIENCES DEPT. AT COMPLETION OF PROJECT

_____ Site Manager (FOL)

_____ Date

7.0 DECONTAMINATION

Decontamination is the procedure to be employed to remove and/or neutralize site contaminants encountered through the execution of the scope of work. This procedure will be employed for the purpose of preventing cross contamination, protecting onsite personnel, and protecting the individuals outside this operation from the spread of contamination. For further information on decontamination procedures, refer to Section 2 of the Brown & Root Health and Safety Guidance Manual.

7.1 STANDARD PROCEDURES

1. Establish a personnel decontamination station (PDS) suitable to handle the activities, type and the amount of contamination, and level of protection. This area will be located adjacent to the exclusion zone or work area, and will consist of the stations described in Section 7.2.

2. Upon leaving the contamination area (exclusion zone), all personnel shall proceed through the appropriate contamination reduction sequence.

3. All protective gear should be left onsite during any lunch break following decontamination procedures.

4. All equipment will be inspected by the FOL or SSO and approved prior to leaving the decontamination area within the contamination reduction corridor.

5. All discarded materials (i.e. used PPE) will be bagged and disposed of in a dumpster identified by the Base Contact. Decontamination fluids will be drummed, labeled, and staged to await sample analyses and ultimate disposal fate.

7.2 PERSONNEL DECONTAMINATION REQUIREMENTS

The decontamination of personnel and their protective clothing shall be performed in sequential stages. These stages shall include:

- Removing contamination from protective clothing and equipment with a detergent/water solution and soft bristle scrub brushes.

- Removal of protective clothing (disposable items shall be discarded into a container) as specified by task in Table 3-1 of this HASP.

- Workers washing hands and face with potable water and soap after removing PPE and leaving the decontamination area.

7.3 SAMPLE CONTAINER/EQUIPMENT DECONTAMINATION

Sample containers will be wiped free of any residual material prior to packaging. The drilling equipment will be removed from the specified well site and decontaminated. Drilling rigs and equipment will be steam cleaned as necessary. The decontamination process will be conducted on a covered pad designed to contain runoff waters. All decon water will be handled as described in Section 4.5 of the Work Plan. Isopropanol will be used as a rinse agent for all sampling equipment. Should a piece of equipment be replaced, decontamination will be done prior to introduction to the well. All equipment will be cleaned to a level which it is visibly cleaned and supports no positive through a scanning of the equipment with the monitoring instruments previously specified.

7.4 CLOSURE OF THE DECONTAMINATION STATION

Decontamination-generated liquid wastes generated during onsite activities will be containerized, labeled, and staged onsite to await disposal. The disposal method used will be based upon available information regarding the characteristics of the site, sample analyses, and contaminant levels. Reusable protective equipment will be cleaned, dried, and prepared for future use. (If gross contamination has occurred, the item will be properly disposed.)

All wash tubs, pail containers, etc., will be thoroughly washed, rinsed, and dried prior to removal from the site. The SSO will be responsible for inspecting and clearing equipment to leave the site.

7.5 DECONTAMINATION EVALUATION

The decontamination process effectiveness will be judged in the following manner.

- Visual observation - Discoloration, stains, dirt, and alterations of the fabric due to chemical contact will be the primary method used to determine effectiveness.

The following methods may be used if gross contamination is encountered:

- Monitoring Instrumentation - Instruments used to detect site contaminants may be employed to scan garments and equipment for the presence of site contaminants after decontamination procedures have been employed.

- Decontamination Solution Analyses - An analyses of the solution (final rinse) and the presence of contaminants may suggest additional cleaning is required. This information may be useful in the ultimate disposal of the fluids generated.

- Sample Analyses - sample analyses may indicate the level of contamination and therefore the potential for contamination. Once again this information may be useful in the ultimate disposal.

It is suggested that a combination of methods be used to determine the effectiveness of the decontamination of the process used.

8.0 TRAINING REQUIREMENTS

8.1 INTRODUCTORY AND REFRESHER TRAINING

The following sections describe the minimum requirements for initial, refresher, and supervisory training for B&R Environmental personnel and their subcontractors.

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 PNS. Additionally, 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.

All B&R Environmental personnel functioning in the supervisory capacity will have had Management and Supervisory training as required by 29 CFR 1910.120 (e)(4).

All participants involved in the Confined Space Operation will receive training on their specific task (i.e. attendant, entrant, supervisor) per 29 CFR 1910.146.

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

8.1.2 Requirements for Subcontractors

All 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 (as appropriate) meeting the requirements of 29 CFR 1910.120(e)(8) prior to performing field work at the PNS. All subcontractor personnel serving in the supervisory capacity will have had Management and Supervisory training as required by 29 CFR 1910.120(e)(4). 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 as Figure 8-1. Figures 8-1 and 9-2 can be combined into one letter. Copies of applicable training certificates must be submitted for each subcontractor employee who will be working on site.

8.1.3 Subcontractor Exceptions

Subcontractors who will not perform any activities in the exclusion zone or areas where there is no potential for exposure, will be excluded from the requirements stipulated in Section 8.1.2. The use of these exceptions is permitted only by obtaining the prior approval of the CLEAN HSM.

8.2 SITE-SPECIFIC TRAINING

B&R Environmental will provide site-specific training to all B&R Environmental employees and subcontractor personnel who will perform work on this project. Site-specific training will include:

- Names of 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
- The contents of the health and safety plan
- Emergency response procedures (evacuation and assembly points)
- Review the contents of relevant Material Safety Data Sheets
- Permit Required Confined Space Training
  - Authorized Attendant
  - Authorized Entrant

8.2.1 Site-Specific Training Documentation

B&R Environmental and subcontractor personnel will be required to sign a statement indicating receipt of site-specific training and understanding of site hazards and control measures. Figure 8-2 will be used to document site-specific training. Documentation of employees receiving Confined Space Training for Buildings 238 and 7 will be on the Confined Space Permits.

FIGURE 8-1

OSHA TRAINING CERTIFICATION

The following statements must be typed on company letterhead, accompany certificates or some other acceptable official documentation, and signed by an officer of the company:

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

Month, day, year

Mr. Mark L. Mengel
Project Manager
Brown & Root Environmental
Foster Plaza 7
661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: Hazardous Waste Site Training - Portsmouth Naval Shipyard

Dear Mr. Mengel:

The employees listed below have had introductory hazardous waste site training or equivalent work experience as required by 29 CFR 1910.120(e). In addition, those employees listed below who have received their introductory training more than 12 months ago have also received 8 hours of refresher training in accordance with 29 CFR 1910.120 (e)(8) within the past 12 months. Copies of training certificates for each employee listed are enclosed with this letter.

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 of Company Officer)

Enclosure: Training Certificates

FIGURE 8-2

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing investigation activities at Portsmouth Naval Shipyard, and that I have received site-specific training which included the elements presented below:

- Names of 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
- The contents of the health and safety plan
- Emergency response procedures (evacuation and assembly points)
- Review contents of relevant Material Safety Data Sheets

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.

NAME	SIGNATURE	DATE

9.0 MEDICAL SURVEILLANCE

9.1 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' medical surveillance program and will be medically qualified to perform hazardous waste site work using respiratory protection. At the Pittsburgh office, the Medical Surveillance Program is administered by the Health Sciences Department, with consultation provided by the Business Fit department of Ohio Valley General Hospital. Our Medical Consultant at that hospital is Teresa Silvaggio, MD, MPH, Director. Dr. Silvaggio is Board-certified in Occupational Medicine. She has over five years experience in serving as the Pittsburgh Office's Medical Consultant. All Ohio Valley General Hospital physicians participating in this program have been thoroughly informed of the nature of operations that B&R Environmental employees perform, and on the potential chemical and physical hazards that may be encountered in fulfilling their assigned duties. This has also included educating these physicians in the various types of respiratory and other personal protective equipment commonly used by our personnel. The forms for Medical Surveillance Clearance can be found in the Brown & Root Health and Safety Guidance Manual, Section 7.

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

9.2 REQUIREMENTS FOR SUBCONTRACTORS

Subcontractors are required to obtain a certificate of their ability to perform hazardous waste site work and to wear respiratory protection. The "Subcontractor Medical Approval Form" (Figure 9-1) can 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 Figure 9-1 with a letter, on company letterhead, containing all of the information in the example letter presented as Figure 9-2. Figures 8-1 and 9-2 can be combined into one letter. The forms for Medical Surveillance Clearance can be found in the Brown & Root Health and Safety Guidance Manual, Section 7.

9.3 EXCEPTIONS FOR SUBCONTRACTORS

Subcontractor personnel who will not perform any activities in the exclusion zones during intrusive operations, or where there is no potential for exposure will be exempted from the requirements stipulated in Section 9.2. This exception can be utilized only with the prior approval of the CLEAN HSM.

9.4 REQUIREMENTS FOR ALL FIELD PERSONNEL

Each field team member (including subcontractors) shall be required to complete and submit a copy of Medical Data Sheet. These will be handed out and collected as part of the site-specific training. This shall be provided to the SSO, prior to participating in site activities.

