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# RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT ADDENDUM SOLID WASTE MANAGEMENT UNIT 181 (SWMU 181) ZONE E CNC CHARLESTON SC

8/30/2002

CH2M HILL

# RFI REPORT ADDENDUM

# SWMU 181 Zone E

***Charleston Naval Complex***
***North Charleston, South Carolina***

SUBMITTED TO
***U.S. Navy Southern Division***
***Naval Facilities Engineering Command***

CH2M Jones

*August 2002*

*Contract N62467-99-C-0960*

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August 30, 2002

Mr. David Scaturo
South Carolina Department of Health and
Environmental Control
Bureau of Land and Waste Management
2600 Bull Street
Columbia, SC 29201

Re: RFI Report Addendum (Revision 1) – SWMU 181, Zone E

Dear Mr. Scaturo:

Enclosed please find four copies of the RFI Report Addendum (Revision 0) for SWMU 181 in Zone E of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

The following pages are included for replacement in the Revision 0 binder:

- Revision 1 Cover/Spine, Flysheet, and Certification Page
- Revised pages iv through viii; 1-3; 4-1 through 4-4; 5-1 and 5-2; and 6-1
- New Appendix A-1, *Results of VOC Analyses on QA/QC Samples for SDG CNC95*
- New Appendix C, CH2M-Jones Responses to SCDHEC Comments on the Revision 0 document

The principal author of this document is Kris Garcia. Please do not hesitate to contact her at 770/604-9182, extension 476, should you have any questions or comments.

Sincerely,

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Dean Williamson

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July 12, 2002

Mr. David Scaturo
South Carolina Department of Health and
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Re: RFI Report Addendum (Revision 0) – SWMU 181, Zone E

Dear Mr. Scaturo:

Enclosed please find four copies of the RFI Report Addendum (Revision 0) for SWMU 181 in Zone E of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

The principal author of this document is Kris Garcia. Please do not hesitate to contact her at 770/604-9182, extension 476, should you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

cc: Rob Harrell/Navy, w/att
Gary Foster/CH2M HILL, w/att

RFI REPORT ADDENDUM

# SWMU 181, Zone E

***Charleston Naval Complex***
***North Charleston, South Carolina***

SUBMITTED TO
***U.S. Navy Southern Division***
***Naval Facilities Engineering Command***

PREPARED BY
***CH2M-Jones***

*August 2002*

*Revision 1*
*Contract N62467-99-C-0960*
*158814.ZE.PR.01*

# Certification Page for RFI Report Addendum (Revision 1) – SWMU 181, Zone E

I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

P.E. No. 21428

Dean Williamson, P.E.

8/29/2002

Date

# Contents

**Section** **Page**

**Acronyms and Abbreviations** ..... **vii**
**1.0 Introduction** ..... **1-1**
1.1 Background ..... 1-1
1.1.1 Site History ..... 1-1
1.1.2 Summary of Interim Measures and UST/AST Removals at SWMU 181 ..... 1-2
1.2 Purpose of the RFI Report Addendum ..... 1-2
1.3 Report Organization ..... 1-3
Figure 1-1 Location of SWMU 181 within the CNC ..... 1-4
Figure 1-2 Aerial Photo of SWMU 181 ..... 1-5
**2.0 Site Setting** ..... **2-1**
2.1 Geologic Setting ..... 2-1
2.2 Hydrogeologic Setting ..... 2-1
Figure 2-1 Shallow Groundwater Contours ..... 2-3
**3.0 Field Investigation and Data Validation** ..... **3-1**
3.1 Investigation Objectives ..... 3-1
3.2 Sampling Procedures, Protocols and Analyses ..... 3-1
3.2.1 Sample Identification ..... 3-1
3.2.2 Concrete/Asphalt Coring ..... 3-2
3.2.3 Soil Sampling ..... 3-2
3.2.4 Decontamination Procedures ..... 3-2
3.3 Soil Analytes ..... 3-2
3.4 Sample Analysis Protocols ..... 3-3
3.5 Data Verification and Validation ..... 3-3
3.6 Data Management ..... 3-3
Table 3-1 Sampling Location Coordinates ..... 3-4
Figure 3-1 Surface Soil and Subsurface Soil Sampling Locations ..... 3-5
**4.0 COPC Screening** ..... **4-1**
4.1 Organic Constituents Detected in the Surface and Subsurface Soil Samples ..... 4-1
4.1.1 VOCs in Surface and Subsurface Soils ..... 4-1
4.1.2 SVOCs in Surface and Subsurface Soils ..... 4-3

# Contents, Continued

4.1.3 Pesticides and PCBs in Surface and Subsurface Soils ..... 4-3
4.2 Inorganic Constituents Detected in the Surface and Subsurface Soil Samples ..... 4-3
4.2.1 Iron in Surface Soil ..... 4-3
4.3 Data Evaluation Summary ..... 4-4
Table 4-1 Volatile Organic Compounds Detected in Surface Soil ..... 4-5
Table 4-2 Volatile Organic Compounds Detected in Subsurface Soil ..... 4-6
Table 4-3 Semivolatile Organic Compounds Detected in Surface Soil ..... 4-7
Table 4-4 Semivolatile Organic Compounds Detected in Subsurface Soil ..... 4-9
Table 4-5 BEQs in Surface and Subsurface Soil Samples ..... 4-12
Table 4-6 Pesticides and PCBs Detected in Surface Soil ..... 4-13
Table 4-7 Pesticides and PCBs Detected in Subsurface Soil ..... 4-14
Table 4-8 Inorganice Constituents Detected in Surface Soil ..... 4-15
Table 4-9 Inorganice Constituents Detected in Subsurface Soil ..... 4-18
**5.0 COPC/COC Refinement ..... 5-1**
5.1 Trichloroethylene in Surface Soil ..... 5-1
5.2 Iron in Surface Soil ..... 5-1
5.3 Summary ..... 5-2
**6.0 Summary of Information Related to Site Closeout Issues ..... 6-1**
6.1 RFI Status ..... 6-1
6.2 Presence of Inorganics in Groundwater ..... 6-1
6.3 Potential Linkage to SWMU 37, Investigated Sanitary Sewers at the CNC ..... 6-1
6.4 Potential Linkage to AOC 699, Investigated Storm Sewers at the CNC ..... 6-2
6.5 Potential Linkage to AOC 504, Investigated Railroad Lines at the CNC ..... 6-2
6.6 Potential Migration Pathways to Surface Water Bodies at the CNC ..... 6-2
6.7 Potential Contamination in Oil/Water Separators ..... 6-2
6.8 Land Use Control Management Plan ..... 6-3
**7.0 Conclusions and Recommendations ..... 7-1**
**8.0 References ..... 8-1**

# Contents, Continued

**Appendices**

**A** Analytical Data Summaries (Additional Appendix A-1, *Results of VOC Analyses on QA/QC Samples for SDG CNC95*)

**B** Data Validation Report

**C** CH2M-Jones Responses to SCDHEC Comments on the *SWMU 181 RFI Report Addendum, Revision 0* (dated July 2002)

# Acronyms and Abbreviations

| | |
|---|---|
| AOC | Area of concern |
| AST | aboveground storage tank |
| BCT | BRAC Cleanup Team |
| BEQ | benzo(a)pyrene equivalent |
| BRAC | Base Realignment and Closure Act |
| CA | corrective action |
| CMS | corrective measures study |
| CNC | Charleston Naval Complex |
| COC | chemical of concern |
| COPC | chemical of potential concern |
| CSI | confirmatory sampling investigation |
| DAF | dilution attenuation factor |
| DMP | Data Management Plan |
| EnSafe | EnSafe Inc. |
| EPA | U.S. Environmental Protection Agency |
| ft bls | feet below land surface |
| GIS | geographic information system |
| IM | interim measure |
| HI | hazard index |
| LUC | land use control |
| MCL | maximum contaminant level |
| MEK | methyl ethyl ketone |
| µg/kg | microgram per kilogram |
| mg/kg | milligram per kilogram |
| NAVBASE | Naval Base |
| NFA | no further action |

# Acronyms and Abbreviations, Continued

| | |
|---|---|
| OWS | oil/water separator |
| PAH | polycyclic aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| QAP | Quality Assurance Plan |
| RBC | risk-based concentration |
| RCRA | Resource Conservation and Recovery Act |
| RFI | RCRA Facility Investigation |
| SAA | satellite accumulation area |
| SB | soil boring |
| SCDHEC | South Carolina Department of Health and Environmental Control |
| SSL | soil screening level |
| SVOC | semivolatile organic compound |
| SWMU | solid waste management unit |
| TCE | trichloroethene |
| UST | underground storage tank |
| VOC | volatile organic compound |

# 1.0 Introduction

In 1993, Naval Base (NAVBASE) Charleston was added to the list of bases scheduled for closure as part of the Defense Base Realignment and Closure Act (BRAC), which regulates closure and transition of property to the community. The Charleston Naval Complex (CNC) was formed as a result of the dis-establishment of the Charleston Naval Shipyard and NAVBASE on April 1, 1996.

Corrective Action (CA) activities are being conducted under the Resource Conservation and Recovery Act (RCRA) with the South Carolina Department of Health and Environmental Control (SCDHEC) as the lead agency for CA activities at the CNC. All RCRA CA activities are performed in accordance with the Final Permit (Permit No. SC0 170 022 560).

In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to complete the RCRA Facility Investigation (RFI) for Solid Waste Management Unit (SWMU) 181 in Zone E of the CNC. The site is recommended for No Further Action (NFA). The area of the CNC in which SMWU 181 is located is zoned for industrial use (M-2). Figure 1-1 illustrates the location of SMWU 181 within Zone E. Figure 1-2 is an aerial photograph of SMWU 181 taken in 1997.

## 1.1 Background

### 1.1.1 Site History

SWMU 181 consists of a former satellite accumulation area (SAA) adjacent to Pier C (see Figure 1-1). The SAA consisted of a 8 x 8 x 8-foot metal storage structure that sat on a concrete quay wall. The unit was permitted on June 29, 1994, and the structure was removed prior to 1996. The unit was managed as part of the Charleston Navel Ship Yard hazardous waste management system. The waste stored in the metal structure consisted of paint cans and rags. The hazardous materials were transferred to Building 1640 (SWMU 2 in Zone A), a permitted facility in which hazardous wastes generated base-wide were stored prior to shipment off site for treatment and/or disposal. SWMU 181 was not investigated at the time of the initial Zone E RFI field work performed during 1996 and 1997.

The materials of concern at this unit are identified in the *Final Zone E RCRA Facility Assessment* (EnSafe Inc. [EnSafe]/Allen & Hoshall, 1995) and include paint cans and rags.

To fulfill the confirmatory sampling investigation (CSI) objectives for SMWU 181, soil was sampled in accordance with the *RFI Addendum Sampling Plan: Uninvestigated Sites – Zone E, Revision 1* (CH2M-Jones, 2001) to evaluate whether any contamination resulted from onsite activities. The CSI sampling event for SMWU 181 was conducted in April 2002. The site area is zoned for industrial use (M-2).

### 1.1.2 Summary of Interim Measures and UST/AST Removals at SWMU 181

#### UST/AST Removals

There are no known or suspected underground storage tanks (USTs) or aboveground storage tanks (ASTs) associated with this site.

#### Interim Measures

No interim measures (IMs) have been conducted at the site.

## 1.2 Purpose of the RFI Report Addendum

This RFI Report Addendum provides information about SMWU 181, including the results of the sampling performed for the CSI. The results of the CSI are presented to complete the nature and extent investigation to identify chemicals of potential concern (COPCs). Based on review of these results, SMWU 181 is recommended for NFA.

Prior to changing the status of any site in the CNC RCRA CA permit, the BRAC Cleanup Team (BCT) agreed that the following issues should be considered:

- Status of the RFI
- Presence of metals (inorganics) in groundwater
- Potential linkage to SWMU 37, Investigated Sanitary Sewers at the CNC
- Potential linkage to Area of Concern (AOC) 699, Investigated Storm Sewers at the CNC
- Potential linkage of AOC 504, Investigated Railroad Lines at the CNC
- Potential linkage to surface water bodies (Zone J)
- Potential contamination associated with oil/water separators (OWSs)
- Relevance or need for land use controls (LUCs) at the site

Information regarding these issues is provided in this RFI Report Addendum to expedite evaluation of closure of the site.

Provided that the information presented in this report is adequate to address these site closeout items, it is expected that the BCT will concur that NFA is appropriate for SWMU 181. At that time, a Statement of Basis will be prepared and made available for public comment in accordance with SCDHEC policy. This will allow for public participation in the final remedy selection.

## 1.3 Report Organization

This RFI Report Addendum consists of the following sections, including this introductory section:

**1.0 Introduction** – Presents the purpose and background information relating to this RFI Report Addendum.

**2.0 Site Setting** – Summarizes the geologic and hydrogeologic setting of SMWU 181.

**3.0 Field Investigation and Data Validation** – Summarizes the conclusions from the CSI field investigation and data validation for SMWU 181.

**4.0 COPC Screening** – Describes the results from the comparison of analytical results to COPC screening criteria.

**5.0 COPC/COC Refinement** – Includes the evaluation of COPCs to determine whether they are defined as chemicals of concern (COCs) for SMWU 181.

**6.0 Summary of Information Related to Site Closeout Issues** – Discusses the various issues that the BCT agreed to evaluate prior to site closeout.

**7.0 Conclusions and Recommendations** – Summarizes the conclusions and recommendations of the CSI field investigation at SMWU 181.

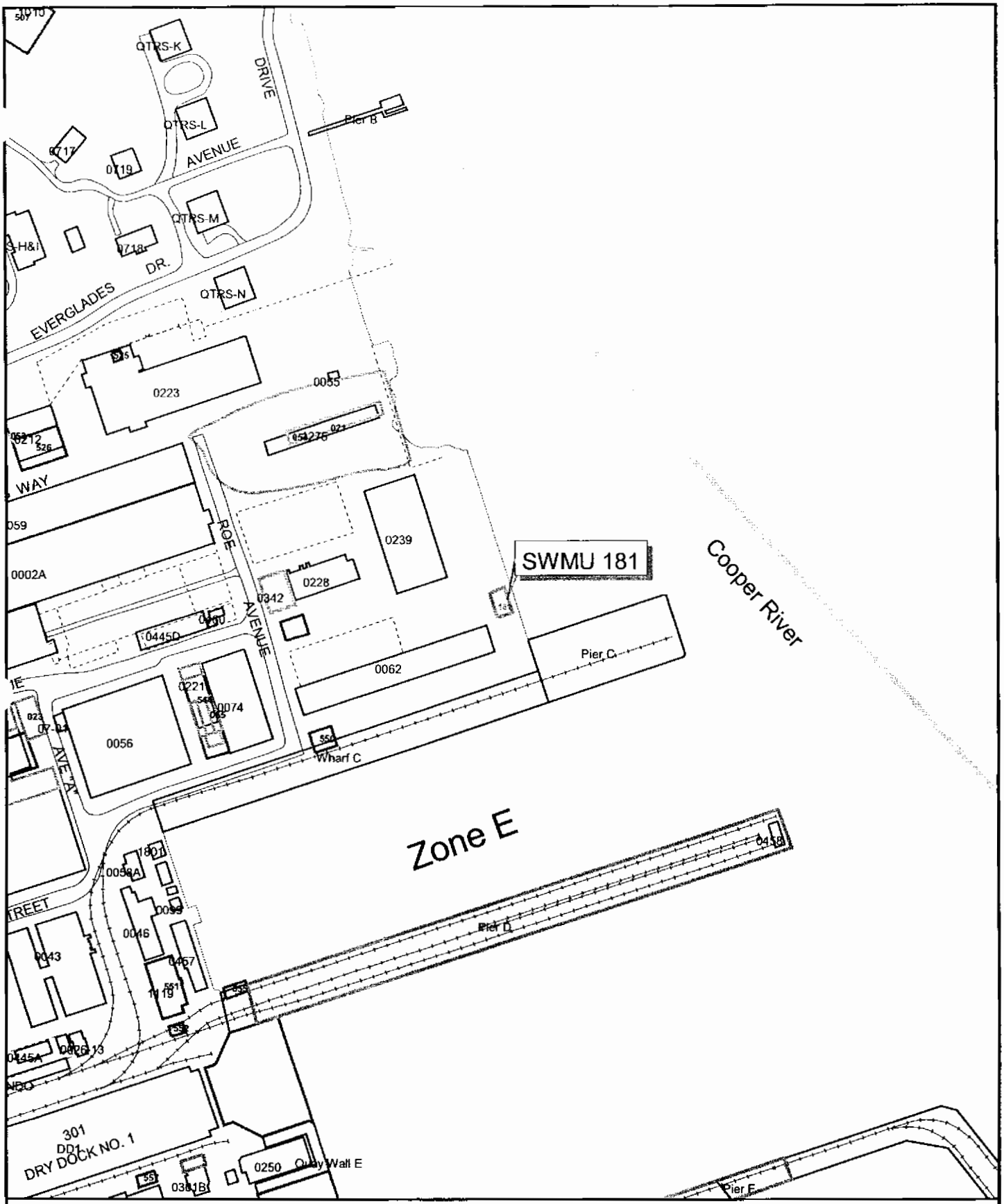
**8.0 References** – Lists the references used in this document.

**Appendix A** contains the analytical results for the samples collected at SWMU 181.
**Appendix A-1** contains the field and laboratory QA/QC analytical results for Sample Delivery Group CNC95.

**Appendix B** contains the data validation report for the samples collected at SWMU 181.

**Appendix C** contains CH2M-Jones' responses to comments provided by SCDHEC on the *SWMU 181 RFI Report Addendum, Revision 0* (dated July 2002).

All tables and figures appear at the end of their respective sections.




Fence
Railroads
Roads
AOC Boundary
SWMU Boundary
Buildings
Zone Boundary

N

0 300 600 Feet

1 inch = 250 feet

**Figure 1-1**
Site Location Map
SWMU 181, Zone E
Charleston Naval Complex

**CH2M**HILL

File Path: C:\18gis\Projects\Zone_E\SWMU181\swmu181.apr, Date: 10 Jul 2002 9:03, User: NMOUDRY, Figure 1-1

Roads
Shoreline
Buildings
Zone Boundary
SWMU

N

0 50 100 Feet

1 inch = 50 feet

**Figure 1-2**
Aerial Photo
SWMU 181, Zone E
Charleston Naval Complex

**CH2MHILL**

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# 2.0 Site Setting

The regional physiographic and geologic setting for the CNC area is described in the *Final Zone A RFI Report, Revision 0* (EnSafe/Allen & Hoshall, 1996). The regional hydrology and hydrogeology for the CNC area is also described in the Zone A RFI Report.

## 2.1 Geologic Setting

Detailed descriptions of the Quaternary- and Tertiary-age sediments encountered during the Zone E RFI, along with a detailed discussion of the various lithologic units encountered in Zone E, are presented in Section 2.2.1 of the *Zone E RFI Report, Revision 0* (EnSafe, 1997).

Due to extensive surface soil disturbance at the CNC during its operational history, approximately the upper 5 feet (ft) of the subsurface are typically a mixture of artificial fill and native sediments. However, the extent of fill placement varies within Zone E. Areas where extensive excavations have been performed or where native soils may have been unsuitable for foundation support may have undergone more extensive fill placement. Detailed descriptions of the soil types encountered in Zone E are presented in Section 2.2.3.3 of the RFI report.

At SWMU 181, the area is covered with concrete and is situated adjacent to a concrete quay wall. During the field investigation, the concrete was found to be approximately 6-inches thick. Immediately underlying the concrete was course gravel overlying dark clay/sand.

A review of the historical maps from 1909 to the present indicates that the whole area has been subjected to a complex series of construction, demolition, and expansion activities over the years. It appears that this area may have been repeatedly graded and leveled before construction of the current quay wall and concrete surfaces.

## 2.2 Hydrogeologic Setting

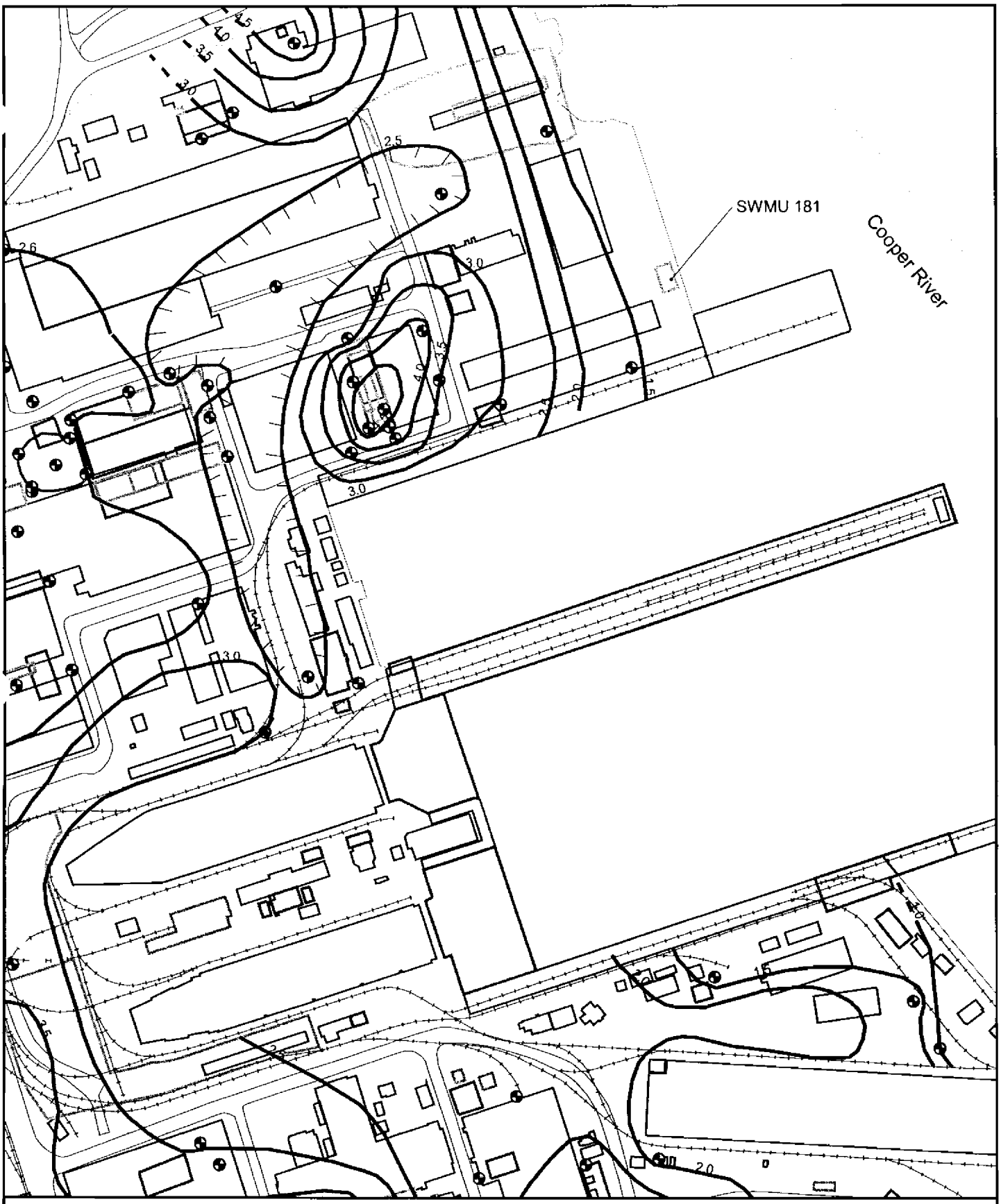
Based on information presented in Section 2.3 of the RFI report and a recent re-evaluation of the groundwater flow patterns in the area, it appears that the groundwater flow environment in Zone E is complex and is influenced by several factors:

- The eastern boundary of Zone E is the Cooper River, a regional groundwater discharge zone.
- The Cooper River is tidally influenced.

