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FINAL SITE-SPECIFIC SAMPLING AND ANALYSIS PLAN FOR BUILDINGS 2009B, 2009C AND 2009D DEFENSE REUTILIZATION AND MARKETING OFFICE NAVAL ACTIVITY PUERTO RICO

9/1/2004

AGVIQ/CH2M HILL

Final

Site-Specific Sampling and Analysis Plan

Buildings 2009B, 2009C, and 2009D

Defense Reutilization and Marketing Office

U.S. Naval Activity Puerto Rico

Ceiba, Puerto Rico

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic

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Prepared by

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Contents

Section **Page**

Acronyms ..... **v**

1 Introduction **1-1**

2 Site Background **2-1**
2.1 Buildings 2009B, C, and D Description 2-1
2.2 Site History 2-1
2.3 Types of Wastes Stored Onsite 2-2
2.4 Current Conditions 2-2

3 Sampling and Analysis Objectives **3-1**
3.1 Target Constituent List 3-1
3.2 Soil Sampling and Analysis Objectives 3-2

4 Field Sampling Plan **4-1**
4.1 Mobilization/Demobilization 4-1
4.2 Decontamination of Personnel and Equipment 4-2
4.3 Utility Clearance 4-2
4.4 Interior Cleaning 4-2
4.4 Soil Samples 4-2
4.5 Sample Designation 4-3
4.5.1 Specifications for Field Location Data 4-3
4.5.2 Specifications for Analytical Data 4-3
4.5.3 Sample Identification Scheme 4-3
4.5.4 Surveying 4-7
4.5.5 Labeling 4-7
4.5.6 Packaging and Shipping 4-8
4.5.7 Custody Control 4-8

5 Data Quality Objectives **5-1**
5.1 Data Quality Objectives (DQOs) 5-1
5.2 QA/QC Procedures 5-1
5.2.1 Field QA/QC Procedures 5-1
5.2.2 Laboratory QA/QC Procedures 5-3
5.3 Quality Control Acceptance Criteria 5-3
5.3.1 Precision 5-4
5.3.2 Accuracy 5-4
5.3.3 Representativeness 5-5
5.3.4 Completeness 5-5
5.3.5 Comparability 5-5
5.4 Electronic Deliverable File Format 5-5

6 Data Validation and Reporting 6-1
6.1 Data Validation 6-1
6.2 Data Quality Evaluation 6-1

7 Project Organization 7-1

8 References 8-1

Appendix

A: PE Certification
B: IDW Management Plan
C: Standard Operating Procedures (SOPs)

List of Exhibits

Number **Page**
1-1 Regional Location Map 1-3
1-2 DRMO Storage Area Location Map 1-4
1-3 DRMO Facility Layout 1-5

2-1 Buildings 2009B, C, and D Site Plan 2-4
2-2 Photograph of East Side of Buildings 2009B, C, and D 2-5
2-3 Photograph of North Side of Buildings 2009B, C, and D 2-6
2-4 Photograph of West Side of Buildings 2009B, C, and D 2-7
2-5 Photograph of inteRior of Building 2009B 2-8
2-6 DRMO Storage Yard Topographic Map 2-9
2-7 DRMO Underground Utilities 2-10

3-1 Target Constituent List for Ignitables Stored in Buildings 2009B, 2009C, and 2009D 3-4
3-2 Soil Closure Standards For DRMO Buildings 2009B, 2009C, and 2009D 3-6
3-3 Locations of Previously Collected Background Samples 3-8
3-4 Background Soil Sampling Concentrations and Calculated Background Limits 3-9

4-1 Required Containers, Preservatives, and Holding Times for Soil and Water Samples 4-4
4-2 Buildings 2009B, 2009C, and 2009D Soil Sample Locations 4-5
4-3 Analytical Sample Summary for RCRA Closure of Buildings 2009B, 2009C, and 2009D 4-6
4-4 Field Station Scheme 4-6
4-5 Sample Designation Scheme 4-7

5-1 QC Acceptance Criteria - Precision, Accuracy, Representativeness, Completeness, and Comparability 5-4
5-2 Analytical Data Electronic Deliverable 5-6

7-1 Organization Chart 7-2

Acronyms

CI	confidence interval
COC	Chain of Custody
CTO	Contract Task Order
DQE	data quality evaluation
DQO	data quality objectives
DRMO	Defense Reutilization and Marketing Office
DV	data validation
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
FACLANT	Naval Facilities Engineering Command, Atlantic
ft	foot/feet
GIS	Geographic Information System
GPS	Global Positioning System
IDW	investigation-derived waste
JV I	AGVIQ-CH2M HILL Joint Venture I
LCSs	laboratory confirmation samples
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per Liter
MS/MSD	matrix spike/matrix spike duplicate
MSL	mean sea level
NAPR	Naval Activity Puerto Rico
NFESC	Naval Facilities Engineering Support Center
NSRR	Naval Station Roosevelt Roads
NTR	Navy Technical Representative
PAH	polynuclear aromatic hydrocarbons
PARCC	precision, accuracy, representativeness, comparability, and completeness
PCB	polychlorinated biphenyl
PPE	personal protective equipment
QA/QC	quality assurance/quality control
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment

RFI	RCRA Facility Investigation
RL	reporting limit
SAP	Sampling and Analysis Plan
sf	square feet
SOP	Standard Operating Procedure
SOW	scope of work
SVOC	semi-volatile organic compound
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
TM	technical memorandum
TOC	total organic carbon
TOX	total halogens
VOC	volatile organic compound
VSI	visual site inspection
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

SECTION 1

Introduction

This sampling and analysis plan (SAP) describes the sampling to be conducted to support clean closure of the hazardous waste storage facility at the Defense Reutilization and Marketing Office (DRMO) facility at U.S. Naval Activity Puerto Rico (NAPR), formerly Naval Station Roosevelt Roads, Puerto Rico (NSRR). The clean closure is based on the expected future industrial use of the property, and appropriate institutional controls (i.e., deed restriction to preclude future residential or similar use of the property) will be implemented. This change in designation from NSRR to NAPR occurred on March 31, 2004, following cessation of the primary mission and activities of NAPR as part of the ongoing base closure.

This SAP has been prepared by AGVIQ-CH2M HILL Joint Venture I (JV I) in accordance with the Closure Plan in the Resource Conservation and Recovery Act (RCRA) Part B Permit for NAPR. The Closure Plan was originally included in the approved RCRA Part B permit issued on October 20, 1994 (U.S. Environmental Protection Agency [EPA] ID No. PR2170027203). A modified Closure Plan was submitted with the RCRA Part B Permit Renewal Application in April 2000. However, the renewal application was withdrawn when the Navy decided in September 2003 to close NAPR. Therefore, this SAP has been prepared to support the Closure Plan for DRMO Hazardous Waste Storage Buildings 2009B, C, and D as included in the 1994 RCRA Part B Permit. This SAP is also based on a scope of work provided by Naval Facilities Engineering Command, Atlantic (FACLANT) as part of the Navy Contract with JV I (N62470-03-D-4401), Contract Task Order (CTO) 25.

NAPR was commissioned in 1943 as a Naval Operations Base and re-designated as a Naval Station in 1957. It occupies over 33,500 acres on the northern side of the eastern coast of Puerto Rico, along the Vieques Passage. The primary mission of NAPR was to provide support for Atlantic Fleet weapons training and development activities (Baker, 1996). The closure of NAPR was approved by Congress in September 2003; closure is expected to be complete by 2005.

Exhibit 1-1 shows the location of NAPR on the main island of Puerto Rico. NAPR is located approximately 35 miles east of San Juan, 10 miles south of Fajardo, and 10 miles west of Vieques Island. Exhibit 1-2 shows the location of the DRMO in the northeast section of NAPR. Exhibit 1-3 shows the layout of the storage buildings, including Buildings 2009B, C, and D, at the DRMO facility. The DRMO facility consists of an administrative/hazardous waste storage building (Building 1973), a large metal building used for non-hazardous waste storage (Building 2010), flammable storage buildings (Buildings 2009A, B, C, and D), some outdoor storage racks, and a large open fenced area where surplus material (non-hazardous) is stored.

The remaining sections of this SAP are organized as summarized as follows:

Section 2, Site Background and Description - Presents the site background and history of Buildings 2009B, C, and D, identifies the types of waste stored in the buildings, and describes the current conditions of the buildings and surrounding area.

Section 3, Sampling and Analysis Objectives - Describes the sampling and analysis objectives to support clean closure.

Section 4, Field Sampling Plan - Identifies the approach, methods, and operational procedures to be employed during investigation activities.

Section 5, Data Quality Objectives - Describes the project-specific data quality objectives, quality assurance/quality control (QA/QC) procedures, quality control acceptance criteria, and data deliverables.

Section 6, Data Validation and Reporting - Details the procedures for data validation, data quality evaluation, and reporting.

Section 7, Project Organization – Provides a project organization chart and contact information for FACLANT and NAPR technical representatives.

Section 8, References – Lists documents cited in this SAP.

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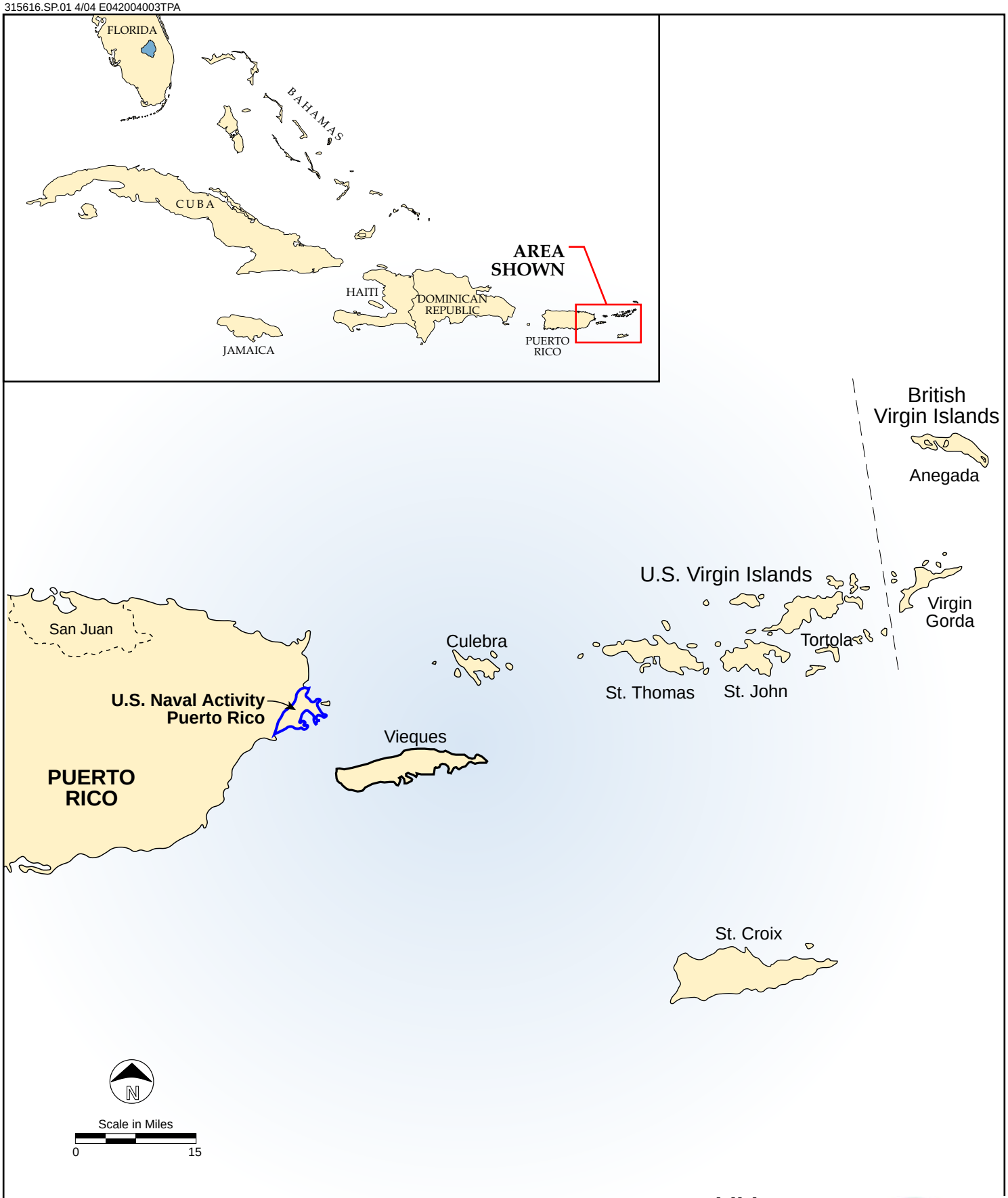

Exhibit 1-1
Regional Location Map
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

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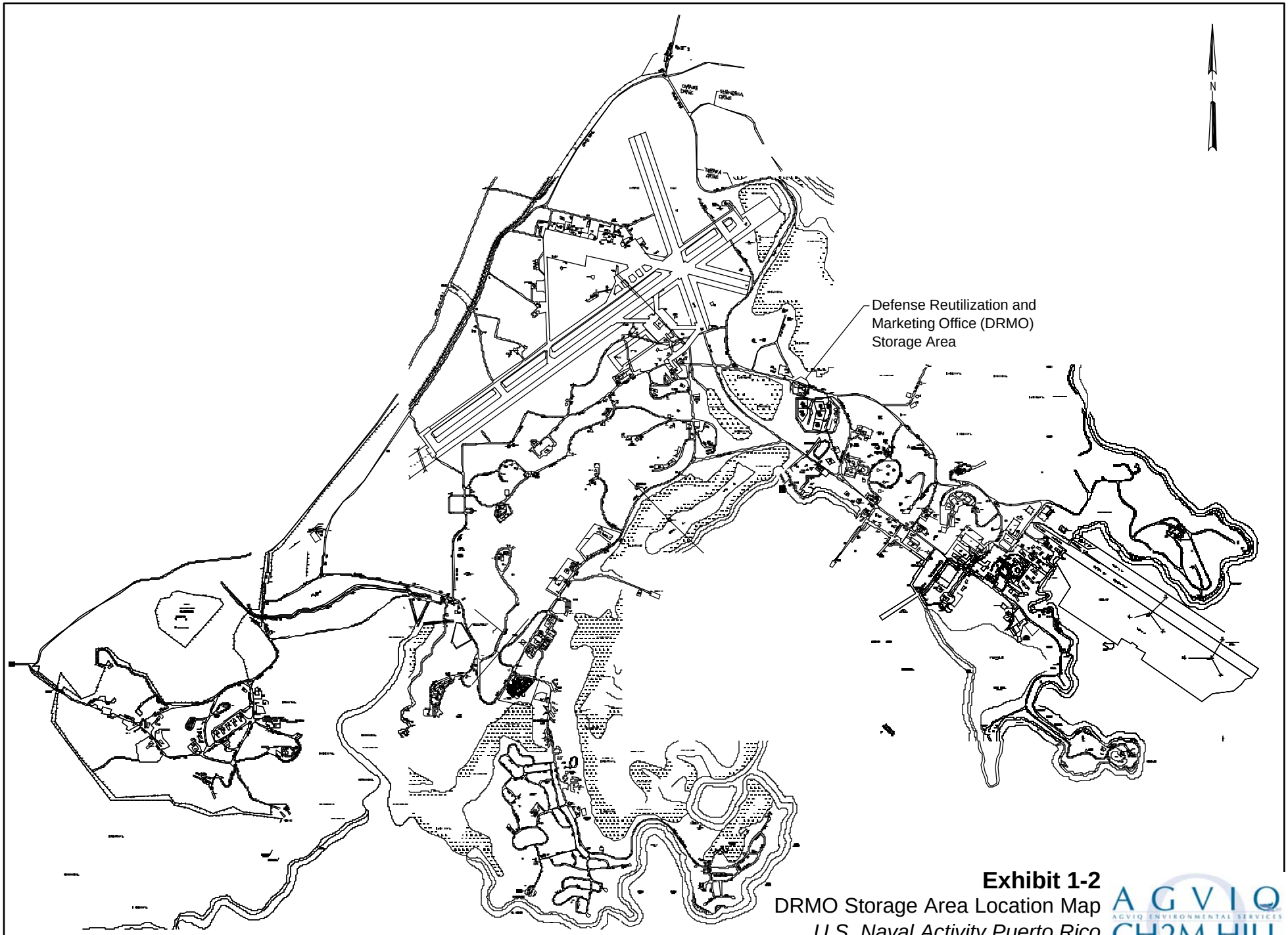

Exhibit 1-2
DRMO Storage Area Location Map
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

Source: Baker Environmental, 1993.

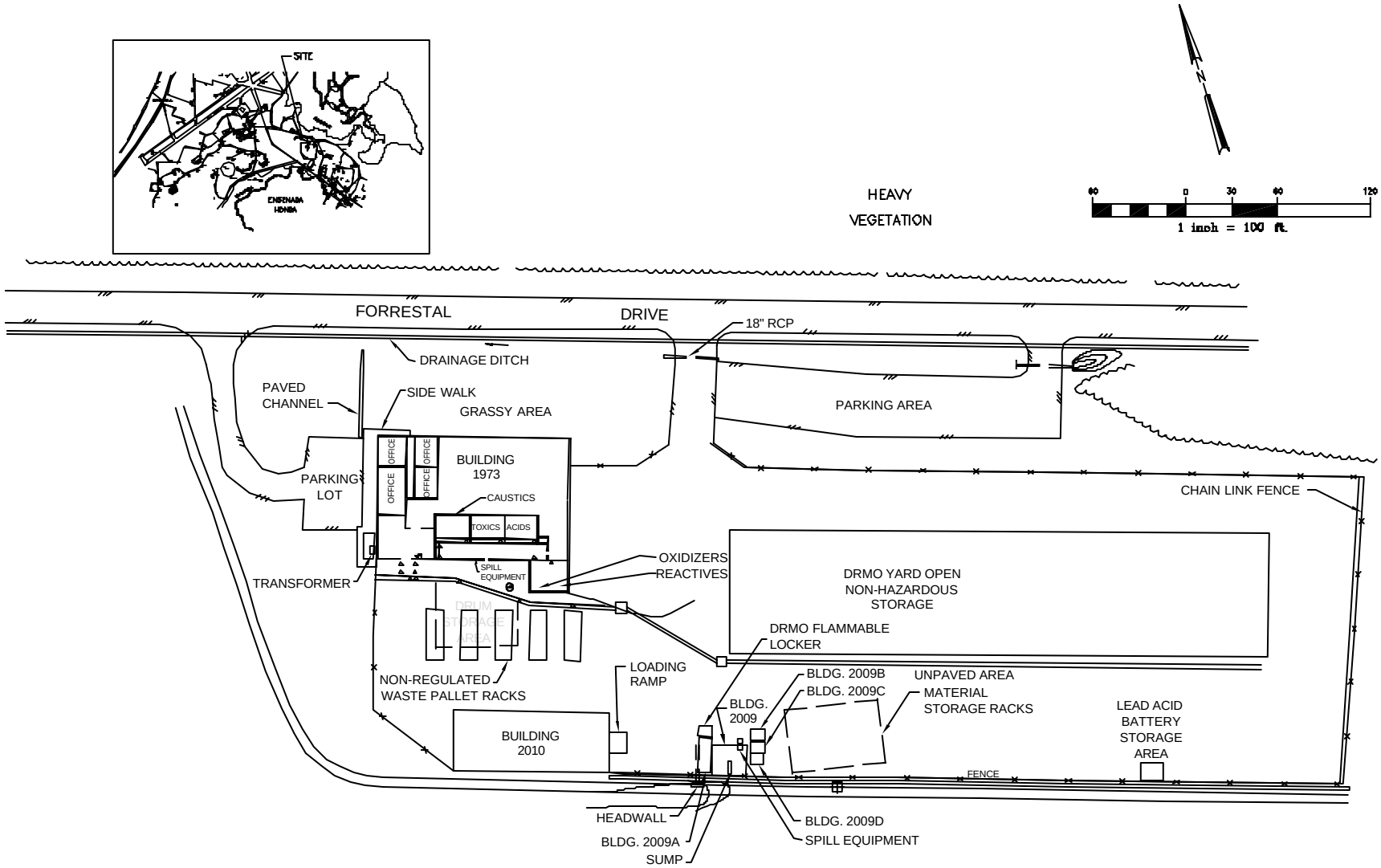

Exhibit 1-3
DRMO Facility Layout
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

Source: Baker Environmental, 1995.

SECTION 2

Site Background

This section provides a description of Buildings 2009B, C, and D including their history and the types of hazardous waste stored, as well as the current conditions of the buildings and surrounding area at the DRMO facility.

2.1 Buildings 2009B, C, and D Description

Buildings 2009B, C, and D are prefabricated, portable storage buildings constructed of heavy gauge steel. The buildings rest on concrete supports adjacent to the eastern side of Building 2009 and are surrounded by unpaved, gravel areas with patches of grass. Exhibit 2-1 provides a site plan of Buildings 2009B, C, and D. Buildings 2009B, C, and D are each 67 square feet (sf) in size with one exterior door on one side of the building. Exhibits 2-2, 2-3, and 2-4 show the east, north, and west sides of the buildings, respectively. The floors of the buildings consist of metal grating equipped with secondary containment beneath the grating. Exhibit 2-5 shows the metal grating on the interior of Building 2009B.

