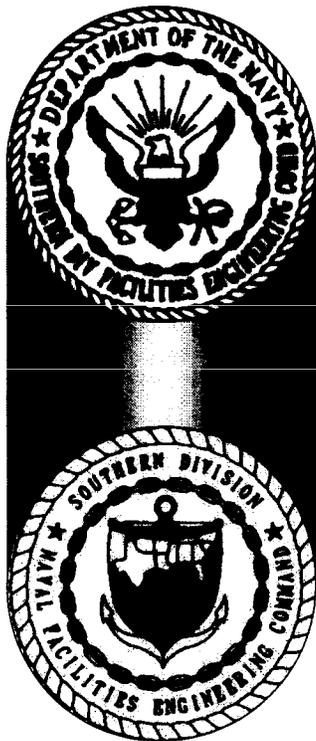


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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT
ADDENDUM CORRECTIVE MEASURES STUDY WORK PLAN AREA OF CONCERN 617
(AOC 617) ZONE F CNC CHARLESTON SC
11/2/2001
CH2M HILL

RFI REPORT ADDENDUM

RFI Report Addendum and CMS Work Plan AOC 617 Zone F



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

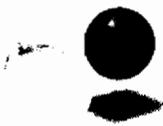
SUBMITTED TO
***U.S. Navy Southern Division
Naval Facilities Engineering Command***

CH2M-Jones

November 2001

*Revision 0
Contract N62467-99-C-0960*

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CH2MHILL

November 2, 2001

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

Re: RFI Report Addendum and CMS Work Plan (Revision 0) – AOC 617, Zone F

Dear Mr. Scaturo:

Enclosed please find four copies of the RFI Report Addendum and CMS Work Plan (Revision 0) for AOC 617 in Zone F 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 Louise Palmer. Please contact her at 704/329-0073, extension 296, if 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

RFI Report Addendum and CMS Work Plan AOC 617, Zone F



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

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

PREPARED BY
CH2M-Jones

November 2001

*Revision 0
Contract N62467-99-C-0960
158814.ZF.PR.03*

Certification Page for RFI Report Addendum and CMS Work Plan (Revision 0) — AOC 617, Zone F

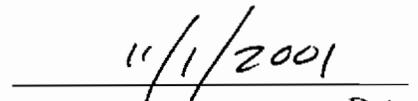
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

P.E. No. 21428



Dean Williamson, P.E.



Date

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1 Acronyms and Abbreviations

2	AOC	area of concern
3	AST	aboveground storage tank
4	BCT	BRAC Cleanup Team
5	BEQ	benzo(a)pyrene equivalent
6	BRAC	Base Realignment and Closure Act
7	BRC	background reference concentration
8	CA	corrective action
9	CMS	corrective measures study
10	CNC	Charleston Naval Complex
11	COC	chemical of concern
12	COPC	chemical of potential concern
13	DAF	dilution attenuation factor
14	EnSafe	Ensafe Inc.
15	EPA	U.S. Environmental Protection Agency
16	ft bls	feet below land surface
17	HHRA	human health risk assessment
18	HI	hazard index
19	ILCR	Incremental Lifetime Cancer Risk
20	IM	interim measure
21	µg/kg	microgram per kilogram
22	µg/L	microgram per liter
23	MCL	maximum contaminant level
24	MCS	media cleanup standard
25	NAVBASE	Naval Base
26	NFA	no further action
27	OWS	oil/water separator
28	PAH	polycyclic aromatic hydrocarbon
29	PCB	polychlorinated biphenyl
30	PRG	preliminary remediation goal

1	RAO	remedial action objective
2	RBC	risk-based concentration
3	RCRA	Resource Conservation and Recovery Act
4	RFI	RCRA Facility Investigation
5	RI	remedial investigation
6	RGO	remedial goal option
7	SCDHEC	South Carolina Department of Health and Environmental Control
8	SPLP	synthetic precipitation leaching procedure
9	SSL	soil screening level
10	SVOC	semivolatile organic compound
11	SWMU	solid waste management unit
12	VOC	volatile organic compound
13	UST	underground storage tank

1.0 Introduction

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

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

11 In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation
12 and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to
13 complete the RCRA Facility Investigation (RFI) for Area of Concern (AOC) 617 in Zone F of
14 the CNC. Figure 1-1 illustrates the location of AOC 617 within Zone F. The insert on
15 Figure 1-1 shows the location of Zone F within the CNC. Figure 1-2 is an aerial photograph
16 showing the layout of AOC 617.

1.1 Background

18 AOC 617 is the site of a former galvanizing plant, designated Building 1176, which operated
19 from the early 1940s to approximately 1985. Shortly thereafter, Building 1176 was
20 demolished to facilitate the expansion of Building 69, which is a shipping and supply
21 warehouse located immediately south of AOC 617.

22 Information regarding specific details of historical galvanizing operations conducted at the
23 site is limited. Available records indicate the former presence of a single 3,000-gallon
24 underground storage tank (UST) used for chemical storage. Historical records also indicate
25 the presence of a series of large (approximately 15 by 20 ft) rectangular aboveground storage
26 tanks (ASTs) within the building, which were used for acid, caustic, and chemical storage
27 and processes. These tanks were apparently removed in conjunction with the demolition of
28 the building. There is no record of a release(s) from any of the aforementioned tanks.

29 Virtually 100 percent of AOC 617 is currently paved; historical drawings also indicate this
30 area was paved during Building 1176 operation. AOC 617 is located in an industrial area

1 east of Hobson Avenue. The CNC Reuse Plan identifies this area for industrial land use. The
2 City of North Charleston zoning for this site is M-2, for marine industrial use.

3 For the Zone F RFI, soil samples were collected and four groundwater sampling events were
4 performed during 1996 and 1997. The findings were reported in the *Zone F RFI Report,*
5 *Revision 0* (EnSafe Inc. [EnSafe], 1997). In addition to the sampling performed at AOC 617,
6 investigations for Zone L (AOC 504 railroad lines, AOC 699 storm sewers, and Solid Waste
7 Management Unit [SWMU] 37 sanitary sewers) were conducted within or adjacent to the
8 AOC 617 boundary; soil sampling was conducted through borings and direct-push
9 sampling methods. Groundwater sampling was performed using the direct-push method as
10 well. The results of those sampling efforts were not reported in the *Zone F RFI Report,*
11 *Revision 0*, but were provided in the *Zone L RFI Report, Revision 0* (EnSafe, 1998).

12 Additional soil and groundwater sampling was conducted and a synthetic precipitation
13 leaching procedure (SPLP) evaluation was performed (by EnSafe), which included the
14 installation of new borings at three locations that had been previously sampled during the
15 1996 investigation. In addition, CH2M-Jones recently completed the collection of additional
16 soil and groundwater samples to better delineate the extent of contamination at AOC 617.
17 The results of these investigations are presented in this RFI Report Addendum.

18 AOC 616 is located approximately 50 ft to the north of AOC 617. It is a former paint shop,
19 designated building 1201, which operated from 1955 to 1977. No visible evidence of the
20 paint shop remains and the area is now occupied by a parking lot for Building 69. The *Zone*
21 *F RFI Report, Revision 0* recommended No Further Action (NFA) for AOC 616. SCDHEC
22 agreed with the recommendation that AOC 616 required NFA in their December 31, 1998
23 comments on the *Zone F RFI Report, Revision 0*. The subsequent *Zone F RFI Work Plan*
24 *Addendum* (EnSafe, 1999) noted that groundwater issues potentially resulting from AOC 616
25 would be addressed under AOC 617. Accordingly, AOC 616 groundwater issues are
26 addressed in the discussion for AOC 617 in this RFI Report Addendum.

27 **1.2 Purpose of the RFI Report Addendum**

28 This report documents the conclusions from the *Zone F RFI Report, Revision 0* for AOCs 616
29 and 617, and provides the results of related sampling within the AOC areas and some
30 additional sampling performed after the RFI Report was issued. The results of additional
31 investigations are presented to complete the nature and extent investigation for chemicals of
32 potential concern (COPCs) previously identified in surface soil, subsurface soil, and
33 groundwater. AOC 616 has been previously recommended for NFA. AOC 617 is

1 recommended for a focused corrective measures study (CMS) to address zinc in
2 groundwater (see Section 8.0 of this report addendum).

3 **1.3 Report Organization**

4 This RFI Report Addendum and CMS Work Plan consists of the following sections,
5 including this introductory section:

6 **1.0 Introduction** — Presents the purpose of and background information relating to this RFI
7 Report Addendum.

8 **2.0 Summary of RFI Conclusions for AOC 617** — Summarizes the conclusions from the RFI
9 and risk evaluations for AOC 617.

10 **3.0 Interim Measures and UST/AST Removals** — Summarizes any interim measures (IMs)
11 or UST/AST removals conducted at the site.

12 **4.0 Summary of Additional Information** — Summarizes information collected after
13 completion of the *Zone F RFI Report, Revision 0*.

14 **5.0 COPC/COC Refinement for AOC 617**— Evaluates and identifies COPCs based on
15 current screening criteria using all RFI data.

16 **6.0 AOC 616** – Summarizes the conclusions from the RFI for AOC 616.

17 **7.0 Conclusions and Recommendations**—Provides recommendations for proceeding with
18 site closure.

19 **8.0 Focused CMS Work Plan for AOC 617** – Provides an overview of the focused CMS to be
20 performed for AOC 617.

21 **9.0 References** — Lists the references used in this document.

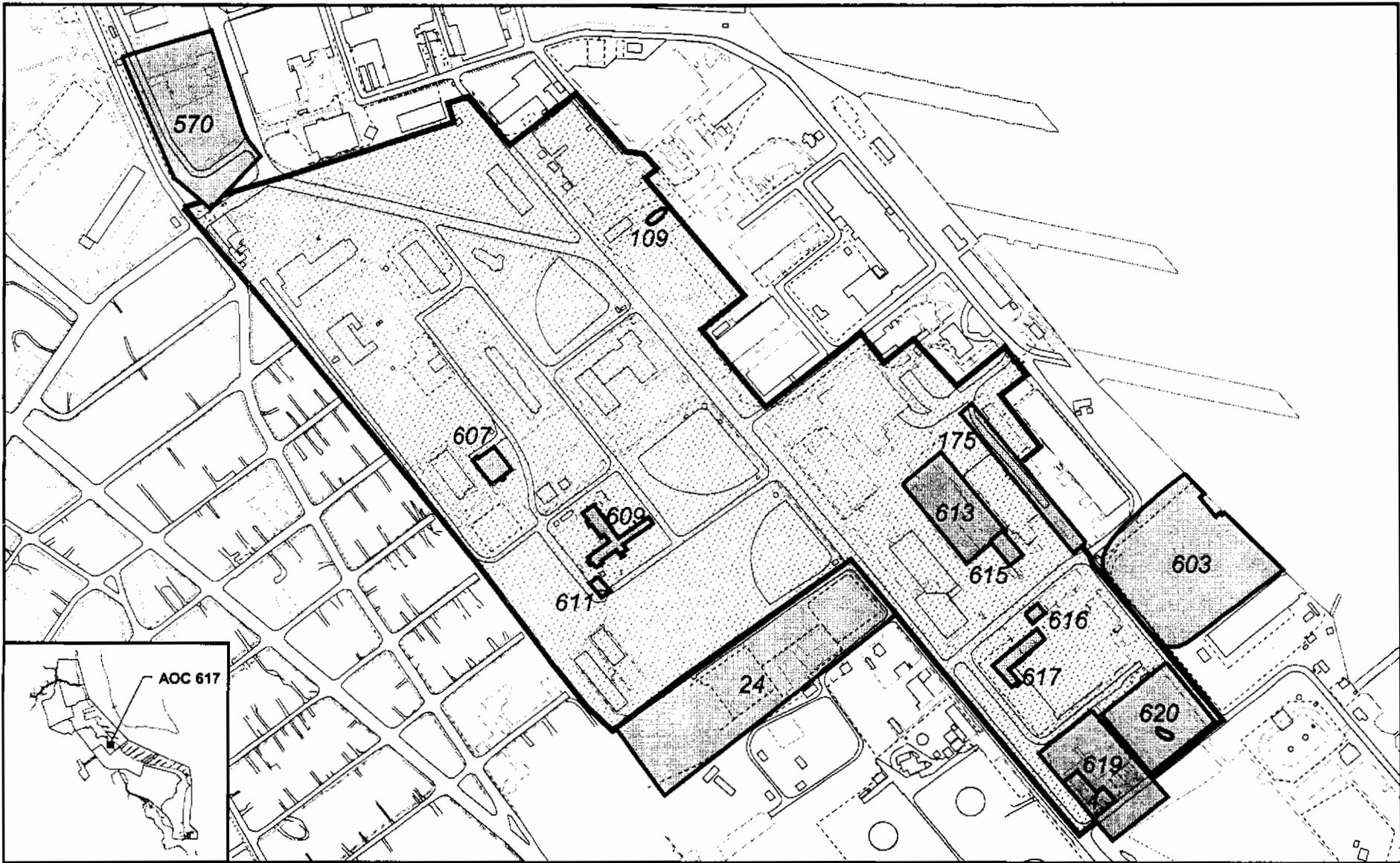
22 **Appendix A** contains excerpts from the *Zone F RFI Report, Revision 0* (EnSafe, 1997) and the
23 *Zone L RFI Report, Revision 0* (EnSafe, 1998).

24 **Appendix B** contains analytical data from sampling subsequent to *Zone F RFI Report,*
25 *Revision 0*.

26 **Appendix C** contains validation reports for the data from sampling subsequent to the *Zone*
27 *F RFI Report, Revision 0*.

28 **Appendix D** provides results of the SPLP leachate evaluation performed by EnSafe.

- 1 **Appendix E** provides soil boring and well completion logs for the monitoring wells
- 2 installed subsequent to the *Zone F Revision 0 RFI Report, Revision 0*.
- 3 **Appendix F** provides responses to SCDHEC Comments on the *Zone F RFI Report, Revision 0*.
- 4 All tables and figures appear at the end of their respective sections.



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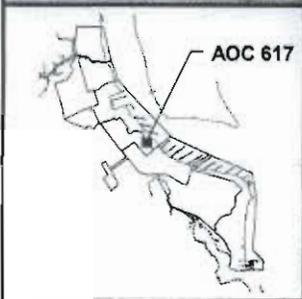
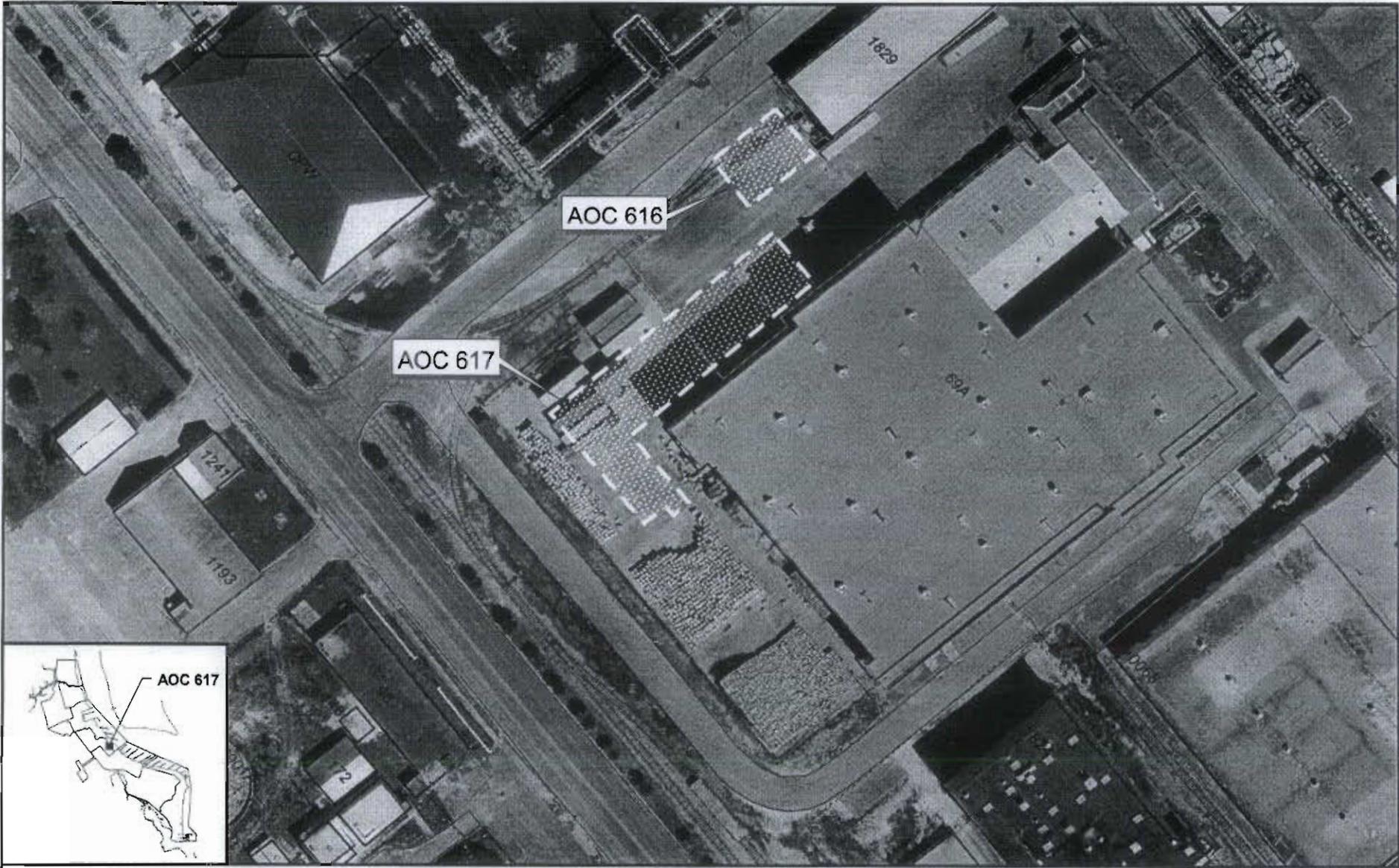
-  Zone F Boundary
-  SWMU/AOC Within Zone F Boundary



300 0 300 600 Feet



Figure 1-1
 Zone F Within CNC
 AOC 616 & 617, Zone F
 Charleston Naval Complex



LEGEND

- 69A Existing Structure
- AOC 616 & 617 Boundary

Note: Aerial Photograph Taken in 1997

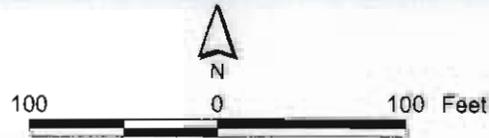


Figure 1-2
 Site Layout
 AOC 616 & 617, Zone F
 Charleston Naval Complex

2.0 Summary of RFI Conclusions for AOC 617

As part of the Zone F RFI, soil and groundwater investigations were conducted at AOC 617. Only soil investigations were conducted at AOC 616 since groundwater well coverage was considered adequate at adjacent sites. Figure 2-1 illustrates the RFI soil sample locations within this area. A total of eight soil borings, four each at AOC 616 (616SB001 through 616SB004) and AOC 617 (617SB001 through 617SB004), were advanced during the 1996-1997 RFI to determine if site activities impacted the surrounding soil. Surface (0 to 1 ft below land surface [ft bls]) and subsurface (3 to 5 ft bls) soil samples were collected from each boring. Groundwater at AOC 617 was investigated at the site with the installation of two monitoring wells, one in 1996 and the other in 1997. Figure 2-2 illustrates the RFI groundwater monitoring well locations at AOC 617.

Based on the results of the sampling, the *Zone F RFI Report, Revision 0* (EnSafe, 1997) did not identify any soil COCs for AOC 616. Soil and groundwater sample results and conclusions regarding contamination and health risk were reported in the RFI Report in the section addressing AOC 617. Conclusions regarding AOC 617 soil and groundwater are summarized below.

2.1 Soil Analysis

Soil samples at AOC 617 were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, pesticides/polychlorinated biphenyls (PCBs), and cyanide, with the exception of sample location F617SB001, which was analyzed for VOCs, SVOCs, and metals. Results of soil analyses were compared in the *Zone F RFI Report, Revision 0* to applicable screening criteria (United States Environmental Protection Agency [EPA] Region III residential risk-based concentrations [RBCs], adjusted for Hazard Index (HI)=0.1, and EPA soil screening levels [SSLs], dilution attenuation factor [DAF]=20) and the Zone F background reference concentrations (BRCs).

Analytes that exceeded the screening criteria were considered COPCs and were further evaluated in the risk assessment to determine which of these parameters were considered COCs. The findings from the screening process are summarized below. Data tables presented in the *Zone F RFI Report, Revision 0* are included in Appendix A of this RFI Report Addendum.

1 2.1.1 Surface Soil

2 The nature and extent of contamination section of the RFI Report (Section 10.9.3.1) contained
3 the following conclusions regarding AOC 617:

- 4 • No VOCs were detected in surface soil.
- 5 • Benzo(a)pyrene exceeded its RBC in one surface soil sample (but did not exceed the SSL)
6 at sample location 617SB004.
- 7 • No pesticide concentrations exceeded their RBCs or SSLs.
- 8 • No PCBs were detected.
- 9 • No inorganics exceeded both their RBCs and Zone F BRCs in surface soil (iron exceeded
10 its RBC but does not have a BRC estimated). Also, no inorganics were detected above
11 applicable SSLs.

12 The fate and transport section of the RFI Report (Section 10.9.5) concluded that no organic or
13 inorganic compounds are present in surface soil at sufficient concentrations to pose a risk to
14 groundwater.

15 2.1.2 Subsurface Soil

16 The nature and extent of contamination section of the RFI Report (Section 10.9.3.1) contained
17 the following conclusions regarding contaminants in subsurface soil at AOC 617:

- 18 • No VOCs exceeded their respective SSLs.
- 19 • Benzo(a)anthracene was detected in two locations (617SB003 and 617SB004) at
20 concentrations exceeding its SSL.
- 21 • No pesticide concentrations exceeded their RBCs or SSLs.
- 22 • Aroclor-1260 was detected in two samples; one sample (F617SB003) exceeded the SSL.
- 23 • The herbicide 2,4-D and dioxin were detected in the duplicate subsurface soil sample
24 collected at F617SB002, but neither compound was above its respective SSL.
- 25 • No metals exceeded both their SSLs and Zone F BRCs for subsurface soil (antimony
26 exceeded its SSL but has no BRC).

27 The fate and transport section of the RFI Report (Section 10.2.5) concluded that one SVOC
28 (benzo[a]anthracene), one PCB (Aroclor-1260), and one inorganic (antimony) were detected
29 in subsurface soil at concentrations exceeding their SSLs. These exceedances were limited to
30 locations F617SB003 and F617SB004. The *Zone F RFI Report, Revision 0* states (for SVOCs and
31 PCBs) that although "these compounds present a potential threat to groundwater, the

1 empirical data suggest otherwise, or at least the potential for leaching is minimal, as they
2 were not detected in site groundwater." For inorganics, the RFI Report states, "groundwater
3 data suggest that leaching of these constituents at or above deleterious effects levels is not
4 occurring."

5 **2.2 Groundwater Analysis**

6 Groundwater was investigated at this site with the installation of two monitoring wells
7 (F617GW001 and F617GW002) in 1996 and 1997. Figure 2-2 illustrates the locations of these
8 wells. Figures 10.9-2 and 10.9-3 of the *Zone F RFI Report, Revision 0* illustrate the shallow
9 groundwater potentiometric contours at low tide and high tide, respectively (and are
10 provided in Appendix A of this RFI Report Addendum). The groundwater potentiometric
11 contours are based on water level measurements made in 1997. The figures indicate that the
12 shallow groundwater flow regime in the vicinity of AOC 617 converges toward the west at
13 low tide and converges towards the east at high tide. The Cooper River is located to the east
14 of AOC 617.

15 Data from the first three sampling events for F617GW001 and the first two sampling events
16 for F617GW002 were reported in the RFI Report. Subsequent groundwater sampling data
17 from these wells are discussed in Section 4.0 of this report addendum.

18 Results of groundwater analyses were compared in the RFI Report to BRCs and tap water
19 RBCs as screening criteria. The nature and extent of contamination section of the RFI Report
20 (Section 10.9.4) reported the following conclusions:

- 21 • No VOCs were detected in shallow groundwater.
- 22 • Two SVOCs were detected at concentrations less than their RBCs.
- 23 • Aluminum, arsenic, cadmium, cobalt, manganese, nickel, thallium, and zinc exceeded
24 both their RBCs and BRCs.
- 25 • pH was measured ranging from 4.95 to 6.55 standard units.

26 **2.3 Human Health Risk Assessment**

27 Analytes that exceeded the screening criteria were considered COPCs and were evaluated
28 further in the risk assessment to determine which of these parameters were considered
29 COCs. The findings from the risk assessment are summarized below.

2.3.1 Surface Soil

The human health risk assessment (HHRA) section of the *Zone F RFI Report, Revision 0* (Section 10.9.6) assessed the risk and hazard posed by contaminants at AOC 617 for the future industrial land use and unrestricted land use scenarios under incidental ingestion and dermal contact pathways. Benzo(a)pyrene equivalents (BEQs) were identified as COCs in surface soil at AOC 617 based on the future unrestricted land use scenario.

2.3.2 Subsurface Soil

No subsurface soil COPCs were identified for further evaluation in the risk assessment.

2.3.3 Groundwater

The HHRA section of the RFI Report (Section 10.9.6) evaluated the groundwater pathway based on the ingestion of shallow groundwater as represented by the initial sampling event of groundwater data. Aluminum, arsenic, cadmium, cobalt, manganese, nickel, thallium, and zinc were identified as COCs based on the unrestricted land use scenario.

2.4 COPC/COC Summary

The *Zone F RFI Report, Revision 0* concluded that, based on the analytical results and the HHRA, COCs requiring further evaluation were identified for surface soil and groundwater at AOC 617. No COCs were identified for subsurface soil.

The RFI Report identified BEQs as the only surface soil COC.

The RFI Report identified the following groundwater COCs:

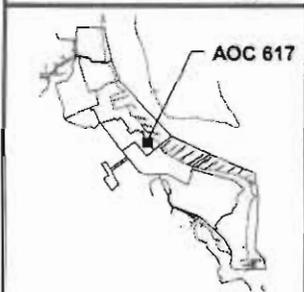
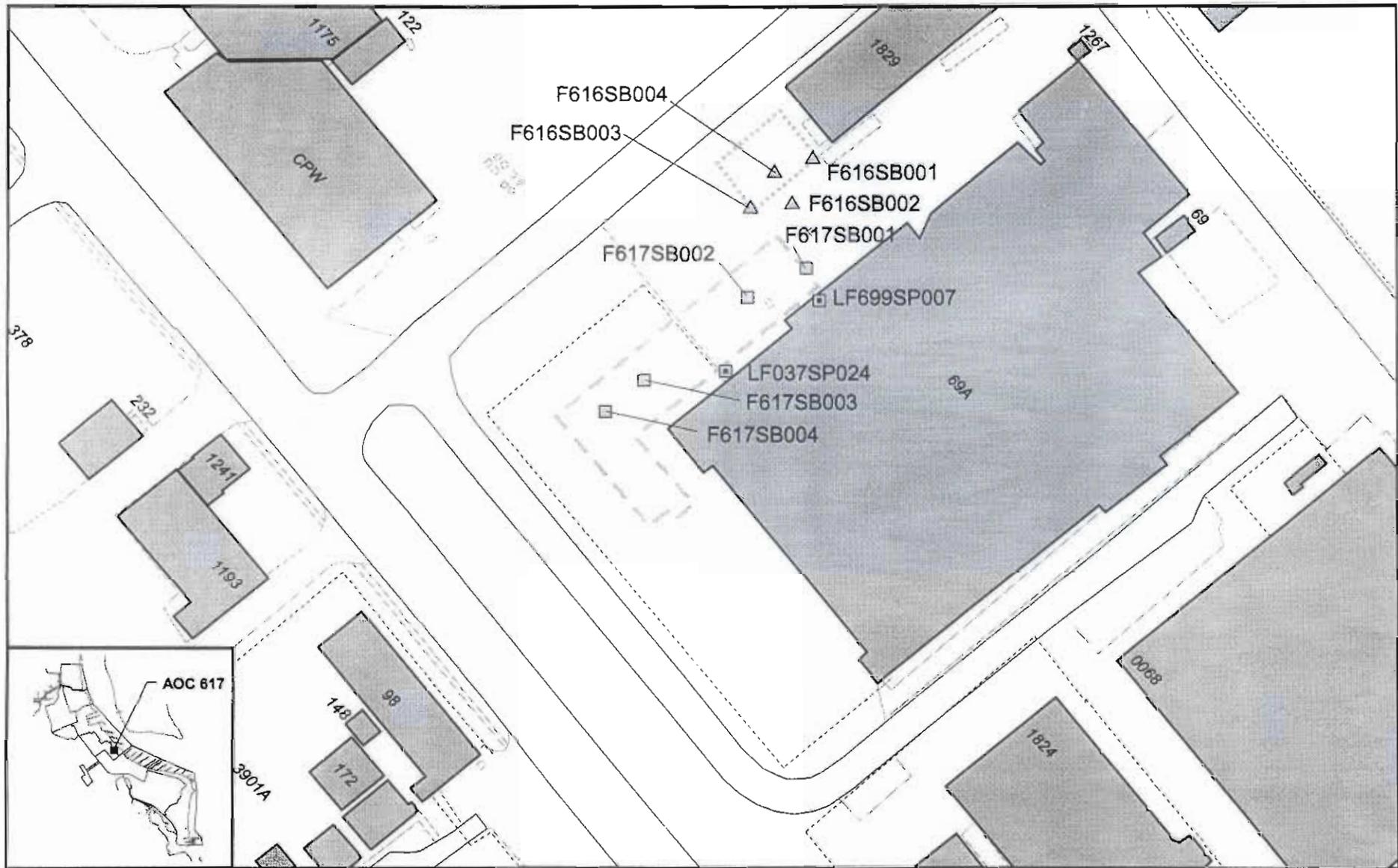
- Aluminum
- Arsenic
- Cadmium
- Cobalt
- Manganese
- Nickel
- Thallium
- Zinc

Each of the analytes identified as COCs is discussed in Section 5.0 of this RFI Report Addendum.

1 **2.5 Additional Data from AOC 699 and SWMU 37**
2 **Investigations**

3 Data from Zone L sites AOC 699 and SWMU 37 were also collected within the geographical
4 area of AOC 617. Soil probes LF037SP024 and LF699SP007 were sampled for cyanide,
5 metals, and VOCs. Groundwater probes LF037GP039 and LF699GP016 were analyzed for
6 cyanide, VOCs, and metals. The BCT has agreed that the metals data from these unfiltered
7 probe samples are not considered to be representative of groundwater quality. The data for
8 the samples were presented in the *Zone L RFI Report, Revision 0* (EnSafe, 1998); detected
9 parameters for soil samples are also presented in Appendix A of this RFI Report
10 Addendum.

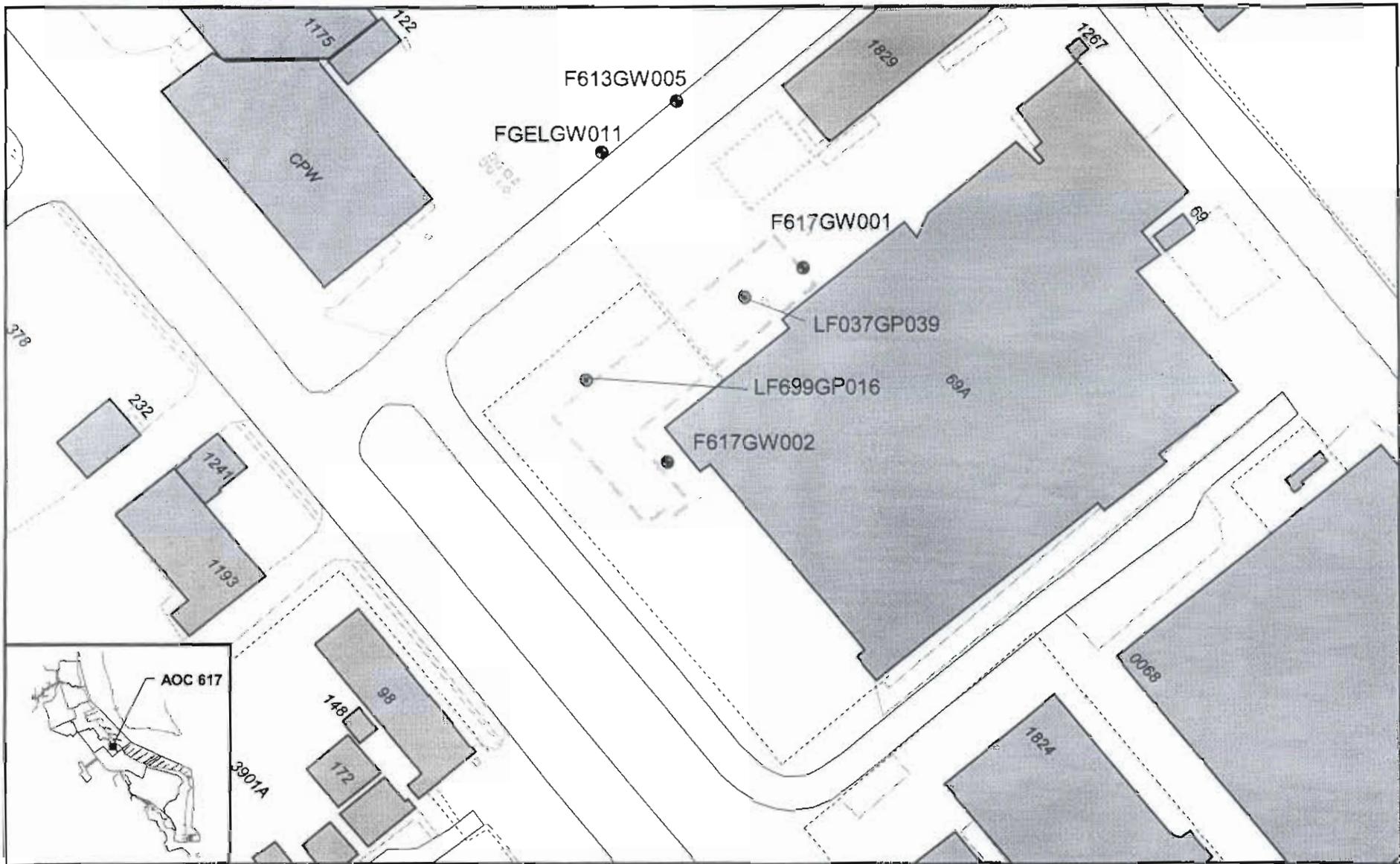
11 The data indicate that no cyanide or VOCs were detected in these soil and groundwater
12 probe samples, with the exception of low levels of acetone in the soil. The acetone
13 concentrations were less than the screening RBC and SSL. With the exception of iron and
14 arsenic, metals concentrations in the soil probe samples were below RBCs, adjusted for
15 HI=0.1. The arsenic concentrations were below the BRC. No BRC was identified for iron.
16 No COPCs were identified for these soil or groundwater samples.



- LEGEND:**
- △ AOC 616 Soil Sample Locations
 - AOC 617 Soil Sample Locations
 - ▣ Zone L Soil Probe Sample Locations
 - - - AOC 616 Boundary
 - - - AOC 617 Boundary



Figure 2-1
Originally Reported Soil Sample Locations
AOC 616 & 617, Zone F
Charleston Naval Complex



LEGEND:

- Groundwater Well Locations
- Zone L Groundwater Probe Sample Locations
- - - AOC 616 Boundary
- - - AOC 617 Boundary



Figure 2-2
Originally Reported Groundwater Well Locations
AOC 616 & 617, Zone F
Charleston Naval Complex

1 **3.0 Interim Measures and UST/AST Removal**

2 No interim measures have been performed at AOC 617.

3 Available records indicate the former presence of a single 3,000-gallon UST used for
4 chemical storage. The exact location of this UST has not been identified. Historical records
5 also indicate the presence of a series of large (approximately 15 by 20 ft) rectangular ASTs
6 within the building, which contained acid, caustic, and other chemicals used in the plant
7 process. These tanks were apparently removed in conjunction with the demolition of the
8 building. There is no record of a release(s) from any of the aforementioned tanks.

1 **4.0 Summary of Additional Investigations**

2 Following the completion of the *Zone F RFI Report, Revision 0* (EnSafe, 1997), additional soil
3 and groundwater investigations were undertaken by EnSafe and CH2M-Jones at AOC 617.
4 The purpose of the additional investigations was to address SCDHEC comments on the RFI
5 Report regarding the extent of soil and groundwater contamination at AOC 617.

6 Figures 4-1 and 4-2 illustrate the locations of the new soil sample locations and groundwater
7 well locations, respectively. The additional investigations undertaken following the
8 completion of the RFI Report are described herein; results are presented in the subsequent
9 paragraphs. Analytical data results and validation reports are provided in Appendices B
10 and C, respectively.

11 During the latter part of 1999, additional field activities were conducted subsequent to the
12 *Zone F RFI Report, Revision 0*, in general accordance with the *Zone F RFI Work Plan Addendum*
13 (EnSafe, 1999). Two new borings were installed at the locations of F617SB003 and
14 F617SB004, and surface (0 to 1 ft bls) and subsurface (3 to 5 ft bls) soil samples were
15 collected. These samples were analyzed for metals, VOCs, SVOCs, pesticides/PCBs, and
16 cyanide. In addition, an SPLP leachate evaluation was performed using soil samples
17 collected from the same borings. Although SPLP was tested for VOCs, SVOCs,
18 pesticides/PCBs, and cyanide, only metals were detected in the leachate. The results of the
19 SPLP leachate evaluation for metals and subsurface soil polycyclic aromatic hydrocarbons
20 (PAHs) are presented in Appendix D of this RFI Report Addendum.

21 In June 2001, CH2M-Jones collected subsurface soil samples from three additional soil
22 borings (F617SB005, F617SB006 and F617SB007). These subsurface samples were analyzed
23 for PAHs.

24 After the completion of the *Zone F RFI Report, Revision 0*, additional groundwater sampling
25 events were conducted at the existing monitoring wells at AOC 617 (F617GW001 and
26 F617GW002) and two wells adjacent to AOC 617 (F613GW005 and FGELGW011). The
27 samples were analyzed for metals, PCBs, and SVOCs in November 1997 and February 1998.
28 A third groundwater monitoring well (F617GW003) was installed at AOC 617 and sampled
29 in 1999. Most recently, a fourth monitoring well (F617GW004) was installed by CH2M-
30 Jones. Logs from these well installations are presented in Appendix E of this report

1 addendum. In June 2001, CH2M-Jones sampled the four monitoring wells at AOC 617
2 (F617GW001, F617GW002, F617GW003, and F617GW004) for analysis of metals.

3 **4.1 Soil Sampling Results**

4 Analytical results from the additional soil samples described above were compared to the
5 appropriate screening criteria. Surface soil results were compared to the range of surface soil
6 background concentrations for Zones F and G (background range), generic SSLs (DAF=10,
7 except for VOCs where DAF=1), and EPA Region III residential RBCs (HI=0.1). The reason
8 for the combining of the soil background data sets for Zones F and G is that only six
9 background soil samples were collected for Zone F, which is a relatively small data set. Zone
10 G has an industrial character, similar to Zone F. PAHs (as BEQs) were compared to the site-
11 wide reference concentration of 1,304 micrograms per kilogram ($\mu\text{g}/\text{kg}$) for surface soil, that
12 was developed by the CNC BRAC Cleanup Team (BCT). When both the maximum of the
13 background range and either the RBC or SSL were exceeded, the chemical was selected as a
14 COPC.

15 Subsurface soil results were compared to the range of subsurface soil background
16 concentrations for Zones F and G (background range), and generic SSLs (DAF=10, except for
17 VOCs where DAF=1). PAHs (as BEQs) were compared to the site-wide reference
18 concentration of 1,400 $\mu\text{g}/\text{kg}$ for subsurface soil developed by the CNC BCT. When both
19 criteria were exceeded, the chemical was selected as a COPC for the soil-to-groundwater
20 leachability pathway.

21 Analytical data from the additional sampling are presented in Appendix B of this report
22 addendum. Tables 4-1 and 4-2 present the detected analytes for surface and subsurface soils,
23 respectively. Concentrations that exceeded the appropriate screening criteria appear in bold
24 text and are outlined within the tables.