- A quay wall of sheet pilings and concrete lies along the waterfront; hydraulic integrity of the quay wall is largely unknown.
- The shallow subsurface has been heavily disturbed by anthropogenic activities related to industrial work within Zone E in the form of utilities, non-native fill material, support pilings, railroad lines, crane rails, etc.
- Geologic heterogeneity predominates the subsurface.

Detailed descriptions of the surficial aquifer, groundwater flow patterns, horizontal and vertical hydraulic gradients, horizontal hydraulic conductivities, grain-size distribution, and tidal influences are presented in Section 2.3 of the RFI report. The types of information, documentation and descriptions of various methodologies used in developing this information are also presented in Section 2.3 of the RFI report.

A recent shallow groundwater contour map has been developed for Zone E (see Figure 2-1), using contemporaneous water level elevation data collected in April 2002. Based on the data, groundwater in the vicinity of SMWU 181 appears to be flowing toward the Cooper River; however, there may be some localized effects due to the presence of the concrete quay walls which control the eastern and southern borders of the area. Depth to groundwater in the vicinity of SWMU 181 is estimated to be approximately 6 ½ to 7 feet below land surface (ft bls).




Known Shallow Groundwater Contour (5/14/02)
Inferred Shallow Groundwater Contour (5/14/02)
Fence
Railroads
Roads
Groundwater Well
AOC Boundary
SWMU Boundary
Buildings
Zone Boundary

N

0 200 400 Feet

1 inch = 250 feet

**Figure 2-1**
Shallow Groundwater Contours
SWMU 181, Zone E
Charleston Naval Complex

**CH2MHILL**

File Path: C:\18gis\Projects\Zone_E\ZoneE_GW\zonee_gw_figs.apr, Date: 10 Jul 2002 9:24, User: NMOUDRY, Figure 2-1 SWMU 181

# 3.0 Field Investigation and Data Validation

## 3.1 Investigation Objectives

The sampling strategy for SWMU 181, as described in the *RFI Addendum Sampling Plan: Uninvestigated Sites – Zone E, Revision 1* (CH2M-Jones, December 2001), was designed to collect sufficient environmental media data to accomplish the following:

- Characterize site conditions
- Define the nature and extent of contamination, if any
- Assess human health and ecological risk
- Assess the need for additional investigation or corrective measures

## 3.2 Sampling Procedures, Protocols, and Analyses

The sampling activities were performed in accordance with the Environmental Services Division *Standard Operating Procedures and Quality Assurance Manual* (ESDSOPQAM) (U.S. Environmental Protection Agency [EPA], 1996a); the *Final Comprehensive RFI Work Plan* (EnSafe/Allen & Hoshall, 1994); the *RFI Addendum Sampling Plan – Uninvestigated Sites, Zone E, Revision 1* (CH2M-Jones, December 2001); and the *Charleston Naval Complex Project Team Notebook and Instructions, Revision 1A* (CH2M-Jones, December 2001).

### 3.2.1 Sample Identification

Media sampled during the CSI field investigation was limited to surface and subsurface soils. All samples collected during the CSI were labeled in accordance with the 10 character protocol established in the *Final Comprehensive RFI Work Plan* (EnSafe/Allen & Hoshall, 1994) and provides a unique sample identification using the following format:

AAAbbCCCdd

- AAA = SWMU/AOC number
- bb = Environmental medium
- CCC = Location
- dd = Sample interval

### 3.2.2 Concrete/Asphalt Coring

Due to the placement of SWMU 181 at the quayside along a roadway at the edge of the Cooper River and its elevation relative to the river, it was anticipated that the concrete

could be several feet thick. However, during the CSI field investigation, it was found that the concrete's thickness was approximately 6 inches and the soil beneath the concrete was accessible for sampling.

### 3.2.3 Soil Sampling

To evaluate the nature and extent of contaminants at SWMU 181, three soil borings (SBs), identified as E181SB001, E181SB002, and E181SB003, were advanced by CH2M-Jones at the three locations shown on Figure 3-1. Stainless-steel hand augers were used to collect surface and subsurface soil samples from the 0-to-1-ft interval below the concrete/soil interface for the surface soil interval and the 3-to-5-ft interval below the concrete/soil interface for the subsurface soil interval. All samples were placed in appropriate containers, labeled, and stored on ice before being shipped to the laboratory for analysis. Proper custody procedures were maintained throughout the sampling and shipping process.

The completed sample auger holes were backfilled with excess cuttings and grouted. A bituminous cold patch was placed flush with the surface.

Each location was surveyed for positioning in the CNC geographic information system (GIS). Coordinate information is presented in Table 3-1.

### 3.2.4 Decontamination Procedures

All decontamination activities were conducted in accordance with the procedures outlined in the *Final Comprehensive RFI Work Plan* (EnSafe/Allen & Hoshall, 1994) and the *RFI Addendum Sampling Plan – Uninvestigated Sites, Zone E, Revision 1* (CH2M-Jones, December 2001).

## 3.3 Soil Analytes

All soil samples collected as part of the SMWU 181 CSI were analyzed for the following:

- Volatile organic compounds (VOCs) (EPA Method 8260B)
- Semivolatile organic compounds (SVOCs) (EPA Method 8270C)
- Metals (EPA Method SW 846, as appropriate)
- Polychlorinated biphenyls (PCBs) (EPA Method 8082)
- Pesticides (EPA Method 8081A)
- Cyanide (EPA Method 9010B)

The samples were sent via overnight carrier to an offsite laboratory, where they were analyzed on an expedited (7-day) turnaround time. All analytical results are presented in Appendix A.

## 3.4 Sample Analysis Protocols

Sample analyses were conducted consistent with the guidance in the EPA's *Test Methods for Evaluating Solid Waste, SW-846, Revision 4*, Office of Solid Waste and Emergency Response (SW846) (EPA, 1996b) and in the EPA Environmental Services Division *Laboratory Operations and Quality Control Manual* (ESDLOQCM) (EPA, 1997).

The analyses also followed the procedures provided in the approved *Final Comprehensive RFI Work Plan* (EnSafe/Allen & Hoshall, 1994).

## 3.5 Data Verification and Validation

Data verification and validation practices were conducted consistent with Quality Assurance Plan (QAP) and the Data Management Plan (DMP) in the approved *Final Comprehensive RFI Work Plan* (EnSafe/Allen & Hoshall, 1994) portion of the *Final Comprehensive RFI Work Plan* to verify that all information and data were valid and properly documented.

In addition, verification and validation procedures were also conducted consistent with the following guidelines:

- *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1994a)
- *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 1994b)

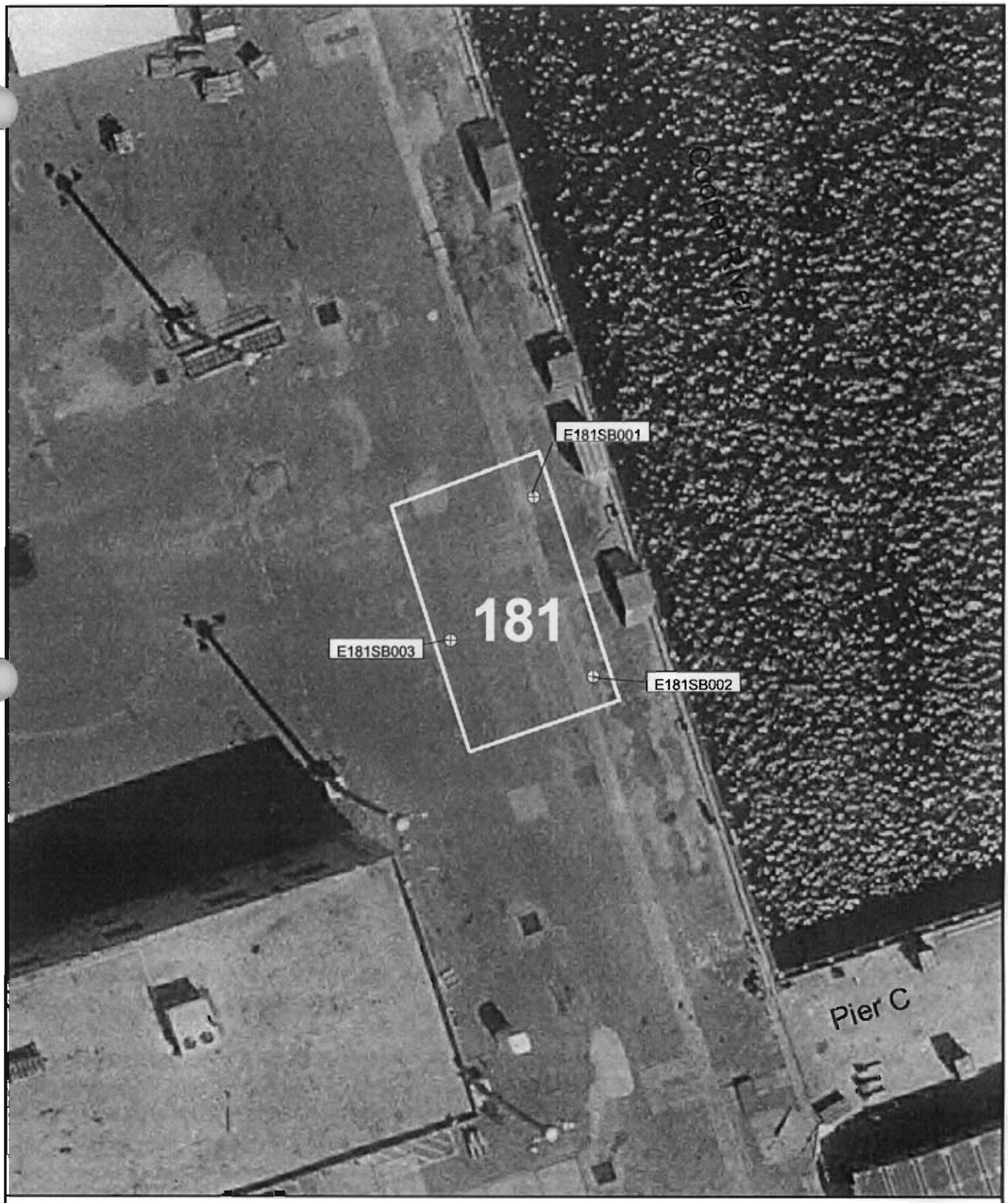
The data validation summary report is presented in Appendix B.

## 3.6 Data Management

Record keeping and data management practices for both field data and analytical data were maintained consistent with the DMP in the approved *Final Comprehensive RFI Work Plan* (EnSafe/Allen & Hoshall, 1994) to verify that all information and data were properly recorded and documented. Electronic data will be maintained in a database by CH2M-Jones for long-term data storage and management.

**TABLE 3-1**
Sampling Location Coordinates
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| New Sample ID | Northing | Easting |
|---|---|---|
| I181SB001 | 377,375.4 | 2,318,012.7 |
| I181SB002 | 377,343.8 | 2,318,023.2 |
| I181SB003 | 377,345.6 | 2,314,995.8 |




Proposed Soil Boring
Roads
Shoreline
AOC Boundary
SWMU Boundary
Buildings

N

0 30 60 Feet

1 inch = 25 feet

**Figure 3-1**
Surface Soil and Subsurface Soil Sampling Locations
SWMU 181, Zone E
Charleston Naval Complex

CH2MHILL

File Path: C:\18gis\Projects\Zone_E\SWMU181\swmu181.apr, Date: 10 Jul 2002 9:08, User: NMOUDRY, Figure 3-1

# Section 4.0

# 4.0 COPC Screening

Data evaluation and COPC screening were conducted as agreed to by the BCT and as described in the *Charleston Naval Complex Project Team Notebook and Instructions, Revision 1A* (CH2M-Jones, December 2001).

This section discusses chemicals that were detected in surface and subsurface soils collected during the CSI sampling conducted at SMWU 181 in April 2002.

## 4.1 Organic Constituents Detected in the Surface and Subsurface Soil Samples

The results of organic analyses on surface soil samples were compared to the EPA Region III residential and industrial risk-based concentrations (RBCs) using a hazard index (HI)=1 for carcinogens and an HI=0.1 for non-carcinogens. In addition, both the surface soil and subsurface soil results were screened against their respective generic soil screening levels (SSLs). If a generic SSL was not available, then the EPA Region III SSL values were used for screening. With both the generic SSLs and the EPA Region III SSLs, screening criteria were specified using a dilution attenuation factor (DAF)=1 for VOCs and a DAF=10 for non-VOCs.

### 4.1.1 VOCs in Surface and Subsurface Soils

A total of five VOCs (acetone, carbon disulfide, methyl ethyl ketone [MEK], toluene, and trichloroethene [TCE]) were detected in surface soil samples (see Table 4-1) and one of these constituents (MEK) was also detected in the subsurface soil samples (see Table 4-2). A detailed discussion of the occurrence of each of these constituents is presented below.

#### Acetone and Methyl Ethyl Ketone

Acetone was detected in one surface soil sample at a concentration of 27 J micrograms per kilogram (µg/kg) (E181SB00101), but was not detected in any of the three subsurface soil samples. Acetone was detected in the field blank and laboratory blanks associated with the analyses (see Appendix A-1). Acetone was detected in four of the blank samples associated with the SWMU 181 sample data group (SDG CNC 95) at concentrations ranging from 4.4 µg/L to 9.2 µg/kg. Acetone is a recognized common laboratory contaminant and has been widely detected previously in many blanks associated with CNC samples. It is also associated with isopropanol used for field equipment decontamination. Based on EPA's

"ten times rule, " acetone at concentrations up to 92 parts per billion (ppb) may be considered possible laboratory contamination. Because of its presence at relatively low concentrations in the laboratory and field blanks and one site sample, it is likely that acetone is detected due to contamination from field isopropanol or as a laboratory contaminant, and therefore is not considered a site COC.

MEK was detected in two of the three surface soil samples at concentrations of 6.9 J µg/kg and 12 µg/kg (E181SB00201 and E181SB00301, respectively) and in only one of the three subsurface soil samples at a concentration of 16 µg/kg. MEK was detected in one of the laboratory blank samples associated with SDG CNC 95 at a concentration of 4.1 J µg/kg (see Appendix A-1). MEK is a recognized common laboratory contaminant and previously has been widely detected in many blanks associated with CNC samples. Based on EPA's "ten times rule," MEK at concentrations up to 41 ppb may be considered as possible laboratory contamination. Because of its presence at a relatively low concentration in the laboratory blank and two site samples, it is likely that MEK is detected due to contamination as a laboratory contaminant, and therefore is not considered a site COC.

### Carbon Disulfide

Carbon disulfide was detected in one of the three surface soil samples at an estimated concentration of 2.3 J µg/kg (E181SB00301) and was not detected in any of the three subsurface soil samples. The one detection was below the EPA Region III residential and industrial RBCs, as well as the SSL (see Table 4-1). Therefore, carbon disulfide is not a COPC for SMWU 181.

### Toluene

Toluene was detected in one of the three surface soil samples at an estimated concentration of 4 J µg/kg (E181SB00201) and was not detected in any of the three subsurface soil samples. The one detected value was below the EPA Region III residential and industrial RBCs, as well as the SSL (see Table 4-1). Therefore, toluene is not a COPC for SMWU 181.

### Trichloroethene

TCE was detected in one of the three surface soil samples at an estimated concentration of 5.8 J µg/kg (E181SB00301) and was not detected in any of the three subsurface soil samples. The one detected value was below the EPA Region III residential and industrial RBCs, but slightly exceeded the SSL of 3 µg/kg (DAF=1) (see Table 4-1). Therefore, TCE is considered to be a surface soil COPC at SMWU 181 and is discussed further in Section 5.0.

### 4.1.2 SVOCs in Surface and Subsurface Soils

A total of 12 SVOCs were detected in the surface soil samples and 16 SVOCs were detected in subsurface soil samples collected from beneath the concrete paving at SMWU 181 (see Tables 4-3 and 4-4). Of the SVOCs detected, 11 of the 12 found in surface soils and 13 of the 16 detected in subsurface soils were polycyclic aromatic hydrocarbon (PAH) compounds. In screening the data, it was found that none of the SVOCs detected at SMWU 181 were present at levels exceeding the screening criteria (see Tables 4-3 and 4-4).

In addition, the PAHs in all surface and subsurface soil samples were also evaluated as to their respective benzo(a)pyrene equivalents (BEQs). Based on the BEQ analysis, it was found that all of the BEQ values were below the respective sitewide reference concentrations of 1,304 µg/kg for surface soils and 1,400 µg/kg for subsurface soils (see Table 4-5).

For these reasons, no SVOCs were identified as COPCs for SWMU 181.

### 4.1.3 Pesticides and PCBs in Surface and Subsurface Soils

Three pesticides and two PCBs were detected in the surface soil samples and four pesticides and two PCBs were detected in the subsurface soil samples collected from beneath the concrete paving at SWMU 181 (see Tables 4-6 and 4-7). Based on a review of the data, none of the pesticides or PCBs detected in the soils at SMWU 181 were present at levels exceeding their respective screening criteria.

For these reasons, no pesticides or PCBs were identified as COPCs for SWMU 181.

## 4.2 Inorganic Constituents Detected in the Surface and Subsurface Soil Samples

Nineteen inorganic constituents were detected in surface soil samples and 17 inorganic constituents were detected in subsurface soil samples collected at SWMU 181 (see Tables 4-8 and 4-9). Based on a review of the data, only iron was found to exceed its screening criteria in a single surface soil sample. None of the inorganic constituents detected in the subsurface soil samples exceeded their respective screening criteria.

### 4.2.1 Iron in Surface Soil

Iron was found at a concentration of 40,000 milligrams per kilogram (mg/kg) in surface soil sample E181SB00301, which exceeded the Zone E background concentration range for surface soil of 1,050 mg/kg to 30,600 mg/kg and also exceeded the EPA Region III

residential RBC of 2,300 mg/kg (see Table 4-8). The concentrations of iron in the other surface soil samples were 6,100 mg/kg in E181SB00101 and 7,800 mg/kg in E181SB00201. The three subsurface soil samples had similar iron concentrations: 6,200 mg/kg in E181SB00102; 5,500 mg/kg in E181SB00202; and 7,200 mg/kg in E181SB00302. All iron concentrations in the subsurface soil are within the Zone E background concentration range for subsurface soils of 924 mg/kg to 35,800 mg/kg.

For these reasons, iron is considered a COPC only for surface soil at SWMU 181 and is discussed further in Section 5.0.

## 4.3 Data Evaluation Summary

Two constituents were identified as COPCs for the surface soil at SMWU 181: TCE and iron. Neither of these constituents were considered COPCs for subsurface soils, and no other constituents were considered COPCs for either surface or subsurface soils. These COPCs are discussed in Section 5.0.

**TABLE 4-1**
Volatile Organic Compounds Detected in Surface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | EPA Region III Industrial RBC (mg/kg) | EPA Region III Residential RBC (mg/kg) | SSL (DAF=1) (mg/kg) |
|---|---|---|---|---|---|---|---|---|
| Acetone | 181SB00101 | E181SB001 | 0.027 | J | 04/16/2002 | 20,000 | 7,800 | 8 |
| | 181SB00201 | E181SB002 | 0.038 | UJ | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.063 | UJ | 04/16/2002 | | | |
| Carbon Disulfide | 181SB00101 | E181SB001 | 0.0079 | U | 04/16/2002 | 20,000 | 780 | 2 |
| | 181SB00201 | E181SB002 | 0.0047 | UJ | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.0023 | J | 04/16/2002 | | | |
| Methyl ethyl ketone | 181SB00101 | E181SB001 | 0.016 | U | 04/16/2002 | 120,000 | 4,700 | 0.4 |
| (2-Butanone) | 181SB00201 | E181SB002 | 0.0069 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.012 | = | 04/16/2002 | | | |
| Toluene | 181SB00101 | E181SB001 | 0.0079 | U | 04/16/2002 | 41,000 | 1,600 | 1.6 |
| | 181SB00201 | E181SB002 | 0.004 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.0048 | U | 04/16/2002 | | | |
| Trichloroethylene | 181SB00101 | E181SB001 | **0.0058** | J | 04/16/2002 | 520 | 58 | 0.003 |
| (TCE) | 181SB00201 | E181SB002 | 0.0047 | U | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.0048 | U | 04/16/2002 | | | |

Concentrations in bold and outlined within the table indicate an exceedance of their respective criteria.

= Analyte was detected at the concentration reported.
U Chemical was not detected.
J Estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
UJ Chemical was not detected and is estimated.

**TABLE 4-2**
Volatile Organic Compounds Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | SSL (DAF=1) (mg/kg) |
|---|---|---|---|---|---|---|
| Methyl ethyl ketone (2-Butanone) | 181SB00102 | E181SB001 | 0.012 | U | 04/16/02 | 0.4[a] |
| | 181SB00202 | E181SB002 | 0.012 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.016 | = | 04/16/02 | |

[a] EPA Region III generic SSL with a DAF=1, EPA Region III RBC Tables, October 2000.
= Analyte was detected at the concentration reported.
U Constituent was not detected.

**TABLE 4-3**
Semivolatile Organic Compounds Detected in Surface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | EPA Region III Industrial RBC (mg/kg) | EPA Region III Residential RBC (mg/kg) | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|---|
| Anthracene | 181SB00101 | E181SB001 | 0.042 | J | 04/16/2002 | 61,000 | 2,300 | 6,000 |
| | 181SB00201 | E181SB002 | 0.39 | U | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.38 | U | 04/16/2002 | | | |
| Benzo(a)Anthracene | 181SB00101 | E181SB001 | 0.051 | J | 04/16/2002 | 7.8 | 0.87 | 1 |
| | 181SB00201 | E181SB002 | 0.036 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.06 | J | 04/16/2002 | | | |
| Benzo(a)Pyrene | 181SB00101 | E181SB001 | 0.06 | J | 04/16/2002 | 0.78 | 0.087 | 4 |
| | 181SB00201 | E181SB002 | 0.036 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.06 | J | 04/16/2002 | | | |
| Benzo(b)Fluoranthene | 181SB00101 | E181SB001 | 0.066 | J | 04/16/2002 | 7.8 | 0.87 | 2.5 |
| | 181SB00201 | E181SB002 | 0.045 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.052 | J | 04/16/2002 | | | |
| Benzo(g,h,i)Perylene | 181SB00101 | E181SB001 | 0.068 | J | 04/16/2002 | NA | NA | NA |
| | 181SB00201 | E181SB002 | 0.037 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.045 | J | 04/16/2002 | | | |
| Benzo(k)Fluoranthene | 181SB00101 | E181SB001 | 0.051 | J | 04/16/2002 | 78 | 8.7 | 24.5 |
| | 181SB00201 | E181SB002 | 0.39 | U | 04/16/2002 | | | |

**TABLE 4-3**
Semivolatile Organic Compounds Detected in Surface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | EPA Region III Industrial RBC (mg/kg) | EPA Region III Residential RBC (mg/kg) | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|---|
| Benzo(k)Fluoranthene | 181SB00301 | E181SB003 | 0.056 | J | 04/16/2002 | 78 | 8.7 | 24.5 |
| bis(2-Ethylhexyl) Phthalate | 181SB00101 | E181SB001 | 0.46 | U | 04/16/2002 | 410 | 46 | 1,800 |
| | 181SB00201 | E181SB002 | 0.16 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.15 | J | 04/16/2002 | | | |
| Chrysene | 181SB00101 | E181SB001 | 0.06 | J | 04/16/2002 | 780 | 87 | 80 |
| | 181SB00201 | E181SB002 | 0.048 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.073 | J | 04/16/2002 | | | |
| Flouranthene | 181SB00101 | E181SB001 | 0.078 | J | 04/16/2002 | 8,200 | 310 | 2,150 |
| | 181SB00201 | E181SB002 | 0.048 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.38 | U | 04/16/2002 | | | |
| Indeno(1,2,3-c,d)pyrene | 181SB00101 | E181SB001 | 0.34 | J | 04/16/2002 | 7.8 | 0.87 | 7 |
| | 181SB00201 | E181SB002 | 0.28 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.27 | J | 04/16/2002 | | | |
| Phenanthrene | 181SB00101 | E181SB001 | 0.042 | J | 04/16/2002 | NA | NA | NA |
| | 181SB00201 | E181SB002 | 0.022 | J | 04/16/2002 | | | |
| | 181SB00301 | E181SB003 | 0.045 | J | 04/16/2002 | | | |
| Pyrene | 181SB00101 | E181SB001 | 0.46 | U | 04/16/2002 | 6,100 | 230 | 2,100 |
| | 181SB00201 | E181SB002 | 0.39 | U | 04/16/2002 | | | |

**TABLE 4-3**
Semivolatile Organic Compounds Detected in Surface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | EPA Region III Industrial RBC (mg/kg) | EPA Region III Residential RBC (mg/kg) | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|---|
| Pyrene | 181SB00301 | E181SB003 | 0.13 | J | 04/16/2002 | 6,100 | 230 | 2,100 |

= Analyte was detected at the concentration reported.
U Constituent was not detected.
J Estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
UJ Constituent was not detected and detection limit is estimated.

