



July 13, 2011

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

Attn: Mr. Tim Gordon

RE: Contract No. N62470-08-D-1006
Task Order No. JM04
SWMUs 7 & 8, Tow Way Fuel Farm Area
Naval Activity Puerto Rico - Ceiba, Puerto Rico
Corrective Measures Study Addendum for SWMUs 7 & 8 - Revised Soil Remedy
Statement of Basis/Proposed Final Soil Remedy Decision

Dear Mr. Gordon:

AGVIQ-CH2M HILL Constructors Inc. Joint Venture III (AGVIQ-CH2M HILL), on behalf of the Navy, is pleased to provide you with two hard copies and two electronic copies provided on CD of the Naval Activity Puerto Rico Corrective Measures Study Addendum for SWMUs 7 & 8 - Revised Soil Remedy and the Statement of Basis/Proposed Final Soil Remedy Decision. Additional distribution has been made as indicated below.

If you have any questions regarding this submittal, please contact Mr. Mark E. Davidson at (843) 743-2124.

Sincerely,

AGVIQ-CH2M HILL Constructors Inc. Joint Venture III

A handwritten signature in black ink, appearing to read 'Tom Beisel'.

Tom Beisel, P.G.
Project Manager

cc: Ms. Debra Evans-Ripley, BRAC PMO SE (letter only)
Mr. David Criswell, BRAC PMO SE (letter only)
Mr. Mark E. Davidson, BRAC PMO SE (1 hard copy and 1 CD)
Mr. Pedro Ruiz, NAPR (1 CD)
Mr. Carl Soderberg, US EPA Caribbean Office (1 hard copy and 1 CD)
Ms. Gloria Toro, PR EQB (1 hard copy and 1 CD)
Ms. Wilmarie Rivera, PR EQB (1 hard copy and 1 CD)
Ms. Brenda Smith, Techlaw, Inc. (1 CD)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

FEB092011

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Mark E. Davidson
US Navy
BRAC PMO SE
4130 Faber Place Drive - Suite 202
North Charleston, SC 29405

- Re: Naval Activity Puerto Rico (NAPR), formerly Naval Station Roosevelt Roads,
EPA I.D. Number PRD2170027203
- 1) SWMU 7 & 8 (Tow Way Fuel Farm) - Corrective Measure Study (CMS) Addendum, Revised Soil Remedy and Draft Statement of Basis for Revised Soil Remedy
 - 2) SWMU 62 (Former Bundy Disposal Area) — Full RFI Work Plan, dated October 14, 2010
 - 3) SWMU 70 (Disposal Area Northwest of Landfill) — Final Full RCRA Facility Investigation Work Plan, dated November 5, 2010
 - 4) SWMU 74 (Fuel Pipelines and Hydrant Pits) — Final Corrective Measure Study (CMS) Work Plan and Addendum A, Phase II Investigation Work Plan
 - 5) SWMU 78 (Pole Yard) — Full RFI Work Plan, dated October 14, 2010

Dear Mr. Davidson:

This letter is addressed to you as the Navy's designated project coordinator pursuant to the January 29, 2007 RCRA Administrative Order on Consent (the Consent Order) between the United States Environmental Protection Agency (EPA) and the U.S. Navy (the Navy).

SWMU 7 & 8 (Tow Way Fuel Farm) - Corrective Measure Study (CMS) Addendum, Revised Soil Remedy and Draft Statement of Basis for Revised Soil Remedy

EPA has completed its review of above documents dated August 2010 and submitted on behalf of the Navy by Mr. Tom Beisel's (of AGVIO/CH2MHILL) letter of September 1, 2010. As part of our review EPA requested our contractor TechLaw Inc., to review both documents. TechLaw's comments are given in the enclosed Technical Reviews dated January 24, 2011 (Enclosures #1 and #2).

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Within 60 days of your receipt of this letter, please submit any necessary revisions to the CMS Addendum for SWMU 7 & 8, and a revised Statement of Basis, addressing comments given in Enclosures #1 and #2.

In addition, the Puerto Rico Environmental Quality Board (PREQB) in its letter of September 22, 2010 to myself, indicated it had no comments on the above documents.

SWMU 62 — Full RFI Work Plan

EPA has completed its review of the *Final Full RCRA Facility Investigation Work Plan, SWMU 62 - Former Bundy Disposal Area*, dated October 14, 2010 (hereafter referred to as the Final Work Plan.) As part of our review EPA requested our contractor TechLaw Inc., to review the Final Work Plan. TechLaw's comments are given in the enclosed Technical Review dated January 10, 2011 (Enclosures #3).

TechLaw's review of the Final Work Plan focused on determining whether the Navy's responses addressed the technical issues indentified in EPA's comment letter dated August 24, 2010.

Within 60 days of your receipt of this letter, please submit any necessary revisions to the Final Work Plan to address the comments given in Enclosure #3.

SWMU 70 — Final Full RCRA Facility Investigation Work Plan

EPA has completed an evaluation of the November 5, 2010, Navy Response to EPA Comments dated September 16, 2010 on the *Draft Full RCRA Facility Investigation Work Plan, SWMU 70 — Disposal Area Northwest of Landfill*, dated June 30, 2010, and the *Final Full RCRA Facility Investigation Work Plan, SWMU 70* dated November 5, 2010 (hereafter referred to as Work Plan) for conformance with the Navy's responses. As part of our review EPA requested our contractor TechLaw Inc., to review both documents. TechLaw's comments are given in the enclosed Technical Review dated January 31, 2011 (Enclosures #4).

Within 60 days of your receipt of this letter, please submit revisions to the Full RFI Work Plan addressing comments made in Enclosure #4.

SWMU 74 — Final CMS Work Plan and Addendum A Phase II Investigation Work Plan

EPA has completed its review of above documents submitted on behalf of the Navy by Baker Enviromental's (Mr. Mark Kimes') letter of October 21, 2010. The revised documents were submitted to address comments given in EPA's letter of September 16, 2010. EPA finds the responses and revisions to be generally acceptable. However EPA has the following comments:

- 1) Although the title page of the CMS Work Plan and the Navy certification are dated October 21, 2010, most of the pages of the document indicate they were "Revised: December 6, 2007". Any pages, figures, or tables in the document revised subsequent to

then, need to reflect the date of the most current submittal, including the pages of Addendum A Phase II of the CMS Work Plan.

1. Section 9.0 (Schedule) indicates that "A schedule for the implementation of this work plan, and follow-up reports for the CMS reports is provided as Figure 9-1. However, the included Figure 9-1 shows a proposed implementation schedule covering June 2007 through May 2010, and is indicated as "Revised: December 6, 2007". The schedule needs to be revised and updated to reflect all activities proposed as part of Addendum A Phase II of the CMS Work Plan.
2. Please note that the adequacy and acceptability of any contingency borings which are installed as part of Addendum A Phase II of the CMS Work Plan at locations which are not previously reviewed and approved by EPA, will be subject to EPA's acceptance as part of its review and approval of the Phase II CMS Investigation Reports (see page A-8) of Addendum A, when developed.

In addition, the PREQB has indicated that it had no further comments on the CMS work plan for SWMU 74 to those given with their letter of August 13, 2010 to myself.

Within 45 days of your receipt of this letter, please submit any necessary revisions to the CMS work plan for SWMU 74, reflecting the above comments.

SWMU 78 — Full RFI Work Plan

EPA has completed its review of the *Final Full RCRA Facility Investigation Work Plan for SWMU 78 — Pole Yard*, dated October 14, 2010 (hereafter referred to as the Final Work Plan). As part of our review EPA requested our contractor TechLaw Inc., to review the Navy's responses to comments transmitted with EPA's letter dated June 16, 2010. Additionally, TechLaw reviewed the Final Work Plan to determine if the revised work plan addressed the original June 16, 2010 comments and email comments from TechLaw dated September 8, 2010 and September 27, 2010 on proposed Navy responses to EPA's June 16, 2010 original comments. TechLaw's comments on the October 14, 2010 responses and the Final Work Plan are given in the enclosed Technical Review dated January 10, 2011 (Enclosures #5).

In addition, the Puerto Rico Environmental Quality Board (PREQB) in its letter of November 10, 2010 to myself, had several comments on the SWMU 78 Full RFI Work Plan. These are given in Enclosure #6.

Within 60 days of your receipt of this letter, please submit any necessary revisions to the Final RFI work plan addressing the comments given in Enclosures #5 and #6.

If you have any questions, please telephone me at (212) 637- 4167.

Sincerely yours,

SIGNATURE

Timothy R. Gordon
Project Coordinator
Resource Conservation & Special Projects Section
RCRA Programs Branch

Enclosures (6)

cc: Ms. Wilmarie Rivera, P.R. Environmental Quality Board, w/encls.
Ms. Gloria Toro, P.R. Environmental Quality Board, w/encls.
Mr. Mark Kimes, Baker Environmental, w/encls.
Mr. Tom Beisel, AGVIQ/CH2MHi11's, w/encls. #1 & #2 only
Ms. Cathy Dare, TechLaw Inc. w/o encls.
Mr. Felix Lopez, USF&WS, w/o encls.

Enclosure #1

**EVALUATION OF THE AUGUST 2010
CORRECTIVE MEASURES STUDY ADDENDUM
SWMUS 7 AND 8 — REVISED SOIL REMEDY
TOW WAY FUEL FARM AREA**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

Submitted to:

**U.S. Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866**

Submitted by:

**TechLaw, Inc.
205 West Wacker Drive
Suite 1622
Chicago, Illinois 60606**

**EPA Task Order No.
Contract No.
TechLaw TOM
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**002
EP-W-07-018
Cathy Dare
315-334-3140
Timothy Gordon
212-637-4167**

January 24, 2011

**EVALUATION OF THE AUGUST 2010
CORRECTIVE MEASURES STUDY ADDENDUM
SWMUS 7 AND 8 — REVISED SOIL REMEDY
TOW WAY FUEL FARM AREA**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

The following comments were generated based on a review of the *Corrective Measures Study Addendum SWMUs 7 and 8 — Revised Soil Remedy, Tow Way Fuel Farm Area*, Naval Activity Puerto Rico (NAPR), Ceiba, Puerto Rico, dated August 2010 (CMS Addendum).

GENERAL COMMENT

1. The CMS Addendum recommends no further action (NFA) at SWMU 7/8 for polynuclear aromatic hydrocarbons (PAHs) and arsenic in site soils and proposes no institutional controls (i.e., no land use restrictions) for "soils/surface media." At present, the CMS Addendum does not provide adequate justification that unrestricted land use is appropriate.

While the development of the arsenic Corrective Action Objective (CAO) is discussed, the development of the CAO for PAHs is not. As indicated in Table 3-1, Soil Delineation Analytical Results at SWMU 7/8, the CAO for each PAH of interest (i.e., benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, and indeno[1,2,3-cd]pyrene) is 2.9 milligrams per kilogram (mg/kg). This CAO exceeds the risk-based Residential and Industrial Regional Screening Level (RSLs) for each PAH. Based on a general review, it appears that the CAO for PAHs is based on a risk-based clean-up target of 1E-05, rather than 1E-06. If the goal is to remediate the site for unrestricted use (i.e., allowing for future potential residential development), the CAO for PAHs should be based on a risk-based clean-up target of 1E-06.

Response:

The revised CMS Addendum includes a more-detailed discussion of the original PAH results versus the latest sampling results. A discussion of PAHs as COCs was included in the work plan, *Work Plan for Pre-Excavation Delineation at SWMUs 7 and 8*, submitted in April 2009. The analytical results of the pre-excavation delineation sampling were presented in the CMS Addendum report. The original RFI and CMS identified the CAOs, and this task was originally intended to achieve these CAOs. The CMS report identified the areas recommended for remedial action, with the preferred remedy of excavation of soil to address PAHs and arsenic. These CMS-recommended areas of excavation were presented in Figures 2-1 and 2-2 of the CMS Addendum report.

The final CMS Task 1 report submitted in April 2003 included a summary of the range of benzo(a)pyrene levels detected in soils to be between 0.0013 mg/kg to 23 mg/kg, compared to an industrial RBC of 7.8 mg/kg and residential RBC of 0.78 mg/kg. The industrial RBC was selected as the CAO by the original CMS report for the remedial alternatives screening. While the original CAOs selected for PAHs were based on health-protective levels for an industrial

worker, current site levels are not only below these CAOs, they also were below detection limits. Figures 2-1 and 2-2 also present the current sample locations. The sample-specific analytical results for these samples are presented Table 3-1. The figures provided in the CMS Addendum indicate the current sample locations coincided with the highest historically detected concentration areas shown in the CMS. As noted in Table 3-1, the areas with the previous highest detected concentration no longer have detectable PAHs. Because current site concentration levels are below detectable levels, site soils are determined to be suitable for unrestricted use for PAHs.

The rationale for absence of PAHs in soils could be attributable to degradation of PAHs in the surface soils, as previously described in the Work Plan. Some of the analytical data provided in the CMS are more than 10 years old. Section 3.1 of the CMS Addendum has been revised to include the above information to support unrestricted use. In addition, a new figure has been included in Section 3.1 showing current soil delineation sample locations for PAHs.

2. It should also be noted that the sample quantitation limits (SQLs) listed for PAHs in Table 3-1 range from 1.9 mg/kg to 2.3 mg/kg. This range exceeds both the residential and industrial RSLs for benzo(a)pyrene (0.015 mg/kg and 0.21 mg/kg, respectively) and benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene (0.15 mg/kg and 2.1 mg/kg, respectively, for the latter PAHs listed). Therefore, it is unclear whether the sampling and analysis plan was designed to evaluate/support an unrestricted use determination for SWMU 7/8.

Revise the CMS to address these concerns. Based on currently available information, it appears that NFA may be appropriate for PAHs, but that institutional controls should be put in place to prevent residential development of the property.

Response:

Table 3-1 includes the reporting limits (RLs) at a 5X dilution. Whereas the method detection limits (MDLs) in each sample were at least an order of magnitude lower, and no 'J' qualified detections were reported in any of the samples, except for one sample, JM04-A22FD(2.0)-060309, which is a duplicate sample of JM04-A22(2.0)-060309 (Appendix A of the CMS Addendum). No benzo(a)pyrene was detected in this sample or any other samples; benzo(a)anthracene and benzo(b)fluoranthene were reported as detects with a 'J' qualifier and were well below the levels protective of the residential receptors (i.e., CAO of 0.78 mg/kg) criteria. The MDLs among all 18 samples ranged between 0.13 mg/kg for benzo(a)pyrene to 0.41 mg/kg for indeno(1,2,3-cd)pyrene, which were all below the residential CAOs for the respective PAH constituent. These data can be found in the Appendix A of the CMS Addendum.

Because none of the pre-excavation delineation samples had any PAH exceedences (mostly non-detect and all below the original detected concentrations by two to three orders of magnitude), it can be concluded that site soils no longer contain PAHs as contaminants requiring corrective actions. Therefore, as recommended in the CMS Addendum report, the site soils will be retained for no further action under unrestricted land use. Table 3-1 has been revised to include MDL values for "ND" and residential/industrial CAO values from the CMS. In addition, text has been included that better explains the lack of detections.

SPECIFIC COMMENTS

1. **Figure 1-4, Surface Soil with Benzo(a)anthracene Above CAO, Figure 1-5, Surface Soil with Benzo(a)fluoranthene Above CAO, Figure 1-6, Surface Soil with Indeno(1,2,3-cd)pyrene Above CAO:** The legend in each of these figures indicates that results for benzo(a)pyrene are shown rather than the results for the compounds identified in the figure titles. Also, the title of Figure 1-5 states that results for benzo(a)fluoranthene are shown rather than the results for benzo(a)fluoranthene, which appears to be a typographical error. These figures appear to be taken from the Final CMS Report; therefore revisions are not required, but recommended.

Response:

All of the individual PAHs were reported as the benzo(a)pyrene equivalent (BEQ) concentrations, as the CAO presented for comparison was for the benzo(a)pyrene. A note has been added to the legend of each figure '*Presented concentration is the benzo(a)pyrene equivalent level.*' for clarity. The title of the Figure 1-5 has been corrected to indicate 'Benzo(b)fluoranthene.' Agree with the comment that substantial revisions to these figures extracted from CMS report is not possible; however, the legends and labels have been edited as indicated.

2. **Section 3.2, Arsenic, Page 32:** This section states, "Because the background data set consisted of only 4 surface soil samples and the CMS Addendum data set was much larger, population comparison statistical tests against background levels could not be conducted." This statement is confusing as it is discussed earlier that 21 samples compose the surface soil data set used to determine the site-wide arsenic background levels, and thus, the arsenic CAO. This was also verified by the *Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico* dated February 29, 2008. Revise Section 3.2 to resolve this apparent discrepancy and, if appropriate (based on the resolution), to present the results of a population comparison statistical test between site-wide background arsenic data and the residual arsenic concentrations at Areas A, B and C of SWMUs 7/8. The results would lend further support to the conclusion that arsenic at these exposure areas is within background levels if such a test is valid for the areas in question.

Response:

The quoted text in Section 3.2 on page 3-2 has been revised to eliminate any reference to 4 background samples because there were 21 background samples. The current statistical comparisons between the three data sets indicate the data sets are drawn from the same sample population. In addition, the site-specific sample location evaluation indicates a lack of association between higher detected arsenic concentrations and the former site operation areas (fuel oils do not include arsenic as a constituent).

To address this comment, a comparison of background data against the three site data sets has been conducted and the results are provided as Appendix C; a bullet statement of the results has been added to Section 3.2.

- 3. Table 2-1, Pre-Excavation Soil Delineation Sample Summary at SWMU 7/8 (June 2009):** The table includes several locations where no samples were collected (e.g., Station IDs A3, A4, A5, A 13 . . . C4 and C16) but no explanation regarding the missing samples is provided within the table. It is noted in the text and on the figures that some samples were not collected due to topography issues or existing structures. Include a footnote or a note in the "Other notes" column indicating why some samples listed within the table were not collected.

Response:

Table 2-1 has been revised to include an explanation as to the reason why a particular sample was not/could not be collected.

Enclosure #2

**EVALUATION OF THE AUGUST 2010 STATEMENT OF BASIS /
PROPOSED FINAL SOIL REMEDY DECISION —
SWMUS 7 AND 8, TOW WAY FUEL FARM AREA**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

Submitted to:

**U.S. Environmental Protection Agency
Region 2
290 Broadway
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Submitted by:

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**EPA Task Order No.
Contract No.
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Telephone No.
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Telephone No.**

**002
EP-W-07-018
Cathy Dare
315-334-3140
Timothy Gordon
212-637-4167**

January 24, 2011

EVALUATION OF THE STATEMENT OF BASIS /
PROPOSED FINAL SOIL REMEDY DECISION —
SWMUS 7 AND 8, TOW WAY FUEL FARM AREA

NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203

The following comment was generated based on a review of the *Statement of Basis / Proposed Final Soil Remedy Decision — SWMUs 7 and 8, Tow Way Fuel Farm Area*, Naval Activity Puerto Rico (NAPR), Ceiba, Puerto Rico, dated August 2010 (Statement of Basis).

GENERAL COMMENT

1. The Field Investigation section does not state the objective of the sampling events performed in 2009. As written, it would not be apparent to a reader not familiar with the Corrective Measures Study Addendum (CMS Addendum) why the sampling event was conducted after the excavation remedy had been initially proposed. Revise the Field Investigation section to include a discussion of the objectives of the sampling performed in 2009.

Response:

A discussion of the objectives of the sampling performed in 2009 are included in Section 2.1, "Pre-Excavation Sample Grid," as follows:

This CMS Addendum was issued to present the findings of the sampling completed in preparation of the soil removals originally described in the CMS. In preparation of performing the soil excavations, a soil sampling approach was designed to improve the delineation of the areas for excavation. The objectives of the post CMS investigation were defined in the Sampling and Analysis Plan (SAP) was primarily to conduct confirmatory sampling in order to do the following:

- *Refine the limits of excavation because the three areas of concern as presented in the CMS were based on the extrapolation of a limited set of soil analytical data.*
- *Determine the current concentrations of the PAH compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene in the upper 2 feet of soil because the possibility exists that concentrations may have decreased through biological degradation and are now below the applicable CAOs.*
- *Determine handling and disposal requirements by collecting soil samples for waste characterization.*

After the horizontal extent sampling described above was completed, revealing an overall lack of PAH detections and low level of arsenic detections, we added the following objectives to our evaluation of the data for inclusion in the CMS Addendum:

- *Determine if arsenic contamination found in SWMU 7/8 is naturally occurring based on historical background levels. Determine if arsenic concentrations in the upper 2 feet of soil fall within the range of background concentrations for the island of Puerto Rico, and/or are present at concentrations that are statistically below the CAOs. If so, the area of arsenic contamination requiring excavation may be smaller in size or may not be required.*
- *Determine extent of soil contamination areas above CAOs by comparing site-wide statistical upper bound mean concentration values against the CAOs.*

The Field Investigation section of the Statement of Basis has been revised to include a discussion of the objectives of the sampling performed in 2009, as detailed above.

Corrective Measures Study Addendum SWMUs 7 and 8 – Revised Soil Remedy

Tow Way Fuel Farm Area Naval Activity Puerto Rico Ceiba, Puerto Rico

Revision No. 00

Contract No. N62470-08-D-1006
Task Order No. JM04

Submitted to:



U.S. Naval Facilities
Engineering Command
Southeast

Prepared by:



1000 Abernathy Road
Suite 1600
Atlanta, GA 30328

March 2011

**Certification Page for Corrective Measures Study Addendum (Revision 0)
SWMUs 7 and 8 – Revised Soil Study**

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: Mark E. Davidson

Title: BRAC Environmental Coordinator

Date: March 18, 2011

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- A Soil Laboratory Analytical Results
- B Arsenic UCL Output Sheets

Acronyms and Abbreviations

AGVIQ-CH2M HILL	AGVIQ-CH2M HILL Joint Venture III
Baker	Baker Environmental, Inc.
BEQ	benzo(a)pyrene equivalent
bgs	below ground surface
CAO	Corrective Action Objective
CMS	Corrective Measures Study
DPT	direct-push technology
EPA	U.S. Environmental Protection Agency
LUCs	land use controls
mg/kg	milligrams per kilogram
NAPR	Naval Activity Puerto Rico
PAH	polynuclear aromatic hydrocarbon
QA	quality assurance
QC	quality control
RBC	risk-based concentration
RFI	RCRA facility investigation
SWMU	solid waste management unit
TEF	toxicity equivalency factor
TWFF	Tow Way Fuel Farm
UCL95%	upper-bound confidence limits at 95 percent
UFP-SAP	Uniform Federal Policy - Sampling and Analysis Plan
WRS	Wilcoxon Ran Sum

1.0 Site and Project Introduction

AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III (AGVIQ-CH2M HILL) was contracted by the Department of the Navy, Naval Facilities Engineering Command Southeast, under Contract No. N62470-08-D-1006, Task Order JM04, to implement corrective measures at solid waste management units (SWMU) 7 and 8 located at the Tow Way Fuel Farm (TWFF), Naval Activity Puerto Rico (NAPR), Ceiba, Puerto Rico. This Corrective Measures Study (CMS) Addendum describes the soil sampling procedures and results of the soil delineation activities performed between January 22, 2009, and July 15, 2009. Sampling was performed in three areas of the site where the polynuclear aromatic hydrocarbon (PAH) compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and the element arsenic exceeded the corrective action objectives (CAOs) established in the CMS prepared by Baker Environmental, Inc. (Baker) in November 2005. Excavation of the upper 2-feet of soil was proposed in the CMS to remove the contamination from three areas of concern. The U.S. Environmental Protection Agency (EPA) approved the CMS for implementation in February 2006.

The objectives of the sampling were to:

- Refine the limits of excavation because the three areas of concern as presented in the CMS were based on the extrapolation of a limited set of soil analytical data.
- Determine the current concentrations of the PAH compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene in the upper 2 feet of soil because the possibility exists that concentrations may have decreased through biological degradation and are now below the applicable CAOs.
- Determine if arsenic concentrations in the upper 2 feet of soil fall within the range of background concentrations for the island of Puerto Rico, and/or are present at concentrations that are statistically below the CAO. If so, the area of arsenic contamination requiring excavation may be smaller in size or may not be required.

In order to meet these objectives, the following tasks were performed:

- Marked the locations of the soil delineation sampling points by establishing grids over the three areas of concern targeted for excavation in the CMS.
- Collected soil samples from the upper 2-feet of soil using a direct-push technology (DPT) drill rig. In areas where a DPT drill rig could not be used due to steep changes in topography or because of physical obstructions, samples were collected using a hand auger.
- Submitted soil samples from 18 borings for the analysis of the PAH compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene using EPA Method 8270C.

- Submitted soil samples from 72 borings for the analysis of arsenic using EPA Method 6010B.
- Grouted the holes upon completion.
- Retained the services of a professionally licensed land surveyor to survey the horizontal locations and vertical elevations of the boreholes relative to previously established benchmarks.

The CMS Addendum is organized as follows:

- Site and Project Introduction
- Summary of Field Investigation Procedures
- Discussion of Results
- Conclusions and Recommendations

1.1 Site Description and Project Background

NAPR occupies over 8,600 acres at the northeastern most portion of Puerto Rico along the Vieques Passage (Figure 1-1). The northern entrance to NAPR is about 35 miles east, along the coastal road (Route 3), from San Juan. The facility was commissioned in 1943 as a Naval Operations Base, but was re-designated a Naval Station in 1957.

The TWFF is located on a hillside along Forrestal Drive north of Ensenada Honda (Figure 1-2). The final revised CMS report, prepared by Baker in November 2005, presented CAOs and remedial approaches to address cleanup of soil and groundwater at multiple SWMUs across the NAPR, including SWMU 7/8. EPA approved the CMS for implementation in February 2006.

The regulatory-approved remedial action to address soil contamination at SWMU 7/8 includes the excavation of the upper 2-feet of soil in three areas of concern where the PAH compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and arsenic exceeded their respective CAOs. The CAOs for the contaminants of concern are presented in Table 1-1. Baker developed the CAOs using an industrial classification risk-exposure scenario involving construction worker contact with surface and subsurface soil.

Figures 1-3 through 1-7 illustrate areas where Baker determined arsenic, benzo(a)-anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene exceeded the CAOs. These figures were obtained from the EPA-approved CMS. The data presented in the CMS indicated that the vertical extent soil contamination above the CAOs was limited to the upper 2 feet of soil. Using the Natural Neighbor interpolation approach of the computer model GMS v5.1, Baker estimated the areal extent of contamination requiring excavation through the extrapolation of a limited set of soil analytical data. The three areas of concern requiring excavation based on Baker's modeling effort are shown on Figure 1-8.

Because the areas requiring excavation were based on modeling results, AGVIQ-CH2M HILL prepared a Uniform Federal Policy-Sampling and Analysis Plan (UFP-SAP) and Work Plan to perform a pre-excavation delineation of SWMU 7/8 to verify the limits of excavation described in the CMS, and to determine if arsenic is naturally occurring or is a

result of past practices used by the Navy (AGVIQ-CH2M HILL, 2009). The UFP-SAP and Work Plan were submitted to the Navy during the first quarter of 2009 and approved for implementation in April 2009.

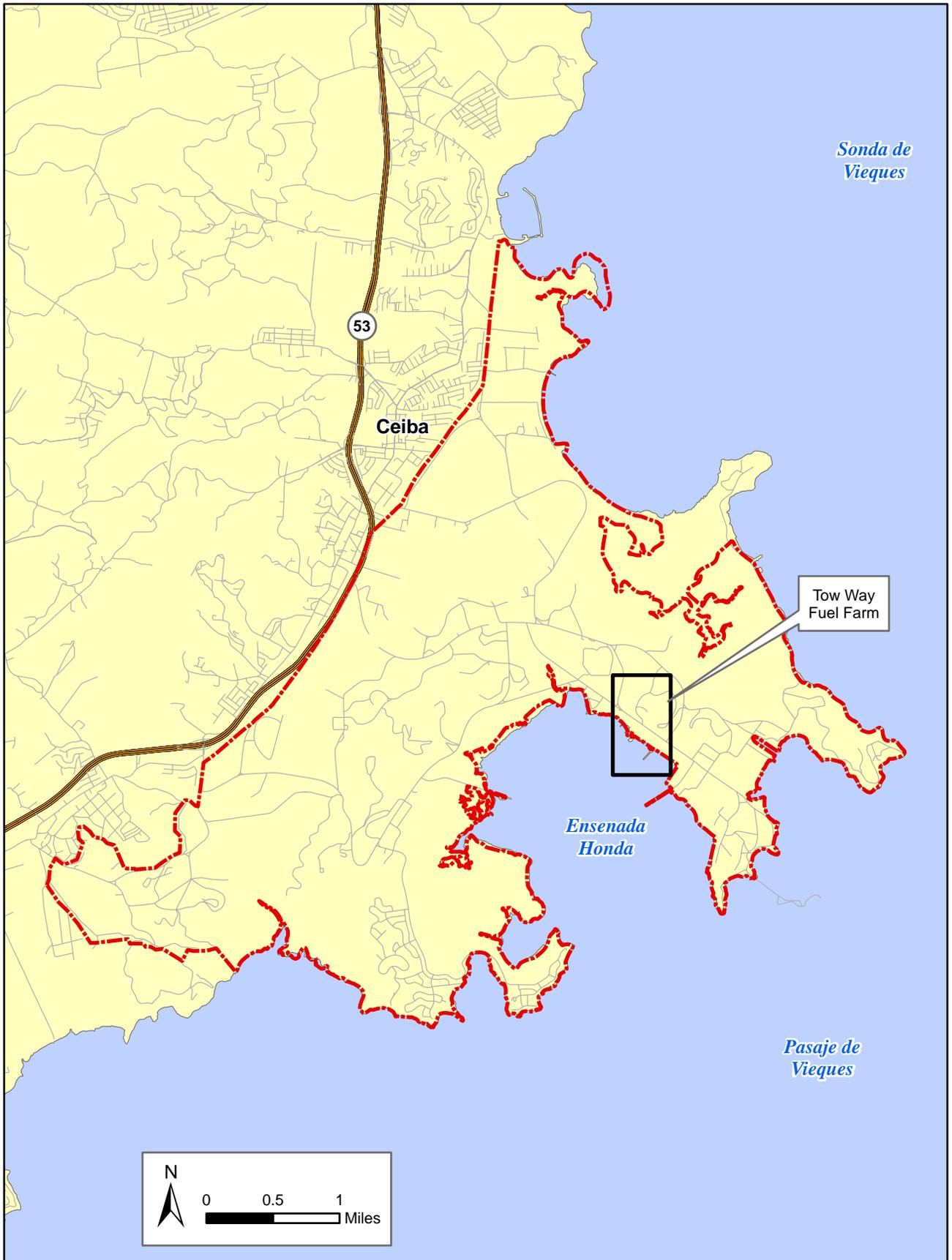
TABLE 1-1
Soil CAOs

Chemical	Maximum Observed Concentration	Surface Soil CAO*	Subsurface Soil CAO*	Total Soil CAO**
Arsenic	3.4	2.65	NA	NA
Benzo(a)anthracene	6J	2.9	NA	73
Benzo(a)pyrene	23J	2.9	7.3	7.3
Benzo(b)fluoranthene	5.9J	2.9	NA	73
Indeno(1,2,3-cd)pyrene	5.3J	2.9	NA	73

CAO Corrective Action Objective
 * Based on industrial worker protection
 ** Based on construction worker protection
 J Estimated
 NA Not Applicable
 All values reported in milligrams per kilogram (mg/kg).

