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November 9, 2007

U.S. Environmental Protection Agency - Region II
290 Broadway – 22nd Floor
New York, New York 10007-1866

Attn: Mr. Adolph Everett, P.E.
Chief, RCRA Programs Branch

Re: Contract N62470-07-D-0502
IQC for A/E Services for Multi-Media
Environmental Compliance Engineering Support
Delivery Order (DO) 0002
U.S. Naval Activity Puerto Rico (NAPR)
EPA I.D. No. PR2170027203
Final Additional Data Collection Work Plan in Support of the Ecological Risk Assessment

Dear Mr. Everett:

Baker Environmental, Inc. (Baker), on behalf of the Navy, is pleased to provide you with one hard copy of the replacement cover and spine, inside cover, text, tables, figures, and appendix for the Draft Additional Data Collection Work Plan in Support of the Ecological Risk Assessment for SWMU 14, Naval Activity Puerto Rico for your review and approval. These replacement pages make up the Final Additional Data Collection Work Plan in Support of the Ecological Risk Assessment for SWMU 14. Directions for inserting the replacement pages into the Draft Additional Data Collection Work Plan in Support of the Ecological Risk Assessment for SWMU 14 are provided for your use. Also included with the copy of the replacement pages is one electronic copy provided on CD of the Final Additional Data Collection Work Plan in Support of the Ecological Risk Assessment for SWMU 14 Naval Activity Puerto Rico.

This document is being submitted in accordance with the EPA comments dated September 24, 2007 on the Draft Additional Data Collection Work Plan in Support of the Ecological Risk Assessment for SWMU 14 dated July 20, 2007 and the Navy responses to these comments that are attached for your review.

If you have questions regarding this submittal, please contact Mr. Mark E. Davidson at (843) 743-2135. Additional distribution has been made as indicated below.

Sincerely,

MICHAEL BAKER JR., INC.

Mark E. Kimes, P.E.
Activity Coordinator

MEK/lp
Attachments

cc: Ms. Debra Evans-Ripley, BRAC PMO SE (letter only)
Mr. David Criswell, Navy BRAC PMO SE (letter only)
Mr. Jeffrey G. Meyers, Navy BRAC PMO SE (letter only)
Mr. Mark Davidson, Navy BRAC PMO SE (1 hard copy and 1 CD)
Mr. Pedro Ruiz, NAPR (1 hard copy and 1 CD)
Ms. Bonnie Capito, NAVFAC Atlantic – Code EV42 (1 hard copy)
Mr. Tim Gordon, US EPA Region II (1 hard copy and 1 CD)
Mr. Andrew Dorn, TechLaw Inc. (1 CD)
Mr. Carl Soderberg, US EPA Caribbean Office (1 CD)
Mr. Manny Vargas, PR EQB (1 hard copy and 1 CD)
Ms. Josefina Gonzalez, PR EQB (1 CD)
Mr. Felix Lopez, U.S. F&WS (1 CD)

NAVY RESPONSES TO EPA COMMENTS DATED SEPTEMBER 24, 2007

**DRAFT ADDITIONAL DATA COLLECTION WORK PLAN
IN SUPPORT OF THE ECOLOGICAL RISK ASSESSMENT, SWMU 14
DATED JULY 20, 2007**

EPA General Comment

EPA has completed its review of the above work plan submitted on July 20, 2007 by Baker Environmental on behalf of the Navy. EPA has determined that the Draft Additional Data Collection Work Plan in Support of Ecological Risk Assessment for SWMU 14 is not fully acceptable. Comments on the draft work plan are given in the enclosed Technical Review prepared for EPA by our consultant, TechLaw, Inc. EPA concurs with those comments. Please submit by 45 days from the date of your receipt of this letter a revised work plan, addressing comments given in the enclosed Technical Review dated August 22, 2007

Navy Response to EPA General Comment

Please see the responses below to comments made by TechLaw on the Draft Additional Data Collection Work Plan in Support of Ecological Risk Assessment for SWMU 14.

TechLaw General Comment No. 1

1. The WP addresses data gaps from past studies. These data gaps were large enough that a full evaluation of ecological risk from exposure to soil, surface water and sediment could not be completed. The WP proposes only to collect additional soil samples without obtaining surface water and sediment samples. The WP describes a "somewhat phased" approach pending the proposed soil sample results. It is indicated that additional media may be sampled only if the soil analysis yields concentrations above 'ecologically important values'. The most 'valued ecological resource' in the area is the adjacent wetland (PEM1). It is critically important to sample the entire flow pathway from SWMU 14 to and including the wetland. The analytical results (soil → sediment and surface water) will then provide the data to assess the ecological risk concerns with the wetland. Revise the WP to include a surface water and sediment sampling component for the wetland.

Navy Response to TechLaw General Comment No. 1: The Navy respectfully disagrees with this comment. As discussed in the Final RFI Report (Baker, 2007) and draft Work Plan, the drainage ditch runs from the southern portion of SWMU 14 along the airfield runway for approximately 3,100 feet and continues in a southern direction for approximately an additional 3,600 feet before terminating within the PEM1 wetland unit. As such, any chemicals associated with a release from SWMU 14 to the drainage ditch would have to travel approximately 6,700 linear feet (approximately 1.3 miles) to reach the wetland unit. Furthermore, current aerial photographs show that the drainage ditch is heavily vegetated. Historical aerial photographs also show that the drainage ditch was heavily vegetated along its entire length during operation of the original fire training pit. The current and historical presence of vegetation within the drainage ditch would serve to hinder the migration of SWMU-related chemicals with surface soil. While a potential historical migration pathway exists for the transport of chemicals associated with fire training activities from the original fire training pit to the PEM1 wetland unit, it can not be assumed at this time that chemicals have migrated along the entire length of the drainage ditch. The proposed sampling and analysis program will determine if a

release from to the drainage ditch has occurred. Furthermore, the proposed sampling and analysis plan will determine if chemicals associated with fire training activities have migrated along the entire length of the drainage ditch. If the sampling program indicates that a release from SWMU 14 to the drainage ditch has occurred and that chemicals associated with fire training activities have migrated along the entire length of the drainage ditch, the Navy will provide a proposal for a surface water and sediment sampling program within the PEM1 wetland unit.

References:

Baker Environmental, Inc. (Baker). 2007. Final RCRA Facility Investigation, Fire Training Pit Area, SMWU 14, Naval Activity Puerto Rico, Ceiba, Puerto Rico. May 23, 2007.

TechLaw General Comment No. 1

2. The WP refers to 'ecologically important concentrations' several times (Subsection 1.1, second paragraph) without clearly defining the meaning of this term. It is later defined (Subsection 2.4.3, pg 2-6) as 'concentrations that are greater than soil screening values and statistically elevated above background concentrations'. This definition indicates that 1) the soil screening values have already been identified, and 2) a method has been developed to establish background concentrations and make statistical comparisons. Both the soil screening levels and background evaluation method need to be described to complete the WP. Several resources were referenced (e.g., Baker, 2006 'Final Summary Report for Environmental Background Concentrations of Inorganic Compounds') without describing how these resources would be used with the new data. The WP needs to be revised to provide a complete list of soil screening values (and their sources) and to describe the method for background comparisons that will be used in the revised SERA and BERA.

Navy Response to TechLaw General Comment No. 2: The work plan will be revised to include the soil screening values (see Section 4.1 and tables 4-1 and 4-2) that will be used to revise the screening-level ecological risk assessment (SERA). The screening values that will be used are identical to those that were previously used in Step 2 of the SERA presented within the Final RCRA Facility Investigation Report for SWMU 14 (Baker, 2007). Section 4 of the Work Plan also will be revised to include a description of the various sources of ecological soil screening values, as well as the preference hierarchy used in their selection.

Statistical evaluations will be performed as a line of evidence in Step 3a of the baseline ecological risk assessment (BERA) to determine if inorganic chemicals in surface and subsurface soil identified as ecological COPCs in Step 2 of the Navy ecological risk assessment (ERA) process warrant additional evaluation beyond Step 3a. For a given medium (i.e., surface soil and subsurface soil), the background data that will be used in the statistical evaluation are the data sets presented and discussed within the *Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds* (Baker, 2006). The statistical comparisons will be conducted in accordance with Navy guidance (Naval Facilities Engineering Service Center [NFESC], 2002). Statistical comparisons will include descriptive summaries of each data set (maximum, minimum, mean, and 95 percent upper confidence limit [UCL] concentrations), statistical tests on the mean/median of the distributions (i.e., student's t-test, Wilcoxin rank sum test, Gehan test, or Satterthwaite's t-test), statistical tests on the right tail of the distributions (i.e., quantile test and/or slippage test), and/or proportional statistics (one sample test of proportions). The significance level (the probability criteria for rejecting the null hypotheses that data sets were sampled from the same population) will be set at 0.05 for all statistical tests (NFESC, 2002). The Work Plan will be revised to include a description of

the methodology that will be used to statistically evaluate the surface and subsurface soil data (see Section 4.2).

References:

Baker Environmental, Inc. (Baker). 2007. Final RCRA Facility Investigation, Fire Training Pit Area, SMWU 14, Naval Activity Puerto Rico, Ceiba, Puerto Rico. May 23, 2007.

Baker. 2006. Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds. Naval Activity Puerto Rico, Ceiba, Puerto Rico. October 17, 2006.

Naval Facilities Engineering Support Center (NFESC). 2004. Guidance for Environmental Background Analysis. Volume III: Groundwater. NFESC User's Guide UG-2059-ENV. April 2004.

NFESC. 2002. Guidance for Environmental Background Analysis. Volume I: Soil. NFESC User's Guide UG-209-ENV. April 2002.

TechLaw General Comment No. 3

3. It is unclear in the WP how the fire pit will be handled in the future (refer to Subsection 2.3). It is unknown if the pit will remain as is or will be returned to a more natural setting. Future use is an important consideration to the SERA/BERA process as it may affect the choice of assessment and measurement endpoints. If SWMU 14 is to retain a physically disturbed character, then potential for ecological risk can be placed into context with the surrounding land use. On the other hand, if SWMU 14 were to transition to more valuable habitat, then a more thorough evaluation of risk may be warranted since exposure settings could change over time. Please revise the WP to describe the anticipated future land use for SWMU 14 and whether this use would affect the scope of work described in the WP.

Navy Response to TechLaw General Comment No, 3: Future land use is not anticipated to change (i.e., the upland vegetative community at SWMU 14 will continue to be grasses maintained via cutting operations). Therefore, the scope of work described within the Work Plan does not require revision. It is noted that even if the upland vegetative community would return to a more natural condition (i.e., coastal scrub forest community), the assessment endpoints evaluated by the SERA (i.e., survival, growth, and reproduction of terrestrial plants and invertebrates, terrestrial avian herbivores, terrestrial avian omnivores, and terrestrial avian carnivores) would not change. Section 2.3 will be revised to include a description of anticipated future land use.

TechLaw General Comment No. 4

4. Excluding groundwater from the ERA process is not well supported. The general statements describing the groundwater setting (bullet points on page 2-5) are not supported by quantitative groundwater flow information. A groundwater connection to the adjacent wetland cannot be excluded in the absence of groundwater flow pathway information. Please update the WP to include more substantial information to support the position that groundwater does not represent an exposure point for ecological receptors.

Navy Response to TechLaw General Comment No. 4: Quantitative groundwater flow information is not available for SWMU 14. While the Navy believes that groundwater does not represent an exposure point for ecological receptors based on the reasons given in the work plan and the fact that groundwater yields at SWMU 14 were observed to be low during the 2006 RFI field investigation (i.e., static water levels were not observed prior to sampling and the temporary monitoring wells yielded less than 1,000 milliliter of water in a day of sampling), Section 2.4.2 of the Work Plan will be revised to indicate that available groundwater data will be evaluated by the revised SERA. It is noted that a list of freshwater screening values has not been established for Appendix IX volatiles, semivolatiles, and metals for use at NAPR. Furthermore, available funding is not available to develop a list of freshwater screening values for all Appendix IX volatiles, semi-volatiles, and metals as part of these responses to comments, nor is funding available to develop screening values during revision of the SERA. For this reason, as well as the Navy's contention that groundwater does not represent an exposure point for ecological receptors, the SERA will only evaluate those chemicals detected in one or more of the temporary monitoring wells. Freshwater screening values for the detected chemicals will be developed and presented within the SERA. The SERA also will be revised to include a description of the various sources of freshwater screening values, as well as the preference hierarchy used in their selection. Appendix C of the Work Plan will be added to include groundwater analytical data from the 2006 RFI field investigation.

Identical to surface and subsurface soil, statistical evaluations will be performed as a line of evidence in Step 3a of the BERA to determine if inorganic chemicals in surface and subsurface soil identified as ecological COPCs in Step 2 of the Navy ERA process warrant additional evaluation beyond Step 3a. The background groundwater analytical data that will be used in the statistical evaluation are the groundwater data set presented and discussed within the *Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds* (Baker, 2006). The statistical comparisons will be conducted in accordance with Navy guidance (NFESC, 2004). The statistical process that will be used to evaluate the data was previously described in the Navy's Response to General Comment No. 2.

References:

Baker. 2006. Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. October 17, 2006.

Naval Facilities Engineering Command (NFESC). 2004. Guidance for Environmental Background Analysis. Volume III: Groundwater. NFESC User's Guide UG-2059-ENV. April 2004.

NFESC. 2002. Guidance for Environmental Background Analysis. Volume I: Soil. NFESC User's Guide UG-209-ENV. April 2002.

TechLaw General Comment No. 5

5. The WP indicates that samples will be analyzed for a targeted set of chemicals (PAHs and metals) which were detected in earlier studies. It is suggested that the organic carbon (OC) content and pH of the soil samples be measured. The OC content will provide an indication of bioavailability for the PAHs if the soil were to become sediment. Certain metals (e.g., aluminum) also become bioavailable at specified pH levels. Integrating chemical concentrations with OC and pH will help support more definitive risk conclusions. It is suggested that these two parameters be included in the analysis program.

Navy Response to TechLaw General Comment No. 5: The Navy agrees with this comment. Section 3.1of the Work Plan and associated Table 3-1 will be revised to indicate that the drainage ditch surface soil samples will be analyzed for total organic carbon and pH.

TechLaw General Comment No. 6

6. The WP proposes to analyze a single surface soil sample for dioxins/furans. It appears that this minimalist approach is attributable to the lack of a source associated with past activities at the pit. Regardless, the WP needs to clearly state the rationale behind the decision to analyze only one surface soil sample for dioxins/furans.

Navy Response to TechLaw General Comment No. 6: Two dioxin/furan chemicals (1,2,3,4,6,7,8-HpCDD and OCDD) were detected in a single subsurface soil sample collected during the March 2006 RFI field investigation. Using the 2,3,7,8-TCDD equivalent concentration for the detected and non-detected dioxin/furan chemicals, screening-level risk estimates (i.e., hazard quotient values) for the American robin, mourning dove, and red-tailed hawk exceeded 1.0, indicating the potential for unacceptable risk. Hazard quotient values greater than 1.0 can be attributed to the inclusion of non-detected results in the derivation of the 2,3,7,8-TCDD equivalent concentration (the maximum hazard quotient value using detected results is 0.27).

Based on these two detections, it was decided to include dioxin/furan chemicals as part of the drainage ditch soil sampling and analysis program. However, based on lack of sufficient funding and the discussion presented in the preceding paragraph, only a single drainage ditch soil sample location (14D-SB01) was proposed for analysis of dioxin/furan chemicals. As evidenced by Figure 3-1 of the draft Work Plan, this drainage ditch soil sample will be collected at a point immediately downgradient from the location of the original fire training pit. Therefore, any release from the original fire training pit would be indicated by this sample. Section 3.1 of the Work Plan will be revised to include the rational for the decision to analyze only one drainage ditch soil sample for dioxin/furan chemicals.

TechLaw General Comment No. 7

7. The WP needs to be thoroughly revised in order to link the figures to the text. It is unclear what purpose the figures serve and why certain types of information are provided within them (e.g., polygons of information in Figure 1-2). It is also suggested that the location of the PEM wetland be clarified in Figure 3-1 in order to place the proposed sampling program in relation to the target wetland. Please revise the WP and include only those figures with relevant information to the project.

Navy Response to TechLaw General Comment No. 7: The Navy respectfully disagrees with this comment. Specifically, the Navy does not believe that the Work Plan needs to be thoroughly revised in order to link figures to the text. Furthermore, the Navy believes that the purpose of the various figures is clearly defined. However, the following revisions will be made:

- Figure 1-2 will be renamed "NAPR SWMU and AOC Location Map".
- Figure 3-1 will be revised to show the location of the PEM1 wetland unit.

TechLaw General Comment No. 8

8. Table 2-1 summarizes the previous SERA findings. However, in order to better understand the potential risk conditions, it is suggested that the actual calculated HQs for those detected chemicals with HQs > 1 be presented. This additional information will highlight which chemicals are the import risk drivers. Please revise Table 2-1 to include the actual, calculated HQs for the detected chemicals.

Navy Response to TechLaw General Comment No. 8: Table 2-1 will be revised to show actual hazard quotient values for the detected chemicals identified as ecological COPCs.

FINAL ADDITIONAL DATA COLLECTION WORK PLAN IN SUPPORT OF THE ECOLOGICAL RISK ASSESSMENT SWMU 14

For NAVAL ACTIVITY PUERTO RICO
EPA I.D. No. PR2170027203
CEIBA, PUERTO RICO

Prepared for:

Department of the Navy
NAVFAC SOUTHEAST
North Charleston, South Carolina

Prepared by:

Baker

Michael Baker Jr., Inc.
Moon Township, PA

Contract No. N62470-07-D-0502
DO 0002

November 9, 2007

IQC for A/E Services for Multi-Media Environmental Compliance Engineering Support

FINAL

ADDITIONAL DATA COLLECTION WORK PLAN IN SUPPORT OF ECOLOGICAL RISK ASSESSMENT SWMU 14

NAVAL ACTIVITY PUERTO RICO
EPA I.D. NO. PR2170027203
CEIBA, PUERTO RICO

NOVEMBER 9, 2007

Prepared for:

DEPARTMENT OF THE NAVY
NAVFAC SOUTHEAST
North Charleston, SC

Under:

Contract No. N62470-07-D-0502
DELIVERY ORDER 0002

Prepared by:

MICHAEL BAKER JR., INC.
Moon Township, Pennsylvania

I certify under penalty of law that I have examined and am familiar with the information submitted in this document and all attachments and that this document and its attachments were prepared either by me personally or under my direction or supervision in a manner designed to ensure that qualified and knowledgeable personnel properly gather and present the information contained therein. I further certify, based on my personal knowledge or on my inquiry of those individuals immediately responsible for obtaining the information, that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowingly and willfully submitting a materially false statement.

Signature _____

Name:__Jeffrey G Meyers_____

Title:___BRAC Env. Coordinator_

Date:___November 9, 2007_____

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LIST OF ACRONYMS AND ABBREVIATIONS

AFFF	Aqueous Film Forming Foam
AQUIRE	Aquatic Toxicity Information Retrieval
AUF	Area Use Factor
BAF	Bioaccumulation Factor
Baker	Baker Environmental Inc. or Michael Baker Jr., Inc.
BCF	Bioconcentration Factor
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BRAC	Base Realignment and Closure
CCME	Canadian Council of Ministers of the Environment
CNO	Chief of Naval Operations
COPC	Chemical of Potential Concern
DO	Delivery Order
DRO	Diesel Range Organics
EC_{50}	Median Effective Concentration
Eco-SSL	Ecological Soil Screening Level
ERA	Ecological Risk Assessment
FCV	Final Chronic Value
FMTUD	Facility Management Transportation and Utility Division
GRO	Gasoline Range Organics
GPS	Global Positioning System
HHRA	Human Health Risk Assessment
HSWA	Hazardous and Solid Waste Amendments (to RCRA)
IAS	Initial Assessment Study
IDW	Investigation Derived Waste
JP-5	Jet Propellant-5
LC_{50}	Median Lethal Concentration
LOAEL	Lowest Observed Adverse Effect Level
LOEC	Lowest Observed Effect Concentration
LOEL	Lowest Observed Effect Level
MATC	Maximum Acceptable Toxicant Concentration
MHSPE	Ministry of Housing, Spatial Planning and Environment
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NACIP	Navy Assessment and Control of Installation Pollutants
NAPR	Naval Activity Puerto Rico

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

NAVFAC	Naval Facilities
NAWQC	National Ambient Water Quality Criteria
NEESA	Naval Energy and Environmental Support
NFESC	Naval Facilities Engineering Service Center
NOEC	No Observed Effect Concentration
NOAA	National Oceaninc and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level
NOEL	No Observed Effect Level
NSRR	Naval Station Roosevelt Roads
NTR	Navy Technical Representative
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PEM1	Palustrine Emergent Persistent
PID	Photoionization Detector
PMO	Project Management Office
PPE	Personal Protective Equipment
ppm	parts per million
Purple K	Potassium Bicarbonate
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SCV	Secondary Chronic Value
SE	Southeast
SERA	Screening-Level Ecological Risk Assessment
SOP	Standard Operating Procedure
SQUIRT	Screening Quick Reference Table
SWMU	Solid Waste Management Unit
SVOC	Semi-Volatile Organic Compound
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This work plan presents the technical approach for collecting and analyzing field samples to address a data gap identified in the screening-level ecological risk assessment (SERA) for Solid Waste Management Unit (SWMU) 14 - Fire Training Pit at Crash Crew Area located at Naval Activity Puerto Rico (NAPR), formerly Naval Station Roosevelt Roads (NSRR), Ceiba, Puerto Rico. Analytical data generated by the field investigation will be used to revise the SERA, which was previously presented in the Final Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for SWMU 14 (Baker Environmental, Inc [Baker], 2007). Step 3a of the baseline ecological risk assessment (BERA) also will be conducted and included with the revised SERA.