25 **4.1.1 Surface Soil**

26 Concentrations of chemicals detected in surface soils from sample collection at borings
27 F617SB003 and F617SB004 are presented in Table 4-1. Comparison of metals concentrations
28 for the additional surface soil data to the screening criteria described above indicated that
29 arsenic, iron, and manganese exceeded the EPA Region III Residential RBC at both sampling
30 locations. However, none of these compounds exceeded the maximum of the background
31 range, indicating that the concentrations are similar to background concentrations. The

1 concentrations of arsenic in both of the soil samples did not exceed the SSL. There is no SSL
2 for manganese or iron.

3 The only organic compound that had a concentration above the detection limits in the two
4 additional surface soil samples was acetone. Both concentrations were below the screening
5 criteria.

6 No pesticides or PCBs were above the detection limits in the two additional surface soil
7 samples.

8 **4.1.2 Subsurface Soil**

9 Concentrations of chemicals detected in the subsurface soil sample collection at borings
10 F617SB003 and F617SB004 are presented in Table 4-2. The concentrations of zinc in two soil
11 borings (F617SB003 and F617SB004) exceeded the maximum of the background range, but
12 did not exceed the SSL. The concentrations of all other metals in subsurface soils are below
13 the screening criteria.

14 Comparison of the additional subsurface soil data to the screening criteria indicated that
15 Aroclor-1260, DDD, and DDE were detected in two samples (F617SB003 and F617SB004),
16 but no pesticides or PCBs exceeded the screening criteria, as shown in Table 4-2.

17 PAHs expressed as BEQs exceeded the site-wide reference concentration of 1,400 µg/kg in
18 the soil sample collected from F617SB003. BEQ concentrations at the other soil sample
19 locations are less than the site-wide reference concentration. There is no SSL for BEQs. Some
20 individual PAH compounds exceeded their SSL values and CNC-wide BRCs at sample
21 location F617SB003. These concentrations appear in bold text and are outlined within Table
22 4-2. These compounds were retained as COPCs.

23 Subsurface soil samples collected at boring F617SB003 and F617SB004 were also analyzed
24 for SPLP to assess whether leaching of contaminants was a concern. No PAHs were detected
25 in the extract from these SPLP tests. The data from the SPLP tests are presented in Appendix
26 D. These data are discussed further in Section 5.0 of this report addendum.

27 CH2M-Jones collected three additional subsurface soil samples from new locations
28 F617SB005, F617SB006, and F617SB007 during June 2001. These samples were analyzed for
29 PAHs. The BEQ concentrations and concentration of individual PAHs in all of the samples
30 collected by CH2M-Jones were less than the site-wide reference concentrations and SSLs.

4.2 Groundwater Sampling Results

As mentioned earlier, additional groundwater sampling events were performed at the two monitoring wells installed during the RFI (F617GW001 and F617GW002), at two wells adjacent to AOC617 (F613GW005 and FGELGW011), and at one new well installed at AOC 617 (F617GW003). Groundwater analytical results were compared to the Zone F BRCs developed in the *Zone F RFI Report, Revision 0*, and EPA maximum contaminant levels (MCLs). In the absence of an MCL, the EPA Region III tap water RBC (HI=0.1) was used. For chemicals that did not have a BRC, the range of background values from the Zone F grid wells was used.

Appendix B presents a summary of the analytical results of the additional groundwater samples; detected analytes are presented in Table 4-3. If the concentration of a chemical detected in groundwater exceeded the MCL or RBC and the BRC, it was selected as a COPC. These concentrations appear in bold text and are outlined within Table 4-3.

A comparison of the additional groundwater data to the screening criteria indicates that the concentration of iron in groundwater exceeded the RBC (HI=0.1) in four monitoring wells (F617GW002, F617GW003, F613GW005, and FGELGW011). However, it is below the range of concentrations from the Zones F background wells. The concentration of zinc in groundwater exceeded the RBC (HI=0.1) and BRC in monitoring wells F617GW003 and F617GW004. The concentration of nickel exceeded the adjusted RBC (HI=0.1) in monitoring well F617GW003. The concentrations of all other metals in groundwater are below the screening criteria.

4.3 COPC Evaluation

This section discusses samples that were collected after completion of the *Zone F RFI Report, Revision 0*. The samples discussed in the following sections have concentrations of individual constituents that exceeded the appropriate screening criteria.

4.3.1 Surface Soil

None of the surface soil samples collected after the completion of the RFI Report had chemical concentrations that exceeded the Zones F and G range of background concentrations or either the RBC or SSL. Therefore, no chemicals were selected as COPCs.

1 **4.3.2 Subsurface Soil**

2 When the subsurface soil samples collected after the RFI Report presented concentrations of
3 a chemical that exceeded both the Zones F and G range of background concentrations (or
4 the BRC for BEQs) and SSL (DAF=10), the chemical was selected as a COPC for the soil-to-
5 groundwater leachability pathway:

6 **BEQs**

7 The BEQ concentration was detected above its BRC of 1,400 µg/kg in one of the subsurface
8 soil samples (from boring F617SB003) collected after completion of the *Zone F RFI Report,*
9 *Revision 0.* There is no generic SSL for BEQs. At F617SB003, the BEQ components
10 benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene
11 exceeded generic SSLs, based on a DAF of 10. Therefore, these PAHs were selected as
12 COPCs for subsurface soil.

13 **4.3.3 Groundwater**

14 When the concentration of a chemical detected in groundwater exceeded the MCL or both
15 the RBC and maximum concentration of the site-wide background range, it was selected as
16 a COPC:

17 **Zinc**

18 Zinc was detected above its adjusted RBC of 1,100 micrograms per liter (µg/L) in two of the
19 six monitoring wells (F617GW003 and F617GW004) sampled. There is no Zone F BRC and
20 no primary MCL for zinc. The concentration of zinc in the groundwater samples collected
21 from F617GW003 exceeded the RBC during two separate sampling events (May 1999 and
22 June 2001). The concentration of zinc in groundwater collected from F617GW003 during
23 these two sampling events was 30,600 and 119,000 µg/L, respectively. The concentration of
24 zinc in F617GW004 was 2,630 µg/L. Zinc was selected as a groundwater COPC.

25 **Nickel**

26 Nickel was detected in both samples from F617GW003 at concentrations of 114 and 396
27 µg/L, in excess of the adjusted RBC (HI=0.1) of 73 µg/L and the Zone F BRC of 5.55 µg/L.
28 Nickel was selected as a groundwater COPC.

TABLE 4-1
 Surface Soil Analytical Results for Detected Compounds
 RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Sample ID	Concentration	Qualifier	Units	EPA Region III Residential RBC (Hf=0.1)	Generic SSL (DAF=10)	Zones F and G Background Range
Metals							
Aluminum	F617SB003	1,560	=	mg/kg	7,821	NA	2,190 - 19,400
	F617SB004	1,520	=				
Antimony	F617SB003	0.36	J	mg/kg	3.1	2.5	0.50 - 5.7
	F617SB004	0.39	J				
Arsenic	F617SB003	3.2	J	mg/kg	0.4258	14.5	3.0 - 30
	F617SB004	2.5	J				
Barium	F617SB003	12.4	J	mg/kg	547.5	800	11 - 129
	F617SB004	15.6	J				
Cadmium	F617SB003	0.66	J	mg/kg	7.82	4	0.12 - 1.7
	F617SB004	0.66	J				
Calcium	F617SB003	340,000	J	mg/kg	NL	NA	2,080 - 52,300
	F617SB004	328,000	J				
Chromium, Total	F617SB003	7.7	J	mg/kg	210	19	6.3 - 39
	F617SB004	7.9	J				
Cobalt	F617SB003	4.9	=	mg/kg	469.3	NA	0.94 - 36
	F617SB004	8.1	=				
Copper	F617SB003	3.3	=	mg/kg	312.9	NA	5.7 - 431
	F617SB004	2.7	=				
Iron	F617SB003	3,390	=	mg/kg	2,346	NA	3,570 - 32,700
	F617SB004	3,470	=				
Lead	F617SB003	2.5	=	mg/kg	400	400	3.5 - 275
	F617SB004	1.6	=				
Magnesium	F617SB003	5,460	J	mg/kg	NA	NA	323 - 5,280
	F617SB004	5,730	J				
Manganese	F617SB003	230	=	mg/kg	156.4	NA	32 - 436
	F617SB004	248	=				
Nickel	F617SB003	9.8	=	mg/kg	156.4	65	2.0 - 27
	F617SB004	11.2	=				
Potassium	F617SB003	1,660	J	mg/kg	NA	NA	202 - 1,730
	F617SB004	2,010	J				
Silver	F617SB003	0.57	J	mg/kg	39	17	5.0 - 5.0
	F617SB004	0.16	J				

TABLE 4-1
 Surface Soil Analytical Results for Detected Compounds
 RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Sample ID	Concentration	Qualifier	Units	EPA Region III Residential RBC (HI=0.1)	Generic SSL (DAF=10)	Zones F and G Background Range
Sodium	F617SB003	718	=	mg/kg	NA	NA	394 - 1,660
	F617SB004	729	=				
Tin (Sn)	F617SB003	4.4	J	mg/kg	4,693	NA	2.6 - 26
	F617SB004	4.6	J				
Vanadium	F617SB003	5.9	=	mg/kg	54.75	3,000	6.8 - 60
	F617SB004	6.9	=				
Zinc	F617SB003	31.1	J	mg/kg	2,346	6,000	18 - 1650
	F617SB004	21.5	J				
Organic Compounds							
Acetone	F617SB003	0.012	=	µg/kg	782	0.8	NA
	F617SB004	0.01	=				

µg/kg Micrograms per kilogram

mg/kg Milligrams per kilogram

= Analyte is detected at the concentration shown.

J Analyte is detected at an estimated concentration.

NA Not applicable/not available

TABLE 4-2
 Subsurface Soil Analytical Results for Detected Compounds
 RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Sample ID	Concentration	Qualifier	Units	Generic SSL (DAF=10)	Zones F and G Background Range
Metals						
Aluminum	F617SB003	7,780	=	mg/kg	NA	2,360 - 36,800
	F617SB004	5,750	=			
Antimony	F617SB003	1.2	J	mg/kg	2.5	0.21 - 0.21
	F617SB004	1.1	J			
Arsenic	F617SB003	3.6	J	mg/kg	14.5	1.4 - 36
	F617SB004	2.2	J			
Barium	F617SB003	18	J	mg/kg	800	7.7 - 63
	F617SB004	18	J			
Beryllium	F617SB003	0.23	J	mg/kg	31.5	0.22 - 2.4
	F617SB004	0.09	J			
Cadmium	F617SB003	0.5	J	mg/kg	4	0.08 - 1.2
	F617SB004	0.32	J			
Calcium	F617SB003	17,300	J	mg/kg	NA	1,040 - 127,000
	F617SB004	17,000	J			
Chromium, Total	F617SB003	14.3	J	mg/kg	19	7.4 - 65
	F617SB004	11.3	J			
Cobalt	F617SB003	1.9	J	mg/kg	NA	0.9 - 15
	F617SB004	1.7	J			
Copper	F617SB003	11.4	=	mg/kg	NA	2.5 - 55
	F617SB004	8.6	=			
Iron	F617SB003	6,630	=	mg/kg	NA	3,110 - 58,100
	F617SB004	4,490	=			
Lead	F617SB003	50.1	=	mg/kg	400	2.4 - 123
	F617SB004	48.2	=			
Magnesium	F617SB003	857	J	mg/kg	NA	399 - 7,040
	F617SB004	576	J			
Manganese	F617SB003	60.9	=	mg/kg	NA	20 - 1,120
	F617SB004	31.9	=			
Mercury	F617SB003	0.18	=	mg/kg	1	0.040 - 0.57
	F617SB004	0.19	=			
Nickel	F617SB003	5.3	=	mg/kg	65	1.9 - 22
	F617SB004	5	=			

TABLE 4-2
 Subsurface Soil Analytical Results for Detected Compounds
 RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Sample ID	Concentration	Qualifier	Units	Generic SSL (DAF=10)	Zones F and G Background Range
Potassium	F617SB003	461	J	mg/kg	NA	195 - 3,790
	F617SB004	263	J			
Selenium	F617SB003	0.8	J	mg/kg	2.5	0.4 - 1.7
	F617SB004	0.63	J			
Sodium	F617SB003	232	J	mg/kg	NA	289 - 3,890
	F617SB004	170	J			
Tin (Sn)	F617SB003	10	=	mg/kg	NA	1.1 - 2.9
	F617SB004	6	J			
Vanadium	F617SB003	14.6	=	mg/kg	3,000	5.9 - 112
	F617SB004	9.5	=			
Zinc	F617SB003	1,200	J	mg/kg	6,000	9.3 - 196
	F617SB004	437	J			
PCBs and Pesticides						
PCB-1260 (Aroclor 1260)	F617SB003	88	=	µg/kg	NA	NA
PCB-1260 (Aroclor 1260)	F617SB004	180	=	µg/kg	NA	NA
p,p'-DDE	F617SB004	6.6	=	µg/kg	27	NA
p,p'-DDE	F617SB003	4.7	J	µg/kg	27	NA
p,p'-DDD	F617SB003	5.8	J	µg/kg	8	NA
p,p'-DDD	F617SB004	6.8	J	µg/kg	8	NA
Organic Compounds						
BEQs	F617SB003	10,043		µg/kg	NA	1,400
	F617SB004	317				
	F617SB006	203				
2-Methylnaphthalene	F617SB003	380	J	µg/kg	NA	NA
Acenaphthene	F617SB003	3,600	=	µg/kg	NA	NA
Acetone	F617SB003	20	J	µg/kg	800	NA
	F617SB004	20	J			
Anthracene	F617SB003	5,700	=	µg/kg	6,000,000	NA
	F617SB006	11	J			

TABLE 4-2
 Subsurface Soil Analytical Results for Detected Compounds
 RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Sample ID	Concentration	Qualifier	Units	Generic SSL (DAF=10)	Zones F and G Background Range
Benzo(a)Anthracene	F617SB003	7,500	=	µg/kg	1,000	627 ^a
	F617SB004	100	J			
	F617SB006	130	=			
Benzo(a)Pyrene	F617SB003	6,400	=	µg/kg	4,000	623 ^a
	F617SB004	93	J			
	F617SB006	127	=			
Benzo(b)Fluoranthene	F617SB003	6,000	=	µg/kg	2,500	631 ^a
	F617SB004	91	J			
	F617SB006	349	J			
Benzo(g,h,i)Perylene	F617SB003	3,100	=	µg/kg	NA	NA
	F617SB006	81	J			
Benzo(k)Fluoranthene	F617SB003	3,600	J	µg/kg	24,500	609 ^a
	F617SB004	79	J			
	F617SB006	116	J			
Carbon Disulfide	F617SB003	1	J	µg/kg	16,000	NA
	F617SB004	2	J			
Chrysene	F617SB003	7,000	=	µg/kg	80,000	616 ^a
	F617SB004	110	J			
	F617SB006	127	=			
Dibenz(a,h)anthracene	F617SB003	1,800	=	µg/kg	1,000	586 ^a
Dibenzofuran	F617SB003	1,900	=	µg/kg	NA	NA
Fluoranthene	F617SB003	18,000	=	µg/kg	2,150,000	NA
	F617SB004	230	J			
	F617SB006	196	=			
	F617SB007	6	J			
Fluorene	F617SB003	3,100	=	µg/kg	280,000	NA
Indeno(1,2,3-c,d)pyrene	F617SB003	4,500	J	µg/kg	7,000	592 ^a
	F617SB006	71	=			
Naphthalene	F617SB003	1,300	=	µg/kg	4,000	NA

TABLE 4-2
 Subsurface Soil Analytical Results for Detected Compounds
RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Sample ID	Concentration	Qualifier	Units	Generic SSL (DAF=10)	Zones F and G Background Range
Phenanthrene	F617SB003	18,000	=	µg/kg	NA	201
	F617SB004	150	J			
Pyrene	F617SB003	15,000	=	µg/kg	2,100,000	216
	F617SB004	200	J			
	F617SB006	152	=			

Concentrations for some individual PAH compounds exceeded their SSL values and CNC-wide BRCs, and are shown in bold and outlined text.

^a CNC-wide background concentration for BEQ components is taken from the *Background PAHs Study Report - Technical Information for Development of Background BEQ Values* (CH2M-Jones, February 2001).

µg/kg Micrograms per kilogram

mg/kg Milligrams per kilogram

= Analyte is detected at the concentration shown.

J Analyte is detected at an estimated concentration.

NA Not applicable/not available

TABLE 4-3
 Groundwater Analytical Results for Detected Compounds
 RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Sample ID	Sampling Date	Concentration (µg/L)	Qualifier	MCL	RBC (HI=0.1)	Zone F BRC
Metals							
Aluminum	F617GW001	25-Nov-1997	595	=	NL	3,700	224
	F617GW003	20-May-1999	3,070	J			
	F617GW003	20-May-1999	54.9	J			
	FGELGW011	12-Nov-1997	323	J			
Arsenic	F617GW003	21-Jun-2001	3.6	J	50	0.045	16.7
	F617GW004	21-Jun-2001	2.38	J			
Barium	F617GW001	25-Nov-1997	39.1	=	2,000	260	94.3
	F617GW002	21-Nov-1997	66.7	J			
	F617GW002	10-Feb-1998	82.1	J			
	F617GW003	20-May-1999	26.8	=			
Beryllium	F617GW003	20-May-1999	1.3	J	4	7.3	0.66
Cadmium	F617GW002	21-Nov-1997	0.32	J	5	1.8	0.82
	F617GW003	20-May-1999	3.4	J			
	F617GW003	21-Jun-2001	4.44	J			
Calcium	F617GW001	25-Nov-1997	49,200	=	NL	NL	NL
	F617GW002	21-Nov-1997	114,000	=			
	F617GW002	10-Feb-1998	132,000	=			
	F617GW003	20-May-1999	20,600	J			
Chromium, Total	F617GW001	25-Nov-1997	2.6	J	100	NL	2.05
	F617GW003	20-May-1999	0.78	J			
	F617GW003	21-Jun-2001	4.7	J			
Cobalt	F617GW001	25-Nov-1997	1.4	J	NL	220	10.9
	F617GW002	21-Nov-1997	2.8	J			
	F617GW002	10-Feb-1998	2.3	J			
	F617GW003	20-May-1999	10.6	J			
Copper	F617GW001	25-Nov-1997	4.3	J	1,300	150	ND
Iron	F617GW001	25-Nov-1997	1,040	=	NL	1,100	8,600 - 62,000
	F617GW002	21-Nov-1997	5,130	J			
	F617GW002	10-Feb-1998	2,570	=			
	F617GW003	20-May-1999	25,800	J			
Lead	F617GW001	25-Nov-1997	0.93	J	15 (MCLG)	NL	NL
Magnesium	F617GW001	25-Nov-1997	10,700	=	NL	NL	NL
	F617GW002	21-Nov-1997	11,500	=			
	F617GW002	10-Feb-1998	9,960	=			
	F617GW003	20-May-1999	5,170	J			

TABLE 4-3
 Groundwater Analytical Results for Detected Compounds
 RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Sample ID	Sampling Date	Concentration (µg/L)	Qualifier	MCL	RBC (HI=0.1)	Zone F BRC
Manganese	F617GW001	25-Nov-1997	329	=	NL	73	2,010
	F617GW002	21-Nov-1997	372	=			
	F617GW002	10-Feb-1998	268	=			
	F617GW003	20-May-1999	223	=			
Mercury	F617GW003	20-May-1999	0.66	J	2	NL	NL
Nickel	F617GW002	21-Nov-1997	1.1	J	NL	73	5.55
	F617GW002	10-Feb-1998	1.3	J			
	F617GW002	21-Jun-2001	1.29	U			
	F617GW003	20-May-1999	114	=			
	F617GW003	21-Jun-2001	396	=			
F617GW004	21-Jun-2001	29.8	J				
Potassium	F617GW001	25-Nov-1997	8,310	=	NL	NL	NL
	F617GW002	21-Nov-1997	7,880	=			
	F617GW002	10-Feb-1998	7,470	=			
	F617GW003	20-May-1999	6,200	J			
Selenium	F617GW003	20-May-1999	3.4	J	50	18	NL
Sodium	F617GW001	25-Nov-1997	141,000	=	NL	NL	NL
	F617GW003	20-May-1999	65,900	=			
Vanadium	F617GW001	25-Nov-1997	1.4	J	NL	26	1.58
Zinc	F617GW001	21-Jun-2001	6.37	J	NL	1,100	NL
	F617GW002	21-Nov-1997	576	=			
	F617GW002	10-Feb-1998	514	=			
	F617GW002	21-Jun-2001	78.2	=			
	F617GW003	20-May-1999	30,600	=			
	F617GW003	21-Jun-2001	119,000	=			
	F617GW004	21-Jun-2001	2,630	=			

Concentrations that exceeded the MCL or RBC and BRC are presented in bold and outlined text.

µg/L Micrograms per liter

= Analyte is detected at the concentration shown.

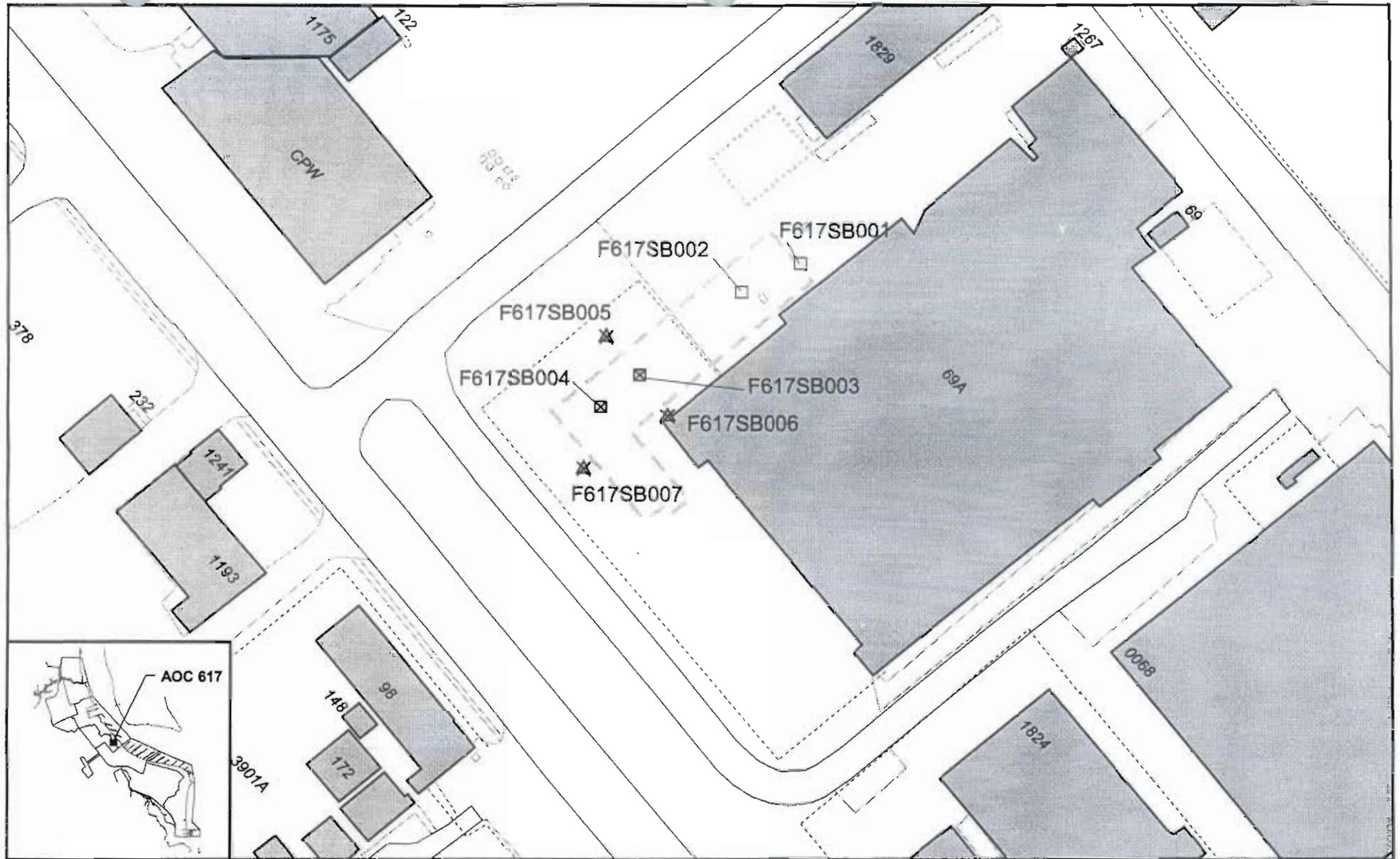
J Analyte is detected at an estimated concentration.

MCLG Maximum contaminant level goal

ND Not detected

NL Not listed

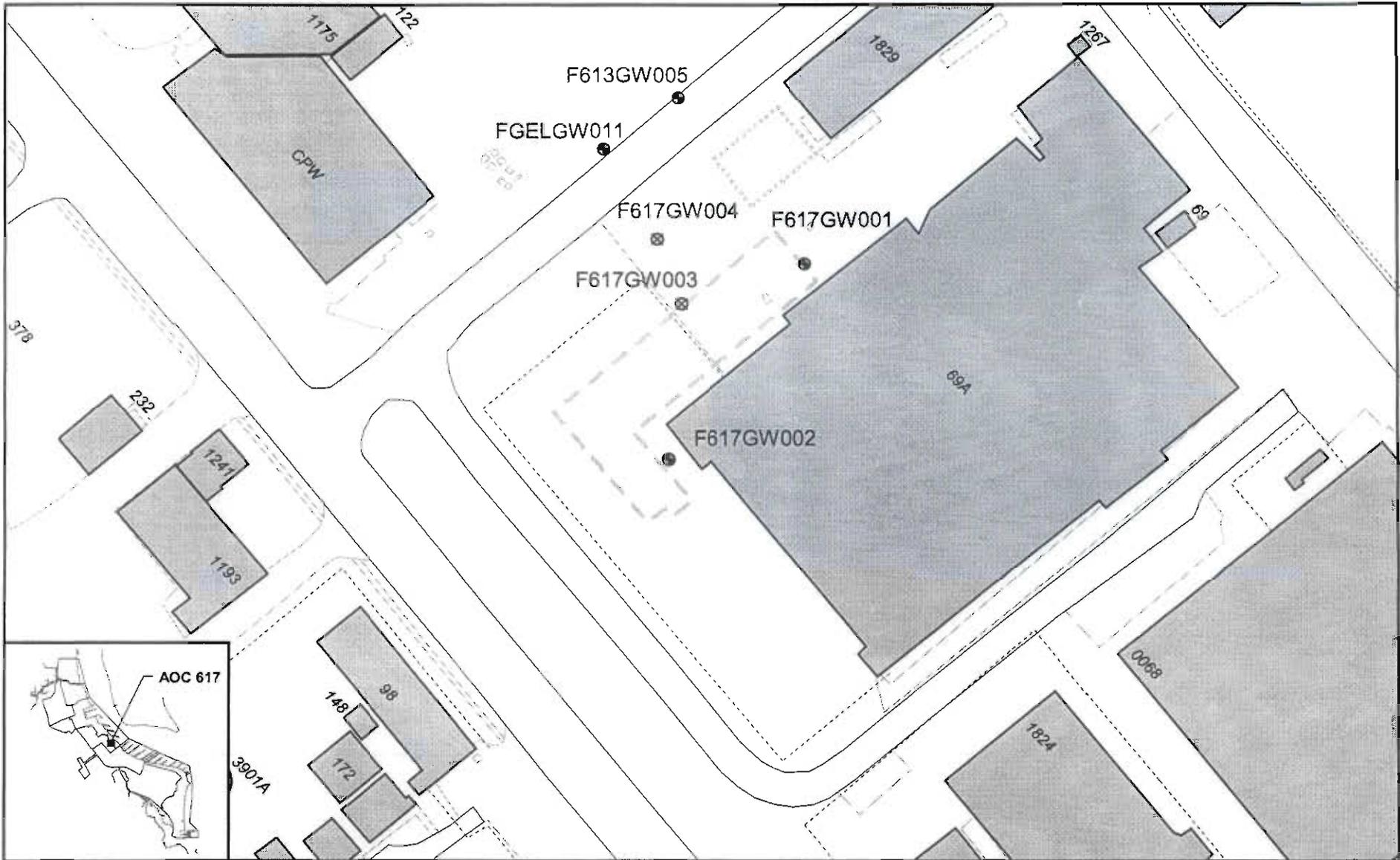
U Analyte was not detected, the reporting limit is presented.



- LEGEND**
- Originally Reported Soil Sample Locations
 - ✱ Soil Sample Locations Installed by CH2M - Jones
 - ⊠ Originally Reported Soil Sample Locations Resampled by EnSafe
 - - - AOC 616 Boundary
 - - - AOC 617 Boundary



Figure 4-1
 RFI Addendum
 Soil Sample Locations
 AOC 617, Zone F
 Charleston Naval Complex



- LEGEND:**
- Originally Reported Groundwater Well Locations
 - ⊗ New Groundwater Well Locations
 - - - AOC 616 Boundary
 - / - AOC 617 Boundary

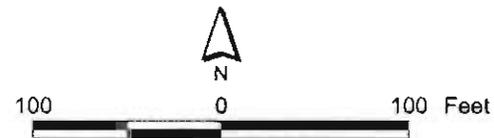


Figure 4-2
 RFI Addendum
 Groundwater Well Locations
 AOC 616 & 617, Zone F
 Charleston Naval Complex

1 **5.0 COPC/COC Refinement**

2 This section discusses and further evaluates compounds that were identified as COCs in the
3 *Zone F RFI Report, Revision 0* (EnSafe, 1997) (and were discussed in Section 2.0 of this RFI
4 Report Addendum). This section also addresses the compounds that were identified as
5 COPCs in Section 4.0 of this report addendum (following the collection of further data after
6 the completion of the RFI Report).

7 **5.1 Surface Soil**

8 Based on the data collected during the RFI, BEQs in surface soils were identified in the RFI
9 Report as a COC and as requiring further evaluation. No COPCs were identified for surface
10 soil as a result of sampling conducted after the *Zone F RFI Report, Revision 0*.

11 **5.1.1 BEQs**

12 The site is completely paved with asphalt; surface soil samples were collected by drilling
13 through the asphalt cover. PAHs, expressed as BEQs, were identified in the RFI Report as a
14 COC at AOC 617, based on the exceedance of the RBC (HI=0.1) of 88 µg/kg in one soil
15 sample (617SB004). The concentration of BEQs in sample 617SB004 was 204 µg/kg;
16 however, this was less than the site-wide reference concentration of 1,304 µg/kg.

17 The sampling of surface soils at AOC 617 by EnSafe subsequent to the RFI included analysis
18 for PAHs. The additional sampling included the re-sampling of surface soils in the
19 immediate vicinity of soil borings 617SB003 and 617SB004. BEQs were not detected in these
20 samples. On this basis, BEQs are not considered a surface soil COC and do not warrant
21 further evaluation.

22 **5.2 Subsurface Soil**

23 No COCs were identified during the RFI investigation that required further investigation.
24 Based on the data collected after the *Zone F RFI Report, Revision 0*, BEQs in subsurface soils
25 were identified as COPCs and as requiring further evaluation.

1 **5.2.1 BEQs**

2 PAHs, expressed as BEQs, were detected at concentrations greater than the BRC of 1,400
3 µg/kg in one soil sample (F617SB003) collected after the completion of the *Zone F RFI Report,*
4 *Revision 0.*

5 The analysis of subsurface soil samples collected in 1999 detected four PAHs
6 (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene) at one
7 location (F617SB003) at concentrations exceeding the SSL. The RFI Report also presented
8 subsurface soil samples collected at F617SB003 and F617SB004 with benzo(a)anthracene
9 concentrations higher than SSLs. However, individual PAH components were not detected
10 in the extract for SPLP tests performed on soil from F617SB003 or from F617SB004,
11 indicating that PAHs did not leach from the soil (see Table 5-1). In addition, PAHs have not
12 been detected in the groundwater at AOC 617, and given the age of the operations at AOC
13 617, BEQs are not considered likely to leach to groundwater in the future. These subsurface
14 soils are not a direct exposure concern due to their location in deeper soils.

15 Based on these considerations, BEQs are not subsurface soil COCs and do not warrant
16 further evaluation. Thus, there are no COCs identified for subsurface soil at AOC 617.

17 **5.3 Groundwater**

18 Eight metals (aluminum, arsenic, cadmium, cobalt, manganese, nickel, thallium, and zinc)
19 were detected at concentrations exceeding their RBCs and shallow groundwater BRCs at
20 AOC 617, and thus require further evaluation. Each of these is discussed in the following
21 subsections. Additional data from monitoring wells F613GW005 and FGELGW011, installed
22 for the AOC 613 investigation, are included in this COPC evaluation because these wells are
23 directly downgradient from AOC 617. The *Zone F RFI Report, Revision 0* discusses the data
24 set from these wells. Table 5-2 presents a summary of the data for the metals in
25 groundwater.

26 The RFI Report showed that the groundwater at AOC 617 generally has a low gradient. The
27 groundwater flow direction in the area exhibiting elevated zinc is generally in a northward
28 direction with some variation to the northwest and northeast, depending on tidal stage.
29 Under any of these conditions, monitoring well F617GW002 is located upgradient of the site,
30 and monitoring well F617GW001 is generally side/cross gradient of the site. The first
31 sampling event conducted at F617GW002 showed several elevated concentrations of metals;
32 the subsequent four sampling events performed at this well presented concentrations that
33 were substantially lower (see Table 5-2).

1 The monitoring well that appears to be within the potential source area for metals at AOC
2 617 is F617GW003, which was installed in 1999. Newly installed monitoring well
3 F617GW004, which was installed in 2001, is immediately downgradient of the source well.
4 The occurrence of each metal identified as a COPC in groundwater is presented below.

5 **5.3.1 Aluminum**

6 Aluminum is listed in the *Zone F RFI Report, Revision 0* as being detected above its shallow
7 groundwater BRC and RBC (HI=0.1) in two groundwater samples (F617GW001 and
8 F617GW002). The maximum concentration of aluminum in groundwater reported for the
9 RFI samples was 10,400 µg/L. These two wells were sampled and analyzed for aluminum
10 four times from 1996 to 2001. The data, as shown in Table 5-2, indicate that aluminum is not
11 consistently detected at elevated concentrations in site groundwater. No known source area
12 of aluminum contamination is present at the site. There is no MCL for aluminum. When the
13 concentrations of aluminum are compared to the unadjusted RBC value (37,000 µg/L at
14 HI=1.0), none of the groundwater samples collected at AOC 617 exceeded the RBC. Based
15 on this information, aluminum is not considered a COC in groundwater and does not
16 warrant further evaluation.

17 **5.3.2 Arsenic**

18 Arsenic is listed as being detected above its shallow groundwater BRC and RBC in one
19 sample collected from well F617GW001 during the 1996 sampling event (31.7 µg/L). As
20 presented in Table 5-2, the subsequent four sampling events at the same well presented
21 concentrations of arsenic ranging from 2.3 µg/L to 18.6 µg/L. Although the maximum
22 concentration was greater than the RBC (0.045 µg/L), it was less than the MCL of 50 µg/L.
23 Arsenic was not detected at a concentration greater than the MCL in any of the groundwater
24 samples collected at AOC 617. Based on this information, arsenic is not considered a
25 groundwater COC and does not warrant further evaluation.

26 **5.3.3 Cadmium**

27 Cadmium was detected above its shallow groundwater BRC and MCL (5 µg/L) in one
28 groundwater sample collected at F617GW002 (5.6 µg/L) (See Table 5-2). Subsequent
29 sampling events at F617GW002 did not detect cadmium in groundwater above the BRC.
30 Cadmium was not detected at concentrations greater than the MCL in any other samples
31 collected at AOC 617. Based on this information, cadmium does not appear to be present at
32 concentrations exceeding the MCL at this well or other wells. Therefore, cadmium is not
33 considered a groundwater COC at this site and does not warrant further evaluation.

1 **5.3.4 Cobalt**

2 Cobalt was detected above its shallow groundwater BRC and RBC (220 µg/L at HI=0.1) in
3 one sample (F617GW002) collected during the first sampling event in 1996. The maximum
4 concentration of cobalt in groundwater reported at AOC 617 was 298 µg/L; however, this
5 value is below the RBC of 2,200 µg/L (HI=1.0). The subsequent sampling event at
6 F617GW002 showed concentrations of cobalt ranging from 16.6 µg/L to 2.3 µg/L. There is
7 no MCL for cobalt. Cobalt was not detected at a concentration greater than the RBC in other
8 wells or in any of the groundwater samples collected at F617GW002. Based on this
9 information, cobalt is not considered a groundwater COC and does not warrant further
10 evaluation.

11 **5.3.5 Manganese**

12 Manganese was detected above its shallow groundwater BRC and RBC in the first
13 groundwater sample collected at F617GW002 (see Table 5-2). The maximum concentration
14 of manganese in groundwater reported for the RFI samples was 4,850 µg/L; subsequent
15 sampling events at F617GW002 resulted in manganese concentrations ranging between 733
16 µg/L to 268 µg/L. There is no MCL for manganese. The background manganese
17 concentrations for Zones F and G range from 149 µg/L to 7,980 µg/L (see Appendix C2 of
18 the *Technical Memorandum: A Summary of Inorganic Chemical Concentrations in Background Soil
19 and Groundwater at the CNC* [CH2M-Jones, 2001]). Manganese was not detected at a
20 concentration greater than the RBC (730 µg/L at HI=1.0) in any of the other groundwater
21 samples from F617GW002 or other AOC 617 monitoring wells, and is well within the range
22 of the background samples for Zones F and G. Manganese is a naturally occurring mineral
23 in groundwater across the CNC. There are no data suggesting that manganese in
24 groundwater at AOC 617 is present due to releases as part of the industrial activities
25 conducted at AOC 617. In addition, the maximum concentration detected was in the
26 upgradient location at AOC 617. Based on these considerations, manganese is not
27 considered a groundwater COC.

28 **5.3.6 Nickel**

29 Nickel was detected above its shallow groundwater BRC and RBC (HI = 0.1) in the first
30 groundwater sample collected at F617GW002 and in both samples collected from
31 F617GW003. During subsequent sampling events, nickel concentrations at F617GW002
32 ranged between 44 µg/L to 1.1 µg/L (see Table 5-2). Concentrations of nickel in the last
33 three events were at approximately 1 µg/L, and these concentrations were below the range
34 of background concentrations for Zones F and G of 1.2 to 20 µg/L (see Appendix C2 of the

1 *Technical Memorandum: A Summary of Inorganic Chemical Concentrations in Background Soil and*
2 *Groundwater at the CNC [CH2M-Jones, 2001]).*

3 The maximum concentration of nickel in groundwater reported at AOC 617 was 604 µg/L.
4 When the concentration of nickel is compared to the current RBC value (730 µg/L at
5 HI=1.0), none of the groundwater samples collected during the RFI exceed the RBC for
6 nickel. There is no MCL for nickel. Nickel in both samples from monitoring well
7 F617GW003 was elevated above the range of background values, but was below the RBC
8 value. F617GW003 is located in the area with elevated groundwater zinc concentrations, and
9 may be considered a source well. However, although the elevated nickel concentrations
10 might be related to site operations, nickel at AOC 617 is not identified as a COC as it is not
11 above RBC values.

12 **5.3.7 Thallium**

13 Thallium was detected above its shallow groundwater BRC, MCL, and RBC in one
14 groundwater sample from F617GW002. Thallium was detected in the first sample from
15 F617GW002 at a concentration of 21 µg/L (compared to an MCL of 2 µg/L); the latter three
16 samples collected from F617GW002 were all below the detection limit for thallium (see
17 Table 5-2). Thallium was not detected in any of the other groundwater samples collected at
18 AOC 617. In addition, no source area for thallium contamination has been found in surface
19 or subsurface soil at AOC 617. Based on this information, thallium does not appear to be
20 present in groundwater at AOC 617 and is not considered a groundwater COC.

21 **5.3.8 Zinc**

22 Zinc is listed as being detected above its RBC in one upgradient groundwater sample
23 (F617GW002) in the first sampling event at a maximum concentration of 145,000 µg/L.
24 However, subsequent sampling events from this well indicated zinc levels between 11,000
25 µg/L and 78 µg/L (see Table 5-2). There is no MCL for zinc. The range of concentrations
26 detected in background samples of shallow groundwater in Zones F and G was from 18
27 µg/L to 124 µg/L.