1.2 Justification and Rationale for Pre-excavation Delineation Activities

The CMS recommended excavation to remove contaminants in the upper 2 feet of soil. However, the size of the three excavation areas were calculated by Baker using a computer model, and the data used in the model were collected prior to 2005. Therefore, it is likely that the excavation areas will differ in size and/or shape than those depicted in the CMS. Therefore, AGVIQ-CH2M HILL recommended the collection of additional soil samples in the three excavation areas to verify the horizontal extent of contamination prior to mobilizing excavation equipment to the field.



- Road
- Expressway
- Naval Station Roosevelt Roads Boundary

FIGURE 1-1
 Tow Way Fuel Farm Location
 Naval Station Roosevelt Roads, Puerto Rico



- Fence
- Former Fuel Tank

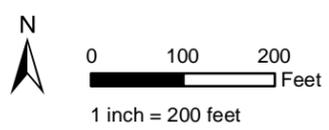
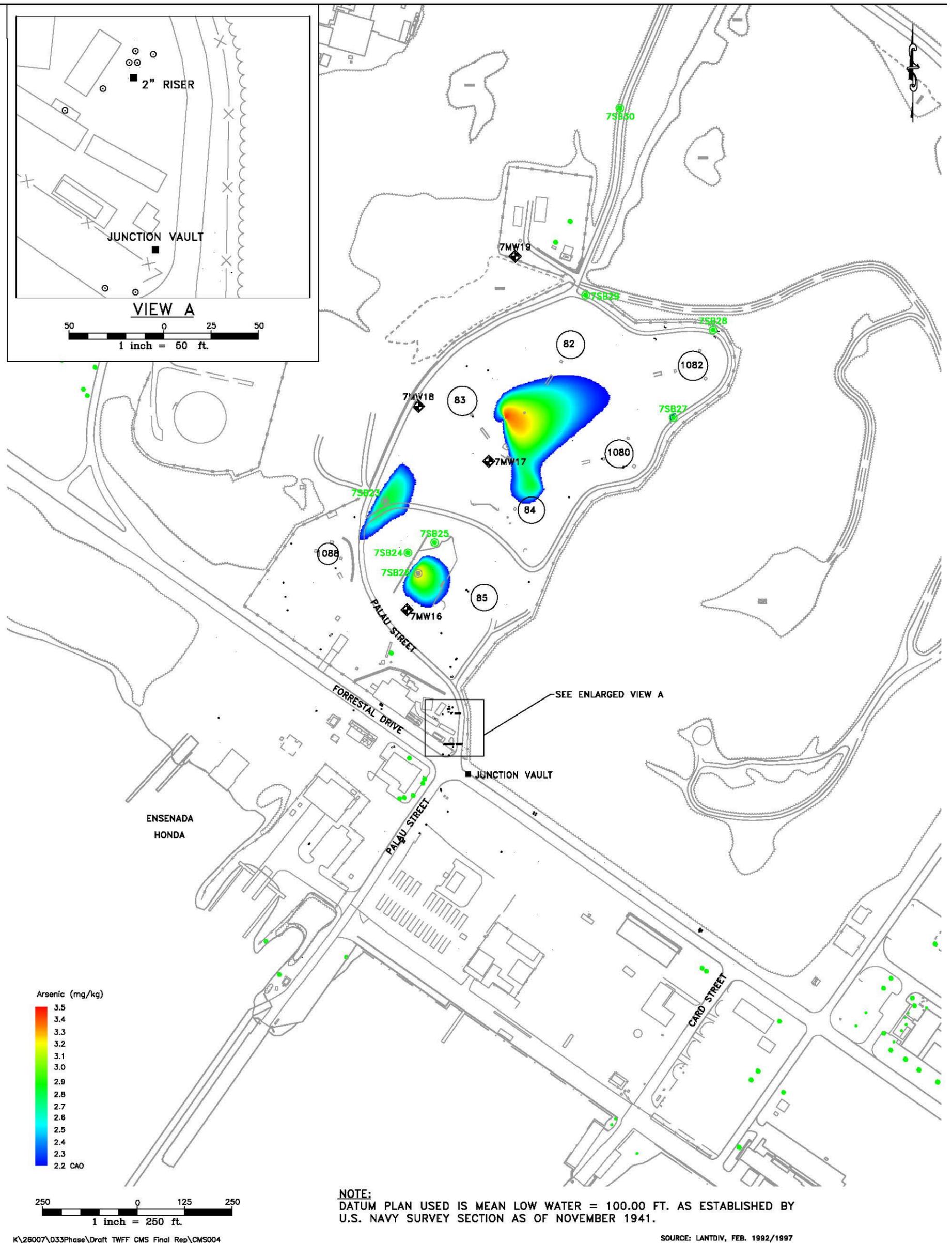


FIGURE 1-2
 SWMU 7/8 Base Map
 Tow Way Fuel Farm
 Naval Station Roosevelt Roads, Puerto Rico



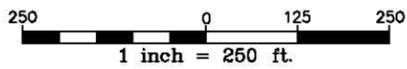
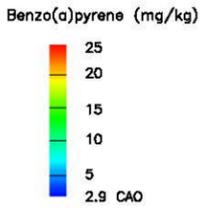
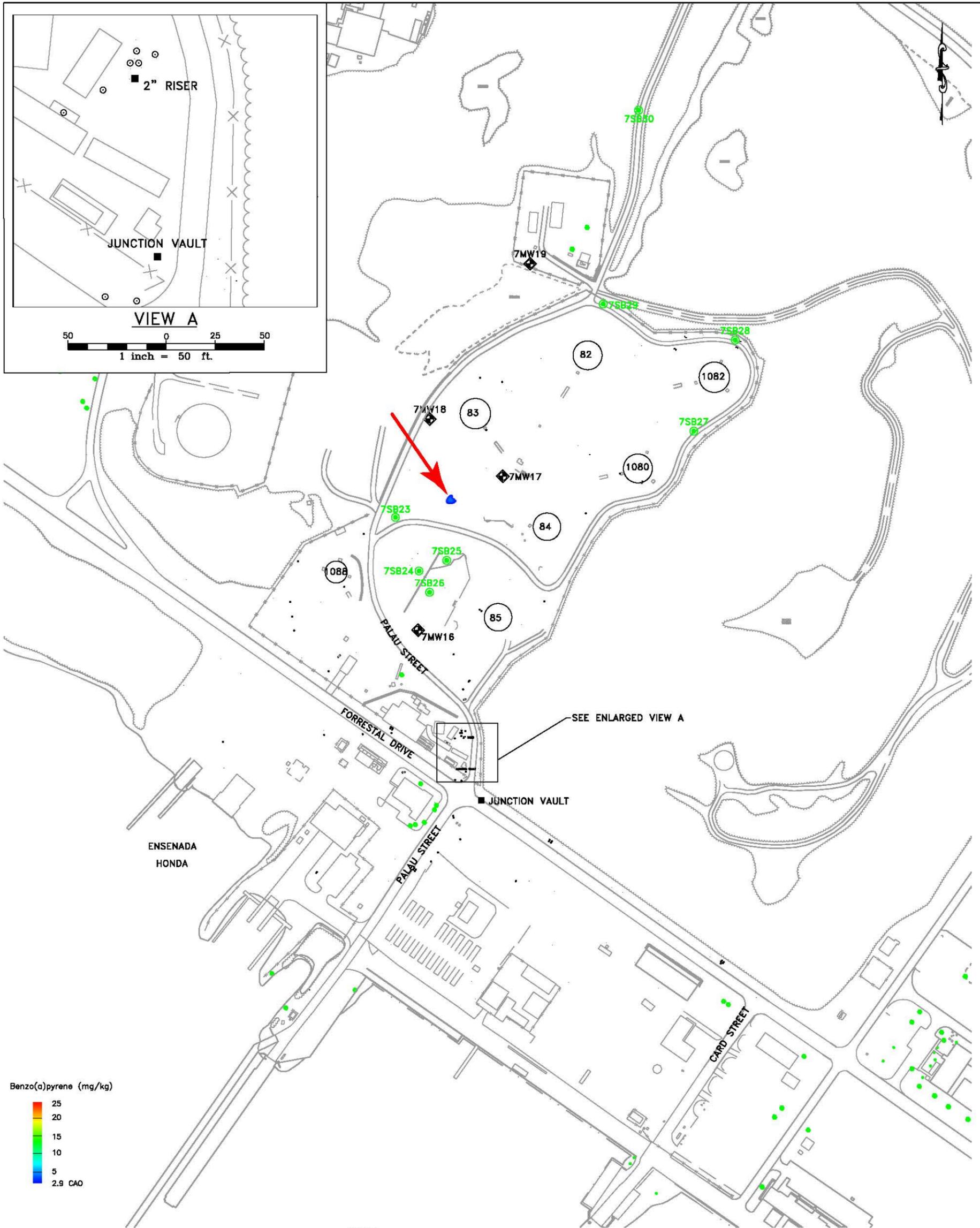
K:\28007\033Phase\Draft TWFF CMS Final Rep\CMS004

SOURCE: LANTRIV, FEB. 1992/1997

LEGEND

- ◆ - NEW MONITOR WELL LOCATION
- - SOIL BORING LOCATION

FIGURE 1-3
 Surface Soil with Arsenic Above CAO
 Corrective Measures Study - Final Report
 Tow Way Fuel Farm, Puerto Rico



NOTE:
 DATUM PLAN USED IS MEAN LOW WATER = 100.00 FT. AS ESTABLISHED BY U.S. NAVY SURVEY SECTION AS OF NOVEMBER 1941.
 PRESENTED CONCENTRATION IS THE BENZO(A)PYRENE EQUIVALENT LEVEL.

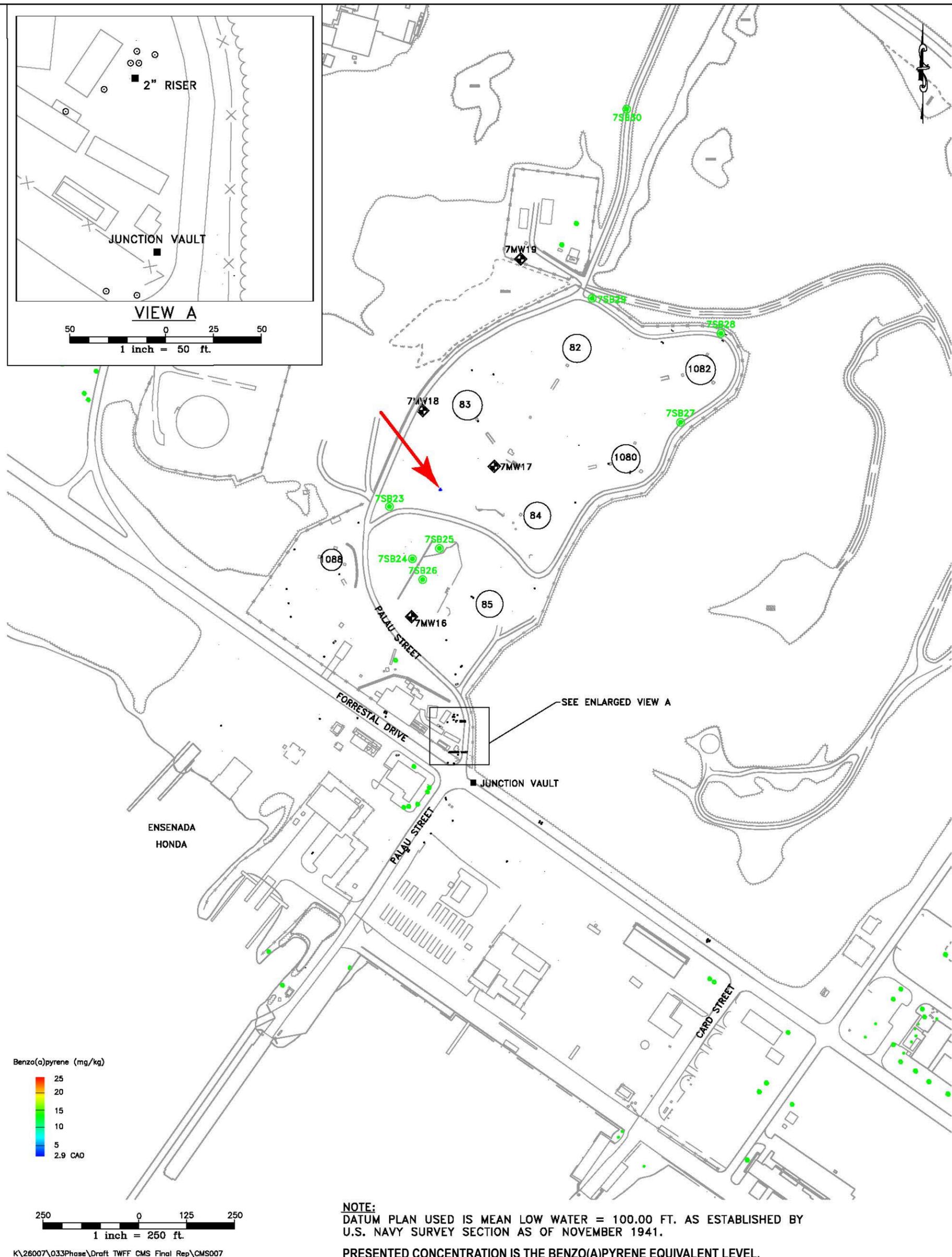
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LEGEND

- ◆ - NEW MONITOR WELL LOCATION
- - SOIL BORING LOCATION

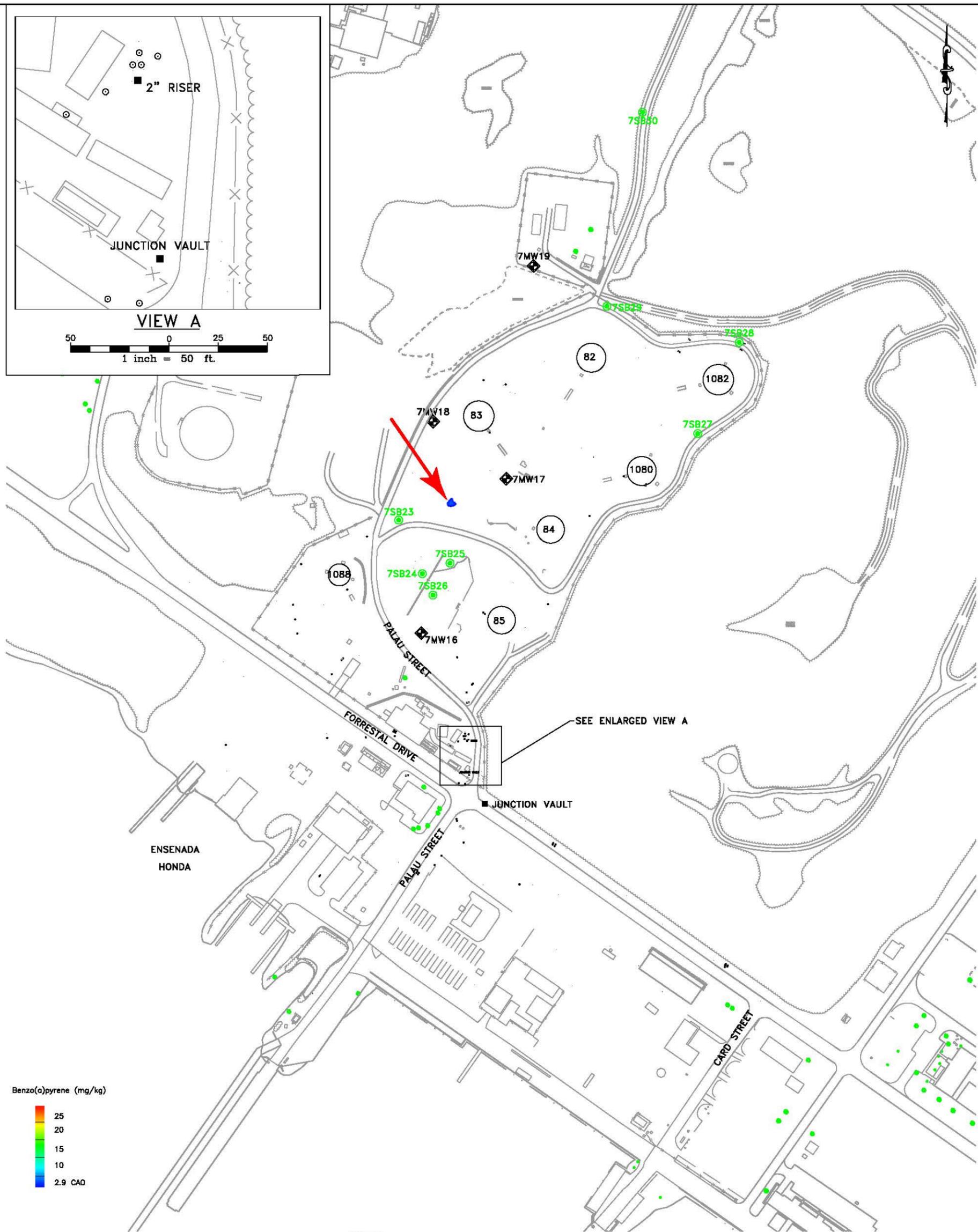
SOURCE: LANTDIV, FEB. 1992/1997

FIGURE 1-4
 Surface Soil with Benzo(a)anthracene Above CAO
 Corrective Measures Study - Final Report
 Tow Way Fuel Farm, Puerto Rico

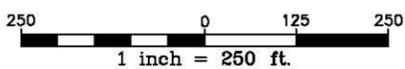
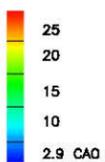


SOURCE: LANTRIV, FEB. 1992/1997

FIGURE 1-5
 Surface Soil with Benzo(b)fluoranthene Above CAO
 Corrective Measures Study - Final Report
 Tow Way Fuel Farm, Puerto Rico



Benzo(a)pyrene (mg/kg)



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LEGEND

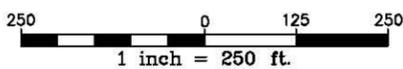
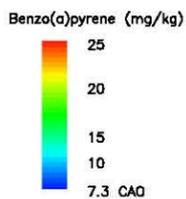
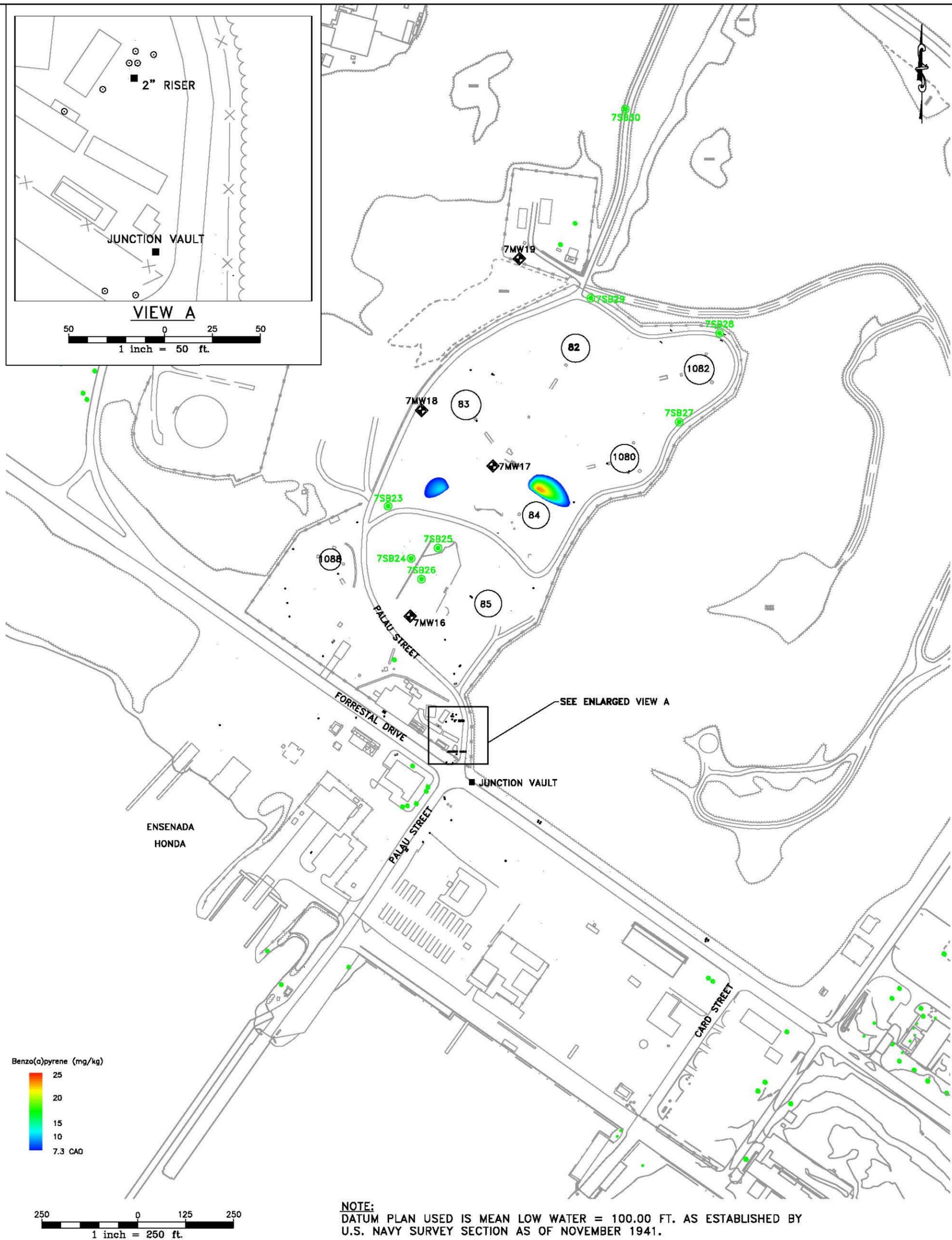
- ◆ - NEW MONITOR WELL LOCATION
- - SOIL BORING LOCATION

NOTE:
 DATUM PLAN USED IS MEAN LOW WATER = 100.00 FT. AS ESTABLISHED BY U.S. NAVY SURVEY SECTION AS OF NOVEMBER 1941.

PRESENTED CONCENTRATION IS THE BENZO(A)PYRENE EQUIVALENT LEVEL.

SOURCE: LANTDIV, FEB. 1992/1997

FIGURE 1-6
 Surface Soil with Indeno(1,2,3-cd)pyrene Above CAO
 Corrective Measures Study - Final Report
 Tow Way Fuel Farm, Puerto Rico



NOTE:
 DATUM PLAN USED IS MEAN LOW WATER = 100.00 FT. AS ESTABLISHED BY U.S. NAVY SURVEY SECTION AS OF NOVEMBER 1941.

K:\26007\033Phase\Draft TWFF CMS Final Rep\CMS009

SOURCE: LANTDIV, FEB. 1992/1997

LEGEND

- ◆ - NEW MONITOR WELL LOCATION
- - SOIL BORING LOCATION

FIGURE 1-7
 Total (Surface and Subsurface) Soil with Benzo(a)pyrene Above CAO
 Corrective Measures Study - Final Report
 Tow Way Fuel Farm, Puerto Rico



- Existing Soil Sampling Location for SVOC
- ⊕ Existing Soil Sampling Location for Arsenic
- - - Fence
- ▭ Assumed Impacted Soil Area (See Note)

8TP02
Soil sample with concentrations (in milligrams per kilogram [mg/kg]) above Corrective Action Objectives (CAOs):
Arsenic: 2.65 mg/kg
Benzo(a)anthracene: 2.9 mg/kg
Benzo(a)pyrene: 2.9 mg/kg
Benzo(b)fluoranthene: 2.9 mg/kg
Indeno(1,2,3-cd)pyrene: 2.9 mg/kg
J = Estimated Detected Concentration

Notes:
1. Preferred remedy for soil selected in the *Revised Final Corrective Measures Study Final Report, Tow Way Fuel Farm* (Baker Environmental, Inc., 2005).
2. Locations without values are either non-detect or at values below CAOs.

FIGURE 1-8
CMS Soil Delineation Sample Locations and Proposed Excavation Areas
Tow Way Fuel Farm
Naval Station Roosevelt Roads, Puerto Rico

2.0 Summary of Field Investigation Procedures

This section describes the work procedures that were used between January 22, 2009, and July 15, 2009 to verify the limits of excavation.

2.1 Pre-excavation Sample Grid

This CMS Addendum was issued to present the findings of the sampling completed in preparation for the soil removals originally described in the CMS. In preparation for performing the soil excavations, a soil sampling approach was designed to improve the delineation of the areas for excavation. The objectives of the post-CMS investigation defined in the Sampling and Analysis Plan (SAP) are primarily to conduct confirmatory sampling in order to do the following:

- Refine the limits of excavation because the three areas of concern as presented in the CMS were based on the extrapolation of a limited set of soil analytical data.
- Determine the current concentrations of the PAH compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene in the upper 2 feet of soil because of the possibility that concentrations may have decreased through biological degradation and are now below the applicable CAOs.
- Determine if arsenic contamination found in SWMU 7/8 is naturally occurring based on historical background levels. Determine if arsenic concentrations in the upper 2 feet of soil fall within the range of background concentrations for the island of Puerto Rico, and/or are present at concentrations that are statistically below the CAOs. If so, the area of arsenic contamination requiring excavation may be smaller in size or may not be required.
- Determine extent of soil contamination areas above CAOs by comparing site-wide statistical upper bound mean concentration values against the CAOs.
- Determine handling and disposal requirements by collecting soil samples for waste characterization.

Determining the above required a sampling design that optimized and adequately described the area for excavation in order to accurately define the volume of soil requiring removal and disposal, while also optimizing the total number of samples needed to be collected and analyzed. Therefore, a systematic sampling grid was placed over each of the three excavation areas identified in the original CMS. A grid spacing of 50 feet was selected to optimize the total number of samples collected from the site and yield fewer than 100 samples for the excavation delineation sampling. The grid spacing and sample location followed the systematic sampling design detailed in , *Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies* (EPA, 1992). Each grid was placed at a random starting point within the site and samples were collected at the intersect nodes for the grids. As a result, the sampling area covered the previously identified proposed excavation areas, and

also extended beyond those areas covering much of the historic fuel operations area at the TWFF.

On January 22 and 23, 2009, AGVIQ-CH2M HILL personnel marked the locations of the sampling grids over the three areas of concern identified in the CMS. A grid spacing of 50 feet was used, and was developed following the EPA guidance (EPA, 1992). The grid was laid out using a Topcon® transit and engineer's tape. During the fieldwork, AGVIQ-CH2M HILL personnel attempted to install the sampling points in the locations as presented in the UFP-SAP and Work Plan (see Figure 2-1). However, the presence of obstructions (tanks and piping) and variations in topography (steep hillsides), necessitated moving or omitting several of the sampling locations. The actual sample locations are depicted on Figure 2-2.

2.2 Pre-Excavation Soil Sampling Procedures

The original RFI and CMS reports included surface soil samples from 0-1 foot below ground surface (bgs). The CMS recommended excavation of soils up to 2 feet bgs for implementation of corrective actions through excavation. Therefore, this CMS addendum focused on an excavation depth of up to 2 feet bgs.

Additionally, the collection of soil samples from 0-2 feet bgs was designed to support the excavation decisions. This sampling depth was considered appropriate because the original PAHs in surface soils were well above the CAO of 7.3 mg/kg and collecting surface soil samples from 0-2 feet bgs instead of the original 0-1 foot bgs affords a potential dilution factor of 2 through mixing. Samples were evaluated to determine if they indicated the presence of PAHs at comparable levels to the previously detected concentrations. A discussion of sample results is detailed in Section 3.0.

Soil sampling activities were conducted between June 1 and 4, 2009. The work was performed in accordance with the Navy approved UFP-SAP and Work Plan. Prior to beginning any intrusive work, each borehole was cleared for underground utility obstructions by One Vision, Inc. of Kennesaw, Georgia.

In areas accessible by vehicle, a truck-mounted DPT rig was used to collect continuous soil samples from the upper 2 feet of soil (0 to 2 feet bgs). A hand auger was used to collect soil samples from the upper 2 feet of soil in areas that could not be accessed by the drill rig. The DPT and hand auger work was performed by GeoEnvironTech, Inc. of Guaynabo, Puerto Rico. The DPT work was performed using a 5410 model Geoprobe® drill rig. Upon retrieval of each soil sample, the AGVIQ-CH2M HILL geologist visually inspected the sample and described the lithology encountered. Lithologic information for each sample point is summarized in Table 2-1. The soil was homogenized by placing the soil in a stainless steel bowl and mixing the soil using a stainless steel spoon. The homogenized soil was transferred to 4-ounce glass jars provided by the laboratory for chemical analysis. All samples were analyzed for arsenic using EPA Method 6010B, and select samples were analyzed for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene using EPA Method 8270C. The analyses performed at each sample location are shown on Figure 2-2 and test results are included in Table 2-1. As illustrated on Figure 2-2, samples from locations A24 and B7 were not analyzed for PAHs because of the observed

presence of asphalt in the soil, which is a common source of PAH compounds. Therefore, the samples from locations A24 and B7 were only analyzed for arsenic.