This document was prepared by Michael Baker Jr., Inc. (Baker), for the Navy Base Realignment and Closure (BRAC) Program Management Office (PMO) Southeast (SE) office under contract with the Naval Facilities (NAVFAC) SE (Contract No. N62470-07-D-0502, Delivery Order [DO] 0002).

1.1 Objective

The objective of this work plan is to present the technical approach for the collection and analysis of field samples at SWMU 14 to address a data gap identified in the SERA. The data gap is associated with the original fire training pit, which was connected to a drainage ditch via a swale. Fluids associated with fire training operations may have discharged to the drainage ditch. The drainage ditch eventually terminates within a freshwater wetland unit. Soil samples were not collected from the drainage ditch, nor were surface water or sediment samples collected from the PEM1 wetland during previous field investigations (1996 and 2006 RFIs [see Section 2.2]). Because the PEM1 wetland unit represents a potential exposure point where ecological receptors could contact affected media (i.e., surface water and sediment), the lack of ditch soil analytical data (which can be used to indicate if a release to the drainage ditch has occurred) or surface water and sediment analytical data (which would indicate if chemicals associated with fire training operations have migrated to the wetland) prevented an evaluation of this potential transport pathway in the SERA. The sampling and analysis program proposed within this work plan will involve the collection and analysis of drainage ditch soil samples (surface and subsurface). Analytical data for the soil samples will be used to determine if the drainage ditch represents a potential transport pathway for the migration of chemicals associated with fire training operations to the PEM1 wetland unit.

The drainage ditch soil analytical data generated by the additional data collection field investigation will be used to revise the SERA previously presented in the Final RFI report (Baker, 2007). The existing surface and subsurface soil analytical data and the drainage ditch soil analytical data also will be used to conduct Step 3a of the BERA. If the drainage ditch soil analytical data indicate that fire training chemicals may have migrated to the Palustrine Emergent Persistent (PEM1) wetland unit at ecologically important concentrations, the ecological risk assessment (ERA) will recommend additional data collection activities within the PEM1 wetland unit. Migration at ecologically important concentrations will be based on a comparison of the drainage way analytical data to soil screening values in Step 2 and Step 3a of the Navy ERA process (see Section 2.2.1 for a discussion of the Navy ERA process and Section 4.1 for a discussion of screening values), as well as statistical comparisons of the drainage ditch soil analytical data to background soil data contained within the Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2006). Statistical evaluations will be conducted in Step 3a of the Navy ERA process in accordance with Navy guidance (Naval Facilities Engineering Service Center [NFESC], 2002; see Section 4.2 for description of statistical methods). The spatial distribution of detections greater than soil screening values will be taken into consideration.

1.2 Organization of the Work Plan

This work plan is organized into seven sections. Section 1.0 of this document includes the SWMU history and objectives of the additional data collection to support the ERA. Section 2.0 provides a description of current conditions and a summary of previous investigations, including the SERA. Section 3.0 provides a description of the activities that will be performed during the proposed field investigation (drainage ditch soil sampling and analysis program). The reporting activities that will be conducted following the completion of the field investigation are described in Section 4.0. Section 5.0 discusses the proposed project schedule for the field investigation and reporting activities. The site management structure that will be utilized during this investigation, including project team responsibilities and field reporting requirements, is presented in Section 6.0, while Section 7.0 presents the report references.

2.0 NAPR AND SWMU 14 BACKGROUND

The following sections provide a description and history NAPR and SWMU 14, current conditions at the SWMU, and previous investigations that have been conducted at SWMU 14.

2.1 NAPR Description and History

NAPR occupies over 8,600 acres on the northern side of the east coast of Puerto Rico, along Vieques Passage, with Vieques Island lying to the east about 10 miles off the harbor entrance (see Figure 1-1). The north entrance to NAPR is about 35 miles east along the coast road (Route 3) from San Juan. The closest large town is Farjardo (population approximately 37,000), which is located approximately 10 miles north of NAPR off Route 3. Ceiba (population approximately 17,000) adjoins the western boundary of NAPR (see Figure 1-1). NAPR was commissioned in 1943 as a Naval Operations Base and re-designated a Naval Station in 1957. NAPR continued in this status until 1957 when it was re-designated NSRR with the mission of providing full support for Atlantic Fleet weapons training and development activities. NSSR operated as a Naval Station until March 31, 2004 at which time NSRR underwent operational closure. On April 1, 2004, NSSR was re-designated as NAPR. The current primary mission of NAPR is to protect the physical assets remaining, comply with environmental regulations, and sustain the value of the property until final disposition of the property.

2.2 SWMU 14 Description and History

SWMU 14 (Fire Training Pit Area) is located north of the base airport runway, adjacent to the airport fire station (see Figure 1-2). The SWMU was operated by the Air Operations Department from the early 1960s through 1983. The SWMU includes three different fire training pits, described as the original pit, temporary pit, and current pit (see Figure 1-3). The original fire training pit was an unlined pit approximately 40 feet in diameter that was used from the early 1960s through the beginning of 1983. The Initial Assessment Study (IAS) conducted in 1984 estimated that approximately 120,000 gallons of waste solvents, fuels, and oils were placed in the pit and set on fire for fire fighting training during the nearly 20 years of operation (Naval Energy and Environmental Support Activity [NEESA], 1984). Wood, trash, plastic, fuel filter elements, oily rags, and other debris also were burned. The fires were extinguished using aqueous film forming foam (AFFF) and potassium bicarbonate (Purple K). Past aerial photographs show drainage from this pit via a swale to a drainage ditch along the runway shoulder. The drainage ditch runs from the southern portion of SWMU 14 southwestward along the airfield runway for approximately 3,100 feet. At the southwestern end of the runway, the drainage ditch continues in a southern direction for approximately an additional 3,600 feet before terminating within a wetland unit classified as Palustrine Emergent Persistent (PEM1) by the Cowardin Wetland Classification System (Cowardin et al., 1979).

The original pit was taken out of operation at the beginning of 1983 for the construction of a new concrete-lined fire training pit. The new/current training pit, approximately 40 feet in diameter, was constructed at the same location as the original fire training pit, and includes a 10-foor wide concrete apron. Fluids from the fire training operations were contained in the pit and passed through an oil/water separator (SWMU 12) before entering the Forestall Wastewater Treatment system. (It is noted that the RCRA Section 7003 Administrative Order states that the corrective action for SWMU 12 is complete without controls). A drainage system encircling the apron intercepted any overtopping, which also was directed to the oil/water separator. When the new/current pit was built, all of the visibly oil-stained, contaminated soil was excavated in the immediate vicinity of the old pit. There are no records of ultimate disposal for this contaminated material. A sample of this soil was colleted and no polychlorinated biphenyls (PCBs) were detected (NEESA, 1984). No other specific

information is available concerning the depth and aerial extent of soil contamination identified and excavated in 1983. The drainage swale connecting the original pit to the drainage ditch (identified in the description of the original pit above) was graded over during the construction of the new pit and is no longer present at this site.

The new/current fire training pit was utilized for training purposes until March 31, 2004 when operations ceased. The training consisted of Navy personnel simulating an aircraft crash by igniting pieces of aircraft with two or three 55-gallon containers of jet fuel (JP-5[Jet Propellant-5]) per training session. Personnel were required to use water (only) to extinguish the training fires developed at this pit. On average, fire training activities lasted from three to four hours and were conducted two to three times per month.

A temporary fire training pit was constructed to the north of the original pit location and was in operation during the construction of the current fire training pit in 1983. This temporary pit was an unlined gravel pit with an approximate diameter of about 2,000 feet and was used approximately six times. An estimated 3,000 gallons of waste fuel, oil, and solvents were burned in this area. Only small amounts of fuel were allowed to soak into the ground (NEESA, 1984). The temporary fire training pit is currently covered with grass and is maintained via grass cutting operations.

2.3 Current Conditions

Fire training operations ceased on March 31, 2004, which corresponds to the operational closure of NSRR. The current fire training pit is a concrete structure, constructed below grade, with a concrete apron. The area contiguous to the current fire training pit is covered with grass and maintained via grass cutting operations. The temporary pit utilized in 1983 also is covered with maintained grasses. Future land use as an airport is not anticipated to change (i.e., the upland vegetative community at SWMU 14 will continue to be limited to maintained grasses). Photographs of the drainage ditch historically connected to the original fire training pit are included as Appendix A.

2.4 Previous Investigations

Various investigations have been conducted at SWMU 14, including an IAS (NEESA, 1984), a Phase I RFI (Baker, 1996), a preliminary human health risk assessment (HHRA) (Baker, 2000a), a Draft Interim Decision Document (Baker, 2000b), and a RFI (Baker, 2007). These investigations, as well as other miscellaneous items are discussed below.

The Navy conducted an IAS in 1984 to identify and assess sites posing a potential threat to human health or to the environment due to contamination from past hazardous waste operations (NEESA, 1984). The IAS reviewed historical records, aerial photographs, surface and aerial surveys, and personnel interviews. Because contaminated soils associated with the original fire pit were removed during construction of the new pit and no PCBs were detected, and because the temporary pit was used so little, the IAS team concluded that there is no threat to human health or the environment from this site. No further action under the Navy Assessment and Control of Installation Pollutants (NACIP) Program was warranted.

The 1994 RCRA/Hazardous and Solid Waste Amendments (HSWA) Permit issued to NSRR requested that a Phase I RFI be conducted to encompass subsurface soils down to the water table. A groundwater investigation was contingent on the subsurface soil sampling results. Project Plans were developed and approved by the United States Environmental Protection Agency (USEPA) to conduct the Phase I RFI for SWMU 14. The Final Phase I RFI document (Baker, 1995) contains the entire set of project plans including a Project Management Plan, Data Collection Quality Assurance Plan, and the Health and Safety Plan.

The Phase I RFI field investigation was conducted in March 1996. This field investigation included the performance of a limited soil gas survey along the perimeter of the original/current fire training pit and surface soil sampling from those areas identified from the soil gas survey exhibiting the highest photoionization detector (PID) readings. As part of the 1996 Phase I RFI, a total of five surface soil samples were collected at the soil gas sampling locations which exhibited the highest PID readings, which ranged from 21.1 parts per million (ppm) to 79.2 ppm. Fourteen semi-volatile organic compounds (SVOCs), twelve being Polynuclear Aromatic Hydrocarbons (PAHs), one PCB (Aroclor-1260), and total petroleum hydrocarbon (TPH) diesel range organics (DRO) and gasoline range organics (GRO) were detected in the surface soil samples. The 1996 Phase I RFI Report was submitted to the USEPA on July 1, 1996 (Baker, 1996). On January 28, 2000, the Navy informed the USEPA of an omission in the data set contained in the report. Due to this omission, an initial HHRA (Baker, 2000a) was developed utilizing the data set from the 1996 Phase I RFI investigation at SWMU 14. The results of the initial HHRA did not indicate an unacceptable cancer risk for any of the exposure scenarios or pathways. This HHRA report was submitted to the USEPA for review and comment on February 4, 2000.

The USEPA provided comments on the Draft HHRA Report for SWMU 14 on July 5, 2000, finding that the preliminary HHRA evaluation for exposure to surface soils is generally adequate and identified deficiencies in site characterization. The USEPA requested that a supplemental site characterization work plan be submitted to adequately characterize all media. The Navy responded to the USEPA comments dated July 5, 2000 in a letter dated August 22, 2000. These responses were followed up by the submission of a Draft Interim Decision Document (Baker, 2000b) that was submitted to the USEPA on November 22, 2000. The purpose of this document was to provide information to support the Navy's recommendation to postpone final site disposition until the site was no longer utilized for training activities.

The USEPA approved the Interim Decision Document on May 4, 2001 based on the recommendations given in Section 4.0 of the document, that "once fire training operations cease (at this unit), additional site characterization of the site will be conducted". Fire training operations ceased on March 31, 2004, at which time funding for the implementation of the 2006 RFI Work Plan for SWMU 14 was procured. The 2007 Final RFI Report (Baker, 2007) was prepared to document the findings of the post-closure 2006 RFI field work and to consolidate this information with data generated during the 1996 Phase I RFI effort targeting potential impacts to surface soils associated with SWMU 14.

As discussed in Section 1.0, the Final RFI Report (Baker, 2007) included a SERA. The sections that follow provide a description of the ERA process conducted at SWMU 14, analytical data used in the SERA, as well as results of the screening-level risk calculation.

2.4.1 Ecological Risk Assessment Process

The SERA at SWMU 14 was performed in accordance with Navy policy for conducting ERAs (Chief of Naval Operations [CNO], 1999) and the Navy guidance for conducting ERAs (available at http://web.ead.anl.gov/ecorisk/), as well as guidance provided by the USEPA (1997). The Navy ERA process (see Figure 2-1) consists of eight steps organized into three tiers and represents a clarification and interpretation of the eight-step ERA process outlined in the USEPA ERA guidance for the Superfund program (USEPA, 1997). Tier 1 of the Navy ERA process represents the SERA, which consists of the following steps:

- Screening-level problem formulation and ecological effects evaluation (Step 1).

- Screening-level exposure estimate and risk calculation (Step 2).

Under Navy policy (CNO, 1999), if the results of Steps 1 and 2 (Tier 1 SERA) indicate that, based on a set of conservative exposure assumptions, there are chemicals present in environmental media that may present a risk to receptor species/communities, the ERA process proceeds to the BERA. According to Superfund guidance (USEPA, 1997), Step 3 represents the problem formulation phase of the BERA. Under Navy policy, the BERA is defined as Tier 2, and the first activity under Tier 2 is Step 3a. In Step 3a, the conservative exposure assumptions applied in Tier 1 are refined and risk estimates are recalculated using the same conceptual site model. The evaluation of risks in Step 3a may also include consideration of background data, chemical bioavailability, and the frequency of detection. If the re-evaluation of the conservative exposure assumptions does not support an acceptable risk determination, the site continues through the BERA process (Step 3b BERA problem formulation).

The Revised Final RFI Work Plan (Baker, 2005) outlined the approach for conducting the ERA at SWMU 14. The risk assessment process for SWMU 14 was to include Step 3a of the Navy ERA process (refinement of conservative exposure assumptions). However, during preparation of the screening-level problem formulation, a data gap was identified which prevented an estimation of risk in the Step 2 screening-level risk calculation for certain potentially complete exposure pathways. Specifically, a potential migration pathway from a source of contamination to relevant abiotic media (surface water and/or sediment) was not addressed by the 1996 and 2006 RFIs. Screening-level risk estimates were provided for those exposure pathways with adequate analytical data on which to base a risk estimate (media-pathway-receptor combinations involving surface and subsurface soil). However, additional data are necessary to determine if exposure pathways involving surface water and sediment are complete. For this reason, the ERA process was terminated after Step 2 (screening-level exposure estimate and risk calculation) with a recommendation for the collection of additional data (drainage ditch surface and subsurface soil).

2.4.2 Data Used in the Screening-Level Ecological Risk Assessment

The SERA used soil analytical data generated during the 1996 and 2006 RFIs. Field work associated with the Phase I RFI, conducted in 1996, consisted of a limited soil gas survey along the perimeter of the new/current fire training pit. A total of 50 sampling nodes were established and spaced along two concentric rings. The first ring was established three feet from the edge of the concrete apron, while the second ring was established at a distance of 10 feet from the edge of the apron. Each ring contained 25 sampling nodes. Each sampling node (generated by driving a metal pin one to two feet into the ground) was screened by inserting the tip of a PID and recording the results. A total of five surface soil samples were collected at the locations which exhibited the highest PID readings. The five surface soil samples (designated 14SS04 through 14SS08) were analyzed for Appendix IX volatile organic compounds (VOCs), SVOCs, PCBs, and TPH DRO and GRO. The Phase I RFI Report describing the findings of this investigation was submitted to the USEPA on July, 1, 1996 (Baker, 1996).

Field work associated with the full RFI, conducted in March 2006, included the collection of four surface soil samples (designated 14SB01-00, 14SB02-00, 14SB03-00, and 14SB07-00; collected at depth from 0 to 1 foot below ground surface (bgs), fourteen subsurface soil samples (designated 14SB01-06, 14SB01-11, 14SB02-03, 14SB02-08, 14SB03-06, 14SB03-11, 14SB04-01, 14SB04-10, 14SB05-02, 14SB05-09, 14SB06-01, 14SB06-07, 14SB07-06, and 14SB07-08; collected at various depths ranging from 1.5 to 3.0 feet bgs to 21.0 to 23.0 feet bgs), and three groundwater samples (designated 14TW01, 14TW02, and 14TW07). Each surface soil, subsurface soil, and groundwater sample was analyzed for Appendix IX VOCs, SVOCs, and metals, as well as TPH DRO and GRO.

Three subsurface soil samples (14SB04-01, 14SB05-09, and 14SB06-07) also were analyzed for dioxins/furans.

Analytical data for soil samples collected from the surface to a depth of one-foot bgs during the 1996 and 2006 RFIs were quantitatively evaluated as surface soil in the SERA. This depth range is the most active biological zone (most soil heterotrophic activity occurs within the surface soil and soil invertebrates occur on the surface or within the oxidized root zone [Suter II, 1995]). As discussed, subsurface soil samples were collected from various depth intervals during the 2006 RFI. Specific depth intervals sampled were 1.5 to 3.0 feet bgs, 3.5 to 5.0 feet bgs, 5.0 to 7.0 feet bgs, 11.0 to 13.0 feet bgs, 13.0 to 15.0 feet bgs, 15.0 to 17.0 feet bgs, 17.0 to 19.0 feet bgs, 19.0 to 21.0 feet bgs, and 21.0 to 23.0 feet below ground surface (bgs). Analytical data for soil samples collected from the 1.5 to 3.0-foot depth interval (14SB04-01 and 14SB06-01) were quantitatively evaluated as subsurface soil in the SERA. Analytical data for subsurface samples collected from deeper depth intervals were not evaluated since these depths are not likely to represent a significant exposure point for ecological receptors.

Analytical data for groundwater samples collected during the RFI field investigations were excluded from evaluation in the SERA for the following reasons (Baker, 2007):

- Groundwater does not represent an exposure point for ecological receptors.

- Depth to groundwater at the site ranges from 14.5 feet bgs (14TW01) to 17.4 feet bgs (14TW08). As such, groundwater expressions (e.g., seeps) are not likely present. Furthermore, based on the depth to groundwater, the various PEM1 wetland units contiguous to SWMU 14 do not likely represent groundwater discharge points.

- A likely discharge point for groundwater originating from the site is the Ensenada Honda, given that SWMU 14 is approximately 1.3 miles from the Ensenada Honda, any chemicals detected in groundwater would be expected to undergo significant attenuation prior to reaching this surface water body.

Because quantitative groundwater flow information is not available for SWMU 14, there is uncertainty associated with the exclusion of groundwater data from evaluation in the SERA. Therefore, the revised SERA will include a quantitative evaluation of groundwater data collected during the 2006 RFI field investigation.

The 1996 and 2006 RFI surface soil, subsurface soil, and groundwater sampling locations are depicted on Figure 2-2. The soil analytical data used in the SERA are provided as Appendix B, while groundwater analytical data are provided as Appendix C.

2.4.3 Screening-Level Ecological Risk Assessment Summary

The results of the SERA for SWMU 14 indicated that, based on a set of conservative exposure assumptions, there are multiple chemicals in surface and subsurface soil that may present risks to one or more receptors species/receptor groups (see Table 2-1). Under Navy policy, if the results of the Steps 1 and 2 (Tier 1 screening-level ERA) indicate that there are chemicals present in environmental media that may present risks to receptor species/receptor groups, the ERA process proceeds to the BERA (i.e., Step 3a). Based on the presence of multiple chemicals in surface and subsurface soil that may present risks to one or more of the receptor species/receptor groups evaluated by the ERA, the SERA concluded that further evaluation in Step 3a is warranted. However, prior to proceeding to Step 3a, The SERA recommended that soil samples be collected from a drainage ditch that was

historically connected to the original fire training pit to determine if a release of fluids associated with fire training operations has occurred. The drainage ditch terminates within a freshwater wetland (classified as a PEM1 by the Cowardin Wetland Classification System [Cowardin et al., 1979]). Soil samples were not collected from the drainage ditch, nor were surface water or sediment samples collected from the PEM1 wetland during previous field investigations (i.e., 1996 and 2006 RFIs). If analytical results indicate that site-related chemicals are present along the length of the ditch at ecologically important concentrations (i.e., concentrations that are greater than soil screening values and statistically elevated above background concentrations), additional sampling within the PEM1 wetland unit would be necessary to allow for an evaluation of potential risks associated with the surface water and sediment exposure pathways.