**TABLE 4-4**
Semivolatile Organic Compounds Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | SSL (DAF=10) mg/kg |
|---|---|---|---|---|---|---|
| 4-Bromophenyl Phenyl Ether | 181SB00102 | E181SB001 | 0.4 | U | 04/16/02 | NA |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.046 | J | 04/16/02 | |
| Acenaphthene | 181SB00102 | E181SB001 | 0.22 | J | 04/16/02 | |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.38 | U | 04/16/02 | |
| Anthracene | 181SB00102 | E181SB001 | 0.46 | = | 04/16/02 | 6,000 |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.38 | U | 04/16/02 | |
| Benzo(a)Anthracene | 181SB00102 | E181SB001 | 0.96 | = | 04/16/02 | 1 |
| | 181SB00202 | E181SB002 | 0.031 | J | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.033 | J | 04/16/02 | |
| Benzo(a)Pyrene | 181SB00102 | E181SB001 | 0.63 | = | 04/16/02 | 4 |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.039 | J | 04/16/02 | |
| Benzo(b)Fluoranthene | 181SB00102 | E181SB001 | 0.63 | J | 04/16/02 | 2.5 |

**TABLE 4-4**
Semivolatile Organic Compounds Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | SSL (DAF=10) mg/kg |
|---|---|---|---|---|---|---|
| Benzo(b)Fluoranthene | 181SB00202 | E181SB002 | 0.037 | J | 04/16/02 | 2.5 |
| | 181SB00302 | E181SB003 | 0.044 | J | 04/16/02 | |
| Benzo(g,h,i)Perylene | 181SB00102 | E181SB001 | 0.36 | J | 04/16/02 | NA |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.035 | J | 04/16/02 | |
| Benzo(k)Fluoranthene | 181SB00102 | E181SB001 | 0.53 | = | 04/16/02 | 24.5 |
| | 181SB00202 | E181SB002 | 0.035 | J | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.033 | J | 04/16/02 | |
| bis(2-Ethylhexyl) Phthalate | 181SB00102 | E181SB001 | 0.35 | J | 04/16/02 | 1,800 |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.16 | J | 04/16/02 | |
| Carbazole | 181SB00102 | E181SB001 | 0.18 | J | 04/16/02 | 0.3 |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.38 | U | 04/16/02 | |
| Chrysene | 181SB00102 | E181SB001 | 0.96 | = | 04/16/02 | 80 |
| | 181SB00202 | E181SB002 | 0.039 | J | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.04 | J | 04/16/02 | |

**TABLE 4-4**
Semivolatile Organic Compounds Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | SSL (DAF=10) mg/kg |
|---|---|---|---|---|---|---|
| Dibenzofuran | 181SB00102 | E181SB001 | 0.087 | J | 04/16/02 | 3.85 |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.38 | U | 04/16/02 | |
| Flouranthene | 181SB00102 | E181SB001 | 2.5 | = | 04/16/02 | 2,150 |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.046 | J | 04/16/02 | |
| Fluorene | 181SB00102 | E181SB001 | 0.19 | J | 04/16/02 | 280 |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.38 | U | 04/16/02 | |
| Indeno(1,2,3-c,d)pyrene | 181SB00102 | E181SB001 | 0.54 | = | 04/16/02 | 7 |
| | 181SB00202 | E181SB002 | 0.30 | J | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.27 | J | 04/16/02 | |
| Phenanthrene | 181SB00102 | E181SB001 | 2 | = | 04/16/02 | NA |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.025 | J | 04/16/02 | |
| Pyrene | 181SB00102 | E181SB001 | 2.3 | = | 04/16/02 | 2,100 |
| | 181SB00202 | E181SB002 | 0.42 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.38 | U | 04/16/02 | |

**TABLE 4-4**
Semivolatile Organic Compounds Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | SSL (DAF=10) mg/kg |
|---|---|---|---|---|---|---|

| | |
|---|---|
| = | Analyte was detected at the concentration reported. |
| J | Estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit. |
| U | Chemical was not detected. |

**TABLE 4-5**
BEQs in Surface and Subsurface Soil Samples
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

**BEQs in Surface Soil**

| Parameter Name | Class | Parameter ID | CAS Number | TEF | E181SB00101 | | | E181SB00201 | | | E181SB00301 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Conc. | Qualifier | BEQ | Conc. | Qualifier | BEQ | Conc. | Qualifier | BEQ |
| Benzo(a)Anthracene | SVOA | BZAA | 56553 | 0.1 | 0.051 | J | 0.0051 | 0.036 | J | 0.0036 | 0.06 | J | 0.006 |
| Benzo(a)Pyrene | SVOA | BZAP | 50328 | 1 | 0.06 | J | 0.06 | 0.036 | J | 0.036 | 0.06 | J | 0.0036 |
| Benzo(b)Fluoranthene | SVOA | BZBF | 205992 | 0.1 | 0.066 | J | 0.0066 | 0.045 | J | 0.0045 | 0.052 | J | 0.0052 |
| Benzo(k)Fluoranthene | SVOA | BZKF | 207089 | 0.01 | 0.051 | J | 0.00051 | 0.39 | U | 0.00195 | 0.056 | J | 0.00056 |
| Chrysene | SVOA | CHRYSENE | 218019 | 0.001 | 0.06 | J | 0.00006 | 0.048 | J | 0.000048 | 0.073 | J | 0.000073 |
| Dibenz(a,h)anthracene | SVOA | DBAHA | 53703 | 1 | 0.23 | U | 0.23 | 0.195 | U | 0.195 | 0.19 | U | 0.0437 |
| Indeno(1,2,3-c,d)pyrene | SVOA | INP123 | 193395 | 0.1 | 0.34 | J | 0.034 | 0.28 | J | 0.028 | 0.27 | J | 0.027 |
| | | | | | | **BEQ:** | **0.33627** | | **BEQ:** | **0.2691** | | **BEQ:** | **0.08613** |

**BEQs in Subsurface Soil**

| Parameter Name | Class | Parameter ID | CAS Number | TEF | E181SB00102 | | | E181SB00202 | | | E181SB00302 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Conc. | Qualifier | BEQ | Conc. | Qualifier | BEQ | Conc. | Qualifier | BEQ |
| Benzo(a)Anthracene | SVOA | BZAA | 56553 | 0.1 | 0.96 | = | 0.096 | 0.031 | J | 0.0031 | 0.033 | J | 0.0033 |
| Benzo(a)Pyrene | SVOA | BZAP | 50328 | 1 | 0.63 | = | 0.63 | 0.21 | U | 0.21 | 0.039 | J | 0.039 |
| Benzo(b)Fluoranthene | SVOA | BZBF | 205992 | 0.1 | 0.63 | J | 0.063 | 0.037 | J | 0.0037 | 0.044 | J | 0.0044 |
| Benzo(k)Fluoranthene | SVOA | BZKF | 207089 | 0.01 | 0.53 | = | 0.0053 | 0.035 | J | 0.000175 | 0.033 | J | 0.00033 |
| Chrysene | SVOA | CHRYSENE | 218019 | 0.001 | 0.96 | = | 0.00096 | 0.039 | J | 0.000039 | 0.04 | J | 0.00004 |
| Dibenz(a,h)anthracene | SVOA | DBAHA | 53703 | 1 | 0.2 | U | 0.2 | 0.21 | U | 0.21 | 0.19 | U | 0.19 |
| Indeno(1,2,3-c,d)pyrene | SVOA | INP123 | 193395 | 0.1 | 0.54 | = | 0.054 | 0.3 | J | 0.03 | 0.27 | J | 0.027 |
| | | | | | | **BEQ:** | **1.04926** | | **BEQ:** | **0.457014** | | **BEQ:** | **0.26407** |

1/2 of the detection limit was used for nondetects
All units are in mg/kg
= Chemical is detected at the concentration shown.
J Chemical is detected at a concentration below the method detection limit; the concentration is not known.
U Chemical was not detected.

**TABLE 4-6**
Pesticides and PCBs Detected in Surface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | EPA Region III Industrial RBC (mg/kg) | EPA Region III Residential RBC (mg/kg) | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|---|
| Alpha-chlordane | 181SB00101 | E181SB001 | 0.00067 | J | 04/16/02 | 16 | 1.8 | 5 |
| | 181SB00201 | E181SB002 | 0.0015 | U | 04/16/02 | | | |
| | 181SB00301 | E181SB003 | 0.0015 | U | 04/16/02 | | | |
| Gamma-chlordane | 181SB00101 | E181SB001 | 0.00098 | J | 04/16/02 | 16 | 1.8 | 5 |
| | 181SB00201 | E181SB002 | 0.0015 | U | 04/16/02 | | | |
| | 181SB00301 | E181SB003 | 0.0015 | U | 04/16/02 | | | |
| Heptachlor Epoxide | 181SB00101 | E181SB001 | 0.00062 | J | 04/16/02 | 0.63 | 0.07 | 0.35 |
| | 181SB00201 | E181SB002 | 0.0015 | U | 04/16/02 | | | |
| | 181SB00301 | E181SB003 | 0.0015 | U | 04/16/02 | | | |
| PCB-1254 (Aroclor-1254) | 181SB00101 | E181SB001 | 0.015 | J | 04/16/02 | 2.9 | 0.32 | 1 |
| | 181SB00201 | E181SB002 | 0.18 | = | 04/16/02 | | | |
| | 181SB00301 | E181SB003 | 0.11 | = | 04/16/02 | | | |
| PCB-1260 (Aroclor-1260) | 181SB00101 | E181SB001 | 0.032 | J | 04/16/02 | 2.9 | 0.32 | 1 |
| | 181SB00201 | E181SB002 | 0.039 | J | 04/16/02 | | | |
| | 181SB00301 | E181SB003 | 0.034 | J | 04/16/02 | | | |

**TABLE 4-6**
Pesticides and PCBs Detected in Surface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | EPA Region III Industrial RBC (mg/kg) | EPA Region III Residential RBC (mg/kg) | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|---|

= Analyte was detected at the concentration reported.
J Estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
U Chemical was not detected.

**TABLE 4-7**
Pesticides and PCBs Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|
| Dieldrin | 181SB00102 | E181SB001 | 0.001 | J | 04/16/02 | 0.002 |
| | 181SB00202 | E181SB002 | 0.0032 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.0029 | U | 04/16/02 | |
| Heptachlor | 181SB00102 | E181SB001 | 0.0016 | U | 04/16/02 | 11.5 |
| | 181SB00202 | E181SB002 | 0.00046 | J | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.0015 | U | 04/16/02 | |
| Heptachlor Epoxide | 181SB00102 | E181SB001 | 0.00042 | J | 04/16/02 | 0.35 |
| | 181SB00202 | E181SB002 | 0.0017 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.0015 | U | 04/16/02 | |
| p,p'-DDT | 181SB00102 | E181SB001 | 0.0018 | J | 04/16/02 | 16 |
| | 181SB00202 | E181SB002 | 0.0032 | U | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.0029 | U | 04/16/02 | |
| PCB-1254 (Aroclor-1254) | 181SB00102 | E181SB001 | 0.082 | U | 04/16/02 | 0.55[a] |
| | 181SB00202 | E181SB002 | 0.043 | J | 04/16/02 | |
| | 181SB00302 | E181SB003 | 0.090 | = | 04/16/02 | |
| PCB-1260 (Aroclor-1260) | 181SB00102 | E181SB001 | 0.082 | U | 04/16/02 | 1 |

**TABLE 4-7**
Pesticides and PCBs Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|
| PCB-1260 (Aroclor-1260) | 181SB00202 | E181SB002 | 0.022 | J | 04/16/02 | 1 |
| | 181SB00302 | E181SB003 | 0.034 | J | 04/16/02 | |

[a] EPA Region III generic SSL with a DAF=1, EPA Region III RBC Tables, October 2000.
= Analyte was detected at the concentration reported.
J Estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
U Chemical was not detected.

**TABLE 4-8**
Inorganic Constituents Detected in Surface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | EPA Region III Industrial RBC (mg/kg) | EPA Region III Residential RBC (mg/kg) | Zone E Surface Soil Background Concentration Range mg/kg | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 181SB00101 | E181SB001 | 5,600 | = | 04/16/2002 | 200,000 | 1,840 | 261 - 20,500 | NA |
| | 181SB00201 | E181SB002 | 6,500 | = | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 4,100 | = | 04/16/2002 | | | | |
| Arsenic | 181SB00101 | E181SB001 | 4.2 | = | 04/16/2002 | 100 | 3.9 | 0.95 - 68 | 14.5 |
| | 181SB00201 | E181SB002 | 4.1 | = | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 24 | = | 04/16/2002 | | | | |
| Barium | 181SB00101 | E181SB001 | 22 | J | 04/16/2002 | 14,000 | 5,500 | 1.8 - 1,980 | 800 |
| | 181SB00201 | E181SB002 | 26 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 20 | J | 04/16/2002 | | | | |
| Beryllium | 181SB00101 | E181SB001 | 0.55 | J | 04/16/2002 | 4,100 | 16 | 0.13 - 1.6 | 31.5 |
| | 181SB00201 | E181SB002 | 0.30 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 0.21 | J | 04/16/2002 | | | | |
| Cadmium | 181SB00101 | E181SB001 | 0.63 | J | 04/16/2002 | 100 | 4 | 0.06 - 1.5 | 4 |
| | 181SB00201 | E181SB002 | 0.38 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 0.95 | = | 04/16/2002 | | | | |
| Calcium | 181SB00101 | E181SB001 | 47,000 | = | 04/16/2002 | NA | NA | 167 - 182,000 | NA |
| | 181SB00201 | E181SB002 | 49,000 | = | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 26,000 | = | 04/16/2002 | | | | |
| Chromium, Total | 181SB00101 | E181SB001 | 17 | = | 04/16/2002 | 316,000 | 12,000 | 2.3 - 567 | 19 |
| | 181SB00201 | E181SB002 | 19 | = | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 34 | = | 04/16/2002 | | | | |
| Cobalt | 181SB00101 | E181SB001 | 1.9 | J | 04/16/2002 | 12,000 | 470 | 0.35 - 111 | NA |
| | 181SB00201 | E181SB002 | 1.9 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 7.3 | J | 04/16/2002 | | | | |
| Copper | 181SB00101 | E181SB001 | 33 | J | 04/16/2002 | 8,200 | 310 | 0.47 - 866 | 5,500 a |
| | 181SB00201 | E181SB002 | 17 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 380 | J | 04/16/2002 | | | | |

**TABLE 4-8**
Inorganic Constituents Detected in Surface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | EPA Region III Industrial RBC (mg/kg) | EPA Region III Residential RBC (mg/kg) | Zone E Surface Soil Background Concentration Range mg/kg | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Iron | 181SB00101 | E181SB001 | 6,100 | = | 04/16/2002 | 61,000 | 2,300 | 1,050 - 30,600 | NA |
| | 181SB00201 | E181SB002 | 7,800 | = | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | **40,000** | = | 04/16/2002 | | | | |
| Lead | 181SB00101 | E181SB001 | 43 | = | 04/16/2002 | 500 | 500 | 1 - 400 | 500 |
| | 181SB00201 | E181SB002 | 39 | = | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 50 | = | 04/16/2002 | | | | |
| Magnesium | 181SB00101 | E181SB001 | 1300 | J | 04/16/2002 | NA | NA | 31 - 14,800 | NA |
| | 181SB00201 | E181SB002 | 1600 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 1100 | J | 04/16/2002 | | | | |
| Manganese | 181SB00101 | E181SB001 | 86 | J | 04/16/2002 | 4,100 | 160 | 0.93 - 508 | 475 |
| | 181SB00201 | E181SB002 | 91 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 290 | J | 04/16/2002 | | | | |
| Mercury | 181SB00101 | E181SB001 | 0.22 | J | 04/16/2002 | NA | NA | 0.03 - 2.7 | 1 |
| | 181SB00201 | E181SB002 | 0.23 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 0.25 | J | 04/16/2002 | | | | |
| Nickel | 181SB00101 | E181SB001 | 7.3 | J | 04/16/2002 | 4,100 | 160 | 0.6 - 72 | 65 |
| | 181SB00201 | E181SB002 | 8 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 19 | = | 04/16/2002 | | | | |
| Potassium | 181SB00101 | E181SB001 | 450 | J | 04/16/2002 | NA | NA | 46 - 2,620 | NA |
| | 181SB00201 | E181SB002 | 680 | J | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 610 | J | 04/16/2002 | | | | |
| Selenium | 181SB00101 | E181SB001 | 0.54 | U | 04/16/2002 | 1000 | 39 | 0.57 - 4 | 2.5 |
| | 181SB00201 | E181SB002 | 0.46 | U | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 0.83 | J | 04/16/2002 | | | | |
| Silver | 181SB00101 | E181SB001 | 0.27 | J | 04/16/2002 | 1,000 | 39 | 0.75 - 0.91 | 17 |
| | 181SB00201 | E181SB002 | 0.20 | U | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 0.18 | U | 04/16/2002 | | | | |

**TABLE 4-8**
Inorganic Constituents Detected in Surface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | EPA Region III Industrial RBC (mg/kg) | EPA Region III Residential RBC (mg/kg) | Zone E Surface Soil Background Concentration Range mg/kg | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Vanadium | 181SB00101 | E181SB001 | 13 | = | 04/16/2002 | 1,400 | 55 | 1.1 - 60 | 3,000 |
| | 181SB00201 | E181SB002 | 16 | = | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 12 | = | 04/16/2002 | | | | |
| Zinc | 181SB00101 | E181SB001 | 76 | = | 04/16/2002 | 61,000 | 2,300 | 1.9 - 855 | 6,000 |
| | 181SB00201 | E181SB002 | 67 | = | 04/16/2002 | | | | |
| | 181SB00301 | E181SB003 | 120 | = | 04/16/2002 | | | | |

Concentrations shown in bold and outlined within the table indicate an exceedance of the respective criteria.
[a] EPA Region III generic SSL with a DAF=10, EPA Region III RBC Tables, October 2000.
= Analyte was detected at the concentration reported
J Estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
U Chemical was not detected.

**TABLE 4-9**
Inorganic Constituents Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | Zone E Surface Soil Background Concentration Range (mg/kg) | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|
| Aluminum | 181SB00102 | E181SB001 | 7,100 | = | 04/16/02 | 1,220 - 29,900 | NA |
| | 181SB00202 | E181SB002 | 5,800 | = | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 6,500 | = | 04/16/02 | | |
| Arsenic | 181SB00102 | E181SB001 | 4.8 | = | 04/16/02 | 0.83 - 26 | 4.5 |
| | 181SB00202 | E181SB002 | 3 | = | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 4.7 | = | 04/16/02 | | |
| Barium | 181SB00102 | E181SB001 | 50 | = | 04/16/02 | 6.1 - 91 | 800 |
| | 181SB00202 | E181SB002 | 25 | J | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 25 | J | 04/16/02 | | |
| Beryllium | 181SB00102 | E181SB001 | 0.42 | J | 04/16/02 | 0.15 - 1.6 | 31.5 |
| | 181SB00202 | E181SB002 | 0.29 | J | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 0.35 | J | 04/16/02 | | |
| Cadmium | 181SB00102 | E181SB001 | 0.12 | J | 04/16/02 | 0.13 - 0.96 | 4 |
| | 181SB00202 | E181SB002 | 0.16 | J | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 0.29 | J | 04/16/02 | | |
| Calcium | 181SB00102 | E181SB001 | 26,000 | = | 04/16/02 | 323 - 229,000 | NA |
| | 181SB00202 | E181SB002 | 13,000 | = | 04/16/02 | | |

**TABLE 4-9**
Inorganic Constituents Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | Zone E Surface Soil Background Concentration Range (mg/kg) | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|
| Calcium | 181SB00302 | E181SB003 | 34,000 | = | 04/16/02 | 323 - 229,000 | NA |
| Chromium, Total | 181SB00102 | E181SB001 | 18 | = | 04/16/02 | 1.6 - 75 | 19 |
| | 181SB00202 | E181SB002 | 14 | = | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 19 | = | 04/16/02 | | |
| Cobalt | 181SB00102 | E181SB001 | 3.3 | J | 04/16/02 | 0.41 - 15 | NA |
| | 181SB00202 | E181SB002 | 1.7 | J | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 1.7 | J | 04/16/02 | | |
| Copper | 181SB00102 | E181SB001 | 12 | J | 04/16/02 | 1.3 - 192 | 5,500[a] |
| | 181SB00202 | E181SB002 | 14 | J | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 27 | J | 04/16/02 | | |
| Iron | 181SB00102 | E181SB001 | 6,200 | = | 04/16/02 | 924 - 35,800 | NA |
| | 181SB00202 | E181SB002 | 5,500 | = | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 7,200 | = | 04/16/02 | | |
| Lead | 181SB00102 | E181SB001 | 10 | = | 04/16/02 | 1.8 - 322 | 500 |
| | 181SB00202 | E181SB002 | 33 | = | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 36 | = | 04/16/02 | | |
| Magnesium | 181SB00102 | E181SB001 | 1,900 | J | 04/16/02 | 77 - 9,140 | NA |

**TABLE 4-9**
Inorganic Constituents Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | Zone E Surface Soil Background Concentration Range (mg/kg) | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|
| Magnesium | 181SB00202 | E181SB002 | 810 | J | 04/16/02 | 77 - 9,140 | NA |
| | 181SB00302 | E181SB003 | 1,500 | J | 04/16/02 | | |
| Manganese | 181SB00102 | E181SB001 | 82 | J | 04/16/02 | 4.9 - 625 | 475[a] |
| | 181SB00202 | E181SB002 | 44 | J | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 68 | J | 04/16/02 | | |
| Mercury | 181SB00102 | E181SB001 | 0.05 | J | 04/16/02 | 0.04 - 0.9 | 1 |
| | 181SB00202 | E181SB002 | 0.098 | J | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 0.16 | J | 04/16/02 | | |
| Nickel | 181SB00102 | E181SB001 | 7.4 | J | 04/16/02 | 0.85 - 20 | 65 |
| | 181SB00202 | E181SB002 | 6.2 | J | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 7.9 | J | 04/16/02 | | |
| Potassium | 181SB00102 | E181SB001 | 2,200 | = | 04/16/02 | 106 - 3440 | NA |
| | 181SB00202 | E181SB002 | 430 | J | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 670 | J | 04/16/02 | | |
| Vanadium | 181SB00102 | E181SB001 | 17 | = | 04/16/02 | 1.6 - 71 | 3,000 |
| | 181SB00202 | E181SB002 | 13 | = | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 16 | = | 04/16/02 | | |

**TABLE 4-9**
Inorganic Constituents Detected in Subsurface Soil
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| Parameter | Sample ID | Station ID | Concentration (mg/kg) | Qualifier | Date Sampled | Zone E Surface Soil Background Concentration Range (mg/kg) | SSL (DAF=10) (mg/kg) |
|---|---|---|---|---|---|---|---|
| Zinc | 181SB00102 | E181SB001 | 30 | = | 04/16/02 | 5.8 - 438 | 6,000 |
| | 181SB00202 | E181SB002 | 37 | = | 04/16/02 | | |
| | 181SB00302 | E181SB003 | 64 | = | 04/16/02 | | |

[a] EPA Region III generic SSL with a DAF=10, EPA Region III RBC Tables, October 2000.
= Analyte was detected at the concentration reported.
J Estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
U Chemical was not detected.

