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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY REPORT AND CORRECTIVE MEASURES STUDY WORK PLAN AREA OF CONCERN 722 ZONE I CNC CHARLESTON SC

10/1/2004

CH2M HILL

RFI REPORT AND CMS WORK PLAN

AOC 722, Zone I

Charleston Naval Complex
North Charleston, South Carolina

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

CH2M Jones

October 2004

Contract N62467-99-C-0960

RFI REPORT AND CMS WORK PLAN

AOC 722, Zone I

Charleston Naval Complex
North Charleston, South Carolina

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

PREPARED BY
CH2M-Jones

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Revision 0
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Certification Page for RFI Report and CMS Work Plan, Revision 0 – AOC 722, Zone I

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.

10/18/2004

Date

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Acronyms and Abbreviations

AOC	Area of concern
AST	Aboveground storage tank
BCT	BRAC Cleanup Team
BEQ	Benzo(a)pyrene equivalent
BOQ	Bachelor Officers' Quarters
BRAC	Base Realignment and Closure Act
CA	Corrective action
CDI	Chronic daily intake
CERFA	Community Environmental Response Facilitation Act
CMS	Corrective measures study
CNC	Charleston Naval Complex
COC	Chemical of concern
COPC	Chemical of potential concern
CSAP	Comprehensive Sampling and Analysis Plan
DAF	Dilution attenuation factor
DCB	Dichlorobenzene
DCE	Dichloroethylene
DPT	Direct-push technology
EBS	Environmental Baseline Survey
ELCR	Excess lifetime cancer risk
EnSafe	EnSafe Inc.
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
ft bls	Feet below land surface
ft msl	Feet above mean sea level
FDS	Fuel distribution system
HI	Hazard index
HQ	Hazard quotient
IRIS	Integrated Risk Information System

Acronyms and Abbreviations, Continued

HEAST	Health Affects Assessment Summary Tables
LUC	Land use control
MCL	Maximum contaminant level
MCS	Media cleanup standard
µg/L	Microgram per liter
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
NAVBASE	Naval Base
OWS	Oil/water separator
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethylene
PSI	Physical site inspection
RAO	Remedial action objective
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RGO	Remedial goal option
RME	Reasonable Maximum Exposure
SCDHEC	South Carolina Department of Health and Environmental Control
SSL	Soil screening level
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit
TCE	Trichloroethylene
UCL_{95}	95-percent Upper Confidence Limit
UST	Underground storage tank
VSI	Visual site inspection
VOC	Volatile organic compound

1.0 Introduction

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

Corrective Action (CA) activities are being conducted under the Resource Conservation and Recovery Act (RCRA) with the South Carolina Department of Health and Environmental Control (SCDHEC) as the lead agency for CA activities at the CNC. All RCRA CA activities are performed in accordance with the Final Permit (Permit No. SC0 170 022 560). In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC.

The Navy conducted a RCRA Facility Investigation (RFI) in 1998 for Zone I of the CNC. Building 1875, which comprises Area of Concern (AOC) 722, is located in Zone I. At the time of the Zone I RFI, AOC 722 had not yet been identified as an AOC. During the Zone I RFI, a background monitoring well (IGDIGW011) was installed approximately 100 feet south of Building 1875 to evaluate groundwater quality at locations in Zone I presumably unaffected by U.S. Navy activities.

Results of groundwater sample analysis from this well indicated the presence of several volatile organic compounds (VOCs), including trichloroethylene (TCE). Additional groundwater assessment activities identified Building 1875 as a likely area of origin for the groundwater contamination. As a result, this area was designated as an AOC requiring RCRA action in the form of a RCRA Facility Assessment (RFA) and subsequently an RFI. The RFA was completed by CH2M-Jones in May 2003 (CH2M-Jones, 2003).

This submittal has been prepared by CH2M-Jones to complete the RFI for AOC 722 in Zone I of the CNC. This report recommends that a Corrective Measures Study (CMS) be performed for shallow groundwater at AOC 722.

1.1 Facility Background and Operational History

AOC 722 consists of Building 1875, which is located directly west of Building 0028, the former Bachelor Officers' Quarters (BOQ). The AOC is located in Zone I of the CNC, approximately 400 feet north of the intersection of Partridge and Thompson Avenues (see Figure 1-1). Building 1875 is a one-story concrete block structure of approximately 4,136 square feet that was built in 1981 to serve as a storage and supply warehouse for the BOQ in Building 0028. Building 0028 is a three-story structure with three wings, constructed in three phases between 1958 and 1971. Figure 1-2 shows an aerial photograph of the site.

The areas north, east, and south of the Building 1875 are grassed. The area west of the building is a gravel parking lot. The topography of the site is relatively flat. The Cooper River lies approximately 400 feet to the east. Building 0028 is now occupied by the U.S. Border Patrol. Facility 1795 lies directly south of AOC 722 and consists of a small concrete pad-mounted electrical transformer operated by SCE&G. The transformer is secured by a brick fence.

1.1.1 Facility Operations

From the construction date until base closure in 1995, Building 1875 was used as a supply warehouse for storage. At some point after the Navy ceased operations at the CNC, Omni Club began using the facility as a maintenance shop, repairing primarily electrical appliances, and to store basic maintenance supplies, including spray paints, cleaners, solvents, and abrasives. The appliance repair activities, including welding, painting, and woodworking, are currently performed inside Building 1875 and on the roofed patio on the east side of the building. The east side of the building is secured by a chain link fence, and a gravel parking lot adjoins the west side.

Available records do not indicate that hazardous wastes were stored or generated at the site during the Navy's operations. Navy handling of hazardous substances and/or petroleum products in this vicinity was limited to boiler additives and fuel oils, both associated with the heating boilers and former USTs at Building 0028. Only fuel oils were stored in the vicinity; no records were found indicating historical storage or generation of VOC wastes or other hazardous substances for either Building 0028 or Building 1875. No records of spills or releases of hazardous wastes were found during the Environmental Baseline Survey (EBS).

Various spray paints, cleaners, solvents and maintenance supplies have been stored or used at the site during the use of the facility by Omni Club.

VOCs detected in groundwater include: tetrachloroethylene (PCE); TCE; cis-1,2-dichloroethylene (cis-1,2-DCE); trans-1,2-dichloroethene (trans-1,2-DCE); benzene, toluene, ethylbenzene, and xylenes; chlorobenzene; 1,2-dichlorobenzene (1,2-DCB), and 1,3-DCB.

1.1.2 USTs and ASTs

No underground storage tanks (USTs), aboveground storage tanks (ASTs), boilers, sewer systems, septic systems, or oil/water separators (OWSs) are associated with Building 1875. Fuel USTs were formerly located next door at Building 0028, but were successfully removed in 2000. According to available information, no wetlands are associated with this facility. The building lies within the 100-year floodplain. The AOC 722 area is currently zoned as B-2, for business use.

1.2 Purpose of the RFI and CMS Work Plan

This RFI Report and CMS Work Plan provides information about the results of the RFI sampling that was performed at AOC 722 after completion of the Zone I RFI. A CMS Work Plan for site groundwater at AOC 722 is included in Section 8 of this report.

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

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

Information regarding these issues is provided in this RFI Report and CMS Work Plan to expedite evaluation of closure of the site.

1.3 Report Organization

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

1.0 Introduction—Presents the purpose of the report and background information relating to the RFI Report and CMS Work Plan.

2.0 Previous Investigations at AOC 722—Summarizes the results of previous investigations at AOC 722.

3.0 AOC 722 RFI Technical Approach—Presents the rationale, field and analytical methodologies employed and sampling locations for the media investigated at AOC 722.

4.0 Summary of AOC 722 RFI Results—Presents results of soil and groundwater sampling conducted at AOC 722 during the RFI.

5.0 Risk Assessment—Provides further evaluations of chemicals of potential concern (COPCs) based on RFI and additional data to assess them as chemicals of concern (COCs).

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

7.0 Recommendations—Provides recommendations for proceeding with the RCRA CA process.

8.0 CMS Work Plan for AOC 722 Groundwater—Presents a focused CMSWP for the shallow groundwater at AOC 722.

9.0 References—Lists the references used in the preparation of this document.

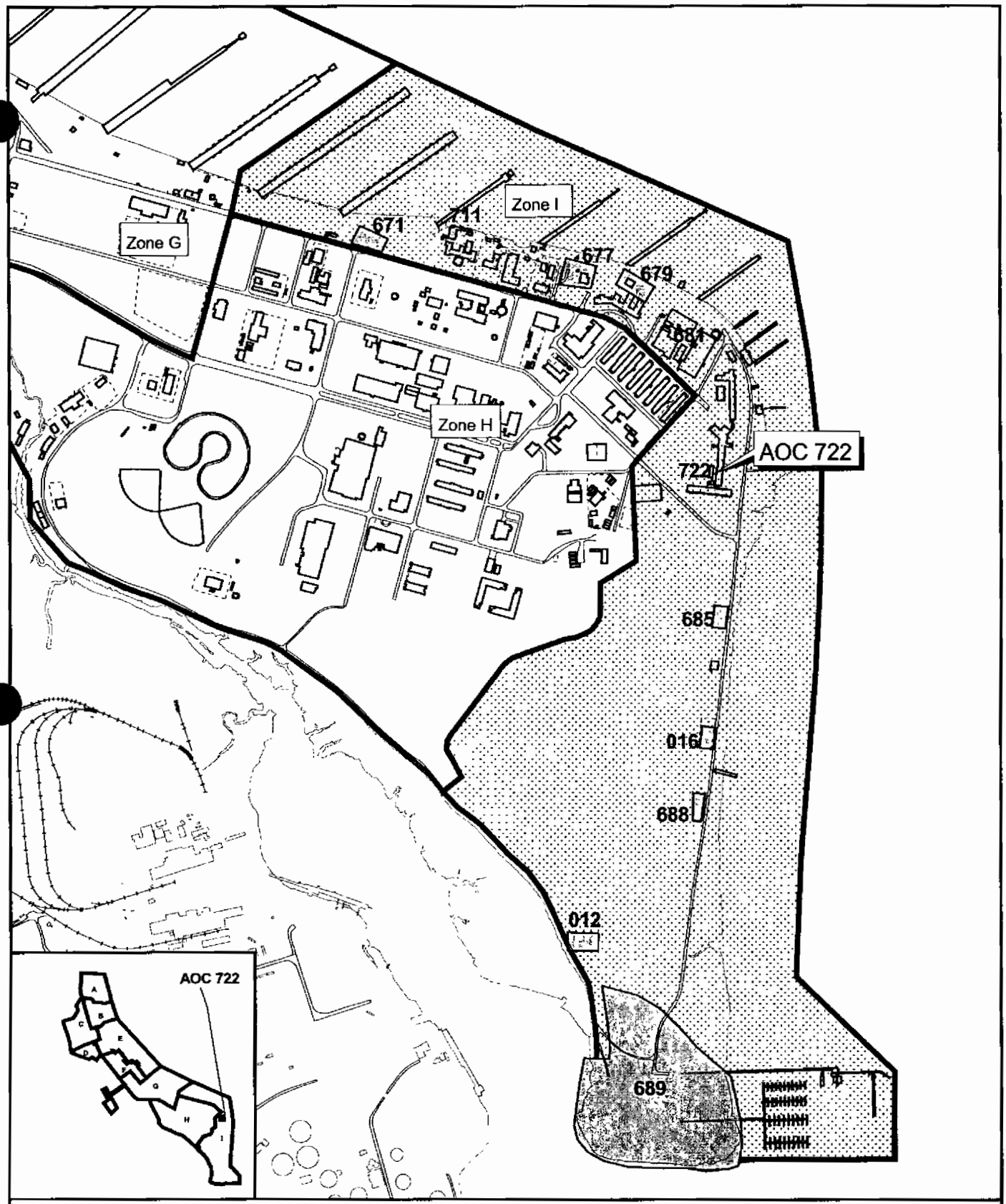
Appendix A presents analytical data for the CH2M-Jones soil and groundwater sampling conducted since 2000.

Appendix B contains data validation summaries for the CH2M-Jones groundwater sampling conducted since 2000.

Appendix C contains monitoring well construction and boring logs for CH2M-Jones monitoring wells installed in 2002.

Appendix D contains the risk and hazard tables for the Section 5.0 Risk Assessment.