Buildings 2009B, C, and D were designed for the storage of containerized ignitable hazardous waste. The structures conform to the standards required for storage of hazardous wastes in containers. The drums were stored without pallets directly on the metal grate. This configuration allowed for a maximum equivalent storage capacity of 495 gallons of ignitable wastes (or nine 55-gallon drums) in each building. The drums were stacked single height along the walls. Spill containment was provided by a 175-gallon sump located beneath each grating floor. The sumps are fully contained with no outlet pipes. The containerized wastes were stored in the buildings while awaiting transport to an offsite permitted hazardous waste disposal facility.

The topography in the vicinity of NAPR ranges from sea level to approximately 295 ft above mean sea level (MSL). The average elevation at the DRMO facility storage area is approximately 130 ft MSL as shown in Exhibit 2-6 (Baker, 1996). Exhibit 2-7 shows the underground utilities (stormwater, potable water, sanitary sewer, electrical, and communication lines).

2.2 Site History

Buildings 2009B, C, and D were brought onsite in the early 1980s as part of the DRMO. No reportable spills occurred in Buildings 2009B, C, and D, and small releases were contained and promptly cleaned up. The volume of hazardous waste generated at NAPR has been significantly reduced in the past several years as a result of waste minimization efforts and preparations for Base closure.

Most of the DRMO facility is paved with asphalt or concrete. The only suspected release identified in the DRMO open storage areas related to oil staining observed during a 1988 visual site inspection (VSI) in the open area near Building 2009. This area was designated as

Solid Waste Management Unit (SWMU) 25 in the 1994 RCRA Part B Permit. This SWMU is comprised of an area measuring approximately 40 feet by 100 feet and is located immediately adjacent to Building 2009. A facility representative reported that this unit was used for hazardous waste storage prior to the use of Buildings 1973 and 2009 for hazardous waste storage. Evidence of a past release was observed during the VSI. Several oil stains, the largest measuring approximately 20 feet in diameter, were observed (A.T. Kearny, Inc., 1988). However, during the 1993 RCRA Facility Assessment (RFA) re-inspection, the area could not be accurately located but may coincide with an area now used for storage of raw material (TRC, 1993). A RCRA Facility Investigation (RFI) was conducted in 1996, which involved the collection and analysis of soil and sediment samples. The RFI of SWMU 25 concluded that there was no evidence of a significant release or potential for a future release from this SWMU, and no unacceptable human health risk was posed by the constituents detected in soil and sediment samples. The constituents detected in the investigation were below applicable industrial Risk-Based Concentrations (RBCs) (Baker, 1996).

2.3 Types of Wastes Stored Onsite

According to the 1994 RCRA Part B Permit, the maximum permitted inventory of hazardous wastes in Buildings 2009B, C, and D was 495 gallons for each building. Buildings 2009B, C, and D were used to store hazardous wastes classified as ignitables (or flammables). No polychlorinated biphenyls (PCBs) or pesticides were stored in Buildings 2009B, C, and D. Hazardous wastes classified as acids, caustics, general toxics, corrosives and reactives were stored in Building 1973. PCBs were stored at a less-than-90-day storage area outside of the DRMO. Pesticides were stored in the pesticide shop and either used at NAPR or returned to the manufacturer.

2.4 Current Conditions

The DRMO discontinued accepting waste as of March 31, 2004. A site visit conducted on May 19, 2004, confirmed that all of the hazardous waste had been removed from Buildings 2009B, C, and D. Certification of the final hazardous waste removal by an independent Professional Engineer (PE) registered in the Commonwealth of Puerto Rico is provided in Appendix A.

During the May 19, 2004, site inspection of Buildings 2009B, C, and D, the buildings were clean and empty with no visual evidence of spills. No petroleum or other flammable material residues were noted on the walls or floors (sumps) and no petroleum odors were detected during a survey of each of the buildings. No evidence of spills or stains on the gravel/soil surface was noted outside of the buildings and in the immediate area surrounding the buildings.

However, the steel walls of the structures are in several stages of deterioration (rust). Rust was noted at several locations inside and outside of the buildings, such that the serviceable life of the buildings is limited. For this reason, these buildings will be decontaminated, demolished and disposed in a construction and demolition debris landfill as part of the closure. The decontamination procedure will not involve the generation of free standing decontamination fluids in the sumps of the buildings because of the potential for migration of the fluids to the soil underlying the buildings. Accordingly, the PE certification in Appendix A does not include a crack survey certification.

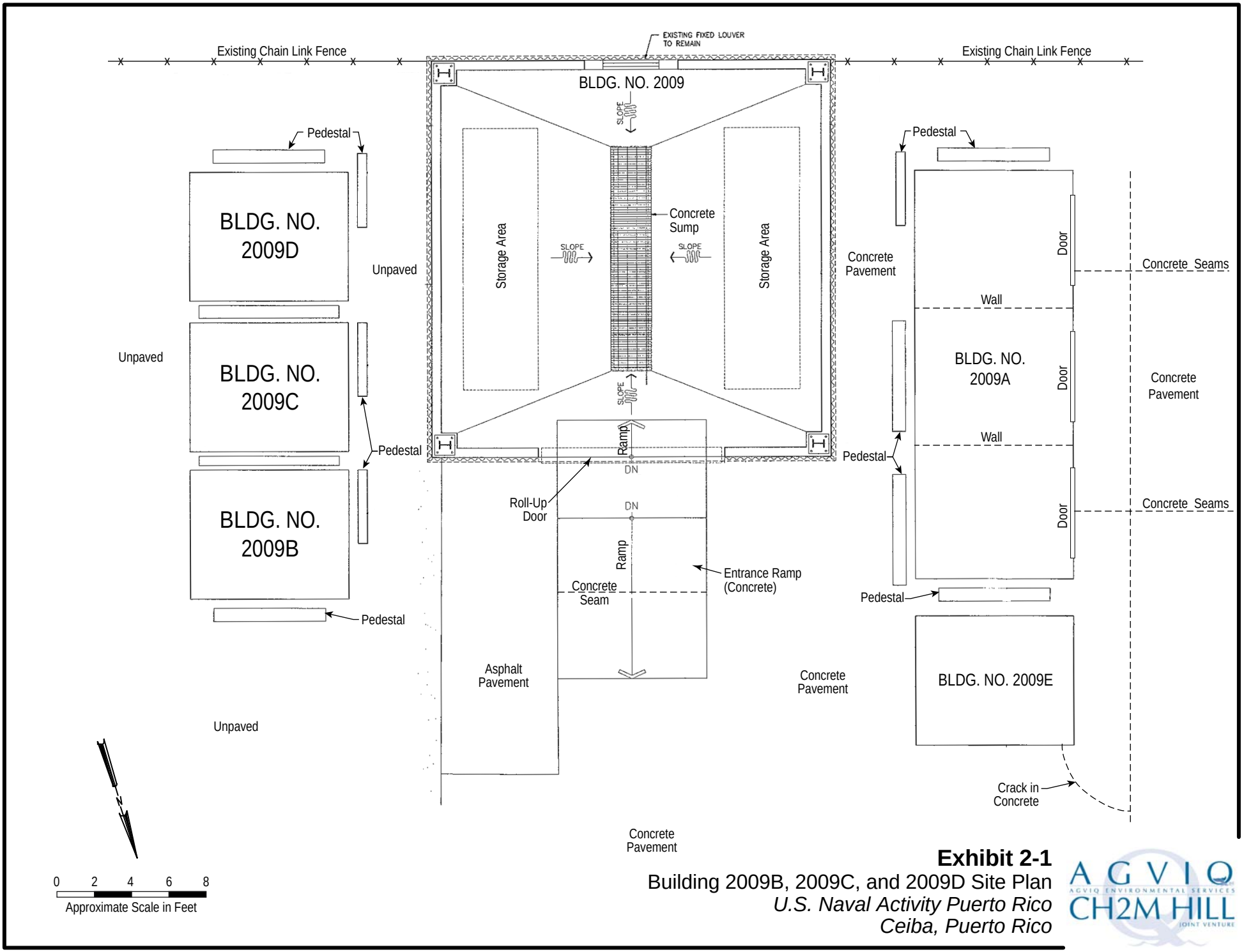

Exhibit 2-1
Building 2009B, 2009C, and 2009D Site Plan
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

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Exhibit 2-2
Photograph of East Side of Buildings 2009B, 2009C, and 2009D
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

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Exhibit 2-3
Photograph of North Side of Buildings 2009B, 2009C, and 2009D
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

AGVIQ ENVIRONMENTAL SERVICES
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Exhibit 2-4
Photograph of West Side of Buildings 2009B, 2009C, and 2009D
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

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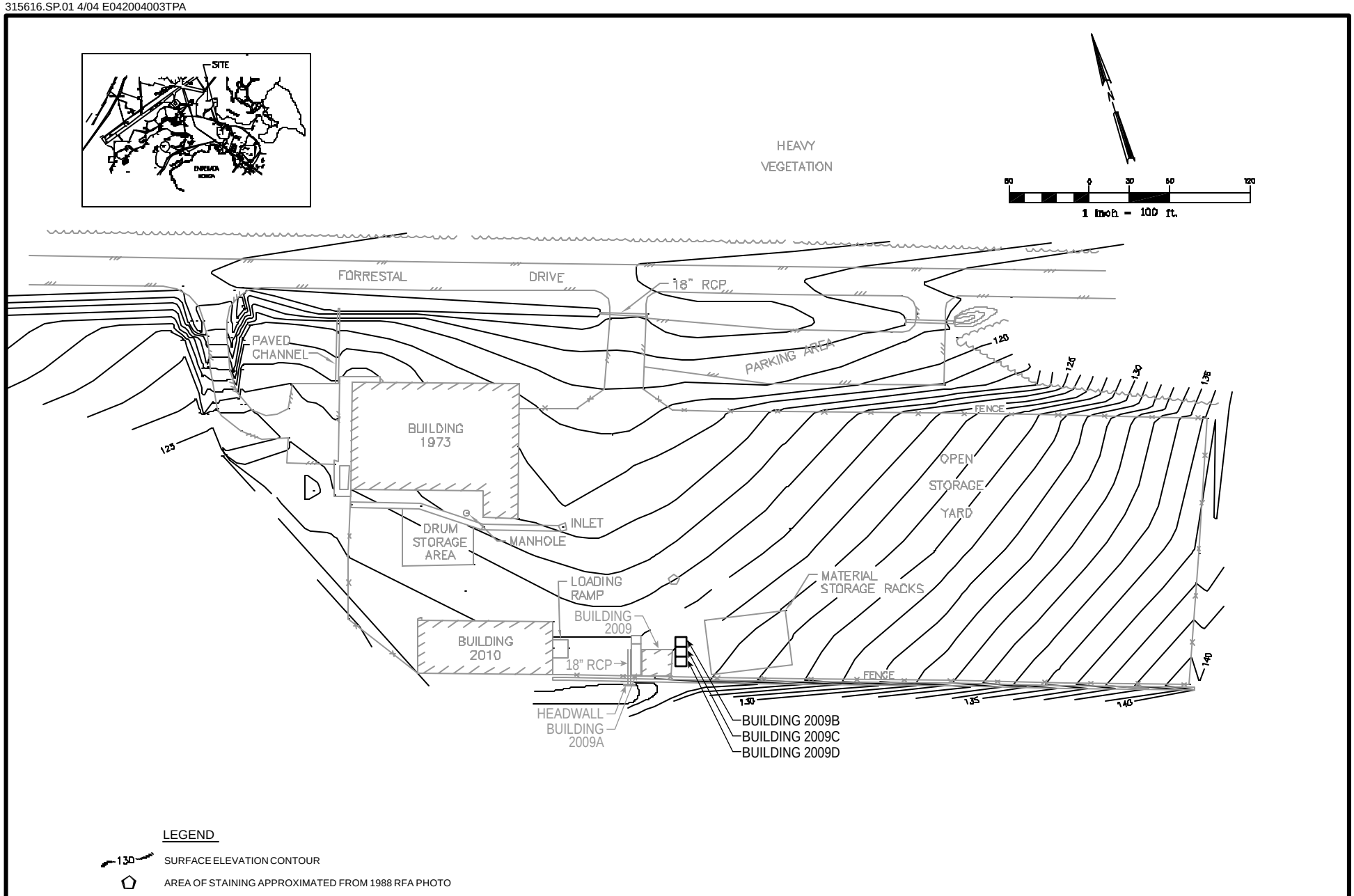
Exhibit 2-5
Photograph of Interior of Building 2009B
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

AGVIQ ENVIRONMENTAL SERVICES
CH2M HILL JOINT VENTURE



LEGEND

130 SURFACE ELEVATION CONTOUR

AREA OF STAINING APPROXIMATED FROM 1988 RFA PHOTO

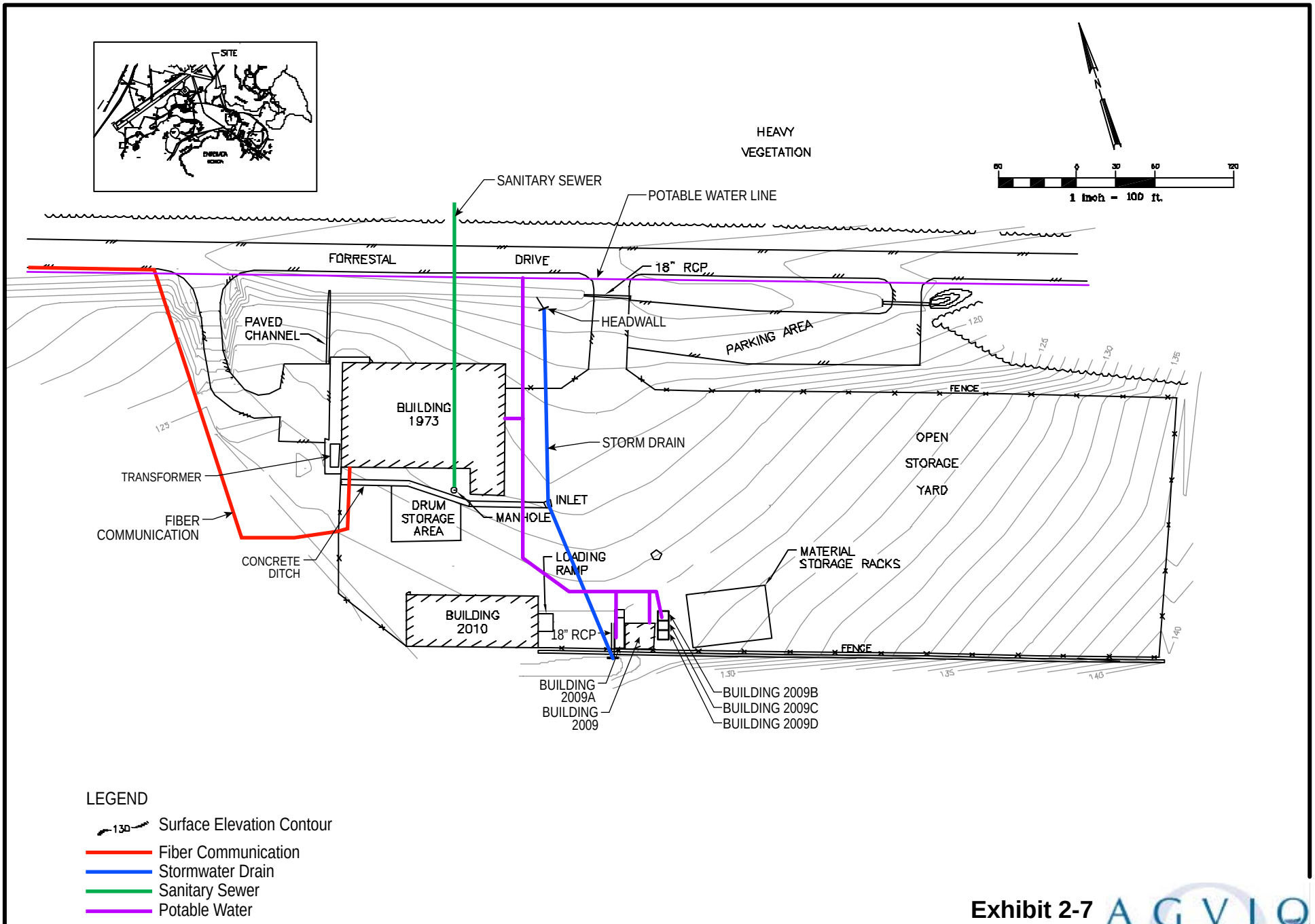
Exhibit 2-6

DRMO Storage Yard Topographic Map

U.S. Naval Activity Puerto Rico

Ceiba, Puerto Rico

Source: Baker Environmental, 1995.



LEGEND

- 130 Surface Elevation Contour
- Fiber Communication
- Stormwater Drain
- Sanitary Sewer
- Potable Water

Exhibit 2-7
DRMO Underground Utilities
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

Source: Baker Environmental, 1995.

SECTION 3

Sampling and Analysis Objectives

DRMO Buildings 2009B, C, and D were used for the storage of only characteristic ignitable hazardous wastes (D001), some contaminated with lead (D008) and silver (D011). The May 19, 2004, inspection of Buildings 2009B, C, and D confirmed that all hazardous waste containers had been removed, and no evidence of significant releases of hazardous waste was observed inside the buildings. The buildings were clean and empty with no visual evidence of spills or leaks. No petroleum or other flammable material residues were noted on the walls or floors (sumps) and no petroleum odors were detected. In addition, the service life of Buildings 2009B, C, and D is limited due to the significant degree of corrosion (rusting) at several locations on the walls and tops of the buildings.

For these reasons, these buildings will be decontaminated by sweeping and wiping the walls and floors of the buildings using sponges, tap water, and a household cleaner (e.g., 409™), demolished, and disposed at a construction and demolition debris landfill as part of the closure of this storage facility. No sampling and analysis will be conducted inside the buildings prior to their demolition because of the apparent lack of contamination inside the buildings, and because the buildings will no longer be used. The building decontamination procedure is described below:

1. Sweep or wipe all interior floor and wall surfaces (from floor to ceiling) to remove debris, dust, and dirt from these surfaces.
2. Wipe the walls and floors using sponges or cotton rags, potable tap water, and a common household cleaning agent (e.g., 409™). The metal grates will be removed, inspected, and also wiped down during this process.
3. All waste materials, including personal protective equipment (PPE), sponges, rags, and wash water will be collected in a 55-gallon drum and disposed as a hazardous waste. The method of disposal for this material (including PPE) will be based on the sampling results for decontamination fluids and investigation-derived waste (IDW) in accordance with the IDW Management Plan provided in Appendix B.

In addition to the demolition and disposal of the buildings, soil sampling will be conducted in the area surrounding and underneath the buildings. The objective of the sampling and analysis will be to determine if the soil near these buildings may have been impacted by possible past releases of hazardous waste outside the buildings. The sampling results will be evaluated relative to the closure criteria presented later in this SAP to determine if clean closure has been achieved. The specific sampling and analysis activities to be performed are presented in Section 4.

3.1 Target Constituent List

To determine the appropriate list of target constituents for the soil sampling and analysis, the 1994 RCRA Part B Permit, manifests (operational records), and Biennial Reports were

reviewed, and interviews with DRMO and NAPR personnel were conducted to develop an inventory of wastes historically received and stored in Buildings 2009B, C, and D. These documents and the information collected during the interviews formed the most complete and accurate database regarding all of the constituents that may have been stored at the DRMO hazardous waste storage buildings. The RCRA Part A application was not used because the hazardous wastes identified in the Part B application were based on a more current and thorough accounting of the types of wastes generated at NAPR that would possibly be stored at the DRMO hazardous waste storage buildings. Exhibit 3-1 presents the listing of the types of hazardous waste stored in Buildings 2009B, C, and D, and the target constituent list based on the waste types. Exhibit 3-1 also presents the laboratory analytical methods and reporting limits for each target constituent.

The closure standards developed for the Target Constituent List relative to the planned soil sampling and analysis are presented in Exhibit 3-2. These standards will be used to determine if the soil sample results support clean closure of the facility. They are based on the expected future industrial use of the property, and appropriate institutional controls (i.e., deed restriction to preclude future residential or similar use of the property) will be implemented.

More specifically, at the time of property sale and/or transfer, a deed restriction will be placed on the property restricting usage of the area until the area is remediated in accordance with RCRA. Any additional remediation will be part of the transferee responsibility as a requirement of the condition of sale and/or transfer of property. The deed restriction will specify that the buyer will need to determine the anticipated usage of the buildings and area in order to determine to which level remediation needs to occur.

The deed restriction will also contain requirements relative to issues and associated recommended corrective measures identified in the final Closure Report. This would include the requirement that any additional corrective measures must be in accordance with applicable laws, regulations, and standards as a requirement of the sale and/or transfer of the property if it is to be used for other than industrial purposes.

3.2 Soil Sampling and Analysis Objectives

To assess potential soil contamination that may have resulted from past possible releases of hazardous wastes in the area surrounding Buildings 2009B, C, and D, eighteen (18) surface soil samples will be collected around and underneath the buildings and analyzed for the target constituents listed in Exhibit 3-1.

To determine background soil concentrations for the site for inorganic constituents, existing background soil sampling data included in the final *Corrective Measures Study Investigation Report for SWMU 9* (Baker Environmental, Inc., April 25, 2003) will be used. This background data includes analytical results for RCRA Appendix IX inorganic parameters for surface soil samples (sampling depth of 0 to 6 inches) collected from five different locations. A duplicate sample was collected from one of the five background sampling locations so there are a total of six background sample concentrations. These sampling locations, which are shown in Exhibit 3-3, are at a sufficient distance away from both SWMU 9 and the DRMO facility to avoid potential impacts from SWMU 9 and the DRMO facility.