# 5.0 COC/COPC Refinement

Based on an evaluation of the CSI analytical results for SWMU 181, two constituents were identified as COPCs in surface soil: TCE and iron. No COPCs were identified for subsurface soil. Screening of the detected concentrations against the current screening criteria adopted by the CNC BCT found that TCE in one surface soil sample (5.8 J µg/kg in E181SB00301) exceeded the 3 µg/kg SSL (DAF=1) for TCE. Also, one surface soil sample (40,000 mg/kg in E181SB00301) exceeded the Zone E surface soil background concentration range (1,050 mg/kg to 30,600 mg/kg) and the EPA Region III residential RBC (2,300 mg/kg) for iron. The nature of these exceedances and the relevance of these constituents in surface soil at this site are further discussed below.

## 5.1 Trichloroethylene in Surface Soil

TCE was detected in only one of the three surface soil samples at an estimated concentration of 5.8 J µg/kg (E181SB00301). The one detected value was below the EPA Region III residential and industrial RBCs, but slightly exceeded the SSL of 3 µg/mg (DAF=1). Therefore, TCE is not a COC that poses an unacceptable risk to human health. TCE was not detected in any of the three subsurface soil samples.

Because TCE was not detected in any of the three subsurface soil samples and was found in only one surface soil sample at a very low concentration, it does not appear that TCE is migrating into the subsurface soil. In addition, the 6-inch concrete slab provides an effective barrier to stormwater infiltration and reduces the potential to create leachate. For these reasons, TCE is not likely to migrate down into the groundwater and is not a considered a COC for SMWU 181.

## 5.2 Iron in Surface Soil

Iron was found at a concentration of 40,000 mg/kg in surface soil sample E181SB00301, which exceeded the Zone E background concentration range for surface soil of 1,050 mg/kg to 30,600 mg/kg and also exceeded the EPA Region III residential RBC of 2,300 mg/kg (see Table 4-8). The concentrations of iron in the other surface soil samples were 6,100 mg/kg in E181SB00101 and 7,800 mg/kg in E181SB00201. Although the single value for iron observed at SWMU 181 exceeded the Zone E background concentration range, the value of 40,000 mg/kg is not inconsistent with concentrations observed in surface soils in other nearby

zones. For example, the maximum concentration of iron detected in the background surface samples collected from the immediately adjacent Zone B was 48,700 mg/kg. The maximum concentrations of iron detected in the background surface samples collected from Zones G and H are 32,700 and 38,800 mg/kg, respectively. Zone G is also adjacent to the southern end of Zone E.

The subsurface soil samples at SWMU 181 had iron concentrations that were similar to each other: 6,200 mg/kg in E181SB00102; 5,500 mg/kg in E181SB00202; and 7,200 mg/kg in E181SB00302. All of these values are within the Zone E background concentration range for subsurface soil of 924 mg/kg to 35,800 mg/kg.

The iron concentration in the subsurface soil sample collected at E181SB003 did not indicate the presence of elevated levels of iron, which would be expected if iron were mobile in the environment. In addition, there is no SSL for iron, indicating that iron leaching from soils into groundwater is not an environmental or health concern, and the promulgation of a secondary maximum contaminant level (MCL) for iron was based only on cosmetic or aesthetic effects. For these reasons, iron is not considered a COC for SWMU 181.

## 5.3 Summary

Based on review of the data, no COCs are identified for SMWU 181.

# 6.0 Summary of Information Related to Site Closeout Issues

## 6.1 RFI Status

The CSI investigation findings, as reported herein, satisfy the requirements of the RFI. Based on review of the data obtained from the CSI field investigation conducted in April 2002, the nature and extent of the COPCs has been adequately defined.

SWMU 181 was not included in the *Zone E RFI Report, Revision 0* (EnSafe, 1997), thus there have been no RFI comments issued with respect to this unit. On August 7, 2002, SCDHEC issued comments on the Revision 0 version of this RFI Report Addendum, and CH2M Jones' responses to those comments are presented in Appendix C. With submittal of this RFI Report Addendum, the RFI requirements are considered to be complete.

The remaining subsections address the issues that the BCT agreed to evaluate prior to site closeout.

## 6.2 Presence of Inorganics in Groundwater

For the purpose of site closeout documentation, the inorganics in groundwater issue refers to the occasional or intermittent detection of several metals (primarily arsenic, thallium, and antimony) in groundwater at concentrations above the applicable MCL, preceded or followed by detections of these same metals below the MCL or below the practicable quantitation limit. Groundwater is not a medium of concern at SMWU 181. No additional evaluation of this issue is warranted.

## 6.3 Potential Linkage to SWMU 37, Investigated Sanitary Sewers at the CNC

The sanitary sewer investigation (SMWU 37) was designed to include segments of the sewer where releases of contamination were known or considered likely to have occurred. No investigations related to SWMU 37 were conducted in the vicinity of SWMU 181. No known or suspected linkage between SWMU 37 and SWMU 181 exists. Further evaluation of this issue is not warranted.

## 6.4 Potential Linkage to AOC 699, Investigated Storm Sewers at the CNC

Investigated segments of the storm sewer (AOC 699) were identified in the *Zone L RFI Report, Revision 0* (EnSafe, 1998). One storm drain is located approximately 35 feet southwest of SMWU 181. The sections of the stormwater sewer system in the vicinity of the site were not investigated as part of the AOC 699 investigations. There are no data or information to suggest that SMWU 181 has impacted the storm sewer system and groundwater is not a medium of concern at this site. Further investigation of a linkage between the storm sewer system and SMWU 181 is not warranted.

## 6.5 Potential Linkage to AOC 504, Investigated Railroad Lines at the CNC

Investigated segments of the CNC railroad lines (AOC 504) were identified in the *Zone L RFI Report, Revision 0* (EnSafe, 1998). No investigations related to AOC 504 were conducted at SWMU 181.

There is an existing railroad line southeast of SMWU 181 that serves Pier C, which remains an active railroad line. Based on historical public works maps, this railroad line has been in place since at least 1909. There is no known linkage between SMWU 181 and the investigated railroad lines. Further evaluation of this issue is not warranted.

## 6.6 Potential Migration Pathways to Surface Water Bodies at the CNC

The nearest surface water body to SMWU 181 is the Cooper River, which lies approximately 10 feet to the east. There were no COCs identified for soil. Therefore, there are no migration pathways of concern. Further evaluation of this issue is not warranted.

## 6.7 Potential Contamination in Oil/Water Separators

There are no OWSs known to be associated with this site. In addition, there is no reference made to an OWS at this facility in the *Oil Water Separator Data* report (Department of the Navy, September 2000). Further evaluation of OWSs is not warranted.

## 6.8 Land Use Control Management Plan

There were no COCs identified under an unrestricted land use scenario during the risk-based screening of the data from SMWU 181. Therefore, no land use restrictions are needed for SWMU 181. This site is zoned M-2 (marine-industrial) and will likely be used for non-residential future land use.

Regardless, the CNC BCT has agreed that all of Zone E will have at least some LUCs and restrictions. At a minimum, these LUCs are likely to include restrictions against residential land use. Because there are no COCs at this particular site, no LUCs are necessary. The site is recommended for NFA.

# 7.0 Conclusions and Recommendations

SWMU 181 consists of an SAA adjacent to Pier C (see Figure 3-1). The SAA consisted of a 8 x 8 x 8-foot metal storage structure that sat on a concrete quay and was used to store paint cans and rags. The unit was permitted on June 29, 1994, and the structure was removed prior to 1996.

The materials of concern at this unit are identified in the *Final Zone E RCRA Facility Assessment* (EnSafe/Allen & Hoshall, 1995) and include paint cans and rags.

Evaluation of the data collected during the CSI is summarized in Section 5.0 and fate and transport considerations are discussed in Section 6.0. However, because no COCs were identified, it was not necessary to conduct a site-specific human health or ecological risk assessment.

The conclusion for soils at SMWU 181 is that there are no COCs identified for surface or subsurface soil. This site is zoned M-2 (marine-industrial) and will likely be designated for commercial/industrial future use. No actions are required to control exposures/risks under current or future unrestricted land use. This site is recommended for NFA.

The BCT has agreed that LUCs will be applied across the entire Zone E of the CNC. These LUCs are expected to include, at a minimum, restrictions limiting the future land use to non-residential activities. Because SWMU 181 is located within Zone E, these LUCs will apply at this SWMU.

# Section 8.0

# 8.0 References

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# Appendix A

**Appendix A**

**Volatile Organic Compound Analytical Results for Surface Soil Samples**

*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | **StationID** | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|
| | **SampleID** | 181SB00101 (0-1ft) | | 181SB00201 (0-1ft) | | 181SB00301 (0-1ft) | |
| | **DateCollected** | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | **DateExtracted** | 4/21/2002 | | 4/19/2002 | | 4/19/2002 | |
| | **DateAnalyzed** | 4/21/2002 | | 4/19/2002 | | 4/19/2002 | |
| | **SDGNumber** | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | |
| Chloromethane | ug/kg | 16 | UJ | 9.5 | U | 9.6 | U |
| Vinyl chloride | ug/kg | 16 | U | 9.5 | U | 9.6 | U |
| Bromomethane | ug/kg | 16 | UJ | 9.5 | UJ | 9.6 | UJ |
| Chloroethane | ug/kg | 16 | U | 9.5 | U | 9.6 | U |
| 1,1-Dichloroethene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Acetone | ug/kg | 27 | J | 38 | UJ | 63 | UJ |
| Carbon Disulfide | ug/kg | 7.9 | U | 4.7 | UJ | 2.3 | J |
| Methylene Chloride | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| trans-1,2-Dichloroethene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 1,1-Dichloroethane | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Vinyl acetate | ug/kg | 16 | U | 9.5 | U | 9.6 | U |
| Methyl ethyl ketone (2-Butanone) | ug/kg | 16 | U | 6.9 | J | 12 | = |
| cis-1,2-Dichloroethylene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 1,2-Dichloroethene (total) | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Chloroform | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 1,1,1-Trichloroethane | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Carbon Tetrachloride | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 1,2-Dichloroethane | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Benzene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Trichloroethylene (TCE) | ug/kg | 5.8 | J | 4.7 | U | 4.8 | U |
| 1,2-Dichloropropane | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Bromodichloromethane | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 2-Chloroethyl vinyl ether | ug/kg | 16 | R | 9.5 | R | 9.6 | R |
| cis-1,3-Dichloropropene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Methyl isobutyl ketone (4-Methyl-2-pentanone) | ug/kg | 16 | U | 9.5 | U | 9.6 | U |
| Toluene | ug/kg | 7.9 | U | 4 | J | 4.8 | U |
| trans-1,3-Dichloropropene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 1,1,2-Trichloroethane | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 2-Hexanone | ug/kg | 16 | U | 9.5 | U | 9.6 | U |
| Tetrachloroethylene (PCE) | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Dibromochloromethane | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Chlorobenzene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Ethylbenzene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| m+p Xylene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |

**Appendix A**

**Volatile Organic Compound Analytical Results for Surface Soil Samples**

*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | **StationID** | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|
| | **SampleID** | 181SB00101 (0-1ft) | | 181SB00201 (0-1ft) | | 181SB00301 (0-1ft) | |
| | **DateCollected** | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | **DateExtracted** | 4/21/2002 | | 4/19/2002 | | 4/19/2002 | |
| | **DateAnalyzed** | 4/21/2002 | | 4/19/2002 | | 4/19/2002 | |
| | **SDGNumber** | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | |
| o-Xylene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Xylenes, Total | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Styrene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| Bromoform | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 1,1,2,2-Tetrachloroethane | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 1,3-Dichlorobenzene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 1,4-Dichlorobenzene | ug/kg | 7.9 | U | 4.7 | UJ | 4.8 | UJ |
| 1,2-Dichlorobenzene | ug/kg | 7.9 | U | 4.7 | U | 4.8 | U |
| 1,2,4-Trichlorobenzene | ug/kg | 7.9 | UJ | 4.7 | UJ | 4.8 | UJ |
| 1,2,3-Trichlorobenzene | ug/kg | 7.9 | UJ | 4.7 | UJ | 4.8 | UJ |

**Notes:**

= indicates that the analyte was detected at the concentration reported

J indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.

U indicates that the concentration was not detected.

UJ indicates that the concentration was not detected and is estimated.

R indicates that the extract was reanalyzed without re-extraction.

**Appendix A**

**Volatile Organic Compound Analytical Results for Subsurface Soil Samples**

*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 181CB00102 (3-5ft) | | 181SB00102 (3-5ft) | | 181SB00202 (3-5ft) | | 181SB00302 (3-5ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | |
| | DateAnalyzed | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| Chloromethane | ug/kg | 14 | U | 12 | U | 12 | U | 9.6 | U |
| Vinyl chloride | ug/kg | 14 | U | 12 | U | 12 | U | 9.6 | U |
| Bromomethane | ug/kg | 14 | UJ | 12 | UJ | 12 | UJ | 9.6 | UJ |
| Chloroethane | ug/kg | 14 | U | 12 | U | 12 | U | 9.6 | U |
| 1,1-Dichloroethene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Acetone | ug/kg | 17 | UJ | 39 | UJ | 12 | UJ | 61 | UJ |
| Carbon Disulfide | ug/kg | 7.2 | UJ | 6.2 | UJ | 5.8 | UJ | 4.8 | UJ |
| Methylene Chloride | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| trans-1,2-Dichloroethene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,1-Dichloroethane | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Vinyl acetate | ug/kg | 14 | U | 12 | U | 12 | U | 9.6 | U |
| Methyl ethyl ketone (2-Butanone) | ug/kg | 14 | U | 12 | U | 12 | U | 16 | = |
| cis-1,2-Dichloroethylene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,2-Dichloroethene (total) | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Chloroform | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,1,1-Trichloroethane | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Carbon Tetrachloride | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,2-Dichloroethane | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Benzene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Trichloroethylene (TCE) | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,2-Dichloropropane | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Bromodichloromethane | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 2-Chloroethyl vinyl ether | ug/kg | 14 | R | 12 | R | 12 | R | 9.6 | R |
| cis-1,3-Dichloropropene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Methyl isobutyl ketone (4-Methyl-2-pentanone) | ug/kg | 14 | U | 12 | U | 12 | U | 9.6 | U |
| Toluene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| trans-1,3-Dichloropropene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,1,2-Trichloroethane | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 2-Hexanone | ug/kg | 14 | U | 12 | U | 12 | U | 9.6 | U |
| Tetrachloroethylene (PCE) | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Dibromochloromethane | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Chlorobenzene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Ethylbenzene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| m+p Xylene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |

**Appendix A**
**Volatile Organic Compound Analytical Results for Subsurface Soil Samples**
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | **StationID** | E181SB001 | | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|---|---|
| | **SampleID** | 181CB00102 (3-5ft) | | 181SB00102 (3-5ft) | | 181SB00202 (3-5ft) | | 181SB00302 (3-5ft) | |
| | **DateCollected** | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | **DateExtracted** | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | |
| | **DateAnalyzed** | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | |
| | **SDGNumber** | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| o-Xylene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Xylenes, Total | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Styrene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| Bromoform | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,1,2,2-Tetrachloroethane | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,3-Dichlorobenzene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,4-Dichlorobenzene | ug/kg | 7.2 | UJ | 6.2 | UJ | 5.8 | UJ | 4.8 | UJ |
| 1,2-Dichlorobenzene | ug/kg | 7.2 | U | 6.2 | U | 5.8 | U | 4.8 | U |
| 1,2,4-Trichlorobenzene | ug/kg | 7.2 | UJ | 6.2 | UJ | 5.8 | UJ | 4.8 | UJ |
| 1,2,3-Trichlorobenzene | ug/kg | 7.2 | UJ | 6.2 | UJ | 5.8 | UJ | 4.8 | UJ |

**Notes:**
= indicates that the analyte was detected at the concentration reported
J indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
U indicates that the concentration was not detected.
UJ indicates that the concentration was not detected and is estimated.
R indicates that the extract was reanalyzed without re-extraction.

**Appendix A**

**Semi-volatile Organic Compound Analytical Results for Surface Soil Samples**

*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|
| | SampleID | 181SB00101 (0-1ft) | | 181SB00201 (0-1ft) | | 181SB00301 (0-1ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/18/2002 | | 4/18/2002 | | 4/18/2002 | |
| | DateAnalyzed | 4/22/2002 | | 4/22/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | |
| N-Nitrosodiphenylamine | ug/kg | 460 | U | 390 | U | 380 | U |
| Phenol | ug/kg | 460 | U | 390 | U | 380 | U |
| bis(2-Chloroethyl) ether (2-Chloroethyl Ether) | ug/kg | 460 | U | 390 | U | 380 | U |
| Bis(2-Chloroisopropyl)Ether | ug/kg | 460 | U | 390 | U | 380 | U |
| 2-Chlorophenol | ug/kg | 460 | U | 390 | U | 380 | U |
| 1,4-Dichlorobenzene | ug/kg | 460 | U | 390 | U | 380 | U |
| Benzyl alcohol | ug/kg | 460 | U | 390 | U | 380 | U |
| 1,2-Dichlorobenzene | ug/kg | 460 | U | 390 | U | 380 | U |
| 1,3-Dichlorobenzene | ug/kg | 460 | U | 390 | U | 380 | U |
| 2-Methylphenol (o-Cresol) | ug/kg | 460 | U | 390 | U | 380 | U |
| N-Nitrosodi-n-propylamine | ug/kg | 460 | U | 390 | U | 380 | U |
| 3-Methylphenol/4-Methylphenol (mp-Cresol) | ug/kg | 460 | U | 390 | U | 380 | U |
| Hexachloroethane | ug/kg | 460 | U | 390 | U | 380 | U |
| Nitrobenzene | ug/kg | 460 | U | 390 | U | 380 | U |
| Isophorone | ug/kg | 460 | U | 390 | U | 380 | U |
| 2-Nitrophenol | ug/kg | 460 | U | 390 | U | 380 | U |
| 2,4-Dimethylphenol | ug/kg | 460 | U | 390 | U | 380 | U |
| bis(2-Chloroethoxy) Methane | ug/kg | 460 | U | 390 | U | 380 | U |
| 2,4-Dichlorophenol | ug/kg | 460 | U | 390 | U | 380 | U |
| Benzoic acid | ug/kg | 2200 | UJ | 1900 | UJ | 1800 | UJ |
| 1,2,4-Trichlorobenzene | ug/kg | 460 | U | 390 | U | 380 | U |
| Naphthalene | ug/kg | 460 | U | 390 | U | 380 | U |
| 4-Chloroaniline | ug/kg | 460 | U | 390 | U | 380 | U |
| Hexachlorobutadiene | ug/kg | 460 | U | 390 | U | 380 | U |
| 4-Chloro-3-methylphenol | ug/kg | 460 | U | 390 | U | 380 | U |
| 2-Methylnaphthalene | ug/kg | 460 | U | 390 | U | 380 | U |
| Hexachlorocyclopentadiene | ug/kg | 460 | U | 390 | U | 380 | U |
| 2,4,6-Trichlorophenol | ug/kg | 460 | U | 390 | U | 380 | U |
| 2,4,5-Trichlorophenol | ug/kg | 2200 | U | 1900 | U | 1800 | U |
| 2-Chloronaphthalene | ug/kg | 460 | U | 390 | U | 380 | U |
| 2-Nitroaniline | ug/kg | 2200 | U | 1900 | U | 1800 | U |
| 3-Nitroaniline | ug/kg | 2200 | U | 1900 | U | 1800 | U |
| Dimethyl Phthalate | ug/kg | 460 | U | 390 | U | 380 | U |

**Appendix A**

**Semi-volatile Organic Compound Analytical Results for Surface Soil Samples**

*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|
| | SampleID | 181SB00101 (0-1ft) | | 181SB00201 (0-1ft) | | 181SB00301 (0-1ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/18/2002 | | 4/18/2002 | | 4/18/2002 | |
| | DateAnalyzed | 4/22/2002 | | 4/22/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | |
| 2,6-Dinitrotoluene | ug/kg | 460 | U | 390 | U | 380 | U |
| Acenaphthylene | ug/kg | 460 | U | 390 | U | 380 | U |
| Acenaphthene | ug/kg | 460 | U | 390 | U | 380 | U |
| 2,4-Dinitrophenol | ug/kg | 2200 | U | 1900 | U | 1800 | U |
| Dibenzofuran | ug/kg | 460 | U | 390 | U | 380 | U |
| 2,4-Dinitrotoluene | ug/kg | 460 | U | 390 | U | 380 | U |
| Diethyl Phthalate | ug/kg | 460 | U | 390 | U | 380 | U |
| 4-Nitrophenol | ug/kg | 2200 | U | 1900 | U | 1800 | U |
| Fluorene | ug/kg | 460 | U | 390 | U | 380 | U |
| 4-Chlorophenyl Phenyl Ether | ug/kg | 460 | U | 390 | U | 380 | U |
| 4,6-Dinitro-2-methylphenol | ug/kg | 2200 | U | 1900 | U | 1800 | U |
| 4-Nitroaniline | ug/kg | 2200 | U | 1900 | U | 1800 | U |
| 4-Bromophenyl Phenyl Ether | ug/kg | 460 | U | 390 | U | 380 | U |
| Hexachlorobenzene | ug/kg | 460 | U | 390 | U | 380 | U |
| Pentachlorophenol | ug/kg | 2200 | U | 1900 | U | 1800 | U |
| Phenanthrene | ug/kg | 42 | J | 22 | J | 45 | J |
| Anthracene | ug/kg | 42 | J | 390 | U | 380 | U |
| Di-n-butyl Phthalate | ug/kg | 460 | U | 390 | U | 380 | U |
| Fluoranthene | ug/kg | 78 | J | 48 | J | 380 | U |
| Pyrene | ug/kg | 460 | U | 390 | U | 130 | J |
| Benzyl Butyl Phthalate | ug/kg | 460 | U | 390 | U | 380 | U |
| Benzo(a)Anthracene | ug/kg | 51 | J | 36 | J | 60 | J |
| 3,3'-Dichlorobenzidine | ug/kg | 920 | U | 780 | U | 750 | U |
| Chrysene | ug/kg | 60 | J | 48 | J | 73 | J |
| bis(2-Ethylhexyl) Phthalate | ug/kg | 460 | U | 160 | J | 150 | J |
| Di-n-octylphthalate | ug/kg | 460 | U | 390 | U | 380 | U |
| Benzo(b)Fluoranthene | ug/kg | 66 | J | 45 | J | 52 | J |
| Benzo(k)Fluoranthene | ug/kg | 51 | J | 390 | U | 56 | J |
| Benzo(a)Pyrene | ug/kg | 60 | J | 36 | J | 60 | J |
| Indeno(1,2,3-c,d)pyrene | ug/kg | 340 | J | 280 | J | 270 | J |
| Dibenz(a,h)anthracene | ug/kg | 460 | U | 390 | U | 380 | U |
| Benzo(g,h,i)Perylene | ug/kg | 68 | J | 37 | J | 45 | J |
| Carbazole | ug/kg | 460 | U | 390 | U | 380 | U |

**Appendix A**

**Semi-volatile Organic Compound Analytical Results for Surface Soil Samples**

*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | | | |
|---|---|---|---|
| **StationID** | E181SB001 | E181SB002 | E181SB003 |
| **SampleID** | 181SB00101 (0-1ft) | 181SB00201 (0-1ft) | 181SB00301 (0-1ft) |
| **DateCollected** | 4/16/2002 | 4/16/2002 | 4/16/2002 |
| **DateExtracted** | 4/18/2002 | 4/18/2002 | 4/18/2002 |
| **DateAnalyzed** | 4/22/2002 | 4/22/2002 | 4/22/2002 |
| **SDGNumber** | CNC95 | CNC95 | CNC95 |

**Notes:**

= indicates that the analyte was detected at the concentration reported

J indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.