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



Zone I Boundary
SWMU/AOC Within Zone I Boundary

N

0 800 1600 Feet

1 inch = 1000 feet

Figure 1-1
Site Location Map
AOC 722, Zone I
Charleston Naval Complex

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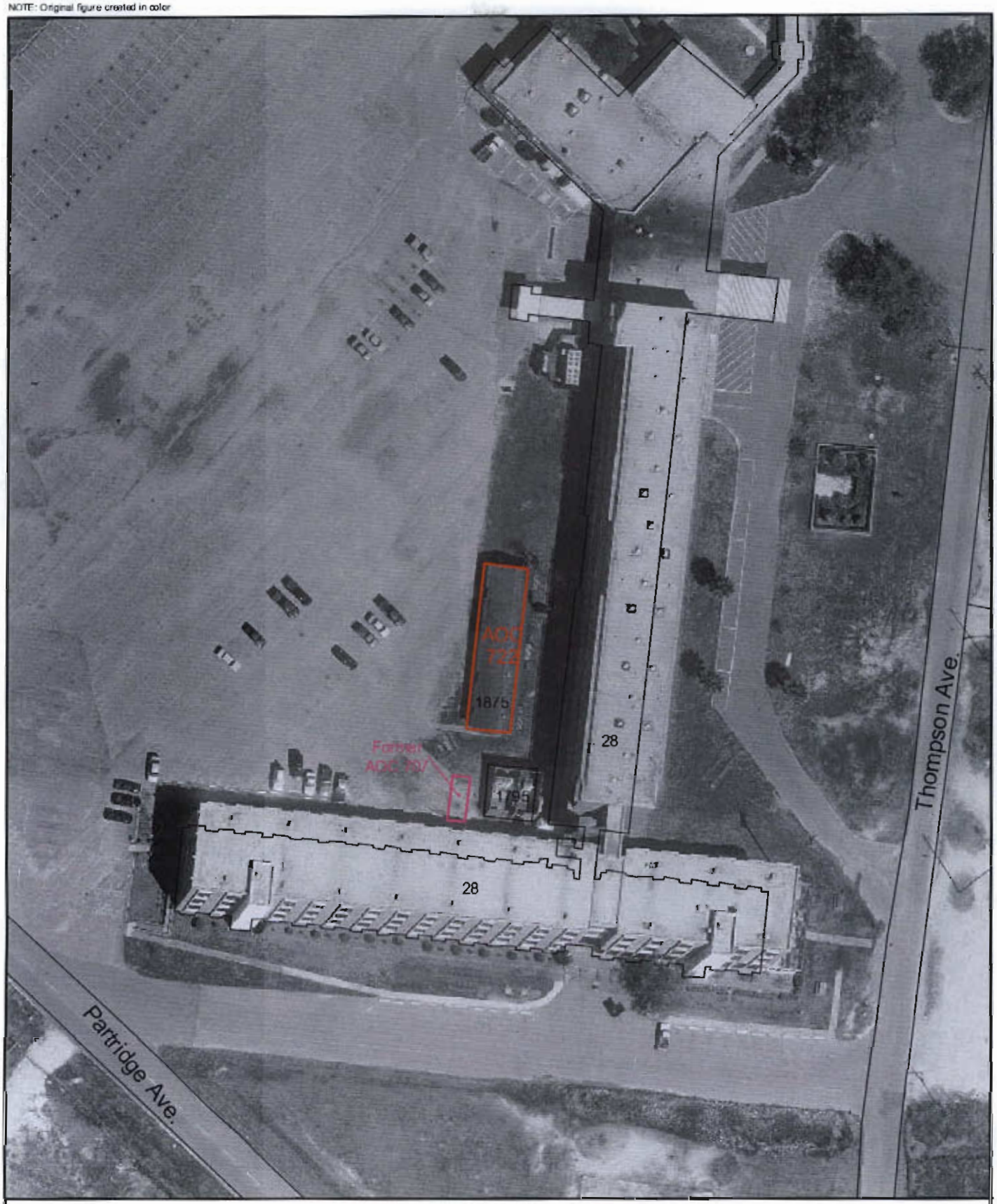
E042004015GNV

NOTE: Aerial Photo Date is 1997
NOTE: Original figure created in color



Roads
AOC Boundary
NFA AOC Boundary
Buildings

N

0 60 120 Feet

1 inch = 75 feet

Figure 1-2
AOC 722 Aerial Photo View
AOC 722, Zone I
Charleston Naval Complex

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E042004015GNV

Section 2.0

2.0 Previous Investigations at AOC 722

The Building 1875 area was not originally identified as a SWMU or AOC requiring investigation in the Zone I RFI process, but RFI sampling results from nearby grid well IGDIGW011 indicated the presence of VOCs in groundwater. The site was evaluated in the *Environmental Baseline Survey for Transfer of Phase IV Parcels (EBS)* by CH2M-Jones in 2001 and 2002. CH2M-Jones also conducted additional groundwater sampling of the area in 2002 with installation of five direct-push technology (DPT) groundwater samplers and three shallow monitoring wells, as discussed below.

2.1 Environmental Baseline Survey

To evaluate the current environmental conditions of Navy property and facilities slated for transfer to the public, an EBS for Transfer was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA). The EBS involved visual site inspections (VSIs) and physical site inspections (PSIs) of existing facilities, interviews with key personnel, and review of available documents pertaining to the construction and use of the facilities as related to a variety of environmental issues.

Both Building 0028 and Building 1875 were included in the EBS and were inspected in August 2002. The EBS did not identify any environmental issues other than the VOCs in groundwater. No records of past spills or leaks of hazardous substances were noted. The current tenant, Omni Club, stores or uses hazardous substances on site. Omni Club conducts appliance maintenance and repair activities, but no issues were observed with this operation during the VSI.

2.2 Groundwater Investigation

During the Zone I RFI, EnSafe Inc. (EnSafe) installed two background grid wells south of Building 0028, designated IGDIGW011 and IGDIGW11D, in order to characterize background groundwater conditions in Zone I. The wells were not associated with any previously identified SWMUs or AOCs.

VOCs and semivolatile organic compounds (SVOCs) were detected in shallow grid well IGDIGW011 shortly after installation in 1995 and generally were confirmed by repeated sampling during the Zone I RFI. In 1998, EnSafe collected additional groundwater samples from a series of five temporary DPT samplers installed around Building 0028, designated IGDIGP001 through IGDIGP005. These DPT locations were chosen to screen groundwater near grid well IGDIGW011. The Zone I RFI concluded that "the results of the DPT sampling did not confirm the presence of a contaminant plume in the area of GDI011/11D, but rather indicate that the detections seen in GDI011 are a hot-spot or a sample anomaly."

Because VOCs had been detected in Zone I shallow aquifer grid well IGDIGW011 during the Zone I RFI, CH2M-Jones implemented a preliminary groundwater investigation in 2002 under guidance from SCDHEC. CH2M-Jones installed three DPT temporary groundwater samplers (IG11GP001 through IG11GP003) around Buildings 0028 and 1875 in May 2002. Five permanent monitoring wells, IG11GW001 through IG11GWGW005, were installed in February and May 2002.

2.3 Groundwater Results

Pre-RFI analytical results (1995 through 2002) were screened against conservative screening criteria in this section. Analytical results were compared directly to the maximum contaminant level (MCL) if available. If an MCL was not available, the Region III tap water risk-based concentration (RBC), based on a hazard index (HI) of 0.1, was used as the screening criterion. Inorganic chemicals were also compared to the range of Zone I background concentrations.

Table 2-1 presents the groundwater results for samples collected from permanent monitoring wells and Table 2-2 presents the groundwater results for samples collected from groundwater probe locations. Sample locations are shown on Figure 2-1.

Fifteen inorganic chemicals were detected in the pre-RFI groundwater samples collected at AOC 722. Antimony and lead were each detected in one sample above their respective screening concentrations. Antimony was detected in one sample collected from monitoring well IGDIGW011 at a concentration of 6.1 micrograms per liter (µg/L), which marginally exceeds its MCL (6.0 µg/L) and background concentration (6.0 µg/L). Antimony was not detected in the two previous or the one subsequent sample collected from this well. Lead was detected in one sample collected from monitoring well IGDIGW11D at a concentration

of 51.4 µg/L, which is above its MCL (15 µg/L) and background concentration (16 µg/L). Lead was not detected in any of the three previous samples collected from this well. Antimony and lead are identified as COPCs based on the detections above their respective screening criteria.

Cyanide was detected in one of eight groundwater samples. The detected concentration was below the U.S. Environmental Protection Agency (EPA) Region III RBC.

Three VOCs were detected in groundwater samples at concentrations that exceed their respective screening criteria. Benzene was detected above screening criteria in one sample collected from monitoring well IG11GW005 at a concentration of 8.4 µg/L. TCE was detected in all five of the monitoring wells installed in February and May 2002 by CH2M-Jones. TCE was detected above its MCL in two permanent monitoring wells and one groundwater probe sample, with a maximum concentration of 72.5 µg/L in monitoring well IG11GW005. TCE was detected above its MCL in the groundwater probe sample collected near Building 1875 (IG11GP003, 25.3 µg/L). TCE has also been detected in shallow grid well IGDIGW011. TCE concentrations in monitoring well IGDIGW011 were above its MCL in four of six pre-RFI samples collected from monitoring well IGDIGW011. Methylene chloride was detected above its MCL in the groundwater probe sample collected approximately 350 feet to the east-southeast of AOC 722 (IG11GP002, 8.0 µg/L).

Fifteen SVOCs were detected in groundwater samples collected at AOC 722. Three compounds, 4-methylphenol, dibenzofuran, and naphthalene, were detected above their respective tap water RBCs (MCLs were not available). All of these SVOCs were detected in monitoring well IGDIGW011.

One pesticide, lindane, was detected in groundwater collected at AOC 722. The detected concentration of lindane (0.62 µg/L) was above its MCL of 0.2 µg/L. It was detected in the sample from monitoring well IGDIGW011 in May 1995. Lindane was not detected in IGDIGW011 during any of the three subsequent sampling events.

Polychlorinated biphenyls (PCBs) were not detected in groundwater samples collected at AOC 722.

2.4 Soil Investigation

During installation of monitoring well IGDIGW011, one surface soil sample (IGDISB01101) was collected. The sample was analyzed for metals, cyanide, VOCs, SVOCs, PCBs, and pesticides. A summary of the detected chemicals is presented in Table 2-3.

2.5 Soil Results

Pre-RFI analytical results (1995) were screened against screening criteria in this section. Analytical results were compared directly to the Region III Industrial RBC based on a HI of 0.1 and the EPA Soil Screening Levels (SSLs) based on a dilution-attenuation factor (DAF) of 10 (1 for VOCs). Inorganic chemicals were also compared to the range of Zone I background concentrations.

Table 2-3 presents the surface soil analytical results for the sample collected at monitoring well IGDIGW011. The location of the surface soil sample is presented on Figure 2-1.

Fourteen metals were detected in the surface soil sample collected at monitoring well IGDIGW011. No inorganic chemicals were detected above their respective RBCs or SSLs. Cyanide was not detected.

Five SVOCs were detected in the surface soil sample collected at the location of monitoring well IGDIGW011. No SVOCs were detected above their respective RBCs or SSLs.

No VOCs, PCBs, or pesticides were detected in the pre-RFI surface soil samples.

TABLE 2-1
Chemicals Detected in Pre-RFI Groundwater Samples (1995 through 2002)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL	EPA Region III RBC[a] (HI=0.1)	Zone I Background Concentration[b]
Metals								
Aluminum	IGDIGW011	GDIGW01102	12/14/1995	38.9	J	NA	4700	1550
	IGDIGW11D	GDIGW11D02	12/15/1995	98.8	J			
Antimony	IGDIGW011	GDIGW01103	05/23/1996	6.1	J	6	NA	6
Arsenic	IGDIGW011	GDIGW01101	05/19/1995	16.1	=	50	NA	66
	IGDIGW11D	GDIGW11D03	05/24/1996	5.2	J			
Barium	IGDIGW011	GDIGW01101	05/19/1995	278	=	2000	NA	278
		GDIGW01102	12/14/1995	140	J			
		GDIGW01103	05/23/1996	163	J			
		GDIGW01104	08/29/1996	153	J			
	IGDIGW11D	GDIGW11D01	06/07/1995	368	J			
		GDIGW11D02	12/15/1995	164	J			
		GDIGW11D03	05/24/1996	183	J			
		GDIGW11D04	08/30/1996	165	J			
Beryllium	IGDIGW011	GDIGW01102	12/14/1995	1.0	J	4	NA	1.2
		GDIGW01103	05/23/1996	1.2	J			
Chromium, Total	IGDIGW011	GDIGW01101	05/19/1995	6.9	J	100	NA	24
		GDIGW01102	12/14/1995	2.1	J			
		GDIGW01103	05/23/1996	5.2	J			
		GDIGW01104	08/29/1996	14.3	=			
	IGDIGW11D	GDIGW11D01	06/07/1995	2.3	J			
		GDIGW11D03	05/24/1996	3.7	J			
Cobalt	IGDIGW11D	GDIGW11D01	06/07/1995	1.0	J	NA	220	4
Iron	IGDIGW011	GDIGW01101	05/19/1995	632	J	NA	1100	3190
		GDIGW01102	12/14/1995	1380	J			
		GDIGW01103	05/23/1996	189	=			
		GDIGW01104	08/29/1996	222	=			
	IGDIGW11D	GDIGW11D01	06/07/1995	1050	=			