3.0 SCOPE OF INVESTIGATION

The additional investigation at SWMU 14 will consist of the following:

- Collection and analysis of surface and subsurface soil from seven locations within the drainage ditch historically connected to the original fire training pit.

- Collection and analysis of surface and subsurface soil from four drainage ways that originate in the town of Ceiba and are connected to the drainage ditch downgradient of the location of the original fire training pit. One location will be established within each drainage way. Analytical data for these four samples will indicate if drainage ditch soil quality is being impacted by off-site sources.

A sample matrix for this investigation is provided in Table 3-1. The various investigation elements are described in detail in the subsections that follow.

3.1 Soil Sampling and Analysis Program

Surface and subsurface soil samples will be collected at seven locations (14D-SB01 through 14D-SB07) within the drainage ditch historically connected to the original fire training pit. Surface and subsurface soil samples (14D-SB08 through 14D-SB11) also will be collected from four drainage ways that originate in the town of Ceiba and are connected to the drainage ditch downgradient of the location of the original training pit (one location will be established within each drainage way). Proposed drainage ditch and drainage way sample locations are depicted on Figure 3-1.

One surface soil sample (0 to 1 foot bgs) and one subsurface soil sample (1-2 feet bgs) will be collected at each location using stainless steel hand augers (see Standard Operating Procedure [SOP] F102 in Baker, 1995). For a given location and depth interval, soil will be composited in an aluminum pan using a stainless steel spoon prior to their distribution to appropriate sample containers. Samples will be collected using dedicated equipment (i.e., equipment will not be re-used). Each surface and subsurface sample will be analyzed for Appendix IX Low-level PAHs and total metals (see Table 3-1). Surface soil samples will additionally be analyzed for total organic carbon (TOC), and pH. In addition, the sample location established closest to the original fire training pit (14D-SB01) will be analyzed for dioxin/furan congeners. These chemical groups include the individual chemicals detected in SWMU 14 surface and/or subsurface soil at concentrations greater than soil screening values and/or at concentrations resulting in maximum exposure doses for upper trophic level receptors greater than ingestion-based screening values (see Table 2-1). The decision to limit the analysis of dioxin/furan chemicals to a single drainage ditch surface soil sample is based on the specific congeners that were detected in soil samples collected during the 2006 RFI field investigation. Two dioxin/furan chemicals (1,2,3,4,6,7,8-HpCDD and OCDD) were detected in a single subsurface soil sample (Baker, 2007). Hazard Quotient values greater than 1.0 for upper trophic level receptors can be attributed to the inclusion of non-detected congener results in the derivation of the 2,3,7,8-TCDD equivalent concentration (the maximum hazard quotient value using detected results is 0.27). It is noted that the drainage ditch surface soil sample that will be analyzed for dioxin/furan chemicals is located immediately downgradient from the location of the original fire training pit. Therefore, any release from the original fire training pit would be indicated by this sample.

The soil sample designations will be as follows. For example, one of the soil borings will be designated 14D-SB01. Extensions to the sample identification will reflect the depth at which the sample was obtained. Sample identification extensions will follow the pattern shown below.

14D-SB01-00 - 0 to 1 foot bgs (surface soil)
14D-SB01-01 - 1 to 2 feet bgs (subsurface soil)

Samples will be packed in ice and shipped next day air to the "fixed base" laboratory. At least one member of the field team will remain on the island until verification by the laboratory of receipt of all shipments. This will minimize any potential re-sampling costs associated with mobilization. Tracking numbers for each shipment will be forwarded to the project manager for assisting in verification of receipt.

All analysis at the laboratory will be performed using current methodologies as presented in Table 3-2. The specific laboratory and third party validator, as well as a certified licensed chemist from Puerto Rico, will be determined at a later date.

3.2 Quality Assurance/Quality Control Samples (QA/QC)

QA/QC requirements for the investigations are presented in the sections that follow and are identified within sample matrix presented in Table 3-3.

3.2.1 Trip Blanks

Trip blank samples will not be required to accompany the samples to the laboratory because the soil samples will not be analyzed for VOCs.

3.2.2 Equipment Rinsates

Equipment rinsate samples are collected from analyte-free water rinse of decontaminated equipment. Equipment rinsate blanks will be collected and submitted to a fixed-base analytical laboratory for analysis. The results from the blanks will be used to determine if the sampling equipment was free of contamination. The equipment rinsate samples are analyzed for the same parameters as the related samples.

It is anticipated that a minimum of three equipment rinsates will be collected. The proposed rate of equipment rinsate blank collection will be dependent on the number of field days, the sample count, and the various media collected as defined in EPA guidance. This guidance defines frequency as one sample per day per media or one sample per 20 individual media samples collected, whichever is more frequent. These samples will be associated with the surface and subsurface soil sampling equipment. The samples will be obtained from a bucket auger used for collection of surface and subsurface soil, as well as a stainless steel spoon and aluminum pan used to composite each soil sample prior to distribution to appropriate sample containers. These samples will be analyzed for the analytes presented in Table 3-3.

3.2.3 Field Blanks

Field blank samples consist of the source water used in equipment decontamination procedures. Since this field event will use disposable/dedicated sampling equipment, only one field blank will be collected and analyzed for the same parameters as the related samples. It is anticipated that one source of water (laboratory-grade de-ionized water) will be utilized for this investigation as shown in Table 3-3.

3.2.4 Field Duplicates

Field duplicate samples of the surface and subsurface soil will be collected during the same time the corresponding environmental sample is collected. One duplicate sample will be collected for every 10 environmental samples collected per media.

3.2.5 Matrix Spike/Matrix Spike Duplicates

Matrix Spike/Matrix Spike Duplicates (MS/MSDs) are laboratory derived and are collected to evaluate the matrix effect of the sample upon the analytical methodology. One MS/MSD will be

collected for every 20 samples collected of a similar matrix. The sample matrices in the preceding paragraphs specified the collection and analysis of these samples.

3.3 Other Investigation Considerations

3.3.1 Utility Clearance

Fifteen days prior to the initiation of the proposed fieldwork, a digging permit request will be submitted by Baker to the Facility Management Transportation and Utility Division (FMTUD) of the Public Works Department at NAPR. All proposed soil borings locations will be cleared by the base utility department.

3.3.2 Investigation Derived Wastes

Investigation Derived Wastes (IDW) generated during the field investigation will only include miscellaneous items such as gloves and used personal protective equipment (PPE). No decontamination fluid IDW will be generated due to the use of dedicated sampling equipment. Soil cuttings from the sampling activities will be returned to the areas sampled. Items of PPE that have come in contact with potentially contaminated materials, such as disposable gloves, as well as dedicated sampling equipment (e.g., stainless steel spoons and aluminum pans) will be placed in garbage bags and disposed in trash dump boxes.

As stated, the use of dedicated equipment or materials negates the requirement of decontamination of any equipment or materials. As such, no IDW sampling or analysis will be required.

3.3.3 Decontamination

The use of dedicated equipment or materials negates the requirement of decontamination.

3.3.4 Surveying

All soil sampling locations have been pre-determined prior to entering the field and are presented on Figure 3-1. This figure will be loaded into a global positioning system (GPS) unit for locating purposes in the field. This methodology reduces the need for a surveyor to identify the sampling locations in the field. Any of the locations that may need to be field modified will be located utilizing the GPS unit.

3.3.5 Health and Safety Procedures

The health and safety procedures previously presented in the found in the RFI Management Plans (Baker, 1995) will be employed during this investigation.

3.3.6 Chain-of-Custody

Chain-of-Custody procedures will be followed to ensure a documented, traceable link between measurement results and the sample/parameter that they represent. These procedures are intended to provide a legally acceptable record of sample preparation, storage, and analysis.

To track sample custody transfers before ultimate disposition, sample custody will be documented using a similar chain-of-custody form as presented in the RFI Management Plans (Baker, 1995). A chain-of-custody form will be completed for each shipment in which the samples are shipped. After

the samples are properly packaged, the shipping container will be sealed and prepared for shipment to the analytical laboratory.

4.0 REPORTING

The drainage ditch soil analytical data will be used to revise the SERA contained within the Final RFI Report (Baker, 2007). Existing surface and subsurface soil analytical data, as well as the drainage ditch analytical data also will be used to conduct Step 3a of the BERA. If the drainage ditch analytical data indicate that site-related chemicals are present along the length of the ditch at ecologically important concentrations (i.e., concentrations that are greater than soil screening values and statistically elevated above background concentrations), the revised ERA will include a recommendation for additional sampling activities within the PEM1 wetland unit to allow for an evaluation of potential risks associated with the surface water and sediment exposure pathways. Additionally, these data will be incorporated into the HHRA contained within the Final RFI Report. A brief overview of the methodology that will be used to revise the SERA and to conduct Step 3a of the BERA is presented within the Sections that follow. It is noted that detailed methodology for the SERA is not presented herein as the technical approach to revise the SERA will follow the methodology presented within the Final RFI Report (Baker, 2007).

4.1 Screening-Level Ecological Risk Assessment

As indicated above, the SERA will be revised to include a quantitative evaluation of drainage ditch soil and groundwater. For drainage ditch soil, this evaluation will involve a comparison of the surface and subsurface soil analytical data to the soil screening values listed in Table 4-1. USEPA ecological soil screening levels (Eco-SSLs) (documentation is available at http://www.epa.gov/ecotox/ecossl/) for terrestrial plants and invertebrates will be preferentially used as soil screening values. For a given chemical, if an Eco-SSL is available for both receptor groups, the lowest value will be selected as the soil screening value. For those chemicals lacking terrestrial plant and invertebrate Eco-SSLs, the literature-based toxicological benchmarks listed below will be used as soil screening values.

- Toxicological thresholds for earthworms and microorganisms (Efroymson et al., 1997a)
- Toxicological thresholds for plants (Efroymson et al., 1997b)

If more than one toxicological benchmark is available for a given chemical from Efroymson et al. (1997a and 1997b), the lowest value will be selected as the soil screening value. For those chemicals lacking an Eco-SSL or a toxicological threshold from Efroymson et al. (1997a and 1997b), the following literature-based values, listed in their order of decreasing preference, will be used as soil screening values:

- Toxicity reference values for plants and invertebrates listed in USEPA (1999).
- Soil standards developed by the Ministry of Housing, Spatial Planning and Environment (MHSPE, 2000), assuming a minimum default soil organic carbon content of 2.0 percent.
- Canadian soil quality guidelines (agricultural land use) developed by the Canadian Council of Ministers of the Environment (CCME, 2006).

CCME soil quality guidelines will be given the lowest preference since many are background-based interim guidelines that do not represent effect-based concentrations.

The drainage ditch soil analytical data also will be evaluated for terrestrial food web exposures using the methodology presented in the Final RFI Report (Baker, 2007). The ingestion-based screening

values that will be used in the derivation of upper trophic level risk estimates are summarized in Table 4-2.

As discussed in Section 2.4.2, available ground water data were not quantitatively evaluated in the SERA. However, as part of the SERA revisions, a quantitative evaluation will be conducted. Based on the proximity of SWMU 14 to various freshwater wetland units (including the PEM1 wetland unit historically connected to the original fire training pit), the groundwater analytical data will be compared to freshwater toxicological benchmarks identified from the literature sources presented and discussed below.

Chronic freshwater National Ambient Water Quality Criteria (NAWQC) (USEPA, 2006; available at http://www.epa.gov/waterscience/criteria/wqcriteria.html) will be used as groundwater screening values. USEPA NAWQC for arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc are expressed as dissolved concentrations. As a measure of conservatism, they will be converted to total recoverable concentrations using the appropriate conversion factors (USEPA, 2006). For those chemicals lacking a freshwater NAWQC, groundwater screening values will be identified from the following information listed in their order of decreasing preference:

- Final Chronic Values (FCVs) for freshwater contained in Ecotox Thresholds (USEPA, 1996a)
- Secondary Chronic Values (SCVs) developed by the USEPA (1996a) and Suter II (1996)
- Chronic screening values for freshwater contained in Ecological Risk Assessment Bulletins – Supplement to Risk Assessment Guidelines (RAGS) (USEPA, 2001)
- Minimum chronic toxicity test endpoints (No Observed Effect Concentration [NOEC], No Observed Effect Level [NOEL], and Maximum Acceptable Toxicant Concentration [MATC] values) for freshwater species reported in the ECOTOX Database System (Aquatic Toxicity Information Retrieval [AQUIRE] database) (USEPA, 2003)
- Chronic Lowest Observable Effect Levels (LOELs) for freshwater contained in National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQUIRTs) (Buchman, 1999)

The order of preference was selected based on their level of protection. For example, FCVs would be expected to offer a greater degree of protection than a single species NOEC, MATC, or LOEL since their derivation considers a larger toxicological database. In the absence of the above-mentioned FCVs, USEPA Region IV chronic screening values, chronic test endpoints, and chronic LOELs, screening values will be derived from the acute literature values listed below:

- Acute LOELs for freshwater contained in NOAA SQUIRTs (Buchman, 1999)
- Acute toxicity test endpoints (NOEC, NOEL, LOEL, Lowest Observed Effect Concentration [LOEC], median lethal concentration [LC_{50}], and median effective concentration [EC_{50}] values) for freshwater species contained in the ECOTOX Database System (AQUIRE database) (USEPA, 2003)
- LC_{50} values for freshwater species contained in Superfund Chemical Matrix (USEPA, 1996b)

Chronic-based screening values will be extrapolated from acute NOEC, NOEL, LOEC, LOEL, LC_{50}, and EC_{50} values as follows:

- An uncertainty factor of 10 will be used to convert an acute NOEC, NOEL, LOEC, or LOEL to a chronic-based screening value

- An uncertainty factor of 100 will be used to convert an EC_{50} or LC_{50} to a chronic-based screening value

When acute toxicity data are used to extrapolate a chronic screening value, NOECs/NOELs will be given preference over LOECs/LOELs, LOECs/LOELs will be given preference over LC_{50} and EC_{50} values, and EC_{50} values will be given preference over LC_{50} values. When more than one value is available from the literature for a given test endpoint (e.g., NOEC), the minimum value will be conservatively used to extrapolate a chronic screening value. In some cases, chronic and acute LOELs for chemical classes (e.g., PAHs) are available from Buchman (1999). A LOEL based on a chemical class will be used to derive a chronic screening value only if that chemical lacked literature-based benchmarks and/or toxicity test endpoints.

4.2 Step 3a of the Baseline Ecological Risk Assessment

In Step 3a, the conservative assumptions employed in the SERA (Tier 1 of the Navy ERA process) will be refined and risk estimates will be recalculated using the same conceptual model. Step 3a will include consideration of background data and chemical bioavailability.

The specific assumptions, parameters, and methods that will be modified for the recalculation of media-specific and food web risk estimates are identified below, along with justification for each modification. These refinements and methods will be used in Step 3a of the BERA to weigh the evidence of potential risk for each ecological chemical of potential concern (COPC) identified for each media and receptor to determine whether additional evaluation (i.e., Step 3b of the Navy ERA process; see Figure 2-1) is warranted.

- Refined risk estimates will be derived using average (arithmetic mean) chemical concentrations. For individual receptor species, average chemical concentrations provide a better estimate of the likely level of chemical exposure because each receptor would be expected to forage in several different areas of the site, and, in many cases, off-site. Average concentrations are also appropriate for evaluating impacts *to populations* of lower trophic level receptors (e.g., terrestrial invertebrates). Because some of these receptors are relatively immobile, *individuals* are likely to be impacted by locations of maximum concentrations. However, evaluation of the average exposure case is more indicative of the level of impact that might be expected at the *population* level.

- Literature-based bioconcentration factors (BCFs) and bioaccumulation factors (BAFs) based on, or modeled from, central tendency estimates (e.g., mean, median, midpoint) will be used in place of maximum or high-end (e.g., 90th percentile) estimates. An assumed BCF/BAF of 1.0 will still used for those chemicals lacking a literature-based BAF/BCF. The refined BCFs and BAFs for those chemicals carried into Step 3a of the baseline ERA will be summarized in tables.

- Central tendency estimates (e.g., mean, median, midpoint) for body weight and food ingestion rate will be used to develop exposure estimates for upper trophic level receptors rather than the minimum body weights and maximum food ingestion rates used in the screening-level ERA. The use of central tendency estimates is more relevant because they

represent the characteristics of a greater proportion of the individuals in the population. The evaluation of food web exposures will still assume an area use factor (AUF) of 1.0.

- In addition to the no observed adverse effect level (NOAEL)-based risk estimates used in the screening-level ERA, consideration also will given to food web exposure risk estimates based on lowest observed adverse effect levels (LOAELs) and MATCs.

- Consideration will be given to available background data by statistically comparing site concentrations to background concentrations in accordance with Navy guidance (NFESC, 2002 and 2004). The process that will be used to statistically evaluate data is depicted on Figure 4-1. As evidenced by the figure, statistical comparisons will include descriptive summaries of each data set (maximum, minimum, and mean concentrations), statistical tests on the mean/median of the distributions (i.e., student's t-test, Wilcoxin rank sum test, Gehan test, and Satterthwaite's t-test), and statistical tests on the right tail of the distributions (i.e., quantile test and/or slippage test). The significance level (the probability criteria for rejecting the null hypotheses that data sets were sampled from the same population) will be set at 0.05 for all statistical tests (NFESC, 2002 and 2004). For a given medium, the background data to be used in the statistical evaluation will be the background data set presented and discussed within the *Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds* (Baker, 2006).

- As exposure does not necessarily equate to risk, consideration will be given to site-specific factors that can affect the bioavailability of chemicals.

- Chemicals not identified as ecological COPCs because maximum detected concentrations (or maximum reporting limits in the case of non-detected chemicals) are less than medium-specific screening values will not evaluated in Step 3a of the baseline ERA since a conclusion of no unacceptable risk can be made with high confidence.

5.0 SCHEDULE

A schedule for the implementation of this work plan and revision of the Final RFI Report is provided as Figure 5-1.

6.0 SITE MANAGEMENT

An organization chart presenting the proposed staffing for this project is provided on Figure 6-1. This section also outlines the responsibilities and reporting requirements of field personnel and staff.

6.1 Project Team Responsibilities

Mr. Mark Kimes, P.E, Activity Coordinator for all work in Puerto Rico, will manage the Baker Project Team. His responsibilities will be to direct the technical performance of the project staff, costs and schedule, ensuring that QA/QC procedures are followed during the course of the project. He will maintain communication with the BRAC PMO SE Navy Technical Representative (NTR), Mr. Mark Davidson. Mr. John Mentz will administer overall QA/QC for this project.

The field portion of this project will consist of one field team managed by the Geologist, Mr. Joe Burawa. Mr. Burawa's responsibilities will include direction of the Baker field team and subcontractors. Mr. John Malinowski will direct the reporting effort associated with the field investigation, ensuring that all necessary staffing is utilized to assist in the revisions to the Final RFI Report.

6.2 Field Reporting Requirements

The Geologist will maintain a daily summary of each day's field activities. The following information will be included in this summary:

- Baker and subcontractor personnel on site
- Major activities of the day
- Samples collected
- Problems encountered
- Other pertinent site information

The Geologist will receive direction from the Project Manager regarding any changes in the scope of the investigation.