The samples were labeled using the alphanumeric coordinate system depicted on Figure 2-2. Sample nomenclature consisted of the task order number, the alphanumeric coordinate, sample depth, and sampling date. For example, a sample was collected at location B10 on June 4, 2009; therefore, the sample identification (ID) is JM04-B10(2.0)-060409.

The soil samples were logged, stored in 4-ounce glass jars, wrapped in bubble wrap, double-sealed in Ziploc® bags, and packed on ice for shipment to Empirical Laboratories, Inc., located in Nashville, Tennessee, following standard chain-of-custody procedures. Laboratory data sheets and chain-of-custody records are provided in Appendix A.

A total of 72 soil samples were collected during the pre-excavation delineation sampling event. For quality assurance/quality control (QA/QC) purposes, 15 additional samples were submitted for QA/QC analysis. These samples included three matrix spike/matrix spike duplicates, seven duplicate samples, and five equipment blanks. Results of the sample analysis are discussed in Section 3 and presented in Appendix A.

2.3 Borehole Abandonment

Upon completion of the work, the DPT and hand auger boreholes were filled with a Portland cement/grout slurry containing 3 to 5 percent bentonite.

2.4 Surveying

Following the completion of sampling activities, each sample location was surveyed (horizontal location and vertical elevation) by Pedro J. Davila Colon of PJDC, Inc., a Puerto Rico-licensed land surveyor. The surveying work was performed between July 2, 2009, and July 15, 2009. Locations were surveyed relative to previously established benchmarks. Coordinate data for each sampling location are presented on Table 2-1.

Table 2-1
Pre-Excavation Soil Delineation Sample Summary at SWMU 7/8 (June 2009)
Roosevelt Roads Naval Station, Puerto Rico

Sample Date	Station ID	Coordinates		Elevation feet NGVD 29	Sample ID	Sample method	Quality Control	USCS	Description	Proximity to existing Asphalt	Other notes
		Easting	Northing								
6/3/2009	A1	782265.280	147022.775	74.00	JM04-A1(2.0)-060309	Hand Auger	---	CL	Silty Clay with cobbles, cobbles are angular gabbro, firm, moderate moist at top to low moisture near bottom, brown, (10YR 4/3)	>30'	Sample collected with hand auger due to accessibility issues.
6/3/2009	A2	782312.690	147036.239	69.70	JM04-A2(2.0)-060309	Hand Auger	---	OL	Silty Clay, Organic, low to medium plasticity, very stiff, moderate moist, brown (5YR 4/2)	>30'	---
--	A3	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of piping and UST - no sample collected
--	A4	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of UST - no sample collected
--	A5	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of UST - no sample collected
6/3/2009	A6	782222.222	146961.035	71.71	JM04-A6(2.0)-060309	Hand Auger	---	CL	Silty Clay, angular cobbles, firm, Brown (10YR 4/4)	>30'	Sample collected with hand auger due to accessibility issues.
6/3/2009	A7	782268.962	146973.733	66.05	JM04-A7(2.0)-060309	Hand Auger	---	CL	Silty Clay, ~20% angular cobbles, 30% silt, 50% clays, moderate moisture, low to moderate plasticity, dark brown (10YR 3/3)	>30'	Sample collected with hand auger due to accessibility issues.
6/3/2009	A8	782316.551	146986.591	62.67	JM04-A8(2.0)-060309	Hand Auger	Field Duplicate	OH	Silty Clay, high plasticity, moderate moisture, ~80% Clay, trace angular cobbles, very stiff, brown (10YR 4/2)	>30'	Sample collected with hand auger due to accessibility issues.
6/4/2009	A9	782365.126	146999.485	63.70	JM04-A9(2.0)-060409	DPT	---	CL/ GW	Silty Clay with cobbles, ~50% angular gravel and cobble, soil is silty clay ~40 silt, moderate moisture, low to moderate plasticity, moderate cohesion, light to dark brown (10YR 5/4)	>30'	---
6/4/2009	A10	782411.978	147010.776	69.86	JM04-A10(2.0)-060409	Hand Auger	MS/MSD	OL	Silty Clay, moderate plasticity, high moisture, angular cobbles, no odor, trace asphalt debris brown (10YR 4/2)	>30'	Sample contained asphalt debris but was not originally scoped to be sampled for PAH's.
6/3/2009	A11	782461.168	147011.818	69.70	JM04-A11(2.0)-060309	Hand Auger	---	CL	Silty Clay, ~50% clay, little sands, angular cobbles, wet at top, dry near bottom, thin SW layer near bottom, dark brown (10YR 4/2)	>30'	Sample collected with hand auger due to accessibility issues.
6/3/2009	A12	782496.254	147020.861	68.25	JM04-A12a(2.0)-060309	Hand Auger	---	CH	Clay, little silt, little angular cobble, "modeling clay" gleyed color with red mottling, moderate moisture, high plasticity, strong cohesion, stiff, gray-brown (10Y 6/3)	>30'	Sample collected with hand auger due to accessibility issues. Sample was moved 10 feet southeast due to accessibility issues.
--	A13	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of UST - no sample collected
6/3/2009	A14	782224.442	146911.443	59.05	JM04-A14(2.0)-060309	Hand Auger	MS/MSD	CL	Silty Clay with cobbles, ~30% silt, 50% clay, moderate to low moisture, low plasticity, dark brown (10YR 4/3)	>30'	Sample collected with hand auger due to accessibility issues.
6/2/2009	A15	782270.728	146924.789	55.66	JM04-A15(2.0)-060209	DPT	---	CL/ GW	Silty Clay with cobbles, ~70% clay, cobbles are angular, low moisture, low plasticity, very stiff, brown (10YR 4/4)	>30'	---
6/2/2009	A16	782318.965	146937.109	56.86	JM04-A16(2.0)-060209	DPT	Field Duplicate	SW ML	Silty Sand/ Sandy Silt, Sand is fine to very coarse grained, ~40% cobbles, angular, dry, Brown (5Y 5/2)	>30'	---

Table 2-1
Pre-Excavation Soil Delineation Sample Summary at SWMU 7/8 (June 2009)
Roosevelt Roads Naval Station, Puerto Rico

Sample Date	Station ID	Coordinates		Elevation feet NGVD 29	Sample ID	Sample method	Quality Control	USCS	Description	Proximity to existing Asphalt	Other notes
		Easting	Northing								
6/4/2009	A17	782366.883	146949.807	60.17	JM04-A17(2.0)-060409	DPT	---	OH	Silty Clay with sand and cobbles, low cohesion, high plasticity, organic, fine sands ~15%, trace angular cobbles, ~45% clay, ~40% silts, moderate moisture dark brown (10YR 3/2)	>30'	---
6/4/2009	A18	782415.376	146961.725	65.05	JM04-A18(2.0)-060409	DPT	---	CH	Clay, few angular cobbles, high plasticity, moderate moisture, ~40% silts, moderate cohesion, brown (10YR 4/3)	>30'	---
6/4/2009	A19	782464.473	146974.042	68.67	JM04-A19(2.0)-060409	DPT	---	CL	Silty Clay, ~35% silt, good cohesion, low plasticity, moderate to low moisture, gray and brown (5YR 6/2)	>30'	---
6/3/2009	A20	782512.975	146986.978	70.75	JM04-A20(2.0)-060309	DPT	---	CL	Silty Clay, low to moderate plasticity, one 2" thick zone of CH near 2' bgs, medium stiff, moderate moist, ~35% silt, some organic material, brown (10YR 3/4)	>30'	---
--	A21	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of piping and UST - no sample collected
6/2/2009	A22	782226.363	146862.636	50.81	JM04-A22(2.0)-060209	DPT	Field Duplicate	ML	Clayey Sandy Silt, low moisture, low plasticity, trace angular gravel, little organic clay, brown (5Y 3/4)	>30'	---
6/2/2009	A23	782275.211	146874.895	51.82	JM04-A23(2.0)-060209	DPT	---	CL	Silty Clay with gravel and cobbles, dry, has no odor, contains some "black specks" (10Y 3/2)	>30'	This sample was closely examined to verify there was no asphalt in the sample, the "black specks" were tiny chips of gabbro.
6/2/2009	A24	782323.614	146887.774	54.23	JM04-A24(2.0)-060209	DPT	---	CL	Silty Clay with cobbles, very stiff, low moisture, trace odor, contains asphalt fragments, brown (5Y 4/2)	>30'	No PAH sample taken due to the presence of asphalt in the sample collected.
6/4/2009	A25	782371.032	146899.353	58.73	JM04-A25(2.0)-060409	DPT	Field Duplicate	OL	Silty Clay, little angular very coarse sand, gravel, and cobble, low plasticity, good cohesion, moderate moisture, abundant organics, brown (10YR 4/3)	>30'	---
6/3/2009	A26	782419.115	146911.606	63.56	JM04-A26(2.0)-060309	DPT	---	CH	Silty Clay, high to moderate plasticity, moderate moisture, medium stiff, dark brown (10YR 3/4)	>30'	---
6/3/2009	A27	782468.611	146924.622	67.13	JM04-A27(2.0)-060309	DPT	---	CH	Clay, high plasticity, little silt, moderate moisture, trace very course sands, light brown (10YR 3/4)	>30'	---
6/2/2009	A28	782229.996	146812.279	46.58	JM04-A28(2.0)-060209	DPT	---	ML	Sandy Silt with cobbles, low moisture, angular cobbles, little sand, some clays, dark brown (5Y 4/3)	>30'	---
6/2/2009	A29	782278.144	146824.565	50.02	JM04-A29(2.0)-060209	DPT	---	ML	Gravelly Clayey Silt, dry, low plasticity, very stiff, little organic clay, brown (5Y 4/4)	>30'	---
6/2/2009	A30	782325.983	146837.821	52.94	JM04-A30(2.0)-060209	DPT	---	CL	Silty Clay, Stiff, with gravel, low moisture, angular cobble and gravel, little sand, light brown (10YR 4/3)	>30'	---
6/2/2009	A31	782374.454	146850.432	56.67	JM04-A31(2.0)-060209	DPT	---	ML	Clayey Silt, low plasticity, ~30% clays, some angular cobbles, little fine to course sands, moderate moisture, brown (5Y 7/3)	>30'	---
6/2/2009	A32	782422.594	146861.752	60.78	JM04-A32(2.0)-060209	DPT	---	CL	Clay, little silt, no sands, very stiff, low plasticity, low moisture, trace gray lamination, reddish brown (5YR 4/6)	>30'	---

Table 2-1
Pre-Excavation Soil Delineation Sample Summary at SWMU 7/8 (June 2009)
Roosevelt Roads Naval Station, Puerto Rico

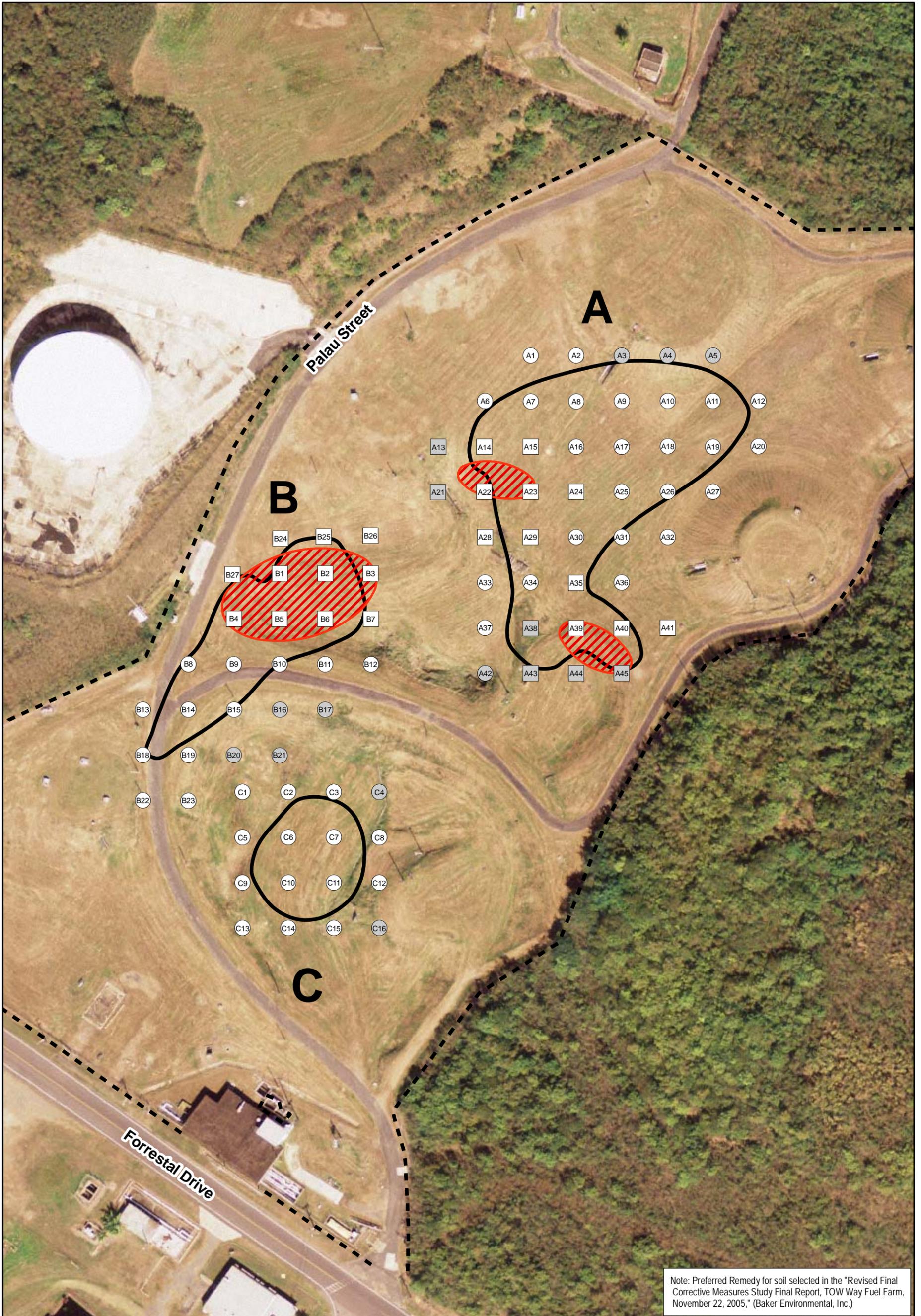
Sample Date	Station ID	Coordinates		Elevation feet NGVD 29	Sample ID	Sample method	Quality Control	USCS	Description	Proximity to existing Asphalt	Other notes
		Easting	Northing								
6/2/2009	A33	782233.911	146763.622	44.48	JM04-A33(2.0)-060209	DPT	---	ML	Sandy Silt, Stiff, little sand, some clays, low plasticity, low moisture, few angular cobbles, dark brown (5Y 4/3)	>30'	---
6/2/2009	A34	782282.361	146775.153	48.38	JM04-A34(2.0)-060209	DPT	---	ML	Sandy Silt with lean clay lense and cobbles, low to moderate moisture, clay has moderate plasticity cobbles are angular, sand is ~20%, dark brown (5Y 3/2)	>30'	---
6/2/2009	A35	782330.677	146786.999	52.54	JM04-A35a(2.0)-060209	DPT	---	CL	Silty Clay with cobbles, very stiff, cobbles are angular ~ 50% cobbles, low moisture, soil is dark brown (5Y 4/2)	>30'	Sample location moved 5 feet to the north to allow for utilities, first attempt yielded no return.
6/2/2009	A36	782376.892	146800.395	60.10	JM04-A36(2.0)-060209	DPT	---	OL	Silty Clay, Stiff, ~35% silt, little sand, trace angular cobbles, low moisture, dark brown (5Y 4/2)	>30'	---
6/2/2009	A37	782232.443	146714.574	42.86	JM04-A37(2.0)-060209	DPT	---	ML/ GW	Silt with cobbles and gravel, angular, low moisture, some organic clays, dark brown (5Y3/2)	>30'	---
--	A38	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of UST - no sample collected
6/2/2009	A39	782333.512	146738.135	57.43	JM04-A39(2.0)-060209	DPT	---	ML/ GW	Cobbly Silt, ~70% cobbles, sandy silt matrix, little organic clay, dry, dark brown (5Y 4/2)	>30'	Sample moved 5 inches west due to no recovery on first attempt
6/2/2009	A40	782380.125	146750.176	65.20	JM04-A40(2.0)-060209	Hand Auger	---	ML/ GW	Sandy Silt with cobbles, some clays, low moisture, angular cobbles, dark brown 10YR 3/3	>30'	Sample collected with hand auger due to accessibility issues.
6/2/2009	A41	782382.410	146700.951	71.30	JM04-A41(2.0)-060209	Hand Auger	MS/MSD	CL/ GW	Silty Clay with cobbles, Moderate moisture, low to moderate plasticity, angular cobbles, brown (10YR 4/3)	>30'	Sample collected with hand auger due to accessibility issues.
--	A42	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of piping and UST - no sample collected
--	A43	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of UST - no sample collected
--	A44	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of UST - no sample collected
--	A45	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of UST - no sample collected
6/4/2009	B1	781998.036	146811.458	55.02	JM04-B1(2.0)-060409	DPT	---	ML	Sandy Silt, little clay, sand is fine to coarse grained, low moisture to dry, few angular cobbles, loose, light brown (5Y 6/3)	>30'	---
6/4/2009	B2	782042.100	146795.968	50.36	JM04-B2(2.0)-060409	DPT	---	ML	Clayey Silt with cobbles, moderate moisture, low plasticity, low cohesion, little fine sands, ~35% angular gravel and cobble, Brown 10YR 5/4	>30'	---
6/4/2009	B3	782086.507	146779.982	43.70	JM04-B3(2.0)-060409	Hand Auger	Field Duplicate	CL	Silty Clay with sand, low cohesion, moderate moisture, low plasticity, sand is fine to very coarse grained, angular, abundant gravel, dark brown (10YR 3/2)	>30'	Sample collected with hand auger due to accessibility issues.

Table 2-1
Pre-Excavation Soil Delineation Sample Summary at SWMU 7/8 (June 2009)
Roosevelt Roads Naval Station, Puerto Rico

Sample Date	Station ID	Coordinates		Elevation feet NGVD 29	Sample ID	Sample method	Quality Control	USCS	Description	Proximity to existing Asphalt	Other notes
		Easting	Northing								
6/4/2009	B4	781930.684	146775.891	55.54	JM04-B4(2.0)-060409	DPT	---	SM	Silty Sand with little clay, silt and clay are in zones with coarse angular sands, sand throughout is fine to very coarse grained, trace angular cobbles, dry, loose, light brown (5Y 7/6)	>30'	---
6/4/2009	B5	781977.782	146761.991	52.03	JM04-B5(2.0)-060409	DPT	---	ML	Sandy Silt, little clay, sand is fine grained to cobble, angular, ~40% sand, 50% silt, 10% clay, low plasticity, dry, brown (5Y 4/4)	>30'	---
6/4/2009	B6	782025.433	146749.192	46.70	JM04-B6(2.0)-060409	DPT	Field Duplicate	OH/ SW	Silty Clay top 4", organic, little sand, trace cobble, Sand bottom 20", fine to very coarse grained with trace angular cobble and trace fines, dry, brown (5Y 6/3)	>30'	---
6/4/2009	B7	782072.620	146738.431	41.37	JM04-B7(2.0)-060409	Hand Auger	---	CL	Silty Clay with sand and cobbles, sand is fine to very coarse, cobbles are angular, moderate moisture, 3 small specs of asphalt/tar located within the sample. dark brown (5Y 7/3)	>30'	Sample was not collected for PAH's due to the presence of Asphalt debris
6/4/2009	B8	781913.149	146729.521	53.02	JM04-B8(2.0)-060409	DPT	---	SM/ GW	Silty Sand with cobbles, sample is ~75% cobbles, angular, trace clays as matrix in very coarse sand (like a saprolite), dry, loose, light brown (5Y 7/4)	12' east	---
6/4/2009	B9	781960.779	146718.079	53.75	JM04-B9(2.0)-060409	DPT	---	ML/ SM	Sandy Silt - Silty Sand, trace clays, abundant angular gravel and cobble, dry, loose, light brown (5Y 7/3)	21' north	---
6/4/2009	B10	782009.902	146707.200	54.51	JM04-B10(2.0)-060409	DPT	MS/MSD	ML/ SM	Sandy Silt - Silty Sand, with cobbles, angular, ~50% cobbles, low moisture, loose, light brown (5Y 7/3)	12' north	---
6/4/2009	B11	782058.597	146695.129	55.62	JM04-B11(2.0)-060409	DPT	---	ML	Sandy Silt with Cobbles	13' north	---
6/4/2009	B12	782106.736	146684.457	56.14	JM04-B12(2.0)-060409	DPT	Field Duplicate	ML	Sandy Silt with cobbles, trace clay, ~40% cobbles, angular, sand is fine to medium grained, little course to very coarse grained, moderate moisture, soft, low plasticity, low cohesiveness, dark brown (10YR 4/3)	13' north	---
6/4/2009	B13	781851.323	146686.101	50.79	JM04-B13(2.0)-060409	DPT	---	GW/ SM	Angular Cobbles with silty sand and fill sand, mostly fine grained, some medium to coarse grained and gravel, low moisture, loose, light brown (5Y 7/4)	20' west	---
6/4/2009	B14	781900.206	146679.898	51.02	JM04-B14(2.0)-060409	DPT	---	SM/GW	Silty Sand with cobbles, top 2" are organic clay, sand is fine grained to very coarse, angular with abundant gravel and cobble, dry, loose, light brown (5Y7/3)	12' north, 18' east	---
6/4/2009	B15	781946.544	146672.126	51.37	JM04-B15(2.0)-060409	DPT	---	ML	Sandy Silt with cobbles, little clay, ~65% silts, cobbles are angular, low moisture, low plasticity, low cohesiveness, dark brown (10YR 4/3)	>30'	---
--	B16	---	---	---	NA	---	---	---	---	---	No sample collected due to steep topography and unsafe conditions
--	B17	---	---	---	NA	---	---	---	---	---	No sample collected due to steep topography and unsafe conditions
6/4/2009	B18	781837.431	146638.485	49.69	JM04-B18(2.0)-060409	DPT	---	SM	Silty Sand with cobbles and gravel, sand is fine to very coarse grained, dry, loose, light brown (5YR 7/3)	30' west	---
6/4/2009	B19	781886.787	146631.536	47.89	JM04-B19(2.0)-060409	DPT	---	SM	Silty Sand with cobbles, fine to very coarse grained, cobbles are angular, dry, loose, light brown (5Y 7/3)	7' east, 33' south	---

Table 2-1
Pre-Excavation Soil Delineation Sample Summary at SWMU 7/8 (June 2009)
Roosevelt Roads Naval Station, Puerto Rico

Sample Date	Station ID	Coordinates		Elevation feet NGVD 29	Sample ID	Sample method	Quality Control	USCS	Description	Proximity to existing Asphalt	Other notes
		Easting	Northing								
--	B20	---	---	---	NA	---	---	---	---	---	No sample collected due to steep topography and unsafe conditions
--	B21	---	---	---	NA	---	---	---	---	---	No sample collected due to steep topography and unsafe conditions
6/4/2009	B22	781851.968	146579.025	44.97	JM04-B22(2.0)-060409	DPT	---	SM	Silty Sand with gravel and cobbles, 4" thick zone of SP fill sand near top, gravel is angular, fine to coarse grained, low moisture, loose, light brown (5Y 7/3)	9' west	---
6/4/2009	B23	781880.131	146582.390	44.35	JM04-B23(2.0)-060409	DPT	---	SM	Silty Sand with gravel and cobbles, 4" thick zone of SP fill sand near top, gravel is angular, fine to coarse grained, low moisture, loose, light brown (5Y 7/3)	9' east	---
6/4/2009	B24	782014.460	146858.756	60.37	JM04-B24(2.0)-060409	DPT	---	OH/ SW	Silty Clay, top 12", organic, trace cobble and coarse sands, angular, Sand, bottom 12", Fine to very coarse grained with some gravel and cobble, dry, loose, light brown (5Y6/3)	>30'	---
6/4/2009	B25	782060.177	146841.826	52.82	JM04-B25(2.0)-060409	DPT	---	CL/ SW	Silty Clay, top 8", moderate moist, trace angular cobble, low to medium plasticity, dark brown (10YR 4/3) Sand, bottom 16", well graded, fine to cobble, angular, few fines (<25%), dry, light brown (5Y 6/3)	>30'	---
6/4/2009	B26	782106.018	146825.561	50.28	JM04-B26(2.0)-060409	DPT	---	OH/ SP	Clay, Top 1, ' organic high plasticity, moderate moisture , Sand bottom 1' fine grained with little cobble, possibly dirty fill sand, dry, dark brown to light gray (5Y3/2) & (5Y 7/1)	>30'	---
6/4/2009	B27	781952.770	146827.819	58.62	JM04-B27(2.0)-060409	DPT	---	SM	Silty Sand with little clay, clay is near bottom of sample as matrix in gravelly cobbly layer, sand is fine to very coarse grained, angular, ~30% silt, ~10% clay, dry, light brown (5Y 7/3)	>30'	---
6/1/2009	C1	781950.281	146563.206	19.37	JM04-C1(2.0)-060109	DPT	---	SM/ ML	Angular cobbles, topsoil, silt, ~50% sand, dry, light brown	>30'	---
6/1/2009	C2	781998.953	146572.770	20.63	JM04-C2(2.0)-060109	DPT	---	SW/ CL	Angular cobbles, sand, fine to cobble, dry, silty clay last 2 inches, light brown	>30'	---
6/1/2009	C3	782048.769	146582.975	22.96	JM04-C3(2.0)-060109	DPT	---	SW	Silty Sand, trace fines, angular, dry, light brown	>30'	---
--	C4	---	---	---	NA	---	---	---	---	---	Cannot excavate soil due to presence of piping and UST - no sample collected
6/1/2009	C5	781961.084	146514.491	17.91	JM04-C5(2.0)-060109	DPT	---	CL	2" gravel then Silty-Clay, trace gravel, low moisture, dark brown	>30'	---
6/1/2009	C6	782009.998	146524.016	20.28	JM04-C6(2.0)-060109	DPT	---	SW	Sand, fine to cobble, angular, trace silts and clays, dry, loose, light brown	>30'	---
6/1/2009	C7	782053.193	146533.603	22.56	JM04-C7a(2.0)-060109	DPT	---	SW	Silty Sand, fine to cobble, angular, dry, light brown	>30'	Sample location moved 5 feet north to allow for utilities.
6/1/2009	C8	782100.448	146544.007	24.06	JM04-C8a(2.0)-060109	DPT	---	OL	Silty Clay, stiff, trace cobbles, moderate moisture, organic, dark brown	>30'	Sample location moved 5 feet west to allow for utilities.



Note: Preferred Remedy for soil selected in the "Revised Final Corrective Measures Study Final Report, TOW Way Fuel Farm, November 22, 2005," (Baker Environmental, Inc.)

Soil Delineation Sampling Point (50 Foot Intervals)

- Arsenic
 - Arsenic and PAHs
 - Grayed sample locations indicate areas where samples cannot be collected due to topography or existing structures
- PAHs = Benzo(a)anthracene
 Benzo(a)Pyrene
 Benzo(a)fluoranthene
 Benzo(1,2,3-cd)Pyrene

▭ Assumed Arsenic Impacted Soil Area (See Note)

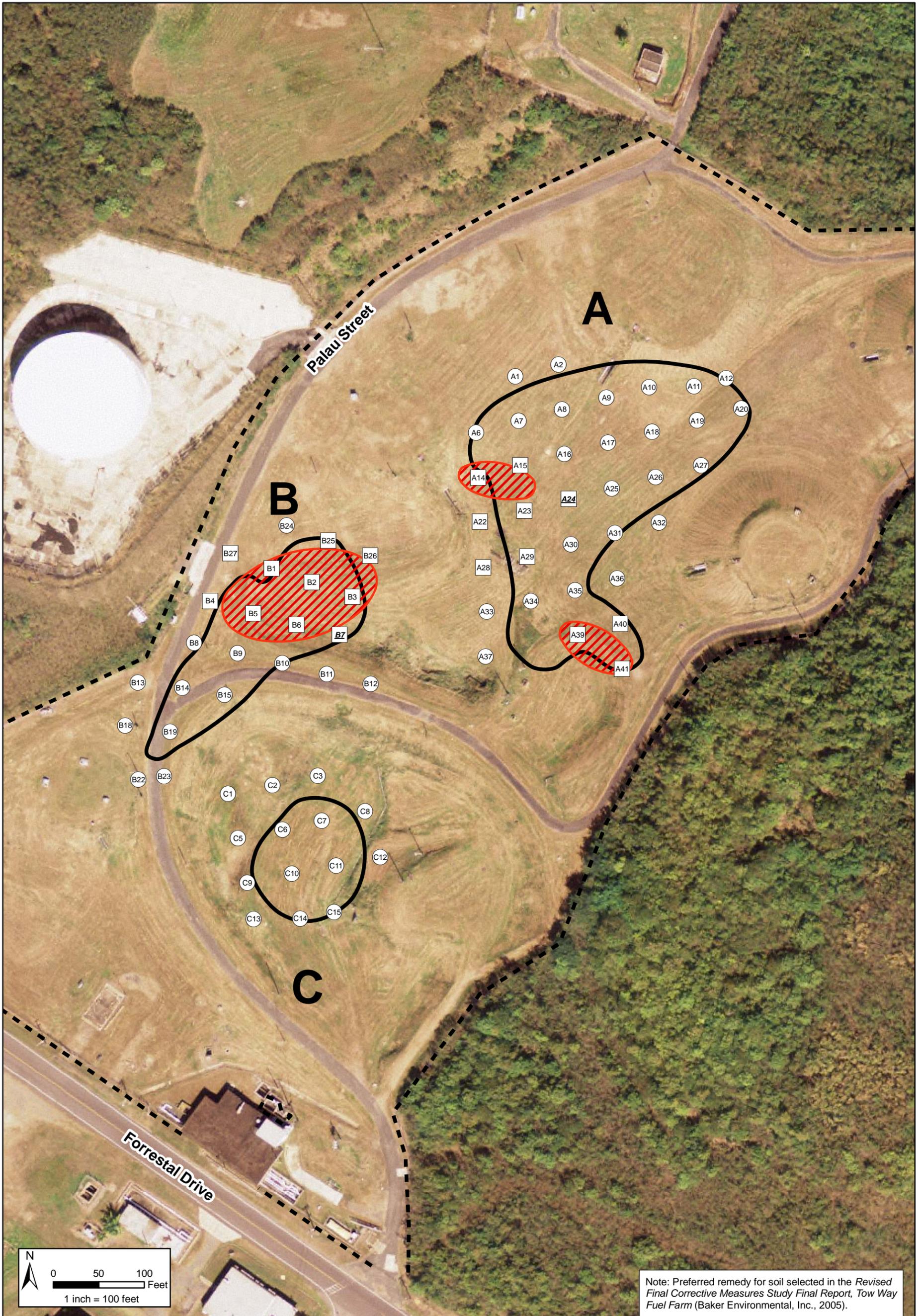
- - - Fence
- ▨ PAH Excavation Area



0 50 100 Feet

1 inch = 100 feet

FIGURE 2-1
 Proposed Soil Delineation Sample Locations
 Tow Way Fuel Farm
 Naval Station Roosevelt Roads, Puerto Rico



Note: Preferred remedy for soil selected in the Revised Final Corrective Measures Study Final Report, Tow Way Fuel Farm (Baker Environmental, Inc., 2005).