TABLE 2-1
Chemicals Detected in Pre-RFI Groundwater Samples (1995 through 2002)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL	EPA Region III RBC[a] (HI=0.1)	Zone I Background Concentration[b]
		GDIGW11D02	12/15/1995	1270	J			
		GDIGW11D03	05/24/1996	1700	=			
		GDIGW11D04	08/30/1996	1770	=			
Lead	IGDIGW011	GDIGW01102	12/14/1995	4.0	J	15	NA	16
		GDIGW01104	08/29/1996	13.0	=			
	IGDIGW11D	GDIGW11D04	08/30/1996	**51.4**	=			
Manganese	IGDIGW011	GDIGW01101	05/19/1995	172	=	NA	73	4850
		GDIGW01102	12/14/1995	92.7	J			
		GDIGW01103	05/23/1996	160	=			
		GDIGW01104	08/29/1996	144	J			
	IGDIGW11D	GDIGW11D01	06/07/1995	218	=			
		GDIGW11D02	12/15/1995	173	J			
		GDIGW11D03	05/24/1996	181	=			
		GDIGW11D04	08/30/1996	184	J			
Nickel	IGDIGW011	GDIGW01101	05/19/1995	3.6	J	NA	73	16
		GDIGW01102	12/14/1995	1.2	J			
		GDIGW01103	05/23/1996	3.3	J			
		GDIGW01104	08/29/1996	8.7	J			
	IGDIGW11D	GDIGW11D01	06/07/1995	4.2	J			
		GDIGW11D02	12/15/1995	2.2	J			
		GDIGW11D03	05/24/1996	3.8	J			
Thallium	IGDIGW011	GDIGW01104	08/29/1996	4.1	J	2	NA	8
	IGDIGW11D	GDIGW11D04	08/30/1996	5.7	J			
Tin (Sn)	IGDIGW11D	GDIGW11D01	06/07/1995	207	=	NA	2200	3
Vanadium	IGDIGW011	GDIGW01101	05/19/1995	10.9	J	NA	26	19
		GDIGW01102	12/14/1995	18.8	J			
		GDIGW01103	05/23/1996	8.3	J			
		GDIGW01104	08/29/1996	13.9	J			

TABLE 2-1
Chemicals Detected in Pre-RFI Groundwater Samples (1995 through 2002)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL	EPA Region III RBC[a] (HI=0.1)	Zone I Background Concentration[b]
	IGDIGW11D	GDIGW11D01	06/07/1995	5.6	J			
		GDIGW11D02	12/15/1995	6.1	J			
		GDIGW11D03	05/24/1996	6.6	J			
		GDIGW11D04	08/30/1996	6.4	J			
Zinc	IGDIGW011	GDIGW01101	05/19/1995	24.2	J	NA	1100	316
	IGDIGW11D	GDIGW11D01	06/07/1995	9.7	J			
Cyanide								
Cyanide	IGDIGW011	GDIGW01103	05/23/1996	4.7	J	NA	73	NA
Volatile Organic Compounds								
1,1-Dichloroethane	IGDIGW011	GDIGW01101	05/19/1995	2.0	J	5 [c]	NA	NA
		GDIGW01102	12/14/1995	1.0	J			
		0Z1GGW1110	07/20/2000	1.3	J			
		GDGW011M1	02/22/2002	0.51	J			
1,1-Dichloroethene	IGDIGW011	0Z1GGW1110	07/20/2000	0.61	J	7	NA	NA
1,2-Dichlorobenzene	IG11GW001	G11GW001M1	02/22/2002	11.6	=	600	NA	NA
	IG11GW002	G11GW002M1	02/22/2002	31.4	=			
	IG11GW003	G11GW003M1	02/22/2002	3.8	J			
1,2-Dichloroethene (total)	IG11GW003	G11GW003M1	02/22/2002	0.56	J	70	NA	NA
	IG11GW005	G11GW005M2	05/23/2002	18.4	=			
	IGDIGW011	GDIGW01101	05/19/1995	2.0	J			
		GDIGW01102	12/14/1995	7.0	=			
		GDIGW01103	05/23/1996	5.0	=			
		GDIGW01104	08/29/1996	4.0	J			
		0Z1GGW1110	07/20/2000	7.2	=			
		GDGW011M1	02/22/2002	3.2	J			
1,2-Dichloropropane	IGDIGW011	GDGW011M1	02/22/2002	0.30	J	5	NA	NA
1,3-Dichlorobenzene	IG11GW001	G11GW001M1	02/22/2002	0.60	J	75 [d]	NA	NA
	IG11GW002	G11GW002M1	02/22/2002	1.2	J			

TABLE 2-1
Chemicals Detected in Pre-RFI Groundwater Samples (1995 through 2002)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL	EPA Region III RBC[a] (HI=0.1)	Zone I Background Concentration[b]
1,4-Dichlorobenzene	IG11GW002	G11GW002M1	02/22/2002	2.9	J	75	NA	NA
2-Hexanone	IG11GW003	G11GW003M1	02/22/2002	9.2	J	NA	150	NA
Benzene	IG11GW002	G11GW002M1	02/22/2002	1.3	J	5	NA	NA
	IG11GW005	G11GW005M2	05/23/2002	**8.4**	=			
	IGDIGW011	0Z1GGW1110	07/20/2000	0.48	J			
Bromodichloromethane	IG11GW004	G11GW004	05/23/2002	4.7	J	80 [e]	NA	NA
Bromoform	IG11GW004	G11GW004	05/23/2002	2.4	J	80 [e]	NA	NA
Carbon Disulfide	IG11GW003	G11GW003M1	02/22/2002	23.0	J	NA	100	NA
	IG11GW005	G11GW005M2	05/23/2002	9.1	=			
	IGDIGW011	GDIGW01101	05/19/1995	9.0	J			
		GDIGW01103	05/23/1996	2.0	J			
		0Z1GGW1110	07/20/2000	3.0	J			
		GDGW011M1	02/22/2002	66.6	J			
	IGDIGW11D	GDGW11DM1	02/22/2002	24.7	J			
Chlorobenzene	IG11GW001	G11GW001M1	02/22/2002	6.0	=	100	NA	NA
	IG11GW002	G11GW002M1	02/22/2002	22.0	=			
	IG11GW003	G11GW003M1	02/22/2002	2.4	J			
Chloroform	IG11GW004	G11GW004	05/23/2002	3.0	J	80 [e]	NA	NA
cis-1,2-Dichloroethylene	IG11GW003	G11GW003M1	02/22/2002	0.6	J	70	NA	NA
	IG11GW005	G11GW005M2	05/23/2002	16.3	=			
	IGDIGW011	GDGW011M1	02/22/2002	2.2	J			
Dibromochloromethane	IG11GW004	G11GW004	05/23/2002	5.4	J	80 [e]	NA	NA
Ethylbenzene	IG11GW005	G11GW005M2	05/23/2002	1.7	J	700	NA	NA
	IGDIGW011	GDGW011M1	02/22/2002	0.26	J			
m+p Xylene	IG11GW005	G11GW005M2	05/23/2002	1.8	J	10000 [f]	NA	NA
Methyl ethyl ketone (2-Butanone)	IG11GW003	G11GW003M1	02/22/2002	3.0	J	NA	190	NA
o-Xylene	IG11GW005	G11GW005M2	05/23/2002	2.4	J	10000 [f]	NA	NA
	IN28G35W1	N28G35W1L1	03/09/2001	0.15	J			

TABLE 2-1
Chemicals Detected in Pre-RFI Groundwater Samples (1995 through 2002)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL	EPA Region III RBC[a] (HI=0.1)	Zone I Background Concentration[b]
Tetrachloroethylene (PCE)	IGDIGW011	GDIGW01101	05/19/1995	4.0	J	5	NA	NA
		GDIGW01102	12/14/1995	1.0	J			
		GDIGW01104	08/29/1996	4.0	J			
Toluene	IG11GW001	G11GW001M1	02/22/2002	0.26	J	1000	NA	NA
	IG11GW002	G11GW002M1	02/22/2002	0.35	J			
	IGDIGW011	GDIGW01102	12/14/1995	2.0	J			
		GDGW011M1	02/22/2002	0.24	J			
Trans-1,2-Dichloroethene	IG11GW005	G11GW005M2	05/23/2002	2.1	J	100	NA	NA
	IGDIGW011	GDGW011M1	02/22/2002	0.96	J			
Trichloroethylene (TCE)	IG11GW001	G11GW001M1	02/22/2002	1.4	J	5	NA	NA
	IG11GW002	G11GW002M1	02/22/2002	3.0	J			
	IG11GW003	G11GW003M1	02/22/2002	0.62	J			
	IG11GW004	G11GW004	05/23/2002	0.62	J			
	IG11GW005	G11GW005M2	05/23/2002	**72.5**	=			
	IGDIGW011	GDIGW01101	05/19/1995	**6.0**	=			
		GDIGW01102	12/14/1995	4.0	J			
		GDIGW01103	05/23/1996	**10.0**	=			
		GDIGW01104	08/29/1996	**12.0**	=			
		0Z1GGW1110	07/20/2000	**8.1**	=			
		GDGW011M1	02/22/2002	2.1	J			
Vinyl chloride	IGDIGW011	0Z1GGW1110	07/20/2000	0.64	J	2	NA	NA
		GDGW011M1	02/22/2002	0.74	J			
Xylenes, Total	IG11GW005	G11GW005M2	05/23/2002	4.2	J	10000	NA	NA
	IN28G35W1	N28G35W1L1	03/09/2001	0.15	J			
Semivolatile Organic Compounds								
1-Methyl naphthalene	IGDIGW011	GDIGW01101	05/19/1995	10.0	J	NA	12 [g]	NA
2,4-Dimethylphenol	IGDIGW011	GDIGW01102	12/14/1995	6.0	J	NA	73	NA
		GDIGW01104	08/29/1996	2.0	J			

TABLE 2-1
Chemicals Detected in Pre-RFI Groundwater Samples (1995 through 2002)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL	EPA Region III RBC[a] (HI=0.1)	Zone I Background Concentration[b]
2-Methylnaphthalene	IGDIGW011	GDIGW01101	05/19/1995	9.0	J	NA	12	NA
		GDIGW01102	12/14/1995	5.0	J			
		GDIGW01104	08/29/1996	2.0	J			
3-Methylphenol (m-Cresol)	IGDIGW011	GDIGW01101	05/19/1995	19.0	J	NA	180	NA
4-Methylphenol (p-Cresol)	IGDIGW011	GDIGW01101	05/19/1995	**19.0**	J	NA	18	NA
		GDIGW01102	12/14/1995	3.0	J			
Acenaphthene	IGDIGW011	GDIGW01101	05/19/1995	10.0	J	NA	37	NA
		GDIGW01102	12/14/1995	11.0	J			
		GDIGW01103	05/23/1996	6.0	J			
		GDIGW01104	08/29/1996	6.0	J			
		0Z1GGW1110	07/20/2000	27.0	=			
Anthracene	IGDIGW011	0Z1GGW1110	07/20/2000	1.8	J	NA	180	NA
Benzoic acid	IGDIGW011	GDIGW01101	05/19/1995	2.0	J	NA	15000	NA
		GDIGW01103	05/23/1996	1.0	J			
	IGDIGW11D	GDIGW11D02	12/15/1995	2.0	J			
Dibenzofuran	IGDIGW011	GDIGW01101	05/19/1995	**6.0**	J	NA	2.4	NA
		GDIGW01102	12/14/1995	**5.0**	J			
		GDIGW01103	05/23/1996	**3.0**	J			
		GDIGW01104	08/29/1996	2.0	J			
		0Z1GGW1110	07/20/2000	**13.0**	=			
Diethyl Phthalate	IGDIGW11D	GDIGW11D02	12/15/1995	2.0	J	6	NA	NA
Fluoranthene	IGDIGW011	0Z1GGW1110	07/20/2000	2.9	J	NA	150	NA
Fluorene	IGDIGW011	GDIGW01101	05/19/1995	6.0	J	NA	24	NA
		GDIGW01102	12/14/1995	6.0	J			
		GDIGW01103	05/23/1996	4.0	J			
		GDIGW01104	08/29/1996	3.0	J			
		0Z1GGW1110	07/20/2000	16.0	=			
Naphthalene	IGDIGW011	GDIGW01101	05/19/1995	**23.0**	J	NA	0.65	NA

TABLE 2-1
Chemicals Detected in Pre-RFI Groundwater Samples (1995 through 2002)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL	EPA Region III RBC[a] (HI=0.1)	Zone I Background Concentration[b]
		GDIGW01102	12/14/1995	**18.0**	=			
		GDIGW01103	05/23/1996	**3.0**	J			
		GDIGW01104	08/29/1996	**6.0**	J			
		0Z1GGW1110	07/20/2000	0.58	J			
Phenanthrene	IGDIGW011	GDIGW01101	05/19/1995	9.0	J	NA	180 [h]	NA
		GDIGW01102	12/14/1995	4.0	J			
		GDIGW01103	05/23/1996	3.0	J			
		GDIGW01104	08/29/1996	2.0	J			
		0Z1GGW1110	07/20/2000	9.4	J			
Pyrene	IGDIGW011	0Z1GGW1110	07/20/2000	2.0	J	NA	18	NA
Pesticides								
Gamma BHC (Lindane)	IGDIGW011	GDIGW01101	05/19/1995	**0.62**	J	0.2	NA	NA

[a] Tap water risk-based concentration (RBC) from the U.S. EPA Region III RBC table (10/2000), based on a hazard index (HI) of 0.1 for non-carcinogenic chemicals.
[b] Project Team Notebook and Instructions, Charleston Naval Complex, Environmental Restoration Project. Revision 1A (CH2M-Jones, 12/2001).
[c] 1,2-Dichloroethane used as a surrogate.
[d] 1,4-Dichlorobenzene used as a surrogate.
[e] Total trihalomethanes (TTHMs).
[f] Total xylenes.
[g] 2-Methylnaphthlene used as a surrogate.
[h] Anthracene used as a surrogate (isometric).
MCL – Maximum Concentration Level from U.S. EPA National Primary Drinking Water Standards (3/2001).