7.0 REFERENCES

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TABLES

Revised: November 9, 2007

TABLE 2-1

SUMMARY OF SCREENING-LEVEL RISK CALCULATION
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors [1]	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Volatiles				
1,1,1,2-Tetrachloroethane		HQ = 2.20	No SV	No SV
1,1,1-Trichloroethane (TCA)		HQ = 2.20		
1,1,2,2-Tetrachloroethane		HQ = 2.20		
1,1,2-Trichloroethane		HQ = 2.20		
1,1-Dichloroethane		HQ = 2.20		
1,1-Dichloroethene		HQ = 2.20		
1,2,3-Trichloropropane	No SSV	No SSV		
1,2-Dibromo-3-chloropropane (DBCP)	No SSV	No SSV		
1,2-Dibromoethane (EDB)		HQ = 2.20		
1,2-Dichloroethane				
1,2-Dichloroethene (trans)		HQ = 2.20		
1,2-Dichloropropane				
1,3-Dichloropropene (cis)		HQ = 2.20		
1,3-Dichloropropene (trans)		HQ = 2.20		
1,4-Dichloro-2-butene (trans)				
2-Butanone (MEK)	No SSV	No SSV		
2-Chloro-1,3-butadiene (Chloroprene)	No SSV	No SSV		
2-Hexanone (MBK)	No SSV	No SSV		
3-Chloropropene (Allyl Chloride)	No SSV	No SSV		
4-Methyl-2-pentanone (MIBK)	No SSV	No SSV		
Acetone	No SSV	No SSV		
Acetonitrile	No SSV	No SSV		
Acrolein	No SSV	No SSV		
Acrylonitrile				
Benzene		HQ = 2.10		
Bromodichloromethane	No SSV	No SSV		
Bromoform	No SSV	No SSV		
Bromomethane	No SSV	No SSV		
Carbon Disulfide	No SSV	No SSV		
Carbon Tetrachloride			No SV	No SV
Chlorobenzene			No SV	No SV
Chloroethane	No SSV	No SSV		
Chloroform			No SV	No SV
Chloromethane	No SSV	No SSV		
Dibromochloromethane	No SSV	No SSV		
Dibromomethane	No SSV	No SSV		
Dichlorodifluoromethane (Freon-12)	No SSV	No SSV		
Ethyl Methacrylate	No SSV	No SSV		
Ethylbenzene			No SV	No SV
Iodomethane	No SSV	No SSV		
Isobutyl Alcohol	No SSV	No SSV		
Methyl Acrylonitrile	No SSV	No SSV		

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TABLE 2-1

SUMMARY OF SCREENING-LEVEL RISK CALCULATION
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors (1)	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Volatiles (continued)				
Methyl Methacrylate	No SSV	No SSV		
Methylene Chloride				
Pentachloroethane	No SSV	No SSV	No SV	No SV
Propionitrile (Ethyl Cyanide)	No SSV	No SSV		
Styrene (Ethenylbenzene)			No SV	No SV
Tetrachloroethene (PCE)				
Toluene			No SV	No SV
Trichloroethene (TCE)			No SV	No SV
Trichlorofluoromethane	No SSV	No SSV		
Vinyl Acetate	No SSV	No SSV		
Vinyl Chloride	HQ = 1.09	HQ =20.00		
Xylenes, total				
Semivolatiles				
1,2,4,5-Tetrachlorobenzene	HQ = 8.40	HQ = 8.00	No SV	No SV
1,2,4-Trichlorobenzene			No SV	No SV
1,2-Dichlorobenzene (o-)				
1,3,5-Trinitrobenzene	HQ = 82.00	HQ = 8.00		
1,3-Dichlorobenzene (m-)				
1,3-Dinitrobenzene (m-)	No SSV	No SSV		
1,4-Dichlorobenzene (p-)				
1,4-Dioxane (p-)	No SSV	No SSV		
1,4-Naphthoquinone	No SSV	No SSV		
1,4-Phenylenediamine	No SSV	No SSV		
1-Naphthylamine	No SSV	No SSV		
2,3,4,6-Tetrachlorophenol			No SV	No SV
2,4,5-Trichlorophenol			No SV	No SV
2,4,6-Trichlorophenol			No SV	No SV
2,4-Dichlorophenol			No SV	No SV
2,4-Dimethylphenol	HQ = 4.20	HQ = 4.00		
2,4-Dinitrophenol				
2,4-Dinitrotoluene	No SSV	No SSV		
2,6-Dichlorophenol				
2,6-Dinitrotoluene	No SSV	No SSV		
2-Acetylaminofluorene	No SSV	No SSV	No SV	No SV
2-Chloronaphthalene	No SSV	No SSV	No SV	No SV
2-Chlorophenol				
2-Methylphenol (o-Cresol)	HQ = 4.20	HQ = 4.00		
2-Naphthylamine	No SSV	No SSV		
2-Nitroaniline	No SSV	No SSV		
2-Nitrophenol				
2-Picoline	No SSV	No SSV		
3,3'-Dichlorobenzidine	No SSV	No SSV	No SV	No SV
3,3'-Dimethylbenzidine	No SSV	No SSV	No SV	No SV

TABLE 2-1

SUMMARY OF SCREENING-LEVEL RISK CALCULATION
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors (1)	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Semivolatiles (continued)				
3-Methylcholanthrene	No SSV	No SSV	No SV	No SV
3-Methylphenol (m-Cresol)	No SSV	No SSV		
3-Nitroaniline	No SSV	No SSV		
4,6-Dinitro-2-methylphenol	No SSV	No SSV		
4-Aminobiphenyl	No SSV	No SSV		
4-Bromophenyl-phenylether	No SSV	No SSV	No SV	No SV
4-Chloro-3-methylphenol	No SSV	No SSV	No SV	No SV
4-Chloroaniline	No SSV	No SSV		
4-Chlorophenyl-phenylether	No SSV	No SSV	No SV	No SV
4-Dimethylaminoazobenzene (p-)	No SSV	No SSV		
4-Methylphenol (p-Cresol)	No SSV	No SSV		
4-Nitroaniline	No SSV	No SSV		
4-Nitrophenol				
4-Nitroquinoline-1-Oxide	No SSV	No SSV		
5-Nitro-o-toluidine	No SSV	No SSV		
7,12-Dimethylbenz(a)anthracene	No SSV	No SSV	No SV	No SV
a,a-Dimethylphenethylamine	No SSV	No SSV		
Acetophenone	No SSV	No SSV		
Aniline	No SSV	No SSV		
Aramite	No SSV	No SSV	No SV	No SV
Benzyl Alcohol	No SSV	No SSV		
Bis(2-chloroethoxy)methane	No SSV	No SSV		
Bis(2-chloroisopropyl)ether	No SSV	No SSV		
Bis(2-chloroethyl)ether	No SSV	No SSV		
Bis(2-ethylhexyl) Phthalate (BEHP)				
Butyl Benzyl Phthalate			No SV	No SV
Diallate (cis)	No SSV	No SSV	No SV	No SV
Diallate (trans)	No SSV	No SSV		
Dibenzofuran	No SSV	No SSV	No SV	No SV
Diethyl Phthalate (DEP)			No SV	No SV
Dimethyl Phthalate				
Di-n-butyl Phthalate (DBP)				
Di-n-octyl Phthalate				
Dinoseb	No SSV	No SSV	No SV	No SV
Ethyl Methanesulfonate (EMS)	No SSV	No SSV		
Hexachlorobenzene				
Hexachlorobutadiene	No SSV	No SSV		
Hexachlorocyclopentadiene			No SV	No SV
Hexachloroethane	No SSV	No SSV	No SV	No SV
Hexachlorophene	No SSV	No SSV	No SV	No SV
Hexachloropropene	No SSV	No SSV		
Isophorone	No SSV	No SSV		
Isosafrole	No SSV	No SSV	No SV	No SV

TABLE 2-1

SUMMARY OF SCREENING-LEVEL RISK CALCULATION
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors (1)	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Semivolatiles (continued)				
Methapyrilene	No SSV	No SSV		
Methyl Methane Sulfonate	No SSV	No SSV		
Nitrobenzene	No SSV	No SSV		
n-Nitrosodiethylamine				
n-Nitrosodimethylamine				
n-Nitroso-di-n-butylamine				
n-Nitrosodi-n-propylamine				
n-Nitrosodiphenylamine			No SV	No SV
n-Nitrosomethylethylamine				
n-Nitrosomorpholine	No SSV	No SSV		
n-Nitrosopiperidine	No SSV	No SSV		
n-Nitrosopyrrolidine	No SSV	No SSV		
o-Toluidine	No SSV	No SSV		
Pentachlorobenzene			No SV	No SV
Pentachloronitrobenzene	No SSV	No SSV		
Pentachlorophenol	HQ = 1.21			
Phenacetin	No SSV	No SSV		
Phenol				
Pronamide	No SSV	No SSV	No SV	No SV
Pyridine	No SSV	No SSV		
Safrole	No SSV	No SSV		
PAHs				
1-Methylnaphthalene				
2-Methylnaphthalene		HQ = 1.42		
Acenaphthene				
Acenaphthylene				
Anthracene				
Benzo(a)anthracene	HQ = 2.83			
Benzo(a)pyrene (BaP)	HQ = 4.17			
Benzo(b)fluoranthene	HQ = 6.33			
Benzo(g,h,i)perylene	HQ = 3.00			
Benzo(k)fluoranthene	HQ = 2.00			
Chrysene	HQ = 3.17			
Dibenz(a,h)anthracene				
Fluoranthene				
Fluorene				
Indeno(1,2,3-cd)pyrene	HQ = 3.17			
Naphthalene				
Phenanthrene				
Pyrene				

Revised: November 9, 2007

TABLE 2-1

SUMMARY OF SCREENING-LEVEL RISK CALCULATION
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological Chemical of Potential Concern	Lower Trophic Level Receptors		Upper Trophic Level Receptors [1]	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
PCBs				
Aroclor-1016				
Aroclor-1221				
Aroclor-1232				
Aroclor-1242				
Aroclor-1248				
Aroclor-1254				
Aroclor-1260				
Dioxins/Furans				
Total dioxin/furan (TEQ)	---		---	HQ = 58.15
Inorganics				
Antimony				
Arsenic				
Barium				
Beryllium			No SV	No SV
Cadmium			HQ = 3.21	HQ = 2.01
Chromium	HQ = 187.75	HQ = 79.75	HQ = 17.35	HQ = 7.37
Cobalt	HQ = 3.61	HQ = 1.88	HQ = 2.51	HQ = 1.31
Lead	HQ = 1.71		HQ = 9.09	HQ = .4.24
Mercury			HQ = 18.23	HQ = 4.50
Nickel				
Selenium	HQ = 4.70	HQ = 1.10	HQ = 5.82	HQ = 1.36
Silver				
Thallium				
Vanadium	HQ = 161.50	HQ = 89.00		
Zinc	HQ = 1.76	HQ = 1.52	HQ = 5.67	HQ = 4.90

Notes:

Shaded cell indicates that the chemical was detected; Blank cells indicate acceptable risk (maximum HQ < 1.0)

--- = Chemical was not analyzed for

HQ = Hazard Quotient

SSV = Soil Screening Value

SV = Ingestion-Based Screening Value

[1] For a given chemical, the hazard quotient value shown is for the most sensitive upper trophic level receptor.

TABLE 3-1

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

		Fixed Based Analytical Lab Analysis				
Media	**Sample Depth (ft bgs)**	App IX Low Level PAHs	Appendix IX Dioxins/Furans	App IX Metals	TOC and pH	**Comment**
Surface Soil Samples						
14D-SB01-00	0.0 - 1.0	X	X	X	X	
14D-SB02-00	0.0 - 1.0	X		X	X	
14D-SB02-00D	0.0 - 1.0	X		X		Duplicate
14D-SB02-00MS/MSD	0.0 - 1.0	X		X		Matrix Spike/Matrix Spike Duplicate
14D-SB03-00	0.0 - 1.0	X		X	X	
14D-SB04-00	0.0 - 1.0	X		X	X	
14D-SB05-00	0.0 - 1.0	X		X	X	
14D-SB06-00	0.0 - 1.0	X		X	X	
14D-SB07-00	0.0 - 1.0	X		X	X	
14D-SB08-00	0.0 - 1.0	X		X	X	
14D-SB09-00	0.0 - 1.0	X		X	X	
14D-SB10-00	0.0 - 1.0	X		X	X	
14D-SB11-00	0.0 - 1.0	X		X	X	
14D-SB11-00D	0.0 - 1.0	X		X		Duplicate
Subsurface Soil Samples						
14D-SB01-01	1.0-2.0	X		X		
14D-SB02-01	1.0-2.0	X		X		
14D-SB03-01	1.0-2.0	X		X		
14D-SB04-01	1.0-2.0	X		X		
14D-SB05-01	1.0-2.0	X		X		
14D-SB06-01	1.0-2.0	X		X		
14D-SB07-01	1.0-2.0	X		X		
14D-SB08-01	1.0-2.0	X		X		
14D-SB09-01	1.0-2.0	X		X		
14D-SB09-01D	1.0-2.0	X		X		Duplicate
14D-SB09-01MS/MSD	1.0-2.0	X		X		Matrix Spike/Matrix Spike Duplicate
14D-SB10-01	1.0-2.0	X		X		
14D-SB11-01	1.0-2.0	X		X		

Notes:
ft bgs - feet below ground surface.
TOC = Total Organic Carbon

TABLE 3-2

METHOD PERFORMANCE LIMITS
APPENDIX IX COMPOUND LIST AND CONTRACT
REQUIRED QUANTITATION LIMITS (CRQL)
ADDITIONAL DATA COLLECTION WORK PLAN - SWMU 14
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Low Level PAHs	Quantitation Limits* Water (µg/L)	Quantitation Limits* Low Soil (µg/kg)	Method Number
Acenaphthene	0.2	6.7	8270C
Acenaphthylene	0.2	6.7	8270C
Anthracene	0.2	6.7	8270C
Benzo(a)anthracene	0.2	6.7	8270C
Benzo(b)fluoranthene	0.2	6.7	8270C
Benzo(k)fluoranthene	0.2	6.7	8270C
Benzo(g,h,i)perylene	0.2	6.7	8270C
Benzo(a)pyrene	0.2	6.7	8270C
Chrysene	0.2	6.7	8270C
Dibenzo(a,h)anthracene	0.2	6.7	8270C
Fluoranthene	0.2	6.7	8270C
Fluorene	0.2	6.7	8270C
Indeno(1,2,3-cd)pyrene	0.2	6.7	8270C
1-Methylnaphthalene	0.2	6.7	8270C
2-Methylnaphthalene	0.2	6.7	8270C
Naphthalene	0.2	6.7	8270C
Phenanthrene	0.2	6.7	8270C
Pyrene	0.2	6.7	8270C
Dioxins/Furans	**Quantitation Limits* Water (ng/L)**	**Quantitation Limits* Low Soil (ng/g)**	**Method Number (Description)**
Dioxins			
2,3,7,8-TCDD	5.0	0.5	8280A
1,2,3,7,8-PeCDD	12.5	1.25	8280A
1,2,3,4,7,8-HxCDD	12.5	1.25	8280A
1,2,3,6,7,8-HxCDD	25.0	2.5	8280A
1,2,3,7,8,9-HxCDD	12.5	1.25	8280A
1,2,3,4,6,7,8-HpCDD	12.5	1.25	8280A
OCDD	25.0	2.5	8280A
Furans			
2,3,7,8-TCDF	5.0	0.5	8280A
1,2,3,7,8-PeCDF	12.5	1.25	8280A
2,3,4,7,8-PeCDF	12.5	1.25	8280A
1,2,3,4,7,8-HxCDF	12.5	1.25	8280A
1,2,3,6,7,8-HxCDF	12.5	1.25	8280A
2,3,4,6,7,8-HxCDF	12.5	1.25	8280A
1,2,3,7,8,9-HxCDF	12.5	1.25	8280A
1,2,3,4,6,7,8-HpCDF	12.5	1.25	8280A
1,2,3,4,7,8,9-HpCDF	12.5	1.25	8280A
OCDF	25.0	2.5	8280A

* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

µg/L - micrograms per liter. ng/L - nanograms per liter
µg/kg - micrograms per kilogram. ng/g - nanograms per gram

TABLE 3-2

METHOD PERFORMANCE LIMITS
APPENDIX IX COMPOUND LIST AND CONTRACT
REQUIRED QUANTITATION LIMITS (CRQL)
ADDITIONAL DATA COLLECTION WORK PLAN - SWMU 14
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Inorganics	Method Number	Quantitation Limits*		Method Description
		Water (µg/L)	Low Soil (mg/kg)	
Antimony	6020	2.5	0.5	Inductively Coupled Plasma
Arsenic	6020	2.5	0.5	Inductively Coupled Plasma
Barium	6020	5	1.0	Inductively Coupled Plasma
Beryllium	6020	0.5	0.1	Inductively Coupled Plasma
Cadmium	6020	0.5	0.1	Inductively Coupled Plasma
Chromium	6020	5	1.0	Inductively Coupled Plasma
Cobalt	6020	0.5	0.1	Inductively Coupled Plasma
Copper	6020	2.5	0.5	Inductively Coupled Plasma
Lead	6020	1.5	0.3	Inductively Coupled Plasma
Mercury	7470A/7471A	0.5	0.10	Cold Vapor AA
Nickel	6020	1	0.2	Inductively Coupled Plasma
Selenium	6020	2.5	0.5	Inductively Coupled Plasma
Silver	6020	1	0.2	Inductively Coupled Plasma
Thallium	6020	1	0.2	Inductively Coupled Plasma
Tin	6020	5	10.0	Inductively Coupled Plasma
Vanadium	6020	5	1.0	Inductively Coupled Plasma
Zinc	6020	20	4.0	Inductively Coupled Plasma

Notes:
* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.
µg/L - micrograms per liter.
mg/kg - milligrams per kilogram.

Revised: November 9, 2007

TABLE 3-3

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM: QA/QC SAMPLES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Analysis Requested			
Media	App IX Low Level PAHs	App IX Metals (Total)	Dioxins/Furans	**Comment**
Equipment Rinsate Samples				
14D-ER01	X	X		Stainless Steel Spoon
14D-ER02	X	X		Bucket Auger
14D-ER03	X	X		Aluminum Pie Pan
Field Blank Samples				
14D-FB01	X	X		Lab Grade Deionized Water

Revised: November 9, 2007

TABLE 4-1
SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Volatile Organics (ug/kg):			
1,1,1,2-Tetrachloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1,1-Trichloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1,2,2-Tetrachloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1,2-Trichloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1-Dichloroethane	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,1-Dichloroethene	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,2,3-Trichloropropane	NA	---	---
1,2-Dibromo-3-chloropropane	NA	---	---
1,2-Dibromoethane (EDB)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,2-Dichloroethane	402 (1)	MHSPE 2000	---
1,2-Dichloropropane	700,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
2-Butanone (Methyl ethyl ketone)	NA	---	---
2-Hexanone	NA	---	---
3-Chloropropene (Allyl chloride)	NA	---	---
4-Methyl-2-pentanone (MIBK)	NA	---	---
Acetone	NA	---	---
Acetonitrile	NA	---	---
Acrolein (Propenal)	NA	---	---
Acrylonitrile	1,000,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Benzene	101 (1)	MHSPE 2000	---
Bromodichloromethane	NA	---	---
Bromoform	NA	---	---
Bromomethane (Methyl bromide)	NA	---	---
Carbon disulfide	NA	---	---
Carbon tetrachloride	1,000,000	Efroymson et al. 1997a	Toxicological threshold for microbial processes
Chlorobenzene	40,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Chloroethane	NA	---	---
Chloroform	1,002 (1)	MHSPE 2000	---
Chloromethane (Methyl chloride)	NA	---	---
Chloroprene	NA	---	---

TABLE 4-1
SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Volatile Organics (ug/kg):			
cis-1,3-Dichloropropene	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
Dibromochloromethane	NA	---	---
Dibromomethane (Methylene bromide)	NA	---	---
Dichlorodifluoromethane	NA	---	---
Ethylbenzene	5,003 (1)	MHSPE 2000	---
Ethyl methacrylate	NA	---	---
Iodomethane (Methyl iodide)	NA	---	---
Isobutanol (Isobutyl alcohol)	NA	---	---
Methacrylonitrile	NA	---	---
Methylene chloride (Dichloromethane)	1,004 (1)	MHSPE 2000	---
Methyl methacrylate	NA	---	---
Pentachloroethane	NA	---	---
Propionitrile	NA	---	---
Styrene	10,030 (1)	MHSPE 2000	---
Tetrachloroethene	400 (1)	MHSPE 2000	---
Toluene	13,001 (1)	MHSPE 2000	---
1,2-Dichloroethene (total)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
trans-1,2-Dichloroethene	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
trans-1,3-Dichloropropene	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
trans-1,4-Dichloro-2-butene	1,000,000	Efroymson et al. 1997a	Toxicological threshold for microbial processess
Trichloroethene	6,010 (1)	MHSPE 2000	---
Trichlorofluoromethane	NA	---	---
Vinyl acetate	NA	---	---
Vinyl chloride	11.0 (1)	MHSPE 2000	---
Xylene	2,501 (1)	MHSPE 2000	---
Semi-Volatile Organics (ug/kg):			
1,2,4,5-Tetrachlorobenzene	50.0	CCME 2006	Canadian soil quality guideline based on agricultural land uses
1,2,4-Trichlorobenzene	20,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
1,3-Dichlorobenzene (m-Dichlorobenzene)	3,003 (1)	MHSPE 2000	Value for total chlorobenzenes (2)