U indicates that the concentration was not detected.

UJ indicates that the concentration was not detected and is estimated.

**Appendix A**

**Semi-volatile Organic Compound Analytical Results for Subsurface Soil Samples**

*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 181CB00102 (3-5ft) | | 181SB00102 (3-5ft) | | 181SB00202 (3-5ft) | | 181SB00302 (3-5ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/18/2002 | | 4/18/2002 | | 4/18/2002 | | 4/18/2002 | |
| | DateAnalyzed | 4/22/2002 | | 4/19/2002 | | 4/22/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| N-Nitrosodiphenylamine | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Phenol | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| bis(2-Chloroethyl) ether (2-Chloroethyl Ether) | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Bis(2-Chloroisopropyl)Ether | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2-Chlorophenol | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 1,4-Dichlorobenzene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Benzyl alcohol | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 1,2-Dichlorobenzene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 1,3-Dichlorobenzene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2-Methylphenol (o-Cresol) | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| N-Nitrosodi-n-propylamine | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 3-Methylphenol/4-Methylphenol (mp-Cresol) | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Hexachloroethane | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Nitrobenzene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Isophorone | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2-Nitrophenol | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2,4-Dimethylphenol | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| bis(2-Chloroethoxy) Methane | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2,4-Dichlorophenol | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Benzoic acid | ug/kg | 1900 | UJ | 2000 | UJ | 2000 | UJ | 1800 | UJ |
| 1,2,4-Trichlorobenzene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Naphthalene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 4-Chloroaniline | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Hexachlorobutadiene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 4-Chloro-3-methylphenol | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2-Methylnaphthalene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Hexachlorocyclopentadiene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2,4,6-Trichlorophenol | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2,4,5-Trichlorophenol | ug/kg | 1900 | U | 2000 | U | 2000 | U | 1800 | U |
| 2-Chloronaphthalene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2-Nitroaniline | ug/kg | 1900 | U | 2000 | U | 2000 | U | 1800 | U |
| 3-Nitroaniline | ug/kg | 1900 | U | 2000 | U | 2000 | U | 1800 | U |
| Dimethyl Phthalate | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 2,6-Dinitrotoluene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Acenaphthylene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |

**Appendix A**

**Semi-volatile Organic Compound Analytical Results for Subsurface Soil Samples**

*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 181CB00102 (3-5ft) | | 181SB00102 (3-5ft) | | 181SB00202 (3-5ft) | | 181SB00302 (3-5ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/18/2002 | | 4/18/2002 | | 4/18/2002 | | 4/18/2002 | |
| | DateAnalyzed | 4/22/2002 | | 4/19/2002 | | 4/22/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| Acenaphthene | ug/kg | 310 | J | 220 | J | 420 | U | 380 | U |
| 2,4-Dinitrophenol | ug/kg | 1900 | U | 2000 | U | 2000 | U | 1800 | U |
| Dibenzofuran | ug/kg | 150 | J | 87 | J | 420 | U | 380 | U |
| 2,4-Dinitrotoluene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Diethyl Phthalate | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 4-Nitrophenol | ug/kg | 1900 | U | 2000 | U | 2000 | U | 1800 | U |
| Fluorene | ug/kg | 310 | J | 190 | J | 420 | U | 380 | U |
| 4-Chlorophenyl Phenyl Ether | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| 4,6-Dinitro-2-methylphenol | ug/kg | 1900 | U | 2000 | U | 2000 | U | 1800 | U |
| 4-Nitroaniline | ug/kg | 1900 | U | 2000 | U | 2000 | U | 1800 | U |
| 4-Bromophenyl Phenyl Ether | ug/kg | 390 | U | 400 | U | 420 | U | 46 | J |
| Hexachlorobenzene | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Pentachlorophenol | ug/kg | 1900 | U | 2000 | U | 2000 | U | 1800 | U |
| Phenanthrene | ug/kg | 3400 | = | 2000 | = | 420 | U | 25 | J |
| Anthracene | ug/kg | 740 | = | 460 | = | 420 | U | 380 | U |
| Di-n-butyl Phthalate | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Fluoranthene | ug/kg | 3700 | = | 2500 | = | 420 | U | 46 | J |
| Pyrene | ug/kg | 3200 | = | 2300 | = | 420 | U | 380 | U |
| Benzyl Butyl Phthalate | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Benzo(a)Anthracene | ug/kg | 1300 | = | 960 | = | 31 | J | 33 | J |
| 3,3'-Dichlorobenzidine | ug/kg | 780 | U | 800 | U | 850 | U | 760 | U |
| Chrysene | ug/kg | 1400 | = | 960 | = | 39 | J | 40 | J |
| bis(2-Ethylhexyl) Phthalate | ug/kg | 320 | J | 350 | J | 420 | U | 160 | J |
| Di-n-octylphthalate | ug/kg | 390 | U | 400 | U | 420 | U | 380 | U |
| Benzo(b)Fluoranthene | ug/kg | 1000 | J | 630 | J | 37 | J | 44 | J |
| Benzo(k)Fluoranthene | ug/kg | 660 | = | 530 | = | 35 | J | 33 | J |
| Benzo(a)Pyrene | ug/kg | 850 | = | 630 | = | 420 | U | 39 | J |
| Indeno(1,2,3-c,d)pyrene | ug/kg | 650 | = | 540 | = | 300 | J | 270 | J |
| Dibenz(a,h)anthracene | ug/kg | 200 | J | 400 | U | 420 | U | 380 | U |
| Benzo(g,h,i)Perylene | ug/kg | 500 | = | 360 | J | 420 | U | 35 | J |
| Carbazole | ug/kg | 320 | J | 180 | J | 420 | U | 380 | U |

**Notes:**

= indicates that the analyte was detected at the concentration reported

J indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.

**Appendix A**

**Semi-volatile Organic Compound Analytical Results for Subsurface Soil Samples**

*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | E181SB001 | E181SB002 | E181SB003 |
|---|---|---|---|---|---|
| | SampleID | 181CB00102 (3-5ft) | 181SB00102 (3-5ft) | 181SB00202 (3-5ft) | 181SB00302 (3-5ft) |
| | DateCollected | 4/16/2002 | 4/16/2002 | 4/16/2002 | 4/16/2002 |
| | DateExtracted | 4/18/2002 | 4/18/2002 | 4/18/2002 | 4/18/2002 |
| | DateAnalyzed | 4/22/2002 | 4/19/2002 | 4/22/2002 | 4/22/2002 |
| | SDGNumber | CNC95 | CNC95 | CNC95 | CNC95 |
| **Parameter** | **Units** | | | | |

U indicates that the concentration was not detected.

UJ indicates that the concentration was not detected and is estimated.

**Appendix A**
**Pesticide Analytical Results for Surface Soil Samples**
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|
| | SampleID | 181SB00101 (0-1ft) | | 181SB00201 (0-1ft) | | 181SB00301 (0-1ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/18/2002 | | 4/18/2002 | | 4/18/2002 | |
| | DateAnalyzed | 4/20/2002 | | 4/20/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | |
| Aldrin | ug/kg | 1.8 | U | 1.5 | U | 1.5 | U |
| Alpha BHC (Alpha Hexachlorocyclohexane) | ug/kg | 1.8 | U | 1.5 | U | 1.5 | U |
| Alpha-chlordane | ug/kg | 0.67 | J | 1.5 | U | 1.5 | U |
| Beta BHC (Beta Hexachlorocyclohexane) | ug/kg | 1.8 | U | 1.5 | U | 1.5 | U |
| Chlordane | ug/kg | 18 | U | 15 | U | 15 | U |
| Delta BHC (Delta Hexachlorocyclohexane) | ug/kg | 1.8 | U | 1.5 | U | 1.5 | U |
| Dieldrin | ug/kg | 3.5 | U | 2.9 | U | 2.8 | U |
| Endosulfan I | ug/kg | 1.8 | U | 1.5 | U | 1.5 | U |
| Endosulfan II | ug/kg | 3.5 | U | 2.9 | U | 2.8 | U |
| Endosulfan Sulfate | ug/kg | 3.5 | U | 2.9 | U | 2.8 | U |
| Endrin Aldehyde | ug/kg | 3.5 | U | 2.9 | U | 2.8 | U |
| Endrin Ketone | ug/kg | 3.5 | U | 2.9 | U | 2.8 | U |
| Endrin | ug/kg | 3.5 | U | 2.9 | U | 2.8 | U |
| Gamma BHC (Lindane) | ug/kg | 1.8 | U | 1.5 | U | 1.5 | U |
| Gamma-chlordane | ug/kg | 0.98 | J | 1.5 | U | 1.5 | U |
| Heptachlor Epoxide | ug/kg | 0.62 | J | 1.5 | U | 1.5 | U |
| Heptachlor | ug/kg | 1.8 | U | 1.5 | U | 1.5 | U |
| Methoxychlor | ug/kg | 18 | U | 15 | U | 15 | U |
| p,p'-DDD | ug/kg | 3.5 | U | 2.9 | U | 2.8 | U |
| p,p'-DDE | ug/kg | 3.5 | U | 2.9 | U | 2.8 | U |
| p,p'-DDT | ug/kg | 3.5 | UJ | 2.9 | UJ | 2.8 | U |
| Toxaphene | ug/kg | 120 | U | 98 | U | 94 | U |

**Notes:**
= indicates that the analyte was detected at the concentration reported
J indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantif
U indicates that the concentration was not detected.
UJ indicates that the concentration was not detected and is estimated.

**Appendix A**
**Pesticide Analytical Results for Subsurface Soil Samples**
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 181CB00102 (3-5ft) | | 181SB00102 (3-5ft) | | 181SB00202 (3-5ft) | | 181SB00302 (3-5ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/18/2002 | | 4/18/2002 | | 4/23/2002 | | 4/18/2002 | |
| | DateAnalyzed | 4/20/2002 | | 4/20/2002 | | 4/24/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| Aldrin | ug/kg | 1.5 | U | 1.6 | U | 1.7 | U | 1.5 | U |
| Alpha BHC (Alpha Hexachlorocyclohexane) | ug/kg | 1.5 | U | 1.6 | U | 1.7 | U | 1.5 | U |
| Alpha-chlordane | ug/kg | 1.5 | U | 1.6 | U | 1.7 | U | 1.5 | U |
| Beta BHC (Beta Hexachlorocyclohexane) | ug/kg | 1.5 | U | 1.6 | U | 1.7 | U | 1.5 | U |
| Chlordane | ug/kg | 15 | U | 16 | U | 17 | U | 15 | U |
| Delta BHC (Delta Hexachlorocyclohexane) | ug/kg | 1.5 | U | 1.6 | U | 1.7 | U | 1.5 | U |
| Dieldrin | ug/kg | 0.61 | J | 1 | J | 3.2 | U | 2.9 | U |
| Endosulfan I | ug/kg | 1.5 | U | 1.6 | U | 1.7 | U | 1.5 | U |
| Endosulfan II | ug/kg | 3 | U | 3 | U | 3.2 | U | 2.9 | U |
| Endosulfan Sulfate | ug/kg | 3 | U | 3 | U | 3.2 | U | 2.9 | U |
| Endrin Aldehyde | ug/kg | 3 | U | 3 | U | 3.2 | U | 2.9 | U |
| Endrin Ketone | ug/kg | 3.4 | J | 3 | U | 3.2 | U | 2.9 | U |
| Endrin | ug/kg | 3 | U | 3 | U | 3.2 | U | 2.9 | U |
| Gamma BHC (Lindane) | ug/kg | 1.5 | U | 1.6 | U | 1.7 | U | 1.5 | U |
| Gamma-chlordane | ug/kg | 1.5 | U | 1.6 | U | 1.7 | U | 1.5 | U |
| Heptachlor Epoxide | ug/kg | 1.5 | U | 0.42 | J | 1.7 | U | 1.5 | U |
| Heptachlor | ug/kg | 1.5 | U | 1.6 | U | 0.46 | J | 1.5 | U |
| Methoxychlor | ug/kg | 15 | U | 16 | U | 17 | U | 15 | U |
| p,p'-DDD | ug/kg | 3 | U | 3 | U | 3.2 | U | 2.9 | U |
| p,p'-DDE | ug/kg | 3 | U | 3 | U | 3.2 | U | 2.9 | U |
| p,p'-DDT | ug/kg | 3.1 | J | 1.8 | J | 3.2 | U | 2.9 | U |
| Toxaphene | ug/kg | 99 | U | 100 | U | 110 | U | 95 | U |

**Notes:**
= indicates that the analyte was detected at the concentration reported
J indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
U indicates that the concentration was not detected.

**Appendix A**
**PCB Analytical Results for Surface Soil Samples**
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|
| | SampleID | 181SB00101 (0-1ft) | | 181SB00201 (0-1ft) | | 181SB00301 (0-1ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/18/2002 | | 4/18/2002 | | 4/18/2002 | |
| | DateAnalyzed | 4/20/2002 | | 4/20/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | |
| PCB-1016 (Arochlor 1016) | ug/kg | 46 | U | 39 | U | 38 | U |
| PCB-1221 (Arochlor 1221) | ug/kg | 46 | U | 39 | U | 38 | U |
| PCB-1232 (Arochlor 1232) | ug/kg | 46 | U | 39 | U | 38 | U |
| PCB-1242 (Arochlor 1242) | ug/kg | 46 | U | 39 | U | 38 | U |
| PCB-1248 (Arochlor 1248) | ug/kg | 46 | U | 39 | U | 38 | U |
| PCB-1254 (Arochlor 1254) | ug/kg | 15 | J | 180 | = | 110 | = |
| PCB-1260 (Arochlor 1260) | ug/kg | 32 | J | 39 | J | 34 | J |

**Notes:**
= indicates that the analyte was detected at the concentration reported
J indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quant
U indicates that the concentration was not detected.
UJ indicates that the concentration was not detected and is estimated.

**Appendix A**
**PCB Analytical Results for Subsurface Soil Samples**
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 181CB00102 (3-5ft) | | 181SB00102 (3-5ft) | | 181SB00202 (3-5ft) | | 181SB00302 (3-5ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/18/2002 | | 4/18/2002 | | 4/23/2002 | | 4/18/2002 | |
| | DateAnalyzed | 4/20/2002 | | 4/20/2002 | | 4/24/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| PCB-1016 (Arochlor 1016) | ug/kg | 39 | U | 40 | U | 42 | UJ | 38 | U |
| PCB-1221 (Arochlor 1221) | ug/kg | 39 | U | 40 | U | 42 | U | 38 | U |
| PCB-1232 (Arochlor 1232) | ug/kg | 39 | U | 40 | U | 42 | U | 38 | U |
| PCB-1242 (Arochlor 1242) | ug/kg | 39 | U | 40 | U | 42 | U | 38 | U |
| PCB-1248 (Arochlor 1248) | ug/kg | 39 | U | 40 | U | 42 | U | 38 | U |
| PCB-1254 (Arochlor 1254) | ug/kg | 80 | U | 82 | U | 43 | J | 90 | = |
| PCB-1260 (Arochlor 1260) | ug/kg | 80 | U | 82 | U | 22 | J | 34 | J |

**Notes:**
= indicates that the analyte was detected at the concentration reported
J indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification li
U indicates that the concentration was not detected.
UJ indicates that the concentration was not detected and is estimated.

**Appendix A**
**Inorganic Constituent Analytical Results for Surface Soil Samples**
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|
| | SampleID | 181SB00101 (0-1ft) | | 181SB00201 (0-1ft) | | 181SB00301 (0-1ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | |
| | DateAnalyzed(1) | 4/23/2002 | | 4/23/2002 | | 4/23/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | |
| Aluminum | mg/kg | 5600 | = | 6500 | = | 4100 | = |
| Antimony | mg/kg | 1.6 | UJ | 0.82 | UJ | 0.68 | UJ |
| Arsenic | mg/kg | 4.2 | = | 4.1 | = | 24 | = |
| Barium | mg/kg | 22 | J | 26 | J | 20 | J |
| Beryllium | mg/kg | 0.55 | J | 0.3 | J | 0.21 | J |
| Cadmium | mg/kg | 0.63 | J | 0.38 | J | 0.95 | = |
| Calcium | mg/kg | 47000 | = | 49000 | = | 26000 | = |
| Chromium, Total | mg/kg | 17 | = | 19 | = | 34 | = |
| Cobalt | mg/kg | 1.9 | J | 1.9 | J | 7.3 | J |
| Copper | mg/kg | 33 | J | 17 | J | 380 | J |
| Iron | mg/kg | 6100 | = | 7800 | = | 40000 | = |
| Lead | mg/kg | 43 | = | 39 | = | 50 | = |
| Magnesium | mg/kg | 1300 | J | 1600 | J | 1100 | J |
| Manganese | mg/kg | 86 | J | 91 | J | 290 | J |
| Nickel | mg/kg | 7.3 | J | 8 | J | 19 | = |
| Potassium | mg/kg | 450 | J | 680 | J | 610 | J |
| Selenium | mg/kg | 0.54 | U | 0.46 | U | 0.83 | J |
| Silver | mg/kg | 0.27 | J | 0.2 | U | 0.18 | U |
| Sodium | mg/kg | 130 | UJ | 190 | UJ | 110 | UJ |
| Thallium | mg/kg | 1.4 | U | 0.61 | U | 0.54 | U |
| Vanadium | mg/kg | 13 | = | 16 | = | 12 | = |
| Zinc | mg/kg | 76 | = | 67 | = | 120 | = |
| Mercury (1) | mg/kg | 0.22 | J | 0.23 | J | 0.25 | J |

(1) All mercury samples were extracted on 4/18/2002 and analyzed on 4/20/2002
= indicates that the analyte was detected at the concentration reported
J indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantific
U indicates that the concentration was not detected.
UJ indicates that the concentration was not detected and is estimated.

**Appendix A**
**Inorganic Constituent Analytical Results for Subsurface Soil Samples**
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 181CB00102 (3-5ft) | | 181SB00102 (3-5ft) | | 181SB00202 (3-5ft) | | 181SB00302 (3-5ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | |
| | DateAnalyzed | 4/23/2002 | | 4/23/2002 | | 4/23/2002 | | 4/23/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| Aluminum | mg/kg | 5300 | = | 7100 | = | 5800 | = | 6500 | = |
| Antimony | mg/kg | 0.6 | UJ | 0.55 | UJ | 0.76 | UJ | 1.1 | UJ |
| Arsenic | mg/kg | 2.2 | J | 4.8 | = | 3 | = | 4.7 | = |
| Barium | mg/kg | 20 | J | 50 | = | 25 | J | 25 | J |
| Beryllium | mg/kg | 0.18 | J | 0.42 | J | 0.29 | J | 0.35 | J |
| Cadmium | mg/kg | 0.1 | U | 0.12 | J | 0.16 | J | 0.29 | J |
| Calcium | mg/kg | 11000 | = | 26000 | = | 13000 | = | 34000 | = |
| Chromium, Total | mg/kg | 9.8 | = | 18 | = | 14 | = | 19 | = |
| Cobalt | mg/kg | 1.2 | J | 3.3 | J | 1.7 | J | 1.7 | J |
| Copper | mg/kg | 7.8 | J | 12 | J | 14 | J | 27 | J |
| Iron | mg/kg | 3000 | = | 6200 | = | 5500 | = | 7200 | = |
| Lead | mg/kg | 15 | = | 10 | = | 33 | = | 36 | = |
| Magnesium | mg/kg | 560 | J | 1900 | J | 810 | J | 1500 | J |
| Manganese | mg/kg | 25 | J | 82 | J | 44 | J | 68 | J |
| Nickel | mg/kg | 2.9 | J | 7.4 | J | 6.2 | J | 7.9 | J |
| Potassium | mg/kg | 390 | J | 2200 | = | 430 | J | 670 | J |
| Selenium | mg/kg | 0.51 | U | 0.48 | U | 0.46 | U | 0.49 | U |
| Silver | mg/kg | 0.23 | U | 0.21 | U | 0.2 | U | 0.22 | U |
| Sodium | mg/kg | 58 | UJ | 55 | UJ | 82 | UJ | 300 | UJ |
| Thallium | mg/kg | 0.68 | U | 0.63 | U | 0.61 | U | 0.72 | U |
| Vanadium | mg/kg | 9.2 | J | 17 | = | 13 | = | 16 | = |
| Zinc | mg/kg | 32 | = | 30 | = | 37 | = | 64 | = |
| Mercury (1) | mg/kg | 0.055 | J | 0.05 | J | 0.098 | J | 0.16 | J |

**Notes:**
(1) All mercury samples were extracted on 4/18/2002 and analyzed on 4/20/2002
= indicates that the analyte was detected at the concentration reported

**Appendix A**
**Cyanide Analytical Results for Surface Soil Samples**
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | StationID | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|
| | SampleID | 181SB00101 (0-1ft) | | 181SB00201 (0-1ft) | | 181SB00301 (0-1ft) | |
| | DateCollected | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | DateExtracted | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | |
| | DateAnalyzed | 4/23/2002 | | 4/23/2002 | | 4/23/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | |
| Cyanide | mg/kg | 1.4 | U | 1.2 | U | 1.1 | U |

**Notes:**
U indicates that the concentration was not detected.

**Appendix A**
**Cyanide Analytical Results for Subsurface Soil Samples**
*RFI Report Addendum, SMWU 181, Zone E, Charleston Naval Complex*

| | **StationID** | E181SB001 | | E181SB001 | | E181SB002 | | E181SB003 | |
|---|---|---|---|---|---|---|---|---|---|
| | **SampleID** | 181CB00102 (3-5ft) | | 181SB00102 (3-5ft) | | 181SB00202 (3-5ft) | | 181SB00302 (3-5ft) | |
| | **DateCollected** | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | | 4/16/2002 | |
| | **DateExtracted** | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | | 4/19/2002 | |
| | **DateAnalyzed** | 4/23/2002 | | 4/23/2002 | | 4/23/2002 | | 4/23/2002 | |
| | **SDGNumber** | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| Cyanide | mg/kg | 1.2 | U | 1.2 | U | 1.3 | U | 1.1 | U |