In addition, these background sampling locations are representative of background conditions relative to the DRMO facility because they are no more than 2 miles from the DRMO facility, and the soil conditions at the background sampling locations are similar to those at the DRMO facility. The area at NAPR that encompasses both SWMU 9 and the DRMO facility is located within a predominantly volcanic formation that also contains sedimentary beds of limestone. These volcanic rocks and interbedded limestones have been complexly faulted, folded, metamorphosed and variously intruded by dioritic rocks. The primary geologic formations of the area consist of alluvium, quartz, diorite, and granodiorite, quartz keratophyre, the Daguao formation, and the Figuera Lava.

In this area, the natural surface soils generally consist of naturally occurring silts and clays from heavily weathered volcanic rock. They are typically shallow and well-drained. The clay-rich material beneath this zone is saprolite, a thoroughly decomposed rock formed in place by chemical weathering if igneous and metamorphic rocks. Beneath the saprolite zone, igneous rocks are typically encountered.

To establish the background limit for inorganic constituents in soil, the background limit for each constituent will be calculated as follows:

$$\text{Limit} = (M) + (T * D)$$

Where:

M = Mean constituent concentration for the five (5) background samples

T = Student t factor for 2 degrees of freedom and a 95% confidence interval (CI) (2.92 for a single tailed t).

D = Standard deviation of the background concentration data

Exhibit 3-4 presents the sampling results for the Appendix IX inorganic constituents that are also target analytes for Buildings 2009B, C, and D. Also presented are the analytical methods for the constituents, as well as mean concentrations, standard deviations, and calculated background limits.

Clean closure will be achieved when the soil sampling data meets the following criteria:

- Inorganic constituents - Using the Student's t-test with a 95% upper CI, the upper limit of the confidence level for the mean constituent concentration of the sample data must be less than or equal to the background limits (as calculated above).
- Organic constituents - Using the Student's t-test with a 95% upper CI, the upper limit of the confidence level for the mean constituent concentration of the sample data must be less than or equal to the applicable EPA Region 3 RBCs (as listed in Exhibit 3-2).

If these criteria are not met, then additional soil sampling and analysis may be required to determine the extent of the impacted soils. Further, groundwater sampling and analysis may be required to assess potential impacts to groundwater. This SAP does not address possible follow-up sampling because it will depend on the results of the initial sampling activities described herein.

EXHIBIT 3-1
Target Constituent List for Ignitables Stored in Buildings 2009B, 2009C, and 2009D
U.S. Naval Activity Puerto Rico

			Water				Soil s			
Waste Types	**EPA Codes**	**Constituents**	**Analytical Method**	**Units**	**Detection Limit (b)**	**Reporting Limit**	**Analytical Method**	**Units**	**Detection Limit (a)**	**Reporting Limit**
Diesel fuel contaminated with silver, Gasoline, Kerosene, Aviation fuel, Petroleum Distillates, mineral spirits	D001	**PAH**								
		Acenaphthene	SW846 8310	µg/L	0.14	0.2	SW846 8310	µg/kg	2	10
		Acenaphthylene	SW846 8310	µg/L	0.15	0.2	SW846 8310	µg/kg	3.6	10
		Anthracene	SW846 8310	µg/L	0.069	0.2	SW846 8310	µg/kg	2	10
		Benzo(a)anthracene	SW846 8310	µg/L	0.081	0.2	SW846 8310	µg/kg	1.9	10
		Benzo(a)pyrene	SW846 8310	µg/L	0.1	0.2	SW846 8310	µg/kg	2.2	10
		Benzo(b)fluoranthene	SW846 8310	µg/L	0.056	0.2	SW846 8310	µg/kg	1.7	10
		Benzo(g,h,I)perylene	SW846 8310	µg/L	0.11	0.2	SW846 8310	µg/kg	2.5	10
		Benzo(k)fluoranthene	SW846 8310	µg/L	0.1	0.2	SW846 8310	µg/kg	1.7	10
		Chrysene	SW846 8310	µg/L	0.082	0.2	SW846 8310	µg/kg	2	10
		Dibenz(a,h)anthracene	SW846 8310	µg/L	0.083	0.2	SW846 8310	µg/kg	2.1	10
		Fluoranthene	SW846 8310	µg/L	0.11	0.2	SW846 8310	µg/kg	2.5	10
		Fluorene	SW846 8310	µg/L	0.11	0.2	SW846 8310	µg/kg	1.8	10
		Indeno(1,2,3-cd)pyrene	SW846 8310	µg/L	0.081	0.2	SW846 8310	µg/kg	2	10
		Methylnaphthalene, 1	SW846 8310	µg/L	0.16	0.2	SW846 8310	µg/kg	2.5	10
		Methylnaphthalene, 2	SW846 8310	µg/L	0.12	0.2	SW846 8310	µg/kg	2.8	10
		Naphthalene	SW846 8310	µg/L	0.17	0.2	SW846 8310	µg/kg	6.1	10
		Phenanthrene	SW846 8310	µg/L	0.1	0.2	SW846 8310	µg/kg	1.7	10
		Pyrene	SW846 8310	µg/L	0.099	0.2	SW846 8310	µg/kg	2.5	10

EXHIBIT 3-1
Target Constituent List for Ignitables Stored in Buildings 2009B, 2009C, and 2009D
U.S. Naval Activity Puerto Rico

			Water				Soil s			
Waste Types	**EPA Codes**	**Constituents**	**Analytical Method**	**Units**	**Detection Limit (b)**	**Reporting Limit**	**Analytical Method**	**Units**	**Detection Limit (a)**	**Reporting Limit**
Diesel fuel contaminated with silver, Gasoline, Kerosene, Aviation fuel, Petroleum Distillates, mineral spirits		**VOC**								
		Benzene	SW 846 8260B	µg/L	0.18	1	SW 846 8260B	µg/kg	0.4	2
		Dichloroethane, 1,2-	SW 846 8260B	µg/L	0.25	1	SW 846 8260B	µg/kg	0.54	2
		Ethylbenzene	SW 846 8260B	µg/L	0.21	1	SW 846 8260B	µg/kg	0.38	2
		Methyl-t-butyl ether	SW 846 8260B	µg/L	0.26	1	SW 846 8260B	µg/kg	0.47	2
		Toluene	SW 846 8260B	µg/L	0.19	1	SW 846 8260B	µg/kg	0.36	2
		Xylenes, total	SW 846 8260B	µg/L	0.67	2	SW 846 8260B	µg/kg	0.98	4
		Other Organics								
		TRPH	SW 846 8015C (b)	mg/L	0.013/ 0.079 (c)	0.04/ 0.1 (d)	SW 846 8015C (b)	mg/kg	0.012/1.3 (c)	0.04/2 (d)
		Metals								
	D004	Arsenic	SW846 6010B	µg/L	1.8	5	SW846 6010B	mg/kg	0.17	0.5
	D006	Cadmium	SW846 6010B	µg/L	0.356	5	SW846 6010B	mg/kg	0.037	0.5
	D007	Chromium	SW846 6010B	µg/L	1.3	5	SW846 6010B	mg/kg	0.2	0.5
	D008	Lead	SW846 6010B	µg/L	2.2	5	SW846 6010B	mg/kg	0.221	0.5
	D011	Silver	SW846 6010B	µg/L	0.65	5	SW846 6010B	mg/kg	0.0281	0.5

Notes:
(a) Method Detection Limits (MDLs) are laboratory specific and are subject to quarterly updates as per 40CFR136, Part B
(b) Gasoline range and diesel range organics (GRO and DRO)
(c) GRO detection limit/DRO detection limit
(d) GRO reporting limit/DRO reporting limit

EXHIBIT 3-2
Soil Closure Standards For DRMO Buildings 2009B, 2009C, and 2009D
U.S. Naval Activity Puerto Rico

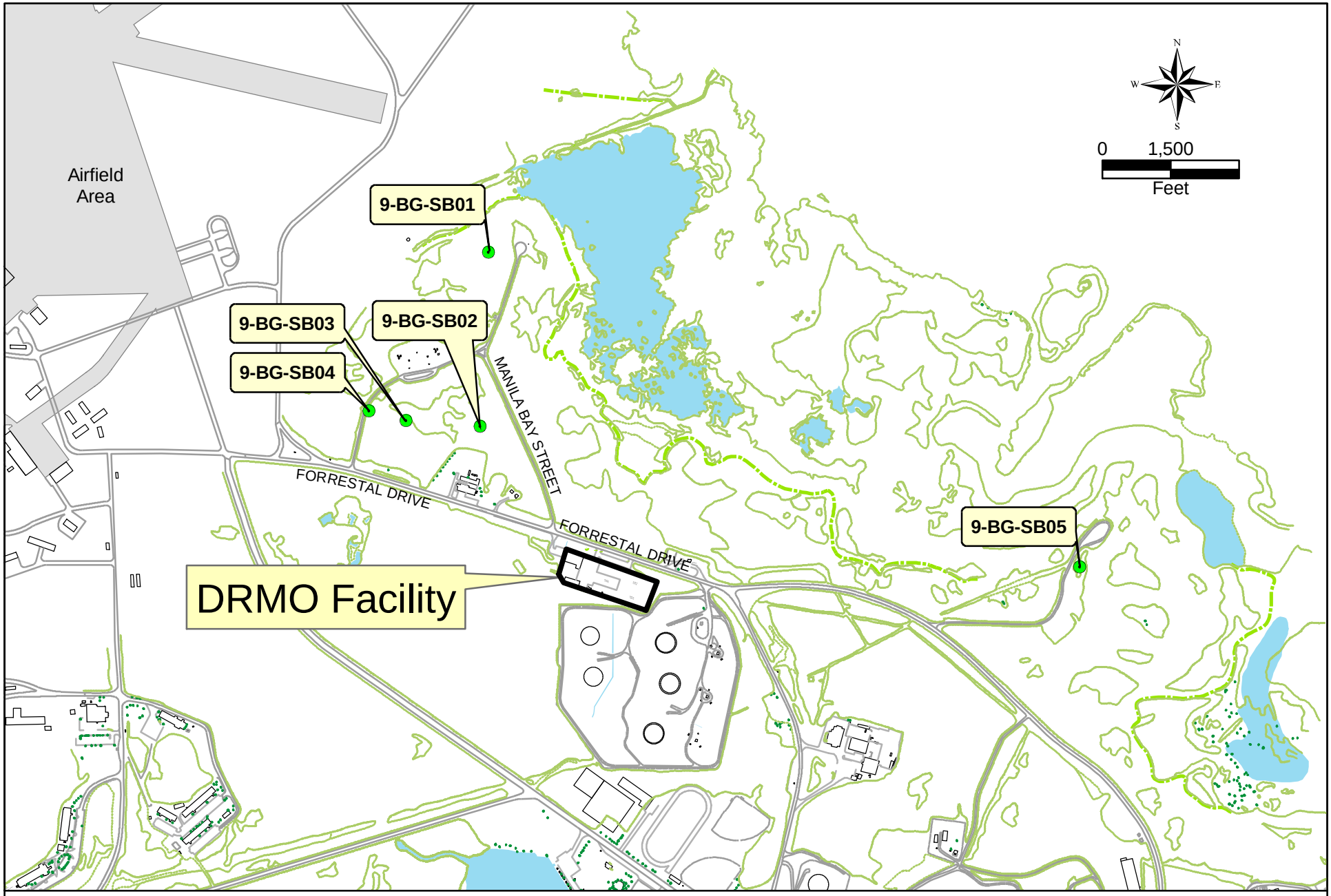
Media to be Sampled	Constituent		Closure Standards
Soil	**Inorganics**		**Background Limit (a)**
	Arsenic		“
	Cadmium		“
	Chromium		“
	Lead		“
	Silver		“
	Organics – PAH	**Units**	**EPA Region 3 RBC (b)**
	Acenaphthene	mg/kg	61,000
	Acenaphthylene	mg/kg	No RBC
	Anthracene	mg/kg	310000
	Benzo(a)anthracene	mg/kg	3.9
	Benzo(a)pyrene	mg/kg	0.39
	Benzo(b)fluoranthene	mg/kg	3.9
	Benzo(g,h,i)perylene		No RBC
	Benzo(k)fluoranthene	mg/kg	39
	Chrysene	mg/kg	390
	Dibenz(a,h)anthracene	mg/kg	0.39
	Dichloroethane, 1,2-	mg/kg	31
	Fluoranthene	mg/kg	41,000
	Fluorene	mg/kg	41,000
	Indeno(1,2,3-cd)pyrene	mg/kg	3.9
	Methylnaphthalene, 1		No RBC
	Methylnaphthalene, 2	mg/kg	4,100
	Methyl-t-butyl ether	mg/kg	720
	Naphthalene	mg/kg	20,000
	Phenanthrene		No RBC
	Pyrene	mg/kg	31,000

EXHIBIT 3-2
Soil Closure Standards For DRMO Buildings 2009B, 2009C, and 2009D
U.S. Naval Activity Puerto Rico

Media to be Sampled	Constituent		Closure Standards
	Organics - Other		
	TRPH		100 (c)
	Organics - VOC		
	Benzene	mg/kg	52
	Dichloroethane, 1,2-	mg/kg	31
	Ethylbenzene	mg/kg	100,000
	Methyl-t-butyl ether	mg/kg	720
	Toluene	mg/kg	200,000
	Xylenes, total	mg/kg	200,000

Notes:
mg/kg = milligrams per kilogram

[a] = Limit = (M) + (T*D)
Where:
M = Mean constituent concentration for background samples
T = Student t factor for 2 degrees of freedom and a 95% confidence interval
D = Standard deviation of background concentration data
[b]RBC values from the April 14, 2004 Region 3 Risk Based Concentrations for industrial soils.
[c] Criterion from *Commonwealth Government of Puerto Rico, Office of the Governor, Environmental Quality Board, Water Quality Area* (November 7, 1990, Amendments 2002)



Legend

- Background Soil Sample Location
- Vegetation
- Trees
- Streams
- Roads
- Fence
- Water
- Airfield Area

Exhibit 3-3
Locations of Previously Collected Background Soil Samples
U.S. Naval Activity
Ceiba, Puerto Rico

TPA \\TAMPA\PROJECTS\ENVIRONMENTAL\167722 ROOSEVELT ROADS\GIS\ROOSEVELT ROADS DRMO SAMPLE SITES.MXD 08/19/2004 JRIVERA1

EXHIBIT 3-4
Background Soil Sampling Concentrations and Calculated Background Limits

Inorganic Constituent	SW-846 Analytical Method	Background Soil Sample Concentrations (mg/kg)						Mean Concentration[a]	Standard Deviation	Calculated Limit[b]
		9BGSS01	9BGSS01D	9BGSS02	9BGSS03	9BGSS04	9BGSS05			
Arsenic	6010B	2.2	0.8	2.5	2.3	2.1	0.21	1.7	0.86	4.2
Cadmium	6010B	0.061U	0.062U	0.92J	0.059U	0.18J	0.061U	0.204	0.325	1.2
Chromium	6010B	9.6	9.5	17	10	27	34	18	9.5	46
Lead	6010B	3.9J	3J	8.3J	3.5J	16J	21J	9.3	6.9	29
Silver	6010B	0.073U	0.074U	0.15U	0.071U	0.067U	0.073U	0.043	0.015	0.085

Notes:
mg/kg = milligrams per kilogram
J = Estimated concentration
U = Undetected. Not detected above method detection limit.
[a] For data sets containing "U" values, mean concentration was calculated using ½ of the reported "U" value.
[b] Limit = (M) + (T*D)
Where:
M = Mean constituent concentration
T = Student t factor for 2 degrees of freedom and 95% confidence interval
D = Standard deviation

SECTION 4

Field Sampling Plan

The field sampling activities described in this section were designed to meet the sampling and analysis objectives presented in Section 3 to support the achievement of clean closure of Buildings 2009B, C, and D. Sampling results will be used to determine whether additional sampling or remedial action is necessary of the soils surrounding Buildings 2009B, C, and D to achieve clean closure.

Specific Standard Operating Procedures (SOPs) to be used in the execution of the field activities are provided in Appendix C. All personnel conducting field work on DRMO property will be trained and have the appropriate level of experience to successfully complete the sampling activities described in this SAP. In addition, they will be trained and certified in health and safety in accordance with Title 29 of the Code of Federal Regulations Part 1910.120. (29 CFR 1910.120), and will comply with the site Health and Safety Plan (provided under separate cover) during the field work activities.

Equipment calibration and maintenance records that are generated during the field work will be documented in field logbooks, retained, and reviewed as part of the project quality records.

4.1 Mobilization/Demobilization

Mobilization activities will include procurement and rental of necessary field equipment, and initial transport of equipment and supplies to the site. Equipment and supplies will be shipped to the site prior to mobilization of the field team to NAPR. Mr. Manuel Vargas of the Puerto Rico Environmental Quality Board will be notified at least 5 business days prior to sampling activities to provide field oversight (phone number: (787) 767-8181 ext. 2849).

Coolers containing sample containers and sampling equipment (stainless steel augers, OVMs, and personnel protective equipment and supplies) will be stored in one of the offices within Building 1973. The office will be kept clean and access to this room will be controlled to prevent contamination of the equipment and supplies.

Demobilization activities will include time for sampling of fluids generated during the decontamination of Buildings 2009B, C, and D and sampling equipment as investigation-derived waste (IDW). Demobilization will also include general site restoration of sampled areas during the field investigation. Decontamination fluids and IDW generated during field activities will be properly labeled and transported offsite to appropriate permitted waste management facilities within 90 days of being generated in accordance with the IDW Management Plan provided in Appendix B.

4.2 Decontamination of Personnel and Equipment

During the field investigation activities, personnel and sampling equipment will be decontaminated in accordance with the *Decontamination of Personnel and Equipment* SOP contained in Appendix C.

Prior to and between successive sample collection activities, the stainless steel hand auger used in the collection of soil samples will be decontaminated as described in Section IV.C of the above-referenced SOP. The sampling probe for the OVM to be used in screening soil samples will be decontaminated as described in Section IV.D of the above-referenced SOP.

4.3 Utility Clearance

Utility clearance will be coordinated with the NAPR Public Works Department prior to initiating any intrusive work (soil sampling). No underground utilities should be impacted since only shallow soil samples (0 to 6 inches) will be collected outside of and underneath Buildings 2009B, C, and D. No known utilities are located in the vicinity of the proposed soil sampling locations. The underground utilities at the DRMO storage yard were shown in Exhibit 2-6.

4.4 Interior Cleaning

The NAPR potable water supply will be used for wiping down the interior of the buildings. This is considered a controlled water source and, therefore, no sampling or analysis will be required prior to starting decontamination activities.

Because the interiors of Buildings 2009B, C, and D are considered clean, the walls, floors, and metal grate surfaces will be wiped down using sponges or cotton rags, tap water, and a common household cleaning agent such as 409 ™. All personnel involved in the wipe-down procedure will wear proper PPE to guard against back-splash, spray, and unsecured footing on slippery surfaces. The goal is to thoroughly clean all surfaces.

Used PPE, sponges, cotton rags, and any fluids generated during the cleaning of the buildings will be collected and containerized in a labeled 55-gallon drum. The method of disposal for this material (including PPE) will be based on the sampling results for decontamination fluids and investigation-derived waste (IDW) in accordance with the IDW Management Plan provided in Appendix B.

4.5 Soil Samples

Eighteen (18) surface soil samples will be collected from the unpaved areas surrounding and underneath Buildings 2009B, C, and D. Each of the surface soil samples will be collected from 0 to 6 inches below ground surface. The soil samples will be collected with a hand auger. The required containers and holding times for the soil samples collected are listed in Exhibit 4-1. The eighteen surface soil sampling locations are shown in Exhibit 4-2. An OVM will be used to screen all soil samples for volatile organic vapors prior to shipping the samples to the laboratory for analysis. The intent of the OVM screening is only to provide a preliminary indication of the degree of potential VOC contamination of the samples. If an

elevated OVM reading is noted, the laboratory will be alerted prior to analysis. No onsite laboratory will be required for this project.

Instruments used during sample collection will be calibrated before being sent to the field and field calibration results will be documented in the field logbook. Where available, calibration materials will be traceable to relevant, recognized performance standards.

Exhibit 4-3 presents a summary of all samples (including quality control [QC] samples discussed in Section 5) that will be collected as part of the closure activities.

4.6 Sample Designation

Sampling locations and samples collected during the investigation will be assigned unique designations to allow the sampling information and analytical data to be entered into the existing Geographic Information System (GIS) Data Management system for NAPR. The existing designation scheme for NAPR will be followed by field personnel. The following sections describe the sample designation specifications.

4.6.1 Specifications for Field Location Data

Field station data is information assigned to a physical location in the field at which some type of sample is collected. For example, each soil location will require a name that will uniquely identify it with respect to other soil locations, or other types of sampling locations. The station name provides for a key in the database to which any samples collected from that location can be linked, to form a relational database.

A listing of the location identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all field activities. Each station will be designated by an alphanumeric code that will identify the station's location by facility, site type, site number, station type, and sequential station number. Exhibit 4-4 documents the scheme that will be used to identify field station data.

4.6.2 Specifications for Analytical Data

Analytical data will be generated through sampling of various media at DRMO. Each analytical sample collected will be assigned a unique sample identifier. The scheme used as a guide for labeling analytical samples in the field is documented below. The format that will be used for electronic deliverables from the analytical laboratory and the data validator is documented below.