FIGURE 9-1

SUBCONTRACTOR MEDICAL APPROVAL FORM

For employees _____
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 found to be medically -

   ( ) qualified to perform work at the Portsmouth Naval Shipyard work site
   ( ) not qualified to perform work at the Portsmouth Naval Shipyard work site

and,

2. Undergone a physical examination as per OSHA 29 CFR 1910.134(b)(10) and 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 which 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 9-1
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 Portsmouth Naval Shipyard 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 9-2

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 L. Mengel
Project Manager
Brown & Root Environmental
Foster Plaza 7
661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: Medical Surveillance - Portsmouth Naval Shipyard

Dear Mr. Mengel:

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 Portsmouth Naval Shipyard worksite.

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 of Company Officer)

10.0 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; exclusion zone, contamination reduction zone, and support zone. This procedure will apply to the drilling and sampling activities. Site control for confined space entry activities will be accomplished by implementing the procedures specified in Attachment 2 of this Health and Safety Plan.

10.1 EXCLUSION ZONE

The exclusion zone will be considered those areas of the site of known or suspected contamination. For purposes of this activity the exclusion zone will include the well head plus twenty feet, when the well is being completed or constructed. Therefore, the exclusion zones for this project will be limited to those areas of the site where active work is being performed and/or anywhere there is believed to be the potential for encountering any of the potential hazards defined in this HASP.

10.2 CONTAMINATION REDUCTION ZONE

The contamination reduction zone (CRZ) will be a buffer area between the exclusion zone and any area of the site where contamination is not suspected. This area will serve as a focal point in supporting exclusion zone activities. In addition, this area will serve as the access and control points to the exclusion zone. For the purposes of supporting this activity decontamination will take place at a central location and not in the CRZ. All potentially contaminated equipment will be bagged to be moved from the exclusion zone to this central location.

10.3 SUPPORT ZONE

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

10.4 SITE MAP

Site maps are presented in the Work Plan for this project and are therefore not repeated here.

10.5 BUDDY SYSTEM

Personnel engaged in onsite activities will practice the "buddy system" to insure the safety of all personnel involved in this operation.

10.6 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS

B&R Environmental personnel will provide MSDS's for all chemicals brought on site. The contents of these documents will be reviewed by the Site Safety Officer with the user(s) of the chemical substances prior to any actual use or application of the substances on site. The MSDS's will then be maintained in a central location (i.e. temporary office) and will be available for anyone to review upon request. Subcontractors will be required to similarly satisfy these requirements.

10.7 COMMUNICATION

As personnel will not be working in close proximity to one another during field activities, a secondary means of communication will be necessary. A 2-way radio communication system will be used. All means of communication will have the approval of the Shipyard, prior to its use.

External communication will be accomplished utilizing a cellular telephone at predetermined and approved locations. External communication will primarily be used for the purpose of resource and emergency resource communications. Prior to the commencement of site activities, the FOL and Shipyard contact will determine and arrange for telephone communications approval.

11.0 STANDARD WORK PRACTICES

Standard Work Practices can be found in the Section 12 the Brown & Root Health and Safety Guidance Manual, and are not repeated here.

12.0 EMERGENCY ACTION PLAN

In the event of an emergency, all site personnel will be evacuated to a predetermined location away from the work place. As a result of this approach, this Emergency Action Plan (EAP) has been developed in accordance with OSHA standard 29 CFR 1910.38(a), as provided for in 29 CFR 1910.120 (l) (1) (ii). B&R Environmental shall utilize Base Fire Protection and Emergency Services and offsite emergency response agencies, as necessary and appropriate, in order to respond to emergency situations.

12.1 PRE-PLANNING

Upon initial arrival at the base, the B&R Environmental FOL/SSO will meet with the Shipyard Fire Department and available emergency services to notify coordinators of the nature, location, and schedule of planned activities. Representatives from these organizations, as well as representatives of the offsite emergency response organizations specified in Table 12-1 will be contacted as part of initial site mobilization efforts and invited to the initial Site-Specific Health and Safety training session referenced in section 8.2 of this Health and Safety Plan. This will enable all parties to understand the nature of the work to be performed, the types of possible emergency response activities which could conceivably arise in the performance of those activities, and their potential role in participating in those response activities.

Based on the nature of the planned activities, the occurrence of any significant emergency situation is not anticipated (i.e., major spills or releases, fires or explosions, etc.) However, as a precautionary measure, all site personnel will be trained in the contents of this EAP, and will be directed to follow base emergency procedures. B&R Environmental will rely on base services and (if/as necessary) offsite emergency support services to handle emergency situations, if encountered. Attachment 7.4 of Section 7 of the Brown & Root Health and Safety Guidance Manual will be used to assist in this process.

12.2 EMERGENCY ESCAPE PROCEDURES AND ASSIGNMENTS

Upon notification of a site emergency requiring evacuation, all site personnel will proceed to predetermined locations based on emergency location and wind directions. If personnel cannot reach those locations without endangering life or health, they shall instead report to a previously-selected alternate meeting place. Personnel shall be instructed to remain at this refuge location until directed to either resume work or leave the site.

12.3 PROCEDURE TO ACCOUNT FOR SITE PERSONNEL

The site work force will be small enough so that accounting for personnel will easily accomplished. Accounting for personnel will be the FOL's responsibility. This will be accomplished by taking a roll call using the site log book.

12.4 RESCUE AND MEDICAL DUTIES

Site personnel shall be prohibited from participating in any emergency rescue or response operations. The only authorized response for site personnel in the event of an emergency situation will be to evacuate the work site and await further instructions.

NOTE: Brown & Root personnel (including subcontractors) will not participate in rescues requiring entry into a confined space. Minor medical (first aid) procedures may be attempted if personnel have been trained to perform first aid procedures.

12.5 ACTIVATION OF EMERGENCY RESPONSE PROCEDURES

Should any emergency occur which requires the support of outside services, the appropriate contacts shall be made by the FOL/SSO. A list of the appropriate contacts can be found in Table 12-1.

Examples requiring outside services are as follows:

- Any field crew member involved in an accident or experiencing signs and symptoms of exposure.
- A condition discovered which suggests the activity is more hazardous than anticipated.
- Emergency conditions in the nearby areas which directly impact operations.

Persons who observe an emergency situation must notify Shipyard contacts and B&R Environmental office contacts (as presented in this HASP), as appropriate, based on the emergency situation.

TABLE 12-1

EMERGENCY INFORMATION

Police (Shipyard)	(207) 438-2555 or Ext. 2555
Fire Department (Shipyard)	(207) 438-2333 or Ext. 2333
Ambulance (Shipyard)	(207) 438-2555 or Ext. 2555
Hospital: Shipyard Portsmouth	 (207) 438-2555 or Ext. 2555 (603) 433-4042
Poison Control Center: Maine New Hampshire	 1-800-442-6305 1-800-562-8236
Base Contact: Marty Raymond, Environmental Affairs	(207) 438-3832
B&R Environmental Project Manager Mr. Mark L. Mengel	(412) 921-8723
B&R Environmental Site Safety Officer Clyde Snyder	(412) 921-8904
CLEAN Health and Safety Manager Matthew M. Soltis, CIH, CSP	(412) 921-8912
EPA Project Manager: Meghan Cassidy	(617) 573-5785
MEDEP Project Manager: Iver McLeod	(207) 287-8010
Agency for Toxic Substances and Disease Registry (ATSDR)	(404) 639-6300

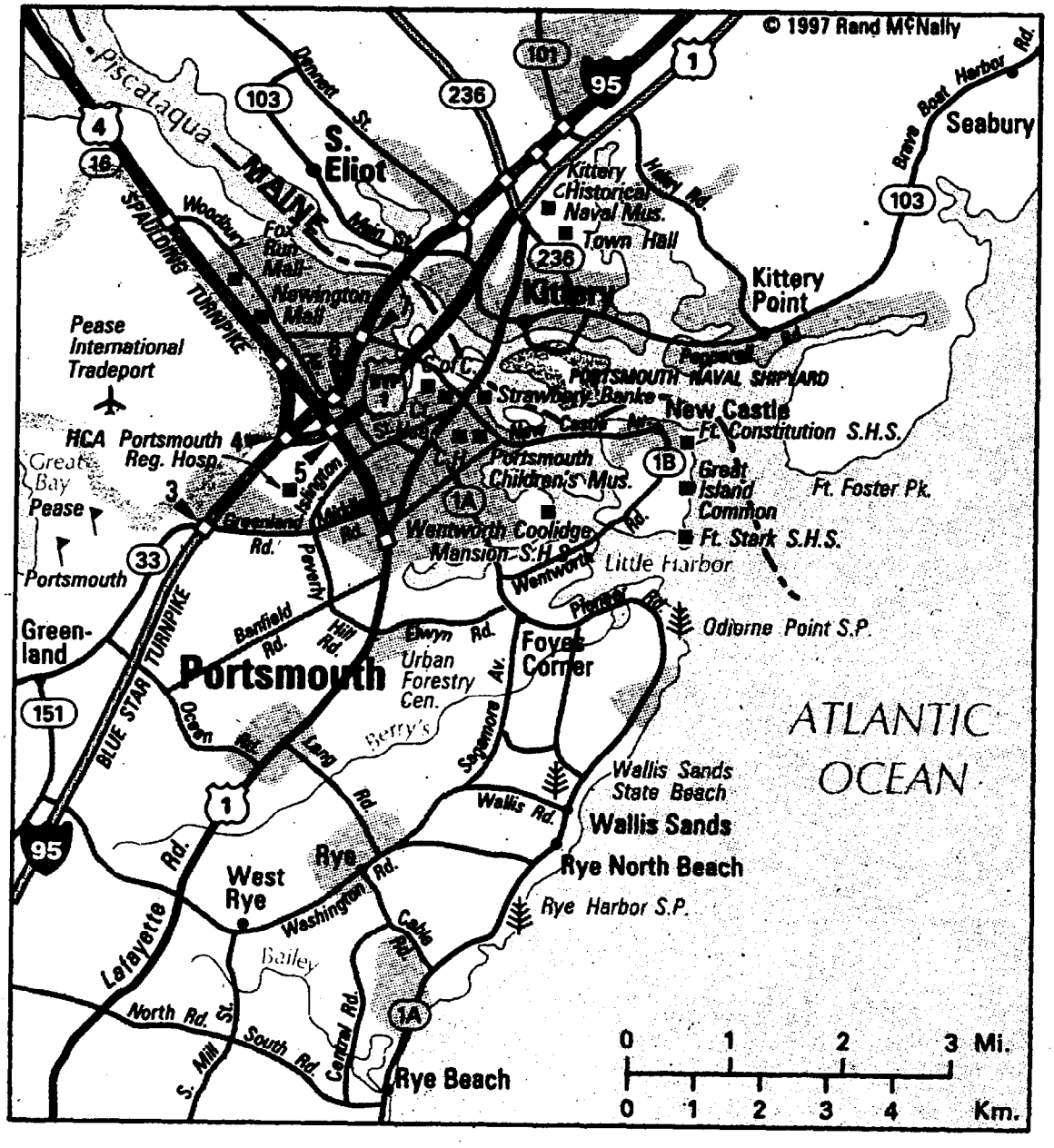
A map depicting directions from the site to the hospital is illustrated on Figure 12-1 of this Health and Safety Plan.