**Notes:**
U indicates that the concentration was not detected.

**APPENDIX A-1**
**Results of VOC Analyses**
**on QA/QC Samples for SDG CNC95**
*RFI Report Addendum, SWMU 181, Zone E*
*Charleston Naval Complex*

| | StationID | FIELDQC | | FIELDQC | | FIELDQC | | FIELDQC | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 181EB001M1 | | 188EB001M1 | | 188TB001M1 | | 704EB001M1 | |
| | DateCollected | 4/16/2002 | | 4/15/2002 | | 4/15/2002 | | 4/15/2002 | |
| | DateExtracted | 4/21/2002 | | 4/21/2002 | | 4/21/2002 | | 4/21/2002 | |
| | DateAnalyzed | 4/21/2002 | | 4/21/2002 | | 4/21/2002 | | 4/21/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| Chloromethane | ug/kg | | | | | | | | |
| Chloromethane | ug/l | 10 | U | 10 | U | 10 | U | 10 | U |
| Vinyl chloride | ug/kg | | | | | | | | |
| Vinyl chloride | ug/l | 10 | U | 10 | U | 10 | U | 10 | U |
| Bromomethane | ug/kg | | | | | | | | |
| Bromomethane | ug/l | 10 | U | 10 | U | 10 | U | 10 | U |
| Chloroethane | ug/kg | | | | | | | | |
| Chloroethane | ug/l | 10 | U | 10 | U | 10 | U | 10 | U |
| 1,1-Dichloroethene | ug/kg | | | | | | | | |
| 1,1-Dichloroethene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Acetone | ug/kg | | | | | | | | |
| Acetone | ug/l | 10 | U | 8 | J | 10 | U | 4.4 | J |
| Carbon Disulfide | ug/kg | | | | | | | | |
| Carbon Disulfide | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Methylene Chloride | ug/kg | | | | | | | | |
| Methylene Chloride | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| trans-1,2-Dichloroethene | ug/kg | | | | | | | | |
| trans-1,2-Dichloroethene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,1-Dichloroethane | ug/kg | | | | | | | | |
| 1,1-Dichloroethane | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Vinyl acetate | ug/kg | | | | | | | | |
| Vinyl acetate | ug/l | 10 | U | 10 | U | 10 | U | 10 | U |
| Methyl ethyl ketone (2-Butanone) | ug/kg | | | | | | | | |
| Methyl ethyl ketone (2-Butanone) | ug/l | 10 | U | 10 | U | 10 | U | 10 | U |
| cis-1,2-Dichloroethylene | ug/kg | | | | | | | | |
| cis-1,2-Dichloroethylene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,2-Dichloroethene (total) | ug/kg | | | | | | | | |
| 1,2-Dichloroethene (total) | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Chloroform | ug/kg | | | | | | | | |
| Chloroform | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,1,1-Trichloroethane | ug/kg | | | | | | | | |
| 1,1,1-Trichloroethane | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Carbon Tetrachloride | ug/kg | | | | | | | | |
| Carbon Tetrachloride | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,2-Dichloroethane | ug/kg | | | | | | | | |
| 1,2-Dichloroethane | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Benzene | ug/kg | | | | | | | | |
| Benzene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Trichloroethylene (TCE) | ug/kg | | | | | | | | |
| Trichloroethylene (TCE) | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,2-Dichloropropane | ug/kg | | | | | | | | |
| 1,2-Dichloropropane | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Bromodichloromethane | ug/kg | | | | | | | | |
| Bromodichloromethane | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 2-Chloroethyl vinyl ether | ug/kg | | | | | | | | |
| 2-Chloroethyl vinyl ether | ug/l | 10 | U | 10 | U | 10 | U | 10 | U |
| cis-1,3-Dichloropropene | ug/kg | | | | | | | | |
| cis-1,3-Dichloropropene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Methyl isobutyl ketone (4-Methyl-2-pentanone) | ug/kg | | | | | | | | |
| Methyl isobutyl ketone (4-Methyl-2-pentanone) | ug/l | 10 | U | 10 | U | 10 | U | 10 | U |
| Toluene | ug/kg | | | | | | | | |
| Toluene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| trans-1,3-Dichloropropene | ug/kg | | | | | | | | |

**APPENDIX A-1**
**Results of VOC Analyses**
**on QA/QC Samples for SDG CNC95**
*RFI Report Addendum, SWMU 181, Zone E*
*Charleston Naval Complex*

| | StationID | FIELDQC | | FIELDQC | | FIELDQC | | FIELDQC | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 181EB001M1 | | 188EB001M1 | | 188TB001M1 | | 704EB001M1 | |
| | DateCollected | 4/16/2002 | | 4/15/2002 | | 4/15/2002 | | 4/15/2002 | |
| | DateExtracted | 4/21/2002 | | 4/21/2002 | | 4/21/2002 | | 4/21/2002 | |
| | DateAnalyzed | 4/21/2002 | | 4/21/2002 | | 4/21/2002 | | 4/21/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| Parameter | Units | | | | | | | | |
| trans-1,3-Dichloropropene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,1,2-Trichloroethane | ug/kg | | | | | | | | |
| 1,1,2-Trichloroethane | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 2-Hexanone | ug/kg | | | | | | | | |
| 2-Hexanone | ug/l | 10 | U | 10 | U | 10 | U | 10 | U |
| Tetrachloroethylene (PCE) | ug/kg | | | | | | | | |
| Tetrachloroethylene (PCE) | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Dibromochloromethane | ug/kg | | | | | | | | |
| Dibromochloromethane | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Chlorobenzene | ug/kg | | | | | | | | |
| Chlorobenzene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Ethylbenzene | ug/kg | | | | | | | | |
| Ethylbenzene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| m+p Xylene | ug/kg | | | | | | | | |
| m+p Xylene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| o-Xylene | ug/kg | | | | | | | | |
| o-Xylene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Xylenes, Total | ug/kg | | | | | | | | |
| Xylenes, Total | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Styrene | ug/kg | | | | | | | | |
| Styrene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| Bromoform | ug/kg | | | | | | | | |
| Bromoform | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,1,2,2-Tetrachloroethane | ug/kg | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,3-Dichlorobenzene | ug/kg | | | | | | | | |
| 1,3-Dichlorobenzene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,4-Dichlorobenzene | ug/kg | | | | | | | | |
| 1,4-Dichlorobenzene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,2-Dichlorobenzene | ug/kg | | | | | | | | |
| 1,2-Dichlorobenzene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,2,4-Trichlorobenzene | ug/kg | | | | | | | | |
| 1,2,4-Trichlorobenzene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,2,3-Trichlorobenzene | ug/kg | | | | | | | | |
| 1,2,3-Trichlorobenzene | ug/l | 5 | U | 5 | U | 5 | U | 5 | U |

**APPENDIX A-1**
**Results of VOC Analyses**
**on QA/QC Samples for SDG CNC95**
*RFI Report Addendum, SWMU 181, Zone E*
*Charleston Naval Complex*

| | StationID | FIELDQC | | LABQC | | LABQC | | LABQC | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 704TB001M1 | | 4264723LB | | 4264737LB | | 4264744LB | |
| | DateCollected | 4/15/2002 | | | | | | | |
| | DateExtracted | 4/21/2002 | | 4/19/2002 | | 4/21/2002 | | 4/22/2002 | |
| | DateAnalyzed | 4/21/2002 | | 4/19/2002 | | 4/21/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| Chloromethane | ug/kg | | | 10 | U | | | 10 | U |
| Chloromethane | ug/l | 10 | U | | | 10 | U | | |
| Vinyl chloride | ug/kg | | | 10 | U | | | 10 | U |
| Vinyl chloride | ug/l | 10 | U | | | 10 | U | | |
| Bromomethane | ug/kg | | | 10 | U | | | 10 | U |
| Bromomethane | ug/l | 10 | U | | | 10 | U | | |
| Chloroethane | ug/kg | | | 10 | U | | | 10 | U |
| Chloroethane | ug/l | 10 | U | | | 10 | U | | |
| 1,1-Dichloroethene | ug/kg | | | 5 | U | | | 5 | U |
| 1,1-Dichloroethene | ug/l | 5 | U | | | 5 | U | | |
| Acetone | ug/kg | | | 6.3 | J | | | 9.2 | J |
| Acetone | ug/l | 10 | U | | | 10 | U | | |
| Carbon Disulfide | ug/kg | | | 5 | U | | | 5 | U |
| Carbon Disulfide | ug/l | 5 | U | | | 5 | U | | |
| Methylene Chloride | ug/kg | | | 5 | U | | | 5 | U |
| Methylene Chloride | ug/l | 5 | U | | | 5 | U | | |
| trans-1,2-Dichloroethene | ug/kg | | | 5 | U | | | 5 | U |
| trans-1,2-Dichloroethene | ug/l | 5 | U | | | 5 | U | | |
| 1,1-Dichloroethane | ug/kg | | | 5 | U | | | 5 | U |
| 1,1-Dichloroethane | ug/l | 5 | U | | | 5 | U | | |
| Vinyl acetate | ug/kg | | | 10 | U | | | 10 | U |
| Vinyl acetate | ug/l | 10 | U | | | 10 | U | | |
| Methyl ethyl ketone (2-Butanone) | ug/kg | | | 10 | U | | | 4.1 | J |
| Methyl ethyl ketone (2-Butanone) | ug/l | 10 | U | | | 10 | U | | |
| cis-1,2-Dichloroethylene | ug/kg | | | 5 | U | | | 5 | U |
| cis-1,2-Dichloroethylene | ug/l | 5 | U | | | 5 | U | | |
| 1,2-Dichloroethene (total) | ug/kg | | | 5 | U | | | 5 | U |
| 1,2-Dichloroethene (total) | ug/l | 5 | U | | | 5 | U | | |
| Chloroform | ug/kg | | | 5 | U | | | 5 | U |
| Chloroform | ug/l | 5 | U | | | 5 | U | | |
| 1,1,1-Trichloroethane | ug/kg | | | 5 | U | | | 5 | U |
| 1,1,1-Trichloroethane | ug/l | 5 | U | | | 5 | U | | |
| Carbon Tetrachloride | ug/kg | | | 5 | U | | | 5 | U |
| Carbon Tetrachloride | ug/l | 5 | U | | | 5 | U | | |
| 1,2-Dichloroethane | ug/kg | | | 5 | U | | | 5 | U |
| 1,2-Dichloroethane | ug/l | 5 | U | | | 5 | U | | |
| Benzene | ug/kg | | | 5 | U | | | 5 | U |
| Benzene | ug/l | 5 | U | | | 5 | U | | |
| Trichloroethylene (TCE) | ug/kg | | | 5 | U | | | 5 | U |
| Trichloroethylene (TCE) | ug/l | 5 | U | | | 5 | U | | |
| 1,2-Dichloropropane | ug/kg | | | 5 | U | | | 5 | U |
| 1,2-Dichloropropane | ug/l | 5 | U | | | 5 | U | | |
| Bromodichloromethane | ug/kg | | | 5 | U | | | 5 | U |
| Bromodichloromethane | ug/l | 5 | U | | | 5 | U | | |
| 2-Chloroethyl vinyl ether | ug/kg | | | 10 | U | | | 10 | U |
| 2-Chloroethyl vinyl ether | ug/l | 10 | U | | | 10 | U | | |
| cis-1,3-Dichloropropene | ug/kg | | | 5 | U | | | 5 | U |
| cis-1,3-Dichloropropene | ug/l | 5 | U | | | 5 | U | | |
| Methyl isobutyl ketone (4-Methyl-2-pentanone) | ug/kg | | | 10 | U | | | 10 | U |
| Methyl isobutyl ketone (4-Methyl-2-pentanone) | ug/l | 10 | U | | | 10 | U | | |
| Toluene | ug/kg | | | 5 | U | | | 5 | U |
| Toluene | ug/l | 5 | U | | | 5 | U | | |
| trans-1,3-Dichloropropene | ug/kg | | | 5 | U | | | 5 | U |

**APPENDIX A-1**
**Results of VOC Analyses**
**on QA/QC Samples for SDG CNC95**
*RFI Report Addendum, SWMU 181, Zone E*
*Charleston Naval Complex*

| | StationID | FIELDQC | | LABQC | | LABQC | | LABQC | |
|---|---|---|---|---|---|---|---|---|---|
| | SampleID | 704TB001M1 | | 4264723LB | | 4264737LB | | 4264744LB | |
| | DateCollected | 4/15/2002 | | | | | | | |
| | DateExtracted | 4/21/2002 | | 4/19/2002 | | 4/21/2002 | | 4/22/2002 | |
| | DateAnalyzed | 4/21/2002 | | 4/19/2002 | | 4/21/2002 | | 4/22/2002 | |
| | SDGNumber | CNC95 | | CNC95 | | CNC95 | | CNC95 | |
| **Parameter** | **Units** | | | | | | | | |
| trans-1,3-Dichloropropene | ug/l | 5 | U | | | 5 * | U | | |
| 1,1,2-Trichloroethane | ug/kg | | | 5 | U | | | 5 | U |
| 1,1,2-Trichloroethane | ug/l | 5 | U | | | 5 | U | | |
| 2-Hexanone | ug/kg | | | 10 | U | | | 10 | U |
| 2-Hexanone | ug/l | 10 | U | | | 10 | U | | |
| Tetrachloroethylene (PCE) | ug/kg | | | 5 | U | | | 5 | U |
| Tetrachloroethylene (PCE) | ug/l | 5 | U | | | 5 | U | | |
| Dibromochloromethane | ug/kg | | | 5 | U | | | 5 | U |
| Dibromochloromethane | ug/l | 5 | U | | | 5 | U | | |
| Chlorobenzene | ug/kg | | | 5 | U | | | 5 | U |
| Chlorobenzene | ug/l | 5 | U | | | 5 | U | | |
| Ethylbenzene | ug/kg | | | 5 | U | | | 5 | U |
| Ethylbenzene | ug/l | 5 | U | | | 5 | U | | |
| m+p Xylene | ug/kg | | | 5 | U | | | 5 | U |
| m+p Xylene | ug/l | 5 | U | | | 5 | U | | |
| o-Xylene | ug/kg | | | 5 | U | | | 5 | U |
| o-Xylene | ug/l | 5 | U | | | 5 | U | | |
| Xylenes, Total | ug/kg | | | 5 | U | | | 5 | U |
| Xylenes, Total | ug/l | 5 | U | | | 5 | U | | |
| Styrene | ug/kg | | | 5 | U | | | 5 | U |
| Styrene | ug/l | 5 | U | | | 5 | U | | |
| Bromoform | ug/kg | | | 5 | U | | | 5 | U |
| Bromoform | ug/l | 5 | U | | | 5 | U | | |
| 1,1,2,2-Tetrachloroethane | ug/kg | | | 5 | U | | | 5 | U |
| 1,1,2,2-Tetrachloroethane | ug/l | 5 | U | | | 5 | U | | |
| 1,3-Dichlorobenzene | ug/kg | | | 5 | U | | | 5 | U |
| 1,3-Dichlorobenzene | ug/l | 5 | U | | | 5 | U | | |
| 1,4-Dichlorobenzene | ug/kg | | | 5 | U | | | 5 | U |
| 1,4-Dichlorobenzene | ug/l | 5 | U | | | 5 | U | | |
| 1,2-Dichlorobenzene | ug/kg | | | 5 | U | | | 5 | U |
| 1,2-Dichlorobenzene | ug/l | 5 | U | | | 5 | U | | |
| 1,2,4-Trichlorobenzene | ug/kg | | | 5 | U | | | 5 | U |
| 1,2,4-Trichlorobenzene | ug/l | 5 | U | | | 5 | U | | |
| 1,2,3-Trichlorobenzene | ug/kg | | | 5 | U | | | 5 | U |
| 1,2,3-Trichlorobenzene | ug/l | 5 | U | | | 5 | U | | |

# Appendix B

# Data Validation Summary - Charleston Naval Complex - Zone E, SWMU 181

TO: Kris Garcia/CH2M HILL/ATL

FROM: Amy Juchem/CH2M HILL/GNA
Herb Kelly/CH2M HILL/GNA

DATE: May 21, 2002

The purpose of this memorandum is to present the results of the data validation process for the samples collected SWMU 181 in Zone E. The samples were collected on April 16, 2002.

The specific samples and analytical fractions reviewed are summarized below in Table 1.

The Quality Control areas that were review and the resulting findings are documented within each subsection that follows. This data was validated for compliance with the analytical method requirements. This process also included a review of the data to assess the accuracy, precision, and completeness based upon procedures described in the guidance documents such as the Environmental Protection Agency (EPA) *National Functional Guidelines for Inorganic Data Review (EPA 1994) and National Functional Guidelines for Organic Data Review (EPA 1999)*. Quality assurance/quality control (QA/QC) summary forms and data reports were reviewed.

Samples were submitted to Severn Trent Services, STL Savannah Laboratories, Inc., in Savannah, Georgia, for the following analyses: SW-846 8260 Volatile Organic Compounds (VOC), SW-846 8270 Semivolatile Organic Compounds (SVOC), SW-846 8081 Organochlorine Pesticides, SW-846 8082 Polychlorinated Biphenyls, Metals following SW-846 6010/7000 Series methodology, and SW-846 9012 Cyanide.

Sample results that were not within the acceptance limits were appended with a qualifying flag, which consisted of a single- or double-letter code that indicated a possible problem with the data. The qualifying flags originated during the data review and validation processes. These also include the secondary, or the two-digit "sub-qualifier" flags. The secondary qualifiers provide the reasoning behind the assignment of a qualifier flag to the data. The secondary qualifiers are presented and defined below.

Attachment 1 lists the changes in data qualifiers, due to the validation process.

The following primary flags were used to qualify the data:

[=] Detected. The analyte was analyzed for and detected at the concentration shown.

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

[U] Undetected. The analyte was analyzed for but not detected above the method detection limit.

[UJ] Detection limit estimated. The analyte was analyzed for but qualified as not detected; the result is estimated.

[R] Rejected. The data is not useable.

## Secondary Data Validation Qualifiers

| Code | Definition |
|---|---|
| 2S | Second Source |
| BL | Blank |
| BD | Blank Spike/Blank Spike Duplicate or (LCS/LCSD) Precision |
| BS | Blank Spike/LCS |
| CC | Continuing Calibration Verification |
| DL | Dilution |
| FD | Field Duplicate |
| HT | Holding Time |
| IB | In-Between (metals - B's → J's ) |
| IC | Initial Calibration |
| IS | Internal Standard |
| LD | Lab Duplicate |
| LR | Concentration exceeded Linear Range |
| MD | MS/MSD or LCS/LCSD Precision |
| MS | Matrix Spike/Matrix Spike Duplicate |
| OT | Other (see DV worksheet) |
| PD | Pesticide Degradation |
| PS | Post Spike |
| RE | Re-extraction/Re-analysis |
| SD | Serial Dilution |
| SS | Spiked Surrogate |
| TN | Tune |

## Table 1 - Chemical Analytical Methods – Field and Quality Control Samples

| SDG | Station ID | Sample ID | Lab Sample ID | Date Collected | Matrix | Sample Type | Upper Depth | Lower Depth | VOC SW8260B | SVOC SW8270C | Pest SW8081A | PCBs SW8081 | Metals SW6010B | Mercury SW7471A | Cyanide SW9012A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNC95 | E181SB001 | 181SB00101 | S242647*7 | 04/16/02 | SO | N | 0 | 1 | X | X | X | X | X | X | X |
| CNC95 | E181SB001 | 181SB00102 | S242647*8 | 04/16/02 | SO | N | 3 | 5 | X | X | X | X | X | X | X |
| CNC95 | FIELDQC | 181CB00102 | S242647*9 | 04/16/02 | SO | FD | 3 | 5 | X | X | X | X | X | X | X |
| CNC95 | E181SB002 | 181SB00201 | S242647*10 | 04/16/02 | SO | N | 0 | 1 | X | X | X | X | X | X | X |
| CNC95 | E181SB002 | 181SB00202 | S242647*11 | 04/16/02 | SO | N | 3 | 5 | X | X | X | X | X | X | X |
| CNC95 | E181SB003 | 181SB00301 | S242647*12 | 04/16/02 | SO | N | 0 | 1 | X | X | X | X | X | X | X |
| CNC95 | E181SB003 | 181SB00302 | S242647*13 | 04/16/02 | SO | N | 3 | 5 | X | X | X | X | X | X | X |
| CNC95 | FIELDQC | 181EB001M1 | S242647*19 | 04/16/02 | WQ | EB | | | X | X | X | X | X | X | X |
| CNC95 | LABQC | 4264723LB | S242647*23 | | SQ | LB | | | X | X | X | X | X | X | X |
| CNC95 | LABQC | 4264724BS | S242647*24 | | SQ | BS | | | X | X | X | X | X | X | X |
| CNC95 | LABQC | 4264737LB | S242647*37 | | WQ | LB | | | X | X | X | X | X | X | X |
| CNC95 | LABQC | 4264738BS | S242647*38 | | WQ | BS | | | X | X | X | X | X | X | X |
| CNC95 | LABQC | 4264744LB | S242647*44 | | SQ | LB | | | X | | | | | | |
| CNC95 | LABQC | 4264745BS | S242647*45 | | SQ | BS | | | X | | | | | | |
| CNC95 | LABQC | 4264747LB | S242647*47 | | SQ | LB | | | | | X | X | | | |
| CNC95 | LABQC | 4264748BS | S242647*48 | | SQ | BS | | | | | X | X | | | |

**MATRIX CODE**

SO – Soil
SQ – Soil QC Samples
WQ - Water QC Samples

**SAMPLE TYPE CODE**

BS - Blank Spike
EB - Equipment Blank
FD - Field Duplicate
N - Native Sample
LB - Laboratory Blank

**ANALYSIS CODE**

VOC - Volatile Organic Compounds
SVOC - Semivolatile Organic Compounds
Pest - Pesticides
PCBs - Polychlorinated Biphenyls

# Organic Parameters

## Quality Control Review

The following list represents the QA/QC measures that were reviewed during the data quality evaluation procedure for organic data.

- **Holding Times** – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- **Blank samples** – Method blanks and equipment blanks were provided for this project. Blank samples enable the reviewer to determine if an analyte may be attributed to sampling or laboratory procedures, rather than environmental contamination from site activities. Trip blanks specific to this site were not provided; however, trip blanks for other sites were contained in the same coolers as these samples that were provided to the laboratory. There were no target parameters detected in those trip blank samples.
- **Surrogate Recoveries** – Surrogate Compounds are added to each sample and the recoveries are used to monitor lab performance and possible matrix interference.
- **Lab Control Sample (LCS)** – This sample is a "controlled matrix", either laboratory reagent water or Ottawa sand, in which target compounds have been added prior to extraction/analysis. The recoveries serve as a monitor of the overall performance of each step during the analysis, including sample preparation.
- **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – Spike recovery is used to evaluate potential matrix interferences, as well as accuracy. Precision information is also determined by calculating the reproducibility between the recoveries of each spiked parameter.
- **GC/MS Tuning** – The mass spectrum of the tuning compound is evaluated for method compliance. The criteria are established to verify the proper mass assignment and mass resolution.
- **Initial Calibration** – The initial calibration ensures that the instrument is capable of producing acceptable qualitative and quantitative data for the compounds of interest.
- **Continuing Calibration** – The continuing calibration checks satisfactory performance of the instrument and its predicted response to the target compounds.
- **Field Duplicate Samples** – These samples are collected to determine precision between a native and its duplicate. This information can only be determined when target compounds are detected.
- **Internal Standards** – The internal standards (retention time and response) are evaluated for method compliance. The internal standards are used in quantitation of the target parameters and monitor the instrument sensitivity and response for stability during each analysis.

- **Confirmation** – If GCMS methodology is not initially used for analysis, SW-846 method 8000 requires confirmation when the composition of samples is not well characterized. Therefore, even when the identification has been confirmed on a dissimilar column or detector, the agreement of the quantitative results on both columns is evaluated. For Pesticide and PCB analyses covered in this report, confirmation was performed using a dissimilar analytical column. The laboratory analyzed samples with a gas chromatograph (GC) utilizing simultaneous primary and confirmation data acquisition. Per SW-86 method 8000, a criteria of 40% Relative Percent Difference (RPD) was used as the acceptance limit.

# Volatile Organic Compounds (VOC) Analyses

The QA/QC parameters for VOC analyses for all of the samples were within acceptable control limits, except as noted below:

## Blanks

The VOC target parameters detected in blank samples are listed in Table 2. Trip blanks specific to this site were not provided; however, trip blanks for other sites were contained in the same coolers as these samples that were provided to the laboratory. There were no target parameters detected in those trip blank samples.