4.6.3 Sample Identification Scheme

A standardized numbering system will be used to identify all samples collected during soil sampling activities. The numbering system will provide a tracking procedure to ensure accurate data retrieval of all samples taken. A listing of the sample identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all sampling activities. Sample identification for all samples collected during the investigations will use the following format.

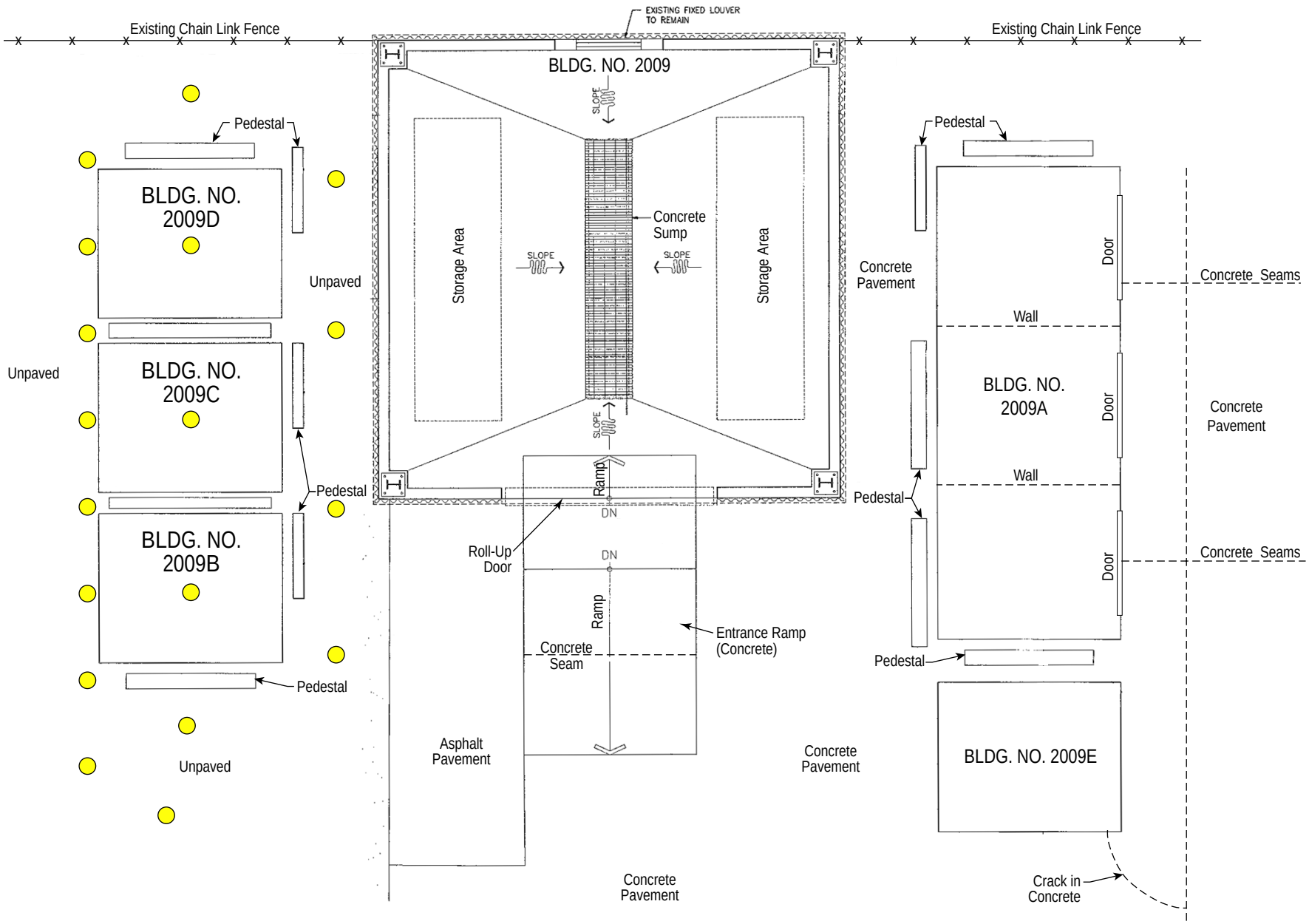
Each sample will be designated by an alphanumeric code that will identify the facility, site, matrix sampled, and contain a sequential sample number. QA/QC samples will have a

unique sample designation. Exhibit 4-4 documents the general guide for sample identification. If one qualifier is pertinent to the sample ID but another is not, only the Exhibit 4-5 applicable qualifiers will be used. A non-utilized character space does not have to be maintained.

EXHIBIT 4-1
Required Containers, Preservatives, and Holding Times for Soil and Water Samples

Analysis	Matrix	Method	Container	Preservation	Maximum Hold Time
VOC[a]	Soil	SW846, 8260B, 5035	3 each 5-g En Core™ sampler, or equivalent	4°C	48 hours to preservation and 14 days from preservation to analysis
PAH[b]	Soil	SW846, 8310	8-oz. Glass jar [1]	4°C	7 days to extraction and 40 days from extraction to analysis
TRPH	Soil	SW846, 8015C (GRO)	2-oz. Glass jar [1]	4°C	14 days
		SW846, 8015C (DRO)	4-oz. Glass jar [1]	4°C	14 days
Metals[c]	Soil	SW846, 6010B	4-oz. Glass jar [1]	4°C	6 months
TCLP (full list)	Soil (IDW)	SW846 1311/8260B, SW846 1311/8270C, SW846 1311/8081A, SW846 1311/8151A, SW846 1311/6010B, SW846 1311/7471A, SW846 9012A (Cyanide) SW846 9030 (Sulfide) SW846 9045 (Corrosivity) SW846 1010 (Ignitability)	4x8 oz Glass Jars	4ºC	14 days to TCLP extractions; 14 days for metals and VOC analyses; SVOCs – 7 days to extraction and 40 days from extraction to analysis
VOC	Water	SW846, 8260B	3x40 ml vials [1] – no headspace	HCl to pH<2, 4°C	14 days preserved, 7 days unpreserved
PAH	Water	SW846 8310	2 X 1 Liter Amber, Glass[1]	4°C	7 days to extraction and 40 days from extraction to analysis
TRPH	Water	SW846, 8015C (GRO)	3x40 ml vials [1] – no headspace	HCl to pH<2, 4°C	14 days
		SW846, 8015C (DRO)	1Liter amber glass [1]	4°C	14 days
Metals	Water	SW846, 6010B	1000 ml plastic or glass[1]	HNO_3 to pH<2, 4°C	6 months

1) Use Teflon-lined caps.
[a] Benzene; 1,2- dichloroethane; ethylbenzene; methyl-t-butyl ether; toluene; xylenes (total)
[b] Acenaphthene; acenaphthylene; anthracene; benzo(a)anthracene; benzo(a) pyrene; benzo(b)fluoranthene; benzo(g,h,I)perylene; benzo(k)fluoranthene; chrysene; dibenz(a,h)anthracene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 1-methylnaphthalene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene
[c] Arsenic, cadmium, chromium, lead, silver



LEGEND

● Soil Sample

Exhibit 4-2

Buildings 2009B, 2009C, and 2009D Soil Sample Locations

U.S. Naval Activity Puerto Rico

Ceiba, Puerto Rico

AGVIQ ENVIRONMENTAL SERVICES
CH2M HILL JOINT VENTURE

EXHIBIT 4-3
Analytical Sample Summary for RCRA Closure of Buildings 2009B, 2009C, and 2009D

Media	Analysis	Method	Interior Buildings 2009B, C, and D	Exterior Buildings 2009B, C, and D	Field QC	Total Number of Samples
Decontamination fluids	VOC[a]	SW846, 8260B	1	--	5	6
	PAH[b]	SW846, 8310	1	--	4	5
	TRPH	SW846, 8015C (GRO, DRO)	1	--	4	5
	Metals[c]	SW846, 6010B	1	--	4	5
Surface Soil	VOC	SW846, 8260B	--	18	7	25
	PAH	SW846, 8310	--	18	5	23
	TRPH	SW846, 8015C (GRO, DRO)	--	18	5	23
	Metals	SW846, 6010B	--	18	5	23
IDW Soil	TCLP (full list)	SW846 1311/8260B, SW846 1311/8270C, SW846 1311/8081A, SW846 1311/8151A, SW846 1311/6010B, SW846 1311/7471A, SW846 9012A (Cyanide) SW846 9030 (Sulfide) SW846 9045 (Corrosivity) SW846 1010 (Ignitability)	1	--	1	2

[a] Benzene; 1,2- dichloroethane; ethylbenzene; methyl-t-butyl ether; toluene; xylenes (total)
[b] Acenaphthene; acenaphthylene; anthracene; benzo(a)anthracene; benzo(a) pyrene; benzo(b)fluoranthene; benzo(g,h,I)perylene; benzo(k)fluoranthene; chrysene; dibenz(a,h)anthracene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 1-methylnaphthalene; 2- methylnaphthalene; naphthalene; phenanthrene; pyrene
[c] Arsenic, cadmium, chromium, lead, silver

EXHIBIT 4-4
Field Station Scheme

First Segment	Second Segment	
Facility, Station Type, Site Number	**Station Type**	**Station Number, Qualifier**
AAANNN	**AA**	**NNNA**
Facility: NR = NAPR Station Type: S = Site Site Number: 2009B = Building 2009B	Station Type: SS = Surface Soil Sample Location Station Number: Sequential Station Number Qualifier: S = Shallow B = Background	

Notes:
"A" = alphabetic
"N" = numeric

EXHIBIT 4-5
Sample Designation Scheme

First Segment	Second Segment		Third Segment
Facility, Station, and Site Number	**Sample Type**	**Sample Location + Sample Qualifier**	**Additional Qualifiers (sample depth, sampling round, etc.)**
AAANN	**AA**	**NNNA or NNAA**	**ANN or NNNN**
Facility: NR = NAPR Station Type: S = Site Site Number: 2009B = Building 2009B	Sample Type: SS = Surface Soil TB = Trip Blank EB = Equipment Blank FB = Field Blank FD = Field Duplicate	Sample Location: 1. Station Samples (NNA) **NN**A - refers to sequential station number NN**A** - letter qualifier for Composite sample (if applicable). 2. QC Samples (NNN) **N**NN - numbered sequentially for each type of blank (i.e., 1, 2, etc.) collected for that day's sampling N**NN** - refers to month of sampling event Sample Qualifiers: P = duplicate sample K = background sample	Additional Qualifiers: 1. QC Samples NNNN - refers to day and year of sampling event

Notes:
"A" = alphabetic
"N" = numeric

4.6.4 Surveying

Sampling locations will be horizontally located using a global positioning system (GPS) and standard surveying techniques following field activities. All survey data will be tied to a coordinate system compatible with local Puerto Rican requirements.

4.6.5 Labeling

To avoid any misidentification, all sample containers will be labeled immediately prior to the sample being collected. Preprinted labels with spaces for the required information will be available and used to label each container. The information to be provided on the label may be found in the SOP included in Appendix C.

4.6.6 Packaging and Shipping

Samples will be packaged and shipped in accordance with the SOP in Appendix C as follows:

- Sample lids will be properly tightened and checked.
- If samples have not been bagged in the field, sample bottles will be placed in separate Ziplock-type bags and sealed. Bottles will be placed in a cooler with sufficient space between the bottles for bubble wrap. Ziplock-type bags filled with ice (three or four per cooler) will be placed in between and on top of the samples.
- The completed chain-of-custody form will be placed in a plastic Ziplock-type bag and taped to the inside lid of the cooler. The cooler will be securely taped shut with strapping tape. Signed custody seals will be placed on the front and back hinges of the cooler.
- Coolers will be shipped via Federal Express for next day delivery to the designated laboratory.

4.6.7 Custody Control

Custody seals will be affixed to all sample coolers after sample collection. Custody seals will be taped to the front and back cooler lid to secure the samples in the cooler. A chain-of-custody record will be included in each cooler before shipping the samples to the analytical laboratory.

SECTION 5

Data Quality Objectives

5.1 Data Quality Objectives (DQOs)

DQOs are the qualitative and quantitative statements which specify the quality of the data required to support the decision-making process during the project activities. The credibility of the data is strengthened by the level of the supporting QA/QC documentation. The greater the importance of the data or the resulting decision, the more QA/QC information that is needed to demonstrate the validity of the data. This reasoning must be applied to the data collected for any project.

Data must be of sufficient quality to support decisions to eliminate sites or individual matrices (for example, soil) from further investigation if contamination is either not present or will not adversely affect human health and the environment, or to justify additional investigation or remediation activities.

The intended use of the data to be collected through the implementation of this SAP will be to determine the following:

- The proper disposal method for decontamination fluids and IDW generated during decontamination of the hazardous waste storage areas and sampling activities, through the sampling and analysis of decontamination fluids and IDW
- If possible past releases of hazardous waste have resulted in soil contamination, through sampling and analysis of soil samples

The overall objective of the data quality is to determine if the closure standards for soil samples presented in this SAP have been met, whereby the permitted hazardous waste storage area can be deemed closed requiring no further regulatory action. To achieve this DQO, Level IV quality control (QC) procedures will be implemented. This includes appropriate QC procedures relative to sample collection, preservation, sample shipment, and laboratory analysis, combined with an evaluation of analytical performance through analysis of QC samples.

5.2 QA/QC Procedures

5.2.1 Field QA/QC Procedures

During field sampling activities, appropriate QA/QC will be achieved by strictly following the requirements described in this SAP, including the SOPs provided in Appendix B. In addition, quality control duplicate samples and blank samples will be collected and analyzed to provide a measure of the internal consistency of the samples and to provide an estimate of the components of variance and the bias in the analytical process. Quality control samples will be collected for all media sampled as part of the DRMO closure

activities. Details regarding the collection of QC blank and duplicate samples are provided in the following subsections.

5.2.1.1 Blanks

Blanks provide a measure of cross-contamination sources, decontamination efficiency, and other potential errors that can be introduced from sources other than the sample. ASTM Type II water will be used for blanks. Four types of blanks will be used or collected during the sampling activities: trip blanks, field blanks, equipment rinseate blanks, and temperature blanks.

One trip blank will be included in each cooler used for the daily shipment of VOC samples. If more than one cooler is being sent on a given day, all of the VOC samples will be placed in one cooler, if possible, to minimize the number of trip blanks needed. The trip blanks will be prepared before each sampling event, shipped or transported to the field with the sampling bottles, and returned unopened for analysis. Trip blanks will indicate if there is contamination during shipment to the field, from storage in the field, or from shipment from the field to the analytical laboratory.

One field blank (ambient blank) will be collected per sampling event. If sampling events extend beyond 1 week (5 working days) or for windy and dusty field conditions, the number of field blanks will be increased. Field blanks are used to determine the chemical quality of water used for such procedures as decontamination and blank collection.

One equipment blank per sample medium will be obtained every other day of sampling. Equipment blanks will give an indication of the efficiency of decontamination procedures of the tools and instruments used in the field.

A temperature blank will be included in each cooler containing samples for analyses so that the laboratory can record the temperature without disturbing the samples. The temperature blank will be labeled, but will not be given a sample number nor will it be listed as a sample on the chain of custody (COC) form.

5.2.1.2 Duplicates

Field duplicate samples will be collected at a frequency of one field duplicate per 10 field samples per matrix. The locations from which the duplicates are taken will be selected randomly. Each duplicate sample will be split evenly into two sample containers and submitted for analysis as two independent samples.

5.2.1.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of one MS/MSD for every 20 field samples collected. Analytical results of these samples indicate the impact of the matrix (water, concrete, soil) on extracting the analyte for analysis. MS/MSD samples give an indication of the laboratory's analytical accuracy and precision within the sample matrix. Data validators will use these results to evaluate the accuracy of the analytical data.

5.2.2 Laboratory QA/QC Procedures

All analyses of decontamination fluids and soil samples will be conducted at a contracted laboratory that fulfills all requirements of the U.S. Navy's QA/QC Program Manual and SW 846. All laboratory analyses will be performed by a laboratory approved by Naval Facilities Engineering Support Center (NFESC). A qualified laboratory will be selected after the SAP is approved, and the procurement of the contractor to implement the SAP is completed.

The laboratory will follow the scope of work prepared by the project team. A signed certificate of analysis will be provided with each laboratory data package, along with a certificate of compliance certifying that all work was performed in accordance with the Scope of Work (SOW). Analyses will include the proper ratio of field QC samples recommended by NFESC guidance for the DQOs (NFESC, 1999), as described in Section 5.1.1.

Sample containers and coolers will be supplied by a laboratory that meets EPA Region 2 QA/QC procedures and guidelines. The laboratory will supply clean first-quality sample containers. Custody seals will also be used on each cooler and sample container to prevent tampering prior to sample collection. All tests will be performed within EPA recommended extraction and analysis times. All extracts will be preserved in glass containers with Teflon®-lined septa and stored at 4°C. The laboratory will be required to retain the sample for a minimum of 90 days and sample extracts for a minimum of 60 days after submission, pending the need for re-analysis.

JV I will be responsible for tracking sample analysis and obtaining results from the laboratory. One hundred percent of the analytical data generated during the DRMO Building 2009B, C, and D closure investigation field program will be validated by an independent third party data validation subcontractor according to EPA's *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (1999) and EPA's *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (2002).

5.3 Quality Control Acceptance Criteria

This section presents the QC acceptance criteria that must be met to ensure the analytical data meet the DQO for the project. The analytical data collected through the implementation of this SAP will be evaluated in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC). Each of these terms is described in the sections that follow. The QC acceptance criteria to satisfy the DQO for this project relative to the degree of PARCC of the project analytical data are presented in Exhibit 5-1. Laboratory specific limits will be generated after a laboratory has been contracted. The quality objectives for the field parameter (OVM) are included in SOPs in Appendix C.

EXHIBIT 5-1
QC Acceptance Criteria – Precision, Accuracy, Representativeness, Completeness, and Comparability

Parameter	Precision[1] (Relative Percent Difference)	Accuracy[1] (Percent Spike Recovery)	Analytical Method	Intended Data Use
Decontamination Fluids				
Organic Compounds	≤ 20	50 – 150	SW-846 Methods 8260B, 8310, and 8015C	Determine disposal options.
Metals	≤ 20	75-125	SW-846 Methods 6010B	Determine disposal options.
Soil				
Organics	≤ 35	50 – 150	SW-846 Methods 8260B, 8310, and 8015C	Assess compliance with closure standards.
Metals	≤ 35	75-125	SW-846 Method 6010B	Assess compliance with closure standards.

[1]Target QC limits until laboratory specific limits are generated.

5.3.1 Precision

Precision is the measure of the agreement or repeatability of a set of duplicate results obtained from repeat determinations made under the same conditions. The precision of a duplicate determination can be expressed as the relative percent difference (RPD), which is determined by the following equation:

$$RPD = \frac{|X1 - X2|}{X1 + X2} \times 200$$

where: X1 = first duplicate value
X2 = second duplicate value

For a given laboratory analysis, the duplicate RPD values are tabulated, and the mean and standard deviations of the RPD are calculated. Control limits for precision usually are plus or minus two standard deviations from the mean.

5.3.2 Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter. Analytical accuracy can be determined by using known reference materials or matrix spikes (MS). Spiking of reference materials into the actual sample matrix is the preferred technique because it quantifies the effects of the matrix on the analytical accuracy.

$$\%R = \frac{SSR - SR}{SA} \times 100$$

Accuracy can be expressed as percent recovery (%R) determined by the following equation:
where: SSR = spiked sample result

SR = sample result (native)
SA = spike added

Accuracy and precision will be monitored by using field duplicate, MS, and matrix spike duplicate (MSD) samples. These data alone cannot be used to evaluate the accuracy and precision of individual samples, but will be used to assess the long-term accuracy and precision of the analytical method.

5.3.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent parameter variations at a sampling point. Representativeness is a measure of how closely the measured results reflect the actual distribution and concentration of certain chemical compounds in the medium sampled. This SAP and the SOPs describe the procedures to be used for collecting samples. This process will generate samples that are as representative as possible. Documentation of laboratory and field procedures will be used to verify that protocols have been followed and that sample identification and integrity have been maintained.

5.3.4 Completeness

Completeness is defined as the percentage of analytical measurements that are judged to be valid, validity being defined by the QC acceptance criteria. Percent completeness is calculated as the number of analyses meeting all quality criteria divided by the total number of analyses performed, multiplied by 100. The completeness goal for the project is 85 percent.

5.3.5 Comparability

Comparability is the term that describes the confidence with which one data set can be compared to another. Comparability refers to such issues as using standard field and analytical techniques, following the same QA/QC procedures, and reporting data in the same units. This criterion becomes important if more than one field team is collecting samples or more than one laboratory is analyzing samples. Consistency in sampling and laboratory procedures will be maintained throughout the project. In addition, accepted methodologies will be used for sample analysis, and these methods will not be changed during the project.

5.4 Electronic Deliverable File Format

An offsite laboratory will analyze the closure samples for Buildings 2009B, C, and D and tabulate the results in an electronic format specified by the Closure Project Team. The data validator will add data validation qualifiers to the table of analytical results. In addition to the hard copy data package deliverable, the Project Team will receive an electronic file from the data validator in a table format that will facilitate downloading into a database. Exhibit 5-2 tabulates the format that will be used for electronic deliverables.