Directions to the hospital:

On Base: To be obtained as part of initial site mobilization efforts.

Off Base: Portsmouth Regional Hospital

Exit the Shipyard through Gate No. 1. At signal light, continue straight down Walker Street. Proceed to second set of signal lights, and continue straight until road ends at Route 1 Bypass. Enter underpass rotary on left side. Go under Route 1 Bypass and loop onto Route 1 Bypass South. Cross bridge and continue straight to traffic circle. At traffic circle, go around to the right 270 degrees, 3/4 circle from entrance to traffic circle. Exit right. Go straight through first set of lights. At second set of traffic lights, turn right onto Borthwick Ave. Ext. Follow Borthwick Ave. Ext. 1/2 to 1 mile. Portsmouth Regional Hospital will be on the right side.



Brown & Root Environmental

Figure 12-1
Hospital Location Map
Portsmouth Naval Shipyard
Kittery, Maine

12.6 INCIDENT FOLLOW-UP

On receiving a report of an incident (or near incident) occurrence the FOL/SSO shall immediately investigate and make the appropriate recommendations to prevent reoccurrence. The CLEAN HSM shall be immediately be notified by telephone on occurrence of an incident. At his discretion he may wish to participate in the investigation. Details of the incident shall be documented on an Incident Report within 24 hours of the occurrence and distributed to the Project Manager and CLEAN HSM.

13.0 SPILL CONTAINMENT PROGRAM

13.1 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 such spillage would constitute a danger to human health or the environment. However, as the job progresses, the potential for accumulating decontamination fluids in a central staging area exists. Once characterized, these fluids can be removed from this area for proper disposal. While these fluids are stored in the staging area await characterization, this spill containment program will be instituted.

13.2 POTENTIAL SPILL AREAS

In an ongoing attempt to prevent and control further potential contamination of the environment, efforts will be taken to minimize the potential for spill releases. Based on planned activities and available information, there are limited areas and/or operations where this potential threat can be reasonably expected. One of these is the area intended to be used for the central staging area for potentially contaminated decontamination fluids and purge waters. Additionally, the handling, loading and unloading areas present limited potential for leaks or spills. At the time of the preparation of this HASP, it is anticipated all investigation derived wastes (such as decontamination fluids and purge waters) generated, as a result of this scope of work, will be containerized, labeled, and staged to await determination of proper disposal procedures. Until the ultimate fate of these substances can be determined, there exists a possibility to accumulate multiple drums of waste materials.

All drums containing liquids will be staged within a constructed (temporary) lined bermed area. The capacity of the bermed area should be capable of containing the contents of the largest container placed within it (plus volumes reduced caused by the displacement of the containers, or approximately 110% of the total capacity of the largest container). Rainwater captured inside the lined area will be allowed to evaporate providing it does not exceed 1% of the bermed areas' capacity. If this capacity is exceeded, the collected rainwater will be removed (provided that close inspection of the bermed area and all containers located within it do not indicate any possibility that captured rainwater may be contaminated).

13.3 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, a daily walk around by the personnel staging or disposing of drums will be conducted during working hours to visually determine that containers are not leaking, and that the bermed staging area is not compromised. If a leak is detected, the drum contents will

be transferred using a hand pump into a new 55-gallon drum. The leak will be collected and contained using absorbents such as Oil-dry, vermiculite, or sand, stored at the staging area in a drum conspicuously marked. This material will then also be handled as discussed for other investigation derived wastes. All inspections will be documented in the Project logbook.

13.4 PERSONNEL TRAINING AND SPILL PREVENTION

All personnel will be instructed on appropriate spill prevention procedures as part of the site-specific health and safety training. This will include training on the following:

- using only appropriate (and approved, as applicable) drums or other vessels to contain substances used, stored, or generated as a result of site activities.
- inspecting such containers frequently for signs of damage or leaks.
- inspecting the integrity of the berms of drum storage areas for damage, and immediately notifying the FOL or the SSO of any evidence that the berms have been (or appear to be imminently) compromised.
- placing any such containers in appropriate, designated locations, where they will be protected from hazards such as those presented by vehicular traffic.

The FOL and the SSO will serve as the Spill Response Coordinators, should the need arise.

13.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the minimum equipment which 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
- Hand operated drum pump with hose
- Container Labels

This equipment is only to be used by B&R Environmental personnel for non-emergency, incidental spill response efforts, and will be made available to base or off site emergency responders, as necessary.

13.6 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) Follow the direction of the SSO and the FOL. Rotate the leak above the liquid level, transfer the contents into a new vessel.

3) Apply inert absorbent to the spill, collect, containerize, and label.

It is not anticipated that a spill will occur which the field crews cannot handle. Should this occur notification of the PNS Fire Department will be carried out by the FOL or SSO.

14.0 DOCUMENTATION AND EQUIPMENT

This section summarizes documentation and equipment required for the support of this HASP. Its purpose is a final checklist to help ensure all of the necessary resources are available to carry out the requirements of this HASP.

14.1 DOCUMENTATION

The use of any level of respiratory protection must be documented by the SSO or FOL. For the tasks that may be performed using respiratory protection, this is to include the completion of all entries in Figure 6-1 ("Air Purifying Respirator Use Log"). In this instance, appropriate entries on this document are to be made for each instance of use, on at least a daily basis. All entries must be completed, and the FOL must sign and date this form and submit it to the Health Sciences Department upon the completion of this project.

Other health and safety documentation requirements relative to this project are defined as follows:

- Health and Safety Log Book
- HASP (Signed Copy)
- OSHA Poster 11 x 14 (posted on site)
- MSDS's (as applicable)
- Medical Data Sheets
- Employee Training Certificates
- Medical Surveillance Documentation
- Incident Reports
- Fit Test Records
- Instrument Calibration Logs
- Instrument Response Data Logs

14.2 HEALTH AND SAFETY EQUIPMENT

- ANSI approved eye wash
- Positive Pressures MSA Self Contained Breathing Apparatus (SCBA)
- Respirator Cleaner/Sanitizer solution
- Nitrile gloves (inner and outer)
- PVC/PE coated coveralls
- Boot covers

- Duct tape
- Decontamination kit (Alconox, wash/rinse tubs, brushes, sorbents, step stool)
- Hard hats, safety glasses
- Splash shield
- Steel toe/shank boots
- Hearing protection

ATTACHMENT 1

TICK CONTROL AND LYME DISEASE

TICK CONTROL
AND
LYME DISEASE

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

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

Recognition

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

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

The earliest symptom of the onset of this disease is the occurrence of an unusual red skin rash. This is commonly the first indication since it has been evidenced that many persons who have contracted this disease were, in fact, unaware that they had been bitten. This rash can appear at the site of the bite anywhere from several days to a few weeks after the bite. It typically starts as a small red spot, and then expands as the spirochetes expand from the bite location. Rash sizes can vary, but have been most commonly associated in a 2 to 3 inch

diameter size range. This rash will fade (with or without treatment) after a few weeks. Close inspection is necessary to detect this symptom as the rashes are easy to miss because they're often very faint. Body sites where rashes frequently occur include the thigh areas, groin, and armpits. Also, it is not uncommon for a rash to develop in more than one place.