TABLE 4-1
SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Semi-Volatile Organics (ug/kg):			
1,4-Dichlorobenzene (p-Dichlorobenzene)	20,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
1,4-Dioxane	NA	---	---
1,4-Naphthoquinone	NA	---	---
1,4-Phenylenediamine (p-phenylenediamine)	NA	---	---
1-Naphthylamine	NA	---	---
2,3,4,6-Tetrachlorophenol	1,001 (1)	MHSPE 2000	Value for total chlorophenols (3)
2,4,5-Trichlorophenol	4,000	Efroymson et al. 1997b	Toxicological threshold for plants
2,4,6-Trichlorophenol	10,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
2,2'-Oxybis(1-chloropropane)	NA	---	---
2,4-Dichlorophenol	1,001 (1)	MHSPE 2000	Value for total chlorophenols (3)
2,4-Dimethylphenol	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
2,4-Dinitrophenol	20,000	Efroymson et al. 1997b	Toxicological threshold for plants
2,6-Dichlorophenol	1,001 (1)	MHSPE 2000	Value for total chlorophenols (3)
2-Acetylaminofluorene	NA	---	---
2-Chloronaphthalene	NA	---	---
2-Chlorophenol	1,001 (1)	MHSPE 2000	Value for total chlorophenols (3)
2-Naphthylamine	NA	---	---
2-Nitroaniline (o-Nitroaniline)	NA	---	---
2-Nitrophenol (o-Nitrophenol)	7,000	---	Value for 4-nitrophenol used as a surrogate
2-Picoline	NA	---	---
3,3'-Dichlorobenzidine	NA	---	---
3,3'-Dimethylbenzidine	NA	---	---
3-Methylcholanthrene	NA	---	---
3-Nitroaniline (m-Nitroaniline)	NA	---	---
4,6-Dinitro-2-methylphenol (4,6-Dinitro-o-cresol)	NA	---	---
4-Aminobiphenyl	NA	---	---
4-Bromophenylphenyl ether	NA	---	---
4-Chloro-3-methylphenol	NA	---	---
4-Chloroaniline	NA	---	---

TABLE 4-1
SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Semi-Volatile Organics (ug/kg):			
4-Chlorophenylphenyl ether	NA	---	---
4-Nitroaniline (p-Nitroaniline)	NA	---	---
4-Nitrophenol (p-nitrophenol)	7,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
4-Nitroquinoline-1-oxide	NA	---	---
5-Nitro-o-toluidine	NA	---	---
7,12-Dimethylbenz(a)anthracene	NA	---	---
Acetophenone	NA	---	---
A,A-Dimethylphenethylamine	NA	---	---
Aniline	NA	---	---
Aramite	NA	---	---
Benzyl alcohol	NA	---	---
bis(2-Chloroethoxy)methane	NA	---	---
bis(2-Chloroethyl)ether	NA	---	---
bis(2-Ethylhexyl)phthalate	6,010 (1)	MHSPE 2000	Value for total phthalates (4)
Butylbenzylphthalate	6,010 (1)	MHSPE 2000	Value for total phthalates (4)
Diallate	NA	---	---
Dibenzofuran	NA	---	---
Diethylphthalate	100,000	Efroymson et al. 1997b	Toxicological threshold for plants
Dimethylphthalate	200,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Di-n-butylphthalate	200,000	Efroymson et al 1997b	Toxicological threshold for plants
Di-n-octylphthalate	6,010 (1)	MHSPE 2000	Value for total phthalates (4)
Dinoseb (2-sec-butyl-4,6-Dinitrophenol)	NA	---	---
Ethyl methanesulfonate	NA	---	---
Hexachlorobenzene	1,000,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Hexachlorobutadiene	NA	---	---
Hexachlorocyclopentadiene	10,000	Efroymson et al. 1997b	Toxicological threshold for plants
Hexachloroethane	NA	---	---
Hexachlorophene	NA	---	---
Hexachloropropene	NA	---	---
Isophorone	NA	---	---

TABLE 4-1
SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Semi-Volatile Organics (ug/kg):			
Isosafrole	NA	---	---
m-Dinitrobenzene (1,3-Dinitrobenzene)	NA	---	---
m-Cresol (3-Methylphenol)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
Methapyrilene	NA	---	---
Methyl methanesulfonate	NA	---	---
N-Nitrosodiethylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitrosodimethylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitroso-di-n-butylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitroso-di-n-propylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitrosodiphenylamine	20,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
N-Nitrosomethylethylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitrosomorpholine	NA	---	---
N-Nitrosopiperidine	NA	---	---
N-Nitrosopyrrolidine	NA	---	---
o-Cresol (2-Methylpheneol)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
o-Toluidine	NA	---	---
p-Cresol (4-Methylphenol)	100	CCME 2006	Canadian soil quality guideline based on agricultural land uses
p-(Dimethylamino)azobenzene	NA	---	---
Pentachlorobenzene	1,150	USEPA 1999	Toxicological threshold for earthworms
Pentachloronitrobenzene	NA	---	---
Pentachlorophenol	1,730	USEPA 1999	Toxicological threshold for plants
Phenacetin	NA	---	---
Phenol	30,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Pronamide	NA	---	---
Pryridine	NA	---	---
Safrole	NA	---	---
PAHs (ug/kg):			
1-Methylnaphthalene	1,200	---	Value for benzo(a)pyrene used as a surrogate
2-Methylnaphthalene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Acenaphthene	20,000	Efroymson et al. 1997b	Toxicological threshold for plants
Acenaphthylene	1,200	---	Value for benzo(a)pyrene used as a surrogate

TABLE 4-1
SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
PAHs (ug/kg):			
Anthracene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Benzo(a)anthracene	1,200	USEPA 1999	Value for benzo(a)pyrene used as a surrogate
Benzo(a)pyrene	1,200	USEPA 1999	Toxicological threshold for plants
Benzo(b)fluoranthene	1,200	USEPA 1999	Toxicological threshold for plants
Benzo(g,h,i)perylene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Benzo(k)fluoranthene	1,200	USEPA 1999	Value for benzo(a)pyrene used as a surrogate
Chrysene	1,200	USEPA 1999	Value for benzo(a)pyrene used as a surrogate
Dibenzo(a,h)anthracene	1,200	USEPA 1999	Value for benzo(a)pyrene used as a surrogate
Fluoranthene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Fluorene	30,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Indeno(1,2,3-cd)pyrene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Naphthalene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Phenanthrene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Pyrene	1,200	---	Value for benzo(a)pyrene used as a surrogate
Inorganics (mg/kg):			
Antimony	78	USEPA 2005a	Ecological soil screening level for invertebrates
Arsenic	18	USEPA 2005b	Ecological soil screening level for plants
Barium	330	USEPA 2005c	Ecological soil screening level for invertebrates
Beryllium	40	USEPA 2005d	Ecological soil screening level for invertebrates
Cadmium	32	USEPA 2005e	Ecological soil screening level for plants
Chromium (total)	0.4	Efroymson et al. 1997a	Toxicological threshold for earthworms
Cyanide	0.9	CCME 2006	Canadian soil quality guideline based on agricultural land uses
Cobalt	13	USEPA 2005f	Ecological soil screening level for plants
Copper	70	USEPA 2006a	Ecological soil screening level for plants
Lead	120	USEPA 2005g	Ecological soil screening level for plants
Mercury	0.1	Efroymson et al. 1997a	Toxicological threshold for earthworms
Nickel	30	Efroymson et al. 1997b	Toxicological threshold for plants
Selenium	1	Efroymson et al. 1997b	Toxicological threshold for plants
Silver	560	USEPA 2006b	Ecoloigcal soil screening level for plants
Thallium	1	Efroymson et al. 1997b	Toxicological threshold for plants
Vanadium	2	Efroymson et al. 1997b	Toxicological threshold for plants
Zinc	50	Efroymson et al. 1997b	Toxicological threshold for plants

TABLE 4-1
SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

NA = Not Available
MHSPE = Ministry of Housing, Spatial Planning and Environment
CCME = Canadian Council of Ministers of the Environment
USEPA = United States Environmental Protection Agency

(1) The screening value shown is an average of the target and intervention soil standards. The value is based on a default organic carbon content of 0.02 (2 percent), which represents a minimum value (adjustment range is 2 to 30 percent).
(2) The value represents a total concentration for chlorobenzenes (mono, di, tri, tetra, penta, and hexachlorobenzene).
(3) The value represents a total concentration for all chlorophenols (mono, di, tri, tetra, and pentachlorophenol).
(4) The value represents a total concentration for all phthalates.
(5) The value represents a sum of the DDT, DDD, and DDE concentrations.
(6) The value represents the sum of the aldrin, dieldrin, and endrin concentrations.
(7) Value represents the sum of alpha-BHC, beta-BHC, delta-BHC, and gamma-BHC concentrations.

Table References:

Canadian Council of Ministers of the Environment (CCME). 2006. Canadian Soil Quality Guidelines for the Protection of Environment and Human Health. Update 6.0.2 http://www.ccme.ca/assets/pdf/ceqg_soil_summary_table_v6_e.pdf

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revisions. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-126/R2.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997b. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revisions. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-85/R3

Ministry of Housing, Spatial Planning and Environment (MHSPE). 2000. Circular on Target Values and Intervention Values for Soil Remediation. Directorate-General for Environmental Protection, Department of Soil Protection, The Hague, Netherlands. February 4, 2000.

United States Environmental Protection Agency (USEPA). 2006a. Ecological Soil Screening Levels for Copper (Interim Final). Office of Solid Waste and Emergecny Response, Washington, D.C. OSWER Directive 9285.7-77.

TABLE 4-1
SOIL SCREENING VALUES
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Table References (continued):

USEPA. 2006b. Ecological Soil Screening Levels for Silver (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWEER Directive 9285.7-61

USEPA. 2005a. Ecological Soil Screening Levels for Antimony (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-61.

USEPA. 2005b. Ecological Soil Screening Levels for Arsenic (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-62.

USEPA. 2005c. Ecological Soil Screening Levels for Barium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-63.

USEPA. 2005d. Ecological Soil Screening Levels for Beryllium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-63.

USEPA. 2005e. Ecological Soil Screening Levels for Cadmium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-65.

USEPA. 2005f. Ecological Soil Screening Levels for Cobalt (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-67

USEPA. 2005g. Ecological Soil Screening Levels for Lead (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-70.

USEPA. 1999. Screening-Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA/530/D-99/001A.

TABLE 4-2
INGESTION-BASED SCREENING VALUES FOR BIRDS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Volatile Organics:									
1,1,1,2-Tetrachloroethane	---	---	---	---	---	---	NA	NA	---
Carbon tetrachloride	---	---	---	---	---	---	NA	NA	---
Chlorobenzene	---	---	---	---	---	---	NA	NA	---
Chloroform	---	---	---	---	---	---	NA	NA	---
Ethylbenzene	---	---	---	---	---	---	NA	NA	---
Pentachloroethane	---	---	---	---	---	---	NA	NA	---
Styrene	---	---	---	---	---	---	NA	NA	---
Toluene	---	---	---	---	---	---	NA	NA	---
Trichloroethene	---	---	---	---	---	---	NA	NA	---
Xylene	Quail	0.191	Subacute	?	"Toxicity"	---	405	40.5	Hill and Camardese 1986
Semi-Volatile Organics:									
1,2,4,5-Tetrachlorobenzene	---	---	---	---	---	---	NA	NA	---
1,2,4-Trichlorobenzene	---	---	---	---	---	---	NA	NA	---
1,2-Dichlorobenzene (o-Dichlorobenzene)	Northern bobwhite	0.157	14 days	Oral (gavage)	Growth/mortality	?	2,500	250	Grimes and Jaber 1989
1,3-Dichlorobenzene (m-Dichlorobenzne)	Northern bobwhite	0.157	14 days	Oral (gavage)	Growth/mortality	?	2,500	250	Grimes and Jaber 1989
1,4-Dichlorobenzene (p-Dichlorobenzne)	Northern bobwhite	0.157	14 days	Oral (gavage)	Growth/mortality	?	2,500	250	Grimes and Jaber 1989
2,3,4,6-Tetrachlorophenol	---	---	---	---	---	---	NA	NA	---
2,4,5-Trichlorophenol	---	---	---	---	---	---	NA	NA	---
2,4,6-Trichlorophenol	---	---	---	---	---	---	NA	NA	---
2,4-Dichlorophenol	---	---	---	---	---	---	NA	NA	---
2-Acetylaminofluorene	---	---	---	---	---	---	NA	NA	---
2-Chloronaphthalene	---	---	---	---	---	---	NA	NA	---
3,3'-Dichlorobenzidine	---	---	---	---	---	---	NA	NA	---
3,3-Dimethylbenzidine	---	---	---	---	---	---	NA	NA	---
3-Methylcholanthrene	---	---	---	---	---	---	NA	NA	---
4-Bromophenylphenyl ether	---	---	---	---	---	---	NA	NA	---
4-Chloro-3-methylphenol	---	---	---	---	---	---	NA	NA	---
4-Chlorophenylphenyl ether	---	---	---	---	---	---	NA	NA	---
7-12-Dimethyl benz(a)anthracene	---	---	---	---	---	---	NA	NA	---
Aramite	---	---	---	---	---	---	NA	NA	---
bis(2-Ethylhexyl)phthalate	Ringed dove	0.155	4 weeks	Oral in diet	Reproduction	Not Applicable	11.0	1.10	Sample et al. 1996
Butylbenzylphthalate	---	---	---	---	---	---	NA	NA	---
Diallate	---	---	---	---	---	---	NA	NA	---
Dibenzofuran	---	---	---	---	---	---	NA	NA	---
Diethylphthalate	---	---	---	---	---	---	NA	NA	---
Di-n-butylphthalate	Ringed dove	0.155	4 weeks	Oral in diet	Reproduction	Not Applicable	1.10	0.11	Sample et al. 1996
Di-n-octylphthalate	Ring-necked pheasant	1.00	?	?	Mortality	Not Applicable	500	50.0	TERRTOX 1998
Dinoseb (2-sec-butyl-4,6-Dintrophenol)	Ring-necked pheasant	?	14 days	Oral (gavage)	Mortality	Not Applicable	2.64	0.264	USEPA 2004
Hexachlorobenzene	Japanese quail	0.19	90 days	Oral	Reproduction	Not Applicable	0.80	0.08	Coulston and Kolbye 1994
Hexachlorobutadiene	Japanese quail	0.19	?	Oral	Reproduction	Not Applicable	8.00	2.50	Coulston and Kolbye 1994
Hexachlorocyclopentadiene	---	---	---	---	---	---	NA	NA	---
Hexachloroethane	---	---	---	---	---	---	NA	NA	---
Hexachlorophene	---	---	---	---	---	---	NA	NA	---
Hexachloropropene	---	---	---	---	---	---	NA	NA	---
Isosafrole	---	---	---	---	---	---	---	---	---

TABLE 4-2
INGESTION-BASED SCREENING VALUES FOR BIRDS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Semi-Volatile Organics:									
N-Nitrosodiphenylamine	---	---	---	---	---	---	NA	NA	---
p-Dimethylaminoazobenzene	---	---	---	---	---	---	NA	NA	---
Pentachlorobenzene	---	---	---	---	---	---	NA	NA	---
Pentachloronitrobenzene	Chicken	1.50	35 weeks	Oral in diet	Reproduction	Not Applicable	70.7	7.07	Sample et al. 1996
Pentachlorophenol	Chicken	1.50	8 weeks	Oral	Growth	Not Applicable	200	100	Eisler 1989
Pronamide	---	---	---	---	---	---	NA	NA	---
PAHs:									
1-Methylnaphthalene	Mallard duck	1.04	7 months	Oral in diet	Hepatic	Not Applicable	228	22.8	Patton and Dieter 1980
2-Methylnaphthalene	Mallard duck	1.04	7 months	Oral in diet	Hepatic	Not Applicable	228	22.8	Patton and Dieter 1980
Acenaphthene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Acenaphthylene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Anthracene	Mallard duck	1.043	7 months	Oral in diet	Hepatic	Not Applicable	228	22.8	Patton and Dieter 1980
Benzo(a)anthracene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Benzo(a)pyrene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Benzo(b)fluoranthene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Benzo(g,h,i)perylene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Benzo(k)fluoranthene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Chrysene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Dibenz(a,h)anthracene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Fluoranthene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Fluorene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Indeno(1,2,3-cd)pyrene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Naphthalene	Mallard duck	1.04	7 months	Oral in diet	Hepatic	Not Applicable	228	22.8	Patton and Dieter 1980
Phenanthrene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Pyrene	Chicken	1.50	34 days	Oral in diet	Reproduction	Not Applicable	395	39.5	Rigdon and Neal 1963
Inorganics:									
Antimony	Northern bobwhite	0.19	6 weeks	Oral	?	Unknown	47,400	4,740	Opresko et al. 1993
Arsenic	Chicken	Unknown	19 days	Oral in diet	Mortality	Unknown	22.4	2.24	USEPA 2005a
Barium	One-day old chicks	0.121	4 weeks	Oral in diet	Mortality	Barium hydroxide	41.7	20.8	Sample et al. 1996
Beryllium	---	---	---	---	---	---	NA	NA	---
Cadmium	Multiple species	Unknown	Various	Oral in diet	Reproduction/growth	Unknown	11.47	1.47 (1)	USEPA 2005b
Chromium	Multiple species	Unknown	Various	Oral in diet	Reproduction/growth	Trivalent chromium	26.6	2.66 (1)(2)	USEPA 2005c
Cobalt	Multiple species	Unknown	Various	Oral in diet	Growth	Unknown	76.1	7.61 (1)	USEPA 2005d
Copper	Chicken	Unknown	84 days	Oral in diet	Reproduction	Unknown	12.1	4.05	USEPA 2006a
Lead	Chicken	Unknown	4 weeks	Oral in diet	Reproduction	Unknown	3.26	1.63	USEPA 2005e
Mercury	Mallard duck	1.00	3 generations	Oral in diet	Reproduction	Methyl mercury dicyandiamide	0.078	0.026	USEPA 1997
Nickel	Mallard duckling	0.782	90 days	Oral in diet	Growth/mortality	Nickel sulfate	107	77.4	Sample et al. 1996
Selenium	Mallard duck	1.00	100 days	Oral in diet	Reproduction	Selanomethionine	0.80	0.40	Sample et al. 1996
Silver	Turkey	Unknown	5 weeks	Oral in diet	Growth	Unknown	20	2.02	USEPA 2006b
Thallium	European starling	Unknown	acute	Oral	Unknown	Unknown	3.50	0.35	USEPA 1999
Tin	Japanese quail	0.15	6 weeks	Oral in diet	Reproduction	bis(Tributyltin)-oxide	16.9	6.80	Sample et al. 1996
Vanadium	Chicken	Unknown	5 weeks	Oral in diet	Growth	Unknown	0.688	0.344	USEPA 2005f
Zinc	White leghorn hen	1.935	44 weeks	Oral in diet	Reproduction	Zinc sulfate	131	14.5	Sample et al. 1996

TABLE 4-2
INGESTION-BASED SCREENING VALUES FOR BIRDS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:
NA = Not Available
LOAEL = Lowest Observed Adverse Effect Level
NOAEL = No Observed Adverse Effect Level
USEPA = United States Environmental Protection Agency
(1) The NOAEL value represents a geometric mean of NOAEL values for growth and/or reproduction. The NOAEL value was used in the derivation of the avian ecological soil screening level.
(2) The NOAEL value shown is for trivalent chromium.

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USEPA. 2005c. Ecological Soil Screening Levels for Chromium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-66.

TABLE 4-2
INGESTION-BASED SCREENING VALUES FOR BIRDS
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Table References (continued):

USEPA. 2005d. Ecological Soil Screening Levels for Cobalt (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-67

USEPA. 2005e. Ecological Soil Screening Levels for Lead (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-70.