28 Zinc was also detected above its RBC of 11,000 µg/L and the Zones F and G background
29 range in monitoring well F617GW003. The concentration of zinc in the groundwater sample
30 collected from F617GW003 exceeded the RBC during two separate sampling events (May
31 1999 and June 2001), at concentrations of 30,600 µg/L and 119,000 µg/L, respectively. A
32 downgradient well installed in 2001 (F617GW004) had zinc at 2,630 µg/L, which is above
33 the range of background concentrations, but below the RBC. Monitoring wells farther

1 downgradient, F613GW005 and FGELGW011, likewise contained zinc at concentrations
2 below the RBC. Based on these data, zinc is considered a COC for the source area near
3 monitoring well F617GW003. A focused CMS will be conducted to address zinc in
4 groundwater in the vicinity of well F617GW003.

5 **5.4 Summary**

6 The only COC identified at AOC 617 is zinc in groundwater. No surface or subsurface soil
7 COCs were identified. Several metals were detected in the first sampling event at
8 F617GW002, however subsequent sampling events (three to four events, depending on the
9 metal) indicated that all the metals at this location were below background and RBC values.
10 The groundwater at well F617GW003 has elevated zinc. Though nickel might be above
11 background at this location, it is below its RBC value, and therefore is not a COC. Any
12 source control actions to address zinc are likely to address the nickel in this location.
13 Section 8.0 of this RFI Report Addendum provides a work plan for a focused CMS to
14 address zinc in groundwater.

TABLE 5-1
 PAHs SPLP (Leachate Testing) Results for Soil-to-Groundwater Migration Pathway Evaluation
 RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Location	Date Sampled	Soil Concentration (mg/kg)	Qualifier	SPLP Concentration (µg/L)	SPLP Qualifier
Benzo(a)Anthracene	F617SB003	10/14/1999	7.5	=	5	U
	F617SB004	10/14/1999	0.1	J	5	U
Benzo(a)Pyrene	F617SB003	10/14/1999	6.4	=	5	U
	F617SB004	10/14/1999	0.09	J	5	U
Benzo(b)Fluoranthene	F617SB003	10/14/1999	6.0	=	5	U
	F617SB004	10/14/1999	0.09	J	5	U
Benzo(k)Fluoranthene	F617SB003	10/14/1999	3.60	J	5	U
	F617SB004	10/14/1999	0.079	J	5	U
Chrysene	F617SB003	10/14/1999	7.0	=	5	U
	F617SB004	10/14/1999	0.11	J	5	U
Dibenz(a,h)anthracene	F617SB003	10/14/1999	1.8	=	5	U
	F617SB004	10/14/1999	0.4	U	5	U
Indeno(1,2,3-c,d)pyrene	F617SB003	10/14/1999	4.5	J	5	U
	F617SB004	10/14/1999	0.37	U	5	U

µg/L Microgram per liter

mg/kg Milligram per kilogram

= Analyte is detected at the concentration shown.

J Analyte is detected at an estimated concentration.

U Analyte was not detected, the reporting limit is presented.

TABLE 5-2
 Summary of Groundwater Analytical Results for Metals
 RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Sample			Aluminum		Arsenic		Cadmium		Cobalt		Manganese		Nickel		Thallium		Zinc	
Station	ID	Date	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
			(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)	
			BRC		16.7		0.82		10.9		2,010		5.55		5.58		NC	
			MCL/RBC		50**		5**		2,200*		730*		730*		2**		11,000*	
F617GW001	617GW00101	11/14/1996	7,420	J	31.70	J	0.50	U	1.60	J	281	J	4.50	J	2.7	U	37.6	=
	617GW00102	05/07/1997	1,220	=	7.90	J	0.30	U	1.60	U	175	=	4.00	U	5.0	U	21.8	=
	617GW00103	09/12/1997	10,400	=	18.60	=	0.30	U	2.80	J	504	=	7.40	U	5.0	U	38.6	U
	617GW00104	11/25/1997	595	=	5.10	U	0.30	U	1.40	J	329	=	3.20	U	5.0	U	17.4	U
	617GW001LA	06/21/2001	NA		2.33	U	0.27	U	NA		NA		0.82	U	NA		6.4	J
F617GW002	617GW002A1	05/06/1997	1,450	=	2.10	U	5.60	=	298	=	4,850	=	604	=	21	=	145,000	=
	617GW002A2	09/11/1997	153	=	2.10	U	0.30	U	16.60	J	733	=	4,4.60	=	5.0	U	11,000	=
	617GW002A3	11/21/1997	71.3	U	2.10	U	0.32	J	2.80	J	372	=	1.10	J	5.0	U	576	=
	617GW002A4	02/10/1998	58.3	U	2.10	U	0.30	U	2.30	J	268	=	1.30	J	5.0	U	514	=
	617GW002LA	06/21/2001	NA		2.33	U	0.27	U	NA		NA		1.29	U	NA		78	=
F617GW003	617GW00301	05/20/1999	3,070	J	3.30	U	3.40	J	10.60	J	223	=	114	=	2.3	UJ	30,600	=
	617GW003LA	06/21/2001	NA		3.60	J	4.44	J	NA		NA		396	=	NA		119,000	=
F617GW004	617GW004LA	06/21/01	NA		2.38	J	0.272	U	NA		NA		29.8	J	NA		2630	=
F613GW005	613GW00501	11/20/1996	549	=	9.90	J	0.50	U	18.10	J	672	=	9.40	J	7.5	U	25.2	U
(AOC 613)	613GW00502	05/05/1997	322	=	27.10	=	0.35	J	5.30	J	404	=	2.50	U	6.6	J	13.6	J
	613GW00503	08/19/1997	404	=	44.70	=	0.46	J	6.20	J	415	=	0.76	U	5.0	U	6.9	U
	613GW00504	11/25/1997	226	=	34.40	=	0.30	U	4.20	J	336	=	2.00	J	5.0	U	5.8	U
FGELGW011	GELGW01101	11/12/1996	17,000	J	14.30	J	2.70	J	48.70	=	1,300	J	26.70	J	4.3	U	1,440	=
(AOC 613)	GELGW01102	05/08/1997	58.3	J	4.70	J	0.40	J	49.80	=	1,290	=	18.60	J	8.0	U	36.4	U
	GELGW01103	08/26/1997	77.40	U	4.00	J	0.30	U	40.90	=	1,060	J	15.60	J	5.0	U	35.7	=
	GELGW01104	11/12/1997	323	J	4.90	J	0.30	U	39.60	=	1,080	=	15.00	J	5.0	U	45	U

Bolded and outlined values are exceedances of background reference concentrations (BRCs) and MCLs/RBCs (RBC used when MCL data is not available).

* Value obtained from EPA Region III (Noncarcinogen HI = 1.0) Table 4/13/2000.

** Value obtained from EPA National Primary Drinking Water Standards March 2001.

= Analyte was detected; the reported value is equal to the sample concentration.

J Analyte was detected; the reported value is an estimated concentration.

MCL Maximum Containment Level

NA Analyte was not analyzed in the sample.

NC No BRC was calculated.

U Analyte was not detected; the reported value is the detection limit.

UJ Analyte was not detected; the reported value is an estimated detection limit.

1 **6.0 AOC 616**

2 **6.1 Introduction**

3 AOC 616 is the site of a former paint shop, designated building 1201, which operated from
4 1955 to 1977. No visible evidence of the paint shop remains and the area is now occupied by
5 a parking lot for Building 69. AOC 616 is located approximately 50 ft to the north of AOC
6 617, as shown on Figure 1-1.

7 The *Zone F RFI Report, Revision 0* (EnSafe, 1997) addressed AOC 616, the conclusions of
8 which are discussed in Section 6.2 of this RFI Report Addendum. Based on SCDHEC review
9 comments on the subsequent *Zone F RFI Work Plan Addendum* (EnSafe, 1999) it was agreed
10 that groundwater issues potentially resulting from AOC 616 would be covered under AOC
11 617. This section presents an evaluation of groundwater at AOC 616, based on the
12 monitoring wells sampled in the vicinity of AOC 617.

13 The *Zone F RFI Report, Revision 0* recommended NFA for AOC 616, and SCDHEC agreed
14 with the recommendation in their December 31, 1998 comments on the RFI Report. This
15 comment and other relevant comments to AOC 616 are provided in Appendix F of this
16 report addendum.

17 **6.2 Summary of RFI Conclusions**

18 As part of the Zone F RFI, soil investigations were conducted at AOC 616. Four soil borings
19 (616SB001 through 616SB004) were advanced during the 1996-1997 RFI to determine if site
20 activities impacted the surrounding soil. Surface and subsurface samples were collected
21 from each boring and were analyzed for metals, VOCs, and SVOCs. Figure 2-1 illustrates
22 the RFI soil sample locations within AOC 616. Based on the results of this investigation, the
23 RFI Report did not identify any soil COCs for AOC 616.

24 **6.3 Groundwater Analysis**

25 Groundwater was not sampled directly beneath AOC 616 during the RFI, as the monitoring
26 well coverage was considered adequate at adjacent sites. In addition, the Fate and Transport
27 evaluation in the RFI Report did not identify any threat to groundwater. Evaluation of the
28 groundwater quality at AOC 616 was covered by the groundwater evaluation at AOC 617.

1 Sections 2.0, 4.0, and 5.0 of this RFI Report Addendum discuss groundwater quality in the
2 vicinity of AOCs 617 and 616. The monitoring wells sampled as part of the AOC 617
3 groundwater investigation that are located closest to AOC 616 are F617GW001, F617GW004,
4 and F613GW005 (see Figure 4-2). No COCs were identified for groundwater samples
5 collected from any of these monitoring wells.

6 **6.4 Summary**

7 No soil or groundwater COCs are identified for AOC 616. This is consistent with the
8 original recommendation and agreement by SCDHEC that AOC 616 requires NFA.

1 **7.0 Conclusions and Recommendations**

2 This RFI Report Addendum for AOC 617 concludes the following:

- 3 • No surface or subsurface soil COCs were identified.
4 • Zinc in groundwater within the vicinity of monitoring well F617GW003 was identified
5 as the only groundwater COC.

6 This RFI Report Addendum recommends that a focused CMS be undertaken at AOC 617 to
7 address zinc in groundwater within the vicinity of monitoring well F617GW003. A work
8 plan for conducting a focused CMS is provided in Section 8.0 of this report.

1 **8.0 Focused CMS Work Plan for AOC 617**

2 A focused CMS will be performed for AOC 617. The media to be addressed in the CMS will
3 be groundwater in the vicinity of monitoring well 617GW003. The CMS will evaluate the
4 potential for pumping zinc-contaminated groundwater and discharging it to the sanitary
5 sewer. Treatment technologies will also be evaluated if the groundwater requires treatment
6 prior to discharge.

7 **8.1 Remedial Action Objectives**

8 Remedial action objectives (RAOs) are medium-specific goals that the remedial actions are
9 designed to accomplish in order to protect human health and the environment by
10 preventing or reducing exposures under current and future land use conditions. The RAOs
11 identified for the groundwater at AOC 617 are 1) to prevent ingestion and direct/dermal
12 contact with groundwater having unacceptable carcinogenic or noncarcinogenic risk, and 2)
13 to restore the aquifer to beneficial use. No remedial actions are required for surface or
14 subsurface soil at AOC 617.

15 **8.2 Remedial Goal Options and Proposed Media Cleanup** 16 **Standards**

17 Throughout the process of remediating a hazardous waste site, a risk manager uses a
18 progression of increasingly acceptable site-specific media levels in considering remedial
19 alternatives. Remedial goal options (RGOs) and media cleanup standards (MCSs) under
20 RCRA are developed at the end of the risk assessment in the RFI/Remedial Investigation
21 (RI)/State programs.

22 RGOs can be based on a variety of criteria, such as specific incremental lifetime cancer risk
23 (ILCR) levels (e.g., 1E-04, 1E-05, or 1E-06), HI levels (e.g., 0.1, 1.0, 3.0), or site background
24 concentrations. For a particular RGO, specific MCSs can be determined as target
25 concentration values. Achieving these MCSs is accepted as demonstrating that RGOs and
26 RAOs have been achieved. Achieving these goals should promote the protection of human
27 health and the environment, while achieving compliance with applicable state and federal
28 standards.

1 The exposure media of concern for AOC 617 is zinc-contaminated groundwater. Because
2 AOC 617 is located within a highly developed area of the CNC, and there are no surface
3 water bodies in the immediate vicinity of the site, ecological exposures were not considered
4 necessary for evaluation.

5 Zinc was the only COC identified for the groundwater, and was detected at concentrations
6 ranging from 6.37 to 119,000 µg/L. Because there is no MCL for zinc, the MCS/RGO is the
7 RBC (11,000 µg/L). This value is also the EPA Region IX preliminary remediation goal
8 (PRG) for zinc.

9 **8.3 Corrective Measure Technology Focused Evaluation**

10 Once an MCS has been determined for zinc, a focused CMS will be conducted that will
11 evaluate the potential for groundwater extraction with discharge to the sanitary sewer. If
12 groundwater treatment is determined to be necessary prior to discharge, several treatment
13 technologies will be evaluated, including ion exchange, alkaline precipitation, and reverse
14 osmosis.

15 **8.4 Focused CMS Approach**

16 The focused CMS will consist of the following tasks that will be performed in the order
17 presented below:

- 18 1. Groundwater elevations will be measured at AOC 617 and surrounding monitoring
19 wells to verify groundwater flow direction.
- 20 2. The corrective measure alternatives described above will be screened using several
21 criteria and decision factors. Other corrective measure alternatives may also be
22 evaluated in the CMS.
- 23 3. A preferred corrective measure alternative will be selected.
- 24 4. The CMS and preferred corrective measure alternative will be documented in the CMS
25 report.

26 **8.5 Approach to Evaluating Corrective Measure Alternatives**

27 According to the RCRA permit issued by SCDHEC (SCDHEC, 1998), the alternatives will be
28 evaluated with the following five standards:

- 29 1. Protect human health and the environment.

- 1 2. Attain MCSs (RGOs).
- 2 3. Control the source of releases to minimize future releases that may pose a threat to
- 3 human health and the environment.
- 4 4. Comply with applicable standards for the management of wastes generated by remedial
- 5 activities.
- 6 5. Other factors include (a) long-term reliability and effectiveness; (b) reduction in toxicity,
- 7 mobility, or volume of wastes; (c) short-term effectiveness; (d) implementability; and (e)
- 8 cost.

9 Each of the five standards is defined in more detail below:

- 10 1. **Protect human health and the environment.** The alternatives will be evaluated on the
- 11 basis of their ability to protect human health and the environment. The ability of an
- 12 alternative to achieve this standard may or may not be independent of its ability to
- 13 achieve the other standards. For example, an alternative may be protective of human
- 14 health, but may not be able to attain the MCSs if the MCSs are not directly tied to
- 15 protecting human health.
- 16 2. **Attain media cleanup standards (RGOs).** The alternatives will be evaluated on the basis
- 17 of their ability to achieve the RGOs defined in this CMS Work Plan. Another aspect of
- 18 this standard is the time frame to achieve the RGOs. Estimates of the time frame for the
- 19 alternatives to achieve RGOs will be provided.
- 20 3. **Control the source of releases.** This standard deals with the control of releases of
- 21 contamination from the source (the area in which the contamination originated). The
- 22 blast media may be considered a source under the unrestricted land use exposure
- 23 scenario, but is within RGOs under industrial land use.
- 24 4. **Comply with applicable standards for management of wastes.** This standard deals
- 25 with the management of wastes derived from implementing the alternatives; for
- 26 example, treatment or disposal of excavated material. The removal alternative will be
- 27 designed to comply with all standards for management of wastes. Consequently, this
- 28 standard will not be explicitly included in the detailed evaluation presented in the CMS.
- 29 5. **Other factors.** Five other factors are to be considered if an alternative is found to meet
- 30 the four standards described above. These other factors are as follows:
 - 31 a. Long-term reliability and effectiveness

1 The two alternatives will be evaluated on the basis of their reliability, and the
2 potential impact should the alternative fail. In other words, a qualitative assessment
3 will be made as to the chance of the alternative's failing and the consequences of that
4 failure.

5 b. Reduction in the toxicity, mobility, or volume of wastes

6 Alternatives with technologies that reduce the toxicity, mobility, or volume of the
7 contamination will be generally favored over those that do not. Consequently, a
8 qualitative assessment of this factor will be performed for each alternative.

9 c. Short-term effectiveness

10 Alternatives will be evaluated on the basis of the risk they create during the
11 implementation of the remedy. Factors that may be considered include fire,
12 explosion, and exposure of workers to hazardous substances.

13 d. Implementability

14 The alternatives will be evaluated for their implementability by considering any
15 difficulties associated with conducting the alternatives (such as the construction
16 disturbances they may create), operation of the alternatives, and the availability of
17 equipment and resources to implement the technologies comprising the alternatives.

18 e. Cost

19 A net present value of each alternative will be developed. These cost estimates will
20 be used for the relative evaluation of the alternatives, not to bid or budget the work.
21 The estimates will be based on information available at the time of the CMS and on a
22 conceptual design of the alternative. They will be "order-of-magnitude" estimates
23 with a generally expected accuracy of -50 percent to +50 percent for the scope of
24 action described for each alternative. The estimates will be categorized into capital
25 costs and operations and maintenance costs for each alternative.

26 In addition to the criteria described above, the alternatives will be evaluated for the ability
27 to achieve all contractual obligations of CH2M-Jones and the Navy.

28 **8.6 Focused CMS Report**

29 The focused CMS Report will be prepared to present the identification, development, and
30 evaluation of potential corrective measures for AOC 617. A proposed outline of the report,
31 as shown in Table 8-1, provides an example of the report format and content organization.

TABLE 8-1
 Outline of Focused CMS Report for AOC 617
RFI Report Addendum & CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

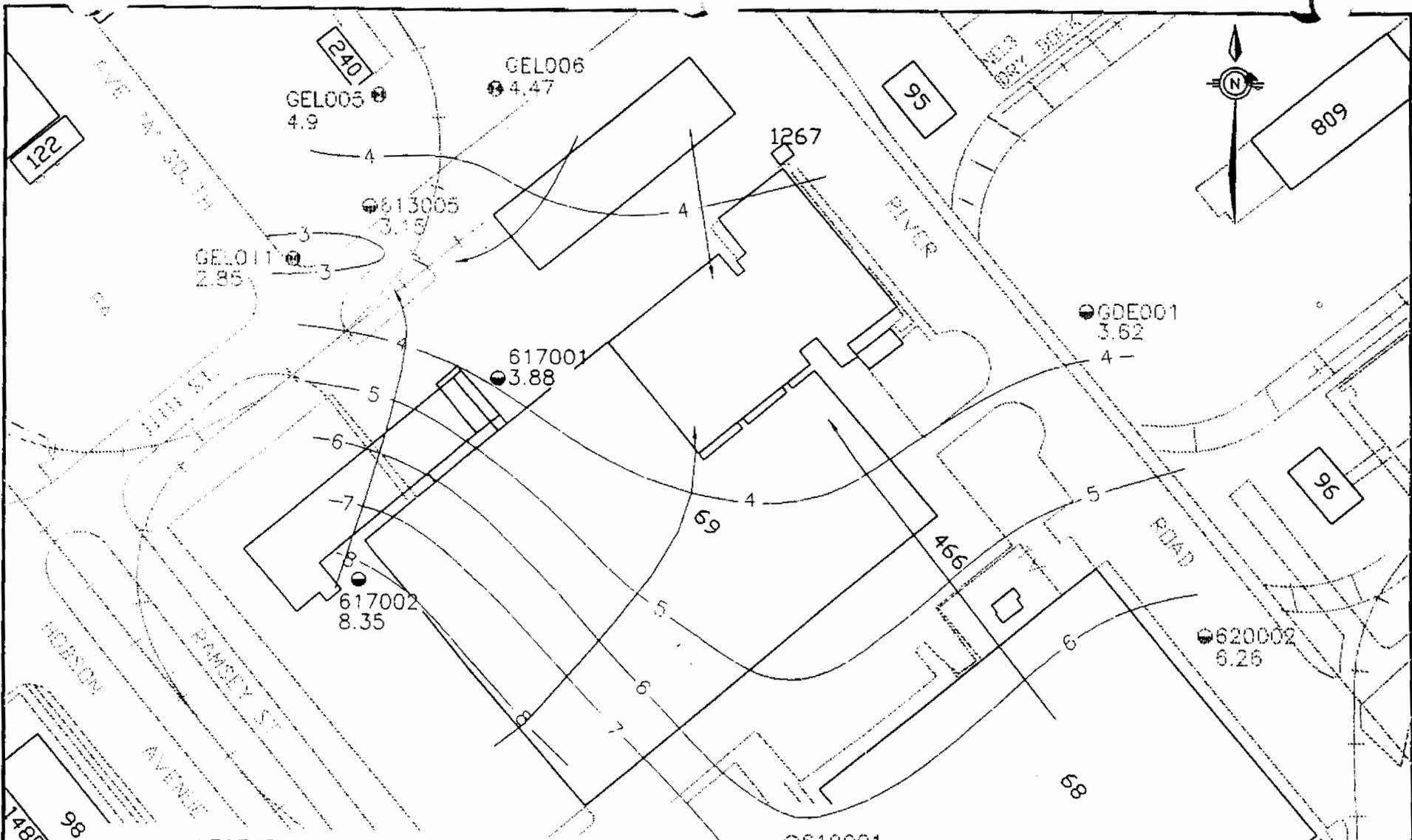
Section No.	Section Title
1.0	Introduction
1.1	Corrective Measures Study Purpose and Scope
1.2	Report Organization
1.3	Background Information
1.3.1	Facility Description
1.3.2	Site History and Background
1.3.2.1	Nature and Extent of Contamination
1.3.2.2	Summary of Risk Assessment
2.0	Remedial Goal Objectives
3.0	Detailed Analysis of Focused Alternatives
3.1	Approach
3.2	Evaluation Criteria
3.3	Description of Alternatives
3.3.1	Alternative 1: Groundwater Extraction & Discharge to Sanitary Sewer
3.3.2	Alternative 2: Groundwater Extraction, Treatment with Ion Exchange, & Discharge to Sanitary Sewer
3.3.3	Alternative 3: Groundwater Extraction, Treatment with Reverse Osmosis, & Discharge to Sanitary Sewer
3.3.4	Alternative 4: Groundwater Extraction, Treatment with Alkaline Precipitation, & Discharge to Sanitary Sewer
3.4	Detailed Analysis of Alternatives
3.4.1	Analysis of Alternative 1
3.4.2	Analysis of Alternative 2
3.4.3	Analysis of Alternative 3
3.4.4	Analysis of Alternative 4 ^a
3.5	Comparative Analysis of Alternatives
4.0	Recommended Remedial Alternative
5.0	References
Appendix A	Corrective Measure Alternative Cost Estimates^b
	List of Tables
	List of Figures

^a Additional alternatives will be analyzed as found necessary.

^b Additional appendices will be added, if necessary.

1 **9.0 References**

- 2 EnSafe Inc. *Zone F RFI Report, NAVBASE Charleston*. Revision 0. December 31, 1997.
- 3 EnSafe Inc. *Zone L RFI Report, NAVBASE Charleston*. Revision 0. December 31, 1998.
- 4 EnSafe Inc. *Zone F RFI Work Plan Addendum, NAVBASE Charleston*. Revision 0. November 3,
5 1999.
- 6 South Carolina Department of Health and Environmental Control (SCDHEC). RCRA Permit
7 SC0 170 022 560. Charleston Naval Complex, Charleston, South Carolina. August 17, 1988.
- 8 SCDHEC. Comments on *Zone F RFI Report, Revision 0*. December 31, 1998.



LEGEND

- - SHALLOW MONITORING WELL
- ⊙ - ADJACENT SHALLOW MONITORING WELL
- ⊕ - ADJACENT SHALLOW MONITORING WELL NOT INSTALLED BY ENSAFE
- 4 - - CONTOUR INTERVAL - 1 FOOT
- - FLOW DIRECTION



ZONE F
 RCRA FACILITY
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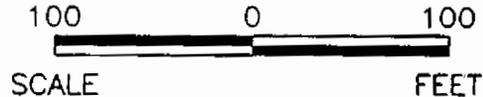
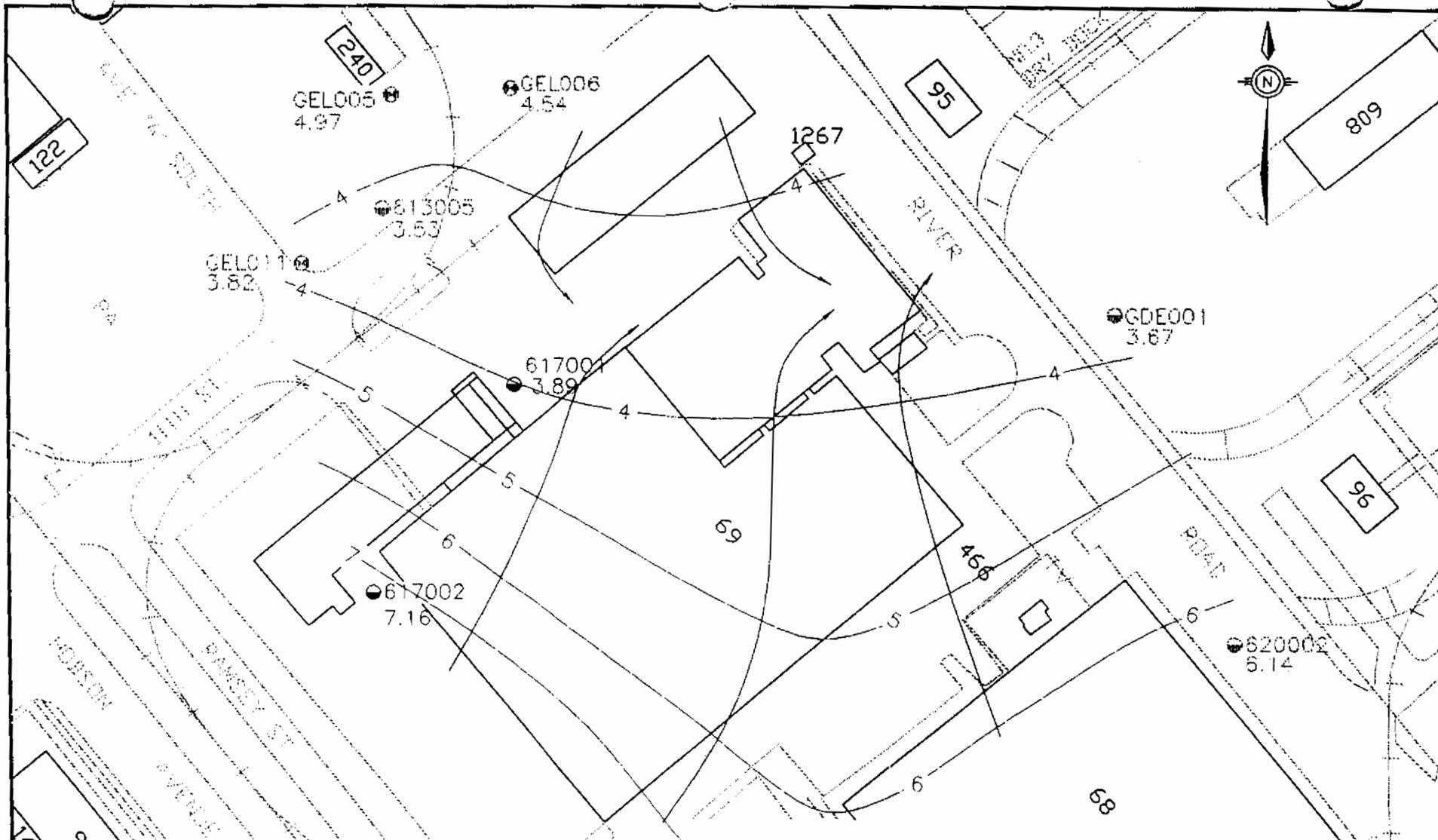


FIGURE 10.9-2
 SHALLOW GROUNDWATER
 LOW-TIDE POTENTIOMETRIC MAP
 AOC #617, GALVANIZING PLANT
 FORMER BLDG 1176

DWG DATE: 10/30/97 | DWG NAME: 2906GPLT



LEGEND

- - SHALLOW MONITORING WELL
- ⊙ - ADJACENT SHALLOW MONITORING WELL
- ⊕ - ADJACENT SHALLOW MONITORING WELL NOT INSTALLED BY ENSAFE
- 4- - CONTOUR INTERVAL - 1 FOOT
- - FLOW DIRECTION



ZONE F
 RCRA FACILITY
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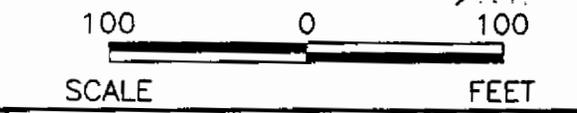


FIGURE 10.9-3
 SHALLOW GROUNDWATER
 HIGH-TIDE POTENTIOMETRIC MAP
 AOC #617, GALVANIZING PLANT
 FORMER BLDG 1176
 DWG DATE: 10/30/97 | DWG NAME: 2906GPH

Table 10.9.1
 AOC 617
 Soil Samples and Analyses

Boring Location	Sample Identifier	Sample Interval	Date Collected	Analyses	Remarks
617SB001	617SB00101	Upper	8/29/96	Note 1	
	617SB00102	Lower			
617SB002	617SB00201	Upper	8/30/96	Note 1/cyanide; pesticides/PCB Note 2	Duplicate Sample*
	617SB00202	Lower			
	617CB00202*				
617SB003	617SB00301	Upper	8/30/96	Note 1/cyanide; pesticides/PCB	
	617SB00302	Lower			
617SB004	617SB00401	Upper	8/30/96	Note 1/cyanide; pesticides/PCB	
	617SB00402	Lower			

Notes:

- 1 = SW-846 (metals, SVOAs, and VOAs); at DQO Level III; pH
- 2 = Appendix IX suite: Appendix IX (pesticides/PCBs, herbicides, SVOAs, VOAs); SW-846 (metals, dioxins, OP-pesticides); cyanide; hex-chrome at DQO Level IV
- * = Duplicate sample

Table 10.9.4
 AOC 617
 Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=20)	Subsurface Background
Volatile Organic Compounds (µg/kg)							
Carbon disulfide	617SB002	ND	780000	NA	1.0	32000	NA
	617SB003	ND			1.0		
Semivolatile Organic Compounds (µg/kg)							
BEQ ¹	617SB001	67.82	88.0	NA	NA	NA	NA
	617SB002	ND					
	617SB003	ND					
	617SB004	204.25					
2-Methylnaphthalene	617SB003	ND	310000	NA	75	126000	NA
	617SB004	ND			280		
Acenaphthene	617SB003	ND	470000	NA	1000	20000	NA
	617SB004	ND			2400		
Anthracene	617SB003	ND	2300000	NA	3400	12000000 ²	NA
	617SB004	40			4200		
Benzo(a)anthracene	617SB001	44	880.0	NA	97	12000	NA
	617SB002	ND			85.5		
	617SB003	ND			5900		
	617SB004	130			5700		
Benzo(a)pyrene	617SB001	56	88.0	NA	110	8000	NA
	617SB002	ND			140		
	617SB003	ND			5500		
	617SB004	130			5000		

Table 10.9.4
 AOC 617
 Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=20)	Subsurface Background
Benzo(b)fluoranthene	617SB001	69	88.0	NA	85	5000 ^a	NA
	617SB002	ND			140		
	617SB003	ND			5700		
	617SB004	82			ND		
Benzo(g,h,i)perylene	617SB001	ND	230000	NA	60	4.66E+08	NA
	617SB002	ND			106		
	617SB003	ND			2800		
	617SB004	73			2200		
Benzo(k)fluoranthene	617SB001	47	8800.0	NA	100	15000	NA
	617SB002	ND			270		
	617SB003	ND			4400		
	617SB004	110			6200		
Benzoic acid	617SB001	ND	31000000	NA	130	400000 ^{a,c}	NA
Chrysene	617SB001	54	88000.0	NA	90	160000	NA
	617SB002	ND			200		
	617SB003	ND			6200		
	617SB004	150			3000		
Dibenz(a,h)anthracene	617SB002	ND	88	NA	45	2000 ^b	NA
	617SB003	ND			1600		
	617SB004	44			1300		
Dibenzofuran	617SB003	ND	31000	NA	510	240000	NA
	617SB004	ND			1200		

Table 10.9.4
 AOC 617
 Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=20)	Subsurface Background
Fluoranthene	617SB001	84	310000.0	NA	170	4300000 ^a	NA
	617SB002	ND			53		
	617SB003	ND			14000		
	617SB004	220			13000		
Fluorene	617SB003	ND	310000	NA	1000	560000	NA
	617SB004	ND			1500		
Indeno(1,2,3-cd)pyrene	617SB001	ND	880	NA	59	14000 ^b	NA
	617SB002	ND			117		
	617SB003	ND			2800		
	617SB004	78			2500		
Naphthalene	617SB003	ND	310000	NA	240	840000	NA
	617SB004	ND			870		
Phenanthrene	617SB001	58	230000.0	NA	ND	1380000	NA
	617SB003	ND			11000		
	617SB004	140			12000		
Pyrene	617SB001	69	230000.0	NA	200	4200000	NA
	617SB002	ND			36		
	617SB003	ND			10000		
	617SB004	210			10000		
bis(2-ethylhexyl)phthalate (BEHP)	617SB001	ND	46000	NA	77	3600000	NA
	617SB003	ND			350		
	617SB004	91			390		

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Table 10.9.4
 AOC 617
 Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=20)	Subsurface Background
Pesticides and PCBs ($\mu\text{g}/\text{kg}$)							
4,4'-DDD	617SB002	ND	2700	NA	23	16000 ^b	NA
	617SB004	4.3			ND		
4,4'-DDE	617SB003	ND	1900.0	NA	21	54000 ^b	NA
	617SB004	3.0			51		
4,4-DDT	617SB003	ND	1900	NA	100	32000 ^b	NA
Aroclor-1260	617SB003	ND	320	NA	1700	1000	NA
	617SB004	ND			870		
Herbicides ($\mu\text{g}/\text{kg}$)							
2,4-D	617SB002	ND	78000	NA	160	3400	NA
Dioxins (ng/kg)							
Dioxin (2,3,7,8-TCDD TEQs ^d)	617SB002	ND	1000	NA	0.18	1900	NA
pH							
	617SB001	7.72	ND	NA	7.39	ND	NA
	617SB002	7.55			7.97		
	617SB003	7.45			7.10		
	617SB004	7.49			7.33		

Table 10.9.4
 AOC 617
 Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=20)	Subsurface Background
Inorganics (mg/kg)							
Aluminum (Al)	617SB001	4310	7800.0	18500	15300	1000000	17100
	617SB002	4070			6435		
	617SB003	3890			2380		
	617SB004	4580			5300		
Antimony (Sb)	617SB003	ND	3.1	0.79	10.7	5	NL
	617SB004	ND			5.5		
Arsenic (As)	617SB001	1.3	0.43	19.9	15.5		18.2
	617SB002	1.8			5.8		
	617SB003	0.97			1.3		
	617SB004	2.6			1.5		
Barium (Ba)	617SB001	10.4	550.0	61.5	27.4	1600 ^f	51.8
	617SB002	5.5			19.8		
	617SB003	3.4			36.1		
	617SB004	9.8			24.9		
Beryllium (Be)	617SB001	0.14	0.15	1.05	0.98	65 ^f	1.20
	617SB002	0.17			0.42		
	617SB003	0.11			0.12		
	617SB004	0.21			0.09		
Cadmium (Cd)	617SB001	0.15	3.9	0.26	0.2	8 ^f	0.09
	617SB002	ND			0.82		
	617SB003	ND			0.32		
	617SB004	0.27			0.25		

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Table 10.9.4
 AOC 617
 Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=20)	Subsurface Background
Calcium (Ca)	617SB001	4400	NL	NL	15710	NL	NL
	617SB002	924			5433		
	617SB003	5500			14600		
	617SB004	25100			2040		
Chromium (Cr)	617SB001	6.2	39 VI	34.8	26	38 ^c (total)	32.2
	617SB002	5.4	7800 III		11.75		
	617SB003	4.1			6.1		
	617SB004	7.5			8.7		
Cobalt (Co)	617SB001	3.0	470.0	15.1	6.4	200	6.85
	617SB002	0.6			1.85		
	617SB003	0.57			1.1		
	617SB004	1.2			0.77		
Copper (Cu)	617SB001	4.1	310.0	48.2	21.5	920	30.4
	617SB002	ND			10.35		
	617SB003	ND			33.2		
	617SB004	4.0			9.4		
Cyanide (Cn)	617SB002	0.36	160.0	0.29	0.17	40 ^c	0.24
	617SB003	0.16			ND	(Amenable)	
	617SB004	0.35			ND		
Iron (Fe)	617SB001	2840	2300.0	NL	23000	NL	NL
	617SB002	2610			9550		
	617SB003	1580			2480		
	617SB004	3830			2570		

Table 10.9.4
AOC 617
Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=20)	Subsurface Background
Lead (Pb)	617SB001	14.9	400.0 ^d	180	45.8	400 ^e	51.7
	617SB002	ND			60.4		
	617SB003	ND			274		
	617SB004	11.2			121		
Magnesium (Mg)	617SB001	317	NL	NL	3220	NL	NL
	617SB002	213			762		
	617SB003	268			649		
	617SB004	689			217		
Manganese (Mn)	617SB001	15.1	180.0	307	215	100	469
	617SB002	9.5			10.83		
	617SB003	9.8			25.41		
	617SB004	44.5			7.8		
Mercury (Hg)	617SB001	ND	2.3	0.62	0.28	2 ^e	0.23
	617SB002	ND			0.93		
	617SB003	ND			0.64		
	617SB004	ND			1.5		
Nickel (Ni)	617SB001	2.5	160.0	12.6	9.0	130	8.85
	617SB002	1.1			4.15		
	617SB003	1.4			44		
	617SB004	3.3			4.1		
Potassium (K)	617SB001	139	NL	NL	1570	NL	NL
	617SB002	138			514.5		
	617SB003	110			110		
	617SB004	214			153		

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Table 10.9.4
 AOC 617
 Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=20)	Subsurface Background
Selenium (Se)	617SB001	0.61	39.0	1.15	0.89	5	1.24
	617SB002	0.42			0.62		
	617SB003	ND			0.68		
	617SB004	ND			0.39		
Sodium (Na)	617SB001	203	NL	NL	596	NL	NL
	617SB002	163			221.5		
	617SB003	138			144		
	617SB004	191			153		
Thallium (Tl)	617SB001	0.39	0.63	NL	ND	1.24	1.24
Tin (Sn)	617SB002	ND	4700	9.38	1.8	11000	NL
	617SB003	ND			33.9		
	617SB004	ND			11.5		
Vanadium (V)	617SB001	6.6	55.0	48.0	49.2	8000	49.4
	617SB002	6.8					
	617SB003	3.5					
	617SB004	8.6					
Zinc (Zn)	617SB001	40.5	2300.0	198	87.0	12000 ^{a,c}	84.2
	617SB002	ND			316		
	617SB003	24.5			296		
	617SB004	284.0			146		

Notes:

- a = Calculated values correspond to a noncancer hazard quotient of 1
- b = Calculated values correspond to a cancer risk level of 1 in 1,000,000
- c = SSL for pH of 6.8
- d = A screening level of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (USEPA, 1994a)
- l = Calculated from methods described in USEPA Interim *Supplemental Guidance to RAGS: Human Health Risk Assessment, Bulletin 2* (USEPA, 1995b)
- * = Residential RBCs (THQ=0.1) were used as a reference concentration for upper interval samples. Generic soil to groundwater SSLs (DAF=20) from the *Soil Screening Guidance: Technical Background Document* (USEPA, 1996c) were used as a reference concentration for lower interval samples

- DAF = Dilution Attenuation Factor
- ND = Not detected
- NL = Not listed
- NA = Not applicable
- BEQ = Benzo(a)pyrene equivalents
- mg/kg = Milligrams per kilogram
- ng/kg = Nanograms per kilogram
- µg/kg = Micrograms per kilogram
- TEQ = TCDD Equivalency Quotient
- THQ = Target Hazard Quotient

Bolded concentrations exceed both the reference concentration (RBC or SSL) and the zone background

All background values for Zone F are based on twice the means of the grid sample concentrations. One grid sample from Zone E is included in each group

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Table 10.9.8
 AOC 617
 Analytes Detected in Shallow Groundwater

Parameters	Location	1 st Quarter Conc.	2 nd Quarter Conc.	3 rd Quarter Conc.	Tap Water RBC* (µg/L)	MCL/SMCL* (µg/L)	Shallow Background
Semivolatile Organic Compounds (µg/L)							
Benzoic Acid	617002	NI	ND	5	15000	NL	NL
Butylbenzylphthalate	617002	NI	1.0	ND	730	NL	NL
Inorganics (µg/L)							
Aluminum (Al)	617001	7420	1220	10400	3700	30	224
	617002	NI	1450	153			
Arsenic (As)	617001	31.7	7.9	18.6	20,045	50	16.7
Barium (Ba)	617001	52.9	34.9	69.4	260	2000	94.3
	617002	NI	ND	74.8			
Cadmium (Cd)	617002	NI	5.6	ND	1.8	5	0.81
Calcium (Ca)	617001	20300	23500	59300	NL	NL	NL
	617002	NI	441000	140000			
Chromium (Cr)	617001	9.2	2.7	13.6	18	100	2.05
Cobalt (Co)	617001	1.6	ND	2.8	220	NL	10.9
	617002	NI	298	16.6			
Copper (Cu)	617001	ND	4.7	5.6	150	1000	NL
Iron (Fe)	617001	16700	3120	12000	1100	300	NL
	617002	NI	314000	314000			
Lead (Pb)	617001	10.5	ND	7.5	15	15	NL

Table 10.9.8
 AOC 617
 Analytes Detected in Shallow Groundwater

Parameters	Location	1 st Quarter Conc.	2 nd Quarter Conc.	3 rd Quarter Conc.	Tap Water RBC* (µg/L)	MCL/SMCL* (µg/L)	Shallow Background
Magnesium (Mg)	617001	4170	6280	11800	NL	NL	NL
	617002	NI	225000	24100			
Manganese (Mn)	617001	281	175	504	84	50	2010
	617002	NI	4850	733			
Mercury (Hg)	617001	0.18	0.24	0.28	1.1	2	NL
	617002	NI	ND	0.12			
Nickel (Ni)	617001	4.5	ND	ND	15	100	5.55
	617002	NI	604	44.6			
Potassium (K)	617001	3620	4780	9100	NL	NL	NL
	617002	NI	3660	8890			
Selenium (Se)	617001	4.9	ND	ND	18	50	NL
	617002	NI	6.5	ND			
Sodium (Na)	617001	179000	168000	153000	NL	NL	NL
	617002	NI	866000	78500			
Thallium (Tl)	617002	NI	21.0	ND	0.29	2	5.58
Vanadium (V)	617001	18.6	3.9	20.8	26	NL	1.58
Zinc (Zn)	617001	37.6	21.8	ND	1100	5000	NL
	617002	NI	145000	1100			

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Table 10.9.8
 AOC 617
 Analytes Detected in Shallow Groundwater

Parameters	Location	1 st Quarter Conc.	2 nd Quarter Conc.	3 rd Quarter Conc.	Tap Water RBC* (µg/L)	MCL/SMCL* (µg/L)	Shallow Background
pH							
Ph	617001	6.27	6.18	6.47	NL	NL	NL
	617002	NI	4.95	6.55			

Notes:

- MCL = Maximum Contaminant Level
- NI = Not installed until April 1997
- NL = Not listed
- µg/L = Micrograms per liter
- SMCL = Secondary Maximum Contaminant Level
- * = Tap water RBCs (THQ=0.1) from *Risk-Based Concentration Table*, January-June 1996 (USEPA 1996b). MCLs/SMCLs from *Drinking Water Regulations and Health Advisories* (USEPA 1996c) were used as reference concentrations.