Soil Delineation Sampling Point

- Arsenic
- Arsenic and Polynuclear Aromatic Hydrocarbons (PAHs)

- - - Fence
- ▭ Assumed Arsenic Impacted Soil Area (See Note)
- ▨ PAH Excavation Area (See Note)

PAHs = Benzo(a)anthracene
 Benzo(a)Pyrene
 Benzo(a)fluoranthene
 Benzo(1,2,3-cd)Pyrene

A24 = Asphalt present in soil sample. Sample only tested for arsenic.

FIGURE 2-2
 Soil Delineation Sample Locations
 Tow Way Fuel Farm
 Naval Station Roosevelt Roads, Puerto Rico

3.0 Discussion of Results

Analytical results are summarized in Table 3-1, and the laboratory reports are presented in Appendix A. Data for the analyses were reviewed for adherence to the analytical protocols presented in the approved UFP-SAP and Work Plan. All analytical results were validated or qualified by a Puerto Rican chemist, an AGVIQ-CH2M HILL certified chemist, and a third-party validator in accordance with the guidance provided in the *Department of Defense Quality Systems Manual - Version 3 Final* (based on National Environmental Laboratory Accreditation Conference Voted Version 5 - June 2003) presented in the UFP-SAP.

3.1 PAHs

The revised CMS (Baker, 2005) identified PAHs as final COCs in surface soils in three areas, based on exceedence of the CAOs. The CAOs identified for surface soil were protective of an industrial worker and CAOs for subsurface soil were based on protection of construction workers.

The revised RCRA Facility Investigation (RFI) report (Baker, 1997) reported the PAH concentrations from collected soil samples as benzo(a)pyrene equivalent (BEQ) levels. The reported BEQ levels in soils ranged between 0.0013 mg/kg to 23 mg/kg, compared to an industrial risk-based concentration (RBC) of 7.8 mg/kg and residential RBC of 0.78 mg/kg from the RFI. The industrial RBC was identified as the CAO in the original CMS report for the remedial alternatives screening. Later during the comment review period, EPA recommended use of 2.9 mg/kg as the industrial worker protective level, which became the identified CAO for the CMS. The areas identified for corrective actions based on detection of individual PAHs converted to BEQ levels were presented in the CMS, and these figures are presented in Section 1.0 (Figures 1-4 to 1-7).

To further delineate the current levels of PAHs in the proposed excavation areas identified during the CMS, additional samples were collected in 2009 (Figure 3-1). A total of 18 samples were collected and analyzed for the specific PAH compounds identified as COCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene). PAHs were not detected in the upper 2 feet of soil in any of the 18 samples collected during the June 2009 sampling event (Table 3-1). Only the field duplicate sample (JM04-A22FD(2.0)-060309) from location A22 had concentrations slightly above MDL levels for benzo(a)anthracene (0.48 mg/kg) and benzo(a)fluoranthene (0.55 mg/kg); the normal sample (JM04-A22(2.0)-060309) did not have any detectable levels for these COCs. The BEQ values in this duplicate sample (based on a toxicity equivalency factor (TEF) of 0.1) for benzo(a)anthracene is 0.048 mg/kg and benzo(b)fluoranthene is 0.055 mg/kg. Therefore, the residential RBC for the BEQ of 0.78 mg/kg was not exceeded in this duplicate sample. The absence of detectable levels in the normal sample indicates an uncertainty associated with presence and levels of the PAHs in this duplicate sample. Overall, the 2009 sample results indicate that PAHs are not at detectable levels in site samples, so soils do not present exposure concern under an unrestricted land use scenario because the detection limits are below the residential RBC of 0.78 mg/kg for BEQ levels.

The PAH results are summarized on Table 3-1 and sample locations are illustrated on Figure 2-2. Figure 3-1 presents the June 2009 sampling results for PAHs, which were below detection limits in all samples. The reason for the absence of PAH concentrations in site soils previously reported during the RFI could be attributable to PAHs degradation over time. The PAHs from source materials tend to degrade with time as a result of exposure to sun, air, bacteria and other degrading agents (photo-oxidation and biological degradation). The analytical data collected during the RFI (Baker, 1997) are more than 10 years old and concentrations from these historical data no longer appear to represent current site conditions as indicated by the 2009 data collected from the same locations (Figure 3-1).

As noted in Table 3-1 and Figure 3-1, the areas with the previous highest detected concentration no longer have detectable PAHs. Because current site concentration levels are below detectable levels (e.g., less than residential RBC), site soils are deemed to be suitable for unrestricted use for PAHs. The rationale for absence of PAHs in soils could be from degradation of PAHs in the surface soils, as previously described.

3.2 Arsenic

A total of 72 samples were collected and analyzed for arsenic. Arsenic was detected in 69 of the 72 samples at concentrations ranging from 0.81J (C2) to 4.3 mg/kg (B23). Of the 69 samples collected, arsenic was detected above the CAO of 2.65 mg/kg in the following nine borings: A30, B9, B14, B23, B26, C3, C7, C9, and C12. Arsenic results are summarized on Table 3-1 and Figure 3-2 highlights the sample locations where arsenic exceeded the CAO of 2.65 mg/kg.

Baker developed a CAO for arsenic based on a statistical estimate using the analytical results from 21 “background” surface soil samples collected in areas that exhibited limited disturbance as a result of Navy operations. Areas of “limited disturbance” were defined by the presence of native flora and fauna (Baker, 2006). The samples collected by Baker had arsenic concentrations ranging between non-detect and 3.4 mg/kg (Baker, 1997 and 2005). During the recent sampling work performed by AGVIQ-CH2M HILL (72 samples versus 21 samples), arsenic concentrations ranged from 0.81J to 4.3 mg/kg. AGVIQ-CH2M HILL calculated the average and median arsenic concentrations to be 1.9 mg/kg and 1.8 mg/kg, respectively.

Published reports indicated that arsenic is a common naturally occurring element in soil on the island of Puerto Rico. A 2003 study indicated that arsenic occurs in soil on the island of Puerto Rico at concentrations ranging from 1 to 22 mg/kg (Agency for Toxic Substances and Disease Registry, 2003). Arsenic is not a contaminant of fuel oils such as those formerly used at the TWFF, and no other metals were identified in Baker’s work as a contaminant of concern.

Based on the limited test results used by Baker to calculate the CAO for arsenic, the fact that arsenic is a naturally occurring element in soil, and the evaluation of recent test results, AGVIQ-CH2M HILL elected to estimate the statistical upper bound concentration values for comparison against CAO values using the larger data set to determine if soil excavation is necessary to remove arsenic.

For the evaluation, AGVIQ-CH2M HILL compared the background sample results from the CMS against those obtained in June 2009. Arsenic results for soil within the TWFF were estimated for the upper-bound estimate of the mean (e.g., upper-bound confident limits at 95 percent [UCL95%]), and these values were compared against the UCL95% mean of the background arsenic to statistically evaluate whether arsenic is of natural origin or was introduced as a result of past naval activities. At locations where the UCL 95% for TWFF exceeded both UCL 95% background levels and the 2.65 mg/kg arsenic CAO, excavation will be necessary to remove the arsenic-impacted soil. However, if UCL95% values were below the CAO (also a statistically estimated value), excavation is not required.

The statistical upper bound estimate of the mean (UCL95% values) for site data groups from soil Areas A, B, and C were compared against the background values identified as the CAO value of 2.65 mg/kg. Also the combined data from Areas A, B, and C were plotted on an X-Y plot and all data when Log-transformed were normal in distribution, as presented in Figure 3-4, which indicates that the samples represent the same statistical data population. Additionally, comparison of the mean values and UCL95% values between data sets indicated similar distribution among the various site data sets. Therefore, the data appear to represent a similar data population between the three data sets. Appendix B contains the detailed output sheets from the UCL calculations.

Our evaluation of the arsenic data indicates the following:

- The detected concentrations in site soil indicated a range between 0.81J mg/kg to 4.3 mg/kg. Typically, larger data sets for naturally occurring inorganic chemicals such as the soil delineation data set, which includes 72 sample locations, will have a greater variation and wider distribution in concentration ranges.
- The maximum detected concentration (4.3 mg/kg in location B23) is adjacent to a roadway and away from former tank areas; the second highest concentration (detection of 4.1 mg/kg in location B26) is in a separate area on the northern end of Area B. Both samples are separated by several samples with low arsenic levels. Based on the June 2009 analytical results, the detected arsenic is randomly distributed across the site (Figure 3-2).
- The highest levels of arsenic are detected in samples located outside of the CMS designated source areas (indicated as Areas A, B, and C on Figure 3-2).
- Overall distribution of arsenic across the three areas of concern is random and does not indicate a distinct distribution pattern; this distribution is most likely representative of soil mineralogy of the area.
- The statistical estimation of the arsenic data calculated separately for Areas A, B, and C has a UCL95% ranging between 1.9 to 2.5 mg/kg (Table 3-2).
- The arsenic distribution is similar among the majority of samples collected across the site, with no elevated or "source" area. Therefore, detected arsenic appears to be related to the natural soil variability and mineralogy and does not indicate a site-specific release.

- A statistical comparison of the site data to background data was performed using the Wilcoxon Rank Sum (WRS) test, where the background data compared against site data were divided into four groups: All Data, Area A, Area B, and Area C. As noted on the table in Appendix B, the comparison results of site data against the background data indicated that the data sets for All Data, Area A, and Area B are not statistically different from background levels. However, Area C is statistically different from the background data set, based on the WRS test. Area C could be statistically different because the data set has the smallest number of samples (n=14) and three samples had concentrations above the background maximum. However, the site maximum detected concentration is not in this data group. Overall detected concentration levels are close in range to all other data sets, as indicated by the combined data set, All Data, being similar to the background data set. Therefore, arsenic is not identified as a final COC based on these statistical comparisons.
- The Q-Q plots of both normal and lognormal data presented in Figures 3-3 and 3-4 estimate correlation coefficient values (R²) of 0.914 (normal) and 0.987 (lognormal), which are substantially greater than 0.5. These R² values indicate the arsenic data are well correlated between various samples and do not indicate a skewed distribution that is typical of site-specific releases.
- The maximum detected arsenic concentration of 4.3 mg/kg is not identified as a “hot spot,” because it is below three times the target CAO value of 8.0 mg/kg (2.65 mg/kg * 3). Therefore, no extremely elevated area is identified for arsenic at SWMU 7/8.
- The CAO selected for arsenic was based on the surface soil background level for arsenic of 2.65 mg/kg. The current comparable statistical value (UCL_{95%}) value for arsenic is 2.5 mg/kg, indicating site arsenic levels are within background levels and do not exceed the surface soil CAO.

3.3 Land Use and Institutional Controls for Site Soils

TWFF (SWMU 7/8) is located on a hillside along Forrestal Road north of Ensenada Honda within Navy-owned property and remains industrial in use. Based on the investigation completed as part of this CMS Addendum, the site soils do not have any contamination above background levels or above detection limits. There are no ongoing petroleum distribution-related activities within the TWFF. The original CMS report identified PAHs and arsenic as COCs and recommended CAOs based on background for arsenic and industrial land use health protective levels for PAHs. Because CMS addendum results indicate site soils no longer have detectable PAHs, and arsenic is within background levels, SWMU 7/8 site soils are recommended for unrestricted land use.

Land use controls (LUCs) are recommended at sites where contaminants are left in place while remedial action is determined necessary to protect human health and the environment. Use of the LUCs ensures that contamination does not pose an unacceptable risk to human health or the environment. The LUCs consist of engineering controls/and or institutional controls. Because the TWFF has no contamination in soils, the surface media of the site are recommended for no LUCs or institutional controls. However, site groundwater has petroleum contamination that requires corrective actions.

Table 3-1
Soil Delineation Analytical Results at SWMU 7/8 (June 2009)
Roosevelt Roads Naval Station, Puerto Rico

Station ID	Sample ID	Sample Depth feet	Arsenic	Benzo (a) Anthracene		Benzo (a) Pyrene		Benzo (b) Fluoranthene		Indeno (1,2,3-cd) Pyrene	
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
			2.65	2.9		2.9		2.9		2.9	
CAOs in Surface Soil (mg/kg)*			RL	MDL	RL	MDL	RL	MDL	RL	MDL	
C13	JM04-C13a(2.0)-060109	0 - 2	1.6J	---	---	---	---	---	---	---	---
C14	JM04-C14(2.0)-060109	0 - 2	1.8J	---	---	---	---	---	---	---	---
C15	JM04-C15(2.0)-060109	0 - 2	2.5J	---	---	---	---	---	---	---	---
C16	NA	---	---	---	---	---	---	---	---	---	---

--- = No data collected

NA = not accessible

RL = reporting limit

MDL = method detection limit

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.

mg/kg = Milligrams per Kilogram

ug/kg = Micrograms per Kilogram

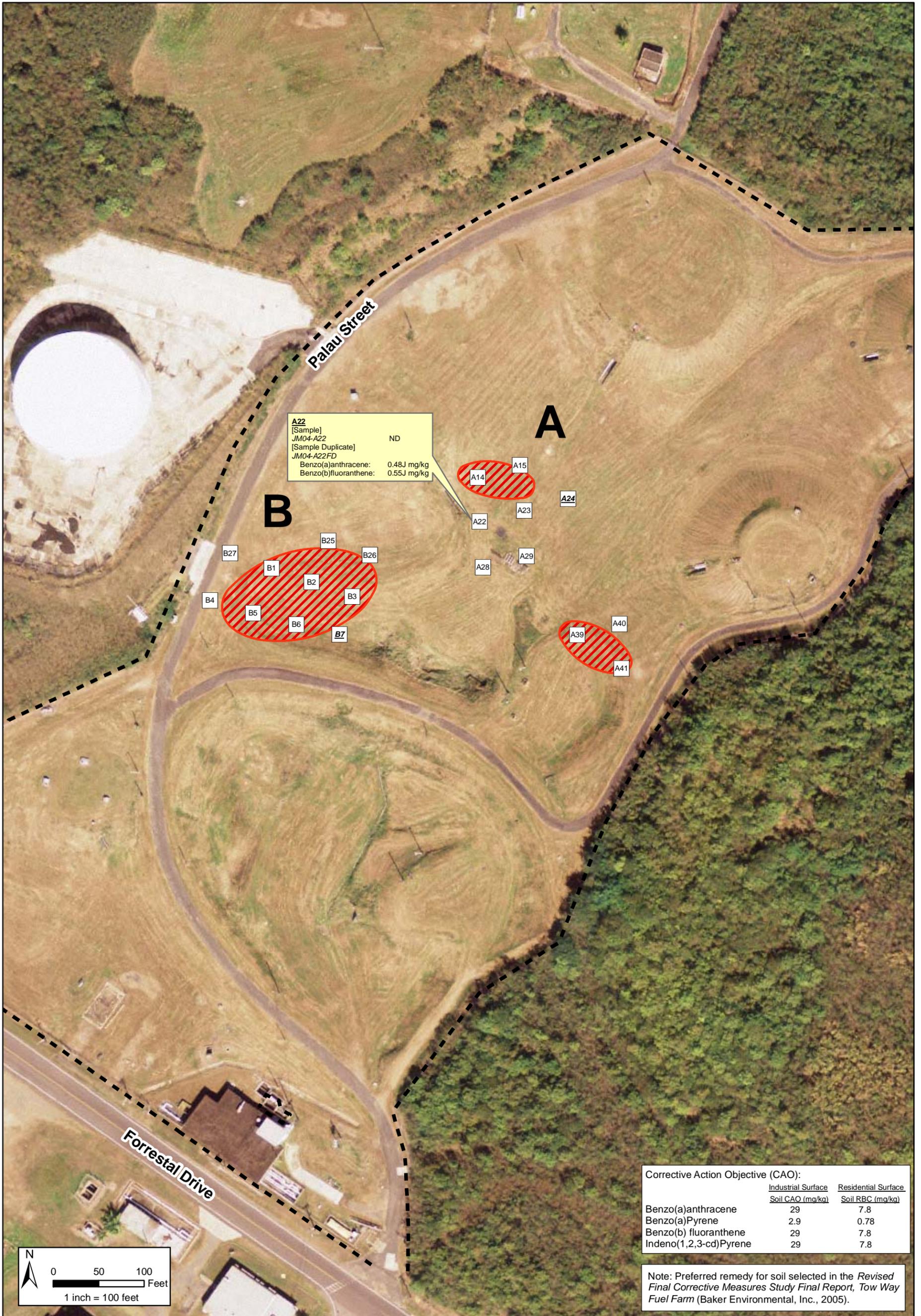
Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

* Screening Levels obtained from "Revised Final Corrective Measures Study Final Report", November 22, 2005 (Table 1-1). PAHs were not detected in any samples, thus no CAO exceedences.

** - only duplicate sample JM04-A22FD(2.0)-060309 had detection of two PAHs, benzo(a)anthracene and benzo(b)fluoranthene at 0.48 mg/kg and 0.55 mg/kg, respectively. Detections are below CAOs.

MDLs are an order of magnitude lower than RLs, and no detectable PAHs are present in site soils. Thus no PAHs are present at detectable levels in site soils.

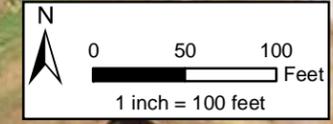


A22
 [Sample] JM04-A22 ND
 [Sample Duplicate] JM04-A22FD
 Benzo(a)anthracene: 0.48J mg/kg
 Benzo(b)fluoranthene: 0.55J mg/kg

Corrective Action Objective (CAO):

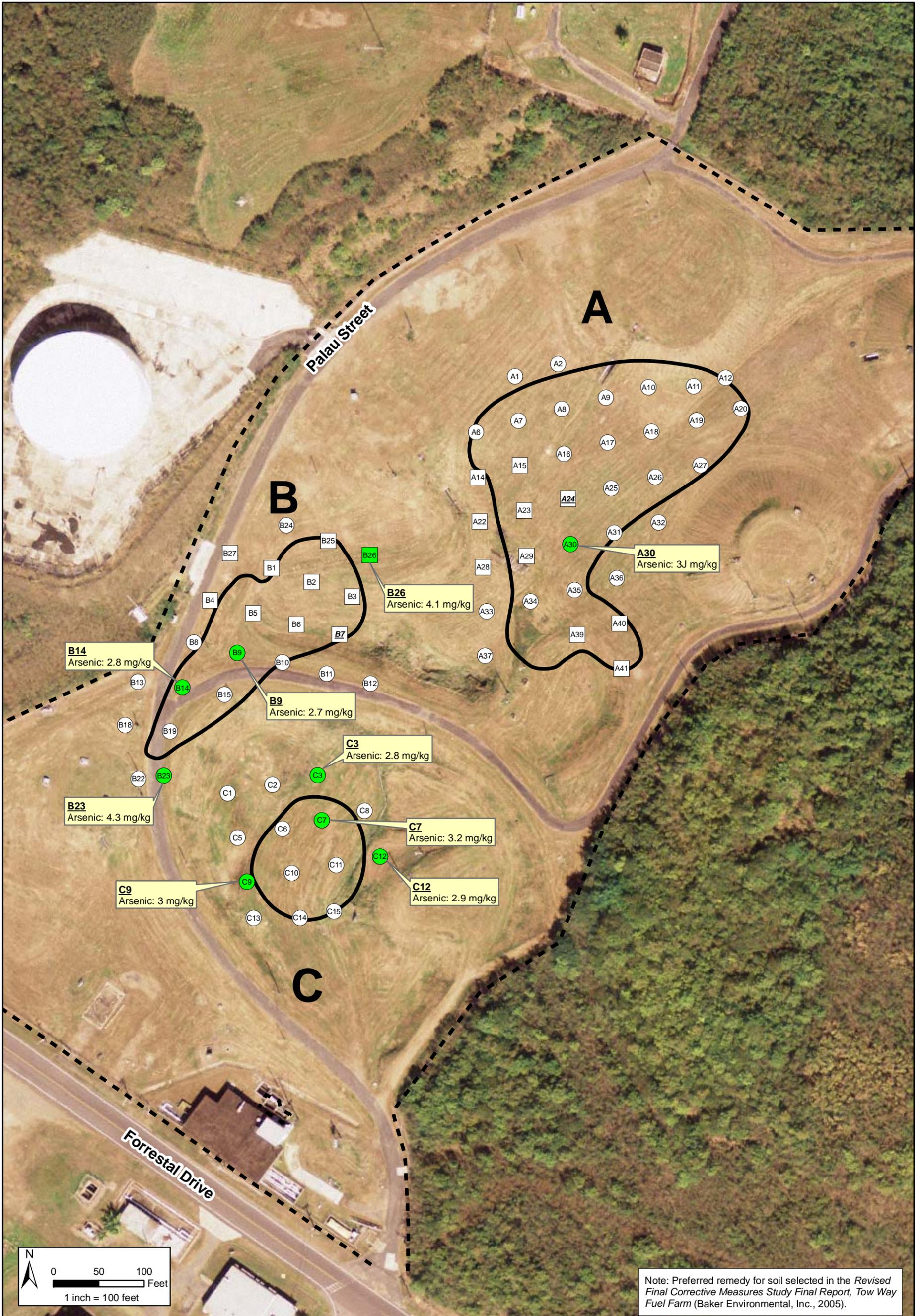
	Industrial Surface Soil CAO (mg/kg)	Residential Surface Soil RBC (mg/kg)
Benzo(a)anthracene	29	7.8
Benzo(a)Pyrene	2.9	0.78
Benzo(b) fluoranthene	29	7.8
Indeno(1,2,3-cd)Pyrene	29	7.8

Note: Preferred remedy for soil selected in the *Revised Final Corrective Measures Study Final Report, Tow Way Fuel Farm* (Baker Environmental, Inc., 2005).



- Polynuclear Aromatic Hydrocarbons (PAHs) Soil Delineation Sampling Point
- A22 Soil sample with concentrations (in milligrams per kilogram [mg/kg]) below detection limits
- Soil sample with concentrations (in milligrams per kilogram [mg/kg]) above CAOs
- Fence
- PAH Excavation Area (See Note)
- PAHs = Benzo(a)anthracene
Benzo(a)Pyrene
Benzo(a)fluoranthene
Benzo(1,2,3-cd)Pyrene
J = Estimated Detected Concentration
ND = Not Detected
- A24 = Asphalt present in soil sample

FIGURE 3-1
 Soil Delineation Sample Locations for PAHs
 Tow Way Fuel Farm
 Naval Station Roosevelt Roads, Puerto Rico



Note: Preferred remedy for soil selected in the Revised Final Corrective Measures Study Final Report, Tow Way Fuel Farm (Baker Environmental, Inc., 2005).

Soil Delineation Sampling Point

- Arsenic
- Arsenic and Polynuclear Aromatic Hydrocarbons (PAHs)

- - - Fence
- ▭ Assumed Arsenic Impacted Soil Area (See Note)

- = Soil sample with concentrations (in milligrams per kilogram [mg/kg]) above Corrective Action Objective (CAO):
Arsenic: 2.65 mg/kg
 J = Estimated Detected Concentration
- ▭ = Asphalt present in soil sample. Sample only tested for arsenic.

FIGURE 3-2
 Soil Delineation Sample Locations that Exceeded the Arsenic CAO
 Tow Way Fuel Farm
 Naval Station Roosevelt Roads, Puerto Rico

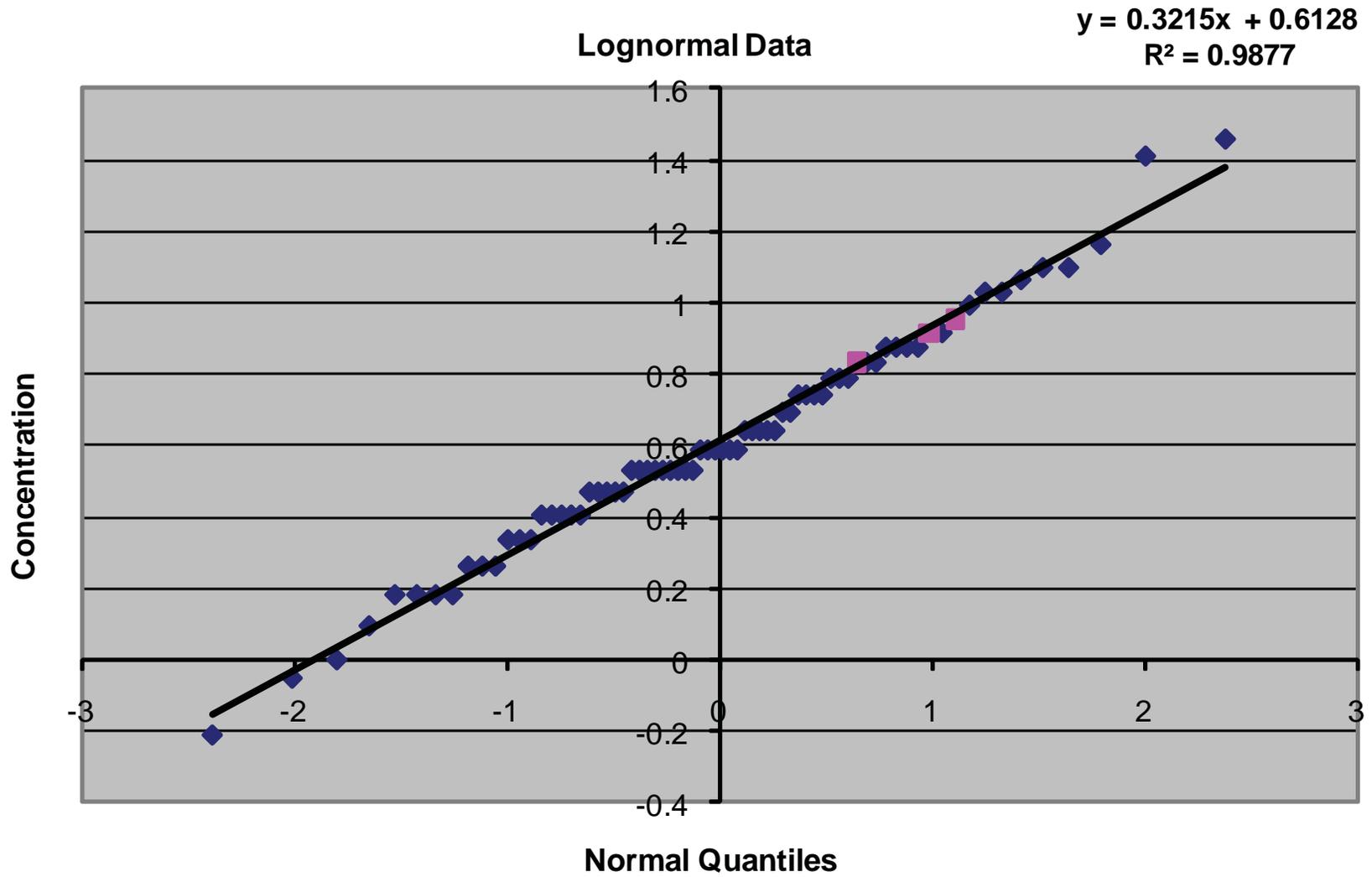


FIGURE 3-3
 Arsenic Distribution Plot Across SWMU 7/8: Lognormal Data
 Tow Way Fuel Farm
 Naval Station Roosevelt Roads, Puerto Rico

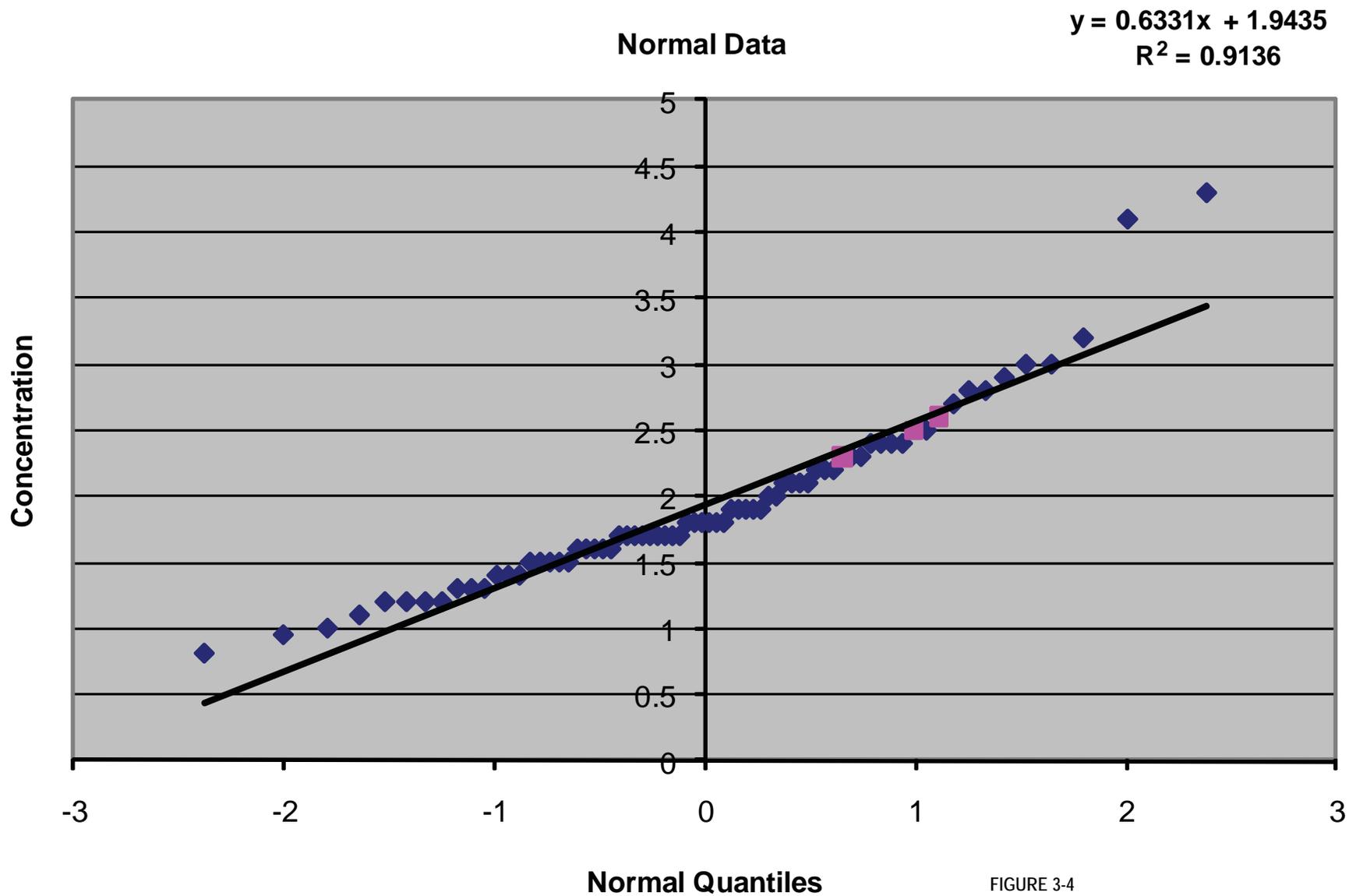


FIGURE 3-4
 Arsenic Distribution Plot Across SWMU 7/8: Normal Data
Tow Way Fuel Farm
Naval Station Roosevelt Roads, Puerto Rico

4.0 Findings and Recommendations

4.1 Findings

Based on the field and analytical data collected from the SWMU 7/8 area, the following findings were made:

- PAHs were not detected in the upper 2 feet in the areas of concern indicated by the CMS.
- Arsenic was detected across the site in 69 out of 72 surface soil samples. However, results of a statistical evaluation indicate the current comparable statistical value (UCL95%) for arsenic is 2.5 mg/kg. Therefore, site arsenic levels are within background levels and are below the CAO of 2.65 mg/kg.