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

Evaluation

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

Control

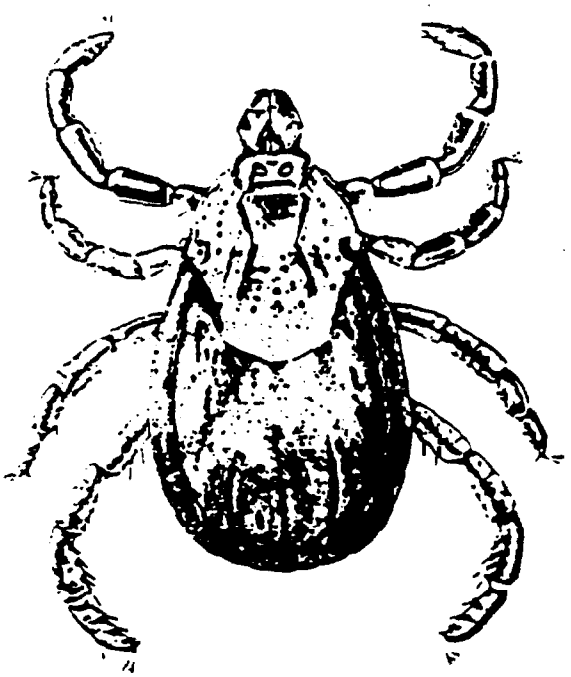
Control of this threat involves several components. First, field personnel must be aware of the climate and area conditions which are commonly associated with being conducive to tick infestation. Second, when working in or walking through potential infested areas, personnel must ensure that they do not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

Tick Removal

In the event that a tick is discovered to be attached to a member of the field team, timely removal of the insect is critical to reducing the potential for contracting the disease. According to available information and research, there is apparently a grace period of at least a few hours from the time of the bite before the tick transmits the microbe (the spirochetes are not present in the mouth parts of the tick). However, the incident of a tick bite is frequently unnoticed, and the discovery of the tick may not occur until after this suspected grace period has already elapsed. Therefore, timely removal is very important. The preferred method of tick removal is to pull it out using tweezers or small forceps. In this method, the tick should be grasped as

close to the mouth as possible, and then pulled steadily upward. Care must be exercised so as not to pull in a jerking motion as this can result in the head becoming detached. After the tick has been removed, disinfect the bite with rubbing alcohol or povidone iodine (Betadine). The tick must not be handled as the microbes can enter the body through any breaks in intact skin. The bite should be checked occasionally for at least a two-week period to see if a rash forms. If it does, medical attention must be promptly sought.

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



An unengorged female American dog tick, *Dermacentor variabilis*

ATTACHMENT 2

CONFINED SPACE ENTRY

DRAFT

BROWN & ROOT ENVIRONMENTAL UNIT
CONFINED SPACE ENTRY OPERATIONS PROGRAM

1.0 PURPOSE

To establish a uniform procedure specifying the minimum requirements for confined space entry operations performed by (or managed by) the Environmental Unit of Brown & Root (the "Unit").

2.0 SCOPE

This procedure applies to all Unit projects with a scope of work that includes the performance of confined space entry operations by Unit or subcontracted personnel. This program has been developed on the basis of two principle requirements. These are as follows:

- That this program will be implemented on a **SITE SPECIFIC** basis, establishing flexibility to provide for the protection of the health and safety of Unit and subcontractor personnel, as well as for internal and regulatory compliance. This concept recognizes that Environmental Unit personnel work on many different sites, often with only brief field operations tasks, as opposed to longer term project sites commonly associated with other Brown & Root units. Therefore, this performance-based program has been developed to establish the minimum requirements for confined space entry operations at any individual Unit office location or project site.

- That all confined space entry operations will be performed using a **PERMIT-REQUIRED** system, with the requirements of this procedure followed as minimum requirements. Recognizing the Federal OSHA regulatory delineation between a Non-permit Confined Space and a Permit-Required Confined Space[1], and also recognizing that OSHA standards are minimum requirements, it is Unit policy that all confined space entry operations will be performed in accordance with the written permit system specified in this procedure.

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[1] Occupational Safety and Health Administration Title 29 CFR 1910.146, Permit-Required Confined Spaces, paragraph (b) "Definitions".

3.0 RESPONSIBILITIES

Unit President: Has the overall responsibility for the health and safety of all personnel and operations in the Unit, including those involved with confined space entry operations. This responsibility is principally satisfied through delegating the necessary authority and accountability to the Unit Office Management level. Successful accomplishment and maintenance of this and other health and safety programs will be achieved through such means as ensuring that health and safety is a principal component of personnel annual performance reviews ranging from Unit top management through to each employee.

Unit Office Management: Provide labor and equipment resources necessary to comply with the requirements of this program. Other responsibilities include:

- Establish office policy on confined space entry operations. Offices setting policy that no personnel at their location will participate in confined space entry operations are exempt from this program, with the possible exception of addressing program requirements for contractor personnel if such work will be subcontracted.

- Supporting the office health and safety Point of Contact in the implementation and maintenance of this program for that office.

Unit Health and Safety Manager (HSM): Provide technical management and oversight of this program, and to aid all Unit locations in effectively implementing these requirements. The Unit HSM will also be responsible for monitoring the overall effectiveness of this program. This will be accomplished by:

- Reviewing all completed permits on an annual basis
- Performing field audits of select project sites where confined space entry operations are performed
- Eliciting feedback from Unit office health and safety Points of Contact
- Maintaining proficiency in regulatory requirements on confined space entry matters
- Modifying elements of this program, when or as appropriate

Other specific responsibilities of the Unit HSM include:

- Establishing minimum components of confined space entry training course material, both for in-house and subcontractor-provided training courses
- Maintaining appropriate recordkeeping for this program
- Regularly communicating with Brown & Root Corporate Health and Safety, to satisfy overall company requirements

Office Health and Safety Points of Contact (POCs): Ensure that the requirements of this program are satisfied for all confined space entry operations performed or managed at their location, whether by Unit personnel or by subcontractors. Other responsibilities include ensuring that:

- If training is provided by subcontractors, that an appropriate organization is selected, and that the training course material satisfies the Unit requirements.

- No individual participates in any confined space entry operations unless they are fully compliant with all program requirements
- All avenues to accomplish a specific task in a manner where confined space entry operations are not necessary (such as the use of remote sampling techniques) are exhausted, and that confined space entry is selected as a field activity approach only as a last resort
- The HSM is alerted when activities at a project site will involve confined space entry operations
- A properly completed written program is present at every site where confined spaces exist
- Appropriate documentation is maintained for that office, and that written permits are submitted to the HSM at the conclusion of project activities to facilitate the annual permit review requirement.

4.0 PROCEDURES

4.1 Introduction

Brown & Root recognizes that the participation of Environmental Unit personnel in confined space entry operations can be one of the most potentially dangerous types of field activities that they may encounter in their work. The risks associated with this type of work are most remarkable because they can be immediate and severe. It is for this reason that the requirements of this program will be strictly enforced at all Unit locations.

There are two scenarios that are commonly encountered in Unit operations and projects. These include project sites where we are a contractor performing work at a client location, and project sites where we are the prime contractor, and we have a subcontractor working under our direction. Also, specific to addressing confined space concerns, we need to address sites where confined spaces exist but our work scope will not involve entry versus sites where actual entry is necessary. As the regulatory requirements for each of these scenarios vary, separate procedures are established in the following sections of this overall program. These procedures all involve the use of a simple, fill-in-the-blank written program that is to be completed by the site Health and Safety Officer (HSO).

4.2 Definitions

A confined space is any space that meets at least one of the following criteria:

- Is large enough and so configured that an employee can bodily enter and perform assigned work (Note: This does **not** mean only spaces large enough to house an employee's entire body. For example, a container where operations involve an employee inserting only their head for a visual inspection or some other limited task would still be considered a confined space)

- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers vaults, test pits, excavations, sewers, building crawl spaces, chemical process vessels, and other such spaces)

- Is not designed for continuous employee occupancy

4.3 General Requirements

The following are General Requirements for the Environmental Unit's Confined Space Entry policy and program.

Confined space entry operations on any Environmental Unit project site will be performed only a last resort. All available alternative means to accomplish the task objectives must be exhausted before commencing any confined space entry activities.

Any project site where planned activities may involve work in or near a confined space must have a written Confined Space Entry Program completed on site and available prior to the commencement of site activities. This includes projects where such spaces exist in the work area, even when no plans to enter the space(s) exist (see section 4.7). The program must be attached to the Health and Safety Plan prepared for that project. The written program shall be completed by the assigned Site Safety Officer, and will be kept current and available for review by the Unit HSM.

All work involving entry into a confined space will be performed by written permit only. There will be no exceptions to this requirement without the express, written consent of the Unit HSM.

4.4 Projects Sites Involving Confined Space Entry Operations

The frequency that Unit projects involve both confined spaces in the work area and a work scope that requires personnel to actually enter a space is very low. This cannot be interpreted as indicating that the level of concern for a Confined Space Entry Program is not a priority. In fact, because this type of activity is infrequent, the level of concern is greater. The nonroutine nature of these operations inhibit our ability to develop and maintain a high level of proficiency. Therefore, the need for an effective program to control or minimize the potentially severe hazards of confined space entry work is a very high priority.