Bolded concentrations exceed both the RBC and the zone background.

All background values for Zone F are based on twice the means of the grid sample concentrations. One grid sample from Zone E is included in each group. Background values for groundwater are based on two sampling rounds in two wells at each depth.

617002 (additional well) was sampled for the first time during the second quarter sampling event.

APPENDIX A

Detected Analytes for LF037SP024 and LF699SP007

RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Location	Sample Date	Concentration	Units	RBC	SSL	Surface Background	Subsurface Background
Acetone	LF037SP024	06/09/1997	0.1650	mg/kg	630,000	0.8	NL	NL
	LF699SP007	06/11/1997	0.0116	mg/kg				
Aluminum	LF037SP024	06/09/1997	5,270	mg/kg	7,800	NL	18,500	17,100
	LF699SP007	06/11/1997	8,280	mg/kg				
Arsenic	LF037SP024	06/09/1997	1.52	mg/kg	0.43	15	19.9	18.2
	LF699SP007	06/11/1997	3.41	mg/kg				
Barium	LF037SP024	06/09/1997	11.0	mg/kg	550	820	61.5	51.8
	LF699SP007	06/11/1997	18.3	mg/kg				
Beryllium	LF699SP007	06/11/1997	0.305	mg/kg	16	32	1.05	1.2
Cadmium	LF699SP007	06/11/1997	0.427	mg/kg	8	4	0.26	0.09
Calcium	LF037SP024	06/09/1997	3450	mg/kg	NL	NL	NL	NL
	LF699SP007	06/11/1997	4960	mg/kg				
Chromium, Total	LF037SP024	06/09/1997	7.35	mg/kg	210	19	34.8	32.2
	LF699SP007	06/11/1997	14.0	mg/kg				
Cobalt	LF037SP024	06/09/1997	0.793	mg/kg	470	NL	15.1	6.85
	LF699SP007	06/11/1997	1.71	mg/kg				
Copper	LF037SP024	06/09/1997	3.38	mg/kg	310	NL	48.2	30.4
	LF699SP007	06/11/1997	10.8	mg/kg				
Iron	LF037SP024	06/09/1997	3,140	mg/kg	2,300	NL	NL	NL
	LF699SP007	06/11/1997	7,490	mg/kg				
Lead	LF037SP024	06/09/1997	16.0	mg/kg	400	400	180	51.7
	LF699SP007	06/11/1997	35.8	mg/kg				

APPENDIX A

Detected Analytes for LF037SP024 and LF699SP007

RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Location	Sample Date	Concentration	Units	RBC	SSL	Surface Background	Subsurface Background
Magnesium	LF037SP024	06/09/1997	380	mg/kg	NL	NL	NL	NL
	LF699SP007	06/11/1997	767	mg/kg				
Manganese	LF037SP024	06/09/1997	22.0	mg/kg	160	NL	307	469
	LF699SP007	06/11/1997	59.1	mg/kg				
Mercury	LF037SP024	06/09/1997	0.0618	mg/kg	2.3	1	0.62	0.23
	LF699SP007	06/11/1997	0.158	mg/kg				
Nickel	LF037SP024	06/09/1997	2.33	mg/kg	160	65	12.6	8.85
	LF699SP007	06/11/1997	4.63	mg/kg				
Potassium	LF037SP024	06/09/1997	177	mg/kg	NL	NL	NL	NL
	LF699SP007	06/11/1997	458	mg/kg				
Sodium	LF037SP024	06/09/1997	154	mg/kg	NL	NL	NL	NL
	LF699SP007	06/11/1997	222	mg/kg				
Vanadium	LF037SP024	06/09/1997	7.23	mg/kg	55	3,000	48.9	49.4
	LF699SP007	06/11/1997	16.2	mg/kg				
Zinc	LF037SP024	06/09/1997	246	mg/kg	2,300	6,000	198	84.2
	LF699SP007	06/11/1997	850	mg/kg				

RBC from EPA Region III RBC table (October 2000); RBC adjusted for HI = 0.1 for non-carcenogenic analytes.

SSL from EPA Soil Screening Guidance (July 1996), adjusted for DAF = 10 for inorganic analytes and DAF = 1 for organic compounds.

Analytical Data Summary

11/01/2001 11:48 AM

	StationID	F617SB003	F617SB003	F617SB003	F617SB003	F617SB004		
	SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T2 (3-5ft)	617SB004S1 (0-1ft)		
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00		
	DateAnalyzed	10/26/1999	10/26/1999	10/29/1999	10/29/1999	10/26/1999		
	SDGNumber	EN020	EN020	EN020	EN020	EN020		
Parameter	Units							
Cyanide, SPLP	ug/L	10	U	10	U		10	U
Cyanide	mg/Kg				0.5	U	0.5	U

Analytical Data Summary

11/01/2001 11:48 AM

	StationID	F617SB004	F617SB004	F617SB004
	SampleID	617SB004S2 (3-5ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/29/1999	10/29/1999
	SDGNumber	EN020	EN020	EN020
Parameter	Units			
Cyanide, SPLP	ug/L	10 U		
Cyanide	mg/Kg		0.5 U	0.5 U

Analytical Data Summary

11/01/2001 11:48 AM

	StationID	F617SB003	F617SB003	F617SB003	F617SB003	F617SB003
	SampleID	617SB003P1 (0-1ft)	617SB003P1 (0-1ft)	617SB003P1 (0-1ft)	617SB003T1 (0-1ft)	617SB003T2 (3-5ft)
	DateCollected	01/28/1997 0:00	01/28/1997 0:00	01/28/1997 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	02/05/1997	02/14/1997	02/22/1997	11/01/1999	11/01/1999
	SDGNumber	28298	28298	28298	EN020	EN020
Parameter	Units					
Cation Exchange Capacity	MEQ/l			25.4 =		
pH	SU		7.73 =			
Total Organic Carbon	%, DR				0.18 =	0.8 =
Total Organic Carbon	mg/Kg	3550 =				

Analytical Data Summary

11/01/2001 11:48 AM

	StationID	F617SB004	F617SB004
	SampleID	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	11/01/1999	11/01/1999
	SDGNumber	EN020	EN020
Parameter	Units		
Cation Exchange Capacity	MEQ/1		
pH	SU		
Total Organic Carbon	%, DR	0.45 =	0.64 =
Total Organic Carbon	mg/Kg		

Analytical Data Summary

11/01/2001 11:48 AM

StationID	F617GW001	F617GW002	F617GW002	
SampleID	617GW00104 (-ft)	617GW002A3 (-ft)	617GW002A4 (-ft)	
DateCollected	11/25/1997 0:00	11/21/1997 0:00	02/10/1998 0:00	
DateAnalyzed	11/26/1997	11/24/1997	02/11/1998	
SDGNumber	31975	31911	32688	
Parameter	Units			
pH	SU	6.64 =	6.62 =	6.6 =

Analytical Data Summary

11/01/2001 11:48 AM

StationID	F617SB003	F617SB003	F617SB003	F617SB003	F617SB004
SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T2 (3-5ft)	617SB004S1 (0-1ft)
DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
DateAnalyzed	10/20/1999	10/20/1999	10/29/1999	10/29/1999	10/20/1999
SDGNumber	EN020	EN020	EN020	EN020	EN020
Parameter	Units				
Aluminum, SPLP	ug/L	58.7 U	309 =		58.7 U
Antimony, SPLP	ug/L	2.6 J	3.9 J		4.4 J
Arsenic, SPLP	ug/L	2 U	2 U		2 U
Barium, SPLP	ug/L	83.7 J	221 =		75.2 J
Beryllium, SPLP	ug/L	0.9 U	0.9 U		0.9 U
Cadmium, SPLP	ug/L	0.3 UJ	0.3 UJ		0.3 UJ
Calcium, SPLP	ug/L	69000 =	142000 =		77700 =
Cobalt, SPLP	ug/L	0.5 U	0.5 U		0.5 U
Copper, SPLP	ug/L	0.6 UJ	1.9 J		0.7 J
Iron, SPLP	ug/L	103 J	68.5 J		39.2 J
Lead, SPLP	ug/L	3 J	2.1 J		4.3 J
Magnesium, SPLP	ug/L	1840 J	3680 J		2150 J
Manganese, SPLP	ug/L	3.1 J	35.5 =		2.5 J
Mercury, SPLP	ug/L	0.4 U	0.4 U		0.4 U
Nickel, SPLP	ug/L	1.1 U	1.1 J		1.7 J
Potassium, SPLP	ug/L	922 J	2140 J		3110 J
Selenium, SPLP	ug/L	1.7 U	1.7 U		1.9 J
Silver, SPLP	ug/L	0.5 UJ	0.5 UJ		0.5 J
Sodium, SPLP	ug/L	1680 J	3250 J		3090 J
Thallium, SPLP	ug/L	2.4 U	2.4 U		2.4 U
Tin (Sn), SPLP	ug/L	3.1 J	2.7 U		4.7 J
Vanadium, SPLP	ug/L	0.5 U	3.6 J		0.5 U
Aluminum	mg/Kg			1560 =	7780 =
Antimony	mg/Kg			0.36 J	1.2 J
Arsenic	mg/Kg			3.2 J	3.6 J
Barium	mg/Kg			12.4 J	18 J
Beryllium	mg/Kg			0.09 U	0.23 J
Cadmium	mg/Kg			0.66 J	0.5 J
Calcium	mg/Kg			340000 J	17300 J
Chromium, Total	mg/Kg			7.7 J	14.3 J
Chromium, Total	ug/L	0.6 U	0.8 J		0.6 U

Analytical Data Summary

11/01/2001 11:48 AM

StationID	F617SB004	F617SB004	F617SB004
SampleID	617SB004S2 (3-5ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
DateAnalyzed	10/20/1999	10/29/1999	10/29/1999
SDGNumber	EN020	EN020	EN020
Parameter	Units		
Aluminum, SPLP	ug/L	58.7	U
Antimony, SPLP	ug/L	7.8	J
Arsenic, SPLP	ug/L	2	U
Barium, SPLP	ug/L	58.6	J
Beryllium, SPLP	ug/L	0.9	U
Cadmium, SPLP	ug/L	0.3	UJ
Calcium, SPLP	ug/L	200000	=
Cobalt, SPLP	ug/L	0.5	U
Copper, SPLP	ug/L	2.7	J
Iron, SPLP	ug/L	97.6	J
Lead, SPLP	ug/L	2.7	J
Magnesium, SPLP	ug/L	1750	J
Manganese, SPLP	ug/L	4.4	J
Mercury, SPLP	ug/L	0.4	U
Nickel, SPLP	ug/L	4	J
Potassium, SPLP	ug/L	1270	J
Selenium, SPLP	ug/L	2.1	J
Silver, SPLP	ug/L	0.5	J
Sodium, SPLP	ug/L	3870	J
Thallium, SPLP	ug/L	2.4	U
Tin (Sn), SPLP	ug/L	5.4	J
Vanadium, SPLP	ug/L	2	J
Aluminum	mg/Kg		1520 =
Antimony	mg/Kg		0.39 J
Arsenic	mg/Kg		2.5 J
Barium	mg/Kg		15.6 J
Beryllium	mg/Kg		0.09 U
Cadmium	mg/Kg		0.66 J
Calcium	mg/Kg		328000 J
Chromium, Total	mg/Kg		7.9 J
Chromium, Total	ug/L	0.8	J
			5750 =
			1.1 J
			2.2 J
			18 J
			0.09 J
			0.32 J
			17000 J
			11.3 J

Analytical Data Summary

11/01/2001 11:48 AM

StationID	F617SB003	F617SB003	F617SB003	F617SB003	F617SB004
SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T2 (3-5ft)	617SB004S1 (0-1ft)
DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
DateAnalyzed	10/20/1999	10/20/1999	10/29/1999	10/29/1999	10/20/1999
SDGNumber	EN020	EN020	EN020	EN020	EN020
Parameter	Units				
Cobalt	mg/Kg			4.9 =	1.9 J
Copper	mg/Kg			3.3 =	11.4 =
Iron	mg/Kg			3390 =	6630 =
Lead	mg/Kg			2.5 =	50.1 =
Magnesium	mg/Kg			5460 J	857 J
Manganese	mg/Kg			230 =	60.9 =
Mercury	mg/Kg			0.05 U	0.18 =
Nickel	mg/Kg			9.8 =	5.3 =
Potassium	mg/Kg			1660 J	461 J
Selenium	mg/Kg			0.16 U	0.8 J
Silver	mg/Kg			0.57 J	0.05 U
Sodium	mg/Kg			718 =	232 J
Thallium	mg/Kg			2.3 R	1.2 R
Tin (Sn)	mg/Kg			4.4 J	10 =
Vanadium	mg/Kg			5.9 =	14.6 =
Zinc, SPLP	ug/L	8.5 J	173 J		45.8 J
Zinc	mg/Kg			31.1 J	1200 J

Analytical Data Summary

11/01/2001 11:48 AM

StationID	F617SB004	F617SB004	F617SB004
SampleID	617SB004S2 (3-5ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
DateAnalyzed	10/20/1999	10/29/1999	10/29/1999
SDGNumber	EN020	EN020	EN020
Parameter	Units		
Cobalt	mg/Kg	8.1 =	1.7 J
Copper	mg/Kg	2.7 =	8.6 =
Iron	mg/Kg	3470 =	4490 =
Lead	mg/Kg	1.6 =	48.2 =
Magnesium	mg/Kg	5730 J	576 J
Manganese	mg/Kg	248 =	31.9 =
Mercury	mg/Kg	0.05 U	0.19 =
Nickel	mg/Kg	11.2 =	5 =
Potassium	mg/Kg	2010 J	263 J
Selenium	mg/Kg	0.17 U	0.63 J
Silver	mg/Kg	0.16 J	0.05 U
Sodium	mg/Kg	729 =	170 J
Thallium	mg/Kg	2.4 R	0.23 R
Tin (Sn)	mg/Kg	4.6 J	6 J
Vanadium	mg/Kg	6.9 =	9.5 =
Zinc, SPLP	ug/L	87.8 J	
Zinc	mg/Kg	21.5 J	437 J

Analytical Data Summary

11/01/2001 11:48 AM

	StationID	F617GW001	F617GW001	F617GW002	F617GW002	F617GW002
	SampleID	617GW00104	617GW001LA	617GW002A3	617GW002A4	617GW002LA
	DateCollected	11/25/1997 0:00	06/21/2001 0:00	11/21/1997 0:00	02/10/1998 0:00	06/21/2001 0:00
	DateAnalyzed	12/10/1997	07/09/2001	12/08/1997	02/18/1998	07/10/2001
	SDGNumber	31975	44646	31911	32688	44646
Parameter	Units					
Aluminum	ug/L	595 =		71.3 U	58.3 U	
Antimony	ug/L	1.6 U	2.65 U	1.6 UJ	1.6 U	2.65 U
Arsenic	ug/L	5.1 U	2.33 U	2.1 U	2.1 U	2.33 U
Barium	ug/L	39.1 =		66.7 J	82.1 J	
Beryllium	ug/L	0.36 U		0.2 U	0.2 U	
Cadmium	ug/L	0.3 U	0.272 U	0.32 J	0.3 U	0.272 U
Calcium	ug/L	49200 =		114000 =	132000 =	
Chromium, Total	ug/L	2.6 J	0.582 U	1 U	1 U	0.582 U
Cobalt	ug/L	1.4 J		2.8 J	2.3 J	
Copper	ug/L	4.3 J		1.4 U	1.4 U	
Iron	ug/L	1040 =		5130 J	2570 =	
Lead	ug/L	0.93 J		0.9 U	0.9 U	
Magnesium	ug/L	10700 =		11500 =	9960 =	
Manganese	ug/L	329 =		372 =	268 =	
Mercury	ug/L	0.1 U		0.1 U	0.1 U	
Nickel	ug/L	3.2 U	0.815 U	1.1 J	1.3 J	1.29 U
Potassium	ug/L	8310 =		7880 =	7470 =	
Selenium	ug/L	3.4 U		3.4 U	3.4 U	
Silver	ug/L	1 U		1 U	1 U	
Sodium	ug/L	141000 =		56500 U	46200 U	
Thallium	ug/L	5 U		5 U	5 U	
Tin (Sn)	ug/L	4.5 U		14 U	14 U	
Vanadium	ug/L	1.4 J		1.1 U	1.1 U	
Zinc	ug/L	17.4 U	6.37 J	576 =	514 =	78.2 =

Analytical Data Summary

11/01/2001 11:48 AM

	StationID	F617GW003	F617GW003	F617GW004
	SampleID	617GW00301	617GW003LA	617GW004LA
	DateCollected	05/20/1999 0:00	06/21/2001 0:00	06/21/2001 0:00
	DateAnalyzed	05/28/1999	07/10/2001	07/10/2001
	SDGNumber	38649	44646	44646
Parameter	Units			
Aluminum	ug/L	3070 J		
Antimony	ug/L	54.9 J	2.65 U	2.65 U
Arsenic	ug/L	3.3 U	3.6 J	2.38 J
Barium	ug/L	26.8 =		
Beryllium	ug/L	1.3 J		
Cadmium	ug/L	3.4 J	4.44 J	0.272 U
Calcium	ug/L	20600 J		
Chromium, Total	ug/L	0.78 J	4.7 J	0.582 U
Cobalt	ug/L	10.6 J		
Copper	ug/L	5.1 U		
Iron	ug/L	25800 J		
Lead	ug/L	2.1 U		
Magnesium	ug/L	5170 J		
Manganese	ug/L	223 =		
Mercury	ug/L	0.66 J		
Nickel	ug/L	114 =	396 =	29.8 J
Potassium	ug/L	6200 J		
Selenium	ug/L	3.4 J		
Silver	ug/L	2 U		
Sodium	ug/L	65900 =		
Thallium	ug/L	2.3 UJ		
Tin (Sn)	ug/L	29.5 U		
Vanadium	ug/L	0.9 U		
Zinc	ug/L	30600 =	119000 =	2630 =

Analytical Data Summary

11/01/2001 11:49 AM

	StationID	F617SB003	F617SB003	F617SB003	F617SB003
	SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/28/1999	10/28/1999	10/22/1999	10/23/1999
	SDGNumber	EN020	EN020	EN020	EN020
Parameter	Units				
PCB-1016 (Arochlor 1016), SPLP	ug/L	1 U	1 U		
PCB-1221 (Arochlor 1221), SPLP	ug/L	2 U	2 U		
PCB-1232 (Arochlor 1232), SPLP	ug/L	1 U	1 U		
PCB-1242 (Arochlor 1242), SPLP	ug/L	1 U	1 U		
PCB-1248 (Arochlor 1248), SPLP	ug/L	1 U	1 U		
PCB-1254 (Arochlor 1254), SPLP	ug/L	1 U	1 U		
PCB-1260 (Arochlor 1260), SPLP	ug/L	1 U	1 U		
PCB-1016 (Arochlor 1016)	mg/Kg			0.036 U	0.04 U
PCB-1221 (Arochlor 1221)	mg/Kg			0.072 U	0.08 U
PCB-1232 (Arochlor 1232)	mg/Kg			0.036 U	0.04 U
PCB-1242 (Arochlor 1242)	mg/Kg			0.036 U	0.04 U
PCB-1248 (Arochlor 1248)	mg/Kg			0.036 U	0.04 U
PCB-1254 (Arochlor 1254)	mg/Kg			0.036 U	0.04 U
PCB-1260 (Arochlor 1260)	mg/Kg			0.036 U	0.088 =

Analytical Data Summary

11/01/2001 11:49 AM

	StationID	F617SB004	F617SB004	F617SB004	F617SB004
	SampleID	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/28/1999	10/28/1999	10/21/1999	10/23/1999
	SDGNumber	EN020	EN020	EN020	EN020
Parameter	Units				
PCB-1016 (Arochlor 1016), SPLP	ug/L	1 U	1 U		
PCB-1221 (Arochlor 1221), SPLP	ug/L	2 U	2 U		
PCB-1232 (Arochlor 1232), SPLP	ug/L	1 U	1 U		
PCB-1242 (Arochlor 1242), SPLP	ug/L	1 U	1 U		
PCB-1248 (Arochlor 1248), SPLP	ug/L	1 U	1 U		
PCB-1254 (Arochlor 1254), SPLP	ug/L	1 U	1 U		
PCB-1260 (Arochlor 1260), SPLP	ug/L	1 U	1 U		
PCB-1016 (Arochlor 1016)	mg/Kg			0.036 U	0.036 U
PCB-1221 (Arochlor 1221)	mg/Kg			0.073 U	0.073 U
PCB-1232 (Arochlor 1232)	mg/Kg			0.036 U	0.036 U
PCB-1242 (Arochlor 1242)	mg/Kg			0.036 U	0.036 U
PCB-1248 (Arochlor 1248)	mg/Kg			0.036 U	0.036 U
PCB-1254 (Arochlor 1254)	mg/Kg			0.036 U	0.036 U
PCB-1260 (Arochlor 1260)	mg/Kg			0.036 U	0.18 =

Analytical Data Summary

11/01/2001 11:49 AM

StationID F617GW003
SampleID 617GW00301
DateCollected 05/20/1999 0:00
DateAnalyzed 05/26/1999
SDGNumber 38649

Parameter	Units		
PCB-1016 (Arochlor 1016)	ug/L	1	U
PCB-1221 (Arochlor 1221)	ug/L	1	U
PCB-1232 (Arochlor 1232)	ug/L	1	U
PCB-1242 (Arochlor 1242)	ug/L	1	U
PCB-1248 (Arochlor 1248)	ug/L	1	U
PCB-1254 (Arochlor 1254)	ug/L	2	U
PCB-1260 (Arochlor 1260)	ug/L	2	U

Analytical Data Summary

11/01/2001 11:49 AM

Parameter	Units	StationID	F617SB003	F617SB003	F617SB003
		SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/28/1999	10/28/1999	10/22/1999
		SDGNumber	EN020	EN020	EN020
Aldrin, SPLP	ug/L		0.05 U	0.05 U	
Dieldrin, SPLP	ug/L		0.1 U	0.1 U	
Endosulfan I, SPLP	ug/L		0.05 U	0.05 U	
Endosulfan II, SPLP	ug/L		0.1 U	0.1 U	
Endosulfan Sulfate, SPLP	ug/L		0.1 U	0.1 U	
Endrin aldehyde, SPLP	ug/L		0.1 U	0.1 U	
Endrin ketone, SPLP	ug/L		0.1 U	0.1 U	
Endrin, SPLP	ug/L		0.1 U	0.1 U	
Gamma BHC (lindane), SPLP	ug/L		0.05 U	0.05 U	
Gamma-chlordane, SPLP	ug/L		0.05 U	0.05 U	
Heptachlor, SPLP	ug/L		0.05 U	0.05 U	
Heptochlor epoxide, SPLP	ug/L		0.05 U	0.05 U	
Methoxychlor, SPLP	ug/L		0.5 U	0.5 U	
p,p'-DDD, SPLP	ug/L		0.1 U	0.1 U	
p,p'-DDE, SPLP	ug/L		0.1 U	0.1 U	
p,p'-DDT, SPLP	ug/L		0.1 U	0.1 U	
Toxaphene, SPLP	ug/L		5 U	5 U	
Alpha BHC (alpha hexachlorocyclohexane), SPLP	ug/L		0.05 U	0.05 U	
Alpha BHC (Alpha Hexachlorocyclohexane)	mg/Kg				0.0018 U
Gamma BHC (Lindane)	mg/Kg				0.0018 U
Beta BHC (beta hexachlorocyclohexane), SPLP	ug/L		0.05 U	0.05 U	
Beta BHC (Beta Hexachlorocyclohexane)	mg/Kg				0.0018 U
Heptachlor	mg/Kg				0.0018 U
Delta BHC (delta hexachlorocyclohexane), SPLP	ug/L		0.05 U	0.05 U	
Delta BHC (Delta Hexachlorocyclohexane)	mg/Kg				0.0018 U
Aldrin	mg/Kg				0.0018 U
Heptachlor Epoxide	mg/Kg				0.0018 U
Gamma-chlordane	mg/Kg				0.0018 U
Alpha-chlordane, SPLP	ug/L		0.05 U	0.05 U	
Alpha-chlordane	mg/Kg				0.0018 U
Endosulfan I	mg/Kg				0.0018 U

Analytical Data Summary

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Parameter	Units	StationID	F617SB003	F617SB004	F617SB004
		SampleID	617SB003T2 (3-5ft)	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/23/1999	10/28/1999	10/28/1999
		SDGNumber	EN020	EN020	EN020
Aldrin, SPLP	ug/L			0.05 U	0.05 U
Dieldrin, SPLP	ug/L			0.1 U	0.1 U
Endosulfan I, SPLP	ug/L			0.05 U	0.05 U
Endosulfan II, SPLP	ug/L			0.1 U	0.1 U
Endosulfan Sulfate, SPLP	ug/L			0.1 U	0.1 U
Endrin aldehyde, SPLP	ug/L			0.1 U	0.1 U
Endrin ketone, SPLP	ug/L			0.1 U	0.1 U
Endrin, SPLP	ug/L			0.1 U	0.1 U
Gamma BHC (lindane), SPLP	ug/L			0.05 U	0.05 U
Gamma-chlordane, SPLP	ug/L			0.05 U	0.05 U
Heptachlor, SPLP	ug/L			0.05 U	0.05 U
Heptochlor epoxide, SPLP	ug/L			0.05 U	0.05 U
Methoxychlor, SPLP	ug/L			0.5 U	0.5 U
p,p'-DDD, SPLP	ug/L			0.1 U	0.1 U
p,p'-DDE, SPLP	ug/L			0.1 U	0.1 U
p,p'-DDT, SPLP	ug/L			0.1 U	0.1 U
Toxaphene, SPLP	ug/L			5 U	5 U
Alpha BHC (alpha hexachlorocyclohexane), SPLP	ug/L			0.05 U	0.05 U
Alpha BHC (Alpha Hexachlorocyclohexane)	mg/Kg		0.002 U		
Gamma BHC (Lindane)	mg/Kg		0.002 U		
Beta BHC (beta hexachlorocyclohexane), SPLP	ug/L			0.05 U	0.05 U
Beta BHC (Beta Hexachlorocyclohexane)	mg/Kg		0.002 U		
Heptachlor	mg/Kg		0.002 U		
Delta BHC (delta hexachlorocyclohexane), SPLP	ug/L			0.05 U	0.05 U
Delta BHC (Delta Hexachlorocyclohexane)	mg/Kg		0.002 U		
Aldrin	mg/Kg		0.002 U		
Heptachlor Epoxide	mg/Kg		0.002 U		
Gamma-chlordane	mg/Kg		0.002 U		
Alpha-chlordane, SPLP	ug/L			0.05 U	0.05 U
Alpha-chlordane	mg/Kg		0.002 U		
Endosulfan I	mg/Kg		0.002 U		

Analytical Data Summary

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Parameter	Units	StationID	F617SB004	F617SB004
		SampleID	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/21/1999	10/23/1999
		SDGNumber	EN020	EN020
Aldrin, SPLP	ug/L			
Dieldrin, SPLP	ug/L			
Endosulfan I, SPLP	ug/L			
Endosulfan II, SPLP	ug/L			
Endosulfan Sulfate, SPLP	ug/L			
Endrin aldehyde, SPLP	ug/L			
Endrin ketone, SPLP	ug/L			
Endrin, SPLP	ug/L			
Gamma BHC (lindane), SPLP	ug/L			
Gamma-chlordane, SPLP	ug/L			
Heptachlor, SPLP	ug/L			
Heptochlor epoxide, SPLP	ug/L			
Methoxychlor, SPLP	ug/L			
p,p'-DDD, SPLP	ug/L			
p,p'-DDE, SPLP	ug/L			
p,p'-DDT, SPLP	ug/L			
Toxaphene, SPLP	ug/L			
Alpha BHC (alpha hexachlorocyclohexane), SPLP	ug/L			
Alpha BHC (Alpha Hexachlorocyclohexane)	mg/Kg		0.0019 U	0.0019 U
Gamma BHC (Lindane)	mg/Kg		0.0019 U	0.0019 U
Beta BHC (beta hexachlorocyclohexane), SPLP	ug/L			
Beta BHC (Beta Hexachlorocyclohexane)	mg/Kg		0.0019 U	0.0019 U
Heptachlor	mg/Kg		0.0019 U	0.0019 U
Delta BHC (delta hexachlorocyclohexane), SPLP	ug/L			
Delta BHC (Delta Hexachlorocyclohexane)	mg/Kg		0.0019 U	0.0019 U
Aldrin	mg/Kg		0.0019 U	0.0019 U
Heptachlor Epoxide	mg/Kg		0.0019 U	0.0019 U
Gamma-chlordane	mg/Kg		0.0019 U	0.0019 U
Alpha-chlordane, SPLP	ug/L			
Alpha-chlordane	mg/Kg		0.0019 U	0.0019 U
Endosulfan I	mg/Kg		0.0019 U	0.0019 U

Analytical Data Summary

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	StationID	F617SB003	F617SB003	F617SB003
	SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/28/1999	10/28/1999	10/22/1999
	SDGNumber	EN020	EN020	EN020
Parameter	Units			
p,p'-DDE	mg/Kg			0.0036 U
Dieldrin	mg/Kg			0.0036 U
Endrin	mg/Kg			0.0036 U
p,p'-DDD	mg/Kg			0.0036 U
Endosulfan II	mg/Kg			0.0036 U
p,p'-DDT	mg/Kg			0.0036 U
Endrin Aldehyde	mg/Kg			0.0036 U
Endosulfan Sulfate	mg/Kg			0.0036 U
Methoxychlor	mg/Kg			0.018 U
Endrin Ketone	mg/Kg			0.0036 U
Toxaphene	mg/Kg			0.18 U

Analytical Data Summary

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	StationID	F617SB003	F617SB004	F617SB004
	SampleID	617SB003T2 (3-5ft)	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/23/1999	10/28/1999	10/28/1999
	SDGNumber	EN020	EN020	EN020
Parameter	Units			
p,p'-DDE	mg/Kg	0.0047	J	
Dieldrin	mg/Kg	0.004	U	
Endrin	mg/Kg	0.004	U	
p,p'-DDD	mg/Kg	0.0058	J	
Endosulfan II	mg/Kg	0.004	U	
p,p'-DDT	mg/Kg	0.004	U	
Endrin Aldehyde	mg/Kg	0.004	U	
Endosulfan Sulfate	mg/Kg	0.004	U	
Methoxychlor	mg/Kg	0.02	U	
Endrin Ketone	mg/Kg	0.004	U	
Toxaphene	mg/Kg	0.2	U	

Analytical Data Summary

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Parameter	Units	StationID	F617SB004	F617SB004
		SampleID	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/21/1999	10/23/1999
		SDGNumber	EN020	EN020
p,p'-DDE	mg/Kg		0.0036 U	0.0066 =
Dieldrin	mg/Kg		0.0036 U	0.0036 U
Endrin	mg/Kg		0.0036 U	0.0036 U
p,p'-DDD	mg/Kg		0.0036 U	0.0068 J
Endosulfan II	mg/Kg		0.0036 U	0.0036 U
p,p'-DDT	mg/Kg		0.0036 U	0.0036 U
Endrin Aldehyde	mg/Kg		0.0036 U	0.0036 U
Endosulfan Sulfate	mg/Kg		0.0036 U	0.0036 U
Methoxychlor	mg/Kg		0.019 U	0.019 U
Endrin Ketone	mg/Kg		0.0036 U	0.0036 U
Toxaphene	mg/Kg		0.19 U	0.19 U

Analytical Data Summary

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Parameter	Units	StationID	SampleID	DateCollected	DateAnalyzed	SDGNumber
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/L	F617GW003	617GW00301	05/20/1999 0:00	05/26/1999	38649
Gamma BHC (Lindane)	ug/L					
Beta BHC (Beta Hexachlorocyclohexane)	ug/L					
Heptachlor	ug/L					
Delta BHC (Delta Hexachlorocyclohexane)	ug/L					
Aldrin	ug/L					
Heptachlor Epoxide	ug/L					
Gamma-chlordane	ug/L					
Alpha-chlordane	ug/L					
Endosulfan I	ug/L					
p,p'-DDE	ug/L					
Dieldrin	ug/L					
Endrin	ug/L					
p,p'-DDD	ug/L					
Endosulfan II	ug/L					
p,p'-DDT	ug/L					
Endrin Aldehyde	ug/L					
Endosulfan Sulfate	ug/L					
Methoxychlor	ug/L					
Endrin Ketone	ug/L					
Toxaphene	ug/L					

Analytical Data Summary

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Parameter	Units	StationID F617SB003		StationID F617SB003		StationID F617SB003		StationID F617SB003	
		SampleID	DateCollected	SampleID	DateCollected	SampleID	DateCollected	SampleID	DateCollected
		617SB003S1 (0-1ft)	10/14/1999 0:00	617SB003S2 (3-5ft)	10/14/1999 0:00	617SB003T1 (0-1ft)	10/14/1999 0:00	617SB003T2 (3-5ft)	10/14/1999 0:00
		DateAnalyzed	10/26/1999	DateAnalyzed	10/26/1999	DateAnalyzed	10/22/1999	DateAnalyzed	10/23/1999
		SDGNumber	EN020	SDGNumber	EN020	SDGNumber	EN020	SDGNumber	EN020
1,2,4-Trichlorobenzene, SPLP	ug/L	5	U	5	U				
1,2-Dichlorobenzene, SPLP	ug/L	5	U	5	U				
1,3-Dichlorobenzene, SPLP	ug/L	5	U	5	U				
1,4-Dichlorobenzene, SPLP	ug/L	5	U	5	U				
2,2'-Oxybis(1-Chloro)propane, SPLP	ug/L	5	U	5	U				
2,2'-Oxybis(1-chloro)propane	mg/Kg					0.36	U	0.4	U
2,4,5-Trichlorophenol, SPLP	ug/L	5	U	5	U				
2,4,6-Trichlorophenol, SPLP	ug/L	5	U	5	U				
2,4-Dichlorophenol, SPLP	ug/L	5	U	5	U				
2,4-Dimethylphenol, SPLP	ug/L	5	U	5	U				
2,4-Dinitrophenol, SPLP	ug/L	10	U	10	U				
2,4-Dinitrotoluene, SPLP	ug/L	5	U	5	U				
2,6-Dinitrotoluene, SPLP	ug/L	5	U	5	U				
2-Chloronaphthalene, SPLP	ug/L	5	U	5	U				
2-Chlorophenol, SPLP	ug/L	5	U	5	U				
2-Methylnaphthalene, SPLP	ug/L	5	U	5	U				
2-Methylnaphthalene	mg/Kg					0.36	U	0.38	J
2-Methylphenol (o-Cresol), SPLP	ug/L	5	U	5	U				
2-Methylphenol (o-Cresol)	mg/Kg					0.36	U	0.4	U
2-Nitroaniline, SPLP	ug/L	5	U	5	U				
2-Nitrophenol, SPLP	ug/L	5	U	5	U				
3,3'-Dichlorobenzidine, SPLP	ug/L	10	U	10	U				
3-Nitroaniline, SPLP	ug/L	5	U	5	U				
4,6-Dinitro-2-methylphenol, SPLP	ug/L	10	U	10	U				
4-Bromophenyl Phenyl Ether, SPLP	ug/L	5	U	5	U				
4-Chloro-3-methylphenol, SPLP	ug/L	5	U	5	U				
4-Chloroaniline, SPLP	ug/L	5	U	5	U				
4-Chlorophenyl phenyl ether, SPLP	ug/L	5	U	5	U				
4-Nitroaniline, SPLP	ug/L	5	U	5	U				
4-Nitrophenol, SPLP	ug/L	10	U	10	U				
Benzoic acid, SPLP	ug/L	25	U	25	U				

Analytical Data Summary

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Parameter	Units	StationID	F617SB004	F617SB004	F617SB004	F617SB004
		SampleID	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
DateCollected			10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
DateAnalyzed			10/26/1999	10/26/1999	10/22/1999	10/22/1999
SDGNumber			EN020	EN020	EN020	EN020
1,2,4-Trichlorobenzene, SPLP	ug/L		5 U	5 U		
1,2-Dichlorobenzene, SPLP	ug/L		5 U	5 U		
1,3-Dichlorobenzene, SPLP	ug/L		5 U	5 U		
1,4-Dichlorobenzene, SPLP	ug/L		5 U	5 U		
2,2'-Oxybis(1-Chloro)propane, SPLP	ug/L		5 U	5 U		
2,2'-Oxybis(1-chloro)propane	mg/Kg				0.37 U	0.37 U
2,4,5-Trichlorophenol, SPLP	ug/L		5 U	5 U		
2,4,6-Trichlorophenol, SPLP	ug/L		5 U	5 U		
2,4-Dichlorophenol, SPLP	ug/L		5 U	5 U		
2,4-Dimethylphenol, SPLP	ug/L		5 U	5 U		
2,4-Dinitrophenol, SPLP	ug/L		10 U	10 U		
2,4-Dinitrotoluene, SPLP	ug/L		5 U	5 U		
2,6-Dinitrotoluene, SPLP	ug/L		5 U	5 U		
2-Chloronaphthalene, SPLP	ug/L		5 U	5 U		
2-Chlorophenol, SPLP	ug/L		5 U	5 U		
2-Methylnaphthalene, SPLP	ug/L		5 U	5 U		
2-Methylnaphthalene	mg/Kg				0.37 U	0.37 U
2-Methylphenol (o-Cresol), SPLP	ug/L		5 U	5 U		
2-Methylphenol (o-Cresol)	mg/Kg				0.37 U	0.37 U
2-Nitroaniline, SPLP	ug/L		5 U	5 U		
2-Nitrophenol, SPLP	ug/L		5 U	5 U		
3,3'-Dichlorobenzidine, SPLP	ug/L		10 U	10 U		
3-Nitroaniline, SPLP	ug/L		5 U	5 U		
4,6-Dinitro-2-methylphenol, SPLP	ug/L		10 U	10 U		
4-Bromophenyl Phenyl Ether, SPLP	ug/L		5 U	5 U		
4-Chloro-3-methylphenol, SPLP	ug/L		5 U	5 U		
4-Chloroaniline, SPLP	ug/L		5 U	5 U		
4-Chlorophenyl phenyl ether, SPLP	ug/L		5 U	5 U		
4-Nitroaniline, SPLP	ug/L		5 U	5 U		
4-Nitrophenol, SPLP	ug/L		10 U	10 U		
Benzoic acid, SPLP	ug/L		25 U	25 U		