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FIGURES

K:_SOUTHNAVFAC\111626 DO2\Task 12 - SWMU 14\CAD\ 111626_14_01.dwg

4 0 2 4 8

1 inch = 4 miles

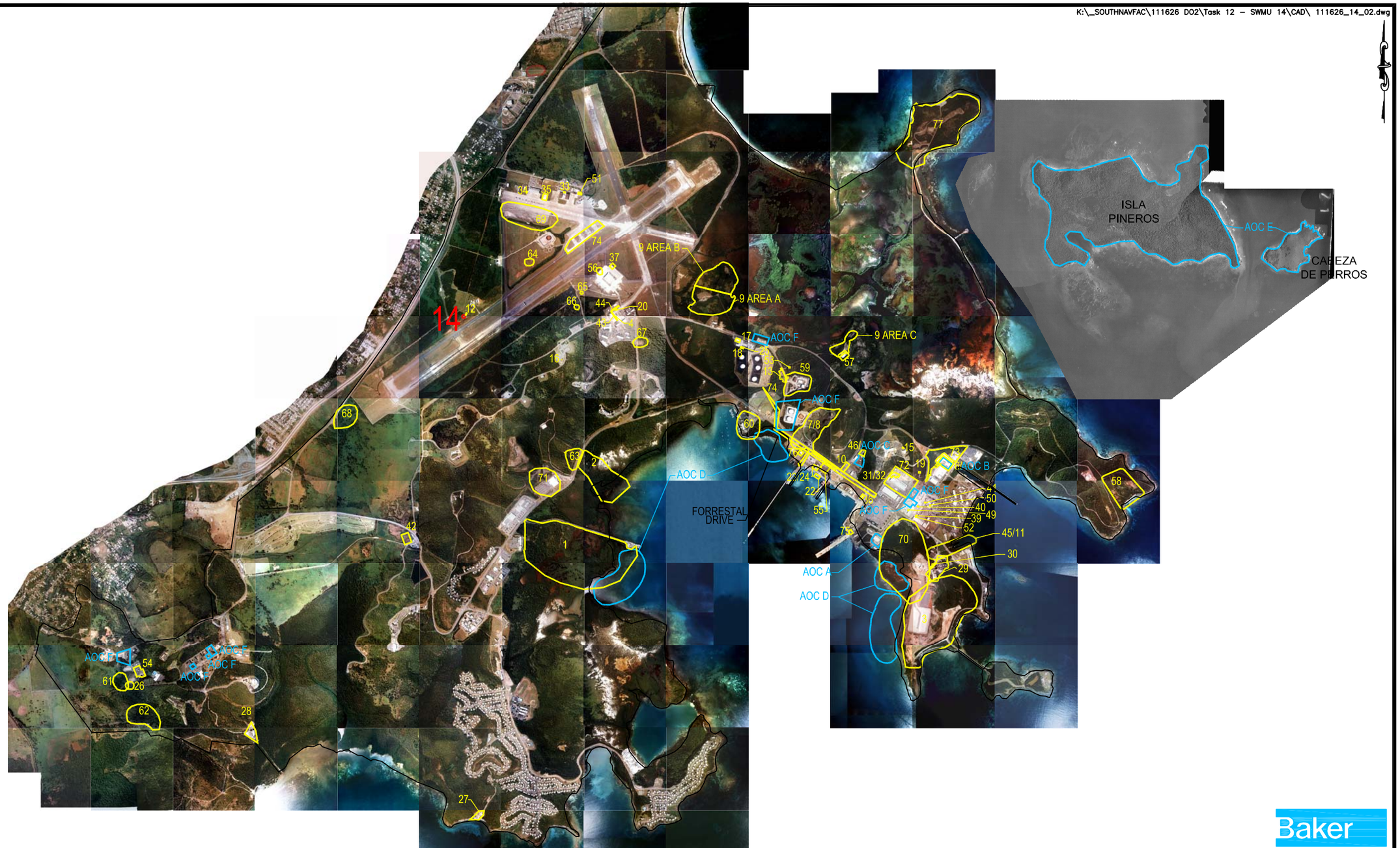
Baker

FIGURE 1-1
REGIONAL LOCATION MAP
SWMU 14-FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN

SOURCE: METRODATA, INC., 1999.

NAVAL ACTIVITY PUERTO RICO

K:_SOUTHNAVFAC\111626 DO2\Task 12 – SWMU 14\CAD\ 111626_14_02.dwg



Baker

LEGEND

1 – SWMUs

14 – AREA OF WHICH THIS INVESTIGATION PERTAINS TO

AOC D – AOCs

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

3000 0 1500 3000

1 inch = 3000 ft.

FIGURE 1-2
NAPR SWMU AND AOC LOCATION MAP
SWMU 14-FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO

1000 0 500 1000

1 inch = 1000 ft.

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

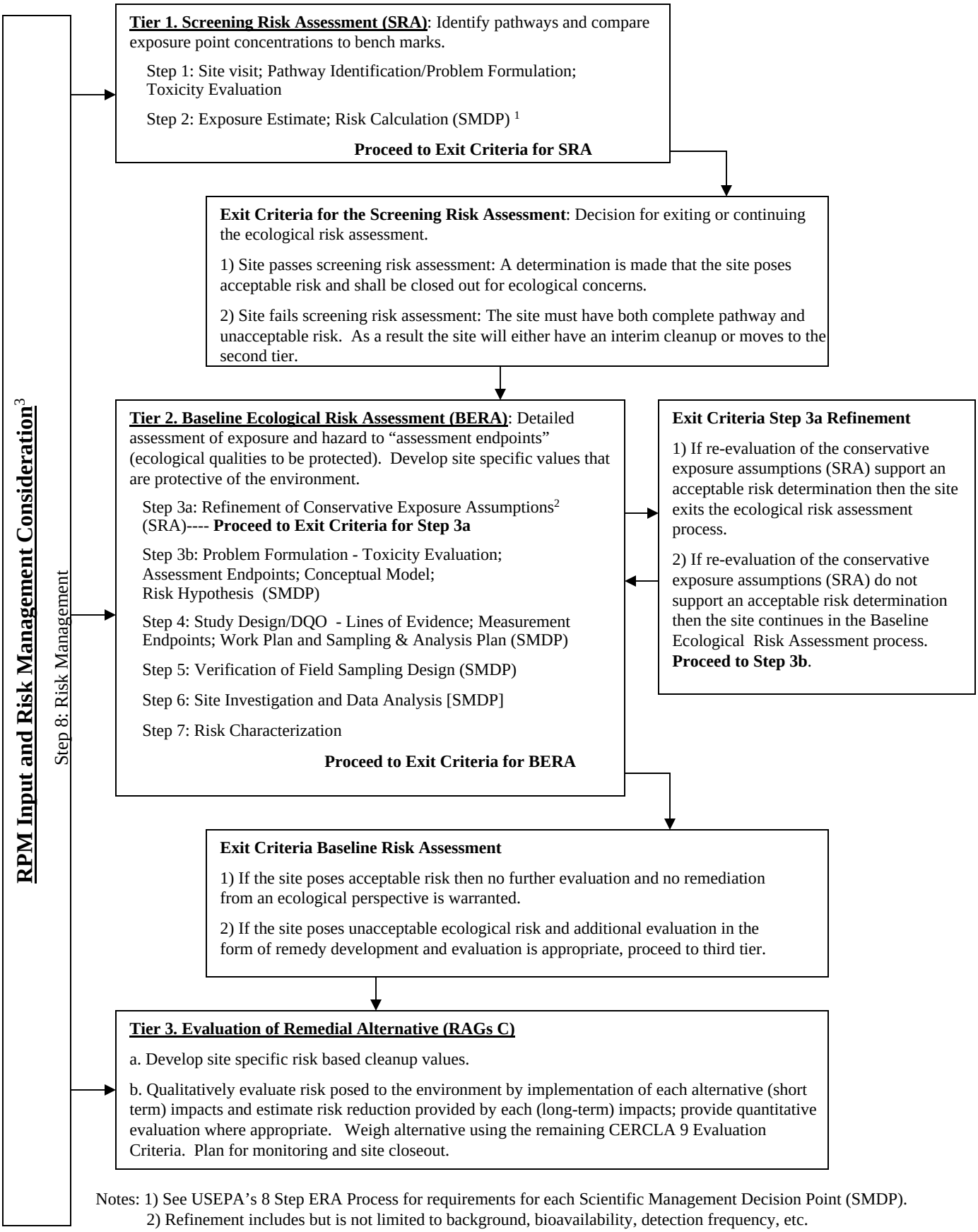
LEGEND

Baker

FIGURE 1-3
LOCATION MAP
SWMU 14-FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN

NAVAL ACTIVITY PUERTO RICO

Figure 2-1: Navy Ecological Risk Assessment Tiered Approach



Notes: 1) See USEPA's 8 Step ERA Process for requirements for each Scientific Management Decision Point (SMDP).
2) Refinement includes but is not limited to background, bioavailability, detection frequency, etc.
3) Risk Management is incorporated throughout the tiered approach.

K:_SOUTHNAVFAC\111626 DO2\Task 12 - SWMU 14\CAD\ 111626_14_05.dwg

150 0 75 150

1 inch = 150 ft.

Baker

Baker Environmental, Inc.

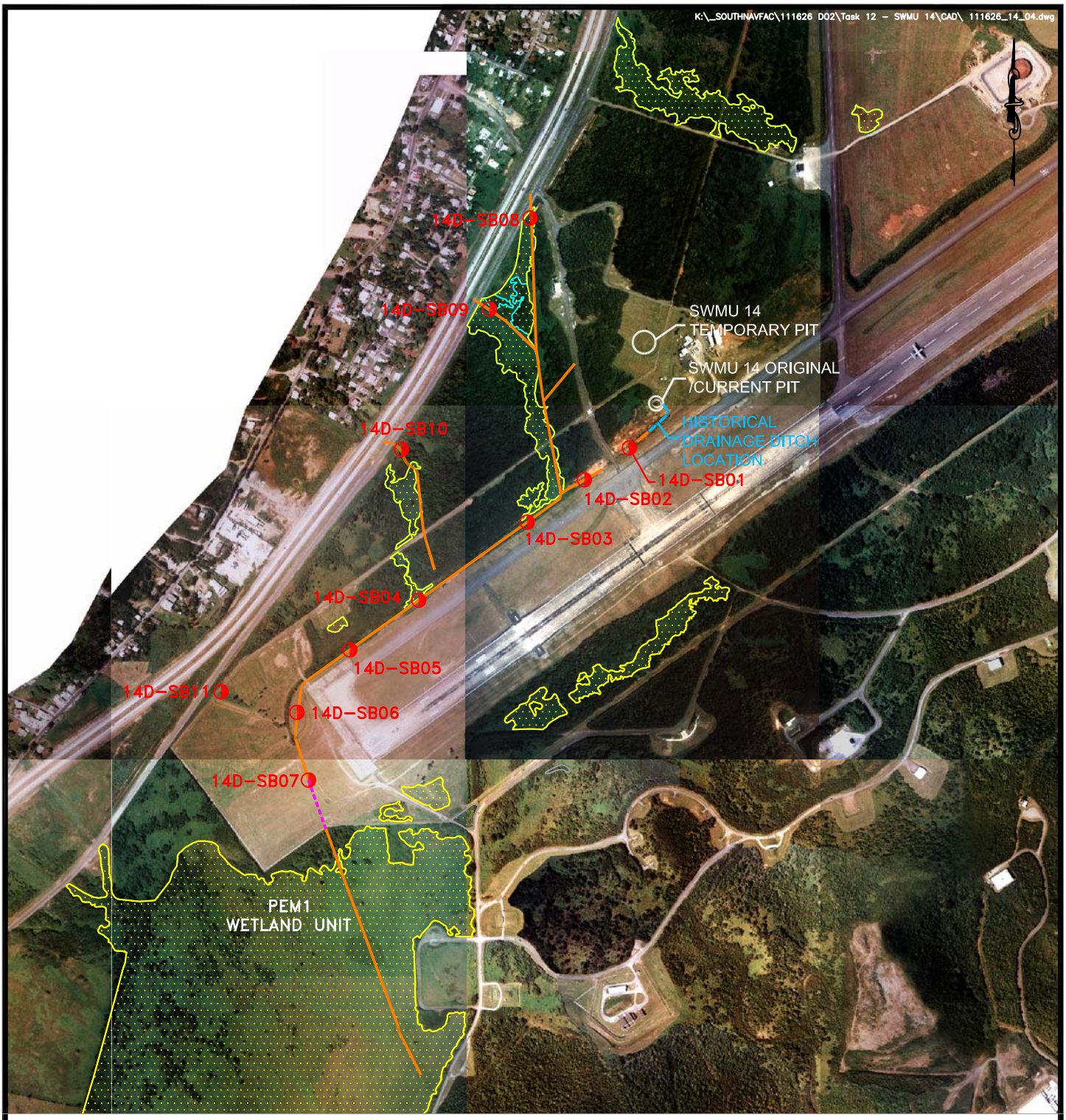
LEGEND

- 1996 SURFACE SOIL SAMPLE
- 2006 SUBSURFACE SOIL SAMPLE
- 2006 SURFACE & SUBSURFACE SOIL SAMPLES
- 2006 SURFACE & SUBSURFACE SOIL AND GROUNDWATER SAMPLES

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000

FIGURE 2-2
RFI SOIL AND GROUNDWATER SAMPLING LOCATIONS
SWMU 14-FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN

NAVAL ACTIVITY PUERTO RICO



1000 0 500 1000

1 inch = 1000 ft.

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Baker

LEGEND

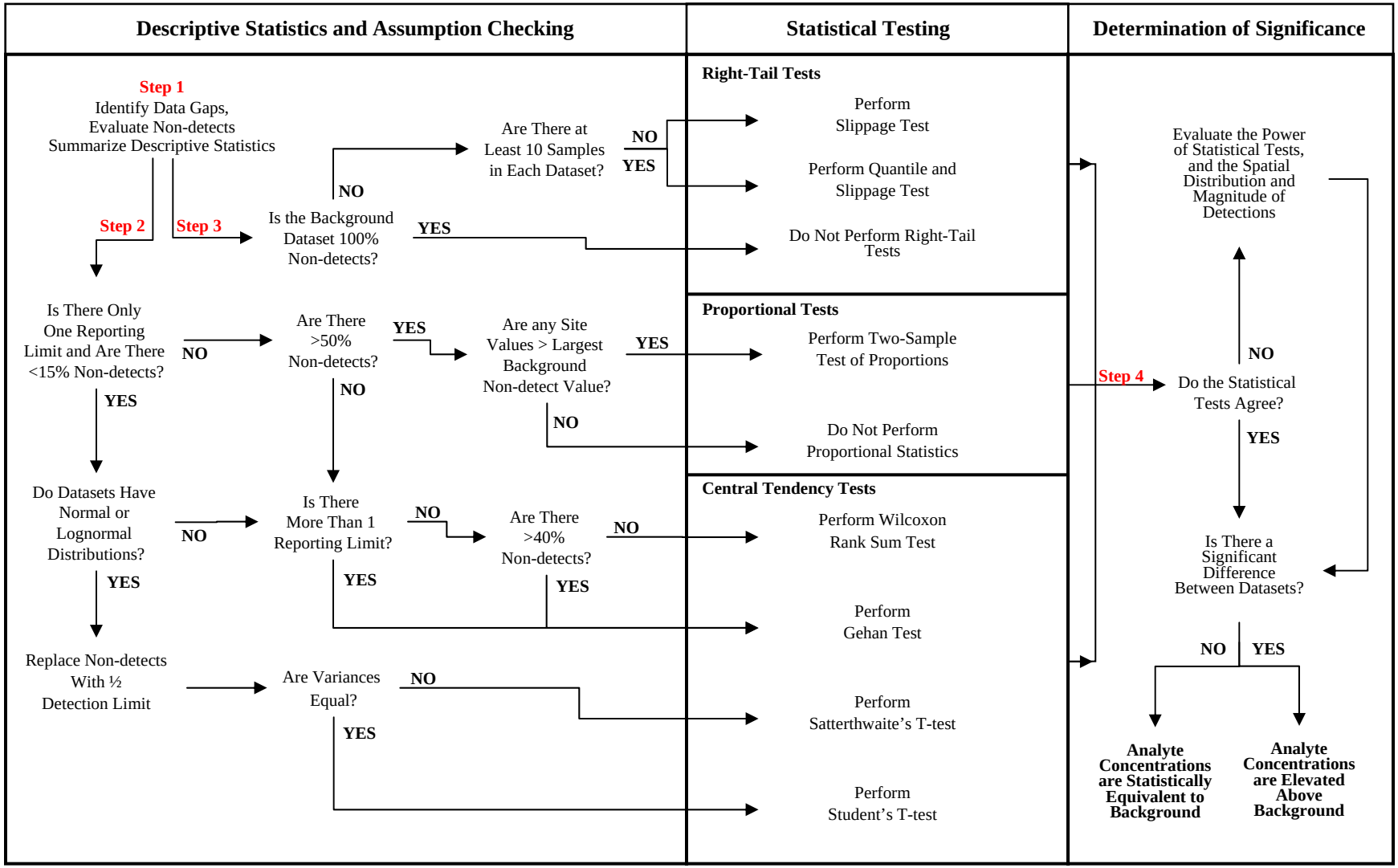
- HISTORIC DRAINAGE DITCH
- DRAINAGE DITCH
- CULVERT
- WETLAND BOUNDARY PEM1 AND UPLAND
- PROPOSED SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION

FIGURE 3-1
SAMPLE LOCATION MAP
SWMU 14-FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN

NAVAL ACTIVITY PUERTO RICO

Revised: November 9, 2007

FIGURE 4-1
STATISTICAL ANALYSIS PROCESS
SWMU 14 –FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

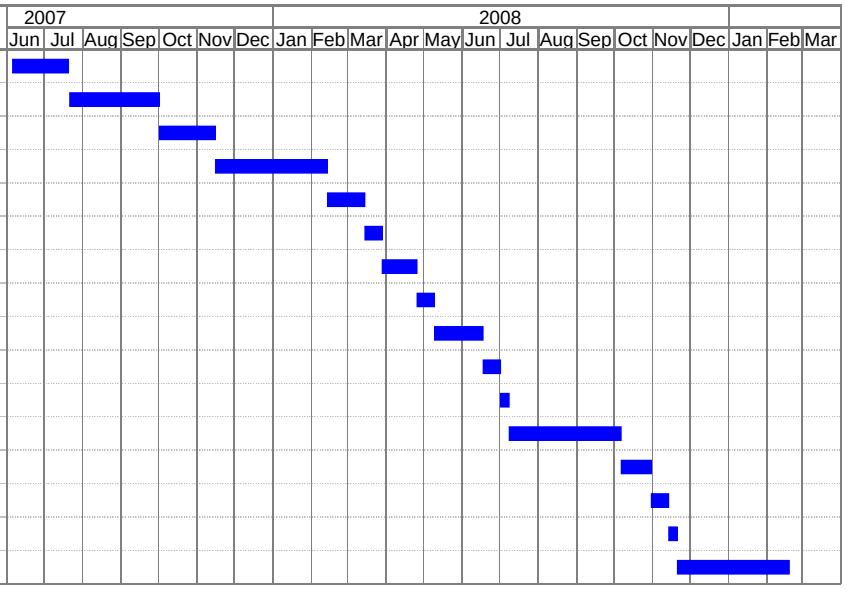


Parametric t-tests performed on log-transformed data if both datasets have lognormal distributions.

Revised: November 9, 2007

FIGURE 5-1
PROPOSED PROJECT SCHEDULE
ADDITIONAL DATA COLLECTION WORK PLAN IN SUPPORT OF ERA
SWMU 14
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

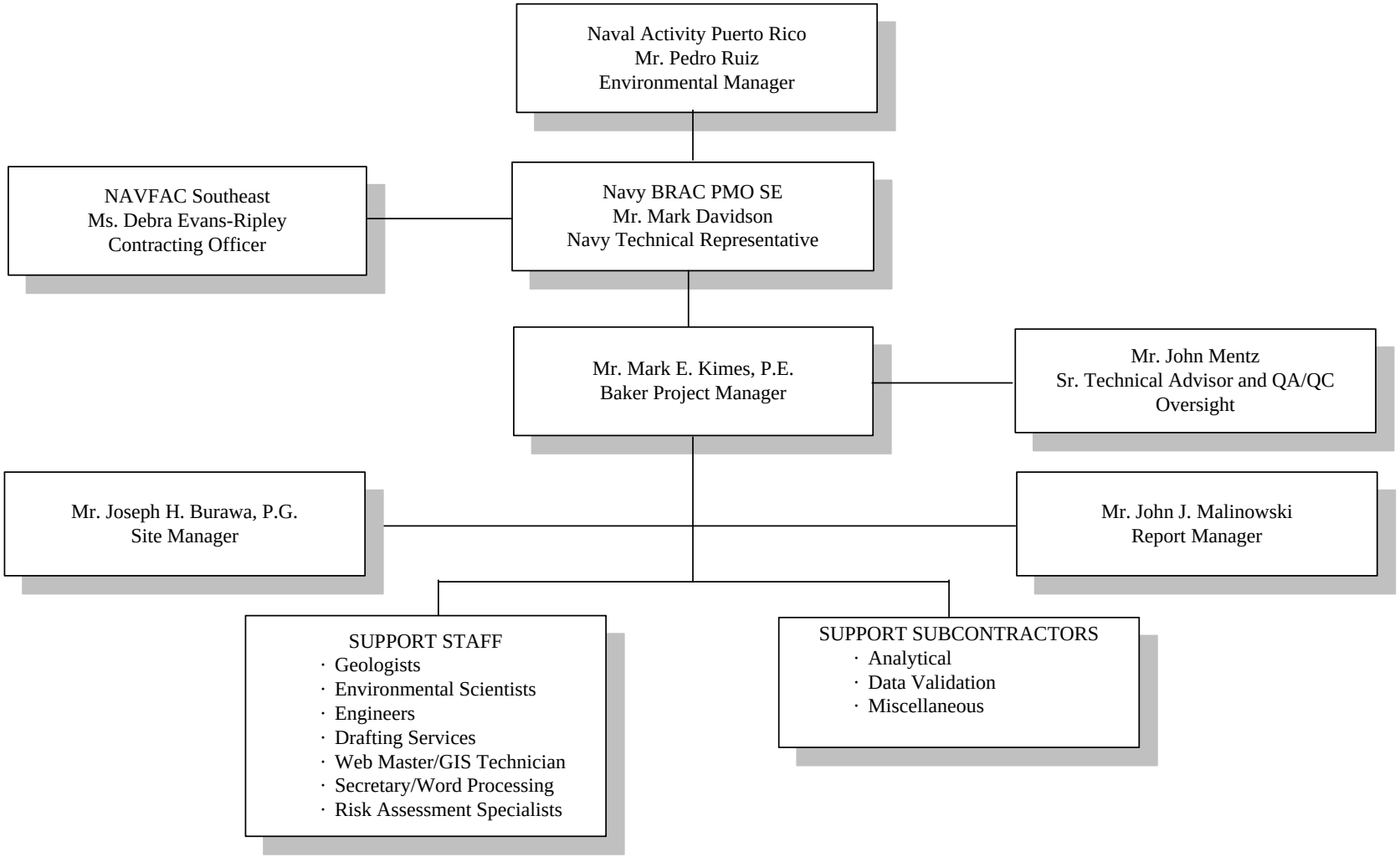
ID	Task Name	Duration	Start	Finish
1	Draft Additional Data Collection Work Plan to the EPA	45 edays	6/5/07	7/20/07
2	EPA Review	72 edays	7/21/07	10/1/07
3	Final Additional Data Collection Work Plan to the EPA	45 edays	10/1/07	11/15/07
4	EPA Review & Approval	90 edays	11/15/07	2/13/08
5	Initiate Field Work	30 edays	2/13/08	3/14/08
6	Field Investigation	14 edays	3/14/08	3/28/08
7	Laboratory Analysis	28 edays	3/28/08	4/25/08
8	Data Validation	14 edays	4/25/08	5/9/08
9	Draft Phase II RFI Report for SWMU 14 to Navy	39 edays	5/9/08	6/17/08
10	Navy Review	14 edays	6/17/08	7/1/08
11	Draft Phase II RFI Report for SWMU 14 to EPA	7 edays	7/1/08	7/8/08
12	EPA Review	90 edays	7/8/08	10/6/08
13	Final Phase II RFI Report for SWMU 14 to Navy	24 edays	10/6/08	10/30/08
14	Navy Review	14 edays	10/30/08	11/13/08
15	Final Phase II RFI Report for SWMU 14 to EPA	7 edays	11/13/08	11/20/08
16	EPA Review & Approval	90 edays	11/20/08	2/18/09



Project:Phase I RFI Work Plan
Date: 11/8/07

Task

FIGURE 6-1
PROJECT ORGANIZATION
ADDITIONAL DATA COLLECTION WORK PLAN - SWMU 14
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO



APPENDIX A
SWMU 14 Photographs

Photograph 1 – Drainage ditch historically connected to the original fire training pit.