EXHIBIT 5-2
Analytical Data Electronic Deliverable

Analytical data must be delivered in a format compatible with Microsoft Access 2.0 or 7.0

Field Name	Field Type	Description
Sampled	A20	The JV I sample ID (taken from the Chain of Custody)
Sample_Analysis	A5	The analysis performed on the sample. Samples are classified into three main groups: VOC, PAH, and INORG.
Date_Analyzed	D	The date the sample was analyzed.
Date_Received	D	The date the sample was received in the lab.
Date_Collected	D	The date the sample was collected.
Lab_Sample_ID	A15	The lab sample ID.
Dilution_Factor	N	The dilution factor used, if applicable.
SDG_Number	A6	The Sample Delivery Group (SDG) number.
CAS_Number	A6-A2-A1	CAS Number of the compound being analyzed (Note that the CAS number must consist of three number segments of defined length, separated by dashes).
Chem_Name	A50	The compound being analyzed.
Ana_Value	N	The analytical result.
Std_Qual	A5	The lab qualifiers, if any (e.g., U, UJ, B)
DV_Qual	A5	The data validation qualifier (e.g., J, R)
Units	A10	The unit of the result (e.g., MG/L)
Detect_Limit	N	The detection limit for the compound.
Method	A15	Analytical method used to analyze the sample fraction.

SECTION 6

Data Validation and Reporting

6.1 Data Validation

Analytical results will be validated by Navy-approved contractors, who will use EPA Region 2 guidance (EPA's Contract Laboratory Program National Functional Guidelines for Organic Data Review (1999) and EPA's Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (2002)).

The hardcopy data packages will be reviewed by the contractor chemists using the process outlined in EPA's *Functional Guidelines for Data Review (EPA, 1999; EPA, 2002)*. Areas of review include (when applicable to the method) holding time compliance, calibration verification, blank results, matrix spike precision and accuracy, method accuracy as demonstrated by laboratory confirmation samples (LCSs), field duplicate results, surrogate recoveries, internal standard performance, and interference checks. A third party Data Validation Contractor will append a completed EPA Region II data validation workbook to each data package and include the marked up Form I's. This data review and validation process is independent of the laboratory's checks and focuses on the usability of the data to support the project data interpretation and decision-making processes. One hundred percent of the raw data will be provided for validation of the data to a QA Level IV.

Data that are not within the acceptance limits will be appended with a qualifying flag, which consists of a single or double-letter abbreviation that reflects a problem with the data. The following flags will be used in the evaluation:

U - Undetected. Analyte was analyzed for but not detected above the method detection limit (MDL).

UJ - Detection limit estimated. Analyte was analyzed for, and qualified as not detected. The result is estimated.

J - Estimated. The analyte was present, but the reported value may not be accurate or precise.

R - Rejected. The data are unusable. (NOTE: Analyte/compound may or may not be present.)

Numerical sample results that are greater than the MDL but less than the laboratory reporting limit (RL) are qualified with a "J" for estimated as required by EPA's *Functional Guidelines* (EPA, 1999; EPA, 2002).

6.2 Data Quality Evaluation

Analytical data will be collected during this investigation in the form of laboratory analytical results and the database will be populated with data validation qualifier results.

The data quality evaluation (DQE) is the quantitative and qualitative evaluation of overall trends in the project-specific database. The objective of the DQE process is to understand the effects of the overall analytical process on data usability to support project-specific DQOs. The DQE includes an analysis of the effect of the specific sample matrix on the overall analytical process.

The DQE deliverable is a DQE technical memorandum (TM) that will be used by the project team to readily understand project-specific data usability. Topics to be addressed in the DQE TM include the following:

- *Potential blank contamination*—the effect on the usability of data for compounds detected in both the field or laboratory blank samples and the corresponding field samples
- *Laboratory performance*—evaluation of the recovery for blank spike samples such as the LCS, calibration criteria, etc.
- *Potential matrix interferences*—evaluation of the accuracy and precision for surrogates, spiked field samples, and duplicate field sample results
- *Assessment of PARCCs*—comparison of data validation (DV) findings with PARCCs (precision, accuracy, representativeness, comparability, and completeness)

This task also includes the evaluation of validated laboratory data. The data evaluation will include incorporation of historical data from the previous investigations, tabulation of the data, and generation of figures and/or tables associated with data (e.g., sampling location maps).

The Data Validation Contractor will submit both an electronic and hardcopy data deliverable to include all data validation qualifiers, and these deliverables will be made part of the overall project file.

SECTION 7

Project Organization

The Navy Technical Representative (NTR) for the closure of DRMO Buildings 2009B, C, and D is Mr. Roberto Pagtalunan. Mr. Pagtalunan is the FACLANT representative and provides technical direction on the project and coordinates funding and overall interaction with other agencies and interested parties. Mr. Pagtalunan can be contacted at the address and phone number listed below.

Mr. Juan Roa is the Public Works Department contact for NAPR. Mr. Roa is responsible for the coordination of DRMO closure activities at NAPR. Mr. Roa can be contacted at the address and phone number listed below.

Mr. Roberto Pagtalunan
Navy Technical Representative
FACLANT Code EV13
Naval Facilities Engineering Command
6506 Hampton Blvd.
Norfolk, VA 23508-1278
Attn: Code EV13RP (Mr. Roberto Pagtalunan)
(757) 322-4741

Mr. Juan Roa
U.S. Naval Activity Puerto Rico
Environmental Engineering Division
Public Works Dept. Bldg. 31
Ceiba, Puerto Rico 00735
(787) 865-4152, x467

The JV I Project Manager designated for the management and technical direction of this sampling and analysis project is Mr. Russell Bowen. Mr. Bowen will be responsible for such activities as technical support and oversight, budget and schedule review and tracking, preparation and review of invoices, personnel resources planning and allocation, and coordination with FACLANT, NAPR, and subcontractors. An organization chart is shown in Exhibit 7-1.

The RCRA closure sampling for Buildings 2009B, C, and D will be performed by qualified JV I staff members. JV I will notify FACLANT and NAPR which JV I personnel will mobilize to the site prior to initiating field activities.

Anticipated subcontract services required for the completion of tasks documented in this SAP include analytical laboratory services and data validation.

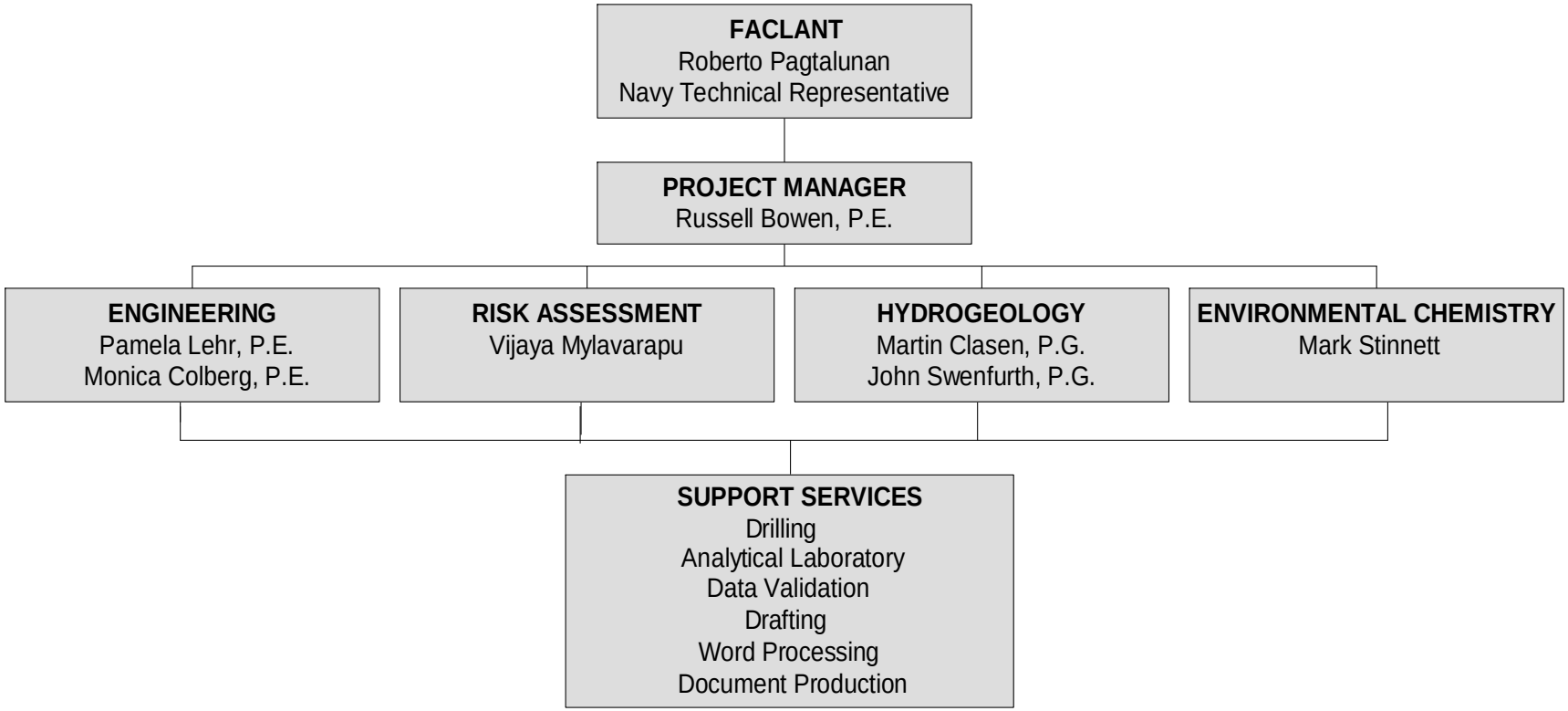


Exhibit 7-1
Organization Chart
U.S. Naval Activity Puerto Rico
Ceiba, Puerto Rico

AGVIQ ENVIRONMENTAL SERVICES
CH2M HILL JOINT VENTURE

SECTION 8

References

A. T. Kearny, Inc. *Phase II RCRA Facility Assessment of NSRR, Puerto Rico*. 1988.

Baker Environmental, Inc. *Draft RCRA Facility Investigation Report for Phase I Investigations at Operable Units 1, 6, and 7, NSRR, Ceiba, Puerto Rico*. 1996.

Baker Environmental, Inc., Final Data Collection Quality Assurance Plan, RCRA Facility Investigation, Naval Station Roosevelt Roads, Puerto Rico, September 14, 1995.

EPA. EPA-821-R-98-002, PB99-121949, February 1999, Method 1664 Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated Hexane Extractable Material (SGT-HEM; Non-polar material) by Extraction and Gravimetry.

NFESC. *Navy Installation Restoration Chemical Data Quality Manual (IR CDQM)*. NFESC Interim Guidance Document. 1999.

TRC Environmental Corporation. *RCRA Facility Assessment Re-Inspection Report.* 1993.

USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (1999).

USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (July, 2002).

APPENDIX A

PE Certification

Hazardous Waste Removal Certification
Hazardous Waste Storage Buildings 2009 B, C, and D
Defense Reutilization and Marketing Office Facility
U. S. Naval Activity Puerto Rico

A visual inspection of Hazardous Waste Storage Buildings 2009B, C, and D at the Defense Reutilization and Marketing Office (DRMO) facility at Naval Activity Puerto Rico was performed on May 19, 2004. Based on the May 19, 2004, visual inspection of Buildings 2009B, C, and D, no hazardous waste was present in the buildings.

Monica Colberg, P.E.
LG Scott (a Division of CH2M HILL, Inc.)

MONICA COLBERG IRIZARRY
INGENIERO LICENCIADO
LIC. 18455
PUERTO RICO

APPENDIX B

IDW Management Plan

Appendix B
Investigation-Derived Waste Management Plan

Contents

Section **Page**

1 Introduction 1-1

2 Waste Handling 2-1
2.1 Solid IDW 2-1
2.1.1 Soils and Soil Cuttings 2-1
2.1.2 Non-soil Solids 2-2
2.2 Liquid IDW 2-3

3 General Considerations 3-1
3.1 Minimization of IDW Volume 3-1
3.2 Labeling Drums 3-1
3.3 Storing IDW 3-1
3.4 Waste Disposal and Manifesting 3-2

Abbreviations and Acronyms

EPA	Environmental Protection Agency
IDW	Investigation-Derived Waste
IDWMP	Investigation-Derived Waste Management Plan
NAPR	Naval Activity Puerto Rico
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
SSA	Site Screening Area
TCLP	Toxicity Characteristic Leaching Procedure

SECTION 1

Introduction

The closure activities at the Naval Activity Puerto Rico will produce investigation-derived waste (IDW). IDW will subsequently require waste management and disposal in a manner that minimizes potential hazards to the public. This Investigation Derived Waste Management Plan (IDWMP) describes methodologies and procedures that JV I field personnel will implement to handle, manage, and dispose of IDW at the DRMO facility on NAPR.

Some examples of IDW that may be generated during field activities include:

- Residual soil and wastewater generated during the decontamination of field equipment
- Non-soil solids including used personal protective equipment (PPE) and disposable sampling equipment

In addition to IDW, wash and rinse waters will be generated during the decontamination of the hazardous waste storage areas. The management of these wastes is also addressed by the procedures contained in this IDWMP.

SECTION 2

Waste Handling

This section describes the waste handling procedures to be followed during the closure activities.

2.1 Solid IDW

The only solid wastes that will be generated during the facility decontamination activities and associated sampling activities include soil and other solid residues (e.g., floor sweepings, and concrete dust and residue from concrete sampling) removed during decontamination of sampling equipment, and waste personal protective equipment (PPE). Excess soil cuttings will not be generated as IDW because only shallow surface soil samples will be collected and any excess soil cuttings will be placed back into the sampling borehole.

2.1.1 Soils

Soil and other solid residue generated during the decontamination of sampling equipment will be contained in 55-gallon drums. This will include any soil that accumulates in the decontamination pad from the washing of equipment. Drums will be sealed and appropriately labeled.

A representative composite soil sample will be collected and tested by the Toxicity Characteristic Leaching Procedure (TCLP) as specified in Title 40 of the Code of Federal Regulations, Part 261 (40 CFR 261) to determine if the soil is a characteristic hazardous waste. Prior to receiving the TCLP testing results, the drum(s) of soil will be stored in the Building 1973 hazardous waste storage area.

The disposal method for the IDW soil will be based on the following criteria:

- If the TCLP testing results indicate that the soil is not a characteristic hazardous waste, the sampling results for the concrete and soil samples collected during the implementation of the SAP will be evaluated. If the concrete and soil sampling results indicate that the closure standards were met, then the IDW soil will be spread on the ground surface along the fence line at the eastern end of the DRMO facility. On the other hand, if the soil sampling results indicate that the closure standards were not met, then the IDW soil will be transported to a waste management facility permitted to receive the IDW soil.
- If the TCLP testing results indicate that the soil is a characteristic hazardous waste, the drums of IDW soil will be transported offsite to a permitted hazardous waste disposal facility within 90 days of the date that the IDW soil was generated. A Navy representative will be responsible for signing the Waste Manifests.

2.1.2 Non-soil Solids

The disposable PPE used by JV I field personnel will be placed in 55-gallon steel drums. Examples of PPE to be contained include nitrile gloves, tyveks, rubber boots, and respirator cartridges. Any expendable items used during sampling will also be contained in drums, such as in-line water filters, C-flex tubing, and paper towels. Drums will be sealed and labeled appropriately.

The PPE will be bagged and drummed pending receipt of sampling analytical results. If the sampling analytical results indicate that the site's IDW soil and decontamination fluids are non-hazardous, the PPE and sampling expendable items will be placed in marked bags and discarded in dumpsters. If sampling analytical results indicate that the site's IDW soil and decontamination fluids are hazardous, the handling and disposal procedures of PPE and sampling expendable items will be identical to those that apply for hazardous soils.

2.2 Liquid IDW

The only liquid IDW that will be generated during the implementation of the SAP will be wash water generated during decontamination of sampling equipment. In addition, liquid wastes will be generated during the decontamination of the hazardous waste storage areas.

These liquid wastes will be collected in 55-gallon steel drums. The drums will be sealed and appropriately labeled until final disposition is determined. Representative samples of the liquid wastes will be collected from each drum and tested as described in Sections 3 and 4 of the SAP to determine its characteristics. If the liquid waste is determined to be non-hazardous, it will be discharged to the sanitary sewer at NAPR.

If the liquid waste is determined to be hazardous, it will be transported offsite to a permitted hazardous waste management facility within 90 days of the date the waste was generated. A Navy representative will be responsible for signing the Waste Manifests.

SECTION 3

General Considerations

General considerations pertinent to the generation and handling of IDW are documented below. These include drum labeling and storage, and disposal and manifesting protocol.

3.1 Labeling Drums

Each 55-gallon drum containing IDW will be labeled with the following information: the type of IDW (soil, PPE, wash water, etc.), the date the drum was filled and sealed, and a brief warning not to handle the drum or its contents without permission from NAPR. The following is an example of the information to be included on each drum:

Investigation Derived Wastes
Soil from DRMO -
12-8-04
Do Not Handle - Analysis Pending
Mr. Juan Roa, NAPR

Once the sampling results are received for the IDW, each IDW container will be re-labeled to identify the site (DRMO building no.), description of IDW (e.g., soil, PPE, wash water), constituents of concern, and accumulation date.

3.2 Storing IDW

Drums containing IDW will be stockpiled at an onsite location designated by Navy personnel, pending the receipt of characterization and sampling analytical results. The contained wastes must be disposed of within 90 days of being stockpiled at the temporary location. For planning purposes, IDW will be stored at NAPR for a maximum of 60 days in order to ensure compliance with the 90-day accumulation limit.

3.3 Waste Disposal and Manifesting

Upon the receipt of characterization and sampling analytical results, JV I will determine the appropriate disposal method for the IDW and submit waste management recommendations to the Navy. Upon the Navy's approval of the disposal method, JV I will prepare waste transport and disposal manifests. The Navy will be responsible for signing all manifests.

APPENDIX C

Standard Operating Procedures (SOPs)

Appendix C
Table of Contents for Standard Operating Procedures

Standard Operating Procedures attached are the following:

Equipment Blanks and Field Blank Preparation

Chain-of-Custody

Decontamination of Personnel and Equipment

Documentation and Records

Preparing Field Log Books

Sampling Contents Of Tanks And Drums

Shallow Soil Sampling

Soil Sampling for VOCs Using the EnCore® Sampler

Volatiles Monitoring by OVM

Disposal of Waste Fluids and Solids

STANDARD OPERATING PROCEDURE

Equipment Blank and Field Blank Preparation

I. Purpose

To prepare blanks to determine whether decontamination procedures are adequate and whether any cross-contamination is occurring during sampling due to contaminated air and dust.

II. Scope

The general protocols for preparing the blanks are outlined. The actual equipment to be rinsed will depend on the requirements of the specific sampling procedure.

III. Equipment and Materials

- Blank liquid (use ASTM Type II grade water)
- HPLC deionized water
- Sample bottles as appropriate
- Gloves
- Preservatives as appropriate

IV. Procedures and Guidelines

A. Decontaminate all sampling equipment that has come in contact with sample according to SOP *Decontamination of Personnel and Equipment.*

B. To collect an equipment blank for volatile analysis from the surfaces of sampling equipment other than pumps, pour blank water over one piece of equipment and into two 40-ml vials until there is a positive meniscus, then seal the vials. Note the sample number and associated piece of equipment in the field notebook as well as the type and lot number of the water used.

For non-volatiles analyses, one aliquot is to be used for equipment. For example, if a pan and trowel are used, place trowel in pan and pour blank fluid in pan such that pan and trowel surfaces which contacted the sample are contacted by the blank fluid. Pour blank fluid from pan into appropriate sample bottles.

Do not let the blank fluid come in contact with any equipment that has not been decontaminated.

C. When collecting an equipment blank from a pump, run an extra gallon of deionized water through the pump while collecting the pump outflow into appropriate containers. Make sure the flow rate is low when sampling VOCs. If a Grundfos Redi-Flo2 pump with disposable tubing is used, remove the disposable tubing after sampling but before decon. When decon

is complete, put a 3 to 5 foot segment of new tubing onto the pump to collect the equipment blank.

D. To collect a field blank, slowly pour ASTM Type II water directly into sample containers.

E. Document and ship samples in accordance with the procedures for other samples.

F. Collect next field sample.

V. Attachments

None.

VI. Key Checks and Items

- Wear gloves.
- Do not use any non-decontaminated equipment to prepare blank.
- Use ASTM-Type II grade water.

STANDARD OPERATING PROCEDURE

Chain-of-Custody

I Purpose

The purpose of this SOP is to provide information on chain-of-custody procedures to be used during the sampling activities.

II Scope

This procedure describes the steps necessary for transferring samples through the use of Chain-of-Custody Records. A Chain-of-Custody Record is required, without exception, for the tracking and recording of samples collected for on-site or off-site analysis (chemical or geotechnical) during program activities. Use of the Chain-of-Custody Record Form creates an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis. This procedure identifies the necessary custody records and describes their completion. This procedure does not take precedence over region specific or site-specific requirements for chain-of-custody.

III Definitions

Chain-of-Custody Record Form - A Chain-of-Custody Record Form is a printed two-part form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one custodian to another custodian. One copy of the form must be retained in the project file.

Custodian - The person responsible for the custody of samples at a particular time, until custody is transferred to another person (and so documented), who then becomes custodian. A sample is under one's custody if:

- It is in one's actual possession.
- It is in one's view, after being in one's physical possession.
- It was in one's physical possession and then he/she locked it up to prevent tampering.
- It is in a designated and identified secure area.

Sample - A sample is physical evidence collected from a facility or the environment, which is representative of conditions at the point and time that it was collected.