Analytical Data Summary

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	StationID	F617SB005	F617SB006	F617SB007
	SampleID	617SB00503 (2-3ft)	617SB00603 (2-3ft)	617SB00703 (2-3ft)
	DateCollected	06/06/2001 0:00	06/06/2001 0:00	06/06/2001 0:00
	DateAnalyzed	06/16/2001	06/16/2001	06/16/2001
	SDGNumber	43550	43550	43550
Parameter	Units			
1,2,4-Trichlorobenzene, SPLP	ug/L			
1,2-Dichlorobenzene, SPLP	ug/L			
1,3-Dichlorobenzene, SPLP	ug/L			
1,4-Dichlorobenzene, SPLP	ug/L			
2,2'-Oxybis(1-Chloro)propane, SPLP	ug/L			
2,2'-Oxybis(1-chloro)propane	mg/Kg			
2,4,5-Trichlorophenol, SPLP	ug/L			
2,4,6-Trichlorophenol, SPLP	ug/L			
2,4-Dichlorophenol, SPLP	ug/L			
2,4-Dimethylphenol, SPLP	ug/L			
2,4-Dinitrophenol, SPLP	ug/L			
2,4-Dinitrotoluene, SPLP	ug/L			
2,6-Dinitrotoluene, SPLP	ug/L			
2-Chloronaphthalene, SPLP	ug/L			
2-Chlorophenol, SPLP	ug/L			
2-Methylnaphthalene, SPLP	ug/L			
2-Methylnaphthalene	mg/Kg			
2-Methylphenol (o-Cresol), SPLP	ug/L			
2-Methylphenol (o-Cresol)	mg/Kg			
2-Nitroaniline, SPLP	ug/L			
2-Nitrophenol, SPLP	ug/L			
3,3'-Dichlorobenzidine, SPLP	ug/L			
3-Nitroaniline, SPLP	ug/L			
4,6-Dinitro-2-methylphenol, SPLP	ug/L			
4-Bromophenyl Phenyl Ether, SPLP	ug/L			
4-Chloro-3-methylphenol, SPLP	ug/L			
4-Chloroaniline, SPLP	ug/L			
4-Chlorophenyl phenyl ether, SPLP	ug/L			
4-Nitroaniline, SPLP	ug/L			
4-Nitrophenol, SPLP	ug/L			
Benzoic acid, SPLP	ug/L			

Analytical Data Summary

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	StationID	F617SB003	F617SB003	F617SB003	F617SB003
	SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/26/1999	10/22/1999	10/23/1999
	SDGNumber	EN020	EN020	EN020	EN020
Parameter	Units				
Benzyl alcohol, SPLP	ug/L	5 U	5 U		
Benzyl butyl phthalate, SPLP	ug/L	5 U	5 U		
bis(2-Chloroethoxy) methane, SPLP	ug/L	5 U	5 U		
bis(2-Ethylhexyl) phthalate, SPLP	ug/L	6 U	5 U		
Di-n-butyl phthalate, SPLP	ug/L	5 U	5 U		
Di-n-octylphthalate, SPLP	ug/L	5 U	5 U		
Dibenzofuran, SPLP	ug/L	5 U	5 U		
Diethyl phthalate, SPLP	ug/L	5 U	5 U		
Dimethyl phthalate, SPLP	ug/L	5 U	5 U		
Hexachlorobenzene, SPLP	ug/L	5 U	5 U		
Hexachlorobutadiene, SPLP	ug/L	5 U	5 U		
Hexachlorocyclopentadiene, SPLP	ug/L	5 U	5 U		
Hexachloroethane, SPLP	ug/L	5 U	5 U		
Isophorone, SPLP	ug/L	5 U	5 U		
N-Nitrosodi-n-propylamine, SPLP	ug/L	5 U	5 U		
N-Nitrosodiphenylamine, SPLP	ug/L	5 U	5 U		
Nitrobenzene, SPLP	ug/L	5 U	5 U		
Pentachlorophenol, SPLP	ug/L	10 U	10 U		
Phenol, SPLP	ug/L	5 U	5 U		
Naphthalene	mg/Kg				
Phenol	mg/Kg			0.36 U	0.4 U
Acenaphthylene, SPLP	ug/L	5 U	5 U		
Acenaphthylene	mg/Kg			0.36 U	0.4 U
bis(2-Chloroethyl) ether (2-Chloroethyl ether), S	ug/L	5 U	5 U		
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	mg/Kg			0.36 U	0.4 U
2-Chlorophenol	mg/Kg			0.36 U	0.4 U
Acenaphthene, SPLP	ug/L	5 U	5 U		
Acenaphthene	mg/Kg			0.36 U	3.6 =
1,3-Dichlorobenzene	mg/Kg			0.36 U	0.4 U
Fluorene, SPLP	ug/L	5 U	5 U		
Fluorene	mg/Kg			0.36 U	3.1 =

Analytical Data Summary

11/01/2001 11:49 AM

	StationID	F617SB004	F617SB004	F617SB004	F617SB004
	SampleID	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/26/1999	10/22/1999	10/22/1999
	SDGNumber	EN020	EN020	EN020	EN020
Parameter	Units				
Benzyl alcohol, SPLP	ug/L	5	U	5	U
Benzyl butyl phthalate, SPLP	ug/L	5	U	5	U
bis(2-Chloroethoxy) methane, SPLP	ug/L	5	U	5	U
bis(2-Ethylhexyl) phthalate, SPLP	ug/L	5	U	5	U
Di-n-butyl phthalate, SPLP	ug/L	5	U	5	U
Di-n-octylphthalate, SPLP	ug/L	5	U	5	U
Dibenzofuran, SPLP	ug/L	5	U	5	U
Diethyl phthalate, SPLP	ug/L	5	U	5	U
Dimethyl phthalate, SPLP	ug/L	5	U	5	U
Hexachlorobenzene, SPLP	ug/L	5	U	5	U
Hexachlorobutadiene, SPLP	ug/L	5	U	5	U
Hexachlorocyclopentadiene, SPLP	ug/L	5	U	5	U
Hexachloroethane, SPLP	ug/L	5	U	5	U
Isophorone, SPLP	ug/L	5	U	5	U
N-Nitrosodi-n-propylamine, SPLP	ug/L	5	U	5	U
N-Nitrosodiphenylamine, SPLP	ug/L	5	U	5	U
Nitrobenzene, SPLP	ug/L	5	U	5	U
Pentachlorophenol, SPLP	ug/L	10	U	10	U
Phenol, SPLP	ug/L	5	U	5	U
Naphthalene	mg/Kg				
Phenol	mg/Kg			0.37	U
Acenaphthylene, SPLP	ug/L	5	U	5	U
Acenaphthylene	mg/Kg			0.37	U
bis(2-Chloroethyl) ether (2-Chloroethyl ether), S	ug/L	5	U	5	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	mg/Kg			0.37	U
2-Chlorophenol	mg/Kg			0.37	U
Acenaphthene, SPLP	ug/L	5	U	5	U
Acenaphthene	mg/Kg			0.37	U
1,3-Dichlorobenzene	mg/Kg			0.37	U
Fluorene, SPLP	ug/L	5	U	5	U
Fluorene	mg/Kg			0.37	U

Analytical Data Summary

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	StationID	F617SB005	F617SB006	F617SB007
	SampleID	617SB00503 (2-3ft)	617SB00603 (2-3ft)	617SB00703 (2-3ft)
	DateCollected	06/06/2001 0:00	06/06/2001 0:00	06/06/2001 0:00
	DateAnalyzed	06/16/2001	06/16/2001	06/16/2001
	SDGNumber	43550	43550	43550
Parameter	Units			
Benzyl alcohol, SPLP	ug/L			
Benzyl butyl phthalate, SPLP	ug/L			
bis(2-Chloroethoxy) methane, SPLP	ug/L			
bis(2-Ethylhexyl) phthalate, SPLP	ug/L			
Di-n-butyl phthalate, SPLP	ug/L			
Di-n-octylphthalate, SPLP	ug/L			
Dibenzofuran, SPLP	ug/L			
Diethyl phthalate, SPLP	ug/L			
Dimethyl phthalate, SPLP	ug/L			
Hexachlorobenzene, SPLP	ug/L			
Hexachlorobutadiene, SPLP	ug/L			
Hexachlorocyclopentadiene, SPLP	ug/L			
Hexachloroethane, SPLP	ug/L			
Isophorone, SPLP	ug/L			
N-Nitrosodi-n-propylamine, SPLP	ug/L			
N-Nitrosodiphenylamine, SPLP	ug/L			
Nitrobenzene, SPLP	ug/L			
Pentachlorophenol, SPLP	ug/L			
Phenol, SPLP	ug/L			
Naphthalene	mg/Kg	0.0363 U	0.0387 U	0.0364 U
Phenol	mg/Kg			
Acenaphthylene, SPLP	ug/L			
Acenaphthylene	mg/Kg	0.0363 U	0.0387 U	0.0364 U
bis(2-Chloroethyl) ether (2-Chloroethyl ether), S	ug/L			
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	mg/Kg			
2-Chlorophenol	mg/Kg			
Acenaphthene, SPLP	ug/L			
Acenaphthene	mg/Kg	0.0363 U	0.0387 U	0.0364 U
1,3-Dichlorobenzene	mg/Kg			
Fluorene, SPLP	ug/L			
Fluorene	mg/Kg	0.0363 U	0.0387 U	0.0364 U

Analytical Data Summary

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Parameter	Units	StationID	F617SB003	F617SB003	F617SB003	F617SB003
		SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T2 (3-5ft)
DateCollected			10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
DateAnalyzed			10/26/1999	10/26/1999	10/22/1999	10/23/1999
SDGNumber			EN020	EN020	EN020	EN020
1,4-Dichlorobenzene	mg/Kg				0.36 U	0.4 U
Phenanthrene, SPLP	ug/L		5 U	5 U		
Phenanthrene	mg/Kg				0.36 U	18 =
Anthracene, SPLP	ug/L		5 U	5 U		
Anthracene	mg/Kg				0.36 U	5.7 =
Benzyl alcohol	mg/Kg				0.36 U	0.4 U
Flouranthene	mg/Kg				0.36 U	18 =
Fluoranthene, SPLP	ug/L		5 U	5 U		
1,2-Dichlorobenzene	mg/Kg				0.36 U	0.4 U
Pyrene, SPLP	ug/L		5 U	5 U		
Pyrene	mg/Kg				0.36 U	15 =
Benzo(a)anthracene, SPLP	ug/L		5 U	5 U		
Benzo(a)Anthracene	mg/Kg				0.36 U	7.5 =
Chrysene, SPLP	ug/L		5 U	5 U		
Chrysene	mg/Kg				0.36 U	7 =
Benzo(b)fluoranthene, SPLP	ug/L		5 U	5 U		
Benzo(b)Fluoranthene	mg/Kg				0.36 U	6 =
N-Nitrosodi-n-propylamine	mg/Kg				0.36 U	0.4 U
4-Methylphenol (p-Cresol), SPLP	ug/L		5 U	5 U		
4-Methylphenol (p-Cresol)	mg/Kg				0.36 U	0.4 U
Benzo(k)fluoranthene, SPLP	ug/L		5 U	5 U		
Benzo(k)Fluoranthene	mg/Kg				0.36 U	3.6 J
Benzo(a)pyrene, SPLP	ug/L		5 U	5 U		
Benzo(a)Pyrene	mg/Kg				0.36 U	6.4 =
Hexachloroethane	mg/Kg				0.36 U	0.4 U
Indeno(1,2,3-c,d)pyrene, SPLP	ug/L		5 U	5 U		
Indeno(1,2,3-c,d)pyrene	mg/Kg				0.36 U	4.5 J
Nitrobenzene	mg/Kg				0.36 U	0.4 U
Dibenz(a,h)anthracene, SPLP	ug/L		5 U	5 U		
Dibenz(a,h)anthracene	mg/Kg				0.36 U	1.8 =
Isophorone	mg/Kg				0.36 U	0.4 U

Analytical Data Summary

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Parameter	Units	F617SB004 617SB004S1 (0-1ft)		F617SB004 617SB004S2 (3-5ft)		F617SB004 617SB004T1 (0-1ft)		F617SB004 617SB004T2 (3-5ft)	
		DateCollected	DateAnalyzed	DateCollected	DateAnalyzed	DateCollected	DateAnalyzed	DateCollected	DateAnalyzed
1,4-Dichlorobenzene	mg/Kg					0.37	U	0.37	U
Phenanthrene, SPLP	ug/L	5	U	5	U				
Phenanthrene	mg/Kg					0.37	U	0.15	J
Anthracene, SPLP	ug/L	5	U	5	U				
Anthracene	mg/Kg					0.37	U	0.37	U
Benzyl alcohol	mg/Kg					0.37	U	0.37	U
Flouranthene	mg/Kg					0.37	U	0.23	J
Fluoranthene, SPLP	ug/L	5	U	5	U				
1,2-Dichlorobenzene	mg/Kg					0.37	U	0.37	U
Pyrene, SPLP	ug/L	5	U	5	U				
Pyrene	mg/Kg					0.37	U	0.2	J
Benzo(a)anthracene, SPLP	ug/L	5	U	5	U				
Benzo(a)Anthracene	mg/Kg					0.37	U	0.1	J
Chrysene, SPLP	ug/L	5	U	5	U				
Chrysene	mg/Kg					0.37	U	0.11	J
Benzo(b)fluoranthene, SPLP	ug/L	5	U	5	U				
Benzo(b)Fluoranthene	mg/Kg					0.37	U	0.091	J
N-Nitrosodi-n-propylamine	mg/Kg					0.37	U	0.37	U
4-Methylphenol (p-Cresol), SPLP	ug/L	5	U	5	U				
4-Methylphenol (p-Cresol)	mg/Kg					0.37	U	0.37	U
Benzo(k)fluoranthene, SPLP	ug/L	5	U	5	U				
Benzo(k)Fluoranthene	mg/Kg					0.37	U	0.079	J
Benzo(a)pyrene, SPLP	ug/L	5	U	5	U				
Benzo(a)Pyrene	mg/Kg					0.37	U	0.093	J
Hexachloroethane	mg/Kg					0.37	U	0.37	U
Indeno(1,2,3-c,d)pyrene, SPLP	ug/L	5	U	5	U				
Indeno(1,2,3-c,d)pyrene	mg/Kg					0.37	U	0.37	U
Nitrobenzene	mg/Kg					0.37	U	0.37	U
Dibenz(a,h)anthracene, SPLP	ug/L	5	U	5	U				
Dibenz(a,h)anthracene	mg/Kg					0.37	U	0.37	U
Isophorone	mg/Kg					0.37	U	0.37	U

Analytical Data Summary

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	StationID	F617SB005	F617SB006	F617SB007
	SampleID	617SB00503 (2-3ft)	617SB00603 (2-3ft)	617SB00703 (2-3ft)
	DateCollected	06/06/2001 0:00	06/06/2001 0:00	06/06/2001 0:00
	DateAnalyzed	06/16/2001	06/16/2001	06/16/2001
	SDGNumber	43550	43550	43550
Parameter	Units			
1,4-Dichlorobenzene	mg/Kg			
Phenanthrene, SPLP	ug/L			
Phenanthrene	mg/Kg	0.0363 U	0.031 J	0.0364 U
Anthracene, SPLP	ug/L			
Anthracene	mg/Kg	0.0363 U	0.0111 J	0.0364 U
Benzyl alcohol	mg/Kg			
Flouranthene	mg/Kg	0.0363 U	0.196 =	0.006 J
Fluoranthene, SPLP	ug/L			
1,2-Dichlorobenzene	mg/Kg			
Pyrene, SPLP	ug/L			
Pyrene	mg/Kg	0.0363 U	0.152 =	0.0364 U
Benzo(a)anthracene, SPLP	ug/L			
Benzo(a)Anthracene	mg/Kg	0.0363 U	0.13 =	0.0364 U
Chrysene, SPLP	ug/L			
Chrysene	mg/Kg	0.0363 U	0.127 =	0.0364 U
Benzo(b)fluoranthene, SPLP	ug/L			
Benzo(b)Fluoranthene	mg/Kg	0.0363 UJ	0.349 J	0.0364 UJ
N-Nitrosodi-n-propylamine	mg/Kg			
4-Methylphenol (p-Cresol), SPLP	ug/L			
4-Methylphenol (p-Cresol)	mg/Kg			
Benzo(k)fluoranthene, SPLP	ug/L			
Benzo(k)Fluoranthene	mg/Kg	0.0363 U	0.116 J	0.0364 U
Benzo(a)pyrene, SPLP	ug/L			
Benzo(a)Pyrene	mg/Kg	0.0363 U	0.127 =	0.0364 U
Hexachloroethane	mg/Kg			
Indeno(1,2,3-c,d)pyrene, SPLP	ug/L			
Indeno(1,2,3-c,d)pyrene	mg/Kg	0.0363 U	0.071 =	0.0364 U
Nitrobenzene	mg/Kg			
Dibenz(a,h)anthracene, SPLP	ug/L			
Dibenz(a,h)anthracene	mg/Kg	0.0363 U	0.0387 U	0.0364 U
Isophorone	mg/Kg			

Analytical Data Summary

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	StationID	F617SB003	F617SB003	F617SB003	F617SB003
	SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/26/1999	10/22/1999	10/23/1999
	SDGNumber	EN020	EN020	EN020	EN020
Parameter	Units				
2-Nitrophenol	mg/Kg			0.36 U	0.4 U
Benzo(g,h,i)perylene, SPLP	ug/L	5 U	5 U		
Benzo(g,h,i)Perylene	ug/Kg			0.36 U	3.1 =
2,4-Dimethylphenol	ug/Kg			0.36 U	0.4 U
bis(2-Chloroethoxy) Methane	ug/Kg			0.36 U	0.4 U
Benzoic acid	ug/Kg			1.8 U	2 U
2,4-Dichlorophenol	ug/Kg			0.36 U	0.4 U
1,2,4--Trichlorobenzene	ug/Kg			0.36 U	0.4 U
4-Chloroaniline	ug/Kg			0.36 U	0.4 U
Hexachlorobutadiene	ug/Kg			0.36 U	0.4 U
4-Chloro-3-methylphenol	ug/Kg			0.36 U	0.4 U
Hexachlorocyclopentadiene	ug/Kg			0.36 U	0.4 U
2,4,6-Trichlorophenol	ug/Kg			0.36 U	0.4 U
2,4,5-Trichlorophenol	ug/Kg			0.36 U	0.4 U
2-Chloronaphthalene	ug/Kg			0.36 U	0.4 U
2-Nitroaniline	ug/Kg			0.36 U	0.4 U
2,6-Dinitrotoluene	ug/Kg			0.36 U	0.4 U
3-Nitroaniline	ug/Kg			0.36 U	0.4 U
2,4-Dinitrophenol	ug/Kg			0.72 U	0.8 U
Dibenzofuran	ug/Kg			0.36 U	1.9 =
4-Nitrophenol	ug/Kg			0.72 U	0.8 U
2,4-Dinitrotoluene	ug/Kg			0.36 U	0.4 U
Dimethyl Phthalate	ug/Kg			0.36 U	0.4 U
Diethyl Phthalate	ug/Kg			0.36 U	0.4 U
4-Chlorophenyl Phenyl Ether	ug/Kg			0.36 U	0.4 U
4-Nitroaniline	ug/Kg			0.36 U	0.4 U
4,6-Dinitro-2-methylphenol	ug/Kg			0.72 U	0.8 U
N-Nitrosodiphenylamine	ug/Kg			0.36 U	0.4 U
4-Bromophenyl Phenyl Ether	ug/Kg			0.36 U	0.4 U
Hexachlorobenzene	ug/Kg			0.36 U	0.4 U
Pentachlorophenol	ug/Kg			0.72 U	0.8 U

Analytical Data Summary

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	StationID	F617SB004	F617SB004	F617SB004	F617SB004
	SampleID	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/26/1999	10/22/1999	10/22/1999
	SDGNumber	EN020	EN020	EN020	EN020
Parameter	Units				
2-Nitrophenol	mg/Kg			0.37 U	0.37 U
Benzo(g,h,i)perylene, SPLP	ug/L	5 U	5 U		
Benzo(g,h,i)Perylene	ug/Kg			0.37 U	0.37 U
2,4-Dimethylphenol	ug/Kg			0.37 U	0.37 U
bis(2-Chloroethoxy) Methane	ug/Kg			0.37 U	0.37 U
Benzoic acid	ug/Kg			1.8 U	1.8 U
2,4-Dichlorophenol	ug/Kg			0.37 U	0.37 U
1,2,4--Trichlorobenzene	ug/Kg			0.37 U	0.37 U
4-Chloroaniline	ug/Kg			0.37 U	0.37 U
Hexachlorobutadiene	ug/Kg			0.37 U	0.37 U
4-Chloro-3-methylphenol	ug/Kg			0.37 U	0.37 U
Hexachlorocyclopentadiene	ug/Kg			0.37 U	0.37 U
2,4,6-Trichlorophenol	ug/Kg			0.37 U	0.37 U
2,4,5-Trichlorophenol	ug/Kg			0.37 U	0.37 U
2-Chloronaphthalene	ug/Kg			0.37 U	0.37 U
2-Nitroaniline	ug/Kg			0.37 U	0.37 U
2,6-Dinitrotoluene	ug/Kg			0.37 U	0.37 U
3-Nitroaniline	ug/Kg			0.37 U	0.37 U
2,4-Dinitrophenol	ug/Kg			0.73 U	0.73 U
Dibenzofuran	ug/Kg			0.37 U	0.37 U
4-Nitrophenol	ug/Kg			0.73 U	0.73 U
2,4-Dinitrotoluene	ug/Kg			0.37 U	0.37 U
Dimethyl Phthalate	ug/Kg			0.37 U	0.37 U
Diethyl Phthalate	ug/Kg			0.37 U	0.37 U
4-Chlorophenyl Phenyl Ether	ug/Kg			0.37 U	0.37 U
4-Nitroaniline	ug/Kg			0.37 U	0.37 U
4,6-Dinitro-2-methylphenol	ug/Kg			0.73 U	0.73 U
N-Nitrosodiphenylamine	ug/Kg			0.37 U	0.37 U
4-Bromophenyl Phenyl Ether	ug/Kg			0.37 U	0.37 U
Hexachlorobenzene	ug/Kg			0.37 U	0.37 U
Pentachlorophenol	ug/Kg			0.73 U	0.73 U

Analytical Data Summary

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	StationID	F617SB005	F617SB006	F617SB007
	SampleID	617SB00503 (2-3ft)	617SB00603 (2-3ft)	617SB00703 (2-3ft)
	DateCollected	06/06/2001 0:00	06/06/2001 0:00	06/06/2001 0:00
	DateAnalyzed	06/16/2001	06/16/2001	06/16/2001
	SDGNumber	43550	43550	43550
Parameter	Units			
2-Nitrophenol	mg/Kg			
Benzo(g,h,i)perylene, SPLP	ug/L			
Benzo(g,h,i)Perylene	ug/Kg	0.0363 U	0.0806 J	0.0364 U
2,4-Dimethylphenol	ug/Kg			
bis(2-Chloroethoxy) Methane	ug/Kg			
Benzoic acid	ug/Kg			
2,4-Dichlorophenol	ug/Kg			
1,2,4--Trichlorobenzene	ug/Kg			
4-Chloroaniline	ug/Kg			
Hexachlorobutadiene	ug/Kg			
4-Chloro-3-methylphenol	ug/Kg			
Hexachlorocyclopentadiene	ug/Kg			
2,4,6-Trichlorophenol	ug/Kg			
2,4,5-Trichlorophenol	ug/Kg			
2-Chloronaphthalene	ug/Kg			
2-Nitroaniline	ug/Kg			
2,6-Dinitrotoluene	ug/Kg			
3-Nitroaniline	ug/Kg			
2,4-Dinitrophenol	ug/Kg			
Dibenzofuran	ug/Kg			
4-Nitrophenol	ug/Kg			
2,4-Dinitrotoluene	ug/Kg			
Dimethyl Phthalate	ug/Kg			
Diethyl Phthalate	ug/Kg			
4-Chlorophenyl Phenyl Ether	ug/Kg			
4-Nitroaniline	ug/Kg			
4,6-Dinitro-2-methylphenol	ug/Kg			
N-Nitrosodiphenylamine	ug/Kg			
4-Bromophenyl Phenyl Ether	ug/Kg			
Hexachlorobenzene	ug/Kg			
Pentachlorophenol	ug/Kg			

Analytical Data Summary

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	StationID	F617SB003	F617SB003	F617SB003	F617SB003
	SampleID	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/26/1999	10/22/1999	10/23/1999
	SDGNumber	EN020	EN020	EN020	EN020
Parameter	Units				
Di-n-butyl Phthalate	ug/Kg			0.36 U	0.4 U
Benzyl Butyl Phthalate	ug/Kg			0.36 U	0.4 U
3,3'-Dichlorobenzidine	ug/Kg			0.72 U	0.8 U
bis(2-Ethylhexyl) Phthalate	ug/Kg			0.36 U	0.4 U
Di-n-octylphthalate	ug/Kg			0.36 U	0.4 U

Analytical Data Summary

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	StationID	F617SB004	F617SB004	F617SB004	F617SB004
	SampleID	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/26/1999	10/22/1999	10/22/1999
	SDGNumber	EN020	EN020	EN020	EN020
Parameter	Units				
Di-n-butyl Phthalate	ug/Kg			0.37 U	0.37 U
Benzyl Butyl Phthalate	ug/Kg			0.37 U	0.37 U
3,3'-Dichlorobenzidine	ug/Kg			0.73 U	0.73 U
bis(2-Ethylhexyl) Phthalate	ug/Kg			0.37 U	0.37 U
Di-n-octylphthalate	ug/Kg			0.37 U	0.37 U

Analytical Data Summary

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	StationID	F617SB005	F617SB006	F617SB007
	SampleID	617SB00503 (2-3ft)	617SB00603 (2-3ft)	617SB00703 (2-3ft)
	DateCollected	06/06/2001 0:00	06/06/2001 0:00	06/06/2001 0:00
	DateAnalyzed	06/16/2001	06/16/2001	06/16/2001
	SDGNumber	43550	43550	43550
Parameter	Units			
Di-n-butyl Phthalate	ug/Kg			
Benzyl Butyl Phthalate	ug/Kg			
3,3'-Dichlorobenzidine	ug/Kg			
bis(2-Ethylhexyl) Phthalate	ug/Kg			
Di-n-octylphthalate	ug/Kg			

Analytical Data Summary

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	StationID	F617GW001	F617GW002	F617GW002	F617GW003
	SampleID	617GW00104	617GW002A3	617GW002A4	617GW00301
	DateCollected	11/25/1997 0:00	11/21/1997 0:00	02/10/1998 0:00	05/20/1999 0:00
	DateAnalyzed	12/08/1997	12/08/1997	02/19/1998	05/26/1999
	SDGNumber	31975	31911	32688	38649
Parameter	Units				
2,2'-Oxybis(1-chloro)propane	ug/L	10 U	10 U	10 U	10 U
2-Methylnaphthalene	ug/L	10 U	10 U	10 U	10 U
2-Methylphenol (o-Cresol)	ug/L	10 U	10 U	10 U	10 U
Phenol	ug/L	10 U	10 U	10 U	10 U
Acenaphthylene	ug/L	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/L	10 U	10 U	10 U	10 U
2-Chlorophenol	ug/L	10 U	10 U	10 U	10 U
Acenaphthene	ug/L	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	ug/L	10 U	10 U	10 U	10 U
Fluorene	ug/L	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	ug/L	10 U	10 U	10 U	10 U
Phenanthrene	ug/L	10 U	10 U	10 U	10 U
Anthracene	ug/L	10 U	10 U	10 U	10 U
Benzyl alcohol	ug/L	10 U	10 U	10 U	10 U
Flouranthene	ug/L	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	ug/L	10 U	10 U	10 U	10 U
Pyrene	ug/L	10 U	10 U	10 U	10 U
Benzo(a)Anthracene	ug/L	10 U	10 U	10 U	10 U
Chrysene	ug/L	10 U	10 U	10 U	10 U
Benzo(b)Fluoranthene	ug/L	10 U	10 U	10 U	10 U
N-Nitrosodi-n-propylamine	ug/L	10 U	10 U	10 U	10 U
4-Methylphenol (p-Cresol)	ug/L	10 U	10 U	10 U	10 U
Benzo(k)Fluoranthene	ug/L	10 U	10 U	10 U	10 U
Benzo(a)Pyrene	ug/L	10 U	10 U	10 U	10 U
Hexachloroethane	ug/L	10 U	10 U	10 U	10 U
Indeno(1,2,3-c,d)pyrene	ug/L	10 U	10 U	10 U	10 U
Nitrobenzene	ug/L	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	ug/L	10 U	10 U	10 U	10 U
Isophorone	ug/L	10 U	10 U	10 U	10 U
2-Nitrophenol	ug/L	10 U	10 U	10 U	10 U
Benzo(g,h,i)Perylene	ug/L	10 U	10 U	10 U	10 U

Analytical Data Summary

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	StationID	F617GW001	F617GW002	F617GW002	F617GW003
	SampleID	617GW00104	617GW002A3	617GW002A4	617GW00301
	DateCollected	11/25/1997 0:00	11/21/1997 0:00	02/10/1998 0:00	05/20/1999 0:00
	DateAnalyzed	12/08/1997	12/08/1997	02/19/1998	05/26/1999
	SDGNumber	31975	31911	32688	38649
Parameter	Units				
2,4-Dimethylphenol	ug/L	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy) Methane	ug/L	10 U	10 U	10 U	10 U
Benzoic acid	ug/L	50 U	50 U	50 U	25 U
2,4-Dichlorophenol	ug/L	10 U	10 U	10 U	10 U
1,2,4--Trichlorobenzene	ug/L	10 U	10 U	10 U	10 U
4-Chloroaniline	ug/L	10 U	10 U	10 U	10 U
Hexachlorobutadiene	ug/L	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	ug/L	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	ug/L	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	ug/L	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	ug/L	50 U	50 U	50 U	25 U
2-Chloronaphthalene	ug/L	10 U	10 U	10 U	10 U
2-Nitroaniline	ug/L	50 U	50 U	50 U	25 U
2,6-Dinitrotoluene	ug/L	10 U	10 U	10 U	10 U
3-Nitroaniline	ug/L	50 U	50 U	50 U	25 U
2,4-Dinitrophenol	ug/L	50 U	50 U	50 U	25 U
Dibenzofuran	ug/L	10 U	10 U	10 U	10 U
4-Nitrophenol	ug/L	50 U	50 U	50 U	25 U
2,4-Dinitrotoluene	ug/L	10 U	10 U	10 U	10 U
Dimethyl Phthalate	ug/L	10 U	10 U	10 U	10 U
Diethyl Phthalate	ug/L	10 U	10 U	10 U	10 U
4-Chlorophenyl Phenyl Ether	ug/L	10 U	10 U	10 U	10 U
4-Nitroaniline	ug/L	50 U	50 U	50 U	25 U
4,6-Dinitro-2-methylphenol	ug/L	50 U	50 U	50 U	25 U
N-Nitrosodiphenylamine	ug/L	10 U	10 U	10 U	10 U
4-Bromophenyl Phenyl Ether	ug/L	10 U	10 U	10 U	10 U
Hexachlorobenzene	ug/L	10 U	10 U	10 U	10 U
Pentachlorophenol	ug/L	50 U	50 U	50 U	25 U
Di-n-butyl Phthalate	ug/L	10 U	10 U	10 U	10 U
Benzyl Butyl Phthalate	ug/L	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	ug/L	20 U	20 U	20 U	10 U

Analytical Data Summary

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	StationID	F617GW001	F617GW002	F617GW002	F617GW003
	SampleID	617GW00104	617GW002A3	617GW002A4	617GW00301
	DateCollected	11/25/1997 0:00	11/21/1997 0:00	02/10/1998 0:00	05/20/1999 0:00
	DateAnalyzed	12/08/1997	12/08/1997	02/19/1998	05/26/1999
	SDGNumber	31975	31911	32688	38649
Parameter	Units				
bis(2-Ethylhexyl) Phthalate	ug/L	10 U	10 U	10 U	10 U
Di-n-octylphthalate	ug/L	10 U	10 U	10 U	10 U

Analytical Data Summary

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Parameter	Units	StationID	F617SB003	F617SB003	F617SB003
		SampleID	617SB003S1 (0-1ft)	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/19/1999	10/26/1999	10/20/1999
		SDGNumber	EN020	EN020	EN020
Chloromethane, SPLP	ug/L		60 U		60 U
Chloromethane	mg/Kg				
Naphthalene, SPLP	ug/L			5 U	
Naphthalene	mg/Kg				
Vinyl Chloride, SPLP	ug/L		60 U		60 U
Vinyl chloride	mg/Kg				
Toluene, SPLP	ug/L		60 U		60 U
Bromomethane, SPLP	ug/L		60 U		60 U
Bromomethane	mg/Kg				
Chloroethane, SPLP	ug/L		60 U		60 U
Chloroethane	mg/Kg				
1,1-Dichloroethene, SPLP	ug/L		60 U		60 U
1,1-Dichloroethene	mg/Kg				
Acetone, SPLP	ug/L		100 R		100 R
Acetone	mg/Kg				
Carbon Disulfide, SPLP	ug/L		60 U		60 U
Carbon Disulfide	mg/Kg				
Methylene Chloride, SPLP	ug/L		60 U		60 U
Methylene Chloride	mg/Kg				
1,2-Dichloropropane, SPLP	ug/L		60 U		60 U
1,1-Dichloroethane	mg/Kg				
Vinyl acetate, SPLP	ug/L		60 U		60 U
Vinyl acetate	mg/Kg				
Methyl ethyl ketone (2-Butanone), SPLP	ug/L		100 U		100 U
Methyl ethyl ketone (2-Butanone)	mg/Kg				
1,2-Dichloroethene (total), SPLP	ug/L		60 U		60 U
1,2-Dichloroethene (total)	mg/Kg				
Chloroform, SPLP	ug/L		60 U		60 U
Chloroform	mg/Kg				
1,1,1-Trichloroethane, SPLP	ug/L		60 U		60 U
1,1,1-Trichloroethane	mg/Kg				

Analytical Data Summary

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	StationID	F617SB003	F617SB003	F617SB003
	SampleID	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T1 (0-1ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/18/1999	10/22/1999
	SDGNumber	EN020	EN020	EN020
Parameter	Units			
Chloromethane, SPLP	ug/L			
Chloromethane	mg/Kg		0.003 U	
Naphthalene, SPLP	ug/L	5 U		
Naphthalene	mg/Kg			0.36 U
Vinyl Chloride, SPLP	ug/L			
Vinyl chloride	mg/Kg		0.003 U	
Toluene, SPLP	ug/L			
Bromomethane, SPLP	ug/L			
Bromomethane	mg/Kg		0.003 U	
Chloroethane, SPLP	ug/L			
Chloroethane	mg/Kg		0.003 U	
1,1-Dichloroethene, SPLP	ug/L			
1,1-Dichloroethene	mg/Kg		0.003 U	
Acetone, SPLP	ug/L			
Acetone	mg/Kg		0.012 =	
Carbon Disulfide, SPLP	ug/L			
Carbon Disulfide	mg/Kg		0.003 U	
Methylene Chloride, SPLP	ug/L			
Methylene Chloride	mg/Kg		0.007 U	
1,2-Dichloropropane, SPLP	ug/L			
1,1-Dichloroethane	mg/Kg		0.003 U	
Vinyl acetate, SPLP	ug/L			
Vinyl acetate	mg/Kg		0.003 U	
Methyl ethyl ketone (2-Butanone), SPLP	ug/L			
Methyl ethyl ketone (2-Butanone)	mg/Kg		0.004 U	
1,2-Dichloroethene (total), SPLP	ug/L			
1,2-Dichloroethene (total)	mg/Kg		0.003 U	
Chloroform, SPLP	ug/L			
Chloroform	mg/Kg		0.003 U	
1,1,1-Trichloroethane, SPLP	ug/L			
1,1,1-Trichloroethane	mg/Kg		0.003 U	

Analytical Data Summary

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Parameter	Units	StationID	F617SB003	F617SB003	F617SB004
		SampleID	617SB003T2 (3-5ft)	617SB003T2 (3-5ft)	617SB004S1 (0-1ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/18/1999	10/23/1999	10/19/1999
		SDGNumber	EN020	EN020	EN020
Chloromethane, SPLP	ug/L				60 U
Chloromethane	mg/Kg		0.003 U		
Naphthalene, SPLP	ug/L				
Naphthalene	mg/Kg			1.3 =	
Vinyl Chloride, SPLP	ug/L				60 U
Vinyl chloride	mg/Kg		0.003 U		
Toluene, SPLP	ug/L				60 U
Bromomethane, SPLP	ug/L				60 U
Bromomethane	mg/Kg		0.003 U		
Chloroethane, SPLP	ug/L				60 U
Chloroethane	mg/Kg		0.003 U		
1,1-Dichloroethene, SPLP	ug/L				60 U
1,1-Dichloroethene	mg/Kg		0.003 U		
Acetone, SPLP	ug/L				100 R
Acetone	mg/Kg		0.02 J		
Carbon Disulfide, SPLP	ug/L				60 U
Carbon Disulfide	mg/Kg		0.001 J		
Methylene Chloride, SPLP	ug/L				60 U
Methylene Chloride	mg/Kg		0.008 U		
1,2-Dichloropropane, SPLP	ug/L				60 U
1,1-Dichloroethane	mg/Kg		0.003 U		
Vinyl acetate, SPLP	ug/L				60 U
Vinyl acetate	mg/Kg		0.003 U		
Methyl ethyl ketone (2-Butanone), SPLP	ug/L				100 U
Methyl ethyl ketone (2-Butanone)	mg/Kg		0.005 U		
1,2-Dichloroethene (total), SPLP	ug/L				60 U
1,2-Dichloroethene (total)	mg/Kg		0.003 U		
Chloroform, SPLP	ug/L				60 U
Chloroform	mg/Kg		0.003 U		
1,1,1-Trichloroethane, SPLP	ug/L				60 U
1,1,1-Trichloroethane	mg/Kg		0.003 U		

Analytical Data Summary

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Parameter	Units	StationID	F617SB004	F617SB004	F617SB004
		SampleID	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)	617SB004S2 (3-5ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/26/1999	10/19/1999	10/26/1999
		SDGNumber	EN020	EN020	EN020
Chloromethane, SPLP	ug/L			60	U
Chloromethane	mg/Kg				
Naphthalene, SPLP	ug/L		5	U	
Naphthalene	mg/Kg				
Vinyl Chloride, SPLP	ug/L			60	U
Vinyl chloride	mg/Kg				
Toluene, SPLP	ug/L			60	U
Bromomethane, SPLP	ug/L			60	U
Bromomethane	mg/Kg				
Chloroethane, SPLP	ug/L			60	U
Chloroethane	mg/Kg				
1,1-Dichloroethene, SPLP	ug/L			60	U
1,1-Dichloroethene	mg/Kg				
Acetone, SPLP	ug/L			100	R
Acetone	mg/Kg				
Carbon Disulfide, SPLP	ug/L			60	U
Carbon Disulfide	mg/Kg				
Methylene Chloride, SPLP	ug/L			60	U
Methylene Chloride	mg/Kg				
1,2-Dichloropropane, SPLP	ug/L			60	U
1,1-Dichloroethane	mg/Kg				
Vinyl acetate, SPLP	ug/L			60	U
Vinyl acetate	mg/Kg				
Methyl ethyl ketone (2-Butanone), SPLP	ug/L			100	U
Methyl ethyl ketone (2-Butanone)	mg/Kg				
1,2-Dichloroethene (total), SPLP	ug/L			60	U
1,2-Dichloroethene (total)	mg/Kg				
Chloroform, SPLP	ug/L			60	U
Chloroform	mg/Kg				
1,1,1-Trichloroethane, SPLP	ug/L			60	U
1,1,1-Trichloroethane	mg/Kg				