The written program presented in Attachment 1 of this procedure will be used at all Unit project sites where confined space entry operations are planned. That program has been developed to provide the site HSO with a standardized tool to serve two purposes:

1. To protect the health and safety of Unit personnel working in or near confined spaces
2. To comply with Federal regulatory requirements

<u>Role of the Site Health and Safety Officer</u>

For applicable projects, the assigned HSO must be thoroughly familiar with this procedure and with the OSHA regulation on Permit-Required Confined Spaces, and will be responsible for completing Attachment 1. The HSO will also be responsible for implementing the specific requirements of the program on his/her site, including ensuring that:

- All confined spaces at the site are properly identified and labeled
- All site personnel are made aware of these spaces, and that unauthorized entry is prohibited. This is to be covered as part of the site-specific health and safety training

- All entries are performed using the written permit system specified in the site written program
- All necessary training requirements are satisfied, and that appropriate training documents are collected and maintained
- All necessary entry equipment is on hand, and maintained in proper working order
- Permits are completed specifying a duration only long enough to perform the job
- A trained and equipped rescue team is on standby prior to the beginning of the confined space activity

The HSO will serve as the Entry Supervisor, which means that he/she is responsible for determining that acceptable entry conditions are present before and during entry, for authorizing (by completing and signing the written permits) and overseeing entries, and for terminating entries and canceling permits.

Testing and Monitoring

Air monitoring in the space must be performed before and during all entry operations. The frequency, types, and sequence of air monitoring are clearly specified in the site specific program included as Attachment 1. While that program specifies that periodic air monitoring during an entry may be acceptable for an isolated space, it is recommended that continuos monitoring always be performed, even for a completely isolated space. Acceptable entry conditions are as specified in Table 1, below.

Table 1
Acceptable Entry Conditions

Atmospheric Parameter	Acceptable Entry Condition
Oxygen content in air	≥ 19.5% and ≤ 23.5%
Flammable or explosive conditions	≤ 10% of an LEL* for gases, vapors or mists ≤ LEL for airborne combustible dusts
Toxic concentrations of chemical hazards	Any exposure reaching a substances published Action Level, Permissible Exposure Limit, Threshold Limit Value, or Recommended Exposure Limit. These will all be specified in the site Health and Safety Plan
Any other atmospheric condition that is Immediately Dangerous to Life or Health	Varies by specific parameter

*LEL = Lower Explosive Limit, sometimes also referred to as LFL for Lower Flammability Limit. For dusts, this may be approximated as a visual condition where the dust obscures vision at a distance of 5 feet or less

If the acceptable entry conditions do not exist, or appear that they may not be constant throughout the entry, the HSO can use the following approach:

1. Ensure that the space is properly isolated (block and bleed lines, use Lockout/Tagout procedures, etc.

2. Purge, inert, flush, or ventilate the space to control or eliminate the hazard

If acceptable entry conditions still do not exist due to flammability or explosive concerns, the entry must not be authorized. If the limiting factor is toxic airborne concerns, appropriate PPE may be used to allow the entry (Note: As with all environmental work, use of PPE is chosen as a control option always only as a last resort).

Rescue

When confined space entry operations are performed, personnel and equipment must be adequate and available to effect non-entry rescue operations in the event of an emergency. This shall include items such as body harnesses (or wristlets, as a second choice), tie-offs, mechanical retrieval apparatus, etc. This equipment must be available and in use during all entry operations. This will enable the Attendant and other authorized personnel to perform an emergency rescue and extract an injured person from outside of the space. **Rescue procedures requiring other personnel to enter a space to assist or evacuate an injured or incapacitated entrant are expressly prohibited.** Also, unauthorized personnel must be prohibited from participating in emergency rescue operations.

It is anticipated that in most instances, we will be prepared to provide emergency rescue services ourselves, at least to the point of removing an injured person and stabilizing them until professional emergency services can be summoned. The identity of the specific emergency response service and the method for contacting them will be clearly identified on the permit completed by the Health and Safety Officer (HSO). At least one member of the team serving in the role of Attendant or Rescue member (a non-entrant) must have current certification in First Aid and CPR. (Note: The POC must ensure that Bloodborne Pathogen Program requirements are satisfied whenever First Aid or CPR practice is authorized.)

4.5 Employee Training

All personnel must be adequately trained in order to be authorized to participate in confined space operations. Training must be performance-based so that participants can successfully demonstrate proficiency in performing their assigned duties. Training shall take place before an individuals first assignment, when their assigned duties change, or when changes occur in the site's written program. Also, if a new hazard is suspected that was not addressed in the employee's training, supplemental training will be required.

Whether training is provided in-house or by a training contractor, the contents of the training must satisfy the requirements of this program, and will be held to the criteria published by the Hazardous Waste Action Coalition Risk Management Committee, Health and Safety Subcommittee (entitled "Confined Space Entry Training Courses", published in 1996). A copy of these criteria are available from the Unit HSM. These criteria are directly applicable as they have been specifically developed by health and safety representatives of firms in our industry (hazardous waste/environmental consulting).

The HSO will ensure that appropriate training has taken place for all authorized individuals, and will have on-hand at the site documentation for each involved employee attesting to:

1. Employee name
2. Signature or initials of the instructor
3. dates of training

Site-specific training for authorized individuals will cover the duties of the entrants and attendants. This will address the aspects for each of these positions as presented below.

Authorized Entrants
Hazards that may be encountered in the space
How to properly use the necessary equipment
Communication methods with the Attendant
Recognizing when emergency exit of the space is necessary

Attendants
Hazards that may be encountered in the space
Behavioral effects of hazard exposure
To continuously maintain an accurate count of entrants and know their identity
To never leave the space unless relieved by another authorized entrant
Communication methods and aspects with Entrants
Monitoring of the space
How and when to summon emergency services
Control unauthorized personnel issues
Performance of nonentry rescues

Entry Supervisor (the HSO)*
Hazards that may be encountered in the space
Verifies that all tests have been conducted (by checking permit entries)
Verifies that all procedures and equipment specified in the permit are in place before signing it and putting it into effect
When and how to terminate the entry and cancel the permit
Verify that rescue services are available at the time of the entry and that the means for summoning them are operable
Removes or prevents unauthorized personnel from entering the space

Offsite emergency rescue services will be contacted by the HSO as part of task mobilization. They will be made aware of the potential hazards that may be encountered in providing assistance, and (when appropriate), they will be provided with Material Safety Data Sheets or similar information for substances that they may be exposed to.

4.6 Coordination With Clients

In nearly all instances, Unit operations will involve arrangements where we are serving as a contractor to a client facility. That is, we will not be addressing entering spaces that we own or control. Therefore, appropriate coordination with the client will be essential to properly understand the nature of any confined spaces and to successfully perform the work. When the scope of work entails (or may entail) working in or near confined spaces, the Project Manager must gather the following information as part of the initial data gathering process:

1. Obtain any available information regarding confined spaces, including descriptions, potential or known hazards, and the client's confined space entry program information
2. Determine if the client has located and designated confined spaces in the work area
3. Establish how the client desires to coordinate our work with their operations, relative to the confined spaces
4. If the scope of work will involve actual entry by Unit personnel, inform the client of our program

Gathered information is to be provided to the Health and Safety individual responsible for preparing the site-specific Health and Safety Plan.

At the conclusion of any confined space entry work done at a client location, the Project Manager is to request a debriefing meeting so that a representative from the project team can communicate hazards that were encountered in the work.

4.7 Project Sites Involving Confined Spaces Where Entries Will Not be Performed

In many instances, we may be performing work at sites where confined spaces exist and our scope of work does not involve any entry into those spaces. In this application, the HSO has only to ensure that spaces in our work area are adequately identified and posted, and complete the one-page written program in Attachment 2 and post it on site in the work area.

4.8 Confined Space Entry Operations involving Subcontractors

For some projects, the scope of work may require a specialized service or capability that we do not have in-house, and a subcontractor will be needed. When that work involves requiring our subcontractor to perform a confined space entry, The HSO must complete and utilize the written program included as Attachment 3. Also, the information presented previously in section 4.6 (when we are the subcontractor) must be gathered by our Project Manager and provided to our subcontractor. Again, in most instances, all or most of that information will have to be obtained from our client. We must provide our subcontractor with the following information:

1. Information regarding the confined space(s), including descriptions, potential or known hazards, and the details of our confined space entry program
2. information on the location and designations (postings) of the confined spaces in the work area
3. Establish how we desire to coordinate our work with their operations, relative to the confined spaces
4. If the scope of work will involve actual entry by subcontractor personnel, inquire if they have their own Permit-Required Confined Space Program and obtain it for our review
5. If the nature of the work is such that Unit and subcontractor personnel will have to perform concurrent operations in or near a confined space, very close coordination will be necessary and the Unit HSM must be contacted for guidance.

At the conclusion of any confined space entry work done by a subcontractor, a debriefing meeting will be held by the HSO to learn of any hazards that were encountered in the work.

4.9 Program Evaluations and Availability

The Unit HSM is responsible for performing evaluations of this overall Program to ensure its continued effectiveness. These reviews will be properly documented, and will occur as follows:

1. Annually, at the end of each calendar year
2. At any time when an indication is discovered that a component of the program is not effective
3. In the event of any modifications in the regulatory requirements for confined space operations
4. If the event of changes or mandates from Brown & Root Corporate Health and Safety

Annual Program evaluations will entail a review of all canceled written permits prepared and used during the course of that year by all Unit locations. The various site-specific written programs that these permits were prepared under are also subject to review. Canceled permits will be retained by the Unit HSM for no less than one calendar year.

Field audits of project work sites where confined space operations are conducted will also be performed. These will be coordinated through the various office safety POCs, and will done on an unannounced, random basis.

Information gathered and program modifications that become necessary will be communicated by the Unit HSM to appropriate Brown & Root Corporate Health and Safety.