IV Responsibilities

Project Manager - The Project Manager is responsible for ensuring that project-specific plans are in accordance with these procedures, where applicable, or that

other, approved procedures are developed. The Project Manager is responsible for development of documentation of procedures which deviate from those presented herein. The Project Manager is responsible for ensuring that chain-of-custody procedures are implemented. The Project Manager also is responsible for determining that custody procedures have been met by the analytical laboratory. Field Team Leader - The Field Team Leader is responsible for determining that chain-of-custody procedures are implemented up to and including release to the shipper or laboratory. It is the responsibility of the Field Team Leader to ensure that these procedures are implemented in the field and to ensure that personnel performing sampling activities have been briefed and trained to execute these procedures.

Sample Personnel - It is the responsibility of the field sampling personnel to initiate chain-of-custody procedures, and maintain custody of samples until they are relinquished to another custodian, the sample shipper, or to a common carrier.

V Procedures

The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is valid. The chain-of-custody procedures track the evidence from the time and place it is first obtained to the courtroom, as well as providing security for the evidence as it is moved and/or passed from the custody of one individual to another.

Chain-of-custody procedures, recordkeeping, and documentation are an important part of the management control of samples. Regulatory agencies must be able to provide the chain-of-possession and custody of any samples that are offered for evidence, or that form the basis of analytical test results introduced as evidence. Written procedures must be available and followed whenever evidence samples are collected, transferred, stored, analyzed, or destroyed.

V.1 Sample Identification

The method of identification of a sample depends on the type of measurement or analysis performed. When in-situ measurements are made, the data are recorded directly in bound logbooks or other field data records with identifying information. Information which shall be recorded in the field logbook, when in-situ measurements or samples for laboratory analysis are collected, includes:

- Field Sampler(s);
- CTO Number;
- Project Sample Number;
- Sample location or sampling station number;
- Date and time of sample collection and/or measurement;
- Field observations;
- Equipment used to collect samples and measurements; and,
- Calibration data for equipment used.

Measurements and observations shall be recorded using waterproof ink.

V.1.1 Sample Label

Samples, other than in-situ measurements, are removed and transported from the sample location to a laboratory or other location for analysis. Before removal, however, a sample is often divided into portions, depending upon the analyses to be performed. Each portion is preserved in accordance with the Sampling and Analysis Plan. Each sample container is identified by a sample label (see Attachment A). Sample labels are provided, along with sample containers, by the analytical laboratory. The information recorded on the sample label includes:

- Project - Contract Task Order (CTO) Number.
- Station Location - The unique sample number identifying this sample.
- Date - A six-digit number indicating the day, month, and year of sample collection (e.g., 12/21/85).
- Time - A four-digit number indicating the 24-hour time of collection (for example: 0954 is 9:54 a.m., and 1629 is 4:29 p.m.).
- Medium - Water, soil, sediment, sludge, waste, etc.
- Sample Type - Grab or composite.
- Preservation - Type and quantity of preservation added.
- Analysis - VOA, SVOCs, metals, other.
- Sampled By - Printed name of the sampler.
- Remarks - Any pertinent additional information.

Using only the work assignment number of the sample label maintains the anonymity of sites. This may be necessary, even to the extent of preventing the laboratory performing the analysis from knowing the identify of the site (e.g., if the laboratory is part of an organization that has performed previous work on the site).

V.2 Chain-of-Custody Procedures

After collection, separation, identification, and preservation, the sample is maintained under chain-of-custody procedures until it is in the custody of the analytical laboratory and has been stored or disposed.

V.2.1 Field Custody Procedures

- Samples are collected as described in the site Sampling and Analysis Plan. Care must be taken to record precisely the sample location and to ensure that the sample number on the label matches the Chain-of-Custody Record exactly.

- The person undertaking the actual sampling in the field is responsible for the care and custody of the samples collected until they are properly transferred or dispatched.

- When photographs are taken of the sampling as part of the documentation procedure, the name of the photographer, date, time, site location, and site description are entered sequentially in the site logbook as photos are taken. Once developed, the photographic prints shall be serially numbered, corresponding to the logbook descriptions; photographs will be stored in the project files. It is

good practice to identify sample locations in photographs by including an easily read sign with the appropriate sample/location number.

- Sample labels shall be completed for each sample, using waterproof ink unless prohibited by weather conditions, e.g., a logbook notation would explain that a pencil was used to fill out the sample label if the pen would not function in freezing weather.

V.2.2 Transfer of Custody and Shipment

Samples are accompanied by a Chain-of-Custody Record Form. A Chain-of-Custody Record Form example is shown in Attachment B. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the Record. This Record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory. The Chain-of-Custody Record is filled out as given below.

- Enter header information (CTO number, samplers, and project name).
- Enter sample specific information (sample number, media, sample analysis required and analytical method grab or composite, number and type of sample containers, and date/time sample was collected).
- Sign, date, and enter the time under "Relinquished by" entry.
- Have the person receiving the sample sign the "Received by" entry. If shipping samples by a common carrier, print the carrier to be used in this space (i.e., Federal Express).
- If a carrier is used, enter the airbill number under "Remarks," in the bottom right corner;
- Place the original (top, signed copy) of the Chain-of-Custody Record Form in a plastic zipper-type bag or other appropriate sample shipping package. Retain the copy with field records.
- Sign and date the custody seal, a 1- by 3-inch white paper label with black lettering and an adhesive backing. Attachment C is an example of a custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field. Custody seals shall be provided by the analytical laboratory.
- Place the seal across the shipping container opening so that it would be broken if the container were to be opened.
- Complete other carrier-required shipping papers.

The custody record is completed using waterproof ink. Any corrections are made by drawing a line through and initialing and dating the change, then entering the correct information. Erasures are not permitted.

Common carriers will usually not accept responsibility for handling Chain-of-Custody Record Forms; this necessitates packing the record in the shipping container (enclosed with other documentation in a plastic zipper-type bag). As long as custody forms are sealed inside the shipping container and the custody seals are intact, commercial carriers are not required to sign the custody form.

The laboratory representative who accepts the incoming sample shipment signs and dates the Chain-of-Custody Record, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal logbooks and custody records throughout sample preparation and analysis.

VI Quality Assurance Records

Once samples have been packaged and shipped, the Chain-of-Custody copy and airbill receipt becomes part of the quality assurance record.

VII References

USEPA. *User's Guide to the Contract Laboratory Program*. Office of Emergency and Remedial Response, Washington, D.C. (EPA/540/P-91/002), January 1991.

Attachment A
Example Sample Label

QAL

Quality Analytical Laboratories, Inc.
2567 Fairlane Drive
Montgomery, Alabama 36116
PH. (334)271-2440

Client _____
Sample No. _____
Location _____
_____
Analysis _____
_____
Preservative HCL
Date _____ By _____

CEIMIC
CORPORATION
10 Dean Knauss Drive, Narragansett, R.I. 02882 • (401) 782-8900

SITE NAME	DATE
ANALYSIS	TIME
	PRESERVATIVE

SAMPLE TYPE

☐ Grab ☐ Composite ☐ Other _____

COLLECTED BY:

Attachment B
Example Chain-of-Custody Record

CH2MH
APPLIED SCIENCES LABORATORY

CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project # ☐☐☐☐☐☐☐☐.☐☐.☐☐

Purchase Order #

Project Name

Company Name CH2M HILL Office

Project Manager & Phone #
Mr. [ ]
Ms. [ ]
Dr. [ ]

Report Copy to:

Requested Completion Date:

Sampling Requirements: SDWA ☐ NPDES ☐ RCRA ☐ OTHER ____

Sample Disposal: Dispose ☐ Return ☐

LAB TEST CODES

ANALYSES REQUESTED

SHADED AREA– FOR LAB USE ONLY

Lab 1 #

Lab 2 #

Quote #

Kit Request #

Project #

No. of Samples

Page of

Login

LIMS Ver

Sampling Date	Sampling Time	Type COMP	Type GRAB	Matrix WATER	Matrix SOIL	Matrix AIR	CLIENT SAMPLE ID (9 CHARACTERS)	# OF CONTAINERS	ANALYSES REQUESTED	REMARKS	LAB 1 ID	LAB 2 ID

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	QC Level: 1 2 3 Other: ____	
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	COC Rec	ICE
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	Ana Req	TEMP
				Cust Seal	Ph
Received By (Please sign and print name)	Date/Time	Shipped Via UPS BUS Fed-Ex Hand Other ____		Shipping #	
Work Authorized By (Please sign and print name)	Remarks				

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client

REV 3/94 FORM 340

Attachment C
Example Custody Seal

CH2M HILL

CUSTODY SEAL

Date

Signature

STANDARD OPERATING PROCEDURE

Decontamination of Personnel and Equipment

I. Purpose

To provide general guidelines for the decontamination of personnel, sampling equipment, and monitoring equipment used in potentially contaminated environments.

II. Scope

This is a general description of decontamination procedures.

III. Equipment and Materials

- Demonstrated analyte-free, deionized ("DI") water (specifically, ASTM Type II water)
- Distilled water
- Potable water; must be from a municipal water supplier, otherwise an analysis must be run for appropriate volatile and semivolatile organic compounds and inorganic chemicals (e.g., Target Compound List and Target Analyte List chemicals)
- 2.5% (W/W) Alconox® and water solution
- Concentrated (V/V) high-grade isopropyl
- Large plastic pails or tubs for Alconox® and water, scrub brushes, squirt bottles for Alconox® solution, isopropyl and water, plastic bags and sheets
- DOT approved 55-gallon drum for disposal of waste
- Phthalate-free gloves
- Decontamination pad and steam cleaner/high pressure cleaner for large equipment

IV. Procedures and Guidelines

A. Personnel Decontamination

To be performed after completion of tasks whenever potential for contamination exists, and upon leaving the exclusion zone.

1. Wash boots in Alconox® solution, then rinse with water. If disposable latex booties are worn over boots in the work area, rinse with Alconox® solution, remove, and discard into DOT-approved 55-gallon drum.
2. Wash outer gloves in Alconox® solution, rinse, remove, and discard into DOT-approved 55-gallon drum.
3. Remove disposable coveralls ("Tyveks") and discard into DOT-approved 55-gallon drum.
4. Remove respirator (if worn).
5. Remove inner gloves and discard.
6. At the end of the work day, shower entire body, including hair, either at the work site or at home.
7. Sanitize respirator if worn.

B. Sampling Equipment Decontamination—Water Sampling Pumps

Sampling pumps are decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Spread plastic on the ground to keep hoses from touching the ground
3. Turn off pump after sampling. Remove pump from well and place pump in decontamination tube, making sure that tubing does not touch the ground
4. Turn pump back on and pump 1 gallon of Alconox® solution through the sampling pump.
5. Rinse with 1 gallon of 10% isopropyl solution pumped through the pump. (DO NOT USE ACETONE).
6. Rinse with 1 gallon of tap water.
7. Rinse with 1 gallon of deionized water.
8. Keep decontaminated pump in decontamination tube or remove and wrap in aluminum foil or clean plastic sheeting.
9. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.
10. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in DOT-approved 55-gallon drums.

C. Sampling Equipment Decontamination—Other Equipment

Reusable sampling equipment is decontaminated after each use as follows:

1. Don phthalate-free gloves.
2. Before entering the potentially contaminated zone, wrap soil contact points in aluminum foil (shiny side out).
3. Rinse and scrub with potable water.
4. Wash all equipment surfaces that contacted the potentially contaminated soil/water with Alconox® solution.
5. Rinse with potable water.
6. Rinse with distilled or potable water and isopropyl solution (DO NOT USE ACETONE).
7. Air dry.
8. Rinse with deionized water.
9. Completely air dry and wrap exposed areas with aluminum foil (shiny side out) for transport and handling if equipment will not be used immediately.
10. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.
11. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in DOT-approved 55-gallon drums.

D. Health And Safety Monitoring Equipment Decontamination

1. Before use, wrap soil contact points in plastic to reduce need for subsequent cleaning.
2. Wipe all surfaces that had possible contact with contaminated materials with a paper towel wet with Alconox® solution, then a towel wet with isopropyl solution, and finally three times with a

towel wet with distilled water. Dispose of all used paper towels in a DOT-approved 55-gallon drum.

E. Sample Container Decontamination

The outsides of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection. The procedure is:

1. Wipe container with a paper towel dampened with Alconox® solution or immerse in the solution AFTER THE CONTAINERS HAVE BEEN SEALED. Repeat the above steps using potable water.
2. Dispose of all used paper towels in a DOT-approved 55-gallon drum.

F. Heavy Equipment And Tools

Heavy equipment such as drilling rigs, drilling rods/tools, and the backhoe will be decontaminated upon arrival at the site and between locations as follows:

1. Set up a decontamination pad in area designated by the Navy
2. Steam clean heavy equipment until no visible signs of dirt are observed. This may require wire or stiff brushes to dislodge dirt from some areas.

V. Attachments

None.

VI. Key Checks and Items

- Clean with solutions of Alconox®, isopropyl, and distilled water.
- Do not use acetone for decontamination.
- Drum all contaminated rinsate and materials.
- Decontaminate filled sample bottles before relinquishing them to anyone.

STANDARD OPERATING PROCEDURE

Documentation and Records

I. Purpose and Scope

The purpose of this guideline is to provide guidance for the documentation of records taken in the field in the form of field notebooks and/or field logbooks.

II. Field Notebooks

Field notebooks are maintained to document field equipment maintenance and contain calibration logs and field forms, as described below. The notebooks provide centrally-located three-ring binders, for information which is not recorded in sequentially-numbered, bound site or field logbooks. As an alternate method to using the field equipment and forms notebooks, the information maintained in these notebooks may be documented in the field logbooks. General site information should be documented into the field notebook that includes:

- Site name, personnel onsite and time and date of arrival
- Ambient weather conditions
- Documentation of field activities including decontamination, sampling, and preparation.
- Lot number and brand name for solvent and acid decontamination solutions and analyte-free water used for equipment and field blanks.

Calibration Logs

Calibration logs may be included in the field equipment notebooks and are used to document the proper maintenance and calibration of field testing equipment. All equipment will be inspected and approved by the Field Team Leader before being used, and a calibration log sheet shall be maintained for each instrument used on-site and shall be kept in the logbook. The calibration log will document:

- Name and identifying number of the instrument
- Date calibrated
- Calibration points
- Identification of the calibrator
- Manufacturer, lot number, and expiration date of calibration standards
- Results of the calibration.

Field Forms

Field forms may also be kept in the field notebook if using a three-ring binder form. Field forms include the following:

- Soil boring log
- Instrument Calibration log

III Attachments

Soil Boring Log Sample Form
Instrument Calibration Form

CH2MHILL

PROJECT NUMBER	BORING NUMBER SHEET 1 OF 1

SOIL BORING LOG

PROJECT : LOCATION : DATE:

WEATHER: DRILLING CONTRACTOR :

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : START : END : LOGGER :

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.5						
1.0						
1.5						
2.0						
2.5						

Sampler Signature: _____ Date: _____

Additional Notes:

Sampler Signature: _____ Date: _____

FIELD INSTRUMENT CALIBRATION LOG

Site Name/Activity: _____

Date: _____

Calibrator: _____

Equipment Make and Model: _____

Serial Number: _____

CONDUCTIVITY

Model: _____ **SN#:** _____

Initial reading _____ (____) Calibrated reading _____
enter units

At a temperature of _____ °C Standard used: _____

Standard Make
and Lot Number: _____ Expiration Date: _____

Calibration check _____ Temp _____ Time _____

PID

Model: _____ **SN#:** _____

Initial Reading: _____ Calibrated Reading: _____

Calibration Gas: _____ Regulator: _____

Calibration Check: _____

pH _____ **Initial Reading** _____ **Calibrated Reading:** _____

At a temperature of _____ °C

Buffer Make and Lot Number: _____

Calibration check_____ Temp _____ Expiration Date: _____

pH _____ **Initial Reading** _____ **Calibrated Reading:** _____

At a temperature of _____ °C

Buffer Make and Lot Number: _____ Expiration Date: _____

Calibration check_____ Temp _____ Time _____

TURBIDIMETER

Model: _____ **SN#:** _____

Standar: _____ _____ _____

Calibrated Reading: _____ _____ _____

DISSOLVED OXYGEN

Model: _____ **SN#:** _____

Initial Reading:_____Mg/L ____% Sat. in Ambient Air

Calibrated Reading:_____Mg/L _____% Sat

Barometric Pressure: Set at _____ Mbs .

Calibration check_____ Temp _____ Time _____

ORP

Initial: _____

Calibrated: _____

Temperature: _____

Standard: _____ Check: _____ at _____

Time: _____

SIGNED: _____ Date _____

STANDARD OPERATING PROCEDURE

Preparing Field Log Books

I. Purpose

To provide general guidelines for entering field data into log books during site investigation and remediation field activities.

II. Scope

This is a general description of data requirements and format for field log books. Log books are needed to properly document all field activities in support of data evaluation and possible legal activities.

III. Equipment and Materials

- Log book
- Indelible pen

IV. Procedures and Guidelines

Properly completed field log books are a requirement of much of the work we perform under the Navy CLEAN contract. Log books are legal documents and, as such, must be prepared following specific procedures and must contain required information to ensure their integrity and legitimacy. This SOP describes the basic requirements for field log book entries.

A. Procedures For Completing Field Log Books

1. Field notes commonly are kept in bound, orange-covered logbooks used by surveyors and produced, for example, by Peninsular Publishing Company and Sesco, Inc. Pages should be water-resistant and notes should be taken only with water-proof, non-erasable permanent ink, such as that provided in Sanford Sharpie® permanent markers.
2. On the inside cover of the log book the following information should be included:
   - Company name and address
   - Log-holders name if log book was assigned specifically to that person
   - Activity or location
   - Project name
   - Project manager's name
   - Phone numbers of the company, supervisors, emergency response, etc.
3. All lines of all pages should be used to prevent later additions of text, which could later be questioned. Any line not used should be marked through with a line and initialed and dated. Any pages not used

should be marked through with a line, the author's initials, the date, and the note "Intentionally Left Blank."

4. If errors are made in the log book, cross a single line through the error and enter the correct information. All corrections shall be initialed and dated by the personnel performing the correction. If possible, all corrections should be made by the individual who made the error.
5. Daily entries will be made chronologically.
6. Information will be recorded directly in the field log book during the work activity. Information will not be written on a separate sheet and then later transcribed into the log book.
7. Each page of the log book will have a the date of the work and the note takers initials.
8. The final page of each day's notes will include the note-takers signature as well as the date.
9. Only information relevant to the subject project will be added to the log book.
10. The field notes will be copied and the copies sent to the Project Manager or designee in a timely manner (at least by the end of each week of work being performed).

B. Information To Be Included In Field Log Books

1. Entries into the log book should be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector's memory. Entries must be legible and complete.
2. General project information will be recorded at the beginning of each field project. This will include the project title, the project number, and project staff.
3. Scope: Describe the general scope of work to be performed each day.
4. Weather: Record the weather conditions and any significant changes in the weather during the day.
5. Tail Gate Safety Talks: Record time and location of meeting, who was present, topics discussed, issues/problems/concerns identified, and corrective actions or adjustments made to address concerns/ problems, and other pertinent information.
6. Standard Health and Safety Procedures: Record level of personal protection being used (e.g., level D PPE), record air monitoring data on a regular basis and note where data were recording (e.g., reading in borehole, reading in breathing zone, etc). Also record other required health and safety procedures as specified in the project specific health and safety plan.
7. Instrument Calibration; Record calibration information for each piece of health and safety and field equipment.
8. Personnel: Record names of all personnel present during field activities and list their roles and their affiliation. Record when personnel and visitors enter and leave a project site and their level of personal protection.

9. Communications: Record communications with project manager, subcontractors, regulators, facility personnel, and others that impact performance of the project.
10. Time: Keep a running time log explaining field activities as they occur throughout the day.
11. Deviations from the Work Plan: Record any deviations from the work plan and document why these were required and any communications authorizing these deviations.
12. Heath and Safety Incidents: Record any health and safety incidents and immediately report any incidents to the Project Manager.
13. Subcontractor Information: Record name of company, record names and roles of subcontractor personnel, list type of equipment being used and general scope of work. List times of starting and stopping work and quantities of consumable equipment used if it is to be billed to the project.
14. Problems and Corrective Actions: Clearly describe any problems encountered during the field work and the corrective actions taken to address these problems.
15. Technical and Project Information: Describe the details of the work being performed. The technical information recorded will vary significantly between projects. The project work plan will describe the specific activities to be performed and may also list requirements for note taking. Discuss note-taking expectations with the Project Manager prior to beginning the field work.
16. Any conditions that might adversely affect the work or any data obtained (e.g., nearby construction that might have introduced excessive amounts of dust into the air).
17. Sampling Information; Specific information that will be relevant to most sampling jobs includes the following:
    - Description of the general sampling area – site name, buildings and streets in the area, etc.
    - Station/Location identifier
    - Description of the sample location – estimate location in comparison to two fixed points – draw a diagram in the field log book indicating sample location relative to these fixed points – include distances in feet.
    - Sample matrix and type
    - Sample date and time
    - Sample identifier
    - Information on how the sample was collected – distinguish between "grab," "composite," and "discrete" samples
    - Number and type of sample containers collected
    - Record of any field measurements taken (i.e. pH, turbidity, dissolved oxygen, and temperature, and conductivity)
    - Parameters to be analyzed for, if appropriate

- Descriptions of soil samples and drilling cuttings can be entered in depth sequence, along with PID readings and other observations. Include any unusual appearances of the samples.