Analytical Data Summary

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Parameter	Units	StationID	F617SB004	F617SB004	F617SB004
		SampleID	617SB004T1 (0-1ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/15/1999	10/22/1999	10/18/1999
		SDGNumber	EN020	EN020	EN020
Chloromethane, SPLP	ug/L				
Chloromethane	mg/Kg		0.003 U		0.004 UJ
Naphthalene, SPLP	ug/L				
Naphthalene	mg/Kg			0.37 U	
Vinyl Chloride, SPLP	ug/L				
Vinyl chloride	mg/Kg		0.003 U		0.004 UJ
Toluene, SPLP	ug/L				
Bromomethane, SPLP	ug/L				
Bromomethane	mg/Kg		0.003 U		0.004 UJ
Chloroethane, SPLP	ug/L				
Chloroethane	mg/Kg		0.003 U		0.004 UJ
1,1-Dichloroethene, SPLP	ug/L				
1,1-Dichloroethene	mg/Kg		0.003 U		0.004 UJ
Acetone, SPLP	ug/L				
Acetone	mg/Kg		0.01 =		0.02 J
Carbon Disulfide, SPLP	ug/L				
Carbon Disulfide	mg/Kg		0.003 U		0.002 J
Methylene Chloride, SPLP	ug/L				
Methylene Chloride	mg/Kg		0.003 U		0.012 U
1,2-Dichloropropane, SPLP	ug/L				
1,1-Dichloroethane	mg/Kg		0.003 U		0.004 UJ
Vinyl acetate, SPLP	ug/L				
Vinyl acetate	mg/Kg		0.003 U		0.004 UJ
Methyl ethyl ketone (2-Butanone), SPLP	ug/L				
Methyl ethyl ketone (2-Butanone)	mg/Kg		0.005 U		0.006 UJ
1,2-Dichloroethene (total), SPLP	ug/L				
1,2-Dichloroethene (total)	mg/Kg		0.003 U		0.004 UJ
Chloroform, SPLP	ug/L				
Chloroform	mg/Kg		0.003 U		0.004 UJ
1,1,1-Trichloroethane, SPLP	ug/L				
1,1,1-Trichloroethane	mg/Kg		0.003 U		0.004 UJ

Analytical Data Summary

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Parameter	Units	StationID	SampleID	DateCollected	DateAnalyzed	SDGNumber
Chloromethane, SPLP	ug/L	F617SB004	617SB004T2 (3-5ft)	10/14/1999 0:00	10/22/1999	EN020
Chloromethane	mg/Kg					
Naphthalene, SPLP	ug/L					
Naphthalene	mg/Kg	0.37	U			
Vinyl Chloride, SPLP	ug/L					
Vinyl chloride	mg/Kg					
Toluene, SPLP	ug/L					
Bromomethane, SPLP	ug/L					
Bromomethane	mg/Kg					
Chloroethane, SPLP	ug/L					
Chloroethane	mg/Kg					
1,1-Dichloroethene, SPLP	ug/L					
1,1-Dichloroethene	mg/Kg					
Acetone, SPLP	ug/L					
Acetone	mg/Kg					
Carbon Disulfide, SPLP	ug/L					
Carbon Disulfide	mg/Kg					
Methylene Chloride, SPLP	ug/L					
Methylene Chloride	mg/Kg					
1,2-Dichloropropane, SPLP	ug/L					
1,1-Dichloroethane	mg/Kg					
Vinyl acetate, SPLP	ug/L					
Vinyl acetate	mg/Kg					
Methyl ethyl ketone (2-Butanone), SPLP	ug/L					
Methyl ethyl ketone (2-Butanone)	mg/Kg					
1,2-Dichloroethene (total), SPLP	ug/L					
1,2-Dichloroethene (total)	mg/Kg					
Chloroform, SPLP	ug/L					
Chloroform	mg/Kg					
1,1,1-Trichloroethane, SPLP	ug/L					
1,1,1-Trichloroethane	mg/Kg					

Analytical Data Summary

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Parameter	Units	StationID	F617SB003	F617SB003	F617SB003
		SampleID	617SB003S1 (0-1ft)	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)
DateCollected			10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
DateAnalyzed			10/19/1999	10/26/1999	10/20/1999
SDGNumber			EN020	EN020	EN020
1,1-Dichloroethane, SPLP	ug/L		60 U		60 U
Carbon Tetrachloride, SPLP	ug/L		60 U		60 U
Carbon Tetrachloride	mg/Kg				
1,2-Dichloroethane, SPLP	ug/L		60 U		60 U
1,2-Dichloroethane	mg/Kg				
Benzene, SPLP	ug/L		60 U		60 U
Benzene	mg/Kg				
Trichloroethylene (TCE), SPLP	ug/L		60 U		60 U
Trichloroethylene (TCE)	mg/Kg				
1,2-Dichloropropane	mg/Kg				
Bromodichloromethane, SPLP	ug/L		60 U		60 U
Bromodichloromethane	mg/Kg				
2-Chloroethyl vinyl ether, SPLP	ug/L		200 U		200 U
2-Chloroethyl vinyl ether	mg/Kg				
cis-1,3-Dichloropropene, SPLP	ug/L		60 U		60 U
cis-1,3-Dichloropropene	mg/Kg				
Methyl Isobutyl ketone (4-Methyl-2-pentanone), SPLP	ug/L		100 U		100 U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	mg/Kg				
Toluene	mg/Kg				
trans-1,3-Dichloropropene	mg/Kg				
trans-1,3-Dichloropropene, SPLP	ug/L		60 U		60 U
1,1,2-Trichloroethane, SPLP	ug/L		60 U		60 U
1,1,2-Trichloroethane	mg/Kg				
2-Hexanone, SPLP	ug/L		100 U		100 U
2-Hexanone	mg/Kg				
Tetrachloroethylene (PCE)	mg/Kg				
Tetrachloroethylene(PCE), SPLP	ug/L		60 U		60 U
Dibromochloromethane, SPLP	ug/L		60 U		60 U
Dibromochloromethane	mg/Kg				
Chlorobenzene, SPLP	ug/L		60 U		60 U
Chlorobenzene	mg/Kg				

Analytical Data Summary

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	StationID	F617SB003	F617SB003	F617SB003
	SampleID	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T1 (0-1ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/18/1999	10/22/1999
	SDGNumber	EN020	EN020	EN020
Parameter	Units			
1,1-Dichloroethane, SPLP	ug/L			
Carbon Tetrachloride, SPLP	ug/L			
Carbon Tetrachloride	mg/Kg		0.003	U
1,2-Dichloroethane, SPLP	ug/L			
1,2-Dichloroethane	mg/Kg		0.003	U
Benzene, SPLP	ug/L			
Benzene	mg/Kg		0.003	U
Trichloroethylene (TCE), SPLP	ug/L			
Trichloroethylene (TCE)	mg/Kg		0.003	U
1,2-Dichloropropane	mg/Kg		0.003	U
Bromodichloromethane, SPLP	ug/L			
Bromodichloromethane	mg/Kg		0.003	U
2-Chloroethyl vinyl ether, SPLP	ug/L			
2-Chloroethyl vinyl ether	mg/Kg		0.009	U
cis-1,3-Dichloropropene, SPLP	ug/L			
cis-1,3-Dichloropropene	mg/Kg		0.003	U
Methyl Isobutyl ketone (4-Methyl-2-pentanone),SPLP	ug/L			
Methyl isobutyl ketone (4-Methyl-2-pentanone)	mg/Kg		0.004	U
Toluene	mg/Kg		0.003	U
trans-1,3-Dichloropropene	mg/Kg		0.003	U
trans-1,3-Dichloropropene, SPLP	ug/L			
1,1,2-Trichloroethane, SPLP	ug/L			
1,1,2-Trichloroethane	mg/Kg		0.003	U
2-Hexanone, SPLP	ug/L			
2-Hexanone	mg/Kg		0.004	U
Tetrachloroethylene (PCE)	mg/Kg		0.003	U
Tetrachloroethylene(PCE), SPLP	ug/L			
Dibromochloromethane, SPLP	ug/L			
Dibromochloromethane	mg/Kg		0.003	U
Chlorobenzene, SPLP	ug/L			
Chlorobenzene	mg/Kg		0.003	U

Analytical Data Summary

11/01/2001 11:49 AM

Parameter	Units	StationID	F617SB003	F617SB003	F617SB004
		SampleID	617SB003T2 (3-5ft)	617SB003T2 (3-5ft)	617SB004S1 (0-1ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/18/1999	10/23/1999	10/19/1999
		SDGNumber	EN020	EN020	EN020
1,1-Dichloroethane, SPLP	ug/L				60 U
Carbon Tetrachloride, SPLP	ug/L				60 U
Carbon Tetrachloride	mg/Kg		0.003 U		
1,2-Dichloroethane, SPLP	ug/L				60 U
1,2-Dichloroethane	mg/Kg		0.003 U		
Benzene, SPLP	ug/L				60 U
Benzene	mg/Kg		0.003 U		
Trichloroethylene (TCE), SPLP	ug/L				60 U
Trichloroethylene (TCE)	mg/Kg		0.003 U		
1,2-Dichloropropane	mg/Kg		0.003 U		
Bromodichloromethane, SPLP	ug/L				60 U
Bromodichloromethane	mg/Kg		0.003 U		
2-Chloroethyl vinyl ether, SPLP	ug/L				200 U
2-Chloroethyl vinyl ether	mg/Kg		10 U		
cis-1,3-Dichloropropene, SPLP	ug/L				60 U
cis-1,3-Dichloropropene	mg/Kg		0.003 U		
Methyl Isobutyl ketone (4-Methyl-2-pentanone), SPLP	ug/L				100 U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	mg/Kg		0.005 U		
Toluene	mg/Kg		0.003 U		
trans-1,3-Dichloropropene	mg/Kg		0.003 U		
trans-1,3-Dichloropropene, SPLP	ug/L				60 U
1,1,2-Trichloroethane, SPLP	ug/L				60 U
1,1,2-Trichloroethane	mg/Kg		0.003 U		
2-Hexanone, SPLP	ug/L				100 U
2-Hexanone	mg/Kg		0.005 U		
Tetrachloroethylene (PCE)	mg/Kg		0.003 U		
Tetrachloroethylene(PCE), SPLP	ug/L				60 U
Dibromochloromethane, SPLP	ug/L				60 U
Dibromochloromethane	mg/Kg		0.003 U		
Chlorobenzene, SPLP	ug/L				60 U
Chlorobenzene	mg/Kg		0.003 U		

Analytical Data Summary

11/01/2001 11:49 AM

Parameter	Units	StationID	F617SB004	F617SB004	F617SB004
		SampleID	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)	617SB004S2 (3-5ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/26/1999	10/19/1999	10/26/1999
		SDGNumber	EN020	EN020	EN020
1,1-Dichloroethane, SPLP	ug/L			60	U
Carbon Tetrachloride, SPLP	ug/L			60	U
Carbon Tetrachloride	mg/Kg				
1,2-Dichloroethane, SPLP	ug/L			60	U
1,2-Dichloroethane	mg/Kg				
Benzene, SPLP	ug/L			60	U
Benzene	mg/Kg				
Trichloroethylene (TCE), SPLP	ug/L			60	U
Trichloroethylene (TCE)	mg/Kg				
1,2-Dichloropropane	mg/Kg				
Bromodichloromethane, SPLP	ug/L			60	U
Bromodichloromethane	mg/Kg				
2-Chloroethyl vinyl ether, SPLP	ug/L			200	U
2-Chloroethyl vinyl ether	mg/Kg				
cis-1,3-Dichloropropene, SPLP	ug/L			60	U
cis-1,3-Dichloropropene	mg/Kg				
Methyl Isobutyl ketone (4-Methyl-2-pentanone),SPLP	ug/L			100	U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	mg/Kg				
Toluene	mg/Kg				
trans-1,3-Dichloropropene	mg/Kg				
trans-1,3-Dichloropropene, SPLP	ug/L			60	U
1,1,2-Trichloroethane, SPLP	ug/L			60	U
1,1,2-Trichloroethane	mg/Kg				
2-Hexanone, SPLP	ug/L			100	U
2-Hexanone	mg/Kg				
Tetrachloroethylene (PCE)	mg/Kg				
Tetrachloroethylene(PCE), SPLP	ug/L			60	U
Dibromochloromethane, SPLP	ug/L			60	U
Dibromochloromethane	mg/Kg				
Chlorobenzene, SPLP	ug/L			60	U
Chlorobenzene	mg/Kg				

Analytical Data Summary

11/01/2001 11:49 AM

Parameter	Units	StationID	F617SB004	F617SB004	F617SB004
		SampleID	617SB004T1 (0-1ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/15/1999	10/22/1999	10/18/1999
		SDGNumber	EN020	EN020	EN020
1,1-Dichloroethane, SPLP	ug/L				
Carbon Tetrachloride, SPLP	ug/L				
Carbon Tetrachloride	mg/Kg		0.003 U		0.004 UJ
1,2-Dichloroethane, SPLP	ug/L				
1,2-Dichloroethane	mg/Kg		0.003 U		0.004 UJ
Benzene, SPLP	ug/L				
Benzene	mg/Kg		0.003 U		0.004 UJ
Trichloroethylene (TCE), SPLP	ug/L				
Trichloroethylene (TCE)	mg/Kg		0.003 U		0.004 UJ
1,2-Dichloropropane	mg/Kg		0.003 U		0.004 UJ
Bromodichloromethane, SPLP	ug/L				
Bromodichloromethane	mg/Kg		0.003 U		0.004 UJ
2-Chloroethyl vinyl ether, SPLP	ug/L				
2-Chloroethyl vinyl ether	mg/Kg		0.01 U		0.012 UJ
cis-1,3-Dichloropropene, SPLP	ug/L				
cis-1,3-Dichloropropene	mg/Kg		0.003 U		0.004 UJ
Methyl Isobutyl ketone (4-Methyl-2-pentanone), SPLP	ug/L				
Methyl isobutyl ketone (4-Methyl-2-pentanone)	mg/Kg		0.005 U		0.006 UJ
Toluene	mg/Kg		0.003 U		0.004 UJ
trans-1,3-Dichloropropene	mg/Kg		0.003 U		0.004 UJ
trans-1,3-Dichloropropene, SPLP	ug/L				
1,1,2-Trichloroethane, SPLP	ug/L				
1,1,2-Trichloroethane	mg/Kg		0.003 U		0.004 UJ
2-Hexanone, SPLP	ug/L				
2-Hexanone	mg/Kg		0.005 U		0.006 UJ
Tetrachloroethylene (PCE)	mg/Kg		0.003 U		0.004 UJ
Tetrachloroethylene(PCE), SPLP	ug/L				
Dibromochloromethane, SPLP	ug/L				
Dibromochloromethane	mg/Kg		0.003 U		0.004 UJ
Chlorobenzene, SPLP	ug/L				
Chlorobenzene	mg/Kg		0.003 U		0.004 UJ

Analytical Data Summary

11/01/2001 11:49 AM

Parameter	Units	StationID	SampleID	DateCollected	DateAnalyzed	SDGNumber
1,1-Dichloroethane, SPLP	ug/L	F617SB004	617SB004T2 (3-5ft)	10/14/1999 0:00	10/22/1999	EN020
Carbon Tetrachloride, SPLP	ug/L					
Carbon Tetrachloride	mg/Kg					
1,2-Dichloroethane, SPLP	ug/L					
1,2-Dichloroethane	mg/Kg					
Benzene, SPLP	ug/L					
Benzene	mg/Kg					
Trichloroethylene (TCE), SPLP	ug/L					
Trichloroethylene (TCE)	mg/Kg					
1,2-Dichloropropane	mg/Kg					
Bromodichloromethane, SPLP	ug/L					
Bromodichloromethane	mg/Kg					
2-Chloroethyl vinyl ether, SPLP	ug/L					
2-Chloroethyl vinyl ether	mg/Kg					
cis-1,3-Dichloropropene, SPLP	ug/L					
cis-1,3-Dichloropropene	mg/Kg					
Methyl Isobutyl ketone (4-Methyl-2-pentanone),SPLP	ug/L					
Methyl isobutyl ketone (4-Methyl-2-pentanone)	mg/Kg					
Toluene	mg/Kg					
trans-1,3-Dichloropropene	mg/Kg					
trans-1,3-Dichloropropene, SPLP	ug/L					
1,1,2-Trichloroethane, SPLP	ug/L					
1,1,2-Trichloroethane	mg/Kg					
2-Hexanone, SPLP	ug/L					
2-Hexanone	mg/Kg					
Tetrachloroethylene (PCE)	mg/Kg					
Tetrachloroethylene(PCE), SPLP	ug/L					
Dibromochloromethane, SPLP	ug/L					
Dibromochloromethane	mg/Kg					
Chlorobenzene, SPLP	ug/L					
Chlorobenzene	mg/Kg					

Analytical Data Summary

11/01/2001 11:49 AM

	StationID	F617SB003	F617SB003	F617SB003
	SampleID	617SB003S1 (0-1ft)	617SB003S1 (0-1ft)	617SB003S2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/19/1999	10/26/1999	10/20/1999
	SDGNumber	EN020	EN020	EN020
Parameter	Units			
Ethylbenzene, SPLP	ug/L	60	U	60 U
Ethylbenzene	mg/Kg			
Xylenes, Total, SPLP	ug/L	60	U	60 U
Xylenes, Total	mg/Kg			
Styrene, SPLP	ug/L	60	U	60 U
Styrene	mg/Kg			
Bromoform, SPLP	ug/L	60	U	60 U
Bromoform	mg/Kg			
1,1,2,2-Tetrachloroethane, SPLP	ug/L	60	U	60 U
1,1,2,2-Tetrachloroethane	mg/Kg			

Analytical Data Summary

11/01/2001 11:49 AM

		StationID	F617SB003	F617SB003	F617SB003
		SampleID	617SB003S2 (3-5ft)	617SB003T1 (0-1ft)	617SB003T1 (0-1ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/26/1999	10/18/1999	10/22/1999
		SDGNumber	EN020	EN020	EN020
Parameter	Units				
Ethylbenzene, SPLP	ug/L				
Ethylbenzene	mg/Kg			0.003	U
Xylenes, Total, SPLP	ug/L				
Xylenes, Total	mg/Kg			0.003	U
Styrene, SPLP	ug/L				
Styrene	mg/Kg			0.003	U
Bromoform, SPLP	ug/L				
Bromoform	mg/Kg			0.003	U
1,1,2,2-Tetrachloroethane, SPLP	ug/L				
1,1,2,2-Tetrachloroethane	mg/Kg			0.003	U

Analytical Data Summary

11/01/2001 11:49 AM

Parameter	Units	StationID	F617SB003	F617SB003	F617SB004
		SampleID	617SB003T2 (3-5ft)	617SB003T2 (3-5ft)	617SB004S1 (0-1ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/18/1999	10/23/1999	10/19/1999
		SDGNumber	EN020	EN020	EN020
Ethylbenzene, SPLP	ug/L				60 U
Ethylbenzene	mg/Kg		0.003 U		
Xylenes, Total, SPLP	ug/L				60 U
Xylenes, Total	mg/Kg		0.003 U		
Styrene, SPLP	ug/L				60 U
Styrene	mg/Kg		0.003 U		
Bromoform, SPLP	ug/L				60 U
Bromoform	mg/Kg		0.003 U		
1,1,2,2-Tetrachloroethane, SPLP	ug/L				60 U
1,1,2,2-Tetrachloroethane	mg/Kg		0.003 UJ		

Analytical Data Summary

11/01/2001 11:49 AM

	StationID	F617SB004	F617SB004	F617SB004
	SampleID	617SB004S1 (0-1ft)	617SB004S2 (3-5ft)	617SB004S2 (3-5ft)
	DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
	DateAnalyzed	10/26/1999	10/19/1999	10/26/1999
	SDGNumber	EN020	EN020	EN020
Parameter	Units			
Ethylbenzene, SPLP	ug/L		60	U
Ethylbenzene	mg/Kg			
Xylenes, Total, SPLP	ug/L		60	U
Xylenes, Total	mg/Kg			
Styrene, SPLP	ug/L		60	U
Styrene	mg/Kg			
Bromoform, SPLP	ug/L		60	U
Bromoform	mg/Kg			
1,1,2,2-Tetrachloroethane, SPLP	ug/L		60	U
1,1,2,2-Tetrachloroethane	mg/Kg			

Analytical Data Summary

11/01/2001 11:49 AM

		StationID	F617SB004	F617SB004	F617SB004
		SampleID	617SB004T1 (0-1ft)	617SB004T1 (0-1ft)	617SB004T2 (3-5ft)
		DateCollected	10/14/1999 0:00	10/14/1999 0:00	10/14/1999 0:00
		DateAnalyzed	10/15/1999	10/22/1999	10/18/1999
		SDGNumber	EN020	EN020	EN020
Parameter	Units				
Ethylbenzene, SPLP	ug/L				
Ethylbenzene	mg/Kg		0.003 U		0.004 UJ
Xylenes, Total, SPLP	ug/L				
Xylenes, Total	mg/Kg		0.003 U		0.004 UJ
Styrene, SPLP	ug/L				
Styrene	mg/Kg		0.003 U		0.004 UJ
Bromoform, SPLP	ug/L				
Bromoform	mg/Kg		0.003 U		0.004 UJ
1,1,2,2-Tetrachloroethane, SPLP	ug/L				
1,1,2,2-Tetrachloroethane	mg/Kg		0.003 U		0.004 UJ

Analytical Data Summary

11/01/2001 11:49 AM

Parameter	Units	StationID	SampleID	DateCollected	DateAnalyzed	SDGNumber
Ethylbenzene, SPLP	ug/L	F617SB004	617SB004T2 (3-5ft)	10/14/1999 0:00	10/22/1999	EN020
Ethylbenzene	mg/Kg					
Xylenes, Total, SPLP	ug/L					
Xylenes, Total	mg/Kg					
Styrene, SPLP	ug/L					
Styrene	mg/Kg					
Bromoform, SPLP	ug/L					
Bromoform	mg/Kg					
1,1,2,2-Tetrachloroethane, SPLP	ug/L					
1,1,2,2-Tetrachloroethane	mg/Kg					

Analytical Data Summary

11/01/2001 11:50 AM

	StationID	F617GW001	F617GW001	F617GW002	F617GW002
	SampleID	617GW00104	617GW00104	617GW002A3	617GW002A3
	DateCollected	11/25/1997 0:00	11/25/1997 0:00	11/21/1997 0:00	11/21/1997 0:00
	DateAnalyzed	12/03/1997	12/08/1997	12/02/1997	12/08/1997
	SDGNumber	31975	31975	31911	31911
Parameter	Units				
Chloromethane	ug/L	5 U		5 U	
Naphthalene	ug/L		10 U		10 U
Vinyl chloride	ug/L	5 U		5 U	
Bromomethane	ug/L	5 U		5 U	
Chloroethane	ug/L	5 U		5 U	
1,1-Dichloroethene	ug/L	5 U		5 U	
Acetone	ug/L	5 U		5 U	
Carbon Disulfide	ug/L	5 U		5 U	
Methylene Chloride	ug/L	5 U		5 U	
1,1-Dichloroethane	ug/L	5 U		5 U	
Vinyl acetate	ug/L	5 U		5 U	
Methyl ethyl ketone (2-Butanone)	ug/L	5 U		5 U	
1,2-Dichloroethene (total)	ug/L	5 U		5 U	
Chloroform	ug/L	5 U		5 U	
1,1,1-Trichloroethane	ug/L	5 U		5 U	
Carbon Tetrachloride	ug/L	5 U		5 U	
1,2-Dichloroethane	ug/L	5 U		5 U	
Benzene	ug/L	5 U		5 U	
Trichloroethylene (TCE)	ug/L	5 U		5 U	
1,2-Dichloropropane	ug/L	5 U		5 U	
Bromodichloromethane	ug/L	5 U		5 U	
2-Chloroethyl vinyl ether	ug/L	5 U		5 U	
cis-1,3-Dichloropropene	ug/L	5 U		5 U	
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/L	5 U		5 U	
Toluene	ug/L	5 U		5 U	
trans-1,3-Dichloropropene	ug/L	5 U		5 U	
1,1,2-Trichloroethane	ug/L	5 U		5 U	
2-Hexanone	ug/L	5 U		5 U	
Tetrachloroethylene (PCE)	ug/L	5 U		5 U	
Dibromochloromethane	ug/L	5 U		5 U	
Chlorobenzene	ug/L	5 U		5 U	

Analytical Data Summary

11/01/2001 11:50 AM

	StationID	F617GW002	F617GW002	F617GW003	F617GW003
	SampleID	617GW002A4	617GW002A4	617GW00301	617GW00301
	DateCollected	02/10/1998 0:00	02/10/1998 0:00	05/20/1999 0:00	05/20/1999 0:00
	DateAnalyzed	02/11/1998	02/19/1998	05/24/1999	05/26/1999
	SDGNumber	32688	32688	38649	38649
Parameter	Units				
Chloromethane	ug/L	5 U		5 U	
Naphthalene	ug/L		10 U		10 U
Vinyl chloride	ug/L	5 U		5 U	
Bromomethane	ug/L	5 U		5 U	
Chloroethane	ug/L	5 U		5 U	
1,1-Dichloroethene	ug/L	5 U		5 U	
Acetone	ug/L	5 U		5 R	
Carbon Disulfide	ug/L	5 U		5 UJ	
Methylene Chloride	ug/L	5 U		5 U	
1,1-Dichloroethane	ug/L	5 U		5 U	
Vinyl acetate	ug/L	5 U		5 U	
Methyl ethyl ketone (2-Butanone)	ug/L	5 U		5 R	
1,2-Dichloroethene (total)	ug/L	5 U		5 U	
Chloroform	ug/L	5 U		5 U	
1,1,1-Trichloroethane	ug/L	5 U		5 U	
Carbon Tetrachloride	ug/L	5 U		5 U	
1,2-Dichloroethane	ug/L	5 U		5 U	
Benzene	ug/L	5 U		5 U	
Trichloroethylene (TCE)	ug/L	5 U		5 U	
1,2-Dichloropropane	ug/L	5 U		5 U	
Bromodichloromethane	ug/L	5 U		5 U	
2-Chloroethyl vinyl ether	ug/L	5 U		5 R	
cis-1,3-Dichloropropene	ug/L	5 U		5 U	
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/L	5 U		5 U	
Toluene	ug/L	5 U		5 U	
trans-1,3-Dichloropropene	ug/L	5 U		5 U	
1,1,2-Trichloroethane	ug/L	5 U		5 U	
2-Hexanone	ug/L	5 U		5 U	
Tetrachloroethylene (PCE)	ug/L	5 U		5 U	
Dibromochloromethane	ug/L	5 U		5 U	
Chlorobenzene	ug/L	5 U		5 U	

Analytical Data Summary

11/01/2001 11:50 AM

	StationID	F617GW001	F617GW001	F617GW002	F617GW002
	SampleID	617GW00104	617GW00104	617GW002A3	617GW002A3
	DateCollected	11/25/1997 0:00	11/25/1997 0:00	11/21/1997 0:00	11/21/1997 0:00
	DateAnalyzed	12/03/1997	12/08/1997	12/02/1997	12/08/1997
	SDGNumber	31975	31975	31911	31911
Parameter	Units				
Ethylbenzene	ug/L	5	U	5	U
Xylenes, Total	ug/L	5	U	5	U
Styrene	ug/L	5	U	5	U
Bromoform	ug/L	5	U	5	U
1,1,2,2-Tetrachloroethane	ug/L	5	U	5	U

Analytical Data Summary

11/01/2001 11:50 AM

	StationID	F617GW002	F617GW002	F617GW003	F617GW003
	SampleID	617GW002A4	617GW002A4	617GW00301	617GW00301
	DateCollected	02/10/1998 0:00	02/10/1998 0:00	05/20/1999 0:00	05/20/1999 0:00
	DateAnalyzed	02/11/1998	02/19/1998	05/24/1999	05/26/1999
	SDGNumber	32688	32688	38649	38649
Parameter	Units				
Ethylbenzene	ug/L	5	U	5	U
Xylenes, Total	ug/L	5	U	5	U
Styrene	ug/L	5	U	5	U
Bromoform	ug/L	5	U	5	U
1,1,2,2-Tetrachloroethane	ug/L	5	U	5	U



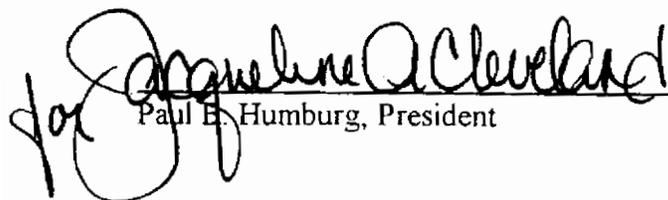
HEARTLAND
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 31911
Date: December 31, 1997
Client Name: EnSafe
Project/Site Name: Charleston - Zone F
Date Sampled: November 20-25, 1997
Number of Samples: 20 Aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, February, 1994
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticide/PCB's, Metals, Cyanide, Chlorides, Sulfates, Total Dissolved Solids

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Paul E. Humburg, President

123197
Date

SDG# 31911

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SVOA	P/P	TAL	CN	CHL	SUL	TDS						
620GW00104	WATER	X	X		X										
620GW004A3	WATER	X	X		X										
SMEGW00804	WATER	X	X		X										
SMETW00804	WATER	X													
SMEGW00504	WATER	X	X		X										
SMEGW00604	WATER	X	X		X										
SMEGW00704	WATER	X	X		X										
SMEHW00704	WATER	X	X		X										
SMETW00704	WATER	X													
SMEGW00104	WATER	X	X		X										
SMEGW00304	WATER	X	X		X										
SMEGW00404	WATER	X	X		X										
617GW002A3	WATER	X	X		X										
617TW002A3	WATER	X													
GDFGW00104	WATER	X	X	X	X	X	X	X	X						
GDFDW00104	WATER	X	X	X	X	X	X	X	X						
GDFEW00104	WATER	X	X	X	X	X	X	X	X						
GDFFW00104	WATER	X	X	X	X	X	X	X	X						
GDFGW01D04	WATER	X	X	X	X	X	X	X	X						
GDFTW01D04	WATER	X													
Total Billable Samples (Water/Soil)		20	0	16	0	5	0	16	0	5	0	5	0	5	0

- VOA= SW846 Volatiles
- SVOA= SW846 Semivolatiles
- P/P= SW846 Pesticide/PCB's
- TAL= SW846 Metals
- CN= SW846 Cyanide
- CHL= SW846 Chlorides
- SUL= SW846 Sulfates
- TDS= SW846 Total Dissolved Solids

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846 Method 8260 with CLP deliverables; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # 31911

A validation was performed on the Volatile Data from SDG 31911. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing calibrations (continued)

The continuing calibration, I25574, contained compounds with %Ds greater than 50% D but less than 90% D. For the samples and non compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

620GW00104	bromomethane (-59.5)
620GW004A3	chloroethane (-80.4)
SMEGW00804	
SMEGW00504	

Method Blanks

The method blanks associated with these samples exhibited contamination and the samples required qualifications. The end-user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as the associated samples. These factors must be taken into consideration when applying the 5X or 10X criteria to field samples.

<u>Associated Blank</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action Level</u>
SBLK1	methylene chloride	5	50

<u>Sample ID</u>	<u>Compound</u>	<u>Qualification</u>
620GW00104	methylene chloride	U
620GW004A3		
SMEGW00804		

Surrogates

Surrogate recoveries for all samples and blanks did not meet QA/QC criteria. Sample SMEGW00504, exhibited a low surrogate recovery for toluene-d₈ (81%). Qualify all positive results as estimated (J) and all non detects as estimated (UJ).

Compound Identification/Quantitation (continued)

For the sample SMEGW00504, replace all E-flagged results with the D-flagged results found in the dilution. For the diluted sample SMEGW00504DL, only use the D-flagged results.

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

System Performance and Overall Assessment

The laboratory did not encounter any large problems. The data as presented requires qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
620GW00104 620GW004A3 SMEGW00804 SMEGW00504	bromomethane (-59.5) chloroethane (-80.4)	+/-	J/UJ
620GW00104 620GW004A3 SMEGW00804	methylene chloride	+	U
SMEGW00504	All results	+/-	J/UJ
SMEGW00504	E-flagged results	+	D
SMEGW00504DL	All results except D-flagged results.	+/-	Do not use

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846 Method 8270 with CLP deliverables; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # 31911

A validation was performed on the Semivolatile Data from SDG 31911. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

**DATA ASSESSMENT AND NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Continuing calibrations (continued)

The continuing calibration, M8357, contained compounds with %Ds greater than 50% D but less than 90% D. For the samples and non compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

SMEGW00704 SMEHW00704 SMEGW00504 620GW00104	2,4-dinitrotoluene (84.8)
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Method Blanks

The method blanks associated with these samples exhibited contamination and the samples required qualifications. The end-user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as the associated samples. These factors must be taken into consideration when applying the 5X or 10X criteria to field samples.

<u>Associated Blank</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action Level</u>
SBLK2	bis(2-ethylhexyl)phthalate	1J	10
SBLK4	bis(2-ethylhexyl)phthalate	1J	10

<u>Sample ID</u>	<u>Compound</u>	<u>Qualification</u>
SMEGW00704 SMEHW00704 GDFGW00104	bis(2-ethylhexyl)phthalate	CRQL

QC Blanks

The QC blanks associated with these samples exhibited contamination and the samples required qualifications. The end-user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as the associated samples. These factors must be taken into consideration when applying the 5X or 10X criteria to field samples.

**DATA ASSESSMENT AND NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 3

QC Blanks (continued)

<u>Associated Blank</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action Level</u>
GDFDW00104	bis(2-ethylhexyl)phthalate	2J	20

<u>Sample ID</u>	<u>Compound</u>	<u>Qualification</u>
SMEGW00404	bis(2-ethylhexyl)phthalate	CRQL

Surrogates

The samples listed below, exhibited surrogate recoveries that were less than 10%. Qualify all positive results for the base/neutral fraction as estimated (J) and reject all non detects (UR).

GDFGW00104 nitrobenzene (9%)

The samples listed below, exhibited surrogate recoveries that were less than 10%. Qualify all positive results for the acid fraction as estimated (J) and reject all non detects (UR).

GDFGW01D04 phenol (2%)
 2-fluorophenol (1%)
 2,4,6-tribromophenol (2%)

Compound Identification/Quantitation

Do not use the results for the re-analyzed samples GDFGW00104RE and GDFGW01D04RE, in favor of the original sample analysis due to similar non compliant surrogate recoveries and exceeding the extraction holding time.

For the sample SMEGW00504, replace all E-flagged results with the D-flagged results found in the dilution. For the diluted sample SMEGW00504DL, only use the D-flagged results.

System Performance and Overall Assessment

The laboratory did not encounter any large problems. The data as presented requires qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
SMEGW00704 SMEHW00704 SMEGW00504 620GW00104	2,4-dinitrotoluene (84.8)	+/-	J/UJ
SMEGW00704 SMEHW00704 GDFGW00104	bis(2-ethylhexyl)phthalate	+	CRQL
SMEGW00404	bis(2-ethylhexyl)phthalate	+	CRQL
GDFGW01D04	All results acid fraction	+/-	J/UR
GDFGW00104	All results base/neutral fraction	+/-	J/UR
GDFGW01D04RE GDFGW00104RE	All results	+/-	do not use
SMEGW00504	E-Flagged results	+	D
SMEGW00504DL	All results except D-Flagged results	+/-	Do not use

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8081; the National Functional Guidelines for Organic Data Review, February 1994, and DQO Level III. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # 31911

A validation was performed on the Pesticide/PCB Data from SDG 31911. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • Calibrations
- * • GC Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

System Performance and Overall Assessment

The data is reported as is without qualifications or rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D= result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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No qualifications are required.

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS, CYANIDE AND WET CHEMISTRY

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW 846 Appendix IX Methods; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 31911

A validation was performed on the Metals, Cyanide and Wet Chemistry Data from SDG 31911. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- * ● Matrix Duplicates
- Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions

* - All criteria were met for this parameter.

Preparation and Field Blanks

The field blanks exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Aluminum	29.4 ug/l	all water samples below 147 ug/l
Barium	0.49 ug/l	no impact
Chromium	1.5 ug/l	all water samples below 7.5 ug/l
Copper	1.6 ug/l	all water samples below 8.0 ug/l
Iron	28.2 ug/l	no impact
Lead	1.5 ug/l	all water samples below 7.5 ug/l
Manganese	0.49 ug/l	no impact
Sodium	19200 ug/l	all water samples below 96000 ug/l

Zinc	14.6 ug/l	all water samples below 73.0 ug/l
Chloride	35.1 mg/l	all water samples below 176 mg/l
TDS	66.0 mg/l	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U".

The preparation blank exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Antimony	-1.73 ug/l	all water samples below 17.3 ug/l

This reviewer qualifies all positive and non-detect results below ten times the negative bias as estimated, "J" or "UJ".

Field Duplicate Results

The RPDs for samples SMEGW00704 and SMEHW00704 for Aluminum (47%), Calcium (38%), Sodium (45%) and Manganese (45%) were greater than 35%. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Serial Dilution results

The serial dilution RPDs for waters for Barium and Iron were greater than 10%. All positive results are qualified as estimated, "J".

"B" Qualifier

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafé's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all water samples below 147 ug/l	Al.	+	U
all water samples below 7.5 ug/l	Cr.		
all water samples below 8.0 ug/l	Cu.		
all water samples below 7.5 ug/l	Pb.		
all water samples below 96000 ug/l	Na.		
all water samples below 73.0 ug/l	Zn.		
all water samples below 176 mg/l	Cl.		
all water samples below 17.3 ug/l	Sb.	+/U	J/UJ
SMEGW00704 and SMEHW00704	Al, Ca, Na and Mn.	+/U	J/UJ
All water samples	Ba and Fe.	+	J
All "B" results	all analytes	B	J

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846 Method 8260 with CLP deliverables; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # 31975

A validation was performed on the Volatile Data from SDG 31975. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- * • Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

System Performance and Overall Assessment

The laboratory did not encounter any large problems. The data as presented did not requires qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID

ANALYTE ID

DL

QL

No qualifications are required.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846 Method 8270 with CLP deliverables; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # 31975

A validation was performed on the Semivolatile Data from SDG 31975. The data was evaluated based on the following parameters.

- * • Data Completeness
- Holding Times
- * • GC/MS Tuning
- * • Calibrations
- * • Internal Standard Performance
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Holding Times

All extraction and analysis holding times for all samples were not met for all samples per the SOW and National Functional Guidelines.

Sample 619GW00304RE, exceeded the extraction holding time by two (2) days. Qualify all positive results as estimated (J).

**DATA ASSESSMENT AND NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Method Blanks

The method blanks associated with these samples exhibited contamination and the samples required qualifications. The end-user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as the associated samples. These factors must be taken into consideration when applying the 5X or 10X criteria to field samples.

<u>Associated Blank</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action Level</u>
SBLK1	phenol 2J	10	
	bis(2-ethylhexyl)phthalate 2J		20
SBLK2	phenol 2J	10	
	bis(2-ethylhexyl)phthalate 7J		70

<u>Sample ID</u>	<u>Compound</u>	<u>Qualification</u>
613GW00504	bis(2-ethylhexyl)phthalate	CRQL
617GW01004		
619GW00204		
619GW00104		
GELGW01404	bis(2-ethylhexyl)phthalate	U

Compound Identification/Quantitation

Do not use the results for sample 619GW00304, in favor of the re-extracted sample analysis due to non compliant surrogate recoveries.

System Performance and Overall Assessment

The laboratory did not encounter any large problems. The data as presented requires qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
619GW00304RE	All results	+	J
613GW00504 617GW01004 619GW00204 619GW00104	bis(2-ethylhexyl)phthalate	+	CRQL
GELGW01404	bis(2-ethylhexyl)phthalate	+	U
619GW00304	All results	+/-	Do not use

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8081; the National Functional Guidelines for Organic Data Validation, February 1994; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 31975B

A validation was performed on the Pesticide/Aroclor Data from SDG 31975B. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Method Deviations

The method requires that all target compounds, with the exception of several PCBs, be analyzed with a five (5) point calibration curve. The laboratory analyzed a single point curve for Toxaphene. No positive results were reported for this compound, therefore the data did not require qualification.