ATTACHMENT 1

CONFINED SPACE ENTRY PROGRAM
For
Projects Involving Entry Operations

CONFINED SPACE ENTRY PROGRAM
For
Projects Involving Entry Operations

Site Name and Address:_____ Project No._____
_____

Project Manager: _____
Site Manager: _____
Site Health and Safety Officer: _____

Confined spaces that exist (or that may be created by project activities) at this site include the following: _____
_____
_____
_____
_____
_____
_____

Each of these spaces have been (or will be, upon creation) clearly posted with signs stating "DANGER - PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER". Unauthorized entry into any of these spaces is strictly prohibited.

On this project, entry into the following space(s) is (are) anticipated:

Space	Reason For Entry	Associated Hazards

ENTRIES WILL BE BY WRITTEN PERMIT ONLY. Figure 1 will be used as the written permit on this site. Permits will be prepared, issued, and canceled by the Site Health and Safety Officer, who will also serve in the role of Entry Supervisor. Permits must be completed before any entry operations begin. Completed permits will be reviewed with all involved personnel as part of their task-specific training, and then posted at or near the entrance to the space.

Equipment and Evaluation of Confined Spaces

All spaces must be properly evaluated before and during entry operations. Figure 2 specifies the equipment that will be maintained on this site to evaluate and support Confined Space Entry operations.

Figure 2
On Site Confined Space Equipment
(Check and Describe All That Apply)

Type of Equipment	Description
_____Testing/monitoring equipment	_____
_____Ventilating equipment	_____
_____Communications equipment	_____
_____Personnel protective equipment	_____
_____Lighting equipment	_____
_____Barriers/shields to protect entrants	_____
_____Ingress/egress equipment	_____
_____Rescue/emergency equipment	_____
_____Other equipment	_____

Spaces will be evaluated by the Site Health and Safety Officer as follows:

- Pre-entry, to determine that satisfactory entry conditions exist
- Continuously, if the space cannot be isolated
- Periodically, if the space can be isolated (at least once every ____ minutes)

The sequence for conducting these evaluations will be (from first to last):

1. Oxygen level
2. Lower Explosive Level (for gases, vapors, mists, or particulates)
3. Toxic gases or vapors

Specific equipment and instrument action levels are specified on the permit.

General Requirements and Responsibilities

Only properly authorized and trained personnel will be permitted to participate in entry operations. The Entry Supervisor (the site Health and Safety Officer) will be responsible for conducting these authorizations and for ensuring that training requirements are satisfied. All persons involved with entry operations will be properly designated on the Permit. At least one Entry Attendant will be stationed outside of the space at all times during any confined space entry operation. The identity of the Attendant(s) will be clearly indicated on the entry permit. Attendants will not be assigned any additional duties that could interfere with fulfilling their responsibilities as space Attendants. **Multiple spaces will not be monitored by a single attendant**. This type of approach is strictly prohibited.

Emergency rescue operations will be non-entry means only. Emergency procedures will be specified on the entry permit.

If entry operations will involve the use of contractor personnel, the Subcontractor Permit Required Confined Space Program (See Attachment 3 of the Brown & Root Environmental Unit Confined Space Entry Operations Program) must be completed by the site Health and Safety Officer and maintained onsite.

At the conclusion of entry operations, the site Health and Safety Officer will ensure that all personnel and equipment have been removed from the space, that a final space evaluation is performed, and the permit will be canceled and filed. A copy of the canceled permit must be sent to the Unit Health and Safety Manager at the conclusion of the project, and not later than by November 30 for projects where work continues toward the end of a calendar year in order to facilitate the annual program evaluation process.

FIGURE 1
CONFINED SPACE ENTRY PERMIT

CONFINED SPACE ENTRY PERMIT

No:

PERSONNEL ENTRY LOG

DESCRIPTIONOF CONFINED SPACE

ENTRY SUPERVISOR	DATE

ATTENDANT(S)

ENTRANT'S NAME	TIMES IN AND OUT							
	IN	OUT	IN	OUT	IN	OUT	IN	OUT

CONFINED SPACE ENTRY PERMIT No:

INITIAL ATMOSPHERIC TESTS PERFORMED

CAUTION: Toxic or flammable gasses or vapors may _____ in the confined space. Be sure to vent at various intervals and locations within the confined space. Always check the oxygen content first.

INITIAL TESTING						
HAZARD TESTED	ACCEPTABLE RANGE	READING	DATE AND TIME	TESTER INITIALS	ACCEPTABLE	
					YES	NO
%Oxygen	19.5-23.5%	%				
%LEL	10% or less	%				
	PEL=	PPM=				
	PEL=.	PPM=				
	PEL=	PPM=				

RESCUE PROCEDURE

PLAN DESCRIPTION

ONSITE RESCUE CONTACTS			OUTSIDE SOURCES AND PHONE
PHONE NUMBER	RADIO NUMBER	PAGER NUMBER	
			FIRE DEPARTMENT
			AMBULANCE
			HOSPITAL
			OTHER

SPECIAL EQUIPMENT NEEDED

- ☐ RESPIRATORS (Type): _____
- ☐ SAFETY HARNESSES/WRISTLETS
- ☐ LIFELINES
- ☐ HOISTING APPARATUS
- ☐ VENTILATION EQUIPMENT: _____
- ☐ TEMPORARY LIGHTING (Type): _____
- ☐ NON-SPARKING TOOLS
- ☐ PROTECTIVE CLOTHING: _____
- ☐ OTHER:

ENTRY SUPERVISOR'S SIGNATURE	DATE	PERMIT ISSUER SIGNATURE	DATE

CONFINED SPACE ENTRY PERMIT No.:

GENERAL INFORMATION:

DESCRIPTION OF THE CONFINED SPACE

DATE ISSUED	TIME ISSUED	DATE EXPIRES	TIME EXPIRES
	:		:

ENTRY SUPERVISOR

ATTENDANT(S)

COMMUNICATION BETWEEN ATTENDANT(S) - ENTRANTS

☐ VOICE ☐ LIGHT ☐ RADIO ☐ OTHER

DESCRIPTION OF WORK

CHECKLIST FOR ISOLATION AND UNAUTHORIZED ACCESS PREVENTION

	Yes	NO	NA	INITIAL
External Battery(ies) in Place	☐	☐	☐	_____
Mechanical Lockout/Tagout	☐	☐	☐	_____
Lines/Pipes Disconnected	☐	☐	☐	_____
Lines/Pipes Blocked	☐	☐	☐	_____
Lines/Pipes Capped	☐	☐	☐	_____
Lines/Pipes Blinded	☐	☐	☐	_____
Hot Work Permit	☐	☐	☐	_____
Warning Signs	☐	☐	☐	_____
Other:_____	☐	☐	☐	_____

REPORT ANY UNAUTHORIZED ENTRY TO:	PHONE NO.	RADIO NO.	PAGER NO.
Health Sciences Department and Project Management			

PRE-ENTRY CHECKLIST

PURGING, INERTING, OR FLUSHING

PERFORMED ☐ YES ☐ NO ☐ NA

METHOD USED ☐ Nitrogen ☐ Steam ☐ Water ☐ Other (specify) _____

MECHANICAL VENTILATION

	Initial	Continuous	Partial	Description
Fresh Air Injection	☐ _____hrs.	☐	☐	_____
General	☐ _____hrs.	☐	☐	_____
Local Exhaust	☐ _____hrs.	☐	☐	_____

SPECIFIC HAZARDOUS TASKS

Certain tasks performed in confined spaces greatly increase the risks to entrants. Check all tasks to be performed.

- ☐ WELDING/GRINDING
- ☐ THERMAL CUTTING
- ☐ SOLDERING/BRAZING
- ☐ ELECTRICAL
- ☐ OTHER, EXPLAIN: _____
- ☐ PAINTING OR CLEANING WITH SOLVENTS
- ☐ CLEANING/SWEEPING/VACUUMING
- ☐ SCRAPING/REMOVING RESIDUE
- ☐ CHEMICAL USE

CONFINED SPACE ENTRY PERMIT No.

PERIODIC ATMOSPHERIC TEST RESULTS

TESTER INFORMATION	ATMOSPHERIC HAZARD TESTED	ACCEPTABLE RANGE OF HAZARD	ACCEPTABLE RANGE OF HAZARD	ACCEPTABLE	
				YES	NO
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		
Date	Oxygen Content ($\%0_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	ppm		

ATTACHMENT 2

CONFINED SPACE ENTRY PROGRAM
For
Project Sites Involving Confined Spaces
Where Entries Will Not be Performed

CONFINED SPACE ENTRY PROGRAM
For
Project Sites Involving Confined Spaces
Where Entries Will Not be Performed

Site Name and Address: _____ Project No._____
_____

Project Manager: _____
Site Manager: _____
Site Health and Safety Officer: _____

Confined spaces that exist (or that may be created by project activities) at this site include the following: _____
_____
_____
_____
_____
_____
_____

Each of these spaces have been (or will be, upon creation) clearly posted with signs stating "DANGER - PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER".

Entry into any of these spaces is NOT permitted by site personnel is for any reason.

Site Manager: _____ Date ___/___/___.

Site Health and Safety Officer:_____ Date ___/___/___.