C. Suggested Format For Recording Field Data

1. Use the left side border to record times and the remainder of the page to record information (see attached example).
2. Use tables to record sampling information and field data from multiple samples.
3. Sketch sampling locations and other pertinent information.
4. Sketch well construction diagrams.

V. Attachments

Example field notes.

STANDARD OPERATING PROCEDURE

Sampling Contents Of Tanks And Drums

I. Scope and Application

This procedure provides an overview approach and guidelines for the routine sampling of drums and tanks. Its purpose is to describe standard procedures and precautions which are applied in sampling drums and tanks. Procedures for opening drums with the individual instruments are included in Attachment D. The samples obtained may be used to obtain physical chemical or radiological data. The resulting data may be qualitative or quantitative in nature, and are appropriate for use in preliminary surveys as well as confirmatory sampling.

II. References

A. *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001, U.S. Environmental Protection Agency, Washington, D.C., 1987.

B. *Data Quality Objectives for Remedial Activities - Development Process*, EPA/540/G-87/003, U.S. Environmental Protection Agency, Washington, D.C., 1987.

C. Annual Book of ASTM Standards, *Standard Recommended Practices for Sampling Industrial Chemicals*, ASTM-E-300, 1986.

D. *Test Method for Evaluating Solid Waste*, SW-846, Volume II, Field Methods, Second Edition, U.S. Environmental Protection Agency, Washington, D.C., 1982.

E. U.S. Environmental Protection Agency, *Characterization of Hazardous Waste Sites – A Method Manual: Volume II, Available Sampling Methods*, USEPA Environmental Monitoring Systems Laboratory, Las Vegas, EPA-600/4-84-076, December, 1984.

F. *Environmental Surveillance Procedures*, Quality Control Program, Martin Marietta Energy Systems, ESH/Sub/87-21706/1, Oak Ridge, TN, September 1988.

III. Summary of Methods

Drums are generally sampled by means of sampling tubes such as glass sample tubes or COLIWASA samplers. In either case, the sampling tube is manually inserted into the waste material. A sample of the drum contents is withdrawn by the sampling device upon its removal. Should a drum contain a bottom sludge, a glass tube will retrieve a sample of this as well.

Storage tank and tank trailers, because of their greater depths, require sampling devices which can be lowered from the top, filled at a particular depth, then withdrawn. Such devices are a COLIWASA, a Kemmerer depth sampler, or a bacon bomb. Where samples of bottom sludge are desired, a gravity corer can be utilized.

This heavy tube with a tapered nose piece will penetrate the sludge as it free falls through the tank.

IV. Comments

The sampling of tanks, containers, and drums present unique problems not associated with environmental samples. Containers of this sort are generally closed except for small access ports, manways, or hatches on the larger vessels, or taps and bungs on smaller drums. The physical size, shape, construction material, and location of access limit the types of equipment and methods of collection that can be used.

When liquids are contained in sealed vessels, gas vapor pressure can build up, sludges can settle out, and density layerings (stratification) can develop. Bulging drums may be under pressure and extreme caution should be exercised. The potential exists for explosive reactions or the release of noxious gases when containers are opened. All vessels should be opened with extreme caution. Check the HSP for the level of personnel protection to be worn. A preliminary sampling of any headspace gases is warranted. As a minimum, a preliminary check with an explosimeter and an organic vapor analyzer may be of aid in selecting a sampling method.

In most cases it is impossible to observe the contents of these sealed or partially sealed vessels. Since some layering or stratification is likely in any solution left undisturbed over time, a sample must be taken that represents the entire depth of the vessel.

V. Required Equipment and Apparatus

A. **Health and safety equipment/materials**: As listed in the site safely plan.
B. **Sampling equipment**: COLIWASA, glass sample tubes, Kemmerer depth sampler, Bacon bomb, gravity corer.
C. **Tools**: Rubber mallet, bung wrench, speed wrench with socket, etc., all non-sparking, paint marker.
D. **Heavy equipment**: Backhoe equipped with explosion shield, drum grapper, and 3-foot copper-beryllium (non-sparking) spike with 6-inch collar (to puncture top of drums for sampling, if necessary).
E. **Sample Containers**: As specified in the field sampling plan.

VI. Procedures

A. Drums

NOTE: DO NOT open more than one drum at a time. Each drum must be handled and sampled as a separate entity to reduce vapors in the sampling area.

1. Drums will be sampled on an area-by-area basis. Drums will be sampled after they have been placed in overpack drums but before they are transferred from the excavation to the onsite storage area.

2. Record, in logbook, all pertinent information from visual inspection of drum; i.e., physical condition, leaks, bulges, labels, etc. Label each drum with a unique identifying number.
3. If possible, stage drums for easy access.
4. If necessary, attach groundstrap to drums and grounding point.
5. Remove any standing material (water, etc.) from container top.
6. Using nonsparking tools, carefully remove the bung or lid while monitoring air quality with appropriate instruments. If necessary (and as a last resort), the nonsparking spike affixed to the backhoe can also be used to puncture the drum for sampling. See Attachment D for method of drum opening. Record air-quality monitoring results.
7. When sampling a previously sealed vessel, a check should be made for the presence of a bottom sludge. This is accomplished by measuring the depth to apparent bottom then comparing it to the known interior depth.
8. Agitation to disrupt the layers and rehomogenize the sample is physically difficult and almost always undesirable. If the vessel is greater than 3 feet in depth (say, a 55-gallon drum), the appropriate sampling method is to slowly lower the sampling device (i.e., suction line of peristaltic pump, glass tube) in known increments of length. Discrete samples can be collected from various depths, then combined or analyzed separately. If the depth of the vessel is greater than the lift capacity of the pump, an at-depth water sampler, such as the Kemmerer or Bacon Bomb type may be required.
9. Extract a representative sample from the drum using a glass rod, COLIWASA, Bacon Bomb, Kemmerer bottle, or gravity corer (See Attachments). Ensure that the entire depth of material is penetrated. Depending on the size of the opening of the drum, 3 to 4 takes should be collected from random locations across the drum surface, to ensure a representative sample. Any observed stratification must be recorded in logbook, including number and thickness of the layers and a conceptualized sketch.
10. Record a visual description of the sample; i.e., liquid, solid, color, viscosity, percent layers, etc.
11. When possible, sampling equipment (like glass tube) should be expendable and be left inside the drum for disposal with drum contents, once sampling is completed.
12. Place lid, bung, cap, etc., back in place on drum. Tighten hand tight. If necessary, the sampling port can be sealed using a cork.
13. Wipe up spilled material with lab wipes. Wipe off sample containers.
14. Mark the drum with a unique sample identification number and date using a paint marker.
15. Samples will be handled as high hazard samples. Samples will be placed in containers defined according to the analytical needs, wiped clean and then packed in paint cans for shipping. Packaging, labeling, and preparation for shipment procedures will follow procedures as specified in the field sampling plan.

B. Underground Storage Tanks

1. A sampling team of at least two people is required for sampling—one will collect samples, the other will relay required equipment and implements.
2. Sampling team will locate a sampling port on the tank. Personnel should be wearing appropriate protective clothing at this time and carrying sampling gear.
3. Do not attempt to climb down into tank. Sampling is accomplished from the top.
4. Collect a sample from the upper, middle, and lower section of the tank contents with one of the recommended sampling devices.
5. If compositing is necessary, ship samples to laboratory in separate containers for laboratory compositing.
6. Samples will be handled as hazardous. Samples will be placed in appropriate containers and packed with ice in a cooler. Packaging, labeling, and preparation for shipment will follow procedures specified in the field sampling plan.

C. Tank Trailers or Above-Ground Storage Tanks

1. A sampling team of two is required. One will collect samples, the other will relay required equipment and implements.
2. Samples will be collected through the manhole (hatch) on top of the tanker or the fill port. Do not open valves at the bottom. Before opening the hatch, check for a pressure gauge or release valve. Open the release valve slowly to bring the tank to atmospheric pressure.
3. If tank pressure is too great, or venting releases large amounts of toxic gas, discontinue venting and sampling immediately. Measure vented gas with organic vapor analyzer and explosimeter.
4. If no release valve exists, slowly loosen hatch cover bolts to relieve pressure in the tank. (Again, stop if pressure is too great.)
5. Once pressure in tank has been relieved, open the hatch and withdraw sample using one of the recommended sampling devices.
6. Sample each trailer compartment.
7. If compositing is necessary ship samples to laboratory in separate containers for laboratory compositing.
8. Samples will be handled has hazardous. Samples will be placed in appropriate containers and packed with ice in a cooler. Packaging, labeling, and preparation for shipment will follow procedures specified in the field sampling plan.

D. Refer to Attachment B for procedures for sampling with appropriate devices as follows:

<u>Drum</u>

Glass tube	—	Procedure 1
COLIWASA	—	Procedure 2

Storage Tank and Tank Trailer

COLIWASA	–	Procedure 2
Bacon Bomb	–	Procedure 3
Gravity Corer (for bottom sludge)	–	Procedure 4

VII. Contamination Control

Sampling tools, instruments and equipment will be protected from sources of contamination prior to use and decontaminated after use as specified in SOP Decon. Liquids and materials from decontamination operations will be handled in accordance with the waste management plan. Sample containers will be protected from sources of contamination. Sampling personnel shall wear chemical resistant gloves when handling any samples. Gloves will be decontaminated or disposed of between samples.

VIII. Attachments

A. Collection of Liquid Containerized Wastes Using Glass Tubes
B. Sampling Containerized Wastes Using the Composite Liquid Waste Sample (COLIWASA)
C. Sampling Containerized Wastes Using the Bacon Bomb Sample
D. Gravity Corer for sampling Sludges in Large Containers
E. Construction of a Typical COLIWASA
F. Drum Opening Techniques and Equipment

IX. Field Checklist

_____ Sampling Instruments
_____ Tools
_____ Rubber Mallet
_____ Logbook
_____ Safety Glasses or Monogoggles
_____ Safety Shoes
_____ Ice/Cooler, as required
_____ Custody Seals, as required
_____ Chain-of-Custody Forms
_____ Drum Labels, as required
_____ Paint Marker, if drum sampling
_____ Black Indelible Pen
_____ Monitoring Instruments

_____ Labels
_____ Sampling and Analysis Plan
_____ Health and Safety Plan
_____ Decontamination Equipment
_____ Lab Wipes
_____ Lab Spatulas or Stainless Steel Spoons
_____ Chemical Preservatives, as required
_____ Appropriate Containers for Waste and Equipment
_____ Duct Tape
_____ Plastic Sheeting

Attachment A Collection of Liquid Containerized Wastes Using Glass Tubes

Discussion

Liquid samples from opened containers (i.e., 55-gallon drums) are collected using lengths of glass tubing. The glass tubes are normally 122 centimeters long and 6 to 16 millimeters inside diameter. Larger diameter tubes may be used for more viscous fluids if sampling with the small diameter tube is not adequate. The tubing is broken and discarded in the container after the sample has been collected, eliminating difficult cleanup and disposal problems. This method should not be attempted with less than a two-person sampling team.

Uses

This method provides for a quick, relatively inexpensive means of collecting concentrated containerized wastes. The major disadvantage is from potential sample loss which is especially prevalent when sampling low-viscosity fluids. Splashing can also be a problem and proper protective clothing should always be worn.

Note: A flexible tube with an aspirator attached is an alternative method to the glass tube, and allows various levels to be sampled discretely.

Procedures for Use

1. Remove cover from sample container.
2. Insert glass tubing almost to the bottom of the container. Tubing should be of sufficient length so that at least 30 centimeters extend above the top of the container.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Cap the top of the tube with a safety-gloved thumb or a stopper.
5. Carefully remove the capped tube from the drum. If the tube has passed through more than one layer, the boundary should be apparent in the glass tube.
6. Insert the bottom uncapped end into the sample container.
7. Partially release the thumb or stopper on the top of the tube and allow the sample to slowly flow into the sample container. If separation of phases is desired, cap off tube before the bottom phase has completely emptied. It may be advisable to have an extra container for "waste," so that the fluid on either side of the phase boundary can be directed into a separate container, allowing collection of pure phase liquids in the sample containers. The liquid remaining after the boundary fluid is removed is collected in yet a third container. NOTE: It is not necessary to put phases in separate containers if analysis of separate phases is not desired.
8. Repeat steps 2 through 6 if more volume is needed to fill the sample container.
9. Remove the tube from the sample container and replace the tube in the drum, breaking it, if necessary, in order to dispose of it in the drum.

<u>Optional Method</u> (if sample of bottom sludge is desired)

1. Remove the cover from the container opening.
2. Insert glass tubing slowly almost to the bottom of the container. Tubing should be of sufficient length so that at least 30 cm extends above the top of the container.
3. Allow the waste in the drum to reach its natural level in the tube.

4. Gently push the tube towards the bottom of the drum into the sludge layer. Do not force it.
5. Cap the top of the tube with a safely-gloved thumb or stopper.
6. Carefully remove the capped tube from the drum and insert the uncapped end in the sample container.
7. Release the thumb or stopper on the top of the tube and allow the sample container to fill to approximately 90 percent of its capacity. If necessary, the sludge plug in the bottom of the tube can be dislodged with the aid of the stainless steel laboratory spatula.
8. Repeat if more volume is needed to fill sample container and recap the tube.

Note:

1. If a reaction is observed when the glass tube is inserted (violent agitation, smoke, light, etc.), the investigators should leave the area immediately.
2. If the glass tube becomes cloudy or smokey after insertion into the drum, the presence of hydrofluoric acid maybe indicated, and a comparable length of rigid plastic tubing should be used to collect the sample.
3. When a solid is encountered in a drum (either layer or bottom sludge) the optional method described above may be used to collect a core of the material, or the material may be collected with a disposable scoop attached to a length of wooden or plastic rod.

Attachment B: Sampling Containerized Wastes using the Composite Liquid Waste Sample (COLIWASA)

Discussion

The COLIWASA is a much cited sampler designed to permit representative sampling of multiphase wastes from drums and other containerized wastes. The sampler is commercially available or can be easily fabricated from a variety of materials including PVC, glass, or Teflon. In its usual configuration it consists of a 152 cm by 4 cm (inside diameter) section of tubing with a neoprene stopper at one end attached by a rod running the length of the tube to a locking mechanism at the other end. Manipulation of the locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper. See Attachment E: Construction of a COLIWASA.

Uses

The COLIWASA is primarily used to sample containerized liquids. The PVC COLIWASA is reported to be able to sample most containerized liquid wastes except for those containing ketones, nitrobenzene, dimethylforamide, mesityloxide and tetrahydrofuran. A glass COLIWASA is able to handle all wastes unable to be sampled with the plastic unit except strong alkali and hydrofluoric acid solutions. Due to the unknown nature of many containerized waste, it would therefore be advisable to eliminate the use of PVC materials and use samplers composed of glass or Teflon.

The major drawbacks associated with using a COLIWASA concern decontamination and costs. The sampler is difficult, if not impossible, to decontaminate in the field, and its high cost in relation to alternative procedures (glass tubes) makes it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

Procedures for Use

1. Check to make sure the sampler is functioning properly. Adjust the locking mechanism if necessary to make sure the neoprene rubber stopper provides a tight closure.
2. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
3. Slowly lower the sampler into the liquid waste. (Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample).
4. When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.
5. Slowly withdraw the sampler from the waste container with one hand while wiping the sampler tube with a laboratory wipe with the other hand. A phase boundary, if present can be observed through the tube.

6. Carefully discharge the sample into a suitable sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.
7. Unscrew the T-handle of the sampler and disengage the locking block.

Attachment C: Sampling Containerized Wastes using the Bacon Bomb Sampler

Discussion

The Bacon Bomb is designed for the withdrawal of samples from various levels within a storage tank. It consists of a cylindrical body with an internal tapered plunger that acts as a valve to admit the sample. A line attached to the top of the plunger is used to open and close the valve. A removable cover provides a point of attachment for the sample line and has a locking mechanism to keep the plunger closed after sampling. The Bacon Bomb is usually constructed of chrome-plated brass and bronze with a rubber o-ring acting as the plunger sealing surface. Stainless steel versions are also available. The volumemetric capacity is 8, 16, or 32 oz (237, 473, or 946 ml).

Uses

The Bacon Bomb is a heavy sampler suited best for viscous materials held in large storage tanks or in lagoons. If a more non-reactive sampler is needed, the stainless steel version would be used, or any of the samplers could be coated with Teflon.

Procedures for Use

1. Attach the sample line and the plunger line to the sampler.
2. Measure and then mark the sampling line at the desired depth.
3. Gradually lower the sampler by the sample line until the desired level is reached.
4. When the desired level is reached, pull up on the plunger line and allow the sampler to fill for a sufficient length of time before releasing the plunger line to seal off the sampler.
5. Retrieve the sampler by the sample line, being careful not to pull up on the plunger line, thereby accidentally opening the bottom valve.
6. Wipe off the exterior of the sampler body.
7. Position the sampler over the sample container and release its contents by pulling up on the plunger line.

Attachment D: Gravity Corer for Sampling Sludges in Large Containers

Discussion

A gravity corer is a metal tube with a replacement tapered nosepiece on the bottom and a ball or other type of check valve on the top. The check valve allows water to pass through the corer on descent but prevents a washout during recovery. The tapered nosepiece facilitates cutting and reduces core disturbance during penetration. Most corers are constructed of brass or steel and many can accept plastic liners and additional weights.

Uses

Corers are capable of collecting samples of most sludges and sediments. They collect essentially undisturbed samples which represent the strata profile that may develop in sediments and sludges during variations in the deposition process. Depending on the density of the substrate and the weight of the corer, penetration to depths of 75 cm (30 in.) can be attained.

Exercise care when using gravity corers in vessels or lagoons that have liners, because penetration depths could exceed that of the substrate and result in damage to the liner material.

Procedures for Use

1. Attach a precleaned corer to the required length of sample line. Solid braided 5 mm (3/16 in.) nylon line is sufficient; however, 20 mm (3/4-in.) nylon is easier to grasp during hand hoisting. An additional weight can be attached to the outside of the corer if necessary.
2. Secure the free end of the line to a fixed support to prevent accidental loss of the corer.
3. Allow corer to free fall through the liquid to the bottom.
4. Retrieve corer with a smooth, continuous, up-lifting motion. Do not bump corer as this may result in some sample loss.
5. Remove nosepiece from corer and slide sample out of corer into stainless steel or Teflon pan (preferred).
6. Transfer sample into appropriate sample bottle with a stainless steel lab spoon or laboratory spatula.

Attachment E: Construction of a Typical COLIWASA

The sampling tube consists of a 1.52 m (5 ft) by 4.13 cm (1-5/8 in) I.D. translucent plastic pipe, usually polyvinyl chloride (PVC) or borosilicate glass plumbing tube. The closure-locking mechanism consists of a short-length, channeled aluminum bar attached to the sampler's stopper rod by an adjustable swivel. The aluminum bar serves both as a T-handle and lock for the samplers' closure system. When the sampler is in the open position, the handle is placed in the T-position and pushed down against the locking block. This manipulation pushes out the neoprene stopper and opens at the sampling tube. In the closed position, the handle is rotated until one leg of the T is squarely perpendicular against the locking block. This tightly seats the neoprene stopper against the bottom opening of he sampling tube and positively locks the sampler in the closed position. The closure tension can be adjusted by shortening or lengthening the stopper rod by screwing it in or out of the T-handle swivel. The closure system of the sampler consists of a sharply tapered neoprene stopper attached to a 0.95 cm (3/8 in) O.D. rod, usually PVC. The upper end of the stopper rod is connected to the swivel of the aluminum T-handle. The sharply tapered neoprene stopper can be fabricated according to specifications by plastic products manufacturers at an extremely high price, or it can be made in-house by grinding down the inexpensive stopper with a shop grinder.

COLIWASA samplers are typically made out of plastic or glass. The plastic type consists of translucent plastic (usually PVC) sampling tube. The glass COLIWASA uses borosilicate glass plumbing pipe as the sampling tube and a Teflon plastic stopper rod. For purpose of multiphase sampling, clear plastic or glass is desirable in order to observe the profile of the multiphase liquid.

The sampler is assembled as follows:

a. Attach the swivel to the T-handle with the 3.18 cm (1 1/4 in) long bolt and secure with the 0.48 cm (3/16 in) National Coarse (NC) washer and lock nut.
b. Attach the PFTE stopper to one end of the stopper rod and secure with the 0.95 cm (3/8 in) washer and lock nut.
c. Install the stopper and stopper rod assembly in the sampling tube.
d. Secure the locking block sleeve on the block with glue or screw. This block can also be fashioned by shaping a solid plastic rod on a lathe to the required dimension.
e. Position the locking block on top of the sampling tube such that the sleeveless portion of the block fits inside the tube, the sleeve sits against the top end of the tube, and the upper end of the stopper rod slips though the center hole of the block.
f. Attach the upper end of the stopper rod to the swivel of the T-handle.
g. Place the sampler in the close position and adjust the tension on the stopper by screwing the T-handle in or out.

Attachment F: Drum Opening Techniques and Equipment [1]

I. Introduction

The opening of closed drums prior to sampling entails considerable risk if not done with the proper techniques, tools, and safety equipment. The potential for vapor exposure, skin exposure due to splash or spraying, or even explosion resulting from sparks produced by friction of the tools against the drum, necessitate caution when opening any closed container. Both manual drum opening and remote drum opening will be discussed in the following paragraphs. When drums are opened manually risks are greater than when opened remotely. For this reason, the remote opening of drums is advised whenever possible.