DATA ASSESSMENT NARRATIVE
PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

Surrogate Recoveries

The samples listed below exhibited low DCB recoveries during pesticide analysis. The positive pesticide results are qualified as estimated, J, and the non-detect pesticide results are qualified as estimated, UJ.

<u>Sample ID</u>	<u>Surrogate</u>	<u>% Recovery</u>
619GW00204	DCB-1/DCB-2	46%/51%
619GW00304	DCB-1	49%

The samples listed below exhibited low DCB recoveries during PCB analysis. The positive PCB results are qualified as estimated, J, and the non-detect PCB results are qualified as estimated, UJ.

<u>Sample ID</u>	<u>Surrogate</u>	<u>% Recovery</u>
619GW00304	DCB-1/DCB-2	50%/52%

System Performance and Overall Assessment

The data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

NJ = Result is considered presumptively present at an estimated concentration

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 5X the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 5X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
619GW00204 619GW00304	All Pesticides	+/-	J/UJ
619GW00304	All PCBs	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW 846 Appendix IX Methods; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 31975

A validation was performed on the Metals Data from SDG 31975. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- * ● Serial Dilutions

* - All criteria were met for this parameter.

Preparation and Field Blanks

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Aluminum	14.0 ug/l	all water samples below 70.0 ug/l
Antimony	1.90 ug/l	no impact
Beryllium	0.23 ug/l	no impact

The calibration blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Antimony	3.7 ug/l	all water samples below 18.5 ug/l

Arsenic	2.5 ug/l	all water samples below 12.5 ug/l
Iron	76.7 ug/l	no impact
Beryllium	0.5 ug/l	all water samples below 2.5 ug/l

The field blanks exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Nickel	1.5 ug/l	all water samples below 7.5 ug/l
Sodium	22300 ug/l	all water samples below 111500 ug/l
Tin	15.9 ug/l	no impact
Zinc	7.3 ug/l	all water samples below 36.5 ug/l

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U".

The preparation blank exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Lead	-1.0 ug/l	all water samples below 10.0 ug/l

This reviewer qualifies all positive and non-detect results below ten times the negative bias as estimated, "J" or "UJ".

"B" Qualifier

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All water samples below 70.0 ug/l	Al.	+	U
All water samples below 2.50 ug/l	Be.		
All water samples below 18.5 ug/l	Sb.		
All water samples below 12.5 ug/l	As.		
All water samples below 7.5 ug/l	Ni.		
All water samples below 111500 ug/l	Na.		
All water samples below 36.5 ug/l	Zn.		
All water samples below 10.0 ug/l	Pb.	+ / U	J / UJ
All "B" results	all analytes	B	J



HEARTLAND
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 31975
Date: January 7, 1998
Client Name: EnSafe
Project/Site Name: Charleston - Zone F
Date Sampled: November 26-December 2, 1997
Number of Samples: 11 Aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, February, 1994
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticide/PCB's, Metals

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:

for Kimberly S. Stopp
Paul B. Humburg, President

14 January 1998
Date

SDG# 31975

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SVOA	P/P	TAL				
613GW00504	WATER	X	X		X				
617GW00104	WATER	X	X		X				
619GW00204	WATER	X	X	X	X				
619GW00304	WATER	X	X	X	X				
619TW00304	WATER	X							
GELGW01404	WATER	X	X		X				
619GW00104	WATER	X	X	X	X				
619DW00104	WATER	X	X	X	X				
619EW00104	WATER	X	X	X	X				
619FW00104	WATER	X	X	X	X				
619TW00104	WATER	X							
Total Billable Samples (Water/Soil)		11	0	9	0	6	0	9	0

VOA= SW846 Volatiles
SVOA= SW846 Semivolatiles
P/P= SW846 Pesticide/PCB's
TAL= SW846 Metals

SDG# 38649

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SVOA		P/P		MET	
109GW00201	WATER	X		X		X		X	
609GW00101	WATER	X		X		X		X	
609TW00101	WATER	X							
609GW00201	WATER	X		X		X		X	
617GW00301	WATER	X		X		X		X	
Total Billable Samples (Water/Soil)		5	0	4	0	4	0	4	0

VOA= Volatiles
SVOA= Semivolatiles
P/P= Pesticides/PCBs
MET= Metals

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8260B; the National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results.

SDG # 38649

A validation was performed on the Volatile Data from SDG 38649. The data was evaluated based on the following parameters.

- * Data Completeness
- * Holding Times
- * GC/MS Tuning
- * Calibrations
- * Internal Standard Performance
- * Blanks
- * Surrogate Recoveries
- * Laboratory Control Samples
- * Matrix Spike/Matrix Spike duplicate
- * Field Duplicates
- * Compound Identification/Quantitation

* - All criteria were met for this parameter

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 2

Initial Calibration

The initial calibration, analyzed 05-13-99, contained compounds with RRFs less than 0.050. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and non detects as rejected (UR).

All Samples acetone (0.04516)

Continuing Calibration

The continuing calibration, UL9455.D, contained compounds with %Ds greater than 50% and less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and non detects as estimated (UJ).

All Samples carbon disulfide (71.6%)
 2-chloroethyl vinyl ether (61.2%)

The continuing calibration, UL9455.D, contained compounds with RRFs less than 0.050. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and non detects as rejected (UR).

All Samples acetone (0.24)
 2-butanone (0.047)
 2-chloroethyl vinyl ether (0.027)

System Performance and Overall Assessment

The data as presented requires qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
All Samples	acetone	+/-	J/UR
All Samples	carbon disulfide 2-chloroethyl vinyl ether	+/-	J/UJ
All Samples	acetone 2-butanone 2-chloroethyl vinyl ether	+/-	J/UR

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8270C; the National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results.

SDG # 38649

A validation was performed on the Semivolatile Data from SDG 38649. The data was evaluated based on the following parameters.

- * Data Completeness
- * Holding Times
- * GC/MS Tuning
- * Calibrations
- * Internal Standard Performance
- * Blanks
- * Surrogate Recoveries
- * Laboratory Control Samples
- * Matrix Spike/Matrix Spike duplicate
- * Field Duplicates
- * Compound Identification/Quantitation

* - All criteria were met for this parameter

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Blank

The end user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as associated samples. These factors must be taken into considerations when applying the 5X and 10X criteria to field samples.

Method Blank

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action Level</u>
SBLK1	bis(2-ethylhexyl)phthalate	2J ug/L	20 ug/L

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
617GW00301 109GW00201 609GW00101 609GW00201	bis(2-ethylhexyl)phthalate	CRQL

System Performance and Overall Assessment

The data as presented requires qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
617GW00301 109GW00201 609GW00101 609GW00201	bis(2-ethylhexyl)phthalate	+	CRQL

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8081; the National Functional Guidelines for Organic Data Validation, February 1994; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 38649

A validation was performed on the Pesticide/Aroclor Data from SDG 38649. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Method Deviations

The SW-846 Method 8081 (1994) requires a five-point calibration curve for all single-component pesticides, Toxaphene, and Aroclors 1016 and 1260. The laboratory analyzed a single point curve for Toxaphene and Aroclors 1016 and 1260. No positive results were reported for this compound, therefore the data did not require qualification.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

Surrogate Recoveries

The sample listed below exhibited a low DCB recovery. The positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

<u>Sample ID</u>	<u>Surrogate</u>	<u>% Recovery</u>
609GW00101	DCB-1	40%

System Performance and Overall Assessment

The data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

NJ = Result is considered presumptively present at an estimated concentration

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 5X the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 5X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
609GW00101	ALL	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW 846 Methods for Appendix IX metals; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDGs # 38649

A validation was performed on the Metals Data from SDG 38649. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions

* - All criteria were met for this parameter.

Preparation and Field Blanks

The preparation and calibration blanks exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Antimony	5.98 ug/l	no impact
Copper	1.12 ug/l	all water samples below 5.6 ug/l
Sodium	82.0 ug/l	no impact
Zinc	26.9 ug/l	all water samples below 135 ug/l
Magnesium	42.0 ug/l	no impact

The USEPA requires that all sample values below five times the preparation or calibration blank contamination be qualified as non-detect, "U".

The preparation blanks exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Mercury	-0.22 ug/l	all water samples below 2.2 ug/l
Thallium	-2.47 ug/l	all water samples below 24.7 ug/l

This reviewer qualifies all samples results below 10 times the absolute value of the negative blank value.

Matrix Spike Recovery results

The matrix spike recoveries for waters for Calcium (69%), Magnesium (66%) and Potassium (70%) were below the lower control limits (> 30% but < 75%). All positive and non-detect results are qualified as estimated, "J" or "UJ".

The matrix spike recovery for waters for Aluminum (196%) was above the upper control limits (> 125%). All positive results are qualified as estimated, "J".

Serial Dilution results

The serial dilution results for waters for Aluminum, Calcium, Iron and Magnesium were greater than 10%. All positive results are qualified as estimated, "J".

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B". Value is below the CRDL but greater than the IDL.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all water samples below 5.6 ug/l	Cu.	+	U
all water samples below 135 ug/l	Zn.		
all water samples below 2.2 ug/l	Hg.	+/U	J/UJ
all water samples below 24.7 ug/l	Tl.		
all water samples	Ca, Mg and K.	+/U	J/UJ
all water samples	Al.	+	J
all water samples	Al, Ca, Fe and Mg.	+	J
all "B" results	all analytes	B	J



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 RALEIGH, NC; COLOGNE, GERMANY

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1
 PROJECT/JOB NO: 2906-07 8-420-00
 COC NO: _____
 PO NO: 7
 REL NO: 96
 LAB NAME: SWL

CLIENT: NAVAL BASE CHARLESTON
 LOCATION: ZONE F
 OFFICERS: (SIGNATURE) Andrew Wertz

PROJECT MANAGER: ^(A.W.) ~~AW~~ CRAIG SMITH
 TELE/FAX NO: 850-434-2230 / 2280

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		ANALYSIS REQUIRED					REMARKS
					TEMP.	CHEMICAL	NO. OF CONTAINERS	VOC	SVOC	Pest/PCB	Metal	
F16090W00101	5-20-99	1010	W	2-40 ml vial, 2-1 L amber, 1-1L poly	4°	HCl, HNO ₃ , HNO ₂	5	X	X	X	X	
F16096V00201		1100					5	X	X	X	X	
F16136W00301		1330					5	X	X	X	X	
F16096W00201		1500					5	X	X	X	X	
F16096 ^{TW} 00101 (AW)		—		2-40 ml vial		HCl	2	X				

Andrew Wertz
5-20-99

ISSUER: Andrew Wertz DATE: 5-20-99 RECEIVER: Don Willis DATE: _____
 ANDREW WERTZ TIME: 1700 PRINTED: _____ TIME: _____
 ENSAFE COMPANY: SWL COMPANY: _____

MODE OF SHIPMENT: FEDEX COMMENTS: _____
 SHIPMENT NO: 80802548951 DOB III
 RESULTS TO: CHARLIE VERNOY 7 DAY TURN



HEARTLAND

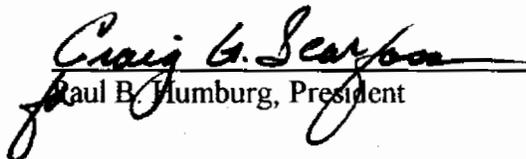
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 32688
Date: March 18, 1998
Client Name: EnSafe
Project/Site Name: Charleston - Zone F
Date Sampled: February 9-11, 1998
Number of Samples: 14 Aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, February, 1994
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticide/PCB's, Explosives, Hydrazine, Metals

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Paul B. Humberg, President

3/31/98.
Date

SDG# 32688

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SVOA		P/P		EXP		HYD		TAL	
607GW008A4	WATER	X		X								X	
607GW009A4	WATER	X		X								X	
607GW06DA4	WATER	X		X								X	
607GW06IA4	WATER	X		X								X	
607TW06IA4	WATER	X											
607EW06IA4	WATER	X		X		X		X		X		X	
607FW06IA4	WATER	X		X		X		X		X		X	
607DW06IA4	WATER	X		X		X		X		X		X	
617GW002A4	WATER	X		X								X	
617TW002A4	WATER	X											
620GW003A4	WATER	X		X								X	
620GW004A4	WATER	X		X								X	
620HW004A4	WATER	X		X								X	
620TW004A4	WATER	X											
Total Billable Samples (Water/Soil)		14	0	11	0	3	0	3	0	3	0	11	0

- VOA= SW846 Volatiles
- SVOA= SW846 Semivolatiles
- P/P= SW846 Pesticide/PCB's
- EXP= SW846 Explosives
- HYD= SW846 Hydrazine
- TAL= SW846 Metals

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260A, Revision 2, 9/94; the National Functional Guidelines for Organic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 32688

A validation was performed on the Volatile Data from SDG 32688. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- • Compound Quantitation

* - All criteria were met for this parameter.

Calibrations

The continuing calibration standard ul4094.d exhibited one (1) compound with a %D greater than 50% but less than 90%. For the following samples and compound, all reported positive and non-detect results are qualified as estimated, J/UJ.

607GW06IA4DL

tetrachloroethene (68.8%)

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Compound Quantitation

For the following sample, the E flagged results in the undiluted sample are replaced with the corresponding D flagged result in the dilution analysis. All other results from the dilution analysis are not used in favor of the results reported from the undiluted analysis.

607GW061A4

System Performance and Overall Assessment

The data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
607GW06IA4DL	tetrachloroethene (68.8%)	+/-	J/UJ
607GW06IA4	All E flagged Results	+E	Do Not Use
607GW06IA4 DL	All except corresponding D flagged results.	+/-	Do Not Use

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270B, Revision 2, 9/94; the National Functional Guidelines for Organic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 32688

A validation was performed on the Semivolatile Data from SDG 32688. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- Compound Quantitation

* - All criteria were met for this parameter.

Calibrations

The continuing calibration standard T25642.D exhibited one (1) compound with a %D greater than 50% but less than 90%. For the following samples and compound, all reported positive and non-detect results are qualified as estimated, J/UJ.

607GW009A4
620GW003A4
620GW004A4
620HW004A4

n-nitroso-di-n-propylamine (52.7%)

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Method Blanks

The method blanks associated with samples in this SDG exhibited contamination. Several samples required qualification. The end-user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as associated samples. These factors must be taken into consideration when applying the 5X or 10X criteria to field samples.

<u>Associated Blank</u>	<u>Compound</u>	<u>Conc.</u>	<u>Action Level</u>
SBLK2	bis(2-ethylhexyl)phthalate	4J µg/L	40 µg/L
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>	
607GW06DA4	bis(2-ethylhexyl)phthalate	CRQL	
607GW008A4			

Field QC Blanks

The field QC blanks associated with samples in this SDG exhibited contamination and several samples required qualification. The end-user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as associated samples. These factors must be taken into consideration when applying the 5X or 10X criteria to field samples.

<u>Associated Blanks</u>	<u>Compound</u>	<u>Conc.</u>	<u>Action Level</u>
607FW06A14	bis(2-ethylhexyl)phthalate	7J µg/L	70 µg/L
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>	
607GW061A4	bis(2-ethylhexyl)phthalate	CRQL	
617GW003A4			
620GW004A4			
607GW009A4	bis(2-ethylhexyl)phthalate	U	
620HW004A4DL			

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 3

Surrogate Recoveries

Sample 607GW06IA4 exhibited acid surrogate recoveries below 10% in both the original analysis and RE analysis. For the following samples and compounds, all positive results for the acid fraction are qualified as estimated, J, and all non-detect results are rejected, UR.

<u>SAMPLE</u>	<u>COMPOUNDS</u>	<u>SURROGATE %R</u>
607GW06IA4	acid fraction results	Phenol 2%, 2-fluorophenol 2%, 2,4,6-tribromophenol 2%
607GW06IA4RE	acid fraction results	Phenol 8%, 2-fluorophenol 12%

Compound Quantitation

For the following sample, the acid fraction results are not used in favor of the acid fraction results reported from the RE analysis of the sample. Although the RE was extracted outside holding times, the surrogate recoveries were somewhat improved.

607GW06IA4

For the following sample, the E flagged results in the undiluted sample are replaced with the corresponding D flagged result in the dilution analysis. All other results from the dilution analysis are not used in favor of the results reported from the undiluted analysis.

620HW004A4

System Performance and Overall Assessment

The data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
607GW009A4 620GW003A4 620GW004A4 620HW004A4	n-nitroso-di-n-propylamine	+/-	J/UJ
607GW06DA4 607GW008A4	bis(2-ethylhexyl)phthalate	+B	CRQL
607GW061A4 617GW003A4 620GW004A4	bis(2-ethylhexyl)phthalate	+B	CRQL
607GW009A4 607HW004A4DL	bis(2-ethylhexyl)phthalate	+B	U
607GW061A4 607GW061A4RE	Acid Fraction Results	+/-	J/UR
607GW061A4	Acid Fraction Results	+/-	Not Used
620HW004A4	All E flagged Results	+E	Do Not Use
620HW004A4DL	All except corresponding D flagged results	+/-	Not Used

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8081/8082; the National Functional Guidelines for Organic Data Review, February 1994, where applicable and DQO Level III. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # 32688

A validation was performed on the Pesticide/PCB Data from SDG 32688. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • Calibrations
- * • GC Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

System Performance and Overall Assessment

The data is reported as is without qualifications or rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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No qualifications are required.

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

EXPLOSIVES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration data, blank analysis results, and LCS recoveries. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8330; the National Functional Guidelines for Organic Data Review, where applicable; and EPA DQO Level III requirements. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG# 32688

A validation was performed on the Explosives data from SDG 32688. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • HPLC Performance
- * • Calibrations
- * • Blanks
- * • LCS Recoveries
- * • Field Duplicates
- * • Identification/Quantitation

* - All criteria were met for this parameter.

Overall Performance

No qualifications were required.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

- U** = Not detected
- J** = Estimated value
- UJ** = Reported Quantitation limit is qualified as estimated
- UR** = Result is rejected and unusable
- D** = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

- CRQL =** The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.
- U =** The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.
- No Action =** The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS and HYDRAZINE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW 846 Methods; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 32688

A validation was performed on the Metals and Hydrazine Data from SDG 32688. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions

* - All criteria were met for this parameter.

Preparation and Field Blanks

The preparation, field and calibration blanks exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Aluminum	19.6 ug/l	all water samples below 98.0 ug/l
Antimony	2.52 ug/l	all water samples below 12.6 ug/l
Arsenic	2.2 ug/l	all water samples below 11.0 ug/l
Barium	0.98 ug/l	all water samples below 4.9 ug/l
Beryllium	0.3 ug/l	no impact
Calcium	99.8 ug/l	no impact
Iron	35.9 ug/l	all water samples below 180.0 ug/l

Magnesium	49.8 ug/l	no impact
Manganese	0.72 ug/l	all water samples below 3.6 ug/l
Silver	1.1 ug/l	no impact
Potassium	699 ug/l	all water samples below 3495 ug/l
Sodium	24700 ug/l	all water samples below 123500 ug/l
Zinc	7.6 ug/l	all water samples below 38.0 ug/l

The USEPA requires that all sample values below five times the preparation or calibration blank contamination be qualified as non-detect, "U".

Serial Dilution results

The serial dilution RPDs for waters for Barium and Sodium were greater than 10%. All positive results are qualified as estimated, "J".

"B" Qualifier

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all water samples below 98.0 ug/l	Al.	+	U
all water samples below 12.6 ug/l	Sb.		
all water samples below 11.0 ug/l	As.		
all water samples below 4.9 ug/l	Ba.		
all water samples below 180.0 ug/l	Fe.		
all water samples below 3.6 ug/l	Mn.		
all water samples below 3495 ug/l	K.		
all water samples below 123500 ug/l	Na.		
all water samples below 38.0 ug/l	Zn.		
all water samples	Ba and Na.	+	J
All "B" results	all analytes	B	J



HEARTLAND

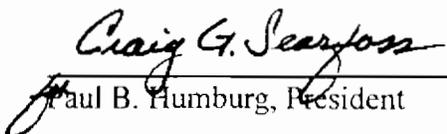
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: EN020
Date: November 19, 1999
Client Name: Ensafe
Project/Site Name: Charleston Zone F
Date Sampled: October 14, 1999
Number of Samples: 40 Non-Aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Laucks Testing Laboratories
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, February, 1994
QA/QC Level: DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, SPLP Volatiles, Semivolatiles, SPLP Semivolatiles, Pesticides/PCBs, SPLP Pesticides/PCBs, Metals, SPLP Metals, Cyanide, SPLP Cyanide and Total Organic Carbon

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Paul B. Humburg, President

11-24-99.
Date

SDG# EN020

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SPLP-V	SVOA	SPLP-SV	P/P	SPLP-P/P	MET	SPLP-MET	CN	SPLP-CN	TOC
616SB002T1	SOIL	X		X		X		X		X		X
616SB002T2	SOIL	X		X		X		X		X		X
617SB003T1	SOIL	X		X		X		X		X		X
617SB003T2	SOIL	X		X		X		X		X		X
617SB004T1	SOIL	X		X		X		X		X		X
617SB004T2	SOIL	X		X		X		X		X		X
619SB001T1	SOIL	X		X		X		X		X		X
619SB001T2	SOIL	X		X		X		X		X		X
619SB004T1	SOIL	X		X		X		X		X		X
619SB004T2	SOIL	X		X		X		X		X		X
619SB015T1	SOIL	X		X		X		X		X		X
619SB015T2	SOIL	X		X		X		X		X		X
109SB004T1	SOIL	X		X		X		X		X		X
109SB004T2	SOIL	X		X		X		X		X		X
109SB005T1	SOIL	X		X		X		X		X		X
109SB005T2	SOIL	X		X		X		X		X		X
607SB016T1	SOIL	X		X		X		X		X		X
613SP027T1	SOIL	X		X		X		X		X		X
613SP027T2	SOIL	X		X		X		X		X		X
109SB004S1	SOIL		X		X		X		X		X	
109SB004S2	SOIL		X		X		X		X		X	
109SB005S1	SOIL		X		X		X		X		X	
109SB005S2	SOIL		X		X		X		X		X	
607SB016S1	SOIL		X		X		X		X		X	
613SP027S1	SOIL		X		X		X		X		X	
613SP027S2	SOIL		X		X		X		X		X	
616SB002S1	SOIL		X		X		X		X		X	
616SB002S2	SOIL		X		X		X		X		X	
617SB003S1	SOIL		X		X		X		X		X	
617SB003S2	SOIL		X		X		X		X		X	
617SB004S1	SOIL		X		X		X		X		X	
617SB004S2	SOIL		X		X		X		X		X	
619SB001S1	SOIL		X		X		X		X		X	
619SB001S2	SOIL		X		X		X		X		X	
619SB004S1	SOIL		X		X		X		X		X	
619SB004S2	SOIL		X		X		X		X		X	
619SB015S1	SOIL		X		X		X		X		X	
619SB015S2	SOIL		X		X		X		X		X	
611SB00901	SOIL							X				
611SB00902	SOIL							X				
Total Billable Samples (Water/Soil)		0 19	0 19	0 19	0 19	0 19	0 19	0 21	0 19	0 19	0 19	0 19

VOA= Volatiles
 SPLP-V= SPLP Volatiles
 SVOA= Semivolatiles
 SPLP-SV= SPLP Semivolatiles
 P/P= Pesticides/PCBs

MET= Metals
 SPLP-MET= SPLP Metals
 CN= Cyanide
 SPLP-CN= SPLP Cyanide
 TOC= Total Organic Carbon

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260B for GC/MS Volatiles; the National Functional Guidelines for Organic Data Validation, 2/94, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # EN020

A validation was performed on the Volatile Data from SDG EN020. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- Internal Standard Performance
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- Compound Quantitation

* - All criteria were met for this parameter.

DATA ASSESSMENT NARRATIVE
VOLATILE ORGANICS

PAGE 2

Calibrations

The initial calibration analyzed 07/02/99 on Instrument ORCA exhibited one (1) compound with a %RSD greater than 15% for which qualifications were required. For the following samples and non-compliant compound, the reported positive results are qualified as estimated, J.

616SB002T2	carbon disulfide (21.6%)
617SB003T2	
617SB004T2	
619SB001T2	
619SB004T2	
619SB015T1	
109SB004T2	
109SB005T1	
109SB005T2	
613SP027T1	
613SP027T2	

The continuing calibration F1019003.D exhibited one (1) compound with a RF less than 0.05. For the following samples and non-compliant compound, the reported positive results are qualified as estimated, J, and the non-detect results are rejected, UR.

619SB001S2	acetone (0.049)
619SB001S1	
619SB015S1	
619SB004S2	
619SB004S1	
619SB015S2	
109SB005S1	
109SB005S2	
109SB004S1	
109SB004S2	
616SB002S1	
616SB002S2	
607SB016S1	
617SB004S1	
617SB003S1	
617SB004S2	
613SP027S2	

**DATA ASSESSMENT NARRATIVE
VOLATILE ORGANICS**

PAGE 3

Calibrations (continued)

The continuing calibration F1020010.D exhibited one (1) compound with a RF less than 0.05. For the following samples and non-compliant compound, the reported positive results are qualified as estimated, J, and the non-detect results are rejected, UR.

617SB003S2 acetone (0.045)
613SP027S1

Blanks

The method blanks and one of the SPLP blanks associated with the field samples in this SDG exhibited contamination for which qualifications were required. The end user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as associated samples. These factors must be taken into considerations when applying the 5X and 10X criteria to field samples.

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action Level</u>
VBLKO1	methylene chloride	4 ug/Kg	40 ug/Kg
VBLKO2	methylene chloride	5 ug/Kg	50 ug/Kg
VBLKO4	methylene chloride	9 ug/Kg	90 ug/Kg
	acetone	4 ug/Kg	40 ug/Kg
T101799ZHE	methylene chloride	20 ug/L	200 ug/L

<u>Samples</u>	<u>Compound</u>	<u>Qualifications</u>
619SB001T2	methylene chloride	U
619SB004T2		
619SB015T1		
109SB005T1		
109SB004T1		
616SB002T1		
616SB002T2		
607SB016T1		
109SB005T2		
617SB003T1		
617SB004T2		
617SB003T2		
613SP027T1		

**DATA ASSESSMENT NARRATIVE
VOLATILE ORGANICS**

PAGE 4

Blanks (continued)

<u>Samples</u>	<u>Compound</u>	<u>Qualifications</u>
613SP027T2 619SB004T1RE	methylene chloride	U
619SB001T1 619SB015T2 109SB004T2 617SB004T1 109SB004S1 109SB004S2 109SB005S1 109SB005S2 607SB016S1 613SP027S2 616SB002S1 616SB002S2 617SB003S1 617SB004S1 619SB001S1 619SB001S2 619SB004S1 619SB015S1 619SB015S2	methylene chloride	CRQL
619SB004T1RE	acetone	U

Internal Standards

The following sample exhibited non-compliant EICP area recoveries below the QC limits for the noted internal standards. All reported positive and non-detect results are qualified as estimated, J/UJ.

619SB004T2 109SB004T1 616SB002T2 617SB003T2 613SP027T2	1,4-dichlorobenzene-d4
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**DATA ASSESSMENT NARRATIVE
VOLATILE ORGANICS**

PAGE 5

Internal Standards (continued)

The following sample exhibited non-compliant EICP area recoveries below the QC limits for the noted internal standards. All reported positive and non-detect results are qualified as estimated, J/UJ.

619SB001T2	chlorobenzene-d5
109SB005T1	1,4-dichlorobenzene-d4
619SB015T1	fluorobenzene
109SB005T2	chlorobenzene-d5
617SB004T2	1,4-dichlorobenzene-d4
613SP027T1	

Surrogate Recoveries

The following samples exhibited a surrogate recovery above the QC limits. The reported positive results are qualified as estimated, J.

<u>Sample</u>	<u>Surrogate</u>	<u>%R</u>
617SB003T2	4-bromofluorobenzene	146%
613SP027T2	4-bromofluorobenzene	141%

Compound Quantitation

For the following samples, the reported results are not used in favor of the results reported from the original analysis of the samples. Both analyses of the sample exhibited similar internal standard area recoveries.

619SB001T2RE
619SB004T2RE
619SB015T1RE
109SB005T1RE
109SB004T1RE
616SB002T2RE
109SB005T2RE
617SB004T2RE
617SB003T2RE
613SP027T1RE
613SP027T2RE

**DATA ASSESSMENT NARRATIVE
VOLATILE ORGANICS**

PAGE 6

Compound Quantitation (continued)

For the following sample, the reported results are not used in favor of the results reported from the RE analysis of the sample. The RE analyses of the sample exhibited acceptable internal standard area recoveries.

619SB004T1

System Performance and Overall Assessment

The data, as reported, required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

L = Result is estimated and biased low.

K = Result is estimated and biased high.

R = Result is rejected and unusable

D = Result value is based on dilution analysis

BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>			
616SB002T2	carbon disulfide (21.6%)	+	J			
617SB003T2						
617SB004T2						
619SB001T2						
619SB004T2						
619SB015T1						
109SB004T2						
109SB005T1						
109SB005T2						
613SP027T1						
613SP027T2						
619SB001S2				acetone (0.049)	+/-	J/UR
619SB001S1						
619SB015S1						
619SB004S2						
619SB004S1						
619SB015S2						
109SB005S1						
109SB005S2						
109SB004S1						
109SB004S2						
616SB002S1						
616SB002S2						
607SB016S1						
617SB004S1						
617SB003S1						
617SB004S2						
613SP027S2						
617SB003S2	acetone (0.045)	+/-	J/UR			
613SP027S1						

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
619SB001T2	methylene chloride	+B	U
619SB004T2			
619SB015T1			
109SB005T1			
109SB004T1			
616SB002T1			
616SB002T2			
607SB016T1			
109SB005T2			
617SB003T1			
617SB004T2			
617SB003T2			
613SP027T1			
613SP027T2			
619SB004T1RE			
619SB001T1			
619SB015T2			
109SB004T2			
617SB004T1			
109SB004S1	methylene chloride	+	CRQL
109SB004S2			
109SB005S1			
109SB005S2			
607SB016S1			
613SP027S2			
616SB002S1			
616SB002S2			
617SB003S1			
617SB004S1			
619SB001S1			
619SB001S2			
619SB004S1			
619SB015S1			
619SB015S2			
619SB004T1RE			

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
	<i>All associated with:</i>		
619SB004T2	1,4-dichlorobenzene-d4	+/-	J/UJ
109SB004T1			
616SB002T2			
617SB003T2			
613SP027T2			
	<i>All associated with:</i>		
619SB001T2	chlorobenzene-d5	+/-	J/UJ
109SB005T1	1,4-dichlorobenzene-d4		
	<i>All associated with:</i>		
619SB015T1	fluorobenzene	+/-	J/UJ
109SB005T2	chlorobenzene-d5		
617SB004T2	1,4-dichlorobenzene-d4	+/-	J/UJ
613SP027T1			
617SB003T2	All Compounds	+	J
613SP027T2			
619SB001T2RE	All Compounds	+/-	Do Not Use
619SB004T2RE			
619SB015T1RE			
109SB005T1RE			
109SB004T1RE			
616SB002T2RE			
109SB005T2RE			
617SB004T2RE			
617SB003T2RE			
613SP027T1RE			
613SP027T2RE			
619SB004T1			

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270C for GC/MS Semivolatiles; the National Functional Guidelines for Organic Data Validation, 2/94, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # EN020

A validation was performed on the Semivolatile Data from SDG EN020. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- Internal Standard Performance
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- Compound Quantitation

* - All criteria were met for this parameter.

Calibrations

The initial calibration analyzed 10/11/99 on Instrument 5970Z exhibited two (2) compounds with %RSDs greater than 15% for which qualifications were required. For the following samples and non-compliant compounds, the reported positive results are qualified as estimated, J.

109SB004S1

benzoic acid (36.9%)

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ORGANICS**

PAGE 2

Calibrations (continued)

The initial calibration analyzed 10/11/99 on Instrument 5970Z exhibited two (2) compounds with %RSDs greater than 15% for which qualifications were required. For the following samples and non-compliant compounds, the reported positive results are qualified as estimated, J.

109SB005T1	benzo(k)fluoranthene (17.4%)
613SP027T1	
109SB004T2	
613SP027T2	
617SB004T2	
617SB003T2	

The continuing calibration standard Z1021011.D exhibited one (1) compound with a %D greater than 50% but less than 90%. For the following samples and non-compliant compound, the reported positive and non-detect results are qualified as estimated, J/UJ.

619SB001T2	benzoic acid (61.5%)
619SB001T1	
619SB004T1	
619SB004T2	
619SB015T1	
619SB015T2	
109SB005T1	
109SB005T2	

The continuing calibration standard Z1022009.D exhibited one (1) compound with a %D greater than 25% but less than 50% for which qualifications were required. For the following samples and non-compliant compound, the reported positive results are qualified as estimated, J.

617SB003T2	indeno(1,2,3-cd)pyrene (36.4%)
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The continuing calibration standard Z1026002.D exhibited one (1) compound with a %D greater than 25% but less than 50% for which qualifications were required. For the following samples and non-compliant compound, the reported positive results are qualified as estimated, J.

109SB004S1	benzoic acid (30.5%)
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**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ORGANICS**

PAGE 3

Blanks

Two (2) of the three (3) SPLP blanks associated with the field samples in this SDG exhibited contamination for which qualifications were required. The end user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as associated samples. These factors must be taken into considerations when applying the 5X and 10X criteria to field samples.

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action Level</u>
SSPLPBLK01	diethylphthalate	3J ug/L	30 ug/L
SSPLPBLK	bis(2-ethylhexyl)phthalate	1J ug/L	10 ug/L

<u>Samples</u>	<u>Compound</u>	<u>Qualifications</u>
109SB005S2 616SB002S1	diethylphthalate	CRQL
619SB001S1 109SB004S1 607SB016S1	bis(2-ethylhexyl)phthalate	CRQL
109SB005S1 617SB003S1 613SP027S2	bis(2-ethylhexyl)phthalate	U

Internal Standards

The following samples exhibited non-compliant EICP area recoveries below the QC limits for the noted internal standards. All reported positive and non-detect results are qualified as estimated, J/UJ.

613SP027T1 613SP027T2	perylene-d12
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**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ORGANICS**

PAGE 4

Compound Quantitation

For the following samples, the reported results are not used in favor of the results reported from the original analyses of the samples. The dilution analyses were not necessary because there were no compounds reported in the lessor dilutions that were above the calibration range.

613SP027T2DL
613SP027T1DL
619SB001T1DL

For the following sample, the E flagged result is not used in favor of the corresponding D flagged result reported in the dilution analysis of the sample. All other results reported in the dilution analysis are not used in favor of the results reported in the lessor dilution of the sample.

617SB003T2

System Performance and Overall Assessment

The data, as reported, required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

L = Result is estimated and biased low.

K = Result is estimated and biased high.

R = Result is rejected and unusable

D = Result value is based on dilution analysis

BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 5X (10X for common laboratory contaminants) the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
109SB004S1	benzoic acid (36.9%)	+	J
109SB005T1 613SP027T1 109SB004T2 613SP027T2 617SB004T2 617SB003T2	benzo(k)fluoranthene (17.4%)	+	J
619SB001T2 619SB001T1 619SB004T1 619SB004T2 619SB015T1 619SB015T2 109SB005T1 109SB005T2	benzoic acid (61.5%)	+/-	J/UJ
617SB003T2	indeno(1,2,3-cd)pyrene (36.4%)	+	J
109SB004S1	benzoic acid (30.5%)	+	J
109SB005S2 616SB002S1	diethylphthalate	+	CRQL
619SB001S1 109SB004S1 607SB016S1	bis(2-ethylhexyl)phthalate	+	CRQL
109SB005S1 617SB003S1 613SP027S2	bis(2-ethylhexyl)phthalate	+	U

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
613SP027T1 613SP027T2	<i>All associated with perylene-d12</i>	+/-	J/UJ
613SP027T2DL 613SP027T1DL 619SB001T1DL	All Compounds	+/-	Do not use
617SB003T2	All E flagged compounds	+E	Do not use
617SB003T2DL	All except corresponding D flagged results	+/-	Do Not use

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8081A/8082; the National Functional Guidelines for Organic Data Validation, February 1994; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # EN020

A validation was performed on the Pesticide/Aroclor Data from SDG EN020. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- Compound Quantitation

* - All criteria were met for this parameter.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

Continuing Calibrations

The continuing calibration analyzed on 10/20/99 at 05:46 exhibited one (1) compound with a %D greater than 15 % and less than 50 % and required qualifications. For the following sample and non-compliant compound, the positive results are qualified as estimated, J.

109SB005T1 Methoxychlor (17.0%)

The continuing calibration analyzed on 10/20/99 at 17:02 exhibited one (1) compound with a %D greater than 15 % and less than 50 % and required qualifications. For the following sample and non-compliant compound, the positive results are qualified as estimated, J.

109SB005T1DL 4,4'-DDE (-17.2%)

The continuing calibration analyzed on 10/22/99 at 16:43 exhibited one (1) compound with a %D greater than 15 % and less than 50 % and required qualifications. For the following samples and non-compliant compound, the positive results are qualified as estimated, J.

613SP027T2DL 4,4'-DDD (-15.8%)
617SB003T2
617SB004T2

The continuing calibration analyzed on 10/22/99 at 17:28 exhibited one (1) compound with a %D greater than 15 % and less than 50 % and required qualifications. For the following sample and non-compliant compound, the positive results are qualified as estimated, J.

617SB003T2 4,4'-DDE (-17.8%)

The continuing calibration analyzed on 10/23/99 at 03:15 exhibited one (1) compound with a %D greater than 15 % and less than 50 % and required qualifications. For the following sample and non-compliant compound, the positive results are qualified as estimated, J.

613SP027T2 4,4'-DDE (-16.9%)

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 3

Surrogate Recoveries

The samples listed below exhibited high DCB recoveries. The positive results are qualified as estimated, J.

<u>Sample ID</u>	<u>Surrogate</u>	<u>% Recovery</u>
109SB005T1	DCB	275%
109SB005T1DL	DCB	335%

Compound Quantitation

Several samples exhibited column quantitation %Ds greater than 40%. The following guidelines were used to qualify the data:

1. No qualifications are required for positive sample results which exhibited column quantitation differences < 40%. The "P" flag is removed from the result.
2. The positive sample result which exhibited a column quantitation difference > 40%, but ≤ 100% is qualified as estimated, J.
3. The positive single component pesticide sample result which exhibited a column quantitation difference > 100% and is < 10X the respective compound CRQL, is qualified as non-detect, U. (All multi-component results are exempt from this rule.)
4. The positive single component pesticide sample result which exhibited a column quantitation difference > 100% and > 10X the respective compound CRQL, is qualified as presumptively present at an estimated concentration, NJ. (All multi-component results are exempt from this rule.)
5. The positive multi-component pesticide sample result which exhibited a column quantitation difference > 100% and < 10% the respective multi-component CRQL is qualified as presumptively present at an estimated concentration, NJ.

DATA ASSESSMENT NARRATIVE
PESTICIDE/AROCLOR ANALYSIS

PAGE - 4

Compound Quantitation, Continued

The following samples and compounds have been qualified for high column quantitation %Ds.

<u>Sample ID</u>	<u>Compound</u>	<u>%D</u>	<u>Lab Qual.</u>	<u>HESI Qual.</u>	<u>Ref. #</u>
109SB005T1	4,4'-DDE	71.4%	P	J	2
	Methoxychlor	28.3%	P		1
109SB005T1DL	Gamma-Chlordane	223.9%	P	NJ	4
109SB005T2	4,4'-DDT	35.5%	P		1
109SB004T1	Aroclor-1260	44.7%	P	J	2
607SB016T1	4,4'-DDD	150.9%	P	U	3
613SP027T1	Alpha-Chlordane	82.2%	P	J	2
	Gamma-Chlordane	525.9%	P	NJ	4
613SP027T2	4,4'-DDE	372%	P	NJ	4

Several samples were diluted to accurately quantitate target compounds. For the following samples, the results for the E-flagged compounds are replaced with the corresponding results from the dilution analysis. All other results from the dilution analysis are not used.

109SB005T1
613SP027T1
613SP027T1DL1
613SP027T2

For the following sample, the results for the dilution analysis are not used in favor of the results reported from the original analysis as the original analysis does not exhibit positive results above the calibration range of the instrument.