Photograph 2 – Drainage ditch looking southwest from SWMU 14.

APPENDIX B
Soil Analytical Data Used in SERA

APPENDIX B

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Volatiles (ug/kg)									
1,1,1,2-Tetrachloroethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
1,1,1-Trichloroethane (TCA)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1,2,2-Tetrachloroethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1,2-Trichloroethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1-Dichloroethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,1-Dichloroethene	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,2,3-Trichloropropane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
1,2-Dibromo-3-chloropropane (DBCP)	25 UJ	25 UJ	23 UJ	24 U	22 U	4.5 UJ	5 UJ	5.4 UJ	4.3 UJ
1,2-Dibromoethane (EDB)	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
1,2-Dichloroethane	6 UJ	6 UJ	6 UJ	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	4.5 U	5 U	5.4 U	4.3 U
1,2-Dichloropropane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,3-Dichloropropene (cis)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,3-Dichloropropene (trans)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
1,4-Dichloro-2-butene (trans)	25 U	25 UJ	23 U	24 U	22 U	90 U	100 U	110 U	85 U
2-Butanone (MEK)	12 U	12 UJ	12 U	12 U	11 U	36 J	31 J	23 J	11 UJ
2-Chloro-1,3-butadiene (Chloroprene)	120 U	120 UJ	120 U	120 U	110 U	4.5 U	5 U	5.4 U	4.3 U
2-Hexanone (MBK)	12 UJ	12 UJ	12 UJ	12 U	11 U	2.3 J	3 J	13 UJ	11 UJ
3-Chloropropene (Allyl Chloride)	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
4-Methyl-2-pentanone (MIBK)	12 U	12 UJ	12 U	12 U	11 U	11 U	12 U	13 U	11 U
Acetone	12 UJ	12 UJ	12 UJ	12 UJ	11 UJ	240 U	95 U	200 U	18 U
Acetonitrile	120 U	120 UJ	120 U	120 U	110 U	4.5 R	5 R	5.4 R	4.3 R
Acrolein	620 U	630 UJ	590 U	590 U	540 U	45 U	50 U	54 U	43 U
Acrylonitrile	120 U	120 UJ	120 U	120 U	110 U	45 U	50 U	54 U	43 U
Benzene	6 U	6 UJ	6 U	6 U	5 U	9.5	5.3 U	5.4 U	4.3 U
Bromodichloromethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Bromoform	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Bromomethane	12 U	12 UJ	12 U	12 U	11 U	0.7 J	5 U	5.4 U	4.3 U
Carbon Disulfide	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Carbon Tetrachloride	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U

APPENDIX B

SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Volatiles (ug/kg) (Cont)									
Chlorobenzene	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Chloroethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
0	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Chloromethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Dibromochloromethane	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Dibromomethane	12 U	12 UJ	12 U	12 UJ	11 UJ	4.5 U	5 U	5.4 U	4.3 U
Dichlorodifluoromethane (Freon-12)	25 U	25 UJ	23 U	24 UJ	22 UJ	4.5 U	5 U	5.4 U	4.3 U
Ethyl Methacrylate	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
Ethylbenzene	6 U	6 UJ	6 U	6 UJ	5 UJ	1.5 J	1.6 J	5.4 U	4.3 U
Iodomethane	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Isobutyl Alcohol	2500 R	2500 R	2300 R	2400 R	2200 R	230 R	250 R	270 R	210 R
Methyl Acrylonitrile	25 U	25 UJ	23 U	24 U	22 U	4.5 UJ	5 UJ	5.4 UJ	4.3 UJ
Methyl Methacrylate	25 U	25 UJ	23 U	24 U	22 U	45 U	50 U	54 U	43 U
Methylene Chloride	6 UJ	6 UJ	6 UJ	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Pentachloroethane	25 U	25 UJ	23 U	24 U	22 U	4.5 U	5 U	5.4 U	4.3 U
Propionitrile (Ethyl Cyanide)	62 R	63 R	59 R	59 R	54 R	230 U	250 U	270 U	210 U
Styrene (Ethenylbenzene)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Tetrachloroethene (PCE)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Toluene	6 U	6 UJ	6 U	6 U	5 U	9.1 U	7.2 U	5.4 U	4.3 U
Trichloroethene (TCE)	6 U	6 UJ	6 U	6 U	5 U	4.5 U	5 U	5.4 U	4.3 U
Trichlorofluoromethane	12 UJ	12 UJ	12 UJ	12 UJ	11 UJ	4.5 U	5 U	5.4 U	4.3 U
Vinyl Acetate	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Vinyl Chloride	12 U	12 UJ	12 U	12 U	11 U	4.5 U	5 U	5.4 U	4.3 U
Xylenes, total	6 U	6 UJ	6 U	6 U	5 U	2.3 J	2.7 J	16 U	13 U
Semivolatiles (ug/kg)									
1,2,4,5-Tetrachlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,2,4-Trichlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,2-Dichlorobenzene (o-)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,3,5-Trinitrobenzene	4000 U	4100 U	3900 U	3900 U	3600 U	380 U	410 U	380 U	420 U
1,3-Dichlorobenzene (m-)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U

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SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Semivolatiles (ug/kg) (Cont)									
1,3-Dinitrobenzene (m-)	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
1,4-Dichlorobenzene (p-)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
1,4-Dioxane (p-)	800 R	820 R	770 R	770 R	710 R	230 R	250 R	270 R	210 R
1,4-Naphthoquinone	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 U	410 U	380 U	420 U
1,4-Phenylenediamine	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 UJ	410 UJ	380 UJ	420 UJ
1-Naphthylamine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
2,3,4,6-Tetrachlorophenol	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
2,4,5-Trichlorophenol	2000 U	2100 U	1900 U	1900 U	1800 U	380 U	410 U	380 U	420 U
2,4,6-Trichlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,4-Dichlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,4-Dimethylphenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,4-Dinitrophenol	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	750 U	810 U	770 U	840 UJ
2,4-Dinitrotoluene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,6-Dichlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2,6-Dinitrotoluene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Acetylaminofluorene	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
2-Chloronaphthalene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Chlorophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Methylnaphthalene	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
2-Methylphenol (o-Cresol)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Naphthylamine	1000 U	1000 U	970 U	970 U	890 U	380 U	410 U	380 U	420 U
2-Nitroaniline	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
2-Nitrophenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
2-Picoline	400 R	410 R	390 R	390 R	360 R	380 U	410 U	380 U	420 U
3,3'-Dichlorobenzidine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
3,3'-Dimethylbenzidine	2000 U	2100 U	1900 U	1900 U	1800 U	380 U	410 U	380 U	420 U
3-Methylcholanthrene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
3-Methylphenol (m-Cresol)	NA	NA	NA	NA	NA	380 U	410 U	380 U	420 U
3-Nitroaniline	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
4,6-Dinitro-2-methylphenol	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	750 U	810 U	770 U	840 U

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SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Semivolatiles (ug/kg) (Cont)									
4-Aminobiphenyl	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	380 U	410 U	380 U	420 U
4-Chloro-3-methylphenol	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Chloroaniline	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Chlorophenyl-phenylether	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
4-Dimethylaminoazobenzene (p-)	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
4-Methylphenol (p-Cresol)	NA	NA	NA	NA	NA	380 U	410 U	380 U	420 U
4-Nitroaniline	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
4-Nitrophenol	2000 U	2100 U	1900 U	1900 U	1800 U	750 UJ	810 UJ	770 UJ	840 UJ
4-Nitroquinoline-1-Oxide	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 U	410 U	380 U	420 UJ
5-Nitro-o-toluidine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
7,12-Dimethylbenz(a)anthracene	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
a,a-Dimethylphenethylamine	2000 U	2100 U	1900 U	1900 U	1800 U	76000 UJ	83000 UJ	78000 UJ	85000 UJ
Acetophenone	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Aniline	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 U	410 U	380 U	420 U
Aramite	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 U	410 U	380 U	420 U
Benzyl Alcohol	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
Bis(2-chloroethoxy)methane	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Bis(2-chloroisopropyl)ether	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Bis(2-chloroethyl)ether	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Bis(2-ethylhexyl) Phthalate (BEHP)	400 U	410 U	97 J	390 U	360 U	380 U	410 U	380 U	420 U
Butyl Benzyl Phthalate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Diallate (cis)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Diallate (trans)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Dibenzofuran	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Diethyl Phthalate (DEP)	400 U	410 U	54 J	390 U	360 U	380 U	410 U	380 U	420 U
Dimethyl Phthalate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Di-n-butyl Phthalate (DBP)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Di-n-octyl Phthalate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Dinoseb	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 U	410 U	380 U	420 U

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SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Semivolatiles (ug/kg) (Cont)									
Ethyl Methanesulfonate (EMS)	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorobutadiene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorocyclopentadiene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachloroethane	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Hexachlorophene	4000 R	4100 R	3900 R	3900 R	3600 R	NA	NA	NA	NA
Hexachloropropene	2000 U	2100 U	1900 U	1900 U	1800 U	380 U	410 U	380 U	420 U
Isophorone	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Isosafrole	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 U	410 U	380 U	420 U
Methapyrilene	1000 UJ	1000 UJ	970 UJ	970 UJ	890 UJ	380 U	410 U	380 U	420 UJ
Methyl Methane Sulfonate	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Nitrobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitrosodiethylamine	400 UJ	410 U	390 U	390 U	360 U	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosodimethylamine	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitroso-di-n-butylamine	400 UJ	410 UJ	390 UJ	390 UJ	360 UJ	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosodi-n-propylamine	400 U	410 U	390 U	390 U	360 U	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosodiphenylamine	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitrosomethylethylamine	400 U	410 UJ	390 UJ	390 UJ	360 UJ	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosomorpholine	800 UJ	820 UJ	770 UJ	770 UJ	710 UJ	380 UJ	410 UJ	380 UJ	420 UJ
n-Nitrosopiperidine	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
n-Nitrosopyrrolidine	2000 UJ	2100 UJ	1900 UJ	1900 UJ	1800 UJ	380 UJ	410 UJ	380 UJ	420 UJ
o-Toluidine	400 R	410 R	390 R	390 R	360 R	380 U	410 U	380 U	420 U
Pentachlorobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pentachloronitrobenzene	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pentachlorophenol	2000 U	2100 U	1900 U	1900 U	1800 U	750 U	810 U	770 U	840 U
Phenacetin	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Phenol	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pronamide	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U
Pyridine	800 U	820 U	770 U	770 U	710 U	380 U	410 U	380 U	420 U
Safrole	400 U	410 U	390 U	390 U	360 U	380 U	410 U	380 U	420 U

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SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
PAHs (ug/kg)									
1-Methylnaphthalene	NA	NA	NA	NA	NA	7.6 U	6 J	7.8 UJ	8.5 UJ
2-Methylnaphthalene	NA	NA	NA	NA	NA	7.6 U	7.4 J	7.8 UJ	8.5 U
Acenaphthene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Acenaphthylene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 UJ	8.5 U
Anthracene	400 U	410 U	390 U	110 J	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(a)anthracene	400 U	45 J	300 J	3400	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(a)pyrene (BaP)	400 U	45 J	1800	5000	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Benzo(b)fluoranthene	400 U	410 U	2800	7600	360 U	5.8 J	8.3 U	7.8 U	8.5 U
Benzo(g,h,i)perylene	66 J	91 J	1200	3600	360 U	11	5.5 J	7.8 U	8.5 U
Benzo(k)fluoranthene	400 U	410 U	640	2400	360 U	5.7 J	8.3 U	7.8 U	8.5 U
Chrysene	400 U	50 J	690	3800	360 U	5 J	8.3 U	7.8 U	8.5 U
Dibenz(a,h)anthracene	400 U	410 U	210 J	920	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Fluoranthene	88 J	110 J	230 J	67 J	360 U	6.5 J	8.3 U	7.8 U	8.5 U
Fluorene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Indeno(1,2,3-cd)pyrene	400 U	58 J	1300	3800	360 U	9.6	4.8 J	7.8 U	8.5 U
Naphthalene	400 U	410 U	390 U	390 U	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Phenanthrene	400 U	410 U	39 J	58 J	360 U	7.6 U	8.3 U	7.8 U	8.5 U
Pyrene	170 J	270 J	650	100 J	360 U	6.6 J	8.3 U	7.8 U	8.5 U
PCBs (ug/kg)									
Aroclor-1016	48 U	49 U	46 U	46 U	42 U	35 U	38 U	36 U	39 U
Aroclor-1221	48 U	49 U	46 U	46 U	42 U	48 U	52 U	49 U	53 U
Aroclor-1232	48 U	49 U	46 U	46 U	42 U	35 U	38 U	36 U	39 U
Aroclor-1242	48 U	49 U	46 U	46 U	42 U	24 U	26 U	24 U	27 U
Aroclor-1248	48 U	49 U	46 U	46 U	42 U	24 U	26 U	24 U	27 U
Aroclor-1254	96 U	98 U	93 U	93 U	85 U	24 U	26 U	24 U	27 U
Aroclor-1260	28	17	12	19	6 NJ	23 J	27 J	36 U	39 U
TPH (mg/kg)									
Diesel Range Organics (DRO)	560	360	120	490	4.5 U	11 U	12 U	12 U	15 U
Gasoline Range Organics (GRO)	3.7	3.8	1.8	1.8	0.032	0.57 U	0.62 U	0.58 U	0.63 U

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SUMMARY OF ANALYTICAL RESULTS, SURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
ADDITIONAL DATA COLLECTION WORK PLAN
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	1996 Phase I RFI					2006 RFI			
	14SS04	14SS05	14SS06	14SS07	14SS08	14SB01-00	14SB02-00	14SB03-00	14SB07-00
	3/22/1996	3/22/1996	3/22/1996	3/22/1996	3/22/1996	03-06-2006	03-07-2006	03-06-2006	03-06-2006
Inorganics (mg/kg)									
Antimony	NA	NA	NA	NA	NA	1.6 J	1.5 J	1.9 J	1.4 J
Arsenic	NA	NA	NA	NA	NA	2.5 J	1.4 J	2.9 J	2.6 J
Barium	NA	NA	NA	NA	NA	110 J	106 J	155 J	26.5 J
Beryllium	NA	NA	NA	NA	NA	0.05 U	0.03 U	0.02 U	0.01 U
Cadmium	NA	NA	NA	NA	NA	1.3	1.1	1.6	0.58 U
Chromium	NA	NA	NA	NA	NA	38.7 J	43.3 J	75.1 J	33.8 J
Cobalt	NA	NA	NA	NA	NA	31.2 J	24.1 J	46.9 J	5.8 J
Copper	NA	NA	NA	NA	NA	88.5 R	124 R	107 R	71.1 R
Lead	NA	NA	NA	NA	NA	85.3 J	79.9 J	40 J	4.9 J
Mercury	NA	NA	NA	NA	NA	0.031 J	0.077	0.042	0.049
Nickel	NA	NA	NA	NA	NA	9.7 J	14.4 J	11.5 J	4.1 J
Selenium	NA	NA	NA	NA	NA	3 J	2.1 J	4.3 J	4.7 J
Silver	NA	NA	NA	NA	NA	0.09 U	0.06 U	0.06 U	0.06 U
Tin	NA	NA	NA	NA	NA				
Thallium	NA	NA	NA	NA	NA	0.43 UJ	0.46 UJ	0.65 J	0.47 UJ
Vanadium	NA	NA	NA	NA	NA	187 J	187 J	323 J	287 J
Zinc	NA	NA	NA	NA	NA	87.8 J	85 J	64.6 J	17.9 J

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NJ - Presumptive evidence for the presence of the material at an estimated value
R - Result is rejected and unusable
NA - Not Analyzed

APPENDIX B

DATA USED IN THE SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI	
	14SB04-01	14SB06-01
	03-06-2006	03-07-2006
	1.5 - 3.0	1.5 - 3.0
Volatiles (ug/kg)		
1,1,1,2-Tetrachloroethane	220 U	4 U
1,1,1-Trichloroethane (TCA)	220 U	4 U
1,1,2,2-Tetrachloroethane	220 U	4 U
1,1,2-Trichloroethane	220 U	4 U
1,1-Dichloroethane	220 U	4 U
1,1-Dichloroethene	220 U	4 U
1,2,3-Trichloropropane	220 U	4 U
1,2-Dibromo-3-chloropropane (DBCP)	220 U	4 UJ
1,2-Dibromoethane (EDB)	220 U	4 U
1,2-Dichloroethane	220 U	4 U
1,2-Dichloroethene (trans)	220 U	4 U
1,2-Dichloropropane	220 U	4 U
1,3-Dichloropropene (cis)	220 U	4 U
1,3-Dichloropropene (trans)	220 U	4 U
1,4-Dichloro-2-butene (trans)	870 U	80 U
2-Butanone (MEK)	540 UJ	8.7 J
2-Chloro-1,3-butadiene (Chloroprene)	220 U	4 U
2-Hexanone (MBK)	540 U	10 UJ
3-Chloropropene (Allyl Chloride)	220 U	4 U
4-Methyl-2-pentanone (MIBK)	540 U	10 U
Acetone	540 UJ	30 U
Acetonitrile	220 U	4 R
Acrolein	2200 R	40 U
Acrylonitrile	2200 UJ	40 U
Benzene	220 U	4 U
Bromodichloromethane	220 U	4 U
Bromoform	220 U	4 U
Bromomethane	220 U	4 U
Carbon Disulfide	220 U	0.9 J
Carbon Tetrachloride	220 U	4 U

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DATA USED IN THE SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI	
	14SB04-01	14SB06-01
	03-06-2006	03-07-2006
	1.5 - 3.0	1.5 - 3.0
Volatiles (ug/kg) (Cont)		
Chlorobenzene	220 U	4 U
Chloroethane	220 U	4 U
Chloroform	220 U	4 U
Chloromethane	220 U	4 U
Dibromochloromethane	220 U	4 U
Dibromomethane	220 UJ	4 U
Dichlorodifluoromethane (Freon-12)	220 U	4 U
Ethyl Methacrylate	2200 U	4 U
Ethylbenzene	740	4 U
Iodomethane	220 UJ	4 U
Isobutyl Alcohol	1100 R	200 R
Methyl Acrylonitrile	2200 UJ	4 UJ
Methyl Methacrylate	2200 UJ	40 U
Methylene Chloride	220 U	4 U
Pentachloroethane	220 UJ	4 U
Propionitrile (Ethyl Cyanide)	11000 R	200 U
Styrene (Ethenylbenzene)	220 U	4 U
Tetrachloroethene (PCE)	220 UJ	4 U
Toluene	220 U	4 U
Trichloroethene (TCE)	220 U	4 U
Trichlorofluoromethane	220 U	4 U
Vinyl Acetate	220 U	4 U
Vinyl Chloride	220 U	4 U
Xylenes, total	130 J	12 U
Semivolatiles (ug/kg)		
1,2,4,5-Tetrachlorobenzene	380 U	400 U
1,2,4-Trichlorobenzene	380 U	400 U
1,2-Dichlorobenzene (o-)	380 U	400 U
1,3,5-Trinitrobenzene	380 U	400 U
1,3-Dichlorobenzene (m-)	380 U	400 U