Prior to sampling, the drums should be staged to allow easy access. Also, any standing water or other material should be removed from the container top so that the representative nature of the sample is not compromised when the container is opened. There is also the possibility of encountering a water reactive substance.

II. Manual Drum Opening

A. Bung Wrench

A common method for opening drums manually is using a universal bung wrench. These wrenches have fittings made to remove nearly all commonly encountered bungs. They are usually constructed of cast iron, brass, or a bronze-beryllium, (a non-sparking alloy formulated to reduce the likelihood of sparks). The use of bung wrenches marked "NON SPARKING" is encouraged. However, the use of a "NON SPARKING" wrench does not completely eliminate the possibility of spark being produced. Such a wrench only prevents a spark caused by wrench-to-bung friction, but it cannot prevent sparking between the threads on the drum and the bung.

A simple tool to use, the fitting on the bung wrench matching the bung to be removed is inserted into the bung and the tool is turned counterclockwise to remove the bung. Since the contents of some drums may be under pressure (especially, when the ambient temperature is high), the bung should be turned very slowly. If any hissing is heard, the person opening the drum should back off and wait for the hissing to stop. Since drums under pressure can spray out liquids when opened, the wearing of appropriate eye and skin protection in addition to respiratory protection is critical.

B. Drum Deheader

One means by which a drum can be opened manually when a bung is not removable with a bung wrench is by using a drum deheader. This tool is constructed of forged steel with an alloy steel blade and is designed to cut the lid of a drum off or part way off by means of a scissors-like cutting

[1] Taken from EPA Training Course: "Sampling for Hazardous Materials," U.S. Environmental Protection Agency, Office of Emergency and Remedial Response Support Division, March 24, 1987.

action. A limitation of this device is that it can be attached only to closed head drums (i.e., DOT Specification 17E and 17F drums). Drums with removable heads must be opened by other means.
Drums are opened with a drum deheader by first positioning the cutting edge just inside the top chime and then tightening the adjustment screw so that the deheader is held against the side of the drum. Moving the handle of the deheader up and down while sliding the deheader along the chime will enable the entire top to be rapidly cut off if so desired. If the top chime of a drum has been damaged or badly dented it may not be possible to cut the entire top off. Since there is always the possibility that a drum may be under pressure, the initial cut should be made very slowly to allow for the gradual release of any built-up pressure. A safer technique would be to employ a remote pressure release method prior to using the deheader.

C. Hand Pick or Spike

When a drum must be opened and neither a bung wrench nor a drum deheader is suitable, then it can be opened for sampling by using a hand pick, pickaxe, or spike. These tools are usually constructed of brass or a non-sparking alloy with a sharpened point that can penetrate the drum lid or head when the tool is swung. The hand picks or pickaxes that are most commonly used are commercially available: whereas, the spikes are generally uniquely fabricated four foot long poles with a pointed end. Often the drum lid or head must be hit with a great deal of force in order to penetrate it. Because of this, the potential for splash or spraying is greater than with other opening methods and therefore this method of drum opening is not recommended, particularly when opening drums containing liquids. Some spikes used for drum opening have been modified by the addition of a circular splash plate near the penetrating end. This plate acts as a shield and reduces the amount of splash in the direction of the person using the spike. Even with this shield, good splash gear is essential.

Since drums, some of which may be under pressure, cannot be opened slowly with these tools, “sprayers” may result and appropriate safety measures must be taken. The pick or spike should be decontaminated after each drum is opened to avoid cross contamination and/or adverse chemical reaction from incompatible materials.

III. Remote Opening

A. Backhoe Spike

The most common means used to open drums remotely for sampling is the use of metal spike attached or welded to a backhoe bucket. In addition to being very efficient, this method can greatly reduce the likelihood of personnel exposure.
Drums should be “staged” or placed in rows with adequate aisle space to allow ease in backhoe maneuvering. Once staged the drums can be quickly opened by punching a hole in the drum head or lid with the spike.

The spike should be decontaminated after each drum is opened to prevent cross contamination. Even though some splash or spray may occur when this method is used, the operator of the backhoe can be protected by mounting a large shatter-resistant shield in front of the operator's cage. This combined with the normal sampling safety gear should be sufficient to protect the operator. Additional respiratory protection can be afforded by providing the operator with an on-board airline system. The hole in the drum can be sealed with a cork.

B. Hydraulic Devices

Recently, remotely operated hydraulic devices have been fabricated to open drums remotely. One such device is discussed here. This device uses hydraulic pressure to pierce through the wall of a drum. It consists of a manually operated pump which pressurizes oil through a length of hydraulic line. A piercing device with a metal point is attached to the end of this line and is pushed into the drum by the hydraulic pressure. The piercing device and be attached so that a hole for sampling can be made in either the side or the head/lid of the drum. Some of the metal piercers are hollow or tube-like so that they can be left in place if desired and serve as a permanent tap or sampling port. The piercer is designed to establish a tight seal after penetrating the container.

C. Pneumatic Devices

Pneumatically-operated devices utilizing compressed air have been designed to remove drum bungs remotely. A pneumatic bung remover consists of a compressed air supply (usually SCBA cylinders) that is controlled by a heavy-day, 2-stage regulator. A high pressure air line of desired length delivers compressed air to a pneumatic drill, which is adapted to turn a bung fitting (preferably, a bronze-beryllium alloy) selected to fit the bung to be removed. An adjustable bracketing system has been designed to position and align the pneumatic drill over the bung. This bracketing system must be attached to the drum before the drill can be operated. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This attachment and removal procedure is time consuming and is the major drawback of this device. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device.

IV. Summary

The opening of closed containers is one of the most hazardous site activities. Maximum efforts would be made to ensure the safety of the sampling team. Proper protective equipment and a general wariness of the possible dangers will minimize the risk inherent to sampling operations. Employing proper drum opening techniques and equipment will also safeguard personnel. The use of remote sampling equipment whenever feasible is highly recommended.

STANDARD OPERATING PROCEDURE

Shallow Soil Sampling

I. Purpose

To provide general guidelines for the collection and handling of surface soil samples during field operations.

II. Scope

The method described for surface soil sampling is applicable for loosely packed earth and is used to collect disturbed-soil samples.

III. Equipment and Materials

- Sample jars.
- A hand auger or trowel that can be used to remove the soil from the ground. Only stainless steel, Teflon®, or glass materials should be used.
- A stainless steel spatula should be used to remove material from the sampling device.
- Unpainted wooden stakes or pin flags
- Fiberglass measuring tape (at least 10 feet in length)

IV. Procedures and Guidelines

A. Wear protective gear, as specified in the Health and Safety Plan.

B. To locate samples, identify the correct location using the pin flags or stakes. Proceed to collect a sample from the undisturbed soil adjacent to the marker following steps C and D. If markers are not present, the following procedures will be used.

1. Use measuring tape to position sampling point at location described in the sampling plan by taking two measurements from fixed landmarks (e.g., corner of building or concrete sump).
2. Note measurements, landmarks, and sampling point on a sketch in the field notebook, and on a site location map.
3. Proceed to sample as described in Section C below.
4. Repeat steps "a" through "c" above until all samples are collected from the area.

C. To the extent possible, differentiate between fill and natural soil. If both are encountered at a boring location, sample both as prescribed in the field sampling plan. Do not locate samples in debris, tree roots, or standing water. If an obstacle prevents sampling at a measured grid point, move as close as possible, but up to a distance of one half the grid spacing in any direction to locate an appropriate sample. If an appropriate location cannot be found, consult with the Field Team Supervisor (FTS). If the FTS concurs, the sampling point will be deleted from the program. The FTS will contact the JV I project manager (PM) immediately. The PM and Navy Technical

Representative (NTR) will discuss whether the point should be deleted from the program. If it is deleted, the PM will follow-up with the NTR in writing.

D. To collect samples:

1. Use a decontaminated stainless steel scoop/trowel to scrape away surficial organic material (grass, leaves, etc.) adjacent to the stake. New disposable scoops or trowels may also be used to reduce the need for equipment blanks.
2. If sampling:
   a. Surface soil: For VOC sample fraction, use Encore® sampler to collect the sample as described in the *Soil Sampling for VOCs Using the Encore® Sampler* SOP. Collect the remaining sample fractions by scooping soil using the hand auger or trowel, starting from the surface and digging down to a depth of about 6 inches.
   b. Subsurface soil. Obtain the subsurface soil sample using an auger to the depth of 6 inches.
3. Record lithologic description and any pertinent observations (such as discoloration) in the logbook.
4. Empty the contents of the scoop/trowel into a decontaminated stainless steel pan.
5. Repeat this procedure until sufficient soil is collected to meet volume requirements.
6. While soil sample is in stainless steel pan, screen the sample for VOCs by measuring organic vapors directly above the sample using an Organic Vapor Monitor (OVM), and record the OVM reading in the field logbook. Follow the *Volatiles Monitoring by OVM* SOP when using the OVM.
7. Transfer sample for analysis into appropriate containers with a decontaminated utensil.
8. Backfill the hole with original soil retrieved from the hole or with concrete, as appropriate. To the extent possible, replace topsoil and grass and attempt to return appearance of sampling area to its pre-sampled condition.

V. Attachments

None.

VI. Key Checks and Items

- Phthalate-free latex or surgical gloves and other personal protective equipment.
- Transfer volatiles first, avoid mixing.
- Decontaminate utensils before reuse, or use dedicated, disposable utensils.

STANDARD OPERATING PROCEDURE

Soil Sampling for VOCs Using the EnCore® Sampler

I. Purpose and Scope

The purpose of this procedure is to provide guidelines for obtaining all VOC samples of surface and subsurface soils of suitable characteristics using the EnCore® Sampler.

II. Equipment and Materials

- The EnCore® Sampler 5g or 25g versions
- Reusable T-handle with a plunger
- 40 mL VOA vial
- 2 oz wide mouth jar

III. Procedures and Guidelines

The sampling point is located and recorded in the field logbook. Debris should be cleared from the sampling location. The EnCore® sampler is being used to collect, store and deliver soil in a sealed, headspace-free state.

A. **Surface and Shallow Subsurface Sampling**

A shovel, post-hole digger, or other tool can be used to remove soil to a point just above the interval to be sampled. Remove EnCore® sampler from package and attach handle. Quickly collect a 5 or 25 gram sample using the EnCore® sampler. Attach the cap. Fill out a label and attach to sampler. Ship one EnCore® Sampler per sample location. If low-level analyses are needed, two additional EnCore® samplers will be required. T**he EnCore® sampler has to reach the lab for preservation within 48 hours.** Please refer to the SOP *Packaging and Shipping Procedures* for guidance on shipping.
The soils removed from the borehole should be visually described in the field log book, including approximated depths.

When sampling is completed, photo-ionization device (PID) readings should be taken directly above the hole, and the hole is then backfilled.

B. **Split-Spoon Sampling**

Using a drilling rig, a hole is advanced to the desired depth. For split-spoon sampling, the samples are then collected following the ASTM D 1586 standard (attached). The sampler is lowered into the hole and driven to a depth equal to the total length of the sampler; typically this is 24 inches. The sampler is driven in 6-inch increments using a 140-pound weight ("hammer") dropped from a height of 30 inches. The number of hammer

blows for each 6-inch interval is counted and recorded. To obtain enough volume of sample for subsequent laboratory analysis, use of a 3-inch ID sampler may be required. Blow counts obtained with a 3-inch ID spoon would not conform to ASTM D 1586 and would therefore not be used for geotechnical evaluations.

Once retrieved from the hole, the sampler is carefully split open. Care should be taken not to allow material in the sampler to fall out of the open end of the sampler. To collect the sample, the surface of the sample should be removed with an empty EnCore® Sampler. Samples collected for volatiles analysis should be placed directly into the sample containers from the desired depth in the split spoon.

Split-spoon samples also will be collected using a tripod rig. When using a tripod rig the soil samples are collected using an assembly similar to that used by the drilling rig.

IV. Attachments

None

V. Key Checks and Preventative Maintenance

Check that sample collection is swift to avoid loss of volatile organics during sampling.

STANDARD OPERATING PROCEDURE

Volatiles Monitoring by OVM

I. Purpose and Scope

The purpose of this procedure is to provide guidelines for the calibration and use of an OVM Organic Vapor Monitor. This is a broad guideline for field use of an OVM; for specific instruction, refer to the operator's manual.

II. Equipment and Materials

- Operations manual
- An OVM hand readout unit and side pack assembly
- 100 ppm isobutylene as calibration gas
- T-type feeder tube with 1.5 liter/min. regulator

III. Procedures and Guidelines

ONLY PROPERLY TRAINED PERSONNEL SHOULD USE THIS INSTRUMENT. FOR SPECIFIC INSTRUCTIONS, SEE OPERATIONS MANUAL.

OVM, Organic Vapor Monitor

1. Introduction

   The OVM Organic Vapor Monitor is designed to detect organic materials in air. It uses a photo-ionization detector (PID) as its detection principle. This detector allows the monitor to respond to a wide variety of organic compounds.

2. Operational Checks
   - See basic operating instructions in operations manual.
3. Calibration
   - See basic operating instructions in operations manual.

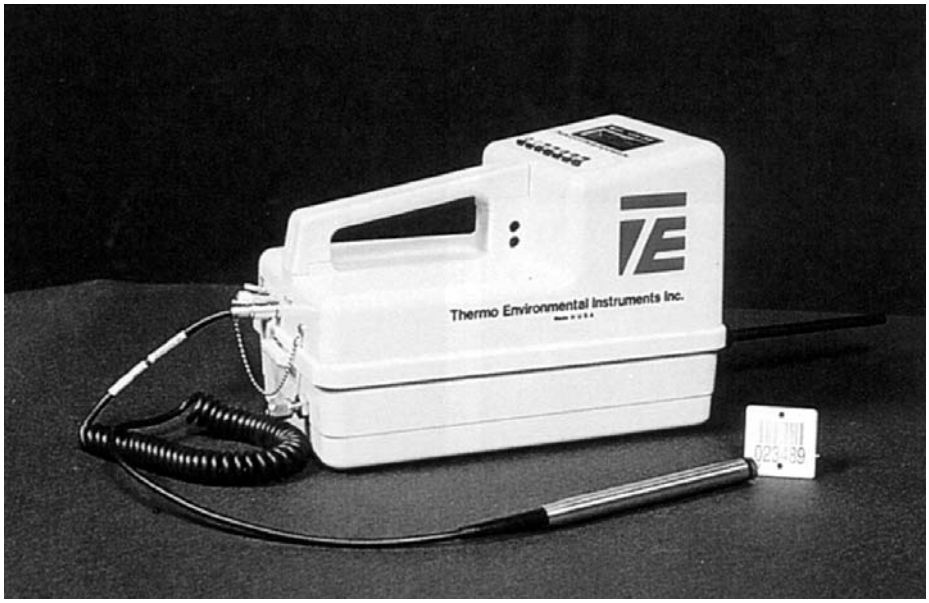
IV. Key Checks and Preventive Maintenance

- Check battery.
- Zero and calibrate at least once every day prior to monitoring.
- Verify sensor probe is working.
- Recharge unit after use.

A complete preventive maintenance program is beyond the scope of this document. For specific instructions, refer to the operations manual. Some key issues are discussed below:

- A complete spare instrument should be available whenever field operations require volatiles monitoring.
- Spare parts should be on hand so minor repairs may be made in the field.
- Batteries should be charged daily.

- Occasionally allow the batteries to totally discharge before recharging to prevent battery memory from occurring.



OVM Datalogger

Calibration Check

Ready Instrument

1. Check to see what lamp is in the instrument.
2. Power-up instrument by plugging in the power plug or the charger cable.

Start Up Instrument

1. Press "ON/OFF" key to ignite lamp and initiate sample pump. The words "LAMP OUT" will be displayed until lamp is ignited. Unit is then operational.

Setting Zero

1. Press "MODE/STORE" key.
2. Using "-/CRSR" key, scroll through: "LOG THIS VALUE"- "R/COMM"- "CONC METER"- "FREE SPACE"-- "RESET TO CALIBRATE." Display should read "RF=1.00".
3. If RF needs to be changed, hold down "RESET" while pressing "-/CRSR" to select cursor position. Then use "+/INC" key to set response factor (RF) to "1.00". Release RESET key only when selection is made.
4. Using "-/CRSR" key, scroll to "LAMP." Verify LAMP setting: If the setting needs to be changed, press "RESET", press "+/INC" for 10 EV LAMP. Press "-/CRSR" for 11 EV LAMP. Press "RESET".
5. Using "-/CRSR" key, scroll through "LAMP"- "ALM"- "AVERAGE"- "LOC. CODE MODE"- "AUTO LOGGING"- "CONC METER"- "FREE SPACE". Display should read "RESET TO CALIBRATE". Press "RESET" key.

6. Press "-/CRSR" in response to "RESTORE BACKUP" prompt.
7. Press "RESET" key. Instrument will zero to ambient air. (Note: Zero gas or a zero filter may be used to set the unit to an absolute zero -- connect prior to pressing "RESET" key.)

Calibration Check and Adjustment

1. Instrument should display "SPAN PPM = - + TO CONTINUE".
2. Press "RESET" and "-/CRSR" keys simultaneously to select cursor position.
3. Press "RESET" and "+/INC" keys simultaneously to scroll through preset SPAN values. Set SPAN = 100, which corresponds to the 100 ppm isobutylene.
4. When span has been entered, press "+/INC" key to continue.
5. Connect span gas cylinder. Turn valve on. Press "RESET" key.
6. When finished calibrating, display will read "RESET TO CALIBRATE". Press "MODE/STORE" key. Display should read about 100 ppm. Turn valve off. Disconnect span gas cylinder.

Troubleshooting

When the analyzer is operating, dust or other foreign matter could be drawn into the probe, forming deposits on the surface of the UV lamp or in the ion chamber. This condition is indicated by meter readings that are low, erratic, unstable, non-repeatable, drifting, or show apparent moisture sensitivity. These deposits interfere with the ionization process and cause erroneous readings.

- If the battery is low, recharge the instrument.
- Drifting readings can mean that the lamp is dirty and needs to be cleaned.
- Humidity can cause false readings.
- High methane concentrations can result in false low readings.

STANDARD OPERATING PROCEDURE

Disposal of Waste Fluids and Solids

I. Purpose and Scope

This SOP describes the procedures used to dispose of hazardous fluid and solid materials generated as a result of the site operations. This SOP does not provide guidance on the details of Department of Transportation regulations pertaining to the transport of hazardous wastes; the appropriate Code of Federal Regulations (49 CFR 171 through 177) should be referenced. Also, the site investigation-derived waste management plan should be consulted for additional information and should take precedence over this SOP.

II. Equipment and Materials

A. Fluids

- DOT-approved 55-gallon steel drums or Baker® Tanks
- Tools for securing drum lids
- Funnel for transferring liquid into drum
- Labels
- Marking pen for appropriate labels
- Seals for 55-gallon steel drums

B. Solids

- DOT-approved 55-gallon steel drums
- Tools for securing drum lids
- Plastic sheets
- Labels
- Marking pen for appropriate labels

III. Procedures and Guidelines

A. Methodology

Clean, empty drums will be brought to the site by the subcontractor for wastewater collection and storage. The empty drums will be located at the field staging area and moved to field locations as required. The drums will be filled with the wash water, rinse water, and decon fluids, and capped, sealed, and moved to the onsite drum storage area by the subcontractor. The drums will be labeled as they are filled in the field and labels indicating that the contents are potentially hazardous affixed.

The drum contents will be sampled to determine the disposal requirements of the wash and rinse waters. Compositing of the sample will be accomplished by collecting a specific volume of the water in each drum into a large sample container.

B. Labels

Drums and other containers used for storing wastes from cleaning operations will be labeled when accumulation in the container begins. Labels will include the following minimum information:

- Container number
- Container contents
- Origin (source area)
- Date that accumulation began
- Date that accumulation ended
- When laboratory results are received, drum labels will be completed or revised to indicate the hazardous waste constituents in compliance with Title 40 of the Code of Federal Regulations, Part 262, Subpart C.

C. Fluids

Wash water, rinse water, and decontamination fluids generated during cleaning of the facility will be collected in 55-gallon, closed-top drums. When a drum is filled, the bung will be secured tightly. Fluids may also be transferred to Baker® Tanks after being temporarily contained in drums to minimize the amount of drums used.

When development and purging is completed, the water will be tested for appropriate hazardous waste constituents. Compositing and sampling of fluids will comply with applicable state and federal regulations.

D. Solids

The solid waste stream will include plastic sheeting used for decontamination pads, Tyveks, disposable sampling materials, and any other disposable material used during the field operations that appears to be contaminated. These materials will be placed in designated drums.

E. Storage and Disposal

The wastes generated at the site at individual locations will be transported to the fenced drum storage area by the subcontractor.

Waste solid materials that contain hazardous constituents will be disposed of at an offsite location in a manner consistent with applicable solid waste, hazardous waste, and water quality regulations. Transport and disposal will be performed by a commercial firm under subcontract.

The liquid wastes meeting acceptable levels of discharge contamination may be disposed of through the sanitary sewer system at the site. Prior to disposal to the sanitary sewer system, contract arrangements will be made with the appropriate authorities. Wastes exceeding acceptable levels for disposal through the sanitary sewer system will be disposed of through contract with a commercial transport and disposal firm.

IV. Attachments

None.

V. Key Checks and Preventative Maintenance

Check that representative samples of the containerized materials are obtained.