POST THIS ON SITE

ATTACHMENT 3

SUBCONTRACTOR PERMIT-REQUIRED CONFINED SPACE ENTRY OPERATIONS

SUBCONTRACTOR PERMIT-REQUIRED CONFINED SPACE ENTRY OPERATIONS

Site Name and Address: _____ Project No._____

_____

Project Manager: _____

Telephone Number: (_____)_____-_____

Site Manager: _____

Site Health and Safety Officer:_____

Subcontractor Performing Confined Space Entry Operations:_____

1.0 General

This project site contains the confined spaces specified in Table 1. Entry into any of these spaces will be written permit only, and in compliance with the requirements of OSHA 29 CFR 1910.146. Permits will be coordinated with and submitted to the site Health and Safety Officer.

Table 1
Confined Spaces
at the
_____ Site

Space	Reason For Entry	Associated Hazards

2.0 Space Description and History (Note to site Health and Safety Officer: this section must be filled out for EACH space to be entered by the subcontractor personnel. Attach additional pages to this program as appropriate.)

The nature of the work to be performed by _____
(name of subcontractor)

is _____

_____

_____

This will involve/require entry into _____
(description of space)

The hazards recognized or anticipated with this space include or may include (check and describe all that apply):

_____ a hazardous atmosphere involving _____

_____ Material that could engulf an entrant, specifically_____

_____ An internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section _____

_____ Other serious safety or health hazards _____

_____

_____

Brown & Root Environmental has implemented the following precautions/procedures for the protection of our employees in or near this space:

- Education and training on confined space recognition
- Posting with "DANGER - PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER" signs
- Other means as follows:_____

_____

If Brown & Root Environmental and _____ will need to perform concurrent operations in or near the space, activities will be conducted in accordance with the following coordinated system:_____

_____

_____

_____

_____

_____

3.0 Subcontractor Debrief

Work was concluded on ____/____/____. The following confined space hazards were confronted or created during entry operations.

_____

_____

_____

_____

_____

_____

_____

_____

Problems encountered in administering or complying with the site Confined Space Entry Program were as follows:_____

_____

_____

Suggestions for improvements of this program discussed during the debrief included

_____

_____

_____

_____ Signature of Subcontractor Agent

_____ HSO Signature

ATTACHMENT 3

OSHA POSTER

JOB SAFETY & HEALTH PROTECTION

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

Employers

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

Employees

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

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

Inspection

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

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

Complaint

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

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

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

Citation

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

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

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

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

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury, or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

More Information

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

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1985
OSHA 2203

William E. Brock, Secretary of Labor

U.S. Department of Labor
Occupational Safety and Health Administration

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

APPENDIX B

SOIL SAMPLE RESULTS FROM BUILDING 238 TANK REMOVAL

CONTRACT MEMORANDUM

Contract Title - TANK REMOVAL / TESTING
Contract No. - N62472-85-D-2095
Report Date - DEC 30 1986
By - STEPHEN DARPANGELO

ONE SOIL SAMPLE WAS TAKEN FROM THREE LOCATIONS OF EXCAVATED SOIL AT THE BLDG 238 TANK REMOVAL SITE. THIS ONE SAMPLE WAS DIVIDED INTO TWO SAMPLES & FORWARDED TO THE LAB FOR ANALYSIS OF EP TOXIC METALS PLUS NICKEL.

pH OF WATER WITHIN TANK WAS TAKEN AND FOUND TO BE 7.0. (pH TAKEN WITH pH-PAPER).

Approval to backfill given by J in Glascow on site visit of 1/13/87 morning.

INDUSTRIAL WASTE SAMPLE RESULTS
NAVSHIPYD-PTSMH-4730/385 (NEW 2-86)

DATE SUBMITTED: 12/31/86

SAMPLE CLASS (CIRCLE 1 PER SHEET):

WASTE RECEIVED: TEST SCHEME 1
PROCESS TANKS: TEST SCHEME 1
JAR TESTS: TEST SCHEME 1
CLARIFIER SUPERNATANT: TEST SCHEME 2
SAMPLE SEWER DISCHARGE: TEST SCHEME 3
PRECOAT FILTER SLUDGE: TEST SCHEME 4

OTHER, SPECIFY TESTING REQUIRED:
EP TOX + Ni ON UST SOIL

SAMPLE IDENTIFICATION:
A - Bldg 238 UST SOIL 12/31/86 10:30
B - Bldg 238 UST SOIL 12/31/86 10:30
C -
D -

LAB ANALYSIS NUMBER K9355
ANALYSIS DATE 1/12/87
SIGNATURE [illegible]
BADGE NUMBER 334-39833

PARAMETER	SAMPLE RESULTS (PPM)				TEST SCHEMES AND LIMITS (PPM)			
	A	B	C	D	1	2	3	EP TOX 4
SAMPLE TIME								
SAMPLE DATE								
pH					INFO	INFO	5.5-9.5	- - - -
ALUMINUM					INFO	- - - -	1.2	- - - -
AMMONIA					- - - -	- - - -	18	- - - -
ARSENIC	<0.5	<0.5			INFO	5.0	- - - -	5.0
BARIUM	1.6	2.5			INFO	100.0	4.0	100.0
CADMIUM	<0.5	<0.5			INFO	1.0	0.6	1.0
CHROMIUM (TOTAL)	<0.5	<0.5			INFO	5.0	1.0	5.0
CHROMIUM (HEX)					INFO	- - - -	0.6	- - - -
COPPER					INFO	- - -	1.0	- - - -
FLUORIDE					- - - -	- - - -	36.0	- - - -
IRON					INFO	- - - -	15.0	- - - -
LEAD	3.9	2.7			INFO	5.0	1.0	5.0
MANGANESE					INFO	- - - -	4.0	- - - -
MERCURY	<0.10	<0.10			INFO	0.2	- - - -	0.2
NICKEL	0.7	0.7			INFO	- - - -	1.0	- - - -
SELENIUM	<0.5	<0.5			INFO	1.0	- - - -	1.0
SILVER	<0.5	<0.5			INFO	5.0	1.0	5.0
TIN					INFO	- - - -	2.0	- - - -
ZINC					INFO	- - - -	1.0	- - - -
T.O.C.					- - - -	- - - -	70.0	- - - -

LABORATORY COMMENTS OR ADDITIONAL RESULTS:
< = LESS THAN

THE ABOVE LIMITS ARE MAXIMUM LIMITS, UNLESS OTHERWISE INDICATED, BASED ON FEDERAL, STATE AND LOCAL REGULATIONS IN EFFECT AT THE TIME OF PRINTING.

FOR INFORMATION ONLY

COPY TO: 137.D1, 137.5, 440.2 (HWTF), 453

APPENDIX C

RESPONSE TO EPA, MEDEP, AND SAPL COMMENTS ON THE DRAFT FINAL WORK PLAN, TEEPEE INCINERATOR (SITE 29) AND BUILDING 238 (SITE 10)

RESPONSE TO USEPA COMMENTS DATED DECEMBER 3, 1997
DRAFT FINAL WORK PLAN, COMMENT RESPONSE LETTER
(PROVIDED IN APPENDIX C, NOVEMBER, 1997)
BUILDING 238 (SITE 10) AND TEEPEE INCINERATOR (SITE 29)
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

GENERAL COMMENTS

COMMENT 3: EPA previously commented that changes which are made to any of the text or tables should be reflected in the other tables to make sure they are consistent with each other. This does not appear to have been done in the Draft Final Work Plan. For example, Section 3.2 states that borings drilled in the fill area of the Teepee Incinerator Site (Site 29) will be sampled at 0-1 ft, 1-3 ft, 3-5 ft, 5-7 ft, and at the groundwater table interface. However, the table in Section 4.1.1 states that the three borings in the fill area will be sampled at 7-9 ft as opposed to 5-7 ft. This discrepancy should be corrected.

In addition, a calculation of the number of soil samples to be analyzed for TCL Volatiles (based on the information presented in Table 3-4 and the table in Section 4.1.1) shows that 30 soil samples will be collected from Site 29 and 4 samples will be collected from Site 10 (not including QA/QC samples). This is a total of 34 soil samples for TCL Volatiles analysis which is not consistent with Table 5-1 which lists 27 samples.

As another example, the total number of soil samples for cyanide would be expected to be 30 for Site 29 and 8 (including both boring and basement area surface soil samples) for Site 10 for a total of 38. Table 5-1 lists 31 samples.

It should also be noted that Table 3-4 specifies that 5 surface soil background samples will be collected while the text in Section 3.2, Field Activities, Page 3-11, Paragraph 1, states that 3 background surface soil samples will be collected.

The Draft Final Work Plan should be reviewed again, thoroughly, to ensure that the sample numbers presented are correct and that the tables are consistent with the text.

RESPONSE: Agreed. A thorough review of the Work Plan has been performed before issuing the Final version.

SPECIFIC COMMENTS

COMMENT 1: EPA requested additional information on the ash disposal area shown in Figure 2-3. In response, the Navy stated that the text had been revised to indicate "..two additional soil borings and an additional monitoring well will be performed"; however, the Navy's response did not indicate which monitoring well would be sampled.

The Draft Work Plan did not contain any groundwater sampling at Site 29. The Draft Final Work Plan added the installation and sampling of a background monitoring well; however, it appears that no groundwater sample collection is proposed for the on-site wells. The purpose of sampling the background well and not sampling on-site wells is not clear. It would not be appropriate to compare current background groundwater data to the on-site groundwater results from 1991 to 1996. Please clarify.