J indicates that the chemical was detected. The reported concentration is estimated.
= indicates that the chemical was detected. The reported value is the measured concentration.

Bold and boxed values exceed the MCL (or RBC where applicable) and the Zone I Background Concentration (inorganics).

TABLE 2-2
Volatile Organic Compounds Detected in Pre-RFI Groundwater Probe Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL[a]	EPA Region III RBC[b] (HI=0.1)
Acetone	IGDIGP005	GDIGP00501	01/28/1998	4.0	J	NA	61
Benzene	IG11GP001	G11GP001M2	05/23/2002	0.42	J	5	NA
	IG11GP002	G11GP002M2	05/23/2002	0.40	J		
Bromodichloromethane	IG11GP001	G11GP001M2	05/23/2002	0.42	J	80 [c]	NA
Carbon Disulfide	IG11GP001	G11GP001M2	05/23/2002	3.2	J	NA	100
	IG11GP002	G11GP002M2	05/23/2002	3.1	J		
	IG11GP003	G11GP003M2	05/23/2002	2.9	J		
	IGDIGP005	GDIGP00501	01/28/1998	1.0	J		
Chloroform	IG11GP002	G11GP002M2	05/23/2002	0.41	J	80 [c]	NA
	IG11GP001	G11GP001M2	05/23/2002	0.41	J		
cis-1,2-Dichloroethylene	IG11GP003	G11GP003M2	05/23/2002	6.0	=	70	NA
	IG11GP001	G11GP001M2	05/23/2002	1.2	J		
	IG11GP002	G11GP002M2	05/23/2002	1.2	J		
1,2-Dichloroethane	IG11GP003	G11GP003M2	05/23/2002	1.8	J	5	NA
1,2-Dichloroethene (total)	IG11GP003	G11GP003M2	05/23/2002	7.9	=	70	NA
	IG11GP002	G11GP002M2	05/23/2002	1.2	J		
	IG11GP001	G11GP001M2	05/23/2002	1.2	J		
Dibromochloromethane	IG11GP001	G11GP001M2	05/23/2002	0.41	J	80 [c]	NA
	IG11GP002	G11GP002M2	05/23/2002	0.40	J		
Ethylbenzene	IG11GP003	G11GP003M2	05/23/2002	0.71	J	700	NA
Methylene Chloride	IGDIGP002	GDIGP00201	01/28/1998	**8.0**	=	NA	4.1
Toluene	IG11GP003	G11GP003M2	05/23/2002	0.52	J	1000	NA
trans-1,2-Dichloroethene	IG11GP003	G11GP003M2	05/23/2002	1.9	J	100	NA
Trichloroethylene (TCE)	IG11GP003	G11GP003M2	05/23/2002	**25.2**	=	5	NA

[a] U.S. EPA National Primary Drinking Water Standards (3/2001).
[b] Tap water risk-based concentration (RBC) from the U.S. EPA Region III RBC table (10/2000), based on a hazard index (HI) of 0.1 for non-carcinogenic chemicals.
[c] Total trihalomethanes (TTHMs).

J indicates that the chemical was detected. The reported concentration is estimated.
= indicates that the chemical was detected. The reported value is the measured concentration.

Bold and boxed values exceed the MCL (or RBC where applicable).

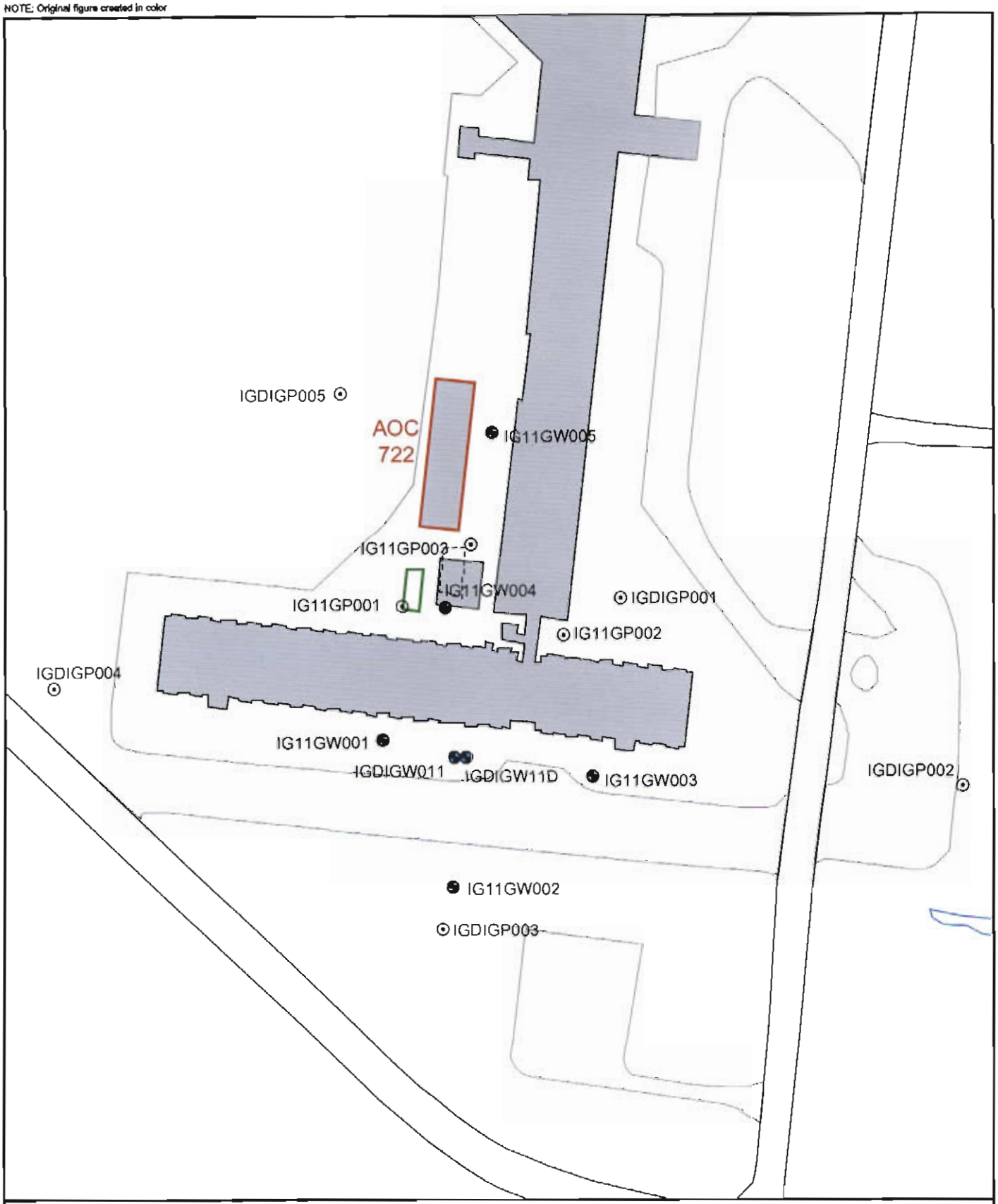
TABLE 2-3
Chemicals Detected in Surface Soil Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (mg/kg)	Qualifier	EPA Region III RBC[a] (HI=0.1)	SSL[b] (DAF=10)	Zone I Background Concentration[c]
Metals								
Aluminum	IGDISB011	GDISB01101	02/17/1995	5630	J	200000	NA	27400
Arsenic	IGDISB011	GDISB01101	02/17/1995	0.46	J	3.8	14.5	20
Barium	IGDISB011	GDISB01101	02/17/1995	14.4	J	14000	800	43
Calcium	IGDISB011	GDISB01101	02/17/1995	12900	J	EN	EN	59500
Chromium, Total	IGDISB011	GDISB01101	02/17/1995	12.5	=	610 [d]	19 [d]	6.3
Copper	IGDISB011	GDISB01101	02/17/1995	4.20	=	8200	NA	556
Iron	IGDISB011	GDISB01101	02/17/1995	3620	J	51000	NA	22700
Lead	IGDISB011	GDISB01101	02/17/1995	21.1	J	1218 [e]	400	203
Magnesium	IGDISB011	GDISB01101	02/17/1995	496	J	EN	NA	3820
Manganese	IGDISB011	GDISB01101	02/17/1995	21.5	J	4100	NA	426
Nickel	IGDISB011	GDISB01101	02/17/1995	4.2	J	4100	65	18
Sodium	IGDISB011	GDISB01101	02/17/1995	400	J	EN	EN	2030
Vanadium	IGDISB011	GDISB01101	02/17/1995	15.3	=	1400	3000	53
Zinc	IGDISB011	GDISB01101	02/17/1995	16.7	J	61000	6000	150
Semivolatile Organic Compounds								
Benzo(a)Anthracene	IGDISB011	GDISB01101	02/17/1995	0.0430	J	7.8	1	NA
Chrysene	IGDISB011	GDISB01101	02/17/1995	0.040	J	780	80	NA
Fluoranthene	IGDISB011	GDISB01101	02/17/1995	0.081	J	4200	2150	NA
Phenanthrene	IGDISB011	GDISB01101	02/17/1995	0.047	J	61000 [f]	6000 [f]	NA
Pyrene	IGDISB011	GDISB01101	02/17/1995	0.063	J	6100	2100	NA

[a] Industrial risk-based concentration (RBC) from the U.S. EPA Region III RBC table (10/2000), based on a hazard index (HI) of 0.1 for non-carcinogenic chemicals.
[b] U.S. EPA Soil Screening Guidance: Technical Background Document (5/1996) based on a dilution attenuation factor (DAF) of 10 (1 for VOCs).
[c] Project Team Notebook and Instructions, Charleston Naval Complex, Environmental Restoration Project. Revision 1A (CH2M-Jones, 12/2001)
[d] Chromium criteria is based on the hexavalent (Cr^{+6}) species.
[e] Adult Lead Methodology (ALM) derived target lead concentration for industrial land use (CH2M-Jones, 2001)
[f] Anthracene used as a surrogate (isometric).
EN Essential nutrient.
mg/kg milligram per kilogram
NA Not applicable or not available.
J indicates that the chemical was detected. The reported concentration is estimated.
= indicates that the chemical was detected. The reported value is the measured concentration.

Bold and boxed values exceed either RBC and/or the SSL, and the Zone I Background Concentration (inorganics).

NOTE: Original figure created in color



Groundwater Probe Locations
Active Well
Fence
Roads
Pavement
Active AOC
NFA AOC
Buildings

N

0 70 140 Feet

1 inch = 83.3333 feet

Figure 2-1
Pre-RFI Groundwater Sampling Locations
AOC 722, Zone I
Charleston Naval Complex
Charleston, South Carolina

CH2MHILL

E042004015GNV

NOTE: Original figure created in color

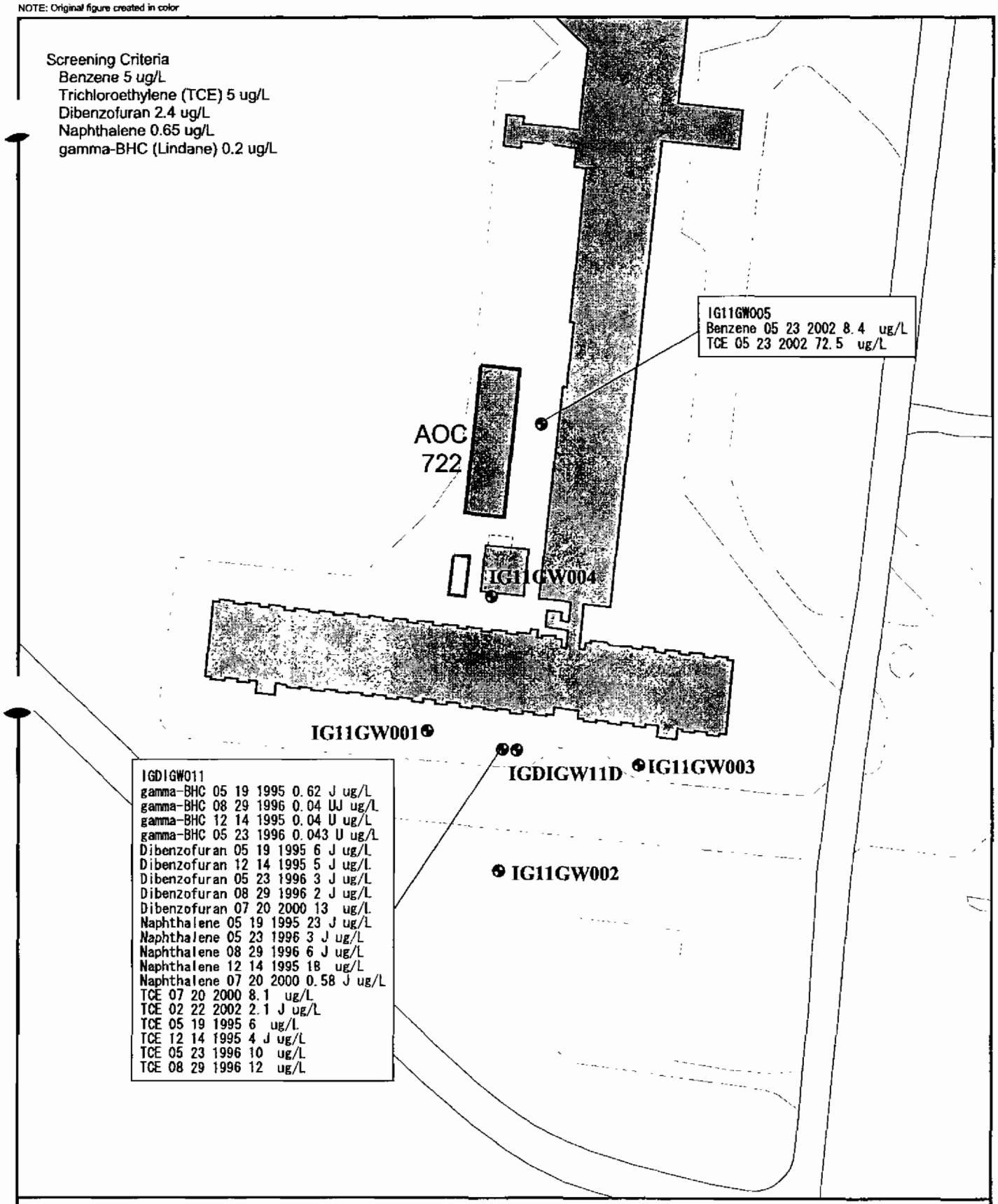


Figure 2-2
Pre-RFI Groundwater COPC Concentrations (Organics)
AOC 722, Zone I
Charleston Naval Complex

CH2MHILL

File Path: c:\18gis\cnc\aoc722 f2-2 organic copcs in gw.apr, Date: 13 Sep 2004 13:18, User: JEDENS, EGIS: Charleston Naval Complex - Figure 2-2 Organic Groundwater COPC Concentrations

3.0 AOC 722 RFI Technical Approach

In May 2003, an RFA/RFI Work Plan was submitted to SCDHEC, which approved it in August 2003. The RFI work was performed to determine the nature and extent of any releases of hazardous wastes or constituents from the vicinity of Building 1875. Based on site operational history and previous groundwater sampling results, delineation of the nature and extent of contamination in soil and groundwater was necessary to complete the RFI.

Soil sampling and monitoring well installation locations were marked in the field prior to the initiation of field work, and the necessary agencies and departments were notified regarding activities planned at these locations, including marking and clearance of existing underground utility lines.

Summaries of detected chemicals are presented in this section to support conclusions drawn from these data. Complete analytical results for samples collected by CH2M-Jones since 2000 are presented in Appendix A. The data validation summary is provided in Appendix B.

3.1 Soil Sampling and Analysis

There were no known releases of hazardous substances to the environment at AOC 722, and no documentation of visual evidence of contamination during any of the site inspections or previous field work. However, groundwater data suggest that a source of VOC contamination may exist in the general area of Building 1875, which was previously used as a supply/storage warehouse. Ten soil borings were proposed upgradient of monitoring well IGDIGW011.

Six soil borings were installed around the perimeter of Building 1875, with three of the borings located in the ditch between Buildings 0028 and 1875. The rationale for these borings was to collect soil samples to evaluate potential releases or spills of liquids to the soil and ditch.

Four soil samples were also collected downgradient of Building 1875. Two soil samples were collected at locations on the south side of Facility 1795 and two from locations south of Building 0028. RFI soil boring locations are shown on Figure 3-1.

The RFI Work Plan (CH2M-Jones, 2003) proposed a surface soil (0 to 1 feet below land surface [ft bls]) and a subsurface (3 to 5 ft bls) soil sample be collected at each location, as site conditions allowed.

Due to the shallow water table at the site, typically less than 3 ft bls, the planned subsurface soil samples at AOC 722 could not be collected.

The soil sample collection and equipment decontamination procedures used generally conformed to the procedures described in the Comprehensive Sampling and Analysis Plan (CSAP) portion of the CNC RFI Work Plan (EnSafe/Allen & Hoshall, 1994). Soil samples were originally planned for collection using a Geoprobe rig, but because of the shallow water table, only surface soil samples (0 to 1 ft bls) were collected from each boring location, using a stainless steel hand auger. For samples beneath asphalt pavement, a small section of payment was cut out prior to sampling. Holes in the asphalt were patched with cold patch material.

Soil samples were collected and analyzed for VOCs, SVOCs, RCRA metals, pesticides, and PCBs in accordance with the data quality objectives of the RFI Work Plan.

3.2 Monitoring Well Installation

Three additional shallow monitoring wells were installed in September 2003 to address the lateral extent of VOCs in groundwater. Figure 3-2 shows the locations of the three new monitoring wells and existing wells sampled during the RFI.

One well was installed to the east of existing well IG11GW005 to determine lateral plume extent. This well, I722GW001, is located in the grassy area on the east side of Building 0028 to better refine hydraulic gradients and direction of shallow groundwater flow.

The second new monitoring well, I722GW002, was installed approximately 60 feet west of Building 1875 to assess lateral VOC plume extent and better refine hydraulic gradients and direction of shallow groundwater flow. The third new monitoring well, I722GW003, was installed to assess the downgradient plume extent of VOCs southeast of existing well IG11GW002.

Wells were constructed of 2-inch diameter polyvinyl chloride (PVC) casin with 10-foot screens to match the existing wells, with a total completed depth of approximately 12 to 14 ft bls. Soil boring/well construction logs and the details of well construction for each well are presented in Appendix C. The new wells were developed after installation and allowed to equilibrate prior to beginning groundwater sampling.

A state of South Carolina certified well driller was used for monitoring well installation on this project. In accordance with Rule R.61-79.265, Subpart F of the South Carolina Hazardous Waste Management Regulations and R.61-71 of the South Carolina Well Standards and Regulations, a request for the advancement of the monitoring wells and soil borings was submitted to, and approved by, SCDHEC prior to the well installation.

3.3 Groundwater Sampling and Analysis

Following development, the three new wells, the three existing shallow monitoring wells, and the two existing grid wells were sampled in October 2003, with samples analyzed for VOCs, SVOCs, RCRA metals, and pesticides. In April 2004, these eight monitoring wells were again sampled, with samples analyzed for VOCs.

Prior to sampling in October 2003 and in April 2004, depth-to-water was measured in wells IG722GW001 through 003, IG11GW001 through 005, IG11GW011, and IG11GW11D. These measurements were used to develop the potentiometric surface contours that are shown on Figures 3-3 (October 2003) and 3-4 (April 2004). Monitoring well G11GW11D is screened in a deeper portion of the aquifer and the water level data from this well were not used in the potentiometric surface figures. Water level information used to develop the potentiometric surface map is presented in Tables 3-1 and 3-2.

TABLE 3-1
Groundwater Levels (October 2003)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Station ID	TOC Elevation (ft msl)	Water Level (ft btoc)	Water Level (ft msl)
I722GW001	5.57	2.64	2.93
I722GW002	5.83	3.20	2.63
I722GW003	4.83	2.20	2.63
IG11GW001	5.72	2.11	3.61
IG11GW002	5.30	2.90	2.40
IG11GW003	5.89	2.17	3.72
IG11GW004	7.41	3.63	3.78
IG11GW005	6.77	4.15	2.62
IGDIGW011	8.59	4.75	3.84
IGDIGW11D	8.78	6.71	2.07

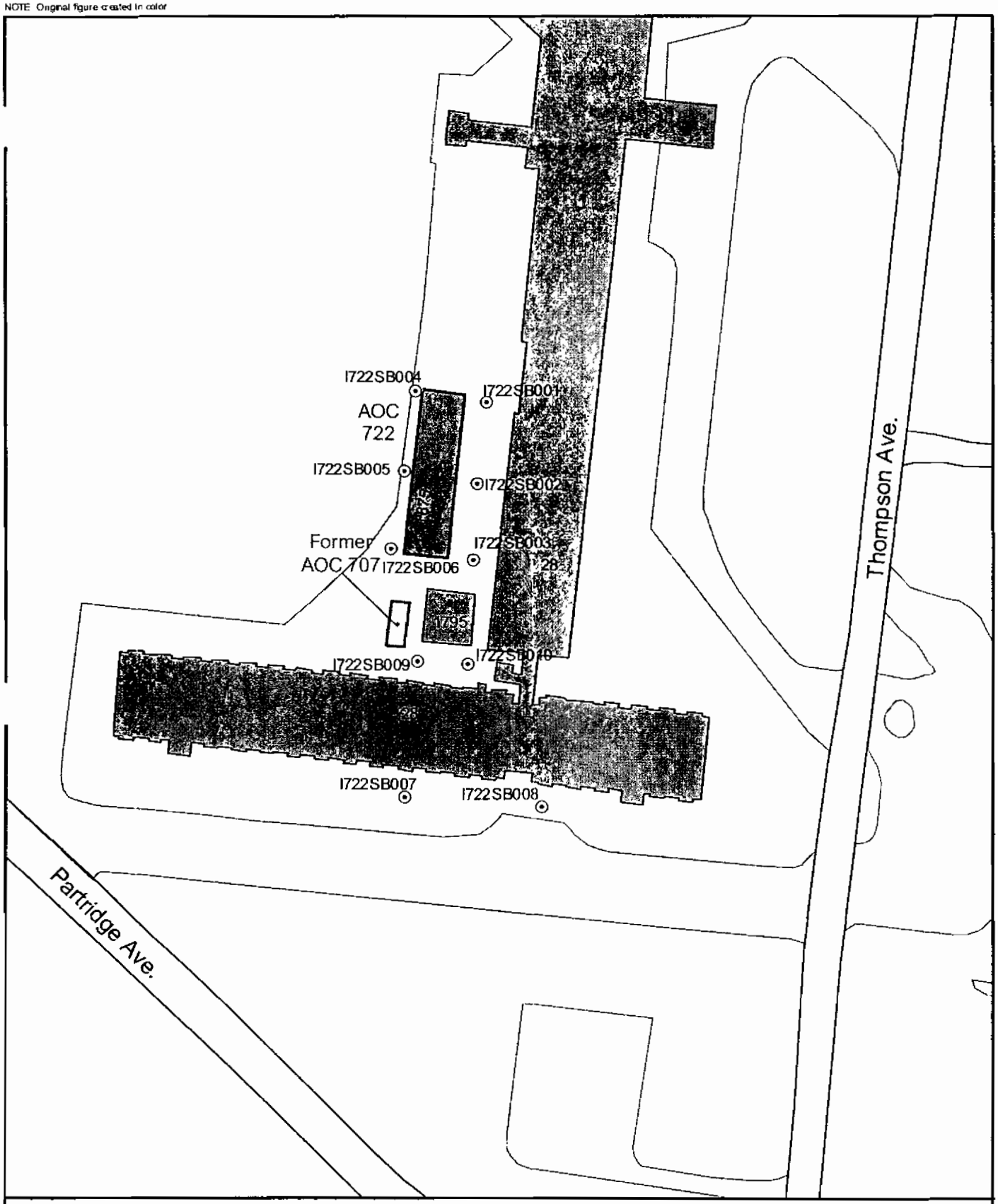
TOC = Top of casing
ft = feet
msl = mean sea level
btoc = below top of casing

TABLE 3-2
Groundwater Levels (April 21, 2004)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Station ID	TOC Elevation (ft msl)	Water Level (ft btoc)	Water Level (ft msl)
I722GW001	5.57	2.29	3.28
I722GW002	5.83	3.10	2.73
I722GW003	4.83	2.49	2.34
IG11GW001	5.72	2.28	3.44
IG11GW002	5.30	2.67	2.63
IG11GW003	5.89	2.13	3.76
IG11GW004	7.41	3.79	3.62
IG11GW005	6.77	4.60	2.17
IGDIGW011	8.59	4.62	3.97
IGDIGW11D	8.78	6.10	2.68

TOC = Top of casing
ft = feet
msl = mean sea level
btoc = below top of casing

NOTE: Original figure created in color



Soil Boring

Roads
Pavement
Shoreline

AOC Boundary
NFA AOC Boundary
Buildings

N

0 60 120 Feet

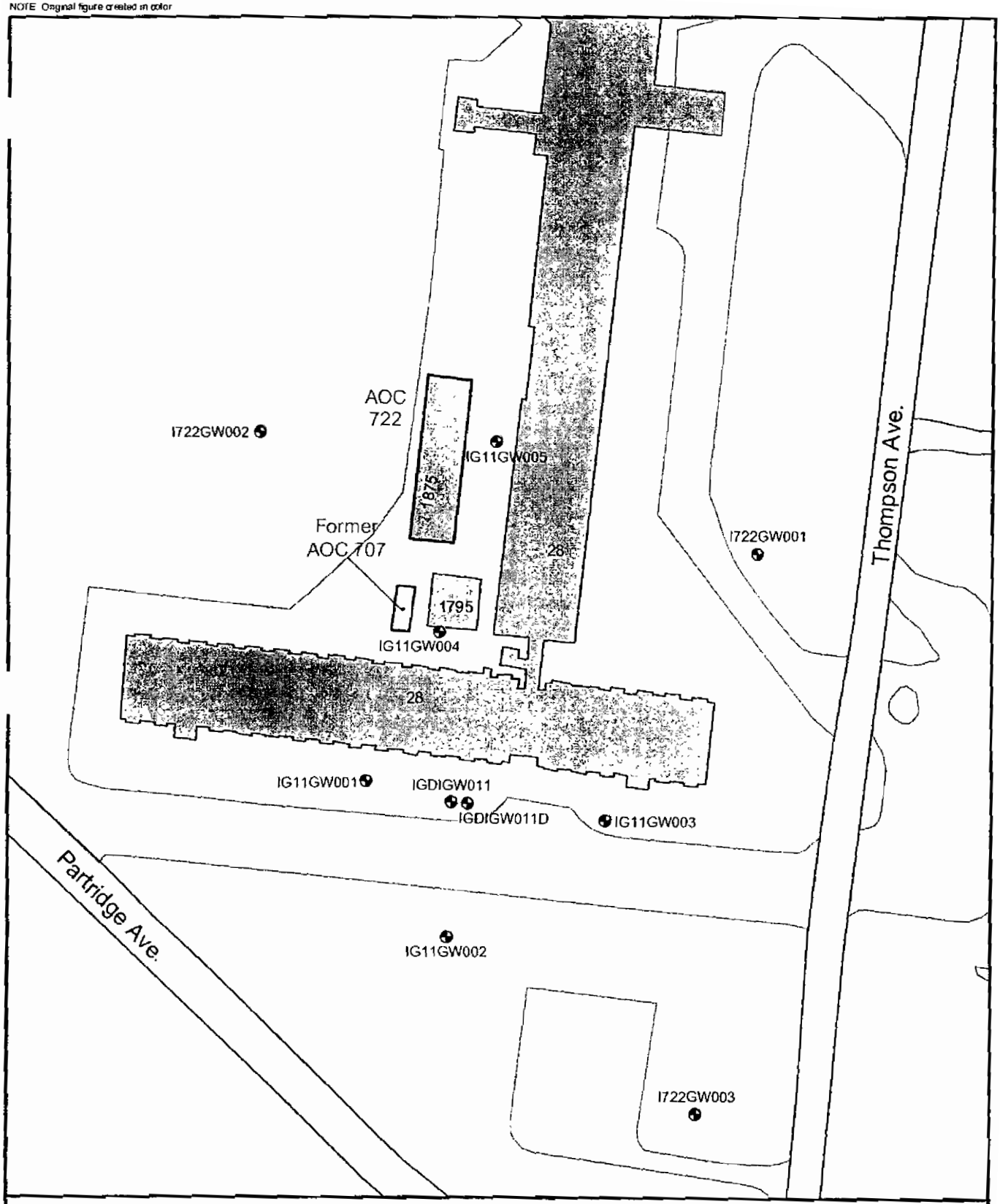
1 inch = 75 feet

Figure 3-1
RFI Soil Sampling Locations
AOC 722, Zone I
Charleston Naval Complex

CH2MHILL

L042004015GNV

NOTE Original figure created in color



Monitoring Well

✓ Roads
Pavement
Shoreline

AOC Boundary
NFA AOC Boundary
Buildings

N

0 60 120 Feet

1 inch = 75 feet

Figure 3-2
RFI Groundwater Sampling Locations
AOC 722, Zone I
Charleston Naval Complex

CH2MHILL

E042004015GNV

NOTE Original figure created in color

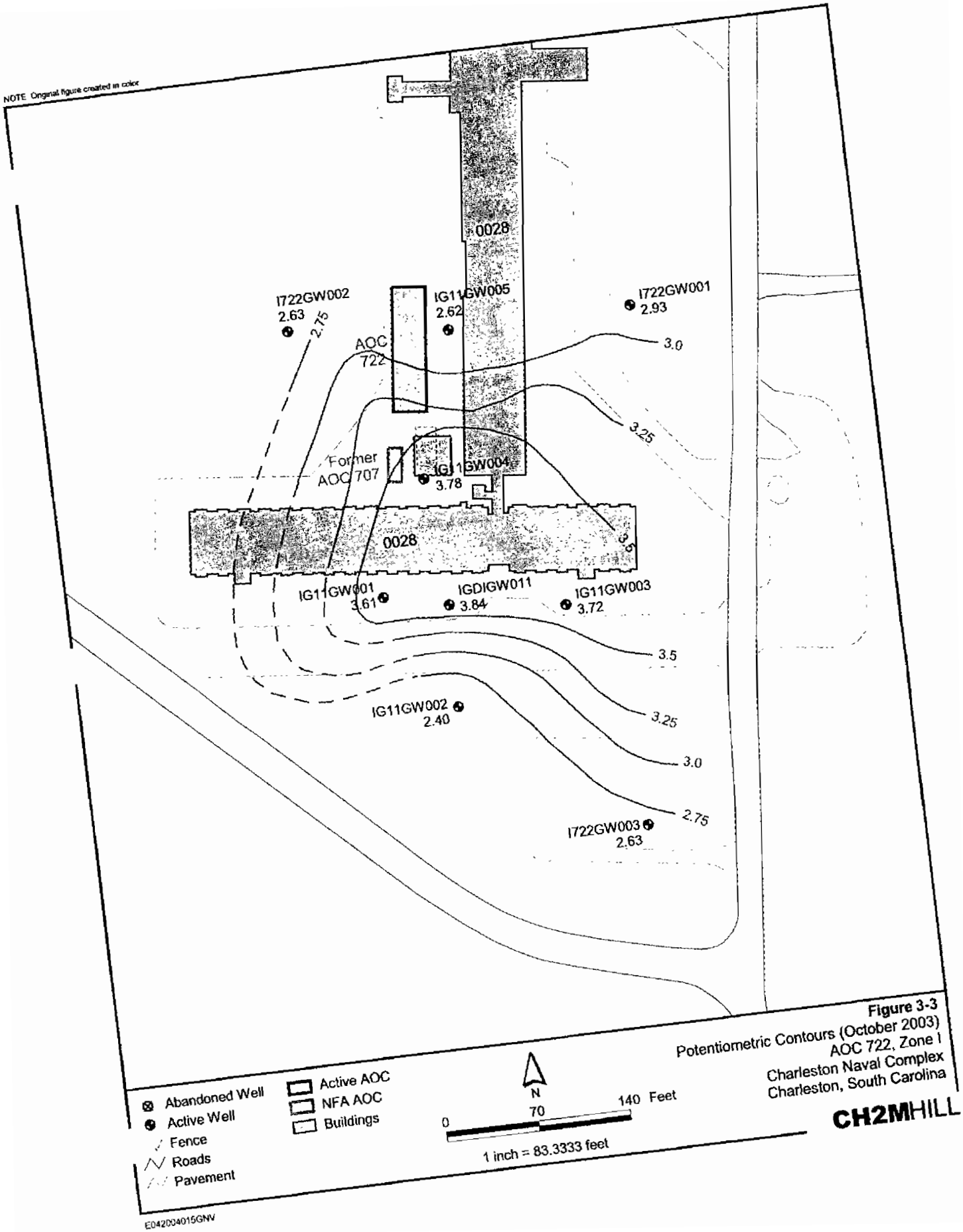
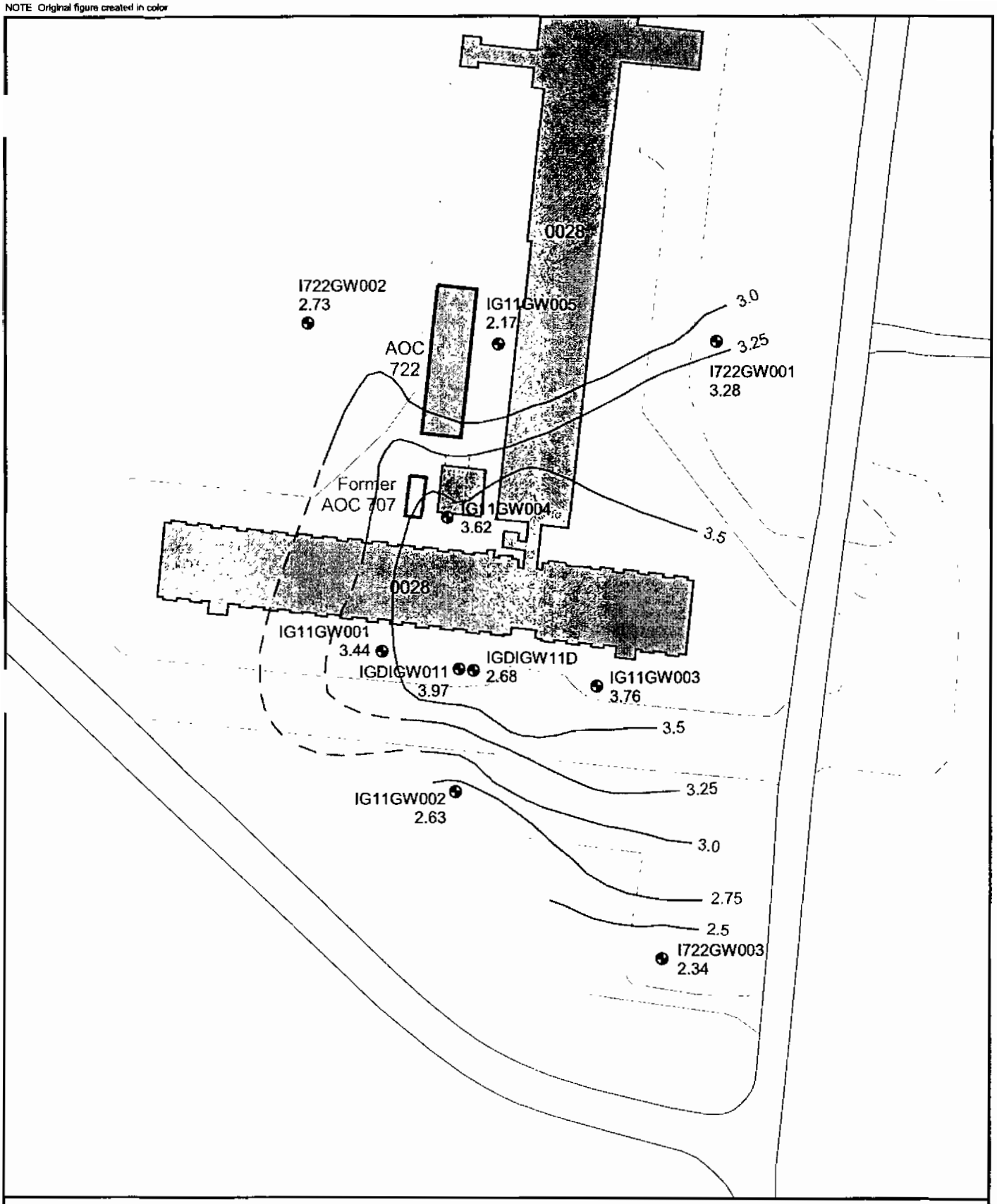


Figure 3-3
Potentiometric Contours (October 2003)
AOC 722, Zone I
Charleston Naval Complex
Charleston, South Carolina

CH2MHILL

E042004015GNV

NOTE Original figure created in color



Abandoned Well
Active Well
Fence
Roads
Pavement
Active AOC
NFA AOC
Buildings

N

0 70 140 Feet

1 inch = 83.3333 feet

Figure 3-4
Potentiometric Contours (April 2004)
AOC 722, Zone I
Charleston Naval Complex
Charleston, South Carolina

E042004015GNV

Section 4.0

4.0 Summary of AOC 722 RFI Results

4.1 Soil Investigation

4.1.1 Surface Soil Results

Ten surface soil samples were proposed in the RFA/RFI Work Plan. These samples were collected in accordance with the RFI Work Plan and analyzed for VOCs, SVOCs, PCBs, RCRA metals, and pesticides. In addition, the analytical results from one surface soil sample (IGDSB011), collected during the installation of monitoring well IGDGW011, was used in the evaluation of the site. This sample was analyzed for VOCs, SVOCs, PCBs, pesticides, metals, and cyanide. The results from these samples are discussed below.

The analytical results from surface soil samples were compared to EPA Region III Industrial RBCs, SSLs (based on DAF of 1 for VOCs and 10 for other chemicals), and the Zone I range of background concentrations (inorganics). Carcinogenic polynuclear aromatic hydrocarbons (cPAHs) were also compared to the base-wide reference concentration developed for the CNC (CH2M-Jones, 2001). An individual constituent was identified as a COPC if it was detected above its background concentration and above either the RBC or SSL, or both. This section presents the results of this comparison. A summary of the chemicals detected in surface soil is presented in Table 4-1.

Seven inorganic chemicals were detected in surface soil samples collected at AOC 722. Two metals were detected at concentrations that exceed their respective Zone I background concentrations and their SSLs in one or more samples. Chromium was detected above its screening criteria in the samples collected at I722SB004 (19.5 milligrams per kilograms [mg/kg]) and I722SB005 (32.0 mg/kg). It should be noted that the chromium SSL is based on the hexavalent chromium species (Cr^{+6}). The trivalent species (Cr^{+3}), which is more abundant and stable, is not considered by EPA to be a threat to shallow groundwater at any concentration. Because no data exist to determine the species of chromium present at the site, the more conservative screening criterion was used, although it is more likely that the trivalent species is present. Mercury was also detected above its Zone I background concentration and its SSL in the sample collected at I722SB008 (6.03 mg/kg).

Two VOCs were detected in surface soil samples collected at AOC 722. None of the detected concentrations exceeded available screening criteria.

Fifteen SVOCs were detected in surface soil samples collected at AOC 722. One compound, benzo(a)pyrene, was detected above its industrial screening criterion and background concentration. It was detected above screening criteria in two surface soil samples collected at 722SB005 (0.832 mg/kg) and 722SB006 (0.964 mg/kg). The calculated benzo(a)pyrene equivalent (BEQ) for these two samples also exceeded the base-wide background concentration for BEQs. No SVOCs were detected above their respective SSLs.

Nine pesticides were detected in surface soil samples collected at AOC 722. One pesticide, dieldrin, was detected above its SSL. It was detected above screening criteria in three surface soil samples collected at 722SB004 (0.0104 mg/kg), 722SB005 (0.00628 mg/kg), and 722SB007 (0.0024 mg/kg). No pesticides were detected above their respective residential RBCs.

Two PCBs were detected in surface soil samples collected at AOC 722. None of the detected concentrations exceeded available screening criteria.

Based on the screening process outlined in this section, the following COPCs were identified for surface soil at AOC 722 based on the RFI data.

- Chromium
- Mercury
- Dieldrin
- Benzo(a)pyrene/BEQs

4.1.2 Subsurface Soil Results

Because groundwater was encountered within or above the planned subsurface soil collection interval, typically at a depth of less than 3 ft bls, the planned subsurface soil samples could not be collected at AOC 722. Therefore, evaluation of subsurface soil could not be performed.

4.2 Groundwater Investigation

Multiple groundwater sampling efforts have been conducted in the area of AOC 722. Most of the samples were collected prior to the establishment of AOC 722. Table 4-2 summarizes the sampling events conducted at AOC 722. The locations of the monitoring wells are shown on Figure 3-2.

4.2.1 Groundwater Sampling and Analysis

Groundwater sampling at AOC 722 was conducted in multiple phases. Early pre-RFI samples, those collected before 1998, were analyzed for VOCs, SVOCs, PCBs, pesticides, metals, cyanide, and general chemistry parameters. Later samples were analyzed for a more limited list of analytes. Samples collected to support the RFI were collected in October 2003 and April 2004 and were analyzed for VOCs. The 2003 samples were also analyzed for total and dissolved metals (lead and thallium). Table 4-2 summarizes the groundwater sampling at AOC 722.

4.2.2 Groundwater Sampling Results

Table 4-3 presents a summary of the detected chemicals in groundwater samples collected at AOC 722 in support of the RFI. The complete analytical results are presented in Appendix A, with data validation summaries for the data included as Appendix B. The analytical results were compared to EPA Primary Drinking Water MCLs, EPA Region III Tap Water RBCs if no MCL was available, and Zone I RFI grid well reference concentration ranges (inorganics only).

Inorganic chemicals were not detected in either the total or filtered (dissolved) groundwater samples collected at AOC 722.

No VOCs were detected in groundwater samples at concentrations that exceeded their respective screening criteria in the samples collected to support the RFI.

Based on the screening process outlined in this section, additional COPCs were not identified for groundwater at AOC 722 based on the RFI sample results.

TABLE 4-1
Chemicals Detected in Surface Soil Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (mg/kg)	Qualifier	EPA Region III RBC[a] (HI=0.1)	SSL[b] (DAF=10)	Zone I Background Concentration[c]
Metals								
Arsenic	I722SB005	722SB00501	07/11/2003	4.19	=	3.8	14.5	20
	I722SB008	722SB00801	07/11/2003	3.83	=			
	I722SB010	722SB01001	07/11/2003	2.55	=			
	I722SB007	722SB00701	07/11/2003	2.52	=			
	I722SB009	722SB00901	07/11/2003	2.52	=			
	I722SB004	722SB00401	07/11/2003	2.50	=			
	I722SB006	722SB00601	07/11/2003	2.42	=			
	I722SB003	722SB00301	07/11/2003	2.13	J			
	I722SB001	722SB00101	07/11/2003	1.47	J			
	I722SB002	722SB00201	07/11/2003	1.18	J			
Barium	I722SB005	722SB00501	07/11/2003	31.3	J	14000	800	43
	I722SB004	722SB00401	07/11/2003	29.7	J			
	I722SB002	722SB00201	07/11/2003	29.1	J			
	I722SB008	722SB00801	07/11/2003	25.6	J			
	I722SB001	722SB00101	07/11/2003	25.5	J			
	I722SB003	722SB00301	07/11/2003	24.7	J			
	I722SB006	722SB00601	07/11/2003	24.5	J			
	I722SB010	722SB01001	07/11/2003	19.9	J			
	I722SB009	722SB00901	07/11/2003	18.4	J			
	I722SB007	722SB00701	07/11/2003	15.5	J			
Cadmium	I722SB005	722SB00501	07/11/2003	0.862	J	200	4	0.61
	I722SB004	722SB00401	07/11/2003	0.487	J			
	I722SB009	722SB00901	07/11/2003	0.408	J			

TABLE 4-1
Chemicals Detected in Surface Soil Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (mg/kg)	Qualifier	EPA Region III RBC[a] (HI=0.1)	SSL[b] (DAF=10)	Zone I Background Concentration[c]
	I722SB006	722SB00601	07/11/2003	0.307	J			
Chromium, Total	I722SB005	722SB00501	07/11/2003	**32.0**	=	610 [d]	19 [d]	6.3
	I722SB004	722SB00401	07/11/2003	**19.5**	=			
	I722SB009	722SB00901	07/11/2003	18.6	=			
	I722SB006	722SB00601	07/11/2003	18.1	=			
	I722SB001	722SB00101	07/11/2003	17.3	=			
	I722SB008	722SB00801	07/11/2003	13.2	=			
	I722SB010	722SB01001	07/11/2003	11.7	=			
	I722SB002	722SB00201	07/11/2003	10.1	=			
	I722SB003	722SB00301	07/11/2003	9.02	=			
	I722SB007	722SB00701	07/11/2003	8.92	=			
Lead	I722SB005	722SB00501	07/11/2003	123	=	1218 [e]	400	203
	I722SB004	722SB00401	07/11/2003	67.4	=			
	I722SB006	722SB00601	07/11/2003	45.9	=			
	I722SB009	722SB00901	07/11/2003	22.4	=			
	I722SB003	722SB00301	07/11/2003	21.4	=			
	I722SB010	722SB01001	07/11/2003	20.8	=			
	I722SB007	722SB00701	07/11/2003	17.3	=			
	I722SB001	722SB00101	07/11/2003	15.7	=			
	I722SB002	722SB00201	07/11/2003	15.3	=			
	I722SB008	722SB00801	07/11/2003	11.6	=			
Mercury	I722SB008	722SB00801	07/11/2003	**6.03**	=	61 [f]	1	0.47
	I722SB005	722SB00501	07/11/2003	0.111	J			
	I722SB007	722SB00701	07/11/2003	0.053	J			

TABLE 4-1
Chemicals Detected in Surface Soil Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (mg/kg)	Qualifier	EPA Region III RBC[a] (HI=0.1)	SSL[b] (DAF=10)	Zone I Background Concentration[c]
	I722SB004	722SB00401	07/11/2003	0.052	J			
	I722SB010	722SB01001	07/11/2003	0.030	J			
	I722SB003	722SB00301	07/11/2003	0.025	J			
	I722SB009	722SB00901	07/11/2003	0.024	J			
	I722SB006	722SB00601	07/11/2003	0.024	J			
	I722SB002	722SB00201	07/11/2003	0.018	J			
	I722SB001	722SB00101	07/11/2003	0.015	J			
Selenium	I722SB009	722SB00901	07/11/2003	0.683	J	1000	2.5	1.1
	I722SB006	722SB00601	07/11/2003	0.449	J			
Volatile Organic Compounds								
Acetone	I722SB007	722SB00701	07/11/2003	0.0768	=	20000	0.8	NA
	I722SB008	722SB00801	07/11/2003	0.0071	J			
Methyl ethyl ketone (2-Butanone)	I722SB007	722SB00701	07/11/2003	0.0155	=	120000	NA	NA
Semivolatile Organic Compounds								
2-Methylnaphthalene	I722SB005	722SB00501	07/11/2003	0.0218	J	4100 [g]	42 [g]	NA
Acenaphthene	I722SB004	722SB00401	07/11/2003	0.0381	J	12000	285	NA
	I722SB005	722SB00501	07/11/2003	0.0284	J			
Anthracene	I722SB005	722SB00501	07/11/2003	0.0829	J	61000	6000	NA
	I722SB004	722SB00401	07/11/2003	0.0757	J			
Benzo(a)Anthracene	I722SB005	722SB00501	07/11/2003	0.710	=	7.8	1	0.616
	I722SB004	722SB00401	07/11/2003	0.292	J			
	I722SB002	722SB00201	07/11/2003	0.187	J			
	I722SB010	722SB01001	07/11/2003	0.0387	J			
Benzo(a)Pyrene	I722SB006	722SB00601	07/11/2003	**0.964**	J	0.78	4	0.598

TABLE 4-1
Chemicals Detected in Surface Soil Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (mg/kg)	Qualifier	EPA Region III RBC[a] (HI=0.1)	SSL[b] (DAF=10)	Zone I Background Concentration[c]
	I722SB005	722SB00501	07/11/2003	0.832	J			
	I722SB004	722SB00401	07/11/2003	0.378	J			
	I722SB002	722SB00201	07/11/2003	0.259	J			
	I722SB010	722SB01001	07/11/2003	0.144	J			
Benzo(b)Fluoranthene	I722SB005	722SB00501	07/11/2003	1.84	J	7.8	2.5	0.608
	I722SB006	722SB00601	07/11/2003	1.57	J			
	I722SB004	722SB00401	07/11/2003	0.472	=			
	I722SB002	722SB00201	07/11/2003	0.385	=			
	I722SB010	722SB01001	07/11/2003	0.157	J			
Benzo(g,h,i)Perylene	I722SB005	722SB00501	07/11/2003	0.536	J	0.78 [h]	4 [h]	NA
	I722SB004	722SB00401	07/11/2003	0.300	J			
	I722SB002	722SB00201	07/11/2003	0.256	J			
Carbazole	I722SB005	722SB00501	07/11/2003	0.0858	J	290	0.3	NA
	I722SB004	722SB00401	07/11/2003	0.0602	J			
Chrysene	I722SB005	722SB00501	07/11/2003	1.11	=	780	80	0.62
	I722SB006	722SB00601	07/11/2003	0.752	J			
	I722SB004	722SB00401	07/11/2003	0.362	J			
	I722SB002	722SB00201	07/11/2003	0.188	J			
	I722SB010	722SB01001	07/11/2003	0.0368	J			
Dibenzofuran	I722SB005	722SB00501	07/11/2003	0.0226	J	820	NA	NA
Fluoranthene	I722SB005	722SB00501	07/11/2003	1.79	=	4200	2150	NA
	I722SB006	722SB00601	07/11/2003	1.12	J			
	I722SB004	722SB00401	07/11/2003	0.730	=			
	I722SB002	722SB00201	07/11/2003	0.256	J			

TABLE 4-1
Chemicals Detected in Surface Soil Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (mg/kg)	Qualifier	EPA Region III RBC[a] (HI=0.1)	SSL[b] (DAF=10)	Zone I Background Concentration[c]
	I722SB010	722SB01001	07/11/2003	0.0604	J			
	I722SB007	722SB00701	07/11/2003	0.0469	J			
	I722SB009	722SB00901	07/11/2003	0.0402	J			
	I722SB003	722SB00301	07/11/2003	0.0202	J			
Fluorene	I722SB005	722SB00501	07/11/2003	0.0370	J	4200	280	NA
	I722SB004	722SB00401	07/11/2003	0.0365	J			
	I722SB006	722SB00601	07/11/2003	0.0200	J			
Indeno(1,2,3-c,d)pyrene	I722SB005	722SB00501	07/11/2003	0.529	J	7.8	7	0.525
	I722SB004	722SB00401	07/11/2003	0.318	J			
	I722SB002	722SB00201	07/11/2003	0.256	J			
Phenanthrene	I722SB005	722SB00501	07/11/2003	0.974	=	61000 [i]	6000 [i]	NA
	I722SB006	722SB00601	07/11/2003	0.528	J			
	I722SB004	722SB00401	07/11/2003	0.444	=			
	I722SB002	722SB00201	07/11/2003	0.075	J			
	I722SB007	722SB00701	07/11/2003	0.0215	J			
	I722SB010	722SB01001	07/11/2003	0.0212	J			
Pyrene	I722SB005	722SB00501	07/11/2003	2.37	=	6100	2100	NA
	I722SB006	722SB00601	07/11/2003	1.37	J			
	I722SB004	722SB00401	07/11/2003	0.59	=			
	I722SB002	722SB00201	07/11/2003	0.269	J			
	I722SB007	722SB00701	07/11/2003	0.0657	J			
	I722SB010	722SB01001	07/11/2003	0.0545	J			
	I722SB009	722SB00901	07/11/2003	0.0534	J			
	I722SB008	722SB00801	07/11/2003	0.0474	J			

TABLE 4-1
Chemicals Detected in Surface Soil Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (mg/kg)	Qualifier	EPA Region III RBC[a] (HI=0.1)	SSL[b] (DAF=10)	Zone I Background Concentration[c]
BEQs	I722SB006	722SB00601	07/11/2003	**2.10**	=	0.78	4	1.304
	I722SB005	722SB00501	07/11/2003	**1.34**	=			
	I722SB004	722SB00401	07/11/2003	0.687	=			
	I722SB002	722SB00201	07/11/2003	0.534	=			
	I722SB010	722SB01001	07/11/2003	0.384	=			
	I722SB007	722SB00701	07/11/2003	0.474	U			
	I722SB009	722SB00901	07/11/2003	0.455	U			
	I722SB008	722SB00801	07/11/2003	0.454	U			
	I722SB003	722SB00301	07/11/2003	0.444	U			
	I722SB001	722SB00101	07/11/2003	0.443	U			
Pesticides								
Alpha-chlordane	I722SB008	722SB00801	07/11/2003	0.117	J	16[j]	5[j]	NA
	I722SB005	722SB00501	07/11/2003	0.0517	J			
	I722SB006	722SB00601	07/11/2003	0.0141	J			
Chlordane	I722SB008	722SB00801	07/11/2003	0.420	J	16	5	NA
Dieldrin	I722SB004	722SB00401	07/11/2003	**0.0104**	J	0.36	0.002	NA
	I722SB005	722SB00501	07/11/2003	**0.00628**	J			
	I722SB007	722SB00701	07/11/2003	**0.0024**	J			
	I722SB009	722SB00901	07/11/2003	0.00126	J			
	I722SB001	722SB00101	07/11/2003	0.00022	J			
Endrin Aldehyde	I722SB001	722SB00101	07/11/2003	0.00036	J	61[k]	0.5[k]	NA
Gamma-chlordane	I722SB008	722SB00801	07/11/2003	0.04750	=	16[j]	5[j]	NA
	I722SB006	722SB00601	07/11/2003	0.0316	J			
	I722SB005	722SB00501	07/11/2003	0.0266	J			

TABLE 4-1
Chemicals Detected in Surface Soil Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (mg/kg)	Qualifier	EPA Region III RBC[a] (HI=0.1)	SSL[b] (DAF=10)	Zone I Background Concentration[c]
	I722SB004	722SB00401	07/11/2003	0.00896	=			
	I722SB007	722SB00701	07/11/2003	0.00116	J			
Heptachlor Epoxide	I722SB006	722SB00601	07/11/2003	0.018	J	0.63	0.35	NA
p,p'-DDD	I722SB002	722SB00201	07/11/2003	0.0114	=	24	8	NA
	I722SB001	722SB00101	07/11/2003	0.00224	J			
	I722SB009	722SB00901	07/11/2003	0.00057	J			
p,p'-DDE	I722SB002	722SB00201	07/11/2003	0.009	=	17	27	NA
	I722SB003	722SB00301	07/11/2003	0.00608	J			
	I722SB010	722SB01001	07/11/2003	0.00464	J			
	I722SB008	722SB00801	07/11/2003	0.00459	J			
	I722SB007	722SB00701	07/11/2003	0.0037	J			
	I722SB001	722SB00101	07/11/2003	0.00353	=			
	I722SB009	722SB00901	07/11/2003	0.00295	J			
p,p'-DDT	I722SB002	722SB00201	07/11/2003	0.0134	=	17	16	NA
	I722SB009	722SB00901	07/11/2003	0.00489	=			
	I722SB001	722SB00101	07/11/2003	0.00092	J			
Polychlorinated Biphenyls								
PCB-1254 (Aroclor 1254)	I722SB010	722SB01001	07/11/2003	0.0464	=	2.9	1	NA
	I722SB002	722SB00201	07/11/2003	0.0156	=			
	I722SB003	722SB00301	07/11/2003	0.0043	=			
PCB-1260 (Aroclor 1260)	I722SB004	722SB00401	07/11/2003	0.274	=	2.9	1	NA
	I722SB005	722SB00501	07/11/2003	0.0384	J			
	I722SB007	722SB00701	07/11/2003	0.0181	=			
	I722SB010	722SB01001	07/11/2003	0.0163	J			

TABLE 4-1
Chemicals Detected in Surface Soil Samples
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (mg/kg)	Qualifier	EPA Region III RBC[a] (HI=0.1)	SSL[b] (DAF=10)	Zone I Background Concentration[c]
	I722SB006	722SB00601	07/11/2003	0.0119	=			
	I722SB002	722SB00201	07/11/2003	0.0045	=			
	I722SB008	722SB00801	07/11/2003	0.0041	J			
	I722SB009	722SB00901	07/11/2003	0.0035	J			
	I722SB001	722SB00101	07/11/2003	0.0030	J			
	I722SB003	722SB00301	07/11/2003	0.0021	J			

[a] Industrial risk-based concentration (RBC) from the U.S. EPA Region III RBC table (10/2000), based on a hazard index (HI) of 0.1 for non-carcinogenic chemicals.
[b] U.S. EPA Soil Screening Guidance: Technical Background Document (5/1996) based on a dilution attenuation factor (DAF) of 10 (1 for VOCs).
[c] Project Team Notebook and Instructions, Charleston Naval Complex, Environmental Restoration Project. Revision 1A (CH2M-Jones, 12/2001)
[d] Chromium criteria is based on the hexavalent (Cr^{+6}) species.
[e] Adult Lead Methodology (ALM) derived target lead concentration for industrial land use (CH2M-Jones, 2001)
[f] Mercuric chloride screening criterion.
[g] Naphthalene used as a surrogate.
[h] Benzo(a)pyrene used as a surrogate.
[i] Anthracene used as a surrogate (isometric).
[j] Chlordane used as a surrogate.
[k] Endrin used as a surrogate.

EN Essential nutrient.
NA Not applicable or not available.
J indicates that the chemical was detected. The reported concentration is estimated.
= indicates that the chemical was detected. The reported value is the measured concentration.

Bold and boxed values exceed either RBC and/or the SSL, and the Zone I Background Concentration (inorganics).

TABLE 4-2
Summary of Groundwater Sampling
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Date	Well(s)	Analyses
May & June 1995	IGDIGW011 and IGDIGW11D	VOCs, SVOCs, PCBs, Pesticides, Metals, and Cyanide
December 1995	IGDIGW011 and IGDIGW11D	VOCs, SVOCs, PCBs, Pesticides, Metals, and Cyanide
May 1996	IGDIGW011 and IGDIGW11D	VOCs, SVOCs, PCBs, Pesticides, Metals, and Cyanide
August 1996	IGDIGW011 and IGDIGW11D	VOCs, SVOCs, PCBs, Pesticides, Metals, and Cyanide
January 1998	IGDIGP001, IGDIGP002, IGDIGP003, IGDIGP004, and IGDIGP005	VOCs
July 2000	IGDIGW011	VOCs and SVOCs
February 2002	IG11GW001, IG11GW002, IG11GW003, IGDIGW011 and IGDIGW11D	VOCs
May 2002	IG11GP001, IG11GP002, IG11GP003, IG11GW004 and IG11GW005	VOCs
October 2003	I722GW001, I722GW002, I722GW003, IG11GW001, IG11GW002, IG11GW003, IG11GW004, IG11GW005, IGDIGW011, and IGDIGW11D	VOCs, Filtered and unfiltered metals
April 2004	I722GW001, I722GW002, I722GW003, \IG11GW001, IG11GW002, IG11GW003, IG11GW004, IG11GW005, IGDIGW011, and IGIDGW11D	VOCs

TABLE 4-3
Chemicals Detected in RFI Groundwater Samples (2003 - 2004)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL[a]	EPA Region III RBC[b] (HI=0.1)	Zone I Background Concentration[c]
Volatile Organic Compounds								
1,1-Dichloroethane	IGDIGW011	GDIGW011N1	10/13/2003	0.65	J	5 [d]	NA	NA
		GDIGW011P1	04/22/2004	0.58	J			
1,2-Dichlorobenzene	IG11GW002	G11GW002N1	10/14/2003	0.48	J	600	NA	NA
1,2-Dichloroethene (total)	I722GW001	722GW001P1	04/21/2004	0.59	J	70	NA	NA
	IG11GW005	G11GW005N1	10/13/2003	0.80	J			
		G11GW005P1	04/22/2004	0.6	J			
	IGDIGW011	GDIGW011N1	10/13/2003	6.3	=			
		GDIGW011P1	04/22/2004	5.5	=			
Benzene	I722GW002	722GW002P1	04/21/2004	0.89	J	5	NA	NA
		G11GW005N1	10/13/2003	0.40	J			
		G11GW005P1	04/22/2004	0.37	J			
Carbon Disulfide	I722GW001	722GW001N1	10/14/2003	3.5	J	NA	100	NA
	I722GW002	722GW002N1	10/13/2003	2.3	J			
	IG11GW001	G11GW001N1	10/13/2003	2.3	J			
	IGDIGW011	GDIGW011N1	10/13/2003	2.3	J			
cis-1,2-Dichloroethylene	I722GW001	722GW001P1	04/21/2004	0.59	J	70	NA	NA
	IG11GW005	G11GW005N1	10/13/2003	0.80	J			
		G11GW005P1	04/22/2004	0.6	J			
	IGDIGW011	GDIGW011N1	10/13/2003	5.1	=			
		GDIGW011P1	04/22/2004	3.9	J			
Ethylbenzene	IG11GW004	G11GW004P1	04/21/2004	0.25	J	700	NA	NA
m+p Xylene	IG11GW004	G11GW004N1	10/14/2003	0.64	J	10000 [e]	NA	NA

TABLE 4-3
Chemicals Detected in RFI Groundwater Samples (2003 - 2004)
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Station ID	Sample ID	Date Collected	Result (µg/L)	Qualifier	MCL[a]	EPA Region III RBC[b] (HI=0.1)	Zone I Background Concentration[c]
Tetrachloroethylene (PCE)	IGDIGW011	GDIGW011N1	10/13/2003	0.55	J	5	NA	NA
trans-1,2-Dichloroethene	IGDIGW011	GDIGW011N1	10/13/2003	1.2	J	100	NA	NA
		GDIGW011P1	04/22/2004	1.6	J			
Trichloroethylene (TCE)	IGDIGW011	GDIGW011N1	10/13/2003	4.9	J	5	NA	NA
		GDIGW011P1	04/22/2004	2.3	J			
Xylenes, Total	IG11GW004	G11GW004N1	10/14/2003	0.64	J	10000	NA	NA

[a] U.S. EPA National Primary Drinking Water Standards (3/2001).
[b] Tap water risk-based concentration (RBC) from the U.S. EPA Region III RBC table (10/2000), based on a hazard index (HI) of 0.1 for non-carcinogenic chemicals.
[c] Project Team Notebook and Instructions, Charleston Naval Complex, Environmental Restoration Project. Revision 1A (CH2M-Jones, 12/2001).
[d] 1,2-Dichloroethane used as a surrogate.
[e] Total xylenes.

J