4.2 Recommendations

Based on the analytical results for the surface soil samples, there is no soil contamination at the site that requires corrective actions. PAH concentrations are below detection limits and do not present human or ecological exposure concern. Therefore, no further action at SWMU 7/8 is recommended for PAHs in site soils.

Based on the extensive sampling conducted across the site, detected arsenic is randomly distributed across the site. The distribution patterns indicate absence of specific elevated areas, and statistical evaluation of the data indicate site arsenic upper-bound estimates are between 1.9 mg/kg and 2.5 mg/kg, which are below the CAO target level of 2.65 mg/kg. No single detection is indicative of extremely elevated values. Therefore, the detected arsenic levels at SWMU 7/8 are considered naturally occurring within the surface soil and no further action is recommended for arsenic in site soils.

As presented in Section 3.3, site soil residual concentrations for the two COCs, PAHs and arsenic are either below detection limits or similar to background levels. Therefore, no land use restrictions are recommended to protect against site soil exposures. Although the original CAOs were for industrial land use, the residual concentration levels render soils similar to background soils. Therefore, no institutional controls will be recommended for site soils/surface media at SWMU 7/ 8. However, site groundwater continues to have contamination that requires further corrective actions.

5.0 References

Agency for Toxic Substances and Disease Registry. 2003. *Petitioned Public Health Assessment, Soil Pathway Evaluation, Isla De Vieques Bombing Range, Vieques, P.R.* February 7.

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Baker. 2005. *Revised Final CMS Final Report for TWFF.* November 22.

Baker. 2006. *Revised Final Summary Report for Environmental Background Concentrations of Inorganic Compounds.* October 17.

AGVIQ-CH2M HILL. 2009. *Draft Sampling and Analysis Plan for Groundwater Sampling at Solid Waste Management Unit 7/8 at Naval Activity Puerto Rico, Ceiba, Puerto Rico.* September, 2009.

EPA. 1992. *Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies.* Office of Research and Development, Washington, D.C. EPA/600/R-92/128.

APPENDIX A

Soil Laboratory Analytical Results



NA Puerto Rico

PREPARED FOR: NA Puerto Rico / SWMU 7 and 8 Soil Delineation

**FINAL REVIEWER/
INITIAL REVIEWER** Camden Robinson/ Associate Project Chemist/CH2M Hill

COPIES: Tom Beisel /Project Manager/AGVIQ-CH2M HILL

DATE: July 22, 2010

SUBJECT: Revised Quality Assessment for Samples Collected June 1st, 2009 thru June 4th, 2009

This quality assurance memorandum is based upon a review of analytical data generated for the soil samples and the associated field quality control samples collected June 1st, 2009 thru June 4th, 2009 at the Naval Activity Puerto Rico in Ceiba, Puerto Rico. The samples were collected as a part of the SWMU 7 and 8 Soil Delineation sampling event conducted at the site. Table 1-1 presents a summary of the AGVIQ-CH2M HILL sample identification numbers, laboratory sample identification numbers, dates of collection, and the analyses performed.

Upon data review, this report has been revised to include the department of defense quality systems manual criteria for the quality control exceedances noted in the report below in order to better understand why samples were qualified as stated. Also, the laboratory summary forms have been added to show the exceedances.

Empirical Laboratories, LLC. of Nashville, Tennessee served as the laboratory for this SWMU 7 and 8 Soil Delineation sampling event. The samples were submitted for Select Polycyclic aromatic Hydrocarbons by SW-846 method 8270C (PAH) and Arsenic by SW-846 6010B.

Data for the analyses were reviewed for adherence to the specified analytical protocols in accordance with AQVIQ-CH2M HILL Sampling Analysis Plan. All analysis results have been validated or qualified according to general guidance provided in the Department of Defense (DOD) Quality Systems Manual - Version 3 Final (based on NELAC Voted Version 5 – June 2003).

The findings of this quality assurance report are based upon the comprehensive review of the following results summaries reported according to the AGVIQ-CH2M HILL Level C (CLP-like data deliverables format): chain of custody documentation, holding times, laboratory method and field blank analyses, surrogate compound recoveries, matrix spike compound recoveries and reproducibility, bromofluorobenzene (BFB) mass tuning results, initial and continuing calibration, second source recovery and internal standard area performance summaries, target compound identification, laboratory control sample results, laboratory and blind field duplicate sample results, detection limits/sensitivity, ICP interference check sample results, ICP serial dilution results, metals post digestion spikes, and electronic data deliverables.

The analyses were performed acceptably, but require several qualifying statements; it is recommended that the analytical data be used only with the qualifying statements provided below. Any aspects of the data, which are not discussed in this report, should be considered qualitatively and quantitatively valid as reported, based on the deliverables reviewed. The validated and qualified results are presented in the data

summary tables. Attachment A contains a copy of the chain of custody, the validated sample results, and the laboratory quality control summary form exceedances.

Table 1-1
Summary Sample Data
NA Puerto Rico

Sample Number	Reference Sample Number	Lab Sample ID	Date Sampled	Analyses Required
JM04-A1(2.0)-060309		0906068-01	06/03/2009	[2]
JM04-A2(2.0)-060309		0906068-02	06/03/2009	[2]
JM04-A6(2.0)-060309		0906068-03	06/03/2009	[2]
JM04-A7(2.0)-060309		0906068-04	06/03/2009	[2]
JM04-A8(2.0)-060309		0906068-05	06/03/2009	[2]
JM04-A8FD(2.0)-060309	JM04-A8(2.0)-060309	0906068-06	06/03/2009	[2]
JM04-A9(2.0)-060409		0906068-07	06/04/2009	[2]
JM04-A10(2.0)-060409		0906068-08	06/04/2009	[2]
JM04-A11(2.0)-060309		0906068-09	06/03/2009	[2]
JM04-A12A(2.0)-060309		0906068-10	06/03/2009	[2]
JM04-A14(2.0)-060309		0906068-11	06/03/2009	[1], [2]
JM04-A15(2.0)-060209		0906068-12	06/02/2009	[1], [2]
JM04-A16(2.0)-060209		0906068-13	06/02/2009	[2]
JM04-A16FD(2.0)-060209	JM04-A16(2.0)-060209	0906068-14	06/02/2009	[2]
JM04-A17(2.0)-060409		0906068-15	06/04/2009	[2]
JM04-A18(2.0)-060409		0906068-16	06/04/2009	[2]

Sample Number	Reference Sample Number	Lab Sample ID	Date Sampled	Analyses Required
JM04-A19(2.0)-060309		0906068-17	06/03/2009	[2]
JM04-A20(2.0)-060309		0906068-18	06/03/2009	[2]
JM04-A22(2.0)-060309		0906068-19	06/03/2009	[1], [2]
JM04-A22FD(2.0)-060309	JM04-A22(2.0)-060309	0906068-20	06/03/2009	[1], [2]
JM04-A23(2.0)-060309		0906068-21	06/03/2009	[1], [2]
JM04-A24(2.0)-060209		0906068-22	06/02/2009	[1], [2]
JM04-A25(2.0)-060209		0906068-23	06/02/2009	[2]
JM04-A25FD(2.0)-060209	JM04-A25(2.0)-060209	0906068-24	06/02/2009	[2]
JM04-A26(2.0)-060409		0906068-25	06/04/2009	[2]
JM04-A27(2.0)-060409		0906068-26	06/04/2009	[2]
JM04-EB03-060309		0906068-27	06/03/2009	[2]
JM04-EB04-060409		0906068-28	06/04/2009	[1]
JM04-A28(2.0)-060209		0906069-01	06/02/2009	[1], [2]
JM04-A29(2.0)-060209		0906069-02	06/02/2009	[1], [2]
JM04-A30(2.0)-060209		0906069-03	06/02/2009	[2]
JM04-A31(2.0)-060209		0906069-04	06/02/2009	[2]
JM04-A32(2.0)-060209		0906069-05	06/02/2009	[2]

Sample Number	Reference Sample Number	Lab Sample ID	Date Sampled	Analyses Required
JM04-A33(2.0)-060209		0906069-06	06/02/2009	[2]
JM04-A34(2.0)-060209		0906069-07	06/02/2009	[2]
JM04-A35(2.0)-060209		0906069-08	06/02/2009	[1], [2]
JM04-A36(2.0)-060209		0906069-09	06/02/2009	[2]
JM04-A37(2.0)-060209		0906069-10	06/02/2009	[2]
JM04-A39(2.0)-060209		0906069-11	06/02/2009	[1], [2]
JM04-A40(2.0)-060209		0906069-12	06/02/2009	[1], [2]
JM04-A41(2.0)-060209		0906069-13	06/02/2009	[1], [2]
JM04-B1(2.0)-060409		0906069-14	06/04/2009	[1], [2]
JM04-B2(2.0)-060409		0906069-15	06/04/2009	[1], [2]
JM04-B3(2.0)-060409		0906069-16	06/04/2009	[1], [2]
JM04-B3FD(2.0)-060409	JM04-B3(2.0)-060409	0906069-17	06/04/2009	[1], [2]
JM04-B4(2.0)-060409		0906069-18	06/04/2009	[1], [2]
JM04-EB02-060209		0906069-27	06/02/2009	[1], [2]
JM04-B12(2.0)-060409		0906071-01	06/04/2009	[2]
JM04-B12FD(2.0)-060409	JM04-B12(2.0)-060409	0906071-02	06/04/2009	[2]
JM04-B13(2.0)-060409		0906071-03	06/04/2009	[2]

Sample Number	Reference Sample Number	Lab Sample ID	Date Sampled	Analyses Required
JM04-B14(2.0)-060409		0906071-04	06/04/2009	[2]
JM04-B15(2.0)-060409		0906071-05	06/04/2009	[2]
JM04-B18(2.0)-060409		0906071-06	06/04/2009	[2]
JM04-B19(2.0)-060409		0906071-07	06/04/2009	[2]
JM04-B22(2.0)-060409		0906071-08	06/04/2009	[2]
JM04-B23(2.0)-060409		0906071-09	06/04/2009	[2]
JM04-B24(2.0)-060409		0906071-10	06/04/2009	[1], [2]
JM04-B25(2.0)-060409		0906071-11	06/04/2009	[1], [2]
JM04-B26(2.0)-060409		0906071-12	06/04/2009	[1], [2]
JM04-B27(2.0)-060409		0906071-13	06/04/2009	[1], [2]
JM04-C1(2.0)-060109		0906071-14	06/01/2009	[2]
JM04-C2(2.0)-060109		0906071-15	06/01/2009	[2]
JM04-C3(2.0)-060109		0906071-16	06/01/2009	[2]
JM04-C5(2.0)-060109		0906071-17	06/01/2009	[2]
JM04-C6(2.0)-060109		0906071-18	06/01/2009	[2]
JM04-C7A(2.0)-060109		0906071-19	06/01/2009	[2]
JM04-C8A(2.0)-060109		0906071-20	06/01/2009	[2]

Sample Number	Reference Sample Number	Lab Sample ID	Date Sampled	Analyses Required
JM04-C9(2.0)-060109		0906071-21	06/01/2009	[2]
JM04-C10(2.0)-060109		0906071-22	06/01/2009	[2]
JM04-C11(2.0)-060109		0906071-23	06/01/2009	[2]
JM04-C12(2.0)-060109		0906071-24	06/01/2009	[2]
JM04-C13A(2.0)-060109		0906071-25	06/01/2009	[2]
JM04-C14(2.0)-060109		0906071-26	06/01/2009	[2]
JM04-C15(2.0)-060109		0906071-27	06/01/2009	[2]
JM04-C15FD(2.0)-060109	JM04-C15(2.0)-060109	0906071-28	06/01/2009	[2]
JM04-EB01-060109		0906071-29	06/01/2009	[2]
JM04-EB05-060409		0906071-30	06/04/2009	[1], [2]

ANALYSES PERFORMED CODES:

[1] - Select Polycyclic aromatic Hydrocarbons (PAH) by SW-846 8270C,

[2] - Arsenic by SW-846 6010B

General Data Qualifiers

As required by U.S. EPA protocols, all compounds, which were qualitatively identified at concentrations below their respective, reporting limits (RL) but above the method detection limit (MDL) have been qualified with "J" qualifiers on the data summary reports to indicate that they are quantitative estimates.

SOIL CLEANUP TARGET ACTION LEVEL REGULATORY LIMITS

All samples collected and analyzed for the month of June 2009 for the select polycyclic aromatic hydrocarbons (PAH) and arsenic analyses were less than the action level soil cleanup target level regulatory limits with the exception of the analytes listed below:

Analyte (Metals List)	Affected Sample	Sample Results (mg/kg)	Soil Cleanup Target Levels (mg/kg)
Arsenic	JM04-A30(2.0)-060209	3.0J	2.65
Arsenic	JM04-B14(2.0)-060409	2.8	2.65
Arsenic	JM04-B23(2.0)-060409	4.3	2.65
Arsenic	JM04-B26(2.0)-060409	4.1	2.65
Arsenic	JM04-C3(2.0)-060109	2.8	2.65
Arsenic	JM04-C7A(2.0)-060109	3.2	2.65
Arsenic	JM04-C9(2.0)-060109	3	2.65
Arsenic	JM04-C12(2.0)-060109	2.9	2.65
Arsenic	JM04-B9(2.0)-060409	2.7	2.65

Organic Data Qualifiers

The samples were all collected on June 1st, 2009 thru June 4th, 2009 but not received by the laboratory until June 6th, 2009. CH2MHill notes that the procedure is to ship samples daily or at a minimum, the samples should be cooled and a temperature log must be kept as stated in CLP Functional Guidelines for Samplers Chapter 3, section 3.1.2.3 and 3.4.1. Due to professional judgment and the fact that the polycyclic aromatic hydrocarbon analytes are temperature sensitive, all of the field sample results were qualified as estimated with a low bias “J/UJ”.

The quantitation limits reported for polycyclic aromatic hydrocarbon benzo(a)pyrene in the samples listed below should be considered quantitative estimates. High percent difference recoveries were noted as exceeding the 20% criteria as stated in the DOD QSM for the associated continuing calibrations. Lack of precision during the continuing calibration indicates instrument instability; therefore a “J” qualifier was appended to the samples listed below to indicate that the reported values are quantitative estimates.

Compound	Affected Samples
Benzo(a)pyrene	JM04-A40(2.0)-060209, JM04-B1(2.0)-060409, JM04-B2(2.0)-060409, JM04-B3(2.0)-060409, JM04-B3FD(2.0)-060409, and JM04-B4(2.0)-060409

The quantitation limits reported for polycyclic aromatic hydrocarbons benzo(a)pyrene, benzo(b)fluoranthene, , and indeno(1,2,3-cd)pyrene for samples JM04-A22(2.0)-060309 and JM04-A28(2.0)-060209 should be considered quantitative estimates due to the biased low response of 38% and 48% respectively, for internal standard perylene-d12, which is outside the criteria of -50 to 100 of the ICAL midpoint standard as stated in the DOD QSM during the sample analysis. Low internal standard recoveries are indicative of matrix interferences with the associated compounds; therefore a “J” qualifier was appended to the analytes listed above for samples JM04-A22(2.0)-060309 and JM04-A28(2.0)-060209 to indicate that the reported values are quantitative estimates.

The samples presented below were analyzed at dilutions for the analysis indicated. These dilutions may have resulted in surrogate compounds diluted below the instrument detection limit; therefore surrogate recoveries may not be reported for all diluted analysis. These dilutions were required to prevent saturation of the instrument, and/or to reduce the effects of the matrix on the target compounds.

Sample ID	Analysis	Dilution Factor
JM04-A14(2.0)-060309	PAH	5X
JM04-A15(2.0)-060209	PAH	5X
JM04-A22(2.0)-060309	PAH	5X
JM04-A22FD(2.0)-060309	PAH	5X
JM04-A23(2.0)-060309	PAH	5X
JM04-A28(2.0)-060209	PAH	5X
JM04-A29(2.0)-060209	PAH	5X
JM04-A35A(2.0)-060209	PAH	5X
JM04-A39(2.0)-060209	PAH	5X
JM04-A40(2.0)-060209	PAH	5X
JM04-A41(2.0)-060209	PAH	5X
JM04-B1(2.0)-060409	PAH	5X
JM04-B2(2.0)-060409	PAH	5X
JM04-B3(2.0)-060409	PAH	5X
JM04-B3FD(2.0)-060409	PAH	5X
JM04-B4(2.0)-060409	PAH	5X
JM04-B24(2.0)-060409	PAH	5X
JM04-B25(2.0)-060409	PAH	5X
JM04-B26(2.0)-060409	PAH	5X
JM04-B27(2.0)-060409	PAH	5X

Samples JM04-A22(2.0)-060309 and JM04-B3(2.0)-060409 and their blind field duplicate samples JM04-A22(2.0)-060309 and JM04-B3FD(2.0)-060409 were submitted to the laboratory to evaluate sampling and analytical precision for those compounds determined to be confidently detected. All compounds met AGVIQ-CH2M HILL's blind duplicate precision criteria of 30% for soil samples relative percent difference (RPD) for polycyclic aromatic hydrocarbons analysis.

Inorganic Qualifiers

Samples JM04-A8(2.0)-060309, JM04-A16(2.0)-060209, JM04-A22(2.0)-060309, JM04-A25(2.0)-060209, JM04-B3(2.0)-060409, JM04-B12(2.0)-060409, and JM04-C15(2.0)-060109 and their blind field duplicate samples JM04-A8FD(2.0)-060309, JM04-A16FD(2.0)-060209, JM04-A22FD(2.0)-060309, JM04-A25FD(2.0)-060209, JM04-B3FD(2.0)-060409, JM04-B12FD(2.0)-060409, and JM04-C15FD(2.0)-060109 were submitted to the laboratory to evaluate sampling and analytical precision for those compounds determined to be confidently detected. All compounds met AGVIQ-CH2M HILL's blind duplicate precision criteria of 30% for soil samples relative percent difference (RPD) for the metals analysis.

Summary

The organic and inorganic analyses were performed acceptably, but required qualifying statements. This analytical quality assurance report has identified the aspects of the data, which required qualification. These qualifiers are noted on the attached analytical sample summary reports. A support documentation package has been prepared for this quality assurance review and is filed with the NA Puerto Rico / SWMU 7 and 8 Soil Delineation project file.

VALID QUALIFIERS

QUALIFIER	
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit
J	The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R/UR	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet the quality control criteria. The presence or absence of the analyte cannot be verified.
B	The analyte was detected in the associated method and/or calibration blank.
JB	The analyte detected in the associated field, equipment, and/or trip blank.

QUALIFICATION CODE REFERENCE

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect.
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995.
K	Second source %D was noncompliant.	Second source %D was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
MB	Presumed contamination from preparation (method) blank.	Presumed contamination from preparation (method) blank or calibration blank.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
Q	MS/MSD recovery was poor or high RPD.	MS/MSD recovery was poor or high RPD.
G	Result is over the calibration range. No other acceptable result was provided.	Result is over the calibration range. Not other acceptable result was provided.
E	Not applicable.	Lab duplicate RPD showed poor agreement.
Z	Field duplicate RPD showed poor agreement.	Field duplicate RPD showed poor agreement
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D was not within control limits.
TN	Tuning (BFB or DFTPP) was noncompliant.	Not applicable.
T	Presumed contamination from trip blank.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination from FB or ER.	Presumed contamination from FB or ER.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Confirmation analysis RPD exceeded 40%.	Post Digestion Spike recovery was not within control limits.
T/D	Not applicable.	Total metals results were less than the dissolved metals result.
SD	Not applicable.	Seed correction factor was below the acceptable limit.
M	Results should be considered estimated due to matrix effects caused by saturation of non-target analytes.	Not applicable
OT	Results should be considered estimated due to sample was analyzed from jar.	Not applicable
LC	Laboratory contamination	Not applicable
ST	Sample Temperature non-conformance	Sample Temperature non-conformance

Attachment A

3.1.2.2 Preserve Samples

Degradation of some contaminants may occur naturally (e.g., VOAs). The sampler must chemically preserve some water samples for certain analytes before shipping them to the laboratory. The sampler should preserve and immediately cool all samples to 4°C (±2°C) upon collection and samples should remain cooled until the time of analysis (do not freeze water samples). Preservation techniques vary among Regions so the sampler should obtain Region-specific instructions and review the appropriate project plans and SOPs. See Appendix C for information regarding the collection of VOAs in water.

3.1.2.3 Ship within Holding Times

Samplers should ship samples to scheduled CLP laboratories as soon as possible after collection. Daily shipment of samples to CLP laboratories is preferred whenever possible. If samples cannot be shipped on a daily basis, they must be properly preserved and maintained to meet CLP-specified temperatures, holding times, and custody requirements.

The technical holding times are the maximum time allowed between a sample collection and the completion of the sample extraction and/or analysis. In contrast, contractual holding times are the maximum lengths of time that the CLP laboratory can hold the sample prior to extraction and/or analysis. These contractual holding times are described in the appropriate CLP SOW. Contractual holding times are shorter than the technical holding times to allow for sample packing and shipping.



If samplers are shipping samples after 5:00 PM ET, they must notify the RSCC (or designee) or SMO by 8:00 AM ET on the following business day. When making a Saturday delivery, samplers shall contact the RSCC (or designee) or SMO by 3:00 PM ET on the Friday prior to delivery.

3.4 Pack and Ship Samples

Once the samples have been collected, it is very important that the sampler properly package the samples for shipment and ensure that the samples are sent to the appropriate laboratory as quickly as possible. Prompt and proper packaging of samples will:

- Protect the integrity of samples from changes in composition or concentration caused by bacterial growth or degradation from increased temperatures;
- Reduce the chance of leaking or breaking of sample containers that would result in loss of sample volume, loss of sample integrity, and exposure of personnel to toxic substances; and
- Help ensure compliance with shipping regulations.

3.4.1 Sample Containers

Once samples are collected, they must be stored in conditions that maintain sample integrity. All samples should be placed in shipping containers or other suitable containers with ice to reduce the temperature as soon as possible after collection. Ideally, all samples should be shipped the day of collection for overnight delivery to the laboratory. If samples cannot be shipped on the day of collection, the sample temperature should be maintained at 4°C ($\pm 2^{\circ}\text{C}$) until they are shipped to the laboratory.

One CLP RAS sample may be contained in several bottles and vials. For example, one soil sample may consist of all containers needed for three of the analytical fractions available under this service (i.e., SVOA fraction, Pesticide fraction, and Aroclor fraction), even though the fractions are collected in separate containers. Therefore, the analysis to be performed and the matrix type will determine the type of container(s) that will be used, as well as the volume that must be collected for that particular sample fraction.

3.4.2 Inventory of Samples and Documentation

Prior to shipment, samplers should conduct an inventory of the contents of the shipping cooler or container against the corresponding TR/COC Record when packing for shipment to laboratories. An inventory will ensure that the proper number of containers have been collected for each analysis of the samples, that the required PE and QC samples and cooler temperature blanks are included, and the correct Sample Numbers and fractions have been assigned to each sample.

3.4.3 Shipping Regulations

Sample shipping personnel are legally responsible for ensuring that the sample shipment will comply with all applicable shipping regulations. For example, hazardous material samples must be packaged, labeled, and shipped in compliance with all IATA Dangerous Goods regulations or DOT regulations and USEPA guidelines. Refer to Appendix B for detailed shipping guidelines when using SW-846 Method 5035A to preserve and ship samples.

3.4.4 Sample Packaging for Shipment

Samplers are responsible for the proper packaging of samples for shipment. To ensure that samples are appropriately packaged (e.g., to avoid breakage and/or contamination) the sampler should consult their respective project plans to determine the proper packing and shipping procedures. The sampler must determine the sample type, pack the shipping containers correctly, include necessary paperwork, label and seal shipping containers or coolers, and ship the samples.

3.4.4.1 Determine the Sample Type and Container

Samplers should know what kinds of samples they are handling to ensure proper packaging. Samplers should refer to their appropriate project plans to determine which type of sample container should be used for each type of sample being taken during the sampling event.

FORM 8
SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06068

Lab File ID (Standard): CCV050S Date Analyzed: 06/12/09

Instrument ID: BNA1 Time Analyzed: 0752

	IS4 (PHN)		IS5 (CRY)		IS6 (PRY)	
	AREA #	RT #	AREA #	RT #	AREA #	RT #
=====	=====	=====	=====	=====	=====	=====
12 HOUR STD	1399635	13.32	1013222	20.94	826807	25.05
UPPER LIMIT	2799270	13.82	2026444	21.44	1653614	25.55
LOWER LIMIT	699818	12.82	506611	20.44	413404	24.55
=====	=====	=====	=====	=====	=====	=====
CLIENT						
SAMPLE NO.						
=====	=====	=====	=====	=====	=====	=====
01 SBLK0609BS2	1440608	13.31	932522	20.91	758236	25.04
02 SBLK0609BS2L	1345843	13.31	947067	20.93	608422	25.05
03 JM04-A14 (2.0	1391372	13.31	842226	20.91	521616	25.04
04 JM04-A15 (2.0	1396409	13.31	890002	20.91	478712	25.03
05 JM04-A22 (2.0	1466127	13.31	657682	20.91	316634*	25.04
06 JM04-A22FD (2	1531239	13.32	880073	20.92	470431	25.04
07 JM04-A23 (2.0	1370926	13.31	670284	20.91	439881	25.04
08 JM04-A14 (2.0	MS1439305	13.31	703719	20.92	367548*	25.04
09 JM04-A14 (2.0	SD1494416	13.31	780922	20.92	380956*	25.04
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS4 (PHN) = Phenanthrene-d10
 IS5 (CRY) = Chrysene-d12
 IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT = +100% of internal standard area
 AREA LOWER LIMIT = - 50% of internal standard area
 RT UPPER LIMIT = + 0.50 minutes of internal standard RT
 RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
 * Values outside of QC limits.