APPENDIX B

DATA USED IN THE SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI	
	14SB04-01	14SB06-01
	03-06-2006	03-07-2006
	1.5 - 3.0	1.5 - 3.0
Semivolatiles (ug/kg) (Cont)		
1,3-Dinitrobenzene (m-)	380 U	400 U
1,4-Dichlorobenzene (p-)	380 U	400 U
1,4-Dioxane (p-)	11000 R	200 R
1,4-Naphthoquinone	380 U	400 U
1,4-Phenylenediamine	380 UJ	400 UJ
1-Naphthylamine	380 U	400 U
2,3,4,6-Tetrachlorophenol	380 U	400 U
2,4,5-Trichlorophenol	380 U	400 U
2,4,6-Trichlorophenol	380 U	400 U
2,4-Dichlorophenol	380 U	400 U
2,4-Dimethylphenol	380 U	400 U
2,4-Dinitrophenol	760 UJ	800 UJ
2,4-Dinitrotoluene	380 U	400 U
2,6-Dichlorophenol	380 U	400 U
2,6-Dinitrotoluene	380 U	400 U
2-Acetylaminofluorene	380 U	400 U
2-Chloronaphthalene	380 U	400 U
2-Chlorophenol	380 U	400 U
2-Methylphenol (o-Cresol)	380 U	400 U
2-Naphthylamine	380 U	400 U
2-Nitroaniline	760 U	800 U
2-Nitrophenol	380 U	400 U
2-Picoline	380 U	400 U
3,3'-Dichlorobenzidine	380 U	400 U
3,3'-Dimethylbenzidine	380 U	400 U
3-Methylcholanthrene	380 U	400 U
3-Methylphenol (m-Cresol)	380 U	400 U
3-Nitroaniline	760 U	800 U
4,6-Dinitro-2-methylphenol	760 U	800 U

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DATA USED IN THE SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI	
	14SB04-01	14SB06-01
	03-06-2006	03-07-2006
	1.5 - 3.0	1.5 - 3.0
Semivolatiles (ug/kg) (Cont)		
4-Aminobiphenyl	380 U	400 U
4-Bromophenyl-phenylether	380 U	400 U
4-Chloro-3-methylphenol	380 U	400 U
4-Chloroaniline	380 U	400 U
4-Chlorophenyl-phenylether	380 U	400 U
4-Dimethylaminoazobenzene (p-)	380 U	400 U
4-Methylphenol (p-Cresol)	380 U	400 U
4-Nitroaniline	760 U	800 U
4-Nitrophenol	760 UJ	800 UJ
4-Nitroquinoline-1-Oxide	380 UJ	400 UJ
5-Nitro-o-toluidine	380 U	400 U
7,12-Dimethylbenz(a)anthracene	380 U	400 U
a,a-Dimethylphenethylamine	77000 UJ	82000 UJ
Acetophenone	380 U	400 U
Aniline	380 U	400 U
Aramite	380 U	400 U
Benzyl Alcohol	380 U	400 U
Bis(2-chloroethoxy)methane	380 U	400 U
Bis(2-chloroisopropyl)ether	380 U	400 U
Bis(2-chloroethyl)ether	380 U	400 U
Bis(2-ethylhexyl) Phthalate (BEHP)	380 U	400 U
Butyl Benzyl Phthalate	380 U	400 U
Diallate (cis)	380 U	400 U
Diallate (trans)	380 U	400 U
Dibenzofuran	380 U	400 U
Diethyl Phthalate (DEP)	380 U	400 U
Dimethyl Phthalate	380 U	400 U
Di-n-butyl Phthalate (DBP)	380 U	400 U
Di-n-octyl Phthalate	380 U	400 U
Dinoseb	380 U	400 U

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SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI	
	14SB04-01	14SB06-01
	03-06-2006	03-07-2006
	1.5 - 3.0	1.5 - 3.0
Semivolatiles (ug/kg) (Cont)		
Ethyl Methanesulfonate (EMS)	380 U	400 U
Hexachlorobenzene	380 U	400 U
Hexachlorobutadiene	380 U	400 U
Hexachlorocyclopentadiene	380 U	400 U
Hexachloroethane	380 U	400 U
Hexachlorophene	NA	NA
Hexachloropropene	380 U	400 U
Isophorone	380 U	400 U
Isosafrole	380 U	400 U
Methapyrilene	380 UJ	400 UJ
Methyl Methane Sulfonate	380 U	400 U
Nitrobenzene	380 U	400 U
n-Nitrosodiethylamine	380 UJ	400 UJ
n-Nitrosodimethylamine	380 U	400 U
n-Nitroso-di-n-butylamine	380 UJ	400 UJ
n-Nitrosodi-n-propylamine	380 UJ	400 UJ
n-Nitrosodiphenylamine	380 U	400 U
n-Nitrosomethylethylamine	380 UJ	400 UJ
n-Nitrosomorpholine	380 UJ	400 UJ
n-Nitrosopiperidine	380 U	400 U
n-Nitrosopyrrolidine	380 UJ	400 UJ
o-Toluidine	380 U	400 U
Pentachlorobenzene	380 U	400 U
Pentachloronitrobenzene	380 U	400 U
Pentachlorophenol	760 U	800 U
Phenacetin	380 U	400 U
Phenol	380 U	400 U
Pronamide	380 U	400 U
Pyridine	380 U	400 U
Safrole	380 U	400 U

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DATA USED IN THE SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI	
	14SB04-01	14SB06-01
	03-06-2006	03-07-2006
	1.5 - 3.0	1.5 - 3.0
PAHs (ug/kg)		
1-Methylnaphthalene	NA	8.2 UJ
2-Methylnaphthalene	1700	8.2 UJ
Acenaphthene	380 U	8.2 U
Acenaphthylene	380 U	8.2 UJ
Anthracene	380 U	8.2 U
Benzo(a)anthracene	380 U	8.2 U
Benzo(a)pyrene (BaP)	380 U	8.2 U
Benzo(b)fluoranthene	380 U	8.2 U
Benzo(g,h,i)perylene	16 J	7.7 J
Benzo(k)fluoranthene	380 U	8.2 U
Chrysene	380 U	8.2 U
Dibenz(a,h)anthracene	380 U	8.2 U
Fluoranthene	380 U	8.2 U
Fluorene	380 U	8.2 U
Indeno(1,2,3-cd)pyrene	380 U	5.6 J
Naphthalene	480	8.2 U
Phenanthrene	45 J	8.2 U
Pyrene	62 J	8.2 U
PCBs (ug/kg)		
Aroclor-1016	36 UJ	38 U
Aroclor-1221	48 UJ	51 U
Aroclor-1232	36 UJ	38 U
Aroclor-1242	24 UJ	26 U
Aroclor-1248	24 UJ	26 U
Aroclor-1254	24 UJ	26 U
Aroclor-1260	36 UJ	38 U

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SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI	
	14SB04-01	14SB06-01
	03-06-2006	03-07-2006
	1.5 - 3.0	1.5 - 3.0
Dioxins / Furans (ug/kg)		
TCDD, 2,3,7,8-	0.113 U	NA
PeCDD, 1,2,3,7,8-	0.113 U	NA
HxCDD, 1,2,3,4,7,8-	0.283 U	NA
HxCDD, 1,2,3,6,7,8-	0.283 U	NA
HxCDD, 1,2,3,7,8,9-	0.283 U	NA
HpCDD, 1,2,3,4,6,7,8-	1.27 J	NA
OCDD	11.6	NA
TCDF, 2,3,7,8-	0.113 U	NA
PeCDF, 1,2,3,7,8-	0.113 U	NA
PeCDF, 2,3,4,7,8-	0.113 U	NA
HxCDF, 1,2,3,4,7,8-	0.283 U	NA
HxCDF, 1,2,3,6,7,8-	0.283 U	NA
HxCDF, 2,3,4,6,7,8-	0.283 U	NA
HxCDF, 1,2,3,7,8,9-	0.283 U	NA
HpCDF, 1,2,3,4,6,7,8-	0.283 U	NA
HpCDF, 1,2,3,4,7,8,9-	0.283 U	NA
OCDF	0.566 U	NA
TPH (mg/kg)		
Diesel Range Organics (DRO)	2400	29
Gasoline Range Organics (GRO)	5.4	0.61 U

APPENDIX B

DATA USED IN THE SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT, SUBSURFACE SOIL
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI	
	14SB04-01	14SB06-01
	03-06-2006	03-07-2006
	1.5 - 3.0	1.5 - 3.0
Inorganics (mg/kg)		
Antimony	1 UJ	1.4 J
Arsenic	0.79 J	1.2 J
Barium	64.4 J	63.8 J
Beryllium	0.01 U	0.01 U
Cadmium	0.84	1
Chromium	20.8 J	31.9 J
Cobalt	12.8 J	24.5 J
Copper	84 R	143 R
Lead	39.8 J	14.8 J
Mercury	0.017 U	0.019 U
Nickel	7.7 J	13.5 J
Selenium	0.54 J	1.1 J
Silver	0.05 U	0.06 U
Thallium	0.42 UJ	0.46 UJ
Tin		
Vanadium	98.8 J	178 J
Zinc	68 J	75.9 J

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NA - Not Analyzed
R - Result is rejected and unusable

APPENDIX C
Groundwater Analytical Data

GROUNDWATER ANALYTICAL DATA
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Volatiles (ug/L)			
1,1,1,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane (TCA)	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U
1,2,3-Trichloropropane	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane (DBCP)	0.5 UJ	0.5 UJ	0.5 U
1,2-Dibromoethane (EDB)	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	4.1	0.5 U	0.5 U
1,2-Dichloroethene (trans)	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U
1,4-Dichloro-2-butene (trans)	20 U	20 U	20 R
2-Butanone (MEK)	16	7.2	2.5 R
2-Chloro-1,3-butadiene (Chloroprene)	0.5 U	0.5 U	0.5 UJ
2-Hexanone (MBK)	2.5 U	2.5 U	2.5 U
3-Chloropropene (Allyl Chloride)	0.5 U	0.5 U	0.5 UJ
4-Methyl-2-pentanone (MIBK)	2.5 U	2.5 U	2.5 U
Acetone	72	58	2.5 U
Acetonitrile	0.5 R	0.5 R	0.5 R
Acrolein	5 R	5 R	5 R
Acrylonitrile	5 R	5 R	5 R
Benzene	220	0.41 J	0.5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U
Bromoform	0.5 U	0.5 U	0.5 U
Bromomethane	0.5 U	0.5 U	0.5 U
Carbon Disulfide	0.13 J	0.22 J	0.5 U
Carbon Tetrachloride	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U	0.5 U
Chloroethane	0.5 U	0.5 U	0.5 UJ
Chloroform	0.5 U	0.5 U	0.5 U

GROUNDWATER ANALYTICAL DATA
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Volatiles (ug/L) (Cont)			
Chloromethane	0.5 U	0.5 U	0.5 UJ
Dibromochloromethane	0.5 U	0.5 U	0.5 U
Dibromomethane	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 U
Ethyl Methacrylate	5 U	5 U	5 U
Ethylbenzene	1.3	0.56	0.5 U
Iodomethane	0.5 U	0.58 J	0.5 UJ
Isobutyl Alcohol	25 UJ	25 UJ	25 UJ
Methyl Acrylonitrile	5 UJ	5 UJ	5 UJ
Methyl Methacrylate	5 U	5 U	5 U
Methylene Chloride	0.5 U	0.5 U	0.5 U
Pentachloroethane	0.5 UJ	0.5 UJ	0.5 UJ
Propionitrile (Ethyl Cyanide)	25 R	25 R	25 R
Styrene (Ethenylbenzene)	0.5 U	0.5 U	0.5 U
Tetrachloroethene (PCE)	0.5 U	0.5 U	0.5 U
Toluene	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	0.5 U	0.5 U	0.5 U
Vinyl Acetate	1 U	1 U	1 U
Vinyl Chloride	0.5 U	0.5 U	0.5 U
Xylene, m/p-	0.28 J	0.35 J	1 U
Xylene, o-	1	0.53	0.5 U
Xylenes, total	1.3	0.91	0.5 U
Semivolatiles (ug/L)			
1,2,4,5-Tetrachlorobenzene	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U
1,2-Dichlorobenzene (o-)	10 U	10 U	10 U
1,3,5-Trinitrobenzene	10 U	10 U	10 U
1,3-Dichlorobenzene (m-)	10 U	10 U	10 U
1,3-Dinitrobenzene (m-)	10 U	10 U	10 U
1,4-Dichlorobenzene (p-)	10 U	10 U	10 U
Semivolatiles (ug/L) (Cont)			
1,4-Dioxane (p-)	25 U	25 U	25 UJ
1,4-Naphthoquinone	10 U	10 U	10 U
1,4-Phenylenediamine	100 UJ	100 UJ	100 UJ

GROUNDWATER ANALYTICAL DATA
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
1-Naphthylamine	10 U	10 U	10 U
2,3,4,6-Tetrachlorophenol	10 U	10 U	10 U
2,4,5-Trichlorophenol	10 U	10 U	10 U
2,4,6-Trichlorophenol	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U
2,4-Dinitrophenol	20 U	20 U	20 U
2,4-Dinitrotoluene	10 U	10 U	10 U
2,6-Dichlorophenol	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U
2-Acetylaminofluorene	10 U	10 U	10 U
2-Chloronaphthalene	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U
2-Methylphenol (o-Cresol)	10 U	10 U	10 U
2-Naphthylamine	10 U	10 U	10 U
2-Nitroaniline	20 U	20 U	20 U
2-Nitrophenol	10 U	10 U	10 U
2-Picoline	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U
3,3'-Dimethylbenzidine	10 U	10 U	10 U
3-Methylcholanthrene	10 U	10 U	10 U
3-Methylphenol (m-Cresol)	10 U	10 U	10 U
3-Nitroaniline	20 U	20 U	20 U
4,6-Dinitro-2-methylphenol	20 U	20 U	20 U
4-Aminobiphenyl	10 U	10 U	10 U
4-Bromophenyl-phenylether	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U
Semivolatiles (ug/L) (Cont)			
4-Chlorophenyl-phenylether	10 U	10 U	10 U
4-Dimethylaminoazobenzene (p-)	10 U	10 U	10 U
4-Methylphenol (p-Cresol)	10 U	10 U	10 U
4-Nitroaniline	20 U	20 U	20 U
4-Nitrophenol	20 U	20 U	20 U
4-Nitroquinoline-1-Oxide	10 U	10 U	10 U
5-Nitro-o-toluidine	10 U	10 U	10 U

GROUNDWATER ANALYTICAL DATA
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
7,12-Dimethylbenz(a)anthracene	10 U	10 U	10 U
a,a-Dimethylphenethylamine	2000 U	2000 U	2000 U
Acetophenone	0.33 J	10 U	10 U
Aniline	10 U	10 U	10 U
Aramite	10 U	10 U	10 U
Benzyl Alcohol	10 U	10 U	10 U
Bis(2-chloroethoxy)methane	10 U	10 U	10 U
Bis(2-chloroisopropyl)ether	10 U	10 U	10 U
Bis(2-chloroethyl)ether	10 U	10 U	10 U
Bis(2-ethylhexyl) Phthalate (BEHP)	10 U	10 U	10 U
Butyl Benzyl Phthalate	10 U	10 U	0.3 J
Chrysene	10 U	10 U	10 U
Diallate (cis)	10 U	10 U	10 U
Diallate (trans)	10 U	10 U	10 U
Dibenzofuran	0.43 J	10 U	10 U
Diethyl Phthalate (DEP)	0.89 J	10 U	1.3 J
Dimethyl Phthalate	10 U	10 U	10 U
Di-n-butyl Phthalate (DBP)	10 U	10 U	0.48 J
Di-n-octyl Phthalate	10 U	10 U	10 U
Dinoseb	10 U	10 U	10 U
Ethyl Methanesulfonate (EMS)	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U

GROUNDWATER ANALYTICAL DATA
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Semivolatiles (ug/L) (Cont)			
Hexachloroethane	10 U	10 U	10 U
Hexachloropropene	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U
Isosafrole	10 U	10 U	10 U
Methapyrilene	10 U	10 U	10 U
Methyl Methane Sulfonate	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U
n-Nitrosodiethylamine	10 U	10 U	10 U
n-Nitrosodimethylamine	10 UJ	10 UJ	10 UJ
n-Nitroso-di-n-butylamine	10 UJ	10 UJ	10 UJ
n-Nitrosodi-n-propylamine	10 UJ	10 UJ	10 UJ
n-Nitrosodiphenylamine	10 U	10 U	10 U
n-Nitrosomethylethylamine	10 U	10 U	10 U
n-Nitrosomorpholine	10 UJ	10 UJ	10 UJ
n-Nitrosopiperidine	10 U	10 U	10 U
n-Nitrosopyrrolidine	10 UJ	10 UJ	10 UJ
o-Toluidine	10 U	10 U	10 U
Pentachlorobenzene	10 U	10 U	10 U
Pentachloronitrobenzene	10 U	10 U	10 U
Pentachlorophenol	20 U	20 U	20 U
Phenacetin	10 U	10 U	10 U
Phenol	10 U	10 U	10 U
Pronamide	10 U	10 U	10 U
Pyridine	10 U	10 U	10 U
Safrole	10 U	10 U	10 U
PAHs (ug/L)			
1-Methylnaphthalene	1.4 J	1.9 J	0.2 UJ
2-Methylnaphthalene	2 J	1.8 J	0.2 U
Acenaphthene	0.081 J	0.079 J	0.2 U
Acenaphthylene	0.2 U	0.2 UJ	0.2 U
Anthracene	0.2 U	0.2 U	0.2 U
PAHs (ug/L) (Cont)			
Benzo(a)anthracene	0.095 J	0.2 U	0.2 U
Benzo(a)pyrene (BaP)	0.084 J	0.2 U	0.2 U
Benzo(b)fluoranthene	0.083 J	0.2 U	0.2 U

GROUNDWATER ANALYTICAL DATA
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Benzo(g,h,i)perylene	0.088 J	0.2 U	0.2 U
Benzo(k)fluoranthene	0.093 J	0.2 U	0.2 U
Chrysene	0.078 J	0.2 U	0.2 U
Dibenz(a,h)anthracene	0.097 J	0.2 U	0.2 U
Fluoranthene	0.078 J	0.2 U	0.2 U
Fluorene	0.25	0.11 J	0.066 J
Indeno(1,2,3-cd)pyrene	0.11 J	0.2 U	0.2 U
Naphthalene	14	3	0.34
Phenanthrene	0.2 U	0.2 U	0.2 U
Pyrene	0.087 J	0.2 U	0.2 U
PCBs (ug/L)			
Aroclor-1016	NA	0.93 U	NA
Aroclor-1221	NA	1.3 U	NA
Aroclor-1232	NA	0.93 U	NA
Aroclor-1242	NA	0.63 U	NA
Aroclor-1248	NA	0.63 U	NA
Aroclor-1254	NA	0.63 U	NA
Aroclor-1260	NA	0.93 U	NA
TPH (mg/L)			
Diesel Range Organics (DRO)	1.8	1.4	1.5
Gasoline Range Organics (GRO)	0.86	0.15 J	0.5 U
Metals (ug/L)			
Antimony	NA	1.4 U	1.2 U
Arsenic	NA	1.4 U	1.4 U
Barium	NA	157 U	110 U
Beryllium	NA	0.1 U	0.34 U
Cadmium	NA	0.2 U	0.2 U
Chromium	NA	16.5 J	27.8 J
Metals (ug/L) (Cont)			
Cobalt	NA	5	28.2
Copper	NA	24.8 R	74.3 J
Lead	NA	6.1	1.9 J
Mercury	NA	0.1 U	0.1 U
Nickel	NA	4.1 J	11.1 J
Selenium	NA	3.3 UJ	3.3 UJ
Silver	NA	0.5 U	0.5 U

GROUNDWATER ANALYTICAL DATA
SWMU 14 - FIRE TRAINING PIT AT CRASH CREW AREA
RCRA FACILITY INVESTIGATION
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	2006 RFI		
	14TW01	14TW02	14TW07
	03-08-2006	03-08-2006	03-08-2006
Thallium	NA	3.9 U	3.9 U
Tin			
Vanadium	NA	59.2	74
Zinc	NA	12.7 U	50.8

Notes:
U - Not detected
UJ - Reported quantitation limit is qualified as estimated
J - Analyte present - Reported value is estimated
NA - Not Analyzed
R - Result is rejected and unusable