**TABLE 2**
Blank Contamination: VOCs
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Lab Sample ID | Sample ID | Sample Type | Parameter | Lab Result | Units | Flag Concentrations |
|---|---|---|---|---|---|---|---|
| CNC95 | Method BLK | 1L0419MB | MB | Acetone | 6.3 | µg/Kg | <63.0 µg/Kg |

If a target parameter determined to be a common contaminant was reported in a field sample, and the concentration was below the level determined to be due to blank contamination, the following actions were taken:

- If the concentration was above the reporting limit, the numeric result was unchanged, but it was flagged "U", as undetected.
- If the concentration was below the reporting limit, the numeric result was changed to the value of the reporting limit, and it was flagged "U", as undetected.

The results qualified due to blank contamination are listed in Attachment 1.

## Recoveries - Surrogate, MS/MSD and LCS

All Surrogate, Matrix Spike (MS), Matrix Spike Duplicate (MSD) and Laboratory Control Sample (LCS) recoveries were within acceptable quality control limits, except as noted in Table 3 below.

**TABLE 3**
Surrogate and LCS Recoveries Out of QC Limits: VOCs
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Sample | Parameter | Recovery | Recovery Limits | Associated Samples | Flag |
|---|---|---|---|---|---|---|
| CNC95 | 181SB00101 | Toluene-d8 | 80* | 84-138 | S242647*7 | No Flags Applied |
| CNC95 | 181SB00201 | Toluene-d8 | 81* | 84-138 | S242647*10 | No Flags Applied |
| CNC95 | 181SB00302 | Toluene-d8 | 79* | 84-138 | S242647*13 | No Flags Applied |
| CNC95 | 1L0419MBLCS | Bromomethane | 146* | 70-130 | S242647*8-S242647*13 | Detects-J, non-detects-UJ |
| | | Acetone | 69* | 70-130 | | |
| | | Carbon Disulfide | 54* | 70-130 | | |
| CNC95 | 1L0419MBLCS | 2-Chloroethylvinylether | 0* | 70-130 | S242647*8-S242647*13 | Detects and non-detects - R |
| CNC95 | 1L0421MBLCS | Acetone | 67* | 70-130 | S242647*7, S242647*19 | Detects-J, non-detects-UJ |
| | | 1,2,4-Trichlorobenzene | 132* | 70-130 | | |
| | | 1,2,3-Trichlorobenzene | 138* | 70-130 | | |
| | | 2-Chloroethylvinlyether | 0* | 70-130 | S242647*7, S242647*19 | Detects and non-detects - R |

* - out of control limits

## Initial and Continuing Calibration Criteria

All initial calibration criteria and continuing calibration criteria were met, except as listed in Table 4.

**TABLE 4**
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: VOC
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| Instrument/Calibration Date | Analyte | %Relative Standard Deviation or $R^2$ (ICAL)/ %Difference (CCAL) | Associated Samples |
|---|---|---|---|
| MSL5972-ICAL-04/10/02, 15:16 | Bromomethane | $R^2$=0.986 | CNC95 - All |
| | 2-Chloroethylvinylether | 41.2% | |
| MSL5972-ICAL-04/10/02, 15:16 | 1,2,4-Trichlorobenzene | 43.4% | CNC95 - All |
| MSL5972-ICAL-04/10/02, 15:16 | 1,2,3-Trichlorobenzene | 49.4% | CNC95 - All |
| MSL5972-CCAL-04/19/02, 08:05 | Bromomethane | 60.8% high | S242647*8- S242647*13 |
| | Carbon Disulfide | 44.8% low | |
| | 1,4-Dichlorobenzene | 22.4% low | |
| | 1,2,4-Trichlorobenzene | 38.0% low | |
| | 1,2,3-Trichlorobenzene | 34.1% low | |
| MSL5972-CCAL-04/21/02, 14:33 | Chloromethane | 20.3% low | S242647*7, S242647*19 |
| | Bromomethane | 25.0% low | |
| | Acetone | 21.3% low | |
| | 1,2,4-Trichlorobenzene | 49.8% high | |
| | 1,2,3-Trichlorobenzene | 49.5% high | |

Flags were applied to the compounds in the associated samples in the following manner:

- When the percent Relative Standard Deviation (%RSD) or correlation coefficient ($R^2$) was out in the initial calibration, all associated samples were qualified. Detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.
- When the percent difference (%D) was low in the continuing calibration standards, detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.
- When the percent difference (%D) was high in the continuing calibration standards, detected compounds were flagged "J", as estimated. Non-detected compounds were not flagged.

- When the Average Relative Response Factor (RRF) was low in the initial calibration, detected compounds were flagged "J", and non-detected compounds were flagged "UJ", as estimated.
- When the Relative Response Factor (RRF) was low in the continuing calibration, detected compounds were flagged "J", and non-detected compounds were flagged "UJ", as estimated.
- In extreme cases where the RRF was significantly low or there was no response, detected compounds were flagged "J", as estimated, and non-detected compounds were qualified "R", as rejected.

# Semivolatile Organic Compounds (SVOC) Analyses

The QA/QC parameters for the SVOC analyses for all of the samples were within acceptable control limits, except as noted below.

## Recoveries - Surrogate, MS/MSD and LCS

All Surrogate, Matrix Spike (MS), Matrix Spike Duplicate (MSD) and Laboratory Control Sample (LCS) recoveries were within acceptable quality control limits, except as noted in Table 5 below.

**TABLE 5**
LCS Recoveries Out of QC Limits: SVOC
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Sample | Parameter | Recovery | Recovery Limits | Associated Samples | Flag |
|---|---|---|---|---|---|---|
| CNC95 | 0418C-DMBLCS | 4-Nitrophenol | 82* | 10-80 | S242647*19 | No Flags (EB) |
| * - out of control limits | | | | | | |

## Initial and Continuing Calibration Criteria

All initial calibration criteria and continuing calibration criteria were met, except as noted in Table 6 below.

**TABLE 6**
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: SVOC
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| Instrument/Calibration Date | Analyte | %Relative Standard Deviation or $R^2$ (ICAL)/ %Difference (CCAL) | Associated Samples |
|---|---|---|---|
| MSD5973-ICAL-04/09/02, 22:27 | Benzoic Acid | $R^2$=0.988 | CNC95 - All |
| | Benzo (b) Fluoranthene | 15.1% | |
| MSD5973-CCAL-04/18/02, 17:27 | Benzoic Acid | 55.8% high | S242647*8 |
| | 2,4-Dinitrophenol | 33.6% high | |
| MSD5973-CCAL-04/18/02, 17:27 | Benzo (b) fluoranthene | 23.0% high | S242647*8 |
| MSD5973-CCAL-04/22/02, 07:15 | Benzoic Acid | 47.3% high | S242647*7, S242647*9-S242647*13, S242647*19 |
| | 2,4-Dinitrophenol | 28.7% high | |

Flags were applied to the compounds in the associated samples in the following manner:

- When the percent Relative Standard Deviation (%RSD) or correlation coefficient ($R^2$) was out in the initial calibration, all associated samples were qualified. Detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.
- When the percent difference (%D) was high in the continuing calibration standards, detected compounds were flagged "J", as estimated. Non-detected compounds were not flagged.

## Field Duplicate Samples

All Field Duplicate Samples were within acceptable quality control limits, except as noted in Table 7 below. No flags were applied due to Field Duplicate precision.

**TABLE 7**
Field Duplicate RPDs Out of QC Limits: SVOC
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Sample | Parameter | Native Concentration | Field Duplicate Concentration | RPD | RPD Limits |
|---|---|---|---|---|---|---|
| CNC95 | 181SB00102 / 181CB00102 | Phenanthrene | 2000 µg/Kg | 3400 µg/Kg | 51.9* | < 35% |
| | | Anthracene | 460 µg/Kg | 740 µg/Kg | 46.7* | < 35% |
| | | Chrysene | 960 µg/Kg | 1400 µg/Kg | 37.3* | < 35% |
| | | Benzo (b) fluroanthene | 630 µg/Kg | 1000 µg/Kg | 45.4* | < 35% |

* - out of control limits

# Organochlorine Pesticide / Polychlorinated Biphenyls (PCBs) Analyses

The QA/QC parameters for the Organochlorine Pesticide/PCB analyses by method SW-846 8081 for all of the samples were within acceptable control limits, except as noted below:

## Recoveries - Surrogate, MS/MSD and LCS

All Surrogate, Matrix Spike (MS), Matrix Spike Duplicate (MSD) and Laboratory Control Sample (LCS) recoveries were within acceptable quality control limits, except as noted in Table 8 below.

**TABLE 8**
Surrogate and LCS Recoveries Out of QC Limits: Organochlorine Pesticides/PCBs
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Sample | Parameter | Recovery | Recovery Limits | Associated Samples | Flag |
|---|---|---|---|---|---|---|
| CNC95 | 181SB00201 | Tetrachloro-m-xylene | 50* / 44* | 60-150 | S242647*10 | No Flags Applied |
| | | Decachlorobiphenyl | 70 / 47* | 60-150 | | |
| CNC95 | 181SB00301 | Tetrachloro-m-xylene | 47* / 45* | 60-150 | S242647*12 | No Flags Applied |
| | | Decachlorobiphenyl | 63 / 46* | 60-150 | | |
| CNC95 | 04180-IMB LCS | Alpha-BHC | 121* | 22-101 | S242647*7-10, S242647*12-13 | Detects-J |
| | | Endrin Ketone | 128* | 29-112 | | |
| CNC95 | 0418P-IMB LCS | Endrin Ketone | 125* | 42-122 | S242647*19 | No Flags Applied (EB) |
| CNC95 | 04230-IMB LCS | Endrin Ketone | 121* | 29-112 | S242647*11 | Detects-J |

* - out of control limits

## Initial and Continuing Calibration Criteria

All initial calibration criteria and continuing calibration criteria were met, except as noted in Table 9 below.

**TABLE 9**
Initial and Continuing Calibration Criteria Exceptions: Organochlorine Pesticides/PCBs
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| Instrument/ Calibration Date | Analyte | % Difference Col#1 / Col#2 | Associated Samples |
|---|---|---|---|
| SGIECD1-CCAL-04/19/02, 12:17 | Endrin Aldehyde | 17.3 / 11.2 high | S242647*19 (EB) |
| | Methoxychlor | 23.1 / 5.2 high | |
| | Endrin Ketone | 19.6 / 6.7 high | |
| | Heptachlor | 3.9 / 20.1 high | |
| SGIECD1 – CCAL – 04/20/02, 00:20 | Endrin Aldehyde | 22.6 / 11.7 high | S242647*7-10, S242647*19 |
| | Methoxychlor | 18.6 / 0.3 high | |
| | Endrin Ketone | 21.7 / 8.6 high | |
| | Heptachlor | 0.9 / 22.6 high | |
| SGIECD1 – CCAL – 04/20/02, 12:04 | Delta-BHC | 20.7 / 27.3 high | S242647*7-10 |
| | Alpha-Chlordane | 18.3 low / 2.3 high | |
| | 4,4'-DDD | 33.0 / 36.8 high | |
| | Endosulfan II | 22.2 / 16.8 high | |
| | 4,4'-DDT | 18.8 / 21.3 low | |
| | Endosulfan Sulfate | 18.9 / 8.9 high | |
| | Endrin Ketone | 27.6 / 52.5 high | |
| | Endrin Aldehyde | 12.8 / 19.5 high | |
| SGIECD1 – CCAL – 04/22/02, 23:11 | Delta-BHC | 16.0 / 21.0 high | S242647*12-13 |
| | 4,4'-DDD | 20.2 / 21.3 high | |
| | Endosulfan II | 18.5 / 13.7 high | |
| | Endrin Aldehyde | 18.3 / 19.0 high | |
| SGIECD1 – CCAL – 04/22/02, 23:11 | Endrin Ketone | 23.4 / 16.2 high | S242647*12-13 |
| SGIECD1 – CCAL – 04/24/02, 11:05 | Endrin Aldehyde | 26.9 / 14.7 high | S242647*11-13 |
| | Methoxychlor | 15.7 high / 3.9 low | |
| | Endrin Ketone | 21.2 / 10.4 high | |
| SGIECD1 – CCAL – 04/24/02, 17:59 | 4,4'-DDD | 21.3 / 19.0 high | S242647*11 |

**TABLE 9**
Initial and Continuing Calibration Criteria Exceptions: Organochlorine Pesticides/PCBs
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| Instrument/ Calibration Date | Analyte | % Difference Col#1 / Col#2 | Associated Samples |
|---|---|---|---|
| | Endrin Aldehyde | 16.1 / 17.8 high | |
| | Endosulfan Sulfate | 15.6 / 8.6 high | |
| | Endrin Ketone | 26.7 / 17.7 high | |
| | Delta-BHC | 14.8 / 16.1 high | |
| | Endosulfan II | 14.8 / 18.8 high | |

Flags were applied to the compounds in the associated samples in the following manner:

- When the percent difference (%D) was low in the continuing calibration standards, detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.
- When the percent difference was high, detected compounds were flagged "J", as estimated. Non-detected compounds were not flagged.

## Second Column Confirmation

The second column confirmation percent difference (%D) for some detected parameters, exceeded the 40 %D criteria. Those results were flagged "J", as estimated. The laboratory reported the lower of the two concentrations. The individual samples and specific compounds that were flagged are listed in Table 10 below.

**TABLE 10**
Second Column Confirmation out of Criteria: Organochlorine Pesticides/PCBs
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Sample ID | Lab Sample ID | Parameter |
|---|---|---|---|
| CNC95 | 181SB00101 | S242647*7 | Heptachlor Epoxide |
| CNC95 | 181SB00102 | S242647*8 | Heptachlor Epoxide |
| CNC95 | 181SB00102 | S242647*8 | Dieldrin |
| CNC95 | 181CB00102 | S242647*9 | Dieldrin |
| CNC95 | 181SB00102 | S242647*8 | 4,4'-DDT |
| CNC95 | 181CB00102 | S242647*9 | Endrin Ketone |
| CNC95 | 181SB00202 | S242647*11 | Heptachlor |
| CNC95 | 181SB00101 | S242647*7 | Aroclor-1254 |

# Inorganic Parameters

## Quality Control Review

The following list represents the QA/QC measures that are typically reviewed during the data quality evaluation procedure for inorganic parameters.

- **Holding Times** – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- **Blank samples** – Sample preparation, initial calibration blanks/continuing calibration blanks, and equipment blanks were provided for this project. Blank samples enable the reviewer to determine if an analyte may be attributed to sampling or laboratory procedures, rather than environmental contamination from site activities.
- **Lab Control Sample (LCS)** – This sample is a "controlled matrix", in which target parameters have been added prior to digestion/analysis. The recoveries serve as a monitor of the overall performance of each step during the analysis, including sample preparation.
- **Field Duplicate Samples** – These samples are collected to determine precision between a native and its duplicate. This information can only be determined when target compounds are detected.
- **Pre/Post Digestion Spike (MS/MSD)** – Spike recovery is used to evaluate potential matrix interferences, as well as accuracy. Precision information is also determined by calculating the reproducibility between the recoveries of each spiked parameter.
- **ICP Interference Check Sample** – This sample verifies the lab's interelement and background correction factors.
- **Initial Calibration Verification** – This parameter ensures that the instrument is capable of producing acceptable quantitative data for the target analyte list to be measured.
- **Continuing Calibration Verification** – This one-point, mid-range parameter establishes that the initial calibration is still valid by checking the performance of the instrument on a continual basis.
- **ICP Serial Dilution** – The serial dilution of samples quantitated by ICP determines whether or not significant physical or chemical interferences exist due to the sample matrix.

# Metals Analyses

The QA/QC parameters for the Metals analyses for all of the samples were within acceptable control limits, except as noted below.

## Blanks

The Metals target parameters detected in blank samples are listed in Table 11.

**TABLE 11**
Blank Contamination: Metals
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Lab Sample ID | Sample ID | Sample Type | Parameter | Lab Result | Units | Flag Concentrations |
|---|---|---|---|---|---|---|---|
| CNC95 | CCB | | CCB | Antimony | 5.19 | ug/L | 2.595 mg/Kg |
| | | | | Barium | 2.8 | ug/L | 1.4 mg/Kg |
| | | | | Chromium | 2.81 | ug/L | 1.405 mg/Kg |
| | | | | Manganese | 3.16 | ug/L | 1.58 mg/Kg |
| | | | | Thallium | 10.0 | ug/L | 5.0 mg/Kg |
| | | | | Vanadium | 2.63 | ug/L | 1.90 mg/Kg |
| CNC95 | S242647*19 | 181EB001M1 | EB | Calcium | 0.064 | mg/L | 32 mg/Kg |
| | | | | Iron | 0.021 | mg/L | 10.5 mg/Kg |
| | | | | Sodium | 1.2 | mg/L | 600 mg/Kg |

If a target parameter was reported in a field sample, and the concentration was below the level determined to be due to blank contamination (5 times the concentration in the associated QC blank samples), it was flagged as "U", not detected. Initial and continuing calibration blanks were also evaluated for possible contamination.

The results qualified due to blank contamination are listed in Attachment 1.

## Recoveries – Matrix Spike/Matrix Spike Duplicate (MS/MSD) and Laboratory Control Sample (LCS)

All Matrix Spike (MS), Matrix Spike Duplicate (MSD) and Laboratory Control Sample (LCS) recoveries were within acceptable quality control limits, except as noted in Table 12 below.

**TABLE 12**
MS/MSD Recoveries Out of QC Limits: Metals
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Sample | Parameter | Recovery | Recovery Limits | Associated Samples | Flag |
|---|---|---|---|---|---|---|
| CNC95 | 188SB00301MS/MSD | Antimony | 52* / 53* | 80-120 | CNC95 - All | Detects-J, non-detects-UJ |
| | | Magnesium | 30* / -19* | 80-120 | CNC95 - All | Detects-J, non-detects-UJ |
| | | Manganese | 123* / 84 | 80-120 | CNC95 - All | Detects-J |
| | | Copper | 100 / 122* | 80-120 | CNC95 - All | Detects-J |
| | | Sodium | 81 / 77* | 80-120 | CNC95 - All | Detects-J, non-detects-UJ |
| | | Mercury | 78* / 89 | 80-120 | CNC95 - All | Detects-J, non-detects-UJ |
| * - out of control limits | | | | | | |

## Field Duplicate Samples

All Field Duplicate Samples were within acceptable quality control limits, except as noted in Table 13 below. No flags were applied due to Field Duplicate precision.

**TABLE 13**
Field Duplicate RPDs Out of QC Limits: Metals
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Sample | Parameter | Native Concentration | Field Duplicate Concentration | RPD | RPD Limits |
|---|---|---|---|---|---|---|
| CNC95 | 181SB00102 / 181CB00102 | Calcium | 26000 mg/Kg | 11000 mg/Kg | 81.1* | < 35% |
| | | Iron | 6200 mg/Kg | 3000 mg/Kg | 69.6* | < 35% |
| | | Manganese | 82 mg/Kg | 25 mg/Kg | 106.5* | < 35% |
| * - out of control limits | | | | | | |

# General Chemistry Analyses

The QA/QC parameters for the General Chemistry analyses for all of the samples were within acceptable control limits.

# Rejected Data

The rejected data are summarized in Table 14 below. The only compound rejected was 2-Chloroethyl vinyl ether. This compound is very reactive and is not detected under acidic conditions, such as those used in preservation of field samples.

**TABLE 14**
Data Qualification Summary: Rejected Data
*Charleston Naval Complex, Zone E, SWMU 181, Charleston, SC*

| SDG | Lab Sample ID | Sample ID | Sample Type | Parameter Class | Parameter | Lab Result | Units | Lab Qual | Final Qual | Reason |
|---|---|---|---|---|---|---|---|---|---|---|
| CNC95 | S242647*7 | 181SB00101 | N | VOA | 2-Chloroethyl vinyl ether | 16 | ug/kg | UJ | R | BS |
| CNC95 | S242647*8 | 181SB00102 | N | VOA | 2-Chloroethyl vinyl ether | 12 | ug/kg | UJ | R | BS |
| CNC95 | S242647*9 | 181CB00102 | FD | VOA | 2-Chloroethyl vinyl ether | 14 | ug/kg | UJ | R | BS |
| CNC95 | S242647*10 | 181SB00201 | N | VOA | 2-Chloroethyl vinyl ether | 9.5 | ug/kg | UJ | R | BS |
| CNC95 | S242647*11 | 181SB00202 | N | VOA | 2-Chloroethyl vinyl ether | 12 | ug/kg | UJ | R | BS |
| CNC95 | S242647*12 | 181SB00301 | N | VOA | 2-Chloroethyl vinyl ether | 9.6 | ug/kg | UJ | R | BS |
| CNC95 | S242647*13 | 181SB00302 | N | VOA | 2-Chloroethyl vinyl ether | 9.6 | ug/kg | UJ | R | BS |

# Conclusion

A review of the analytical data submitted regarding the investigation of Zone E, SWMU 181, at the Charleston Naval Complex, Charleston, South Carolina by CH2M HILL has been completed. An overall evaluation of the data indicates that the sample handling, shipment, and analytical procedures have been adequately completed, and that the analytical results should be considered usable as qualified.

The analytical data had minor QC concerns as indicated above. However, with the exception of the rejected data, it did not affect data usability for those specific results.

The validation review demonstrated that the analytical systems were generally in control and the data results can be used in the decision making process.