FORM 8
SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Lab File ID (Standard): CCV050S Date Analyzed: 06/12/09

Instrument ID: BNA1 Time Analyzed: 0752

	IS4 (PHN) AREA #	RT #	IS5 (CRY) AREA #	RT #	IS6 (PRY) AREA #	RT #
=====	=====	=====	=====	=====	=====	=====
12 HOUR STD	1399635	13.32	1013222	20.94	826807	25.05
UPPER LIMIT	2799270	13.82	2026444	21.44	1653614	25.55
LOWER LIMIT	699818	12.82	506611	20.44	413404	24.55
=====	=====	=====	=====	=====	=====	=====
CLIENT SAMPLE NO.						
=====	=====	=====	=====	=====	=====	=====
01 SBLK0609BS2	1440608	13.31	932522	20.91	758236	25.04
02 SBLK0609BS2L	1345843	13.31	947067	20.93	608422	25.05
03 JM04-A28 (2.0	1401035	13.32	715137	20.91	396638*	25.04
04 JM04-A29 (2.0	1487799	13.31	948380	20.92	620393	25.04
05 JM04-A35A (2.	1474639	13.32	714695	20.92	464254	25.04
06 JM04-A39 (2.0	1462207	13.31	843877	20.92	466702	25.04
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A14
(2.0)-060309

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06068

Matrix: (soil/water) SOIL Lab Sample ID: 0906068-11

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606811D

% Moisture: 24 decanted: (Y/N) N Date Sampled: 06/03/09 09:40

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 13:48

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO. COMPOUND CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG
MDL RL CONC Q

CAS NO.	COMPOUND	MDL	RL	CONC	UG/KG Q
56-55-3-----	Benzo (a) anthracene	240	2200		UD ⁴⁵
205-99-2-----	Benzo (b) fluoranthene	210	2200		UD ↓
50-32-8-----	Benzo (a) pyrene	150	2200		UD ↓
193-39-5-----	Indeno (1,2,3-cd) pyrene	300	2200		UD ↓

c-1

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A15 (2.0)-060209

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06068

Matrix: (soil/water) SOIL Lab Sample ID: 0906068-12

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606812D

% Moisture: 25 decanted: (Y/N) N Date Sampled: 06/02/09 14:40

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 14:25

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	240	2200		UD
205-99-2-----	Benzo (b) fluoranthene	210	2200		UD
50-32-8-----	Benzo (a) pyrene	150	2200		UD
193-39-5-----	Indeno (1,2,3-cd) pyrene	310	2200		UD

43-ST
↓

0.2

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B5(2
.0)-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06127

Matrix: (soil/water) SOIL Lab Sample ID: 0906127-01

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0612701D

% Moisture: 17 decanted: (Y/N) N Date Sampled: 06/04/09 10:35

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/13/09 02:08

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)			UG/KG Q
		MDL	RL	CONC	
56-55-3-----	Benzo(a)anthracene	220	2000		UD
205-99-2-----	Benzo(b)fluoranthene	190	2000		UD
50-32-8-----	Benzo(a)pyrene	140	2000		UD
193-39-5-----	Indeno(1,2,3-cd)pyrene	280	2000		UD

01 02
W ST
| |

01-RevQual
02-Qual Code
ml

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A22 (2.0)-060309

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06068

Matrix: (soil/water) SOIL Lab Sample ID: 0906068-19

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606819D

% Moisture: 16 decanted: (Y/N) N Date Sampled: 06/03/09 09:40

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 15:02

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:		UG/KG Q
		MDL	(ug/L or ug/Kg) RL CONC	
56-55-3-----	Benzo (a) anthracene	220	2000	UD <i>US-ST</i>
205-99-2-----	Benzo (b) fluoranthene	190	2000	UD
50-32-8-----	Benzo (a) pyrene	140	2000	UD
193-39-5-----	Indeno (1,2,3-cd) pyrene	270	2000	UD ↓

c-h

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B6 (2
.0) -060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06127

Matrix: (soil/water) SOIL Lab Sample ID: 0906127-02

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0612702D

% Moisture: 23 decanted: (Y/N) N Date Sampled: 06/04/09 10:50

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/13/09 02:44

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	240	2200		UD 5
205-99-2-----	Benzo (b) fluoranthene	200	2200		UD 1
50-32-8-----	Benzo (a) pyrene	150	2200		UD 1
193-39-5-----	Indeno (1,2,3-cd) pyrene	300	2200		UD 1

01 - Rev 2 ml
02 - Dual code
ml

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A22F
D(2.0)-060309

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06068

Matrix: (soil/water) SOIL Lab Sample ID: 0906068-20

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606820D

% Moisture: 19 decanted: (Y/N) N Date Sampled: 06/03/09 09:40

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 15:40

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	220	2100	480	JD J-ST
205-99-2-----	Benzo (b) fluoranthene	200	2100	550	JD J-ST
50-32-8-----	Benzo (a) pyrene	140	2100		UD J-ST
193-39-5-----	Indeno (1,2,3-cd) pyrene	290	2100		UD ↓

o-h

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B6FD
(2.0)-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06127

Matrix: (soil/water) SOIL Lab Sample ID: 0906127-03

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0612703D

% Moisture: 21 decanted: (Y/N) N Date Sampled: 06/04/09 10:50

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/13/09 03:21

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL CONC	UG/KG	
56-55-3-----	Benzo(a) anthracene	230	2100		UD ^{01.02}
205-99-2-----	Benzo(b) fluoranthene	200	2100		UD
50-32-8-----	Benzo(a) pyrene	140	2100		UD
193-39-5-----	Indeno(1,2,3-cd) pyrene	290	2100		UD

01-Rev 2 uel
02-2 uel code
ml

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-EB0
6-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06127

Matrix: (soil/water) WATER Lab Sample ID: 0906127-09

Sample wt/vol: 1065 (g/mL) ML Lab File ID: 0612709

% Moisture: _____ decanted: (Y/N) _____ Date Sampled: 06/04/09 15:40

Extraction: (SepF/Cont/Sonc/Soxh) SEPF Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/17/09 09:00

Injection Volume: 0.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/L	Q	01	02
		MDL	RL	or ug/Kg CONC				
56-55-3-----	Benzo (a) anthracene	0.85	4.7		U	U	U	
205-99-2-----	Benzo (b) fluoranthene	0.67	4.7		U	U	U	
50-32-8-----	Benzo (a) pyrene	0.56	4.7		U	U	U	
193-39-5-----	Indeno (1,2,3-cd) pyrene	1.3	4.7		U	U	U	

01-level
02-dual code
m

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A23 (2.0)-060309

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06068

Matrix: (soil/water) SOIL Lab Sample ID: 0906068-21

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606821D

% Moisture: 24 decanted: (Y/N) N Date Sampled: 06/03/09 09:40

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 16:17

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	240	2200		UD
205-99-2-----	Benzo (b) fluoranthene	210	2200		UD
50-32-8-----	Benzo (a) pyrene	150	2200		UD
193-39-5-----	Indeno (1,2,3-cd) pyrene	300	2200		UD

C-2

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-EB0
4-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06068

Matrix: (soil/water) WATER Lab Sample ID: 0906068-28

Sample wt/vol: 1060 (g/mL) ML Lab File ID: 0606828

% Moisture: _____ decanted: (Y/N) _____ Date Sampled: 06/04/09 09:55

Extraction: (SepF/Cont/Sonc/Soxh) SEPF Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/17/09 07:46

Injection Volume: 0.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/L Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene_____	0.86	4.7		U
205-99-2-----	Benzo (b) fluoranthene_____	0.67	4.7		U
50-32-8-----	Benzo (a) pyrene_____	0.57	4.7		U
193-39-5-----	Indeno (1,2,3-cd) pyrene_____	1.3	4.7		U

c.d

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B5 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906127
 Matrix (soil/water): SOIL Lab Sample ID: 0906127-01
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 82.8
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.8	J		P

01 02
J

01 - Rev 2nd
02 - Qual Code
ml

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B6(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906127
 Matrix (soil/water): SOIL Lab Sample ID: 0906127-02
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 77.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.9	J		P

01 02
J

01 - Rev 2uel
02 - 2uel code
ml

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B6FD(2.0)-06040
9

SNP 6/20/09

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906127
 Matrix (soil/water): SOIL Lab Sample ID: 0906127-03
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 79.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

*01 02
J*

*01 - Rev 2 up
02 - Qual code
ml*

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B7(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906127
 Matrix (soil/water): SOIL Lab Sample ID: 0906127-04
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 60.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.2	J		P

01 02
J

*01 - Rev 2 ml
02 - Qual Code
ml*

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B8 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906127
 Matrix (soil/water): SOIL Lab Sample ID: 0906127-05
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 85.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.2	J		P

01 02
J

01 - Rev 2 ml
02 - Dual Code
ml

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B9 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906127
 Matrix (soil/water): SOIL Lab Sample ID: 0906127-06
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 81.9
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.7			P

01 02

*01 - Rev 2nd
02 - Qual Code
ml*

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B10 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906127
 Matrix (soil/water): SOIL Lab Sample ID: 0906127-07
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 81.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.1	J		P

01 02
J

01 - Rev 2 w/d
02 - Qual Core
ml

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B11(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906127
 Matrix (soil/water): SOIL Lab Sample ID: 0906127-08
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 85.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.5	J		P

01 02
J

01 - Arsenic
02 - Qual Code
ml

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A1 (2.0) -060309

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-01
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 79.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.4	J		P

C.K.

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A2 (2.0) -060309

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-02
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 79.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.6	J		P

af

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A6(2.0)-060309

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-03
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 80.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.3	J		P

o-h

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A7 (2.0) -060309

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-04
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 79.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.1	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A8 (2.0) -060309

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068

Matrix (soil/water): SOIL Lab Sample ID: 0906068-05

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 77.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.2	J		P

o.k

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A8FD (2.0) -06030

9

3/2/09

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-06
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 79.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.1	J		P

0-1

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A9(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-07
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 76.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.4	J		P

C.L

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A10(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068

Matrix (soil/water): SOIL Lab Sample ID: 0906068-08

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 79.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.5	U		P

OK

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A11 (2.0) -060309

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-09
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 79.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

ch

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A12A(2.0)-06030

9

*5/20
4/12/09*

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-10
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 72.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.6	J		P

c.l

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A14 (2.0) -060309

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-11
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 75.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.0	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A15 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-12
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 74.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

c-l

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A16(2.0)-060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
Matrix (soil/water): SOIL Lab Sample ID: 0906068-13
Level (low/med): LOW Date Received: 6/6/2009
% Solids: 78.8
Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.6	J		P

C-1

Color Before: _____ Clarity Before: _____ Texture: _____
Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A16FD(2.0)-0602
09

09/06/09

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-14
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 65.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.6	J		P

CL

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A17(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068

Matrix (soil/water): SOIL Lab Sample ID: 0906068-15

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 73.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.0	J		P

OK

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A18 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-16
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 72.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.3	J		P

cl

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A19(2.0)-060309

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068

Matrix (soil/water): SOIL Lab Sample ID: 0906068-17

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 72.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.4	J		P

o.k.

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A20 (2.0) -060309

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068

Matrix (soil/water): SOIL Lab Sample ID: 0906068-18

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 72.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.4	J		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

ch

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A22 (2.0) -060309

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-19
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 84.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

C.A.

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A22FD (2.0) -0603
09

Lab Name: Empirical Laboratories Contract: CH2M Hill *8/11/09*
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-20
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 80.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

CA

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A23 (2.0) -060309

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-21
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 75.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.1	J		P

OK

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A24 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-22
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 73.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.2	J		P

ck

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A25 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-23
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 81.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.4			P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A25FD(2.0)-0602
09

3/18/09

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-24
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 80.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.6			P

cl

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A26(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-25
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 74.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.1	J		P

OK

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-A27(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): SOIL Lab Sample ID: 0906068-26
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 71.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.2	J		P

C.A.

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-EB03-060309

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906068
 Matrix (soil/water): WATER Lab Sample ID: 0906068-27
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	10.0	U		P

CA

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A28 (2.0)-060209

Lab Name: EMPIRICAL LABS Contract: CH2MHILL
 Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069
 Matrix: (soil/water) SOIL Lab Sample ID: 0906069-01
 Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606901D
 % Moisture: 31 decanted: (Y/N) N Date Sampled: 06/02/09 11:20
 Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09
 Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 17:31
 Injection Volume: 0.5 (uL) Dilution Factor: 5.0
 GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	260	2400		UD ⁴⁵⁻¹⁵
205-99-2-----	Benzo (b) fluoranthene	230	2400		UD ↓
50-32-8-----	Benzo (a) pyrene	170	2400		UD ↓
193-39-5-----	Indeno (1,2,3-cd) pyrene	340	2400		UD ↓

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A29(
2.0)-060209

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-02

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606902D

% Moisture: 22 decanted: (Y/N) N Date Sampled: 06/02/09 15:15

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 18:09

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	230	2100		UD <i>CT-ST</i>
205-99-2-----	Benzo (b) fluoranthene	200	2100		UD
50-32-8-----	Benzo (a) pyrene	150	2100		UD
193-39-5-----	Indeno (1,2,3-cd) pyrene	290	2100		UD ↓

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A35A
(2.0)-060209

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-08

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606908D

% Moisture: 18 decanted: (Y/N) N Date Sampled: 06/02/09 12:05

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 18:46

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:		UG/KG Q
		MDL	(ug/L or ug/Kg) RL CONC	
56-55-3-----	Benzo (a) anthracene	220	2000	UD ^{UJST}
205-99-2-----	Benzo (b) fluoranthene	190	2000	UD
50-32-8-----	Benzo (a) pyrene	140	2000	UD
193-39-5-----	Indeno (1,2,3-cd) pyrene	280	2000	UD

C.L

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A39
(2.0)-060209

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-11

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606911D

% Moisture: 45 decanted: (Y/N) N Date Sampled: 06/02/09 12:15

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 19:23

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	330	2400		UD 415-ST
205-99-2-----	Benzo (b) fluoranthene	290	2400		UD ↓
50-32-8-----	Benzo (a) pyrene	210	2400		UD ↓
193-39-5-----	Indeno (1,2,3-cd) pyrene	420	2400		UD ↓

C.D.

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A40(
2.0)-060209

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-12

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606912D

% Moisture: 13 decanted: (Y/N) N Date Sampled: 06/02/09 15:50

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 22:28

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL CONC		
56-55-3-----	Benzo (a) anthracene	210	1900		UD ^{US} ST
205-99-2-----	Benzo (b) fluoranthene	180	1900		UD ↓
50-32-8-----	Benzo (a) pyrene	130	1900		UD ^{US} - CS
193-39-5-----	Indeno (1,2,3-cd) pyrene	260	1900		UD ^{US} ST

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-A41
(2.0)-060209

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-13

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606913D

% Moisture: 9 decanted: (Y/N) N Date Sampled: 06/02/09 16:00

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/11/09 08:35

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or RL	ug/Kg) CONC	
56-55-3-----	Benzo (a) anthracene	200	1800		UD 43-57
205-99-2-----	Benzo (b) fluoranthene	170	1800		UD ↓
50-32-8-----	Benzo (a) pyrene	120	1800		UD ↓
193-39-5-----	Indeno (1,2,3-cd) pyrene	250	1800		UD ↓

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FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B1 (2 .0) -060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-14

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606914D

% Moisture: 24 decanted: (Y/N) N Date Sampled: 06/04/09 11:10

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 23:04

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	240	2200		UD 45-57
205-99-2-----	Benzo (b) fluoranthene	210	2200		UD ↓
50-32-8-----	Benzo (a) pyrene	150	2200		UD 45-57
193-39-5-----	Indeno (1,2,3-cd) pyrene	300	2200		UD 45-57

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FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B2 (2 .0) -060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-15

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606915D

% Moisture: 22 decanted: (Y/N) N Date Sampled: 06/04/09 10:05

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/12/09 23:41

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	230	2100		UD 45-ST
205-99-2-----	Benzo (b) fluoranthene	200	2100		UD ↓
50-32-8-----	Benzo (a) pyrene	150	2100		UD 45-ST
193-39-5-----	Indeno (1,2,3-cd) pyrene	300	2100		UD 45-ST

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B3 (2 .0) -060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-16

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606916D

% Moisture: 26 decanted: (Y/N) N Date Sampled: 06/04/09 11:25

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/13/09 00:18

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO. COMPOUND CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG
MDL RL CONC Q

56-55-3-----	Benzo (a) anthracene	240	2200		UD 45-57
205-99-2-----	Benzo (b) fluoranthene	210	2200		UD ↓
50-32-8-----	Benzo (a) pyrene	150	2200		UD 45-57
193-39-5-----	Indeno (1,2,3-cd) pyrene	310	2200		UD 45-57

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FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B3FD
(2.0)-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-17

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606917D

% Moisture: 27 decanted: (Y/N) N Date Sampled: 06/04/09 11:25

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/13/09 00:55

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	250	2300		UD 4J-S
205-99-2-----	Benzo (b) fluoranthene	220	2300		UD ↓
50-32-8-----	Benzo (a) pyrene	160	2300		UD 4J-C
193-39-5-----	Indeno (1,2,3-cd) pyrene	320	2300		UD 4J-S

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FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B4 (2 .0)-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) SOIL Lab Sample ID: 0906069-18

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0606918D

% Moisture: 16 decanted: (Y/N) N Date Sampled: 06/04/09 13:25

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/13/09 01:31

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)			UG/KG Q
		MDL	RL	CONC	
56-55-3-----	Benzo (a) anthracene	220	2000		UD 45 ST
205-99-2-----	Benzo (b) fluoranthene	190	2000		UD ↓
50-32-8-----	Benzo (a) pyrene	140	2000		UD 45 C
193-39-5-----	Indeno (1,2,3-cd) pyrene	270	2000		UD 45 ST

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FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-EBO 2-060209

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06069

Matrix: (soil/water) WATER Lab Sample ID: 0906069-27

Sample wt/vol: 900.0 (g/mL) ML Lab File ID: 0606927

% Moisture: _____ decanted: (Y/N) _____ Date Sampled: 06/02/09 16:30

Extraction: (SepF/Cont/Sonc/Soxh) SEPF Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/17/09 08:23

Injection Volume: 0.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/L Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	1.0	5.6		U
205-99-2-----	Benzo (b) fluoranthene	0.79	5.6		U
50-32-8-----	Benzo (a) pyrene	0.67	5.6		U
193-39-5-----	Indeno (1,2,3-cd) pyrene	1.6	5.6		U

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

JM04-A28 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-01
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 68.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.9	J		P

JM04-A29 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-02
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 78.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

JM04-A30 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-03
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 58.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	3.0	J		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

JM04-A31 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-04
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 76.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.6	J		P

JM04-A32 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-05
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 75.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

JM04-A33 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-06
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 79.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.4	J		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

JM04-A34 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-07
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 70.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.4	J		P

JM04-A35A (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-08
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 81.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.9	J		P

JM04-A36 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-09
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 84.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.8	J		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

JM04-A37 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-10
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 74.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.5	J		P

JM04-A39 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-11
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 54.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.8	J		P

JM04-A40 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-12
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 87.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

JM04-A41 (2.0) -060209

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-13
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 91.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.95	J		P

JM04-B1 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-14
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 76.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.6	U		P

JM04-B2 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-15
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 77.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

JM04-B3(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-16
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 74.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.8	J		P

JM04-B3FD(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-17
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 72.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.5	J		P

JM04-B4(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069
 Matrix (soil/water): SOIL Lab Sample ID: 0906069-18
 Level (low/med): LOW Date Received: 06/06/09
 % Solids: 84.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.3	J		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

JM04-EB02-060209

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: 0906069

Matrix (soil/water): WATER Lab Sample ID: 0906069-27

Level (low/med): LOW Date Received: 06/06/09

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	10.0	U		P

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Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B24 (2.0)-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06071

Matrix: (soil/water) SOIL Lab Sample ID: 0906071-10

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0607110D

% Moisture: 24 decanted: (Y/N) N Date Sampled: 06/04/09 11:00

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/11/09 10:26

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL CONC	UG/KG	
56-55-3-----	Benzo (a) anthracene	240	2200	UD	UD UD UD UD UD
205-99-2-----	Benzo (b) fluoranthene	210	2200	UD	
50-32-8-----	Benzo (a) pyrene	150	2200	UD	
193-39-5-----	Indeno (1,2,3-cd) pyrene	300	2200	UD	

cd

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B25 (2.0)-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06071

Matrix: (soil/water) SOIL Lab Sample ID: 0906071-11

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0607111D

% Moisture: 13 decanted: (Y/N) N Date Sampled: 06/04/09 10:30

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/11/09 11:03

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL	CONC	

56-55-3-----	Benzo (a) anthracene	210	1900		UD 45-ST
205-99-2-----	Benzo (b) fluoranthene	180	1900		UD ↓
50-32-8-----	Benzo (a) pyrene	130	1900		UD ↓
193-39-5-----	Indeno (1,2,3-cd) pyrene	260	1900		UD ↓

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FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B26 (2.0)-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06071

Matrix: (soil/water) SOIL Lab Sample ID: 0906071-12

Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0607112D

% Moisture: 27 decanted: (Y/N) N Date Sampled: 06/04/09 10:15

Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted: 06/09/09

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/11/09 11:40

Injection Volume: 0.5 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/KG Q
		MDL	(ug/L or ug/Kg) RL CONC	UG/KG	
56-55-3-----	Benzo (a) anthracene	250	2300	UP	43-5 ↓
205-99-2-----	Benzo (b) fluoranthene	220	2300	UP	
50-32-8-----	Benzo (a) pyrene	160	2300	UP	
193-39-5-----	Indeno (1,2,3-cd) pyrene	310	2300	UP	

cd

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-B27(
2.0)-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL
 Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06071
 Matrix: (soil/water) SOIL Lab Sample ID: 0906071-13
 Sample wt/vol: 15.0 (g/mL) G Lab File ID: 0607113D
 % Moisture: 15 decanted: (Y/N) N Date Sampled: 06/04/09 13:05
 Extraction: (SepF/Cont/Sonc/Soxh) SOXH Date Extracted:06/09/09
 Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/11/09 12:17
 Injection Volume: 0.5 (uL) Dilution Factor: 5.0
 GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:		UG/KG Q
		MDL	(ug/L or ug/Kg) RL CONC	
56-55-3-----	Benzo (a) anthracene_____	210	2000	UD <i>WST</i>
205-99-2-----	Benzo (b) fluoranthene_____	180	2000	UD ↓
50-32-8-----	Benzo (a) pyrene_____	130	2000	UD ↓
193-39-5-----	Indeno (1,2,3-cd) pyrene_____	270	2000	UD ↓

C.K

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

JM04-EB0
5-060409

Lab Name: EMPIRICAL LABS Contract: CH2MHILL
 Lab Code: NA Case No.: NA SAS No.: NA SDG No.: CH2.B06071
 Matrix: (soil/water) WATER Lab Sample ID: 0906071-30
 Sample wt/vol: 1060 (g/mL) ML Lab File ID: 0607130
 % Moisture: _____ decanted: (Y/N) _____ Date Sampled: 06/04/09 15:40
 Extraction: (SepF/Cont/Sonc/Soxh) SEPF Date Extracted: 06/09/09
 Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 06/17/09 09:37
 Injection Volume: 0.5 (uL) Dilution Factor: 1.0
 GPC Cleanup: (Y/N) N pH: NA

CAS NO.	COMPOUND	CONCENTRATION UNITS:			UG/L Q
		MDL	(ug/L or ug/Kg) RL	CONC	
56-55-3-----	Benzo (a) anthracene	0.86	4.7		U
205-99-2-----	Benzo (b) fluoranthene	0.67	4.7		U
50-32-8-----	Benzo (a) pyrene	0.57	4.7		U
193-39-5-----	Indeno (1,2,3-cd) pyrene	1.3	4.7		U

CT

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B12 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071

Matrix (soil/water): SOIL Lab Sample ID: 0906071-01

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 78.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.1	J		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

c.l

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B12FD(2.0)-0604 09

5/12/09

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071

Matrix (soil/water): SOIL Lab Sample ID: 0906071-02

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 84.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.5	J		P

ct

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B13 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-03
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 83.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.3	U		P

cf

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B14 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-04
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 88.3
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.8			P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B15 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-05
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 77.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.3	J		P

CH

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B18 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071

Matrix (soil/water): SOIL Lab Sample ID: 0906071-06

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 76.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.5	J		P

ck

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B19(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-07
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 81.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.8	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B22 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-08
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 78.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.5	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B23 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-09
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 81.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	4.3			P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

CF

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1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B24 (2.0) -060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-10
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 76.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.5	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B25(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-11
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 87.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.2	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

C.K.

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B26(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-12
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 73.3
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	4.1			P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-B27(2.0)-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071

Matrix (soil/water): SOIL Lab Sample ID: 0906071-13

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 85.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.9	J		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C1 (2.0) -060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-14
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 79.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.2	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C2 (2.0) -060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-15
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 87.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.81	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

c.l

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C3 (2.0) -060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-16
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 85.7
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.8			P

C-K

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C5 (2.0) -060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-17
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 81.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.9	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C6(2.0)-060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-18
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 85.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.3			P

C.H.

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C7A(2.0)-060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-19
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 90.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	3.2			P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C8A(2.0)-060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-20
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 80.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.0	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C9(2.0)-060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-21
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 79.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	3.0			P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

c.t

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C10(2.0)-060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-22
 Level (low/mod): LOW Date Received: 6/6/2009
 % Solids: 78.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

ct

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C11 (2.0) -060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-23
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 85.4
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C12 (2.0) -060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-24
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 83.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.9			P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C13A(2.0)-06010

9

for U/22/05

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-25
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 67.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.6	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C14 (2.0) -060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-26
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 92.3
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.8	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C15(2.0)-060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): SOIL Lab Sample ID: 0906071-27
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 72.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.5	J		P

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-C15FD(2.0)-0601 09

*sub
6/2/09*

Lab Name: Empirical Laboratories Contract: CH2M Hill

Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071

Matrix (soil/water): SOIL Lab Sample ID: 0906071-28

Level (low/med): LOW Date Received: 6/6/2009

% Solids: 82.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.8	J		P

c.f.

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-EB01-060109

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): WATER Lab Sample ID: 0906071-29
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 0.0
 Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	10.0	U		P

C-T

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

USEPA - CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

JM04-EB05-060409

Lab Name: Empirical Laboratories Contract: CH2M Hill
 Lab Code: _____ Case No.: _____ NRAS No.: _____ SDG NO.: 0906071
 Matrix (soil/water): WATER Lab Sample ID: 0906071-30
 Level (low/med): LOW Date Received: 6/6/2009
 % Solids: 0.0

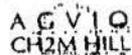
Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	10.0	U		P

0.7

Color Before: _____ Clarity Before: _____ Texture: _____
 Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____



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CHAIN-OF-CUSTODY RECORD

COC NUMBER:

0000006

PROJECT NAME: Naval Activity Puerto Rico	PROJECT NUMBER: 378718.10.02.01.07	LAB NAME AND CONTACT: Empirical Laboratories	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company) Tom Belsel/CH2M HILL	RECIPIENT 1 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
PROJECT PHASE/SITE/TASK: SWMU 7/8 - Soil Delineation Sampling	CTO OR DO NUMBER: N62470-08-D-1006	LAB PO NUMBER: 30024338	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company) Bryan Burkingstock/CH2M HILL	RECIPIENT 2 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
PROJECT CONTACT: Samuel Smith	PROJECT TEL NO AND FAX NO: 404.915.8292/770.604.9183	LAB TEL NO AND FAX NO: 615.345.1115/615.345.5426	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	RECIPIENT 3 (Address, Tel No., and Fax No.):

0906127

ITEM	SAMPLE IDENTIFIER	SAMPLE DESCRIPTION/LOCATION	MATRIX (see codes on SOP)	DATE COLLECTED	TIME COLLECTED	DATA PKG LEVEL (see codes on SOP)	TAT (calendar days)	ANALYSES REQUIRED (Include Method Numbers)										SAMPLE TYPE (see codes on SOP)	COMMENTS/ SCREENING READINGS	LAB ID (for lab's use)
								Amesek - 49108	Select PAH's - EPA/8270D											
1	JM04-B5(2.0)-060409	B5	SO	06/04/09	10:35	C/TV	14	X	X									N	7 Day Prelims	-15-01
2	JM04-B6(2.0)-060409	B6	SO	06/04/09	10:50	C/TV	14	X	X									N	7 Day Prelims	-20-02
3	JM04-B6FD(2.0)-060409	B6	SO	06/04/09	10:50	C/TV	14	X	X									FD	7 Day Prelims	-21-03
4	JM04-B7(2.0)-060409	B7	SO	06/04/09	11:45	C/TV	14	X	X									N	7 Day Prelims	-22-04
5	JM04-B8(2.0)-060409	B8	SO	06/04/09	13:30	C/TV	14	X										N	7 Day Prelims	-23-05
6	JM04-B9(2.0)-060409	B9	SO	06/04/09	14:05	C/TV	14	X										N	7 Day Prelims	-24-06
7	JM04-B10(2.0)-060409	B10	SO	06/04/09	14:15	C/TV	14	X										N	7 Day Prelims	-25-07
8	JM04-B10MS(2.0)-060409	B10	SO	06/04/09	14:15	C/TV	14	X										MSD	7 Day Prelims	↓
9	JM04-B10SD(2.0)-060409	B10	SO	06/04/09	14:15	C/TV	14	X										MSD	7 Day Prelims	
10	JM04-B11(2.0)-060409	B11	SO	06/04/09	14:20	C/TV	14	X										N	7 Day Prelims	-26-08

WS 6/15/09

0906069

SAMPLER(S) AND COMPANY: (please print) Samuel Smith/CH2M HILL Kimberley Coke/CH2M HILL	COURIER AND SHIPPING NUMBER: Fed-Ex/86859172517	SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
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WS 6/15/09

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
Printed Name and Signature: Samuel Smith	June 5th, 2009	15:10	Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature: Will Schwed	6/6/09	11:00

ACVIO
CH2M HILL

1007 Abernathy Blvd, Suite 1600
Atlanta, GA 30329
Tel No: (770) 604-9187
Fax No: (770) 604-9183

CHAIN-OF-CUSTODY RECORD

CX# NUMBER:

0000010

PROJECT NAME:	PROJECT NUMBER:	LAB NAME AND CONTACT:	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company):	RECIPIENT 1 (Address, Tel No., and Fax No.):
Naval Activity Puerto Rico	37K718.10.02.01.07	Empirical Laboratories	Tom Beise/CH2M HILL	1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
PROJECT PHASE/TASK:	CTD OR DO NUMBER:	LAB PO NUMBER:	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company):	RECIPIENT 2 (Address, Tel No., and Fax No.):
SWMU 7/8 - Soil Delineation Sampling	N62470-08-D-1006	30024338	Bryan Barkingstock/CH2M HILL	1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
PROJECT CONTACT:	PROJECT TEL. NO AND FAX NO:	LAB TEL. NO AND FAX NO:	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company):	RECIPIENT 3 (Address, Tel No., and Fax No.):
Samuel Smith	404.915.8292/770.604.9183	615.345.1115/615.345.5426		

0906/27

ANALYSES REQUIRED (Include Method Numbers)

ITEM	SAMPLE IDENTIFIER	SAMPLE DESCRIPTION/LOCATION	MATRIX (see codes on SOP)	DATE COLLECTED	TIME COLLECTED	DATA PKG LEVEL (see codes on SOP)	TAT (calendar days)	ANALYSES	SAMPLE TYPE (see codes on SOP)	COMMENTS/SCREENING READINGS	LAB ID (for lab's use)
1	JM04-EB03-060309	EB03	WQ	06/03/09	16:00	C/TV	14	X	N	Acetate Sleeve/7 Day Prelims	
2	JM04-EB04-060409	EB04	WQ	06/04/09	9:55	C/TV	14	X	N	Acetate Sleeve/7 Day Prelims	
3	JM04-EB05-060409	EB05	WQ	06/04/09	15:40	C/TV	14	X X	N	Hand Auger/7 Day Prelims	
4	JM04-EB06-060409	EB06	WQ	06/04/09	15:40	C/TV	14	X	N	Shoe/7 Day Prelims	28-09
5										126 TOTAL BOTTLES	WS
6											6/5/09

SAMPLER(S) AND COMPANY: (please print)	COURIER AND SHIPPING NUMBER:	SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
Samuel Smith/CH2M HILL, Kimberley Coke/CH2M HILL	Fed-Ex/86859172517	

INITIALED BY	DATE	TIME	RECEIVED BY	DATE	TIME
Printed Name and Signature: Samuel Smith	June 5th, 2009	1510	Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:	6/6/09	11:00



1000 Abernathy Road, Suite 1600
Atlanta, GA 30328
Tel No: (770) 604-9182
Fax No: (770) 604-9183

CHAIN-OF-CUSTODY RECORD

¹ COC NUMBER:
0000001

² PROJECT NAME: Naval Activity Puerto Rico	⁵ PROJECT NUMBER: 378718.10.02.01.07	⁴ LAB NAME AND CONTACT: Empirical Laboratories	¹¹ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company) Tom Beisel/CH2M HILL	¹⁴ RECIPIENT 1 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
³ PROJECT PHASE/SITE/TASK: SWMU 7/8 - Soil Delineation Sampling	⁶ CTO OR DO NUMBER: N62470-08-D-1006	⁹ LAB PO NUMBER: 30024338	¹² FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company) Bryan Burkinstock/CH2M HILL	¹⁵ RECIPIENT 2 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
⁴ PROJECT CONTACT: Samuel Smith	⁷ PROJECT TEL NO AND FAX NO: 404.915.8292/770.604.9183	¹⁰ LAB TEL NO AND FAX NO: 615.345.1115/615.345.5426	¹³ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	¹⁶ RECIPIENT 3 (Address, Tel No., and Fax No.):

¹⁷ ITEM	¹⁸ SAMPLE IDENTIFIER	¹⁹ SAMPLE DESCRIPTION/LOCATION	²⁰ MATRIX (see codes on SOP)	²¹ DATE COLLECTED	²² TIME COLLECTED	²³ DATA PKG LEVEL (see codes on SOP)	²⁴ TAT (calendar days)	²⁵ ANALYSES REQUIRED (Include Method Numbers)											²⁶ SAMPLE TYPE (see codes on SOP)	²⁷ COMMENTS/ SCREENING READINGS	²⁸ LAB ID (for lab's use)							
								Arsenic - 6010B	Select PAH's - 8270C/8270D																			
1	JM04-A1(2.0)-060309	A1	SO	06/03/09	9:10	C/IV	14	X																	N	7 Day Prelims	-01	
2	JM04-A2(2.0)-060309	A2	SO	06/03/09	11:10	C/IV	14	X																		N	7 Day Prelims	-02
3	JM04-A6(2.0)-060309	A6	SO	06/03/09	9:15	C/IV	14	X																		N	7 Day Prelims	-03
4	JM04-A7(2.0)-060309	A7	SO	06/03/09	10:05	C/IV	14	X																		N	7 Day Prelims	-04
5	JM04-A8(2.0)-060309	A8	SO	06/03/09	10:50	C/IV	14	X																		N	7 Day Prelims	-05
6	JM04-A8FD(2.0)-060309	A8	SO	06/03/09	10:50	C/IV	14	X																		FD	7 Day Prelims	-06
7	JM04-A9(2.0)-060409	A9	SO	06/04/09	8:40	C/IV	14	X																		N	7 Day Prelims	-07
8	JM04-A10(2.0)-060409	A10	SO	06/04/09	9:25	C/IV	14	X																		N	7 Day Prelims	-08
9	JM04-A10MS(2.0)-060409	A10	SO	06/04/09	9:25	C/IV	14	X																		MSD	7 Day Prelims	
10	JM04-A10SD(2.0)-060409	A10	SO	06/04/09	9:25	C/IV	14	X																		MSD	7 Day Prelims	↓

²⁹ SAMPLER(S) AND COMPANY: (please print) Samuel Smith/CH2M HILL Kimberley Coke/CH2M HILL	³⁰ COURIER AND SHIPPING NUMBER: Fed-Ex/868591727517	³¹ SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
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³² RELINQUISHED BY	DATE	TIME	³³ RECEIVED BY	DATE	TIME
Printed Name and Signature: Samuel Smith	June 5th, 2009	1510	Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature: Will Schwab	6/6/09	11:00



1000 Abernathy Road, Suite 1600
Atlanta, GA 30328
Tel No: (770) 604-9182
Fax No: (770) 604-9183

CHAIN-OF-CUSTODY RECORD

¹ COC NUMBER:

0000002

² PROJECT NAME: Naval Activity Puerto Rico	³ PROJECT NUMBER: 378718.10.02.01.07	⁸ LAB NAME AND CONTACT: Empirical Laboratories	¹¹ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company) Tom Beisel/CH2M HILL	¹⁴ RECIPIENT 1 (Address, Tel No. , and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
³ PROJECT PHASE/SITE/TASK: SWMU 7/8 - Soil Delineation Sampling	⁶ CTO OR DO NUMBER: N62470-08-D-1006	⁹ LAB PO NUMBER: 30024338	¹² FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company) Bryan Burkingstock/CH2M HILL	¹⁵ RECIPIENT 2 (Address, Tel No. , and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
⁴ PROJECT CONTACT: Samuel Smith	⁷ PROJECT TEL NO AND FAX NO: 404.915.8292/770.604.9183	¹⁰ LAB TEL NO AND FAX NO: 615.345.1115/615.345.5426	¹³ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	¹⁶ RECIPIENT 3 (Address, Tel No. , and Fax No.):

17 ITEM	18 SAMPLE IDENTIFIER	19 SAMPLE DESCRIPTION/LOCATION	20 MATRIX (see codes on SOP)	21 DATE COLLECTED	22 TIME COLLECTED	23 DATA PKG LEVEL (see codes on SOP)	24 TAT (calendar days)	25 ANALYSES REQUIRED (Include Method Numbers)											26 SAMPLE TYPE (see codes on SOP)	27 COMMENTS/ SCREENING READINGS 0906068	28 LAB ID (for lab's use)				
								Arsenic - 6010B	Select PAH's - 8270C/8270D																
1	JM04-A11(2.0)-060309	A11	SO	06/03/09	13:45	C/IV	14	X														N	7 Day Prelims	-09	
2	JM04-A12A(2.0)-060309	A12A	SO	06/03/09	14:00	C/IV	14	X															N	7 Day Prelims	-10
3	JM04-A14(2.0)-060309	A14	SO	06/03/09	9:40	C/IV	14	X	X														N	7 Day Prelims	-11
4	JM04-A14MS(2.0)-060309	A14	SO	06/03/09	9:40	C/IV	14	X	X														MSD	7 Day Prelims	↓
5	JM04-A114SD(2.0)-060309	A14	SO	06/03/09	9:40	C/IV	14	X	X														MSD	7 Day Prelims	↓
6	JM04-A15(2.0)-060209	A15	SO	06/02/09	14:40	C/IV	14	X	X														N	7 Day Prelims	-12
7	JM04-A16(2.0)-060209	A16	SO	06/02/09	14:30	C/IV	14	X															N	7 Day Prelims	-13
8	JM04-A16FD(2.0)-060209	A16	SO	06/02/09	14:30	C/IV	14	X															FD	7 Day Prelims	-14
9	JM04-A17(2.0)-060409	A17	SO	06/04/09	8:45	C/IV	14	X															N	7 Day Prelims	-15
10	JM04-A18(2.0)-060409	A18	SO	06/04/09	8:35	C/IV	14	X															N	7 Day Prelims	-16

²⁹ SAMPLER(S) AND COMPANY: (please print) Samuel Smith/CH2M HILL Kimberley Coke/CH2M HILL	³⁰ COURIER AND SHIPPING NUMBER: Fed-Ex/86859172517	³¹ SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
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³¹ RELINQUISHED BY		DATE	TIME	³¹ RECEIVED BY		DATE	TIME
Printed Name and Signature: Samuel Smith		June 5th, 2009	1510	Printed Name and Signature:			
Printed Name and Signature:				Printed Name and Signature:			
Printed Name and Signature:				Printed Name and Signature: Will Schwab		6/6/09	11:00



1000 Abernathy Road, Suite 1600
Atlanta, GA 30328
Tel No: (770) 604-9182
Fax No: (770) 604-9183

CHAIN-OF-CUSTODY RECORD

¹ COC NUMBER:

0000004

² PROJECT NAME: Naval Activity Puerto Rico	³ PROJECT NUMBER: 378718.10.02.01.07	⁴ LAB NAME AND CONTACT: Empirical Laboratories	¹¹ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company) Tom Beisel/CH2M HILL	¹⁴ RECIPIENT 1 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
⁵ PROJECT PHASE/SITE/TASK: SWMU 7/8 - Soil Delineation Sampling	⁶ CTO OR DO NUMBER: N62470-08-D-1006	⁷ LAB PO NUMBER: 30024338	¹² FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company) Bryan Burkingstock/CH2M HILL	¹⁵ RECIPIENT 2 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
⁸ PROJECT CONTACT: Samuel Smith	⁹ PROJECT TEL NO AND FAX NO: 404.915.8292/770.604.9183	¹⁰ LAB TEL NO AND FAX NO: 615.345.1115/615.345.5426	¹³ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	¹⁶ RECIPIENT 3 (Address, Tel No., and Fax No.):

¹⁷ ITEM	¹⁸ SAMPLE IDENTIFIER	¹⁹ SAMPLE DESCRIPTION/LOCATION	²⁰ MATRIX (see codes on SOP)	²¹ DATE COLLECTED	²² TIME COLLECTED	²³ DATA PKO LEVEL (see codes on SOP)	²⁴ TAT (calendar days)	²⁵ ANALYSES REQUIRED (Include Method Numbers)												²⁶ SAMPLE TYPE (see codes on SOP)	²⁷ COMMENTS/ SCREENING READINGS	²⁸ LAB ID (for lab's use)
								Arsenic - 6010B	Select PAH's - 8270C/8270D													
1	JM04-A28(2.0)-060209	A28	SO	06/02/09	11:20	C/IV	14	X	X										N	7 Day Prelims	-01	
2	JM04-A29(2.0)-060209	A29	SO	06/02/09	15:15	C/IV	14	X	X										N	7 Day Prelims	-02	
3	JM04-A30(2.0)-060209	A30	SO	06/02/09	15:35	C/IV	14	X											N	7 Day Prelims	-03	
4	JM04-A31(2.0)-060209	A31	SO	06/02/09	14:05	C/IV	14	X											N	7 Day Prelims	-04	
5	JM04-A32(2.0)-060209	A32	SO	06/02/09	14:00	C/IV	14	X											N	7 Day Prelims	-05	
6	JM04-A33(2.0)-060209	A33	SO	06/02/09	11:25	C/IV	14	X											N	7 Day Prelims	-06	
7	JM04-A34(2.0)-060209	A34	SO	06/02/09	11:55	C/IV	14	X											N	7 Day Prelims	-07	
8	JM04-A35A(2.0)-060209	A35A	SO	06/02/09	12:05	C/IV	14	X	X										N	7 Day Prelims	-08	
9	JM04-A36(2.0)-060209	A36	SO	06/02/09	13:50	C/IV	14	X											N	7 Day Prelims	-09	
10	JM04-A37(2.0)-060209	A37	SO	06/02/09	11:35	C/IV	14	X											N	7 Day Prelims	-10	

²⁹ SAMPLER(S) AND COMPANY: (please print) Samuel Smith/CH2M HILL Kimberley Coke/CH2M HILL	³⁰ COURIER AND SHIPPING NUMBER: Fed-Ex/868591727517	³¹ SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
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³² RELINQUISHED BY	DATE	TIME	³³ RECEIVED BY	DATE	TIME
Printed Name and Signature: Samuel Smith	June 5th, 2009	1510	Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature: Will Schwab	6/6/09	11:00



1000 Abernathy Road, Suite 1600
Atlanta, GA 30328
Tel No: (770) 604-9182
Fax No: (770) 604-9183

CHAIN-OF-CUSTODY RECORD

¹ COC NUMBER:

0000009

² PROJECT NAME: Naval Activity Puerto Rico	⁵ PROJECT NUMBER: 378718.10.02.01.07	⁸ LAB NAME AND CONTACT: Empirical Laboratories	¹¹ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company) Tom Beise/CH2M HILL	¹⁴ RECIPIENT 1 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
³ PROJECT PHASE/SITE/TASK: SWMU 7/8 - Soil Delineation Sampling	⁶ CTO OR DO NUMBER: N62470-08-D-1006	⁹ LAB PO NUMBER: 30024338	¹² FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company) Bryan Burkingstock/CH2M HILL	¹⁵ RECIPIENT 2 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
⁴ PROJECT CONTACT: Samuel Smith	⁷ PROJECT TEL NO AND FAX NO: 404.915.8292/770.604.9183	¹⁰ LAB TEL NO AND FAX NO: 615.345.1115/615.345.5426	¹³ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	¹⁶ RECIPIENT 3 (Address, Tel No., and Fax No.):

¹⁷ ITEM	¹⁸ SAMPLE IDENTIFIER	¹⁹ SAMPLE DESCRIPTION/LOCATION	²⁰ MATRIX (see codes on SOP)	²¹ DATE COLLECTED	²² TIME COLLECTED	²³ DATA PKG LEVEL (see codes on SOP)	²⁴ TAT (calendar days)	²⁵ ANALYSES REQUIRED (Include Method Numbers)												²⁶ SAMPLE TYPE (see codes on SOP)	²⁷ COMMENTS/ SCREENING READINGS 0906069	²⁸ LAB ID (for lab's use)
								Arsenic - 6010B	Select PAH's - 8270C/8270D													
1	JM04-C9(2.0)-060109	C9	SO	06/01/09	13:20	C/IV	14	X	X									N	7 Day Prelims			
2	JM04-C10(2.0)-060109	C10	SO	06/01/09	11:50	C/IV	14	X	X									N	7 Day Prelims			
3	JM04-C11(2.0)-060109	C11	SO	06/01/09	11:40	C/IV	14	X	X									N	7 Day Prelims			
4	JM04-C12(2.0)-060109	C12	SO	06/01/09	13:55	C/IV	14	X	X									N	7 Day Prelims			
5	JM04-C13A(2.0)-060109	C13A	SO	06/01/09	13:30	C/IV	14	X	X									N	7 Day Prelims			
6	JM04-C14(2.0)-060109	C14	SO	06/01/09	13:35	C/IV	14	X	X									N	7 Day Prelims			
7	JM04-C15(2.0)-060109	C15	SO	06/01/09	14:10	C/IV	14	X	X									N	7 Day Prelims			
8	JM04-C15FD(2.0)-060109	C15	SO	06/01/09	14:10	C/IV	14	X	X									FD	7 Day Prelims			
9	JM04-EB01-060109	EB01	WQ	06/01/09	16:30	C/IV	14	X										N	7 Day Prelims			
10	JM04-EB02-060209	EB02	WQ	06/02/09	16:30	C/IV	14	X	X									N	Hand Auger/7 Day Prelims	-27		

²⁹ SAMPLER(S) AND COMPANY: (please print) Samuel Smith/CH2M HILL Kimberley Coke/CH2M HILL	³⁰ COURIER AND SHIPPING NUMBER: Fed-Ex/868591727517	³¹ SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
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³² RELINQUISHED BY	DATE	TIME	³³ RECEIVED BY	DATE	TIME
Printed Name and Signature: Samuel Smith	June 5th, 2009	15:00	Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:	6/6/09	11:00

CHAIN-OF-CUSTODY RECORD

¹ PROJECT NAME: Naval Activity Puerto Rico	² PROJECT NUMBER: 378718.10.02.01.07	³ LAB NAME AND CONTACT: Empirical Laboratories	¹¹ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company) Tom Beisel/CH2M HILL	¹⁴ RECIPIENT 1 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
¹ PROJECT PHASE/SITE/TASK: SWMU 7/8 - Soil Delineation Sampling	⁶ CTO OR DO NUMBER: N62470-08-D-1006	⁹ LAB PO NUMBER: 30024338	¹² FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company) Bryan Burkingstock/CH2M HILL	¹³ RECIPIENT 2 (Address, Tel No., and Fax No.): 1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
⁴ PROJECT CONTACT: Samuel Smith	⁷ PROJECT TEL NO AND FAX NO: 404.915.8292/770.604.9183	¹⁰ LAB TEL NO AND FAX NO: 615.345.1115/615.345.5426	¹³ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	¹⁶ RECIPIENT 3 (Address, Tel No., and Fax No.):

¹⁷ ITEM	¹⁸ SAMPLE IDENTIFIER	¹⁹ SAMPLE DESCRIPTION/LOCATION	²⁰ MATRIX (see codes on SOP)	²¹ DATE COLLECTED	²² TIME COLLECTED	²³ DATA PKG LEVEL (see codes on SOP)	²⁴ TAT (calendar days)	²⁵ ANALYSES REQUIRED (Include Method Numbers)												²⁶ SAMPLE TYPE (see codes on SOP)	²⁷ COMMENTS/ SCREENING READINGS	²⁸ LAB ID (for lab's use)
								Arsenic - 6010B	Select PAH's - 8270C/8270D													
1	JM04-B12(2.0)-060409	B12	SO	06/04/09	14:40	C/IV	14	X	X											N	7 Day Prelims	-01
2	JM04-B12FD(2.0)-060409	B12	SO	06/04/09	14:40	C/IV	14	X	X											FD	7 Day Prelims	-02
3	JM04-B13(2.0)-060409	B13	SO	06/04/09	13:45	C/IV	14	X												N	7 Day Prelims	-03
4	JM04-B14(2.0)-060409	B14	SO	06/04/09	14:00	C/IV	14	X												N	7 Day Prelims	-04
5	JM04-B15(2.0)-060409	B15	SO	06/04/09	14:45	C/IV	14	X												N	7 Day Prelims	-05
6	JM04-B18(2.0)-060409	B18	SO	06/04/09	15:10	C/IV	14	X												N	7 Day Prelims	-06
7	JM04-B19(2.0)-060409	B19	SO	06/04/09	14:55	C/IV	14	X												N	7 Day Prelims	-07
8	JM04-B22(2.0)-060409	B22	SO	06/04/09	15:15	C/IV	14	X												N	7 Day Prelims	-08
9	JM04-B23(2.0)-060409	B23	SO	06/04/09	15:25	C/IV	14	X												N	7 Day Prelims	-09
10	JM04-B24(2.0)-060409	B24	SO	06/04/09	11:00	C/IV	14	X	X											N	7 Day Prelims	-10

²⁹ SAMPLER(S) AND COMPANY: (please print) Samuel Smith/CH2M HILL Kimberley Coke/CH2M HILL	³⁰ COURIER AND SHIPPING NUMBER: Fed-Ex/868591727517	³¹ SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
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³² RELINQUISHED BY	DATE	TIME	³³ RECEIVED BY	DATE	TIME
Printed Name and Signature: Samuel Smith	June 5th, 2009	15:10	Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:	6/6/09	11:00

CHAIN-OF-CUSTODY RECORD

0000008

² PROJECT NAME:	⁵ PROJECT NUMBER:	⁸ LAB NAME AND CONTACT:	¹¹ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company)	¹⁴ RECIPIENT 1 (Address, Tel No., and Fax No.):
Naval Activity Puerto Rico	378718.10.02.01.07	Empirical Laboratories	Tom Beisel/CH2M HILL	1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
³ PROJECT PHASE/SITE/TASK:	⁶ CTO OR DO NUMBER:	⁹ LAB PO NUMBER:	¹² FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company)	¹⁵ RECIPIENT 2 (Address, Tel No., and Fax No.):
SWMU 7/8 - Soil Delineation Sampling	N62470-08-D-1006	30024338	Bryan Burkingstock/CH2M HILL	1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
⁴ PROJECT CONTACT:	⁷ PROJECT TEL NO AND FAX NO:	¹⁰ LAB TEL NO AND FAX NO:	¹³ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	¹⁶ RECIPIENT 3 (Address, Tel No., and Fax No.):
Samuel Smith	404.915.8292/770.604.9183	615.345.1115/615.345.5426		

¹⁷ ITEM	¹⁸ SAMPLE IDENTIFIER	¹⁹ SAMPLE DESCRIPTION/LOCATION	²⁰ MATRIX (see codes on SOP)	²¹ DATE COLLECTED	²² TIME COLLECTED	²³ DATA PKG LEVEL (see codes on SOP)	²⁴ TAT (calendar days)	²⁵ ANALYSES REQUIRED (Include Method Numbers)												²⁶ SAMPLE TYPE (see codes on SOP)	²⁷ COMMENTS/ SCREENING READINGS	²⁸ LAB ID (for lab's use)
								Arsenic - 6010B	Select PAH's - 8270C/8270D													
1	JM04-B25(2.0)-060409	B25	SO	06/04/09	10:30	C/IV	14	X	X											N	7 Day Prelims	- 11
2	JM04-B26(2.0)-060409	B26	SO	06/04/09	10:15	C/IV	14	X	X											N	7 Day Prelims	- 12
3	JM04-B27(2.0)-060409	B27	SO	06/04/09	13:05	C/IV	14	X	X											N	7 Day Prelims	- 13
4	JM04-C1(2.0)-060109	C1	SO	06/01/09	10:20	C/IV	14	X												N	7 Day Prelims	- 14
5	JM04-C2(2.0)-060109	C2	SO	06/01/09	10:30	C/IV	14	X												N	7 Day Prelims	- 15
6	JM04-C3(2.0)-060109	C3	SO	06/01/09	11:10	C/IV	14	X												N	7 Day Prelims	- 16
7	JM04-C5(2.0)-060109	C5	SO	06/01/09	10:40	C/IV	14	X												N	7 Day Prelims	- 17
8	JM04-C6(2.0)-060109	C6	SO	06/01/09	11:35	C/IV	14	X												N	7 Day Prelims	- 18
9	JM04-C7A(2.0)-060109	C7A	SO	06/01/09	11:05	C/IV	14	X												N	7 Day Prelims	- 19
10	JM04-C8A(2.0)-060109	C8A	SO	06/01/09	11:20	C/IV	14	X												N	7 Day Prelims	- 20

²⁹ SAMPLER(S) AND COMPANY: (please print)	³⁰ COURIER AND SHIPPING NUMBER:	³¹ SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
Samuel Smith/CH2M HILL Kimberley Coke/CH2M HILL	Fed-Ex/868591727517	

³² RELINQUISHED BY	DATE	TIME	³³ RECEIVED BY	DATE	TIME
Printed Name and Signature: Samuel Smith	June 5th, 2009	1510	Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:	6/6/09	11:00

CH2M HILL

Tel No (770) 604-9182
Fax No (770) 604-9183

CHAIN-OF-CUSTODY RECORD

0000009

PROJECT NAME:	PROJECT NUMBER:	LAB NAME AND CONTACT:	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company)	RECIPIENT 1 (Address, Tel No., and Fax No.):
Naval Activity Puerto Rico	378718.10.02.01.07	Empirical Laboratories	Tom Beisel/CH2M HILL	1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
PROJECT PHASE/SITE/TASK:	CTO OR DO NUMBER:	LAB PO NUMBER:	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company)	RECIPIENT 2 (Address, Tel No., and Fax No.):
SWMU 7/8 - Soil Delineation Sampling	N62470-08-D-1006	30024338	Bryan Burkingstock/CH2M HILL	1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
PROJECT CONTACT:	PROJECT TEL NO AND FAX NO:	LAB TEL NO AND FAX NO:	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	RECIPIENT 3 (Address, Tel No., and Fax No.):
Samuel Smith	404.915.8292/770.604.9183	615.345.1115/615.345.5426		

ITEM	SAMPLE IDENTIFIER	SAMPLE DESCRIPTION/LOCATION	MATRIX (see codes on SOP)	DATE COLLECTED	TIME COLLECTED	DATA PKG LEVEL (see codes on SOP)	TAT (calendar days)	ANALYSES REQUIRED (Include Method Numbers)												SAMPLE TYPE (see codes on SOP)	COMMENTS/ SCREENING READINGS	LAB ID (for lab's use)
								Arsenic - 6010B	Select PAH's - 8210C/8270D													
1	JM04-C9(2.0)-060109	C9	SO	06/01/09	13:20	C/IV	14	X	X											N	7 Day Prelims	-21
2	JM04-C10(2.0)-060109	C10	SO	06/01/09	11:50	C/IV	14	X	X											N	7 Day Prelims	-22
3	JM04-C11(2.0)-060109	C11	SO	06/01/09	11:40	C/IV	14	X	X											N	7 Day Prelims	-23
4	JM04-C12(2.0)-060109	C12	SO	06/01/09	13:55	C/IV	14	X	X											N	7 Day Prelims	-24
5	JM04-C13A(2.0)-060109	C13A	SO	06/01/09	13:30	C/IV	14	X	X											N	7 Day Prelims	-25
6	JM04-C14(2.0)-060109	C14	SO	06/01/09	13:35	C/IV	14	X	X											N	7 Day Prelims	-26
7	JM04-C15(2.0)-060109	C15	SO	06/01/09	14:10	C/IV	14	X	X											N	7 Day Prelims	-27
8	JM04-C15FD(2.0)-060109	C15	SO	06/01/09	14:10	C/IV	14	X	X											FD	7 Day Prelims	-28
9	JM04-EB01-060109	EB01	WQ	06/01/09	16:30	C/IV	14	X												N	7 Day Prelims	-29
10	JM04-EB02-060209	EB02	WQ	06/02/09	16:30	C/IV	14	X	X											N	Hand Auger/7 Day Prelims	

SAMPLER(S) AND COMPANY: (please print)

Samuel Smith/CH2M HILL
Kimberly Coke/CH2M HILL

COURIER AND SHIPPING NUMBER:

Fed-Ex/868591727517

SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
Printed Name and Signature: Samuel Smith	June 5th, 2009	15:00	Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:	6/6/09	11:00

CH2M HILL

Tel No (770) 604-9100
Fax No (770) 604-9103

CHAIN-OF-CUSTODY RECORD

COX NUMBER:

0000010

¹ PROJECT NAME:	² PROJECT NUMBER:	³ LAB NAME AND CONTACT:	¹¹ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company)	¹⁴ RECIPIENT 1 (Address, Tel No., and Fax No.):
Naval Activity Puerto Rico	378718.10.02.01.07	Empirical Laboratories	Tom Beisel/CH2M HILL	1000 Abernathy Road, Atlanta GA 30328. 678.530.4033/770.604.9183
¹ PROJECT PHASE/SITE/TASK:	⁷ C/O OR DO NUMBER:	⁹ LAB PO NUMBER:	¹² FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company)	¹⁵ RECIPIENT 2 (Address, Tel No., and Fax No.):
SWMU 7/8 - Soil Delineation Sampling	N62470-08-D-1006	30024338	Bryan Burkingstock/CH2M HILL	1000 Abernathy Road, Atlanta GA 30328. 678.530.4060/770.604.9183
⁴ PROJECT CONTACT:	⁷ PROJECT TEL NO AND FAX NO:	¹⁰ LAB TEL NO AND FAX NO:	¹³ FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	¹⁶ RECIPIENT 3 (Address, Tel No., and Fax No.):
Samuel Smith	404.915.8292/770.604.9183	615.345.1115/615.345.5426		

¹⁷ ITEM	¹⁸ SAMPLE IDENTIFIER	¹⁹ SAMPLE DESCRIPTION/LOCATION	²⁰ MATRIX (see codes on SOP)	²¹ DATE COLLECTED	²² TIME COLLECTED	²³ DATA PKG LEVEL (see codes on SOP)	²⁴ TAT (calendar days)	²⁵ ANALYSES REQUIRED (Include Method Numbers)												²⁶ SAMPLE TYPE (see codes on SOP)	²⁷ COMMENTS/ SCREENING READINGS	²⁸ LAB ID (for lab's use)
								Arsenic - 60108	Select PAH's - 8270C/8270D													
1	JM04-EB03-060309	EB03	WQ	06/03/09	16:00	C/IV	14	X										N	Acetate Sleeve/7 Day Prelims			
2	JM04-EB04-060409	EB04	WQ	06/04/09	9:55	C/IV	14		X									N	Acetate Sleeve/7 Day Prelims			
3	JM04-EB05-060409	EB05	WQ	06/04/09	15:40	C/IV	14	X	X									N	Hand Auger/7 Day Prelims	-30		
4	JM04-EB06-060409	EB06	WQ	06/04/09	15:40	C/IV	14		X									N	Shoe/7 Day Prelims			
5																			126 TOTAL BOTTLES			
6																						
7																						
8																						
9																						
10																						

²⁹ SAMPLER(S) AND COMPANY: (please print)	³⁰ COURIER AND SHIPPING NUMBER:	³¹ SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
Samuel Smith/CH2M HILL Kimberley Coke/CH2M HILL	Fed-Ex/868591727517	

³² RELINQUISHED BY	DATE	TIME	³³ RECEIVED BY	DATE	TIME
Printed Name and Signature: Samuel Smith	June 5th, 2009	7:50	Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:	6/6/09	11:00

APPENDIX B

Arsenic UCL Output Sheets

	A	B	C	D	E	F	G	H	I	J	K	L	
1	Appendix B:		Arsenic UCL Output Sheets										
2	User Selected Options		General UCL Statistics for Data Sets with Non-Detects										
3	From File		C:\Documents and Settings\sharper\Desktop\Arsenic.wst										
4	Full Precision		ON										
5	Confidence Coefficient		95%										
6	Number of Bootstrap Operations		2000										
7													
8													
9	Arsenic-A												
10													
11	General Statistics												
12	Number of Valid Data				35		Number of Detected Data				34		
13	Number of Distinct Detected Data				17		Number of Non-Detect Data				1		
14									Percent Non-Detects				2.86%
15													
16	Raw Statistics						Log-transformed Statistics						
17	Minimum Detected				0.95		Minimum Detected				-0.051293		
18	Maximum Detected				3		Maximum Detected				1.0986123		
19	Mean of Detected				1.7573529		Mean of Detected				0.5296426		
20	SD of Detected				0.4632122		SD of Detected				0.2680362		
21	Minimum Non-Detect				2.5		Minimum Non-Detect				0.9162907		
22	Maximum Non-Detect				2.5		Maximum Non-Detect				0.9162907		
23													
24													
25	UCL Statistics												
26	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only						
27	Shapiro Wilk Test Statistic				0.9665549		Shapiro Wilk Test Statistic				0.9753791		
28	5% Shapiro Wilk Critical Value				0.933		5% Shapiro Wilk Critical Value				0.933		
29	Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level						
30													
31	Assuming Normal Distribution						Assuming Lognormal Distribution						
32	DL/2 Substitution Method						DL/2 Substitution Method						
33	Mean				1.7428571		Mean				0.5208854		
34	SD				0.4643374		SD				0.2690993		
35	95% DL/2 (t) UCL				1.8755733		95% H-Stat (DL/2) UCL				1.9444124		
36													
37	Maximum Likelihood Estimate(MLE) Method				N/A		Log ROS Method						
38	MLE method failed to converge properly						Mean in Log Scale				0.5292874		
39							SD in Log Scale				0.2640734		
40							Mean in Original Scale				1.7550669		
41							SD in Original Scale				0.4565497		
42							95% Percentile Bootstrap UCL				1.8707812		
43							95% BCA Bootstrap UCL				1.8822098		
44													

A	B	C	D	E	F	G	H	I	J	K	L
45	Gamma Distribution Test with Detected Values Only					Data Distribution Test with Detected Values Only					
46	k star (bias corrected)			13.512923		Data appear Normal at 5% Significance Level					
47	Theta Star			0.1300498							
48	nu star			918.87875							
49											
50	A-D Test Statistic			0.2956142		Nonparametric Statistics					
51	5% A-D Critical Value			0.7470066		Kaplan-Meier (KM) Method					
52	K-S Test Statistic			0.7470066		Mean					
53	5% K-S Critical Value			0.150777		SD					
54	Data appear Gamma Distributed at 5% Significance Level					SE of Mean					
55						95% KM (t) UCL					
56	Assuming Gamma Distribution					95% KM (z) UCL					
57	Gamma ROS Statistics using Extrapolated Data					95% KM (jackknife) UCL					
58	Minimum			0.95		95% KM (bootstrap t) UCL					
59	Maximum			3		95% KM (BCA) UCL					
60	Mean			1.7600554		95% KM (Percentile Bootstrap) UCL					
61	Median			1.7		95% KM (Chebyshev) UCL					
62	SD			0.4566294		97.5% KM (Chebyshev) UCL					
63	k star			13.927178		99% KM (Chebyshev) UCL					
64	Theta star			0.1263756							
65	Nu star			974.90243		Potential UCLs to Use					
66	AppChi2			903.42597		95% KM (t) UCL					
67	95% Gamma Approximate UCL			1.8993059		95% KM (Percentile Bootstrap) UCL					
68	95% Adjusted Gamma UCL			1.9061626							
69	Note: DL/2 is not a recommended method.										
70											
71											
72	Arsenic-B										
73											
74	General Statistics										
75	Number of Valid Data			23		Number of Detected Data			21		
76	Number of Distinct Detected Data			12		Number of Non-Detect Data			2		
77						Percent Non-Detects			8.70%		
78											
79	Raw Statistics					Log-transformed Statistics					
80	Minimum Detected			1.2		Minimum Detected			0.1823216		
81	Maximum Detected			4.3		Maximum Detected			1.458615		
82	Mean of Detected			2.0095238		Mean of Detected			0.6311302		
83	SD of Detected			0.8478825		SD of Detected			0.3554323		
84	Minimum Non-Detect			2.3		Minimum Non-Detect			0.8329091		
85	Maximum Non-Detect			2.6		Maximum Non-Detect			0.9555114		
86											
87	Note: Data have multiple DLs - Use of KM Method is recommended					Number treated as Non-Detect			19		
88	For all methods (except KM, DL/2, and ROS Methods),					Number treated as Detected			4		
89	Observations < Largest ND are treated as NDs					Single DL Non-Detect Percentage			82.61%		
90											

A	B	C	D	E	F	G	H	I	J	K	L	
91	UCL Statistics											
92	Normal Distribution Test with Detected Values Only					Lognormal Distribution Test with Detected Values Only						
93	Shapiro Wilk Test Statistic				0.7852318	Shapiro Wilk Test Statistic				0.9045634		
94	5% Shapiro Wilk Critical Value				0.908	5% Shapiro Wilk Critical Value				0.908		
95	Data not Normal at 5% Significance Level					Data not Lognormal at 5% Significance Level						
96												
97	Assuming Normal Distribution					Assuming Lognormal Distribution						
98	DL/2 Substitution Method					DL/2 Substitution Method						
99	Mean				1.9413043	Mean				0.593733		
100	SD				0.839731	SD				0.3613049		
101	95% DL/2 (t) UCL				2.2419695	95% H-Stat (DL/2) UCL				2.3833708		
102												
103	Maximum Likelihood Estimate(MLE) Method					Log ROS Method						
104	Mean				1.0793006	Mean in Log Scale				0.6229625		
105	SD				1.6211453	SD in Log Scale				0.3399701		
106	95% MLE (t) UCL				1.6597506	Mean in Original Scale				1.9835838		
107	95% MLE (Tiku) UCL				2.6435926	SD in Original Scale				0.8129799		
108						95% Percentile Bootstrap UCL				2.2782609		
109						95% BCA Bootstrap UCL				2.339618		
110												
111	Gamma Distribution Test with Detected Values Only					Data Distribution Test with Detected Values Only						
112	k star (bias corrected)				6.5901768	Data Follow Appr. Gamma Distribution at 5% Significance Level						
113	Theta Star				0.3049271							
114	nu star				276.78743							
115												
116	A-D Test Statistic					0.9225272	Nonparametric Statistics					
117	5% A-D Critical Value				0.7438888	Kaplan-Meier (KM) Method						
118	K-S Test Statistic				0.7438888	Mean				1.9795396		
119	5% K-S Critical Value				0.1896771	SD				0.8018462		
120	Data follow Appr. Gamma Distribution at 5% Significance Level					SE of Mean				0.1725692		
121						95% KM (t) UCL				2.2758658		
122	Assuming Gamma Distribution					95% KM (z) UCL				2.2633906		
123	Gamma ROS Statistics using Extrapolated Data					95% KM (jackknife) UCL				2.2754899		
124	Minimum				1.2	95% KM (bootstrap t) UCL				2.4680374		
125	Maximum				4.3	95% KM (BCA) UCL				2.2451087		
126	Mean				2.0121412	95% KM (Percentile Bootstrap) UCL				2.276087		
127	Median				1.8	95% KM (Chebyshev) UCL				2.7317511		
128	SD				0.8084708	97.5% KM (Chebyshev) UCL				3.0572336		
129	k star				7.3019096	99% KM (Chebyshev) UCL				3.696581		
130	Theta star				0.2755637							
131	Nu star				335.88784	Potential UCLs to Use						
132	AppChi2				294.42241	95% KM (BCA) UCL				2.2451087		
133	95% Gamma Approximate UCL				2.2955242							
134	95% Adjusted Gamma UCL				2.3176349							
135	Note: DL/2 is not a recommended method.											
136												
137												

	A	B	C	D	E	F	G	H	I	J	K	L		
138	Arsenic_C													
139														
140	General Statistics													
141	Number of Valid Observations					14	Number of Distinct Observations					13		
142														
143	Raw Statistics						Log-transformed Statistics							
144						Minimum	0.81						Minimum of Log Data	-0.210721
145						Maximum	3.2						Maximum of Log Data	1.1631508
146						Mean	2.1721429						Mean of log Data	0.7240769
147						Median	2.1						SD of log Data	0.3546313
148						SD	0.6599088							
149						Coefficient of Variation	0.3038054							
150						Skewness	-0.211792							
151														
152	Relevant UCL Statistics													
153	Normal Distribution Test						Lognormal Distribution Test							
154						Shapiro Wilk Test Statistic	0.9619333						Shapiro Wilk Test Statistic	0.8928635
155						Shapiro Wilk Critical Value	0.874						Shapiro Wilk Critical Value	0.874
156	Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level							
157														
158	Assuming Normal Distribution						Assuming Lognormal Distribution							
159						95% Student's-t UCL	2.4844789						95% H-UCL	2.6588991
160	95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL						3.10302	
161						95% Adjusted-CLT UCL	2.4515754						97.5% Chebyshev (MVUE) UCL	3.499656
162						95% Modified-t UCL	2.4828151						99% Chebyshev (MVUE) UCL	4.2787705
163														
164	Gamma Distribution Test						Data Distribution							
165						k star (bias corrected)	7.7842842	Data appear Normal at 5% Significance Level						
166						Theta Star	0.2790421							
167						MLE of Mean	2.1721429							
168						MLE of Standard Deviation	0.7785366							
169						nu star	217.95996							
170						Approximate Chi Square Value (.05)	184.79159	Nonparametric Statistics						
171						Adjusted Level of Significance	0.03122						95% CLT UCL	2.4622425
172						Adjusted Chi Square Value	180.74115						95% Jackknife UCL	2.4844789
173													95% Standard Bootstrap UCL	2.4514077
174						Anderson-Darling Test Statistic	0.3402533						95% Bootstrap-t UCL	2.4743485
175						Anderson-Darling 5% Critical Value	0.7346361						95% Hall's Bootstrap UCL	2.4571019
176						Kolmogorov-Smirnov Test Statistic	0.13932						95% Percentile Bootstrap UCL	2.4364286
177						Kolmogorov-Smirnov 5% Critical Value	0.2286799						95% BCA Bootstrap UCL	2.4214286
178	Data appear Gamma Distributed at 5% Significance Level												95% Chebyshev(Mean, Sd) UCL	2.9409134
179													97.5% Chebyshev(Mean, Sd) UCL	3.273561
180	Assuming Gamma Distribution												99% Chebyshev(Mean, Sd) UCL	3.9269828
181						95% Approximate Gamma UCL	2.5620222							
182						95% Adjusted Gamma UCL	2.6194376							
183														
184	Potential UCL to Use												Use 95% Student's-t UCL	2.4844789
185														
186														

	A	B	C	D	E	F	G	H	I	J	K	L
187	Arsenic-All											
188												
189	General Statistics											
190	Number of Valid Data					72	Number of Detected Data					69
191	Number of Distinct Detected Data					25	Number of Non-Detect Data					3
192							Percent Non-Detects					4.17%
193												
194	Raw Statistics						Log-transformed Statistics					
195	Minimum Detected					0.81	Minimum Detected					-0.210721
196	Maximum Detected					4.3	Maximum Detected					1.458615
197	Mean of Detected					1.9182609	Mean of Detected					0.5999805
198	SD of Detected					0.6539202	SD of Detected					0.3193879
199	Minimum Non-Detect					2.3	Minimum Non-Detect					0.8329091
200	Maximum Non-Detect					2.6	Maximum Non-Detect					0.9555114
201												
202	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect					63
203	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected					9
204	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage					87.50%
205												
206	UCL Statistics											
207	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
208	Lilliefors Test Statistic					0.1488203	Lilliefors Test Statistic					0.0855273
209	5% Lilliefors Critical Value					0.1066619	5% Lilliefors Critical Value					0.1066619
210	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
211												
212	Assuming Normal Distribution						Assuming Lognormal Distribution					
213	DL/2 Substitution Method						DL/2 Substitution Method					
214	Mean					1.8897222	Mean					0.5836657
215	SD					0.654755	SD					0.3225168
216	95% DL/2 (t) UCL					2.0183231	95% H-Stat (DL/2) UCL					2.0592886
217												
218	Maximum Likelihood Estimate(MLE) Method						Log ROS Method					
219	Mean					1.1781961	Mean in Log Scale					0.5969564
220	SD					1.232781	SD in Log Scale					0.3129317
221	95% MLE (t) UCL					1.4203274	Mean in Original Scale					1.9089505
222	95% MLE (Tiku) UCL					2.0338233	SD in Original Scale					0.6415657
223							95% Percentile Bootstrap UCL					2.0293433
224							95% BCA Bootstrap UCL					2.0486965
225												

	A	B	C	D	E	F	G	H	I	J	K	L	
226	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only						
227	k star (bias corrected)					9.464015	Data Follow Appr. Gamma Distribution at 5% Significance Level						
228	Theta Star					0.20269							
229	nu star					1306.0341							
230													
231	A-D Test Statistic					0.6062517	Nonparametric Statistics						
232	5% A-D Critical Value					0.7508082	Kaplan-Meier (KM) Method						
233	K-S Test Statistic					0.7508082	Mean						1.9088178
234	5% K-S Critical Value					0.1072004	SD						0.6416249
235	Data follow Appr. Gamma Distribution at 5% Significance Level						SE of Mean						0.076722
236							95% KM (t) UCL						2.0366827
237	Assuming Gamma Distribution						95% KM (z) UCL						2.0350143
238	Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL						2.0366758
239	Minimum					0.81	95% KM (bootstrap t) UCL						2.0541721
240	Maximum					4.3	95% KM (BCA) UCL						2.0354488
241	Mean					1.9197148	95% KM (Percentile Bootstrap) UCL						2.0382724
242	Median					1.8	95% KM (Chebyshev) UCL						2.2432414
243	SD					0.6400366	97.5% KM (Chebyshev) UCL						2.3879467
244	k star					9.8839779	99% KM (Chebyshev) UCL						2.6721924
245	Theta star					0.1942249							
246	Nu star					1423.2928	Potential UCLs to Use						
247	AppChi2					1336.6859	95% KM (BCA) UCL						2.0354488
248	95% Gamma Approximate UCL					2.0440975							
249	95% Adjusted Gamma UCL					2.0466985							
250	Note: DL/2 is not a recommended method.												
251													

Appendix B2: Statistical Comparisons of Site to Background

Wilcoxon Rank Sum Test		
Area	Probability	Conclusion
All	0.194	nsd
A	0.433	nsd
B	0.165	nsd
C	0.0105	Site > Bkgd

* could not be run due to elevated nondetect values

nsd = no significant difference

Area	Mean of Site Detects	Mean of Bkgd Detects	Median of Site Detects	Median of Bkgd Detects	Maximum of Bkgd Detects
All	1.92	1.43	1.8	1.5	2.5
A	1.76		1.7		
B	2.01		1.8		
C	2.17		2.1		

Area	Number of Site Detects	Number of Bkgd Detects	Number of Site Results	Number of Bkgd Results
All	69	15	72	21
A	34		35	
B	21		23	
C	14		14	

**STATEMENT OF BASIS /
PROPOSED FINAL SOIL REMEDY DECISION**

**REGION 2
ID# PR2170027203**

**NAVAL ACTIVITY PUERTO RICO (former Naval Station Roosevelt Roads)
Ceiba, Puerto Rico
(March 2011)**

Facility/Unit Type: SWMUs 7 & 8, Tow Way Fuel Farm (fuel storage and possible sludge disposal pits)

Contaminants:

Surface Soil: arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene

Subsurface Soil: benzo(a)pyrene

Proposed Final Remedy:

No further action is recommended for arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene in site soils.

FACILITY DESCRIPTION

The Tow Way Fuel Farm and Tow Way Fuel Farm Sludge Disposal Pits at Naval Activity Puerto Rico (NAPR) have been identified as solid waste management units (SWMUs) 7 and 8, respectively, under the 1994 Resource Conservation and Recovery Act (RCRA) permit issued to the former Naval Station Roosevelt Roads by the U. S. Environmental Protection Agency (EPA). The Tow Way Fuel Farm (TWFF) is located on a hillside along Forrestal Road north of Ensenada Honda (Figure 1). The fuel farm was constructed prior to 1957, and originally consisted of nine bomb-proof underground storage tanks (USTs). The tanks were used for the storage of marine diesel fuel, jet fuel (JP-5), and Bunker C fuel. Closure for Tanks 56A and 56B was completed in November 1996. Seven USTs remain: 82, 83, 84, 85, 1080, 1082, and 1088. However, on March 31, 2004, base operations, including the storage and distribution of fuel, were discontinued and all USTs were drained and are currently empty. During the facility's operational history, numerous releases of various quantities have occurred from the various storage tanks, resulting in the release of petroleum hydrocarbons to the environment.

CORRECTIVE MEASURES STUDY

In November 2005, Baker Environmental Inc. (Baker) prepared a Corrective Measures Study (CMS) for NAPR. The report was an all encompassing document that established Corrective Action Objectives (CAOs) and remedial approaches to address cleanup of soil and groundwater at multiple SWMUs across the NAPR, including cleanup activities at SWMUs 7 and 8. The EPA approved the CMS in February 2006.

The regulatory-approved remedial action to address soil contamination at SWMUs 7 and 8 includes the excavation of the upper 2-feet of soil in three areas of concern where the PAH compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene, along with arsenic, exceeded their respective CAOs (Figure 2).

The CAOs for the contaminants of concern are presented below in Table 1. Baker developed the CAOs using an industrial classification risk-exposure scenario involving construction worker contact with surface and subsurface soil.

FIELD INVESTIGATION

In preparation of performing the soil excavations, a soil sampling approach was designed to improve the delineation of the areas for excavation. The objectives of the post CMS investigation were primarily to conduct confirmatory sampling in order to do the following:

- Determine the horizontal extent of excavation for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and arsenic.
- Determine handling and disposal requirements by collecting soil samples for waste characterization.

On January 22 and 23, 2009, AGVIO-CH2M HILL personnel marked locations of sampling grids (grid spacing of 50-feet) covering the three areas of concern identified in the CMS. However, due to the presence of obstructions (tanks and piping) and variations in topography (steep hillsides), several sampling locations had to be either moved or omitted. The sample locations are depicted on Figure 2.

Soil sampling activities were conducted between June 1 and 4, 2009. In areas accessible by vehicle, a truck-mounted direct push technology (DPT) rig was used to collect continuous soil samples from the upper 2-feet of soil (0 to 2 feet below ground surface [bgs]). A hand auger was used to collect soil samples from the upper 2 feet of soil in areas that could not be accessed by the DPT rig. The homogenized soil was transferred to 4-ounce glass jars provided by the laboratory for chemical analysis. All samples were analyzed for arsenic using EPA Method 6010B, and select samples were analyzed for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene using EPA Method 8270C.

Table 1				
Chemical	Maximum Observed Concentration	Surface Soil CAO*	Subsurface Soil CAO*	Total Soil CAO**
Arsenic	4.3	2.65	NA	NA
Benzo(a)anthracene	6J	2.9	NA	73
Benzo(a)pyrene	23J	2.9	7.3	7.3
Benzo(b)fluoranthene	5.9J	2.9	NA	73
Indeno(1,2,3-cd)pyrene	5.3J	2.9	NA	73
CAO Corrective Action Objective * Based on industrial worker protection ** Based on construction worker protection J Estimated NA Not Applicable All values reported in milligrams per kilogram (mg/kg)				
<p><u>DISCUSSION OF RESULTS</u></p> <p>PAH</p> <p>Eighteen samples were collected and analyzed for PAH compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene. PAHs were not detected in the upper 2 feet of soil in the areas of concern indicated by the CMS.</p> <p>ARSENIC</p> <p>Seventy-two samples were collected and analyzed for arsenic. Arsenic was detected in 69 of the 72 samples at concentrations ranging from 0.81J (C2) to 4.3 mg/kg (B23). Of the 69 samples collected, arsenic was detected above the CAO of 2.65 mg/kg in the following nine borings: A30, B9, B14, B23, B26, C3, C7, C9, and C12 (Figure 2). However, results of a statistical evaluation indicate the current comparable statistical value (UCL95%) for arsenic is 2.5 mg/kg. Therefore, site arsenic levels are within background levels and are below the CAO of 2.65 mg/kg.</p> <p>Based upon the horizontal extent sampling results described above, the following objectives were added to the evaluation of the data:</p> <ul style="list-style-type: none"> • Determine if arsenic contamination found in SWMU 7/8 is naturally occurring based on historical background levels. • Determine extent of soil contamination areas above CAOs by comparing site-wide statistical upper bound mean concentration values against the CAOs. • Comprehensively address the potential presence and specific concentration levels of the identified chemicals of concern (COCs) 		<p><u>PROPOSED FINAL REMEDY</u></p> <p>Based on the analytical results for the surface soil samples, there is no soil contamination at the site that requires corrective actions. PAH concentrations are below detection limits and do not present human or ecological exposure concern. Therefore, no further action at SWMUs 7 and 8 is recommended for PAHs in site soils.</p> <p>Based on the extensive sampling conducted across the site, detected arsenic is randomly distributed across the site. The distribution patterns indicate absence of specific elevated areas, and statistical evaluation of the data indicate site arsenic upper-bound estimates are between 1.9 mg/kg and 2.5 mg/kg, which are below the CAO target level of 2.65 mg/kg. No single detection is indicative of extremely elevated values. Therefore, the detected arsenic levels at SWMUs 7 and 8 are considered naturally occurring within the surface soil and no further action is recommended for arsenic in site soils.</p> <p>In summary, no land use restrictions are necessary for site soils, as residual concentrations are similar to background levels for arsenic and PAHs are below detection levels.</p> <p><u>PUBLIC PARTICIPATION</u></p> <p>Public review and comment on the proposed remedy for SWMUs 7 and 8 will be implemented as part of the public comment period for the proposed Administrative Order on Consent between the Navy and EPA. A public notice of that public comment period will be published in both Spanish and English in select Puerto Rico newspapers.</p>		

NEXT STEPS

Following completion of public review and comment on the proposed remedy, the EPA will advise of any required modifications based on the public comments, or its acceptability.

KEY DOCUMENTS

Revised Final Corrective Measures Study Report Final Report Tow Way Fuel Farm, dated November 22, 2005.

Corrective Measures Study Addendum SWMUs 7 and 8 – Revised Soil Remedy, dated March 2011.

FURTHER INFORMATION

The key documents may be reviewed at:

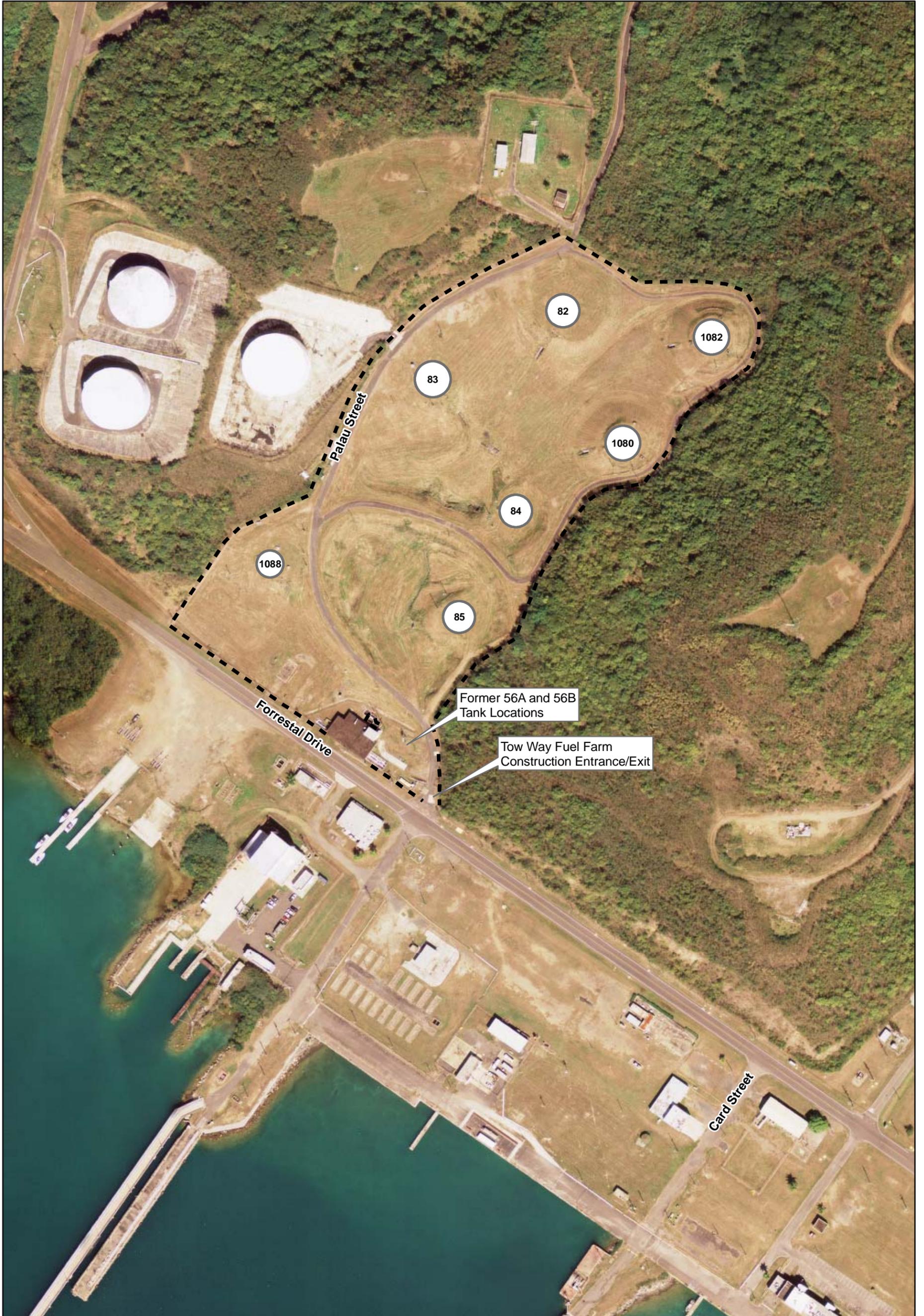
U.S. Environmental Protection Agency,
Region 2 RCRA File Room
290 Broadway, 15th floor
New York, NY 1007-1866
Attn: Mr. David Abrines, phone 212-637-3043; or

U. S. Environmental Protection Agency
Caribbean Environmental Protection Division
Centro Europa Building, Suite 417
1492 Ponce de Leon Ave
Santurce, PR 00907-4127
Attn: Mr. Luis Negron, phone 787-
977-5855; and

Puerto Rico Environmental Quality Board
Oficina del Presidente – Piso 5
Ave. Ponce de Leon #1308
Carr Estatal 8838
Sector El Cinco
Rio Piedras, PR 00926
Attn: Ms. Wilmarie Rivera, phone 787- 767-8181
Ext. 6141

Or at the following internet web page address:

<http://nsrr-ir.org/>



- Fence
- Former Fuel Tank

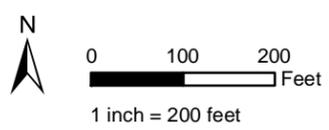
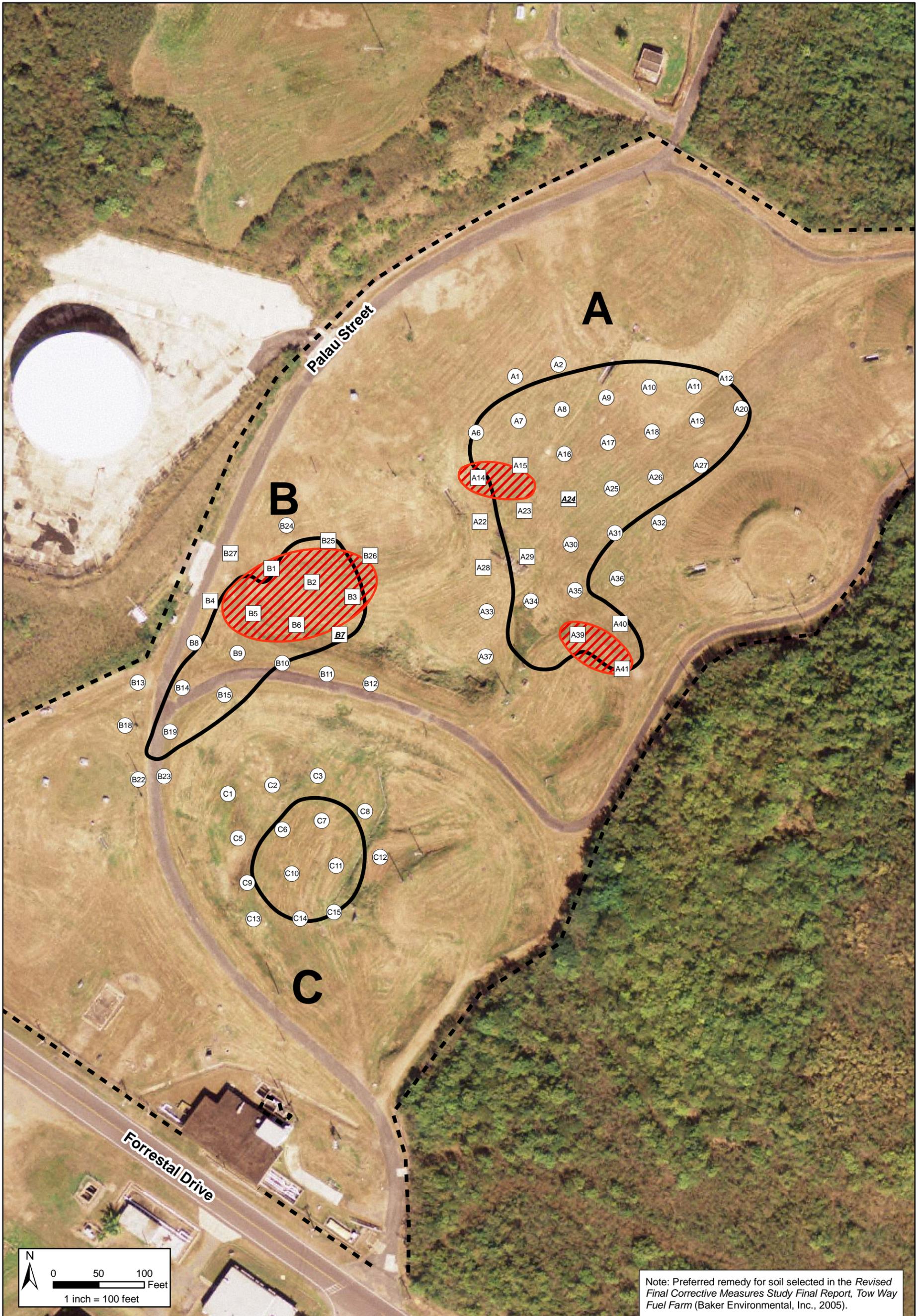


FIGURE 1
 SWMU 7/8 Base Map
 Tow Way Fuel Farm
 Naval Station Roosevelt Roads, Puerto Rico



Soil Delineation Sampling Point

- Arsenic
- Arsenic and Polynuclear Aromatic Hydrocarbons (PAHs)

- Fence
- ▭ Assumed Arsenic Impacted Soil Area (See Note)
- ▨ PAH Excavation Area (See Note)

PAHs = Benzo(a)anthracene
 Benzo(a)Pyrene
 Benzo(a)fluoranthene
 Benzo(1,2,3-cd)Pyrene

▣ = Asphalt present in soil sample. Sample only tested for arsenic.

Note: Preferred remedy for soil selected in the Revised Final Corrective Measures Study Final Report, Tow Way Fuel Farm (Baker Environmental, Inc., 2005).

FIGURE 2
 Soil Delineation Sample Locations
 Tow Way Fuel Farm
 Naval Station Roosevelt Roads, Puerto Rico