RESPONSE: In response to EPA's first paragraph; the monitoring well referenced in the response to comment is the background well proposed on Figure 3-1. For consistency between the work plan and subsequent report, the background well at Site 29 has been labeled as DW-11

and the wells at Site 10 have been labeled as BA-01 and BA-02.

Groundwater sampling was not proposed for the existing wells at the DRMO originally because the investigation of Site 29 was suppose to be performed concurrently with the groundwater monitoring program that has since been completed. There are currently no plans to resample the DRMO wells during this investigation. Instead, data from the newly installed upgradient background well will be compared to the recent low-flow sampling data from the existing DRMO wells collected between December 1996 and November 1997.

COMMENT 4: With respect to the Building 238 (Site 10) portion of this comment, the Navy proposes to collect a subsurface sample from the downgradient soil boring at a depth equal to the location of the former UST. The boring location was moved to the downgradient side of the previously drilled soil borings. The Navy must ensure that the boring is drilled outside of the area which was previously excavated for the tank removal and backfilled.

RESPONSE: Agreed. The Navy is aware that only a short distance exists between the edge of the excavation and the end of the dock. Every effort will be made to place the boring in a position between the end of the dock and the edge of the excavation. This will be accomplished by visually observing the asphalt patch which remains from the UST excavation.

COMMENT 9: In response to this comment, the text in Section 3.2, Field Activities, Page 3-11, Paragraph 3, was modified. However, it now states "One monitoring well will be located downgradient of the previously installed borings and drilled *to the water table* to monitor local conditions. It is expected that the well will be drilled to a depth which allows for the placement of the middle of the screen at approximately 13.5 feet...". These two statements appear to be in conflict since previous information has indicated that the water table (given that it fluctuates with the tide) is above the depth of 13.5 feet; therefore, drilling to the water table would not be sufficient.

Related to this, Section 3.1.2, Site 10 (Building 238), Page 3-6, Paragraph 2, states that the soil boring will be drilled to the depth equal to the bottom of the tank (13.5 ft bgs). However, the middle of the screen will be placed at 13.5 ft; therefore, the well will obviously be placed at a depth below 13.5 ft which requires that the boring be drilled below 13.5 ft.

The text and the tables should be reviewed again and the appropriate corrections made.

RESPONSE: Agreed. The second sentence in the third paragraph on Page 3-11 will be revised to read; "One monitoring well will be located downgradient of the previously installed borings to monitor local groundwater conditions."

The seventh sentence in the second paragraph on page 3-6 will be revised to read; "The new boring will be drilled to a depth that will allow for the placement of the middle of the well screen to be positioned at a depth equal to the bottom of the former tank (approximately 13.5 feet)."

COMMENT 21: EPA recommended that the background dioxin soil samples be collected in both the native soil and clean fill since the Site 29 conditions include both matrices. Figure 4-2 on page 4-8 indicates that the 3 background soil locations are all in native soil. It does not appear that the Navy has addressed EPA's concern. Please clarify.

RESPONSE: Based on the Navy's experience for dioxin sampling at other sites where the dioxin levels have not exceeded EPA Region III Risk-Based Concentrations (RBCs), the Navy proposes no dioxin sampling be performed at this time. The Navy currently proposes the following approach for dioxin sampling:

a. Take soil samples for dioxin for laboratory analysis;

b. Compare laboratory analysis to RBCs. If the dioxin levels do not exceed Region III's RBC levels, the Navy proposes not establishing background levels for dioxin at Portsmouth Naval Shipyard. If the dioxin levels exceed Region III's RBCs, the Navy will calculate a site-specific risk based on the sampling performed and state whether additional sampling, including background levels, should be performed.

c. If in the interim, if the Maine Department of Environmental Protection's Soil Screening Values (SSVs) are finalized, the dioxin levels will be compared to the more conservative value of the SSV or the RBCs.

RESPONSE TO MEDEP COMMENTS DATED DECEMBER 29, 1997
DRAFT FINAL WORK PLAN COMMENT RESPONSE LETTER DATED 12/17/97
BUILDING 238 (SITE 10) AND TEEPEE INCINERATOR (SITE 29)
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

COMMENT: The Maine Department of Environmental Protection has reviewed the document referenced above. As we have discussed, the Navy did not respond to the State's August 19, 1997 comments within Appendix C of the Draft Final Work Plan. The Navy did respond to our comments in a separate letter dated December 17, 1997. As the 12/17 response indicates, the Navy will monitor each split spoon sample below the groundwater table (taken to determine lithology) with a Photoionization Detector (PID) and will visually evaluate each split spoon sample. The sample, which provides the highest PID readings in samples collected below the water table, will be collected and delivered to the lab for chemical analysis. If the PID indicates no contamination, a sample will be collected based upon visual observations.

The MEDEP finds this approach an acceptable compromise to our desire for collecting a sample at five foot intervals. However, as discussed with the Navy on December 22, the contractor has the flexibility to take more than one sample if their observations indicate this is necessary. For example, if black sand is found within a boring (as was discovered in nearby borings drilled during the RFI Data Gap investigation) and the PID indicates volatiles are present in a different type of material within the same boring, the State expects that a sample will be taken of each type of material. In addition, based on the earlier RFI Data Gap boring results, the State assumes that any black sand found (which is likely used sand blasting grit) contains high concentrations of heavy metals, especially lead, copper, nickel, and zinc, unless laboratory analysis indicates otherwise.

RESPONSE: Agreed.

RESPONSE TO SAPL COMMENTS DATED DECEMBER 6, 1997
DRAFT FINAL WORK PLAN, COMMENT RESPONSE LETTER
(PROVIDED IN APPENDIX C, NOVEMBER, 1997
BUILDING 238 (SITE 10) AND TEEPEE INCINERATOR (SITE 29)
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

1. **COMMENT:** Pages 2-8 and 2-10, Sections 2.2.1.

The Navy has revised the text to include a description of the sort of material that was burned or otherwise disposed of at Site 29 since 1918. However, it is not clear what the description is based on and how complete the understanding of historical site activities (and potential contamination) is. Information concerning documentation of handling and disposal activities, as well as the nature of the waste stream, should be provided.

RESPONSE: The information used in describing the historical activities as Site 29 was obtained from the historical report "Investigation of the Defense Reutilization and Marketing Office (DRMO)", Department of the Navy, 1996. The following will be added to the end of the second paragraph in Section 2.2.1: "For additional information concerning documentation of handling and disposal activities, as well as the nature of the waste stream, please refer to the Department of the Navy, 1996."

2. **COMMENT:** Page 2-10, Section 2.2.2.

Revisions to the text in this section indicate subsurface soils were sampled at the time the tank was removed in 1986. How and where were the samples collected, what were they analyzed for, and what were the results?

RESPONSE: A discussion of the samples collected in 1986 is provided in Section 3.1.2 in the second paragraph. Paragraph 2.2.2 will be revised to: "...of the tank. Subsurface soils were sampled at the time of the tank removal (Appendix B) and no clean-up action was required by MEDEP. According to information...".

3. **COMMENT:** Page 3-1, Section 3.1.1.

The Navy's response to comment 4 in our April 23rd letter is confusing. The text in the draft final work plan states that it is not anticipated that any monitoring wells are necessary to further define the horizontal and vertical limits of site-related contamination in groundwater. However, the last sentence of the first paragraph of the Navy's response states that the additional wells are (emphasis added) necessary at the time. This should be clarified. Earlier in that same paragraph the Navy stated that the potentiometric surface maps from the Round 7 data package indicate that the general groundwater flow direction is toward the four monitoring wells at the edge of the DRMO. However, a review of the potentiometric surface maps from Round 8 data package indicate a westward flow such that only one well (DW-3) might be downgradient of the teepee incinerator. This must be addressed, particularly because the Navy views soil contamination located below the water table as a groundwater issue that should be evaluated using monitoring well data.

RESPONSE: The text on page 3-1 of the Draft Final Work Plan is correctly stated. There was a typographical error in the response to comment 4. The last sentence in the response should have read "..., additional wells are ***not*** necessary at the current time."

Groundwater flow patterns may vary seasonally throughout the year and can also be affected by tidal changes due the sites close proximity to the shore. Nonetheless, potential migration of

contaminants from the former incinerator should be detected in any or all of the wells (DW-3, DW-8, DW-9) located in a downgradient direction.

4. **COMMENT:** Page 3-8, Figure 3-2.

The Navy is proposing to install a monitoring well up-gradient of Site 10. Given the configuration of the shoreline in the area, and the distance from the proposed well to the site, it is not clear that the proposed location is actually up-gradient of Site 10. What is the rationale for selecting the proposed up-gradient well location?

RESPONSE: Based upon the overall groundwater gradient across the shipyard, the proposed location appears to be positioned in an upgradient location for Site 10. However, it is understood that there is also a potential that flushing may occur due to tidal changes.

5. **COMMENT:** Page A-6, Section 3.0.

In response to our April 23rd question about how the potential for site worker exposure to radiological hazards would be determined, the Navy stated the shipyard would conduct on-site radiological overcheck monitoring with a field survey instrument during any "intrusive" work. The results of this monitoring should be provided to the RAB.

RESPONSE: A summary of the results from on-site radiological overcheck monitoring during any intrusive work is included in final reports.