607SB016T1DL

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 5

Compound Quantitation, Continued

Sample 613SP027T1 exhibited a positive result above the calibration range of the instrument for Gamma-Chlordane. Gamma-Chlordane was not detected in the dilution analysis. For the following sample and E-flagged compound, the positive result is qualified as estimated, J.

613SP027T1 Gamma-Chlordane

System Performance and Overall Assessment

The data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

NJ = Result is considered presumptively present at an estimated concentration

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 5X the method blank value. The sample result for the blank contaminant is qualified as non detected at the compound value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 5X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
109SB005T1	Methoxychlor	+	J
109SB005T1DL	4,4'-DDE	+	J
613SP027T2DL 617SB003T2 617SB004T2	4,4'-DDD	+	J
617SB003T2	4,4'-DDE	+	J
613SP027T2	4,4'-DDE	+	J
109SB005T1 109SB005T1DL	ALL	+	J
ALL	All P < 40%	+	
ALL	All P > 40% But ≤ 100%	+	J
ALL	single component pests All P > 100% And < 10X CRQL	+	U
ALL	single component pests All P > 100% And > 10X CRQL	+	NJ
ALL	multi-component pests All P > 100% And < 10X CRQL	+	NJ
109SB005T1 613SP027T1 613SP027T1DL1 613SP027T2	All E-Flagged	+E	D
109SB005T1DL 613SP027T1DL 613SP027T2DL	All except corresponding D-Flagged results	+/-	not used

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
607SB016T1DL	ALL	+/-	not used
613SP027T1	Gamma-Chlordane	+E	J

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS (SOILS AND SPLP) AND WET CHEMISTRY

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 methods: the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDGs # EN020

A validation was performed on the Metals for soils and splp and wet chemistry Data from SDG EN020. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions

* - All criteria were met for this parameter.

Preparation and Field Blanks

The preparation and calibration blanks exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	2.42 mg/kg	no impact
Zinc	0.40 mg/kg	no impact

The USEPA requires that all sample values below five times the preparation or calibration blank contamination be qualified as non-detect, "U".

The preparation blanks exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Cadmium	-0.06 mg/kg	all soil samples below 0.6 mg/kg
Cobalt	-0.06 mg/kg	no impact
Magnesium	-4.43 mg/kg	no impact
Thallium	-0.25 mg/kg	all soil samples below 2.5 mg/kg
Cadmium	-0.4 ug/l	all splp samples below 4.0 ug/l
Copper	-1.0 ug/l	all splp samples below 10.0 ug/l
Magnesium	-29.3 ug/l	no impact
Manganese	-0.3 ug/l	all splp samples below 3.0 ug/l

This reviewer qualifies all samples results below 10 times the absolute value of the negative blank value.

Matrix Spike Recovery results

The matrix spike recovery for soils for Thallium (0%) was below 30%. All positive results are qualified as estimated, "J" and all non-detect results are rejected, "UR".

The matrix spike recovery for soils for Antimony (47%), Chromium (49%) and Zinc (63%) and for splp samples Silver (63%) were below the lower control limits (>30% but <75%). All positive and non-detect results are qualified as estimated, "J" or "UJ".

Matrix Duplicate results

The matrix duplicate RPD results for splp samples for Zinc (128%) is greater than 35% and Chromium and Iron were greater than the CRDL. All positive results are qualified as estimated, "J".

Serial Dilution recovery results

The serial dilution results for soils for Arsenic, Calcium, Magnesium and Potassium and for splp samples for Potassium were greater than 10%. All positive results are qualified as estimated, "J".

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B". Value is below the CRDL but greater than the IDL.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all soil samples below 0.6 mg/kg	Cd.	+/U	J/UJ
all soil samples below 2.5 mg/kg	Tl.		
all splp samples below 4.0 ug/l	Cd.		
all splp samples below 10.0 ug/l	Cu.		
all splp samples below 3.0 ug/l	Mn.		
all soil samples	Tl.	+	J
		U	UR
all soil samples	Sb, Cr and Zn.	+/U	J/UJ
all splp samples	Ag.		
all splp samples	Zn, Cr and Fe.	+	J
all soil samples	As, Ca, Mg and K.	+	J
all splp samples	K.		
all "B" results	all analytes	B	J

Data Validation Summary - Charleston Naval Complex - Zone F, AOC 617

TO: Rebecca Carovillano/CH2M HILL/DEN
FROM: Herb Kelly/CH2M HILL/GNA
DATE: September 18, 2001

The purpose of this memorandum is to present the results of the data validation process for the samples collected at AOC 617 in Zone F. The samples were collected on the dates of June 6 and June 21, 2001.

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

The Quality Control areas that were reviewed and the resulting findings are documented within each subsection that follows. This data were 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 General Engineering Laboratories, Inc., in Charleston, South Carolina, for the following analyses: SW-846 8270 Semivolatile Organic Compounds (SVOC) and Metals following method SW-846 6010.

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

<u>Code</u>	<u>Definition</u>
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

TABLE 1
 Chemical Analytical Methods – Field and Quality Control Samples
 Charleston Naval Complex, Zone F, AOC 617, Charleston, SC

SDG	Station ID	Sample ID	Analysis Code	Sample Date	Matrix	Sample Type	Replicate 1	Replicate 2	Replicate 3	Field	QC
43550	F617SB005	617SB005	43550001	6/6/01	SO	N	2	3			X
43550	F617SB006	617SB00603	43550002	6/6/01	SO	N	2	3			X
43550	F617SB007	617SB00703	43550003	6/6/01	SO	N	2	3			X
43551	FIELDQC	617EB007	43551001	6/6/01	WQ	EB					X
44646	F617GW001	617GW001LA	44646001	6/21/01	WG	N				X	
44646	F617GW002	617GW002LA	44646002	6/21/01	WG	N				X	
44646	F617GW003	617GW003LA	44646003	6/21/01	WG	N				X	
44646	F617GW004	617GW004LA	44646004	6/21/01	WG	N				X	
44646	FIELDQC	617EW001LA	44646005	6/21/01	WQ	EB				X	

MATRIX CODE

SO - Soil
 WG - Groundwater
 WQ - Water QC Samples

SAMPLE TYPE CODE

EB - Equipment Blank
 N - Native Sample

ANALYSIS CODE

PAHs - Polyaromatic Hydrocarbons

Organic Parameters

Quality Control Review

The following list represents the QA/QC measures that are typically 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.
- **Surrogate Recoveries** – Surrogate Compounds are added to each sample and the recoveries are used to monitor lab performance and possible matrix interference.
- **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.
- **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.
- **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.
- **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.

Polyaromatic Hydrocarbons (PAHs) Analyses

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

Calibrations

All initial and continuing calibration criteria were met except as noted in Table 2 below.

TABLE 2

Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: PAHs
Charleston Naval Complex, Zone F, AOC 617, Charleston, SC

Instrument/Calibration Date	Analyte	%Relative Standard Deviation or R ² (ICAL) /%Difference (CCAL)	Associated Samples
MSD7-ICAL-06/12	Benzo(b)fluoranthene	0.986	43550 - 1-3
MSD7-CCAL-6/16, 1341	Benzo(k)fluoranthene	22.5 high	43550 - 1-3
	Benzo(g,h,i)perylene	20.8 high	

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

- When the percent Relative Standard Deviation (%RSD) or R² 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 was high, detected compounds were flagged "J", as estimated. Non-detected compounds were not flagged.

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.
- **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 3.

TABLE 3

Blank Contamination: Metals
Charleston Naval Complex, Zone F, AOC 617, Charleston, SC

SDG	Lab Sample ID	Sample ID	Sample Type	Parameter	Lab Result	Units	Flag	Concentrations
44646	44646005	617EW001LA	EB	Nickel	0.912	µg/L		<4.56 µg/L

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.

Conclusion

A review of the analytical data submitted regarding the investigation of AOC 617 in Zone F 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, however, 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 F - AOC 617

SDG	Sample ID	Lab Sample ID	Matrix	Parameter Class	Analytical Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
43550	617SB005	43550001	SO	SVOA	SW8270	BENZO(b)FLUORANTHENE	36.3	U	36.3	UJ	ug/Kg	IC
43550	617SB00603	43550002	SO	SVOA	SW8270	BENZO(k)FLUORANTHENE	116	=	116	J	ug/Kg	CC
43550	617SB00603	43550002	SO	SVOA	SW8270	BENZO(g,h,i)PERYLENE	80.6	=	80.6	J	ug/Kg	CC
43550	617SB00603	43550002	SO	SVOA	SW8270	BENZO(b)FLUORANTHENE	349	=	349	J	ug/Kg	IC
43550	617SB00703	43550003	SO	SVOA	SW8270	BENZO(b)FLUORANTHENE	36.4	U	36.4	UJ	ug/Kg	IC
44646	617GW001LA	44646001	WG	METAL	SW6010	ZINC	6.37	B	6.37	J	ug/L	IB
44646	617GW002LA	44646002	WG	METAL	SW6010	NICKEL	1.29	B	1.29	U	ug/L	BL
44646	617GW003LA	44646003	WG	METAL	SW6010	CHROMIUM, TOTAL	4.7	B	4.7	J	ug/L	IB
44646	617GW003LA	44646003	WG	METAL	SW6010	CADMIUM	4.44	B	4.44	J	ug/L	IB
44646	617GW003LA	44646003	WG	METAL	SW6010	ARSENIC	3.6	B	3.6	J	ug/L	IB
44646	617GW004LA	44646004	WG	METAL	SW6010	NICKEL	29.8	B	29.8	J	ug/L	IB
44646	617GW004LA	44646004	WG	METAL	SW6010	ARSENIC	2.38	B	2.38	J	ug/L	IB

TABLE D-1

SPLP Sample Analytes Detected in Surface Soil at AOC 617

RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Location	Sample ID	Concentration	Unit	Qualifier
Antimony, SPLP	F617SB003	617SB003S1	2.6	µg/L	J
	F617SB004	617SB004S1	4.4		J
Barium, SPLP	F617SB003	617SB003S1	83.7	µg/L	J
	F617SB004	617SB004S1	75.2		J
Calcium, SPLP	F617SB003	617SB003S1	69,000	µg/L	=
	F617SB004	617SB004S1	77,700		=
Copper, SPLP	F617SB004	617SB004S1	0.7	µg/L	J
Iron, SPLP	F617SB003	617SB003S1	103	µg/L	J
	F617SB004	617SB004S1	39.2		J
Lead, SPLP	F617SB003	617SB003S1	3	µg/L	J
	F617SB004	617SB004S1	4.3		J
Magnesium, SPLP	F617SB003	617SB003S1	1,840	µg/L	J
	F617SB004	617SB004S1	2,150		J
Manganese, SPLP	F617SB003	617SB003S1	3.1	µg/L	J
	F617SB004	617SB004S1	2.5		J
Nickel, SPLP	F617SB004	617SB004S1	1.7	µg/L	J
Potassium, SPLP	F617SB003	617SB003S1	922	µg/L	J
	F617SB004	617SB004S1	3,110		J
Selenium, SPLP	F617SB004	617SB004S1	1.9	µg/L	J
Silver, SPLP	F617SB004	617SB004S1	0.5	µg/L	J
Sodium, SPLP	F617SB003	617SB003S1	1,680	µg/L	J
	F617SB004	617SB004S1	3,090		J
Tin (Sn), SPLP	F617SB003	617SB003S1	3.1	µg/L	J
	F617SB004	617SB004S1	4.7		J
Zinc, SPLP	F617SB003	617SB003S1	8.5	µg/L	J
	F617SB004	617SB004S1	45.8		J

= Analyte was detected at the concentration shown.

J Analyte is presented as an estimated concentration.

TABLE D-2
SPLP Sample Analytes Detected in Subsurface Soil at AOC 617
RFI Report Addendum and CMS Work Plan, AOC 617, Zone F, Charleston Naval Complex

Parameter	Location	Sample ID	Concentration	Unit	Qualifier
Aluminum, SPLP	F617SB003	617SB003S2	309	µg/L	=
Antimony, SPLP	F617SB003	617SB003S2	3.9	µg/L	J
	F617SB004	617SB004S2	7.8		J
Barium, SPLP	F617SB003	617SB003S2	221	µg/L	=
	F617SB004	617SB004S2	58.6		J
Calcium, SPLP	F617SB003	617SB003S2	142,000	µg/L	=
	F617SB004	617SB004S2	200,000		=
Chromium, Total	F617SB003	617SB003S2	0.8	µg/L	J
	F617SB004	617SB004S2	0.8		J
Copper, SPLP	F617SB003	617SB003S2	1.9	µg/L	J
	F617SB004	617SB004S2	2.7		J
Iron, SPLP	F617SB003	617SB003S2	68.5	µg/L	J
	F617SB004	617SB004S2	97.6		J
Lead, SPLP	F617SB003	617SB003S2	2.1	µg/L	J
	F617SB004	617SB004S2	2.7		J
Magnesium, SPLP	F617SB003	617SB003S2	3,680	µg/L	J
	F617SB004	617SB004S2	1,750		J
Manganese, SPLP	F617SB003	617SB003S2	35.5	µg/L	=
	F617SB004	617SB004S2	4.4		J
Nickel, SPLP	F617SB003	617SB003S2	1.1	µg/L	J
	F617SB004	617SB004S2	4		J
Potassium, SPLP	F617SB003	617SB003S2	2,140	µg/L	J
	F617SB004	617SB004S2	1,270		J
Selenium, SPLP	F617SB004	617SB004S2	2.1	µg/L	J
Silver, SPLP	F617SB004	617SB004S2	0.5	µg/L	J
Sodium, SPLP	F617SB003	617SB003S2	3,250	µg/L	J
	F617SB004	617SB004S2	3,870		J
Tin (Sn), SPLP	F617SB004	617SB004S2	5.4	µg/L	J
Vanadium, SPLP	F617SB003	617SB003S2	3.6	µg/L	J
	F617SB004	617SB004S2	2		J
Zinc, SPLP	F617SB003	617SB003S2	173	µg/L	J
	F617SB004	617SB004S2	87.8		J

= Analyte was detected at the concentration shown.
J Analyte is presented as an estimated concentration.

ENSAFE

Monitoring Well NBCF617003

Project: ZONE F - Naval Base Charleston

Coordinates: 2319693.8 E, 373408.2 N

Location: Charleston, SC

Surface Elevation: 10.5 feet msl

Started at 1525 on 05/11/99

TOC Elevation: 10.29 feet msl

Completed at 1700 on 05/11/99

Depth to Groundwater: 6.15 feet TOC Measured: 5-20-99

Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler

Groundwater Elevation: 4.14 feet msl

Drilling Company: Alliance Environmental (SC cert. #889)

Total Depth: 14.0 feet

Geologist: S. Tompkins

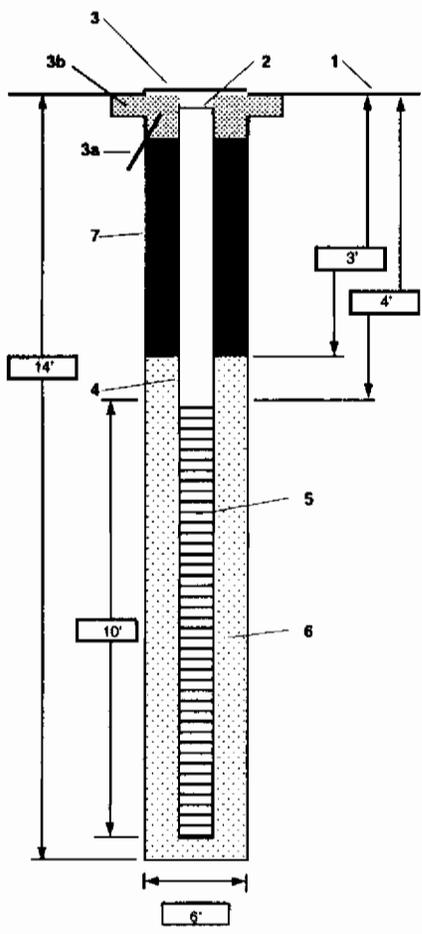
Well Screen: 4.1 to 13.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
							SP	Surface conditions: asphalt Sand: lt. brown; fine; trace silt; loose; dry.	0	
			1		75	SC	Sand: gray-brown; becomes clayey @ 3-4'; dark staining and chemical odor @ 2-3'.	8.5		
			2		67	CL	Clay: gray; sandy; moist	6.5		
5			3		79	SP	Sand: lt. brown; fine; moist.	5.9		
			4		83	CL	Clay: lt. brown w/ rust orange streaks; sandy; moist.	4.5		
10			5		100	CL	Clay: as above grading to gray-brown, very soft, sandy clay @ 9.3-10'.	2.8		
			6		92	SC	Sand: lt. brown-buff; fine; orange-rust clay stringers throughout.	2.5		
			7		92	SC	Sand: as above.	1.3		
15								0.5		
20								3.3		



PROJECT NUMBER 158814	WELL NUMBER H617GW004	SHEET 1 OF 1
WELL COMPLETION DIAGRAM		

PROJECT : Charleston Naval Complex LOCATION : Charleston, SC
 DRILLING CONTRACTOR : EEG
 DRILLING METHOD AND EQUIPMENT USED : hollow stem auger
 WATER LEVELS : 7' bts START : 06/06/2001 END : 06/06/2001 LOGGER : T. Wiley/ATL



1- Ground elevation at well	_____
2- Top of casing elevation	_____
3- Wellhead protection cover type	flush mount
a) drain tube?	_____
b) concrete pad dimensions	2' x 2'
4- Dia./type of well casing	2"
5- Type/slot size of screen	0.010 " slotted well screen
6- Type screen filter	#2 sand
a) Quantity used	8 bags
7- Type of seal	bentonite pellets
a) Quantity used	5 gal bucket
Development method	_____
Development time	_____
Estimated purge volume	_____
Comments	Grout weight = _____
	Total Depth (BTOC) = _____
	Final field parameters collected during well development (): _____
	pH = _____
	conductivity = _____
	temperature = _____

Note: Diagram not to scale.

**Initial Comments and Responses on the Draft Final Zone F RFI Report
Specific to AOC 616 and AOC 617
April 7, 1999**

**SCDHEC (Eric Cathcart) Comments on the
Zone F Draft RCRA Facility Investigation Report
(dated 31 December 1998) NAVBASE Charleston
February 26, 1999**

SCDHEC Comment 1:

Soil sample blanks for the following areas contained detectable contaminants: SWMU 4, AOC 619, SWMU 36, AOC 620, SWMU 109, AOC 607, AOC 609, AOC 611, AOC 613, AOC 616, AOC 617, and Grid soil samples. Groundwater blanks contained detectable contaminants for the following areas: AOC 619, AOC 620, SWMU 109, AOC 607, AOC 609, AOC 613, GEL samples, Location 240, AOC 617, and Grid groundwater samples. These detections were noted in the volatile, semivolatile, and metals methods. In accordance with the Environmental Protection Agency, *Standard Operating Procedures* for sample collection, trace contaminants in field, trip, equipment, and distilled water blanks may indicate a problem with either decontamination procedures and/or cross contamination of samples during collection or transport. The RFI report should fully explain the existence of trace contaminants in blanks. Please revise the text to include this/these explanation(s).

Navy/EnSafe Response 1:

The Project Chemist has reviewed and evaluated the data and compiled the findings in the following memo to the Project Team for review and approval.

Memorandum

To: Charleston Naval Complex Project Team

From: Charlie Vernoy, EnSafe

Subject: **Response to Comments on the Draft Zone F and K RFI Reports**

Date: March 31, 1999

Several comments by the South Carolina Department of Health and Environmental Control (SCDHEC) on the Draft Zone F and K RFI Report discuss the context of the Data Validation section and how blank contamination can be further explained relevantly to specific site samples. This memo is intended to explain the data validation process and how it relates to blank contamination associated with the RFI report process for the Charleston Naval Complex (CNC) project and offer a resolution to stated comments. For demonstration purposes, AOC 607 in Zone F has been designated as the site to be addressed in this memo.

As part of the RFI process at CNC, chemical environmental samples undergo a third party data validation review process following USEPA Functional Guidelines. This process includes the review of analytical data generated at specific data quality objectives (DQOs) and making a determination of the validity of the results through implementation of the functional guidelines and providing professional judgement in the qualification of the data. DQOs include the collection and analysis of quality control (QC) blanks which are intended

to identify possible contaminants that may be associated with the collection/analysis process.

To assess possible cross contamination from sampling procedures, deionized water, equipment, and field blanks are collected on a weekly basis per sampling event and trip blanks are submitted daily when volatile organic compounds (VOCs) are requested for analysis. The laboratory is also required to provide data on internal laboratory contamination and must analyze method blanks according to specific method requirements. The QC blanks and environmental samples are analyzed by the same methods and are routinely batched in the same Sample Delivery Group (SDG). A typical SDG includes a total of 20 samples. Batching QC and environmental samples together in the same SDG provides needed information to the data validator to make necessary decisions about the quality of the data. There are occasions when a sampling event at a particular site will have multiple SDGs and it becomes the responsibility of the data validator to incorporate the findings of QC blanks into other SDGs associated with the site.

Each SDG has its own data package incorporating the analytical results of samples and providing necessary QC data to make judgements about the validity of the data. When reviewing the data, the validator follows strict guidelines and must qualify sample data when appropriate. Contamination found in QC blank data is one aspect where qualification of data is necessary. Functional guidelines state that when contamination is found in QC blanks the validator must incorporate the findings to site samples where applicable. The way the validator applies the finding is through the "5x" or "10x" rule. The "5x" rule is taking the analytical result of the contaminant found in a QC blank and multiplying the result by five. If a compound is found in all associated blanks, then the highest result is subjected to the rule. The adjusted result is then compared to all site samples and if detections in site samples are less than the adjusted result of the blank contaminant, site sample detections are adjusted to non-detect. This rule covers all compounds except for acetone, methylene chloride, 2-butanone, and bis(2-ethylhexyl)phthalate, which are known laboratory and possible field sampling contaminants, where the "10x" rule will apply.

Upon completion of the data review process, the validator generates a validation report which includes the functional guideline checklist with instructions on qualifying data, actual data sheets of site samples showing data qualifiers, an electronic file of the site sample data with qualifiers, and a summary report outlining deficiencies noted and data qualifiers used. EnSafe reviews the report for consistency and electronically adds the data files to a database. Once the data is validated and added to the database it becomes final and is used in writing nature and extent, fate and transport, and risk assessment sections for RFI reports. As part of the Data Validation section in the CNC RFI reports, all SDG data validation summary reports and database spreadsheets are included for review.

As part of the RFI report process, all contaminants detected in site samples that are not validated to non-detect are to be mentioned in the nature and extent section and compared to regulatory limits such as risk-based concentrations, soil screening and maximum contaminant levels. In short, if an adjusted blank contaminant detection was not higher than the site sample detection, then the site sample result is reported in the RFI report. This result would then be reviewed as a possible chemical of potential concern (COPC) or chemical of concern (COC) and identified as such where applicable. The quarterly monitoring sampling

program would help to determine if a COPC or COC was from cross contamination or actual detection.

Section 4.3 in the Zone F and K Draft RFI reports summarized blank contamination found in common multiple blanks associated with a particular site (usually first round sampling events). The sections did not list contaminations found in only one blank because of the assumption that it was a single occurrence and not part of a trend. The data validation summary reports listed all blank contamination per SDG but do not point out trends between the SDGs.

In addressing comments concerning blank contamination at CNC, AOC 607 was used to demonstrate the association between field and method blank detections in all sampling events under the RFI in Zone F. Tables 1 and 2 list compounds detected and the ranges associated with the blanks. The asterisk denotes compounds that were detected in a blank but were not detected in a site sample.

Table 1 - Soil AOC 607

<i>Field Blanks</i>	<i>Range</i>	<i>Method Blanks</i>	<i>Range</i>
1234678-HxCDF	3.76-11.7 pg/L	1234678-HpCDD	3.67 pg/L
123478-HxCDF	0.704-2.29 pg/L	234678-HxCDF	3.15 pg/L
123678-HxCDD	2.74-7.37 pg/L	Acetone	2-12 ug/L
123678-HxCDF	1.3 pg/L	Aluminum	2.27 ug/L
123789-HxCDD	50.2-131 pg/L	Beryllium	.035-.039 ug/L
234678-HxCDF	2.74-3.5 pg/L	bis(2-Ethylhexyl)phthalate	45-53 ug/L
2-Butanone	23 ug/L	Butylbenzylphthalate	94 ug/L
Acetone	4-120 ug/L	Chloroform	1 ug/L
Acetonitrile	2800-14000 ug/L	Chromium*	.155-.202 ug/L
Aluminum	246 ug/L	Iron	4.9-6.27 ug/L
Barium	16.7 ug/L	Lead	0.296 ug/L
Benzyl Alcohol*	2 ug/L	Methylene Chloride	2-14 ug/L
Beryllium	0.31-.41 ug/L	OCDD	31 pg/L
Bromodichloromethane*	13 ug/L	Thallium	.425-4.76 ug/L
Calcium	18.7 ug/L	Tin	1.37-2.8 ug/L
Chloroform*	34 ug/L	Vanadium	0.052-.852 ug/L
Chromium	1 ug/L		
Copper	0.75 ug/L		
Cyanide	3.5 ug/L		
Iron	596 ug/L		
Magnesium	1340 ug/L		
Manganese	13.3 ug/L		
Mercury	0.11 ug/L		
Methylene Chloride	1-14 ug/L		
Napthalene	1 ug/L		
Nickel	14 ug/L		
N-Nitrosodimethylamine*	1-4 ug/L		
OCDD	388-744 pg/L		
OCDF	2.5-6.71 pg/L		
Potassium	1320 ug/L		
Sodium	6410 ug/L		
Thallium	6.8 ug/L		
Tin	2.8 ug/L		
Toluene	2 ug/L		
Vanadium	1.7 ug/L		
Zinc	7.1-10.3 ug/L		

Notes:

* Compounds not detected in any site samples.

Table 2 - Water AOC 607

<i>Field Blanks</i>	<i>Ranges</i>	<i>Method Blanks</i>	<i>Ranges</i>
1234678-HpCDD*	3-6 pg/L	1234789-HpCDF*	3.76 pg/L
234678-HxCDF*	3 pg/L	234678-HxCDF*	6.45 pg/L
Acetone	3 ug/l	Acetone	3-7 ug/L
Aluminum	9.3-19.6 ug/L	Aluminum	12-23.8 ug/L
Antimony	1.7-2.8 ug/L	Antimony	1.6-6.22 ug/L
Arsenic	2.2-2.5 ug/L	Arsenic	2.53-2.67 ug/L
Barium	.34-.98 ug/L	Barium	.35-2.55 ug/L
BEHP*	1-110 ug/L	BEHP*	1-10 ug/L
Bromodichloromethane*	2 ug/L	Benzene*	1 ug/L
Calcium	39.2-99.8 ug/L	Benzoic acid	4 ug/L
Chloroform*	1-7 ug/L	Calcium	60.5 ug/L
Chromium	1.5 ug/L	Chloroform*	1-3 ug/L
Cobalt	1.1 ug/L	Cobalt	1.24 ug/L
Di-n-octyl phthalate*	9 ug/L	Copper	1.14-2.5 ug/L
Iron	22.4-35.9 ug/L	Cyanide*	1.79-2.5 ug/L
Magnesium	49.8 ug/L	Diethylphthalate*	1 ug/L
Manganese	.38-.72 ug/L	Heptachlor*	0.012 ug/L
Methylene Chloride	6-19 ug/L	Iron	20.1-32 ug/L
Nickel	1.8 ug/L	Lead	.91-1.4 ug/L
OCDD*	9 pg/L	Magnesium	50.6-56.9 ug/L
OCDF*	4 pg/L	Manganese	.5-1.2 ug/L
Potassium	690-699 ug/L	Methylene Chloride	2-17 ug/L
Silver	2.3-3.8 ug/L	Nickel	.72-1 ug/L
Sodium	33.2-24700 ug/L	OCDD*	7.35-11 pg/L
Tetrachloroethene	1-14 ug/L	OCDF*	5.66 pg/L
Zinc	7.6 ug/L	Potassium	178 ug/L
		Silver	1.44-1.94 ug/L
		Sodium	27.5-107 ug/L
		Tetrachloroethene	2 ug/L
		Thallium	3.4-3.75 ug/L
		Tin	19.6 ug/L
		Toluene	2 ug/L
		Vanadium	0.813 ug/L
		Xylene*	1-2 ug/L
		Zinc	7.61-10.2 ug/L

Notes:

* Compounds not detected in any site samples.

In reviewing the compounds for both lists, explanations can be made as to why certain compounds were detected. The majority of compounds that make the lists are inorganics. In comparing the method blank lists there was an increase of inorganic compounds detected in the water events as compared to the soil events. Detections generally ranged higher for the water event method blanks. The field blank lists showed virtually the same number of inorganic compounds for both soil and water events. In contrast to the method blanks, detections of common metals in the field blanks generally ranged higher for soil events. A possible reason for the high incident of metals in field blanks maybe the water from the North Charleston Water System which is used for the on-site carbon filtered/single canister deionized water system. The deionized system is routinely maintained by the Culligan company, but even working at optimal efficiency the system cannot filter out all compounds. The same can be said of the laboratories that use a carbon filtered/dual canister deionized system to filter water for the method blanks. Eliminating all metal detections from blank analyses is an insurmountable task and efforts to identify exact sources of metals are impossible.

The organic blank detections are easier to explain in some cases. For example, the VOCs bromodichloromethane and chloroform were detected in field blanks for the soil and water events and but just chloroform was detected in the method blanks. The two VOCs are common by-products of the chlorination process of municipal water systems. As noted in the tables, bromodichloromethane and chloroform were not detected in any site samples during water sampling events.

The chlorinated dioxin and dibenzofuran detections noted in the field and method blanks are common contaminants found in a dioxin lab. Due to the extremely low detection limits (parts per quadrillion) that a dioxin lab routinely meets due to current technology, it has become extremely difficult to decontaminate glassware down to non-detect levels. However, once the 2,3,7,8-TCDD Toxicity Equivalency Factors (TEFs) are applied to the results, the overall detections are minimal.

It is possible for acetone to be detected in samples because of the decontamination procedures at CNC that use isopropyl alcohol. Acetone being a contaminant of isopropyl alcohol. But the decontamination procedures used in the field are not what laboratories follow so the acetone detections in the method blanks must be from cross contamination in the lab. Acetone is used in laboratories as a solvent for the extraction of soils.

Methylene chloride is not used in decontamination procedures but was detected in field blanks as well as in method blanks. The explanation for this is that laboratories use methylene chloride when performing water extraction for semivolatile and pesticides analyses and very likely cross contamination with CNC samples has occurred. Methylene chloride has not been identified as a COC at AOC 607.

Tetrachloroethene (PCE), also not used in decontamination procedures, was detected in the field and method blanks for the water events. AOC 607 has large PCE detections in the shallow and intermediate groundwater around building 1189 and it is very possible that cross contamination between samples as occurred. The detections for PCE do not affect the results found in the site samples.

The detections of benzene, toluene, and xylene are all below their respective method detection limits (MDLs) and cannot be verified as a true detection. The high detections of acetonitrile (an Appendix IX compound) occurred in two field blanks collected in 11/96. Both blanks were from the same SDG and no associated site samples had detections of the compound.

The phthalate compounds detected in both field and method blanks are commonly found in plastics found in disposable gloves and glassware. The phthalates that were detected in blanks during water events were not detected in any site samples. Phthalates were detected in the method blanks during soil events and not the field blanks leading to the speculation that phthalate contamination is caused by the laboratory.

CH2M-Jones Response 1:

No further response required.

SCDHEC Comment 12:

AOC 617

The RFI Report indicates the possibility of organic species exhibiting significant enrichment with depth. The source of the organics has not been positively identified; therefore, further investigations should be performed.

Navy/Ensafe Response 12:

The report identified SVOCs in surface and subsurface soil samples. Only one location, 617SB004 detected SVOCs (benzo(a)pyrene) at a concentration of 130 µg/kg which exceeds the residential RBC of 88 µg/kg. The resulting cumulative residential exposure risk was 3E-06. This affected area is beneath 8 - 12 inches of concrete which forms an apron around Building 69. Building 69 is a reasonably new facility which is leased and used as warehouse. The likelihood of removing the concrete and exposing the soil is very low given the relatively recent age and activity of this area.

Significantly higher concentrations of SVOCs were detected in subsurface soil samples collected. Although concentrations of benzo(a)anthracene and Aroclor-1260 were detected in subsurface soil at locations 617SB003 and 617SB004, neither of these analytes was detected in groundwater.

Based on the groundwater flow regime at this site, it appears as though no wells are located to intercept groundwater downgradient of the area of impacted soil. The Navy proposes to install a shallow monitoring well along the western side of the former Building 1176.

CH2M Jones Response 12:

Groundwater well 617GW003 was installed downgradient of the soil locations in question. PAHs and BEQs are addressed in the RFI Report Addendum. The groundwater at the site has been investigated as agreed upon with SCDHEC. No further investigation of groundwater under the RFI is necessary.

**Initial Comments and Responses on the Draft Final Zone F RFI Report
Specific to AOC 616 and AOC 617
April 7, 1999**

**SCDHEC (Johnny Tapia) Comments on the
Zone F Draft RCRA Facility Investigation Report
(dated 31 December 1998) NAVBASE Charleston
March 12, 1999**

SCDHEC Comment 8:

This comment is applicable to all units in Zone F. The Risk uncertainty section generally summarizes all detections and explain contributing or mitigating factors to be considered when reaching a decision on the fate of the unit. Since groundwater contamination is assessed based mainly on the first quarter of groundwater sampling, mitigating or contributing factors, such as results of subsequent rounds of groundwater sampling that confirm or refute possible contamination, should be acknowledged. Also, new contaminants detected should be mentioned. Please review the report.

Navy/Ensafe Response 8:

The Navy agrees and will evaluate all available data for incorporation into the final report.

CH2M-Jones Response 8:

All RFI data have been considered in assessment of groundwater for development of this RFI Report Addendum.

SCDHEC Comment 31:

AOC 616

The only medium investigated at this unit was soil. The location of this unit is between AOC 613/AOC 615/SWMU 175 and AOC 617. Even though the past use of this unit was as a paint shop and that suspected chemicals were solvents, any possible groundwater contamination would be investigated and remediated under the corrective action at the surrounding units. Therefore, based on the above, the Department agrees with the conclusion that this unit required No Further Action (NFA).

Navy/Ensafe Response 31:

The Navy concurs.

CH2M-Jones Response 31:

Potential groundwater contamination at AOC 616 has been evaluated in this RFI Report Addendum. Based on this evaluation and previous evaluations of the site, CH2M-Jones recommends No Further Action for AOC 616.

SCDHEC Comment 32:

AOC 617

The figures for this unit need to identify the location of the UST. Please correct all figures.

Navy/Ensafe Response 32:

The figures will be revised to include the location of the UST.

CH2M-Jones Response 32:

The location of this tank is unknown. Because no contamination has been found to be associated with this tank and the tank has been removed for several years, there is no need to modify the figures to show its former location.

SCDHEC Comment 33:

Iron was consistently detected in groundwater at levels much higher than Tap water RBCs. Considering past operations of this unit, iron should be included in the risk assessment as a potential threat to human health or the environment. Please revise.

Navy/Ensafe Response 33:

Iron will be addressed in the Final RFI report, please refer to the response to Comment 7.

CH2M-Jones Response 33:

Iron as a potential COC has been discussed in the RFI Report Addendum and is not considered a COC at this site.

SCDHEC Comment 34:

Well 617002 was installed later in the investigation process, however it detected higher levels and more chemicals than the previously installed well. There is a question about if the investigation was conducted at the footprint of this former operation, and about the definition of the extent of groundwater contamination, i.e. higher and more frequent detections located on upgradient well. The lack of definition of extent and location of groundwater contamination is acknowledged in the report, and should be clarified. Please propose additional groundwater work.

Navy/Ensafe Response 34:

The Navy agrees and proposes to install one shallow monitoring well in a downgradient location on the west side of the former Building 1176.

CH2M-Jones Response 34:

Additional groundwater investigations, as agreed to by the BCT, have been completed at AOC 617. No further investigations of groundwater are necessary as part of the RFI.

Response to Reply to Comments on the Draft Final Zone F RFI Report
June 25, 1999

SCDHEC (Eric Cathcart) Reply to Comments
received 7 April 1999 on The Zone F Draft RCRA Facility
Investigation Report (dated 31 December 1998)
Charleston Naval Complex

SCDHEC Comment 1:

Soil sample blanks for the following areas contained detectable contaminants: SWMU 4, AOC 619, SWMU 36, AOC 620, SWMU 109, AOC 607, AOC 609, AOC 611, AOC 613, AOC 616, AOC 617, and Grid soil samples. Groundwater blanks contained detectable contaminants for the following areas: AOC 619, AOC 620, SWMU 109, AOC 607, AOC 609, AOC 613, GEL samples, Location 240, AOC 617, and Grid groundwater samples. These detections were noted in the volatile, semivolatile, and metals methods. In accordance with the Environmental Protection Agency, *Standard Operating Procedures* for sample collection, trace contaminants in field, trip, equipment, and distilled water blanks may indicate a problem with either decontamination procedures and/or cross contamination of samples during collection or transport. The RFI report should fully explain the existence of trace contaminants in blanks. Please revise the text to include this/these explanation(s).

Navy/EnSafe Response 1: The Project Chemist has reviewed and evaluated the data and compiled the findings in the following memo to the Project Team for review and approval.

Memorandum

To: Charleston Naval Complex Project Team

From: Charlie Vernoy, EnSafe

Subject: **Response to Comments on the Draft Zone F and K RFI Reports**

Date: March 31, 1999

Contents of the memorandum not included. Refer to original comment letter.

SCDHEC response:

The presence of tetrachloroethene in the field and method blanks for groundwater samples and the Navy's suggestion that cross contamination may have occurred between samples for AOC 607 concerns the Department. The Navy should make every effort to prevent cross contamination in future samples. Field personnel should review the procedures for sample collection and shipment as noted in CVA Final Comprehensive Sampling and Analysis Plan dated 30 August 1994 and the EPA Region IV Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual.

The Navy's explanation for the high incident of metals in the field blanks should be validated through water quality data from the North Charleston Water System. The data report should be submitted within ninety days of receipt of this letter.

Navy/EnSafe Response:

EnSafe will contact the City of North Charleston to inquire if such data is available and, if so, obtain a copy for comparison to the metals detected in Zone F field blanks.

CH2M-Jones Response:

Data from the City for the time period during described sampling are not available for comparison.

SCDHEC Comment 12:

Page 10.9.46 and 10.9.75, AOC 617

The RFI Report indicates the possibility of organic species exhibiting significant enrichment with depth. The source of the organics has not been positively identified; therefore, further investigations should be performed.

Navy EnSafe Response 12:

The report identified SVOCs in surface and subsurface soil samples. Only one location, 617SB004 detected SVOCs (benzo(a)pyrene) at a concentration of 130 µg/kg which exceeds the residential RBC of 88 µg/kg. The resulting cumulative residential exposure risk was 3E- 06. This affected area is beneath 8 - 12 inches of concrete which forms an apron around Building 69. Building 69 is a reasonably new facility which is leased and used as warehouse. The likelihood of removing the concrete and exposing the soil is very low given the relatively recent age and activity of this area.

Significantly higher concentrations of SVOCs were detected in subsurface soil samples collected. Although concentrations of benzo(a)anthracene and Aroclor-1260 were detected in subsurface soil at locations 617SB003 and 617SB004, neither of these analytes was detected in groundwater.

Based on the groundwater flow regime at this site, it appears as though no wells are located to intercept groundwater downgradient of the area of impacted soil. The Navy proposes to install a shallow monitoring well along the western side of the former Building 1176.

SCDHEC response:

The Navy should pinpoint the exact location of the former building 1176 to assist in the source investigation. The Department was advised during the team meeting that the tank/vat mentioned in the report contained pickling compounds. The Navy should also locate the former tank/vat area and include on a site map.

The Department has issued monitoring well approval for one (1) well dated 28 April 1999.

Navy/Ensafe Response:

The site maps will be revised to show the footprint of the former Building 1176 as well as process features. The new well, 617003, has been installed, developed, and sampled for VOCs, SVOCs, metals, and pesticides/PCBs at DQO Level III.

Validated data should be available in early July.

CH2M-Jones Response:

The location of the former building is shown on figure provided in the RFI Report Addendum. The additional data collected by the Navy as well as additional data collected by CH2M-Jones are also provided in this RFI Report Addendum.