Attachment 1 - Changed Qualifiers and Results
Zone E - SWMU 181

| SDG | Parameter Class | Sample ID | Lab Sample ID | Matrix | Analytical Method | Parameter | Lab Result | Lab Qual | Final Result | Final Qual | Units | Reason |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | ANTIMONY | 1.6 | J | 1.6 | UJ | mg/kg | BL,MS |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | BARIUM | 22 | J | 22 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | BERYLLIUM | 0.55 | J | 0.55 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | CADMIUM | 0.63 | J | 0.63 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | COBALT | 1.9 | J | 1.9 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | COPPER | 33 | = | 33 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | MAGNESIUM | 1300 | = | 1300 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | MANGANESE | 86 | = | 86 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW7471A | MERCURY | 0.22 | = | 0.22 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | NICKEL | 7.3 | J | 7.3 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | POTASSIUM | 450 | J | 450 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | SILVER | 0.27 | J | 0.27 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | SODIUM | 130 | J | 130 | UJ | mg/kg | BL, MS |
| CNC95 | METAL | 181SB00101 | S242647*7 | SO | SW6010B | THALLIUM | 1.4 | J | 1.4 | U | mg/kg | BL |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW6010B | ANTIMONY | 0.55 | U | 0.55 | UJ | mg/kg | MS |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW6010B | BERYLLIUM | 0.42 | J | 0.42 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW6010B | CADMIUM | 0.12 | J | 0.12 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW6010B | COBALT | 3.3 | J | 3.3 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW6010B | COPPER | 12 | = | 12 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW6010B | MAGNESIUM | 1900 | = | 1900 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW6010B | MANGANESE | 82 | = | 82 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW7471A | MERCURY | 0.05 | J | 0.05 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW6010B | NICKEL | 7.4 | J | 7.4 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00102 | S242647*8 | SO | SW6010B | SODIUM | 55 | J | 55 | UJ | mg/kg | BL,MS |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | ANTIMONY | 0.6 | U | 0.6 | UJ | mg/kg | MS |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | ARSENIC | 2.2 | J | 2.2 | J | mg/kg | IB |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | BARIUM | 20 | J | 20 | J | mg/kg | IB |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | BERYLLIUM | 0.18 | J | 0.18 | J | mg/kg | IB |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | COBALT | 1.2 | J | 1.2 | J | mg/kg | IB |

Attachment 1 - Changed Qualifiers and Results
Zone E - SWMU 181

| SDG | Parameter Class | Sample ID | Lab Sample ID | Matrix | Analytical Method | Parameter | Lab Result | Lab Qual | Final Result | Final Qual | Units | Reason |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | COPPER | 7.8 | = | 7.8 | J | mg/kg | MS |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | MAGNESIUM | 560 | J | 560 | J | mg/kg | MS |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | MANGANESE | 25 | = | 25 | J | mg/kg | MS |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW7471A | MERCURY | 0.055 | J | 0.055 | J | mg/kg | MS |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | NICKEL | 2.9 | J | 2.9 | J | mg/kg | IB |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | POTASSIUM | 390 | J | 390 | J | mg/kg | IB |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | SODIUM | 58 | U | 58 | UJ | mg/kg | MS |
| CNC95 | METAL | 181CB00102 | S242647*9 | SO | SW6010B | VANADIUM | 9.2 | J | 9.2 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | ANTIMONY | 0.82 | J | 0.82 | UJ | mg/kg | BL,MS |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | BARIUM | 26 | J | 26 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | BERYLLIUM | 0.3 | J | 0.3 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | CADMIUM | 0.38 | J | 0.38 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | COBALT | 1.9 | J | 1.9 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | COPPER | 17 | = | 17 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | MAGNESIUM | 1600 | = | 1600 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | MANGANESE | 91 | = | 91 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW7471A | MERCURY | 0.23 | = | 0.23 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | NICKEL | 8 | J | 8 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | POTASSIUM | 680 | J | 680 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00201 | S242647*10 | SO | SW6010B | SODIUM | 190 | J | 190 | UJ | mg/kg | BL,MS |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | ANTIMONY | 0.76 | J | 0.76 | UJ | mg/kg | BL,MS |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | BARIUM | 25 | J | 25 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | BERYLLIUM | 0.29 | J | 0.29 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | CADMIUM | 0.16 | J | 0.16 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | COBALT | 1.7 | J | 1.7 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | COPPER | 14 | = | 14 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | MAGNESIUM | 810 | J | 810 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | MANGANESE | 44 | = | 44 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW7471A | MERCURY | 0.098 | J | 0.098 | J | mg/kg | MS |

Attachment 1 - Changed Qualifiers and Results
Zone E - SWMU 181

| SDG | Parameter Class | Sample ID | Lab Sample ID | Matrix | Analytical Method | Parameter | Lab Result | Lab Qual | Final Result | Final Qual | Units | Reason |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | NICKEL | 6.2 | J | 6.2 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | POTASSIUM | 430 | J | 430 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00202 | S242647*11 | SO | SW6010B | SODIUM | 82 | J | 82 | UJ | mg/kg | BL,MS |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | ANTIMONY | 0.68 | J | 0.68 | UJ | mg/kg | BL,MS |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | BARIUM | 20 | J | 20 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | BERYLLIUM | 0.21 | J | 0.21 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | COBALT | 7.3 | J | 7.3 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | COPPER | 380 | = | 380 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | MAGNESIUM | 1100 | = | 1100 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | MANGANESE | 290 | = | 290 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW7471A | MERCURY | 0.25 | = | 0.25 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | POTASSIUM | 610 | J | 610 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | SELENIUM | 0.83 | J | 0.83 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00301 | S242647*12 | SO | SW6010B | SODIUM | 110 | J | 110 | UJ | mg/kg | BL,MS |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | ANTIMONY | 1.1 | J | 1.1 | UJ | mg/kg | BL,MS |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | BARIUM | 25 | J | 25 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | BERYLLIUM | 0.35 | J | 0.35 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | CADMIUM | 0.29 | J | 0.29 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | COBALT | 1.7 | J | 1.7 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | COPPER | 27 | = | 27 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | MAGNESIUM | 1500 | = | 1500 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | MANGANESE | 68 | = | 68 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW7471A | MERCURY | 0.16 | = | 0.16 | J | mg/kg | MS |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | NICKEL | 7.9 | J | 7.9 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | POTASSIUM | 670 | J | 670 | J | mg/kg | IB |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | SODIUM | 300 | J | 300 | UJ | mg/kg | BL, MS |
| CNC95 | METAL | 181SB00302 | S242647*13 | SO | SW6010B | THALLIUM | 0.72 | J | 0.72 | U | mg/kg | BL |
| CNC95 | PCB | 181SB00101 | S242647*7 | SO | SW8082 | PCB-1254 (AROCHLOR 1254) | 15 | J | 15 | J | ug/kg | 2C |

Attachment 1 - Changed Qualifiers and Results
Zone E - SWMU 181

| SDG | Parameter Class | Sample ID | Lab Sample ID | Matrix | Analytical Method | Parameter | Lab Result | Lab Qual | Final Result | Final Qual | Units | Reason |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNC95 | PCB | 181SB00202 | S242647*11 | SO | SW8082 | PCB-1016 (AROCHLOR 1016) | 42 | U | 42 | UJ | ug/kg | CC |
| CNC95 | PEST | 181SB00101 | S242647*7 | SO | SW8081A | ALPHA-CHLORDANE | 0.67 | J | 0.67 | J | ug/kg | CC |
| CNC95 | PEST | 181SB00101 | S242647*7 | SO | SW8081A | HEPTACHLOR EPOXIDE | 0.62 | J | 0.62 | J | ug/kg | 2C |
| CNC95 | PEST | 181SB00101 | S242647*7 | SO | SW8081A | p,p'-DDT | 3.5 | U | 3.5 | UJ | ug/kg | CC |
| CNC95 | PEST | 181SB00102 | S242647*8 | SO | SW8081A | DIELDRIN | 1 | J | 1 | J | ug/kg | 2C |
| CNC95 | PEST | 181SB00102 | S242647*8 | SO | SW8081A | HEPTACHLOR EPOXIDE | 0.42 | J | 0.42 | J | ug/kg | 2C |
| CNC95 | PEST | 181SB00102 | S242647*8 | SO | SW8081A | p,p'-DDT | 1.8 | J | 1.8 | J | ug/kg | 2C, CC |
| CNC95 | PEST | 181CB00102 | S242647*9 | SO | SW8081A | DIELDRIN | 0.61 | J | 0.61 | J | ug/kg | 2C |
| CNC95 | PEST | 181CB00102 | S242647*9 | SO | SW8081A | ENDRIN KETONE | 3.4 | = | 3.4 | J | ug/kg | 2C, BS |
| CNC95 | PEST | 181CB00102 | S242647*9 | SO | SW8081A | p,p'-DDT | 3.1 | = | 3.1 | J | ug/kg | CC |
| CNC95 | PEST | 181SB00201 | S242647*10 | SO | SW8081A | p,p'-DDT | 2.9 | U | 2.9 | UJ | ug/kg | CC |
| CNC95 | PEST | 181SB00202 | S242647*11 | SO | SW8081A | HEPTACHLOR | 0.46 | J | 0.46 | J | ug/kg | 2C |
| CNC95 | SVOA | 181SB00101 | S242647*7 | SO | SW8270C | BENZO(b)FLUORANTHENE | 66 | J | 66 | J | ug/kg | IC |
| CNC95 | SVOA | 181SB00101 | S242647*7 | SO | SW8270C | Benzoic acid | 2200 | U | 2200 | UJ | ug/kg | IC |
| CNC95 | SVOA | 181SB00102 | S242647*8 | SO | SW8270C | BENZO(b)FLUORANTHENE | 630 | = | 630 | J | ug/kg | IC, CC |
| CNC95 | SVOA | 181SB00102 | S242647*8 | SO | SW8270C | Benzoic acid | 2000 | U | 2000 | UJ | ug/kg | IC |
| CNC95 | SVOA | 181CB00102 | S242647*9 | SO | SW8270C | BENZO(b)FLUORANTHENE | 1000 | = | 1000 | J | ug/kg | IC |
| CNC95 | SVOA | 181CB00102 | S242647*9 | SO | SW8270C | Benzoic acid | 1900 | U | 1900 | UJ | ug/kg | IC |
| CNC95 | SVOA | 181SB00201 | S242647*10 | SO | SW8270C | BENZO(b)FLUORANTHENE | 45 | J | 45 | J | ug/kg | IC |
| CNC95 | SVOA | 181SB00201 | S242647*10 | SO | SW8270C | Benzoic acid | 1900 | U | 1900 | UJ | ug/kg | IC |
| CNC95 | SVOA | 181SB00202 | S242647*11 | SO | SW8270C | BENZO(b)FLUORANTHENE | 37 | J | 37 | J | ug/kg | IC |
| CNC95 | SVOA | 181SB00202 | S242647*11 | SO | SW8270C | Benzoic acid | 2000 | U | 2000 | UJ | ug/kg | IC |
| CNC95 | SVOA | 181SB00301 | S242647*12 | SO | SW8270C | BENZO(b)FLUORANTHENE | 52 | J | 52 | J | ug/kg | IC |
| CNC95 | SVOA | 181SB00301 | S242647*12 | SO | SW8270C | Benzoic acid | 1800 | U | 1800 | UJ | ug/kg | IC |
| CNC95 | SVOA | 181SB00302 | S242647*13 | SO | SW8270C | BENZO(b)FLUORANTHENE | 44 | J | 44 | J | ug/kg | IC |
| CNC95 | SVOA | 181SB00302 | S242647*13 | SO | SW8270C | Benzoic acid | 1800 | U | 1800 | UJ | ug/kg | IC |
| CNC95 | VOA | 181SB00101 | S242647*7 | SO | SW8260B | 1,2,3-Trichlorobenzene | 7.9 | U | 7.9 | UJ | ug/kg | IC |
| CNC95 | VOA | 181SB00101 | S242647*7 | SO | SW8260B | 1,2,4-TRICHLOROBENZENE | 7.9 | U | 7.9 | UJ | ug/kg | IC |
| CNC95 | VOA | 181SB00101 | S242647*7 | SO | SW8260B | 2-Chloroethyl vinyl ether | 16 | U | 16 | R | ug/kg | BS |

Attachment 1 - Changed Qualifiers and Results
Zone E - SWMU 181

| SDG | Parameter Class | Sample ID | Lab Sample ID | Matrix | Analytical Method | Parameter | Lab Result | Lab Qual | Final Result | Final Qual | Units | Reason |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNC95 | VOA | 181SB00101 | S242647*7 | SO | SW8260B | ACETONE | 27 | = | 27 | J | ug/kg | CC, BS |
| CNC95 | VOA | 181SB00101 | S242647*7 | SO | SW8260B | BROMOMETHANE | 16 | U | 16 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00101 | S242647*7 | SO | SW8260B | CHLOROMETHANE | 16 | U | 16 | UJ | ug/kg | CC |
| CNC95 | VOA | 181SB00102 | S242647*8 | SO | SW8260B | 1,2,3-Trichlorobenzene | 6.2 | U | 6.2 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00102 | S242647*8 | SO | SW8260B | 1,2,4-TRICHLOROBENZENE | 6.2 | U | 6.2 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00102 | S242647*8 | SO | SW8260B | 1,4-DICHLOROBENZENE | 6.2 | U | 6.2 | UJ | ug/kg | CC |
| CNC95 | VOA | 181SB00102 | S242647*8 | SO | SW8260B | 2-Chloroethyl vinyl ether | 12 | U | 12 | R | ug/kg | BS |
| CNC95 | VOA | 181SB00102 | S242647*8 | SO | SW8260B | ACETONE | 39 | = | 39 | UJ | ug/kg | BL, BS |
| CNC95 | VOA | 181SB00102 | S242647*8 | SO | SW8260B | BROMOMETHANE | 12 | U | 12 | UJ | ug/kg | IC |
| CNC95 | VOA | 181SB00102 | S242647*8 | SO | SW8260B | CARBON DISULFIDE | 6.2 | U | 6.2 | UJ | ug/kg | CC, BS |
| CNC95 | VOA | 181CB00102 | S242647*9 | SO | SW8260B | 1,2,3-Trichlorobenzene | 7.2 | U | 7.2 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181CB00102 | S242647*9 | SO | SW8260B | 1,2,4-TRICHLOROBENZENE | 7.2 | U | 7.2 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181CB00102 | S242647*9 | SO | SW8260B | 1,4-DICHLOROBENZENE | 7.2 | U | 7.2 | UJ | ug/kg | CC |
| CNC95 | VOA | 181CB00102 | S242647*9 | SO | SW8260B | 2-Chloroethyl vinyl ether | 14 | U | 14 | R | ug/kg | BS |
| CNC95 | VOA | 181CB00102 | S242647*9 | SO | SW8260B | ACETONE | 17 | = | 17 | UJ | ug/kg | BL, BS |
| CNC95 | VOA | 181CB00102 | S242647*9 | SO | SW8260B | BROMOMETHANE | 14 | U | 14 | UJ | ug/kg | IC |
| CNC95 | VOA | 181CB00102 | S242647*9 | SO | SW8260B | CARBON DISULFIDE | 7.2 | U | 7.2 | UJ | ug/kg | CC, BS |
| CNC95 | VOA | 181SB00201 | S242647*10 | SO | SW8260B | 1,2,3-Trichlorobenzene | 4.7 | U | 4.7 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00201 | S242647*10 | SO | SW8260B | 1,2,4-TRICHLOROBENZENE | 4.7 | U | 4.7 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00201 | S242647*10 | SO | SW8260B | 1,4-DICHLOROBENZENE | 4.7 | U | 4.7 | UJ | ug/kg | CC |
| CNC95 | VOA | 181SB00201 | S242647*10 | SO | SW8260B | 2-Chloroethyl vinyl ether | 9.5 | U | 9.5 | R | ug/kg | BS |
| CNC95 | VOA | 181SB00201 | S242647*10 | SO | SW8260B | ACETONE | 38 | = | 38 | UJ | ug/kg | BL, BS |
| CNC95 | VOA | 181SB00201 | S242647*10 | SO | SW8260B | BROMOMETHANE | 9.5 | U | 9.5 | UJ | ug/kg | IC |
| CNC95 | VOA | 181SB00201 | S242647*10 | SO | SW8260B | CARBON DISULFIDE | 4.7 | U | 4.7 | UJ | ug/kg | CC, BS |
| CNC95 | VOA | 181SB00202 | S242647*11 | SO | SW8260B | 1,2,3-Trichlorobenzene | 5.8 | U | 5.8 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00202 | S242647*11 | SO | SW8260B | 1,2,4-TRICHLOROBENZENE | 5.8 | U | 5.8 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00202 | S242647*11 | SO | SW8260B | 1,4-DICHLOROBENZENE | 5.8 | U | 5.8 | UJ | ug/kg | CC |
| CNC95 | VOA | 181SB00202 | S242647*11 | SO | SW8260B | 2-Chloroethyl vinyl ether | 12 | U | 12 | R | ug/kg | BS |
| CNC95 | VOA | 181SB00202 | S242647*11 | SO | SW8260B | ACETONE | 8.2 | J | 12 | UJ | ug/kg | BL, BS |

Attachment 1 - Changed Qualifiers and Results
Zone E - SWMU 181

| SDG | Parameter Class | Sample ID | Lab Sample ID | Matrix | Analytical Method | Parameter | Lab Result | Lab Qual | Final Result | Final Qual | Units | Reason |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNC95 | VOA | 181SB00202 | S242647*11 | SO | SW8260B | BROMOMETHANE | 12 | U | 12 | UJ | ug/kg | IC |
| CNC95 | VOA | 181SB00202 | S242647*11 | SO | SW8260B | CARBON DISULFIDE | 5.8 | U | 5.8 | UJ | ug/kg | CC, BS |
| CNC95 | VOA | 181SB00301 | S242647*12 | SO | SW8260B | 1,2,3-Trichlorobenzene | 4.8 | U | 4.8 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00301 | S242647*12 | SO | SW8260B | 1,2,4-TRICHLOROBENZENE | 4.8 | U | 4.8 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00301 | S242647*12 | SO | SW8260B | 1,4-DICHLOROBENZENE | 4.8 | U | 4.8 | UJ | ug/kg | CC |
| CNC95 | VOA | 181SB00301 | S242647*12 | SO | SW8260B | 2-Chloroethyl vinyl ether | 9.6 | U | 9.6 | R | ug/kg | BS |
| CNC95 | VOA | 181SB00301 | S242647*12 | SO | SW8260B | ACETONE | 63 | = | 63 | UJ | ug/kg | BL, BS |
| CNC95 | VOA | 181SB00301 | S242647*12 | SO | SW8260B | BROMOMETHANE | 9.6 | U | 9.6 | UJ | ug/kg | IC |
| CNC95 | VOA | 181SB00301 | S242647*12 | SO | SW8260B | CARBON DISULFIDE | 2.3 | J | 2.3 | J | ug/kg | CC, BS |
| CNC95 | VOA | 181SB00302 | S242647*13 | SO | SW8260B | 1,2,3-Trichlorobenzene | 4.8 | U | 4.8 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00302 | S242647*13 | SO | SW8260B | 1,2,4-TRICHLOROBENZENE | 4.8 | U | 4.8 | UJ | ug/kg | IC, CC |
| CNC95 | VOA | 181SB00302 | S242647*13 | SO | SW8260B | 1,4-DICHLOROBENZENE | 4.8 | U | 4.8 | UJ | ug/kg | CC |
| CNC95 | VOA | 181SB00302 | S242647*13 | SO | SW8260B | 2-Chloroethyl vinyl ether | 9.6 | U | 9.6 | R | ug/kg | BS |
| CNC95 | VOA | 181SB00302 | S242647*13 | SO | SW8260B | ACETONE | 61 | = | 61 | UJ | ug/kg | BL, BS |
| CNC95 | VOA | 181SB00302 | S242647*13 | SO | SW8260B | BROMOMETHANE | 9.6 | U | 9.6 | UJ | ug/kg | IC |
| CNC95 | VOA | 181SB00302 | S242647*13 | SO | SW8260B | CARBON DISULFIDE | 4.8 | U | 4.8 | UJ | ug/kg | CC, BS |

## CH2M HILL Chain of Custody/ Laboratory Analysis Form

COC Tracking #: **ZE181-040402-01** page 1 of 2

| | |
|---|---|
| Laboratory: | STL |
| Project Name: | Charleston Navy Complex |
| Site Name: | Zone E, SWMU 181 |
| Project Number: | 158814.PM.04 |
| TAT: | 7 day |
| Project Manager: | |
| QA Level: | 3 |
| Address: | GNV: 3011 SW Williston Rd., Gainesville, FL 32605 |
| | ATL: 115 Perimeter Center Place NE, Suite 700, Atlanta, GA 30346-1278 |
| Send Report To: | see last page of COC |
| EDD: | CNC format |

Lab Batch/SDG:

| Sample ID | Station ID | Sample Description | Depth Begin | Depth End | Date & Time Collected | Matrix | # of containers | VOCs (SW8260B) 3 - 5g Encore & 1 2 ounce jar | SVOCs (SW8270C) 1 - 8 ounce jar | Pesticides/PCBs (SW8081A/8082) | Metals (SW6010B/7000) 1 - 4 ounce jar | Cyanide (SW9012) | VOCs (SW8260B) 3 - 40mL vial, HCl | SVOCs (SW8270C) 2 - 1L amber | Pesticides/PCBs (SW8081A/8082) 2 - 1L amber | Metals (SW6010B/7000) 1 - 250mL HDPE, HNO3 | Cyanide (SW9012) 1 - 250mL HDPE, NaOH | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 181SB00101 ✓ | E181SB001 | | 0 | 1 | 4-16 / 1015 | SO | 6 | X | X | X | X | X | | | | | | |
| 181SB00102 ✓ | E181SB001 | | 3 | 5 | 4-16 / 1030 | SO | 6 | X | X | X | X | X | | | | | | |
| 181CB00102 | E181SB001 | | 3 | 5 | 4-16 / 1035 | SO | 6 | X | X | X | X | X | | | | | | |
| 181SB00201 ✓ | E181SB002 | ~~4-16 0915~~ | 0 | 1 | 4-16 / 0915 | SO | 6 | X | X | X | X | X | | | | | | |
| 181SB00202 ✓ | E181SB002 | | 3 | 5 | 4-16 / 0930 | SO | 6 | X | X | X | X | X | | | | | | |
| 181SB00301 ✓ | E181SB003 | | 0 | 1 | 4-16 / 0946 | SO | 6 | X | X | X | X | X | | | | | | |
| 181SB00302 ✓ | E181SB003 | | 3 | 5 | 4-16 / 1000 | SO | 6 | X | X | X | X | X | | | | | | |
| 181EB001M1 ✓ | E181EB001 | | | | 4-16 1100 | SQ | 9 | | | | | | X | X | X | X | X | EB |
| 181TB001M1 | E181TB001 | | | | | SQ | 3 | | | | | | X | | | | | TB |

RUSH!

Sampling Completed RCRA Soils

Sampled By: Brian Crawford Date/Time: 4-16-02

Relinquished by: [signature] Date/Time: 4-16-02/1605

Additional Samplers: Andrew O'Connor

Received By Lab: F Swafford Date/Time: 4/17/02 8:58

Relinquished by: Date/Time:

Received By: Date/Time:

Shipped Via: UPS FedEx Hand Other Tracking#:

Remarks:

Temperature:

Receipt Exceptions:

5742640

**Comments Prepared by Susan Byrd, Risk Assessor, SCDHEC (August 7, 2002)**

**General Comments**

**SCDHEC Comment 1:**
According to the Risk Assessment Guidance for Superfund, sample results containing common laboratory contaminants should only be considered positive if the sample concentrations exceed 10 times the maximum detected in any blank. EPA considers acetone, MEK, methylene chloride, toluene, and the phthalate esters to be common lab contaminants. If contaminants detected in blanks are not common laboratory contaminants, sample results are only considered positive if the concentration in the sample exceeds 5 times the maximum amount detected in any blank. All contaminants detected in blanks should be identified as common or not and then multiplied by the appropriate value (5 or 10) before being compare to the site sample data.

**CH2M-Jones Response 1:**
*We agree.*

**Specific Comments:**

**SCDHEC Comment 1:**
Section 4.1.1, VOCs in Surface and Subsurface Soil, Page 4-1, Paragraph 1. The text refers to Appendix A to present field blank and laboratory blank data; however, all data validation information is presented in Appendix B. Please revise the text accordingly.

**CH2M-Jones Response 1:**
*The text will be revised to indicate that Appendix B is the correct source, not Appendix A.*

**SCDHEC Comment 2:**
Section 4.1.1, Page 4-2, Paragraph 2. The text states that MEK was detected in 5 of 6 blank samples. According to Appendix B, acetone was the only organic blank contamination. Please clarify.

**CH2M-Jones Response 2:**
*The statement made in the text of the RFI RA was based on review of the analytical results of the QA/QC samples. These data will be added as Appendix A-1 in the Revision 1 document for the SWMU 181 RFI Report Addendum (see attached material).*

**SCDHEC Comment 3:**
Section 5.2, Iron in Surface Soil, Pages 5-1 and 5-2. Iron was detected in surface soil at a concentration of 40,000 mg/kg which exceeds the maximum value of the background range for Zone E (30,600 mg/kg) as well as the residential RBC of 2,3000 mg/kg. Iron was eliminated as a COC because of the construction/demolition activities in the area and

because iron is not a major constituent of paint which is the material of concern. Because of the uncertainties of disposal practices at the CNC, historical evidence should not be used exclusively to eliminate COCs that fail risk-based screenings. According to the Team Notebook, a basewide background screening can be conducted if the zone specific is not applicable. Appendix J of the Team Notebook indicates that the less industrialized zones such as B, G, and H (where one might expect the iron concentrations to be lower) have maximum detected concentrations of iron that exceed 40,000 mg/kg. Therefore, in accordance with the Team Notebook, basewide background information should be the rationale used to eliminate iron as a COC.

**CH2M-Jones Response 3:**
*Section 5.2 will be expanded to include the use of the base-wide background information with respect to iron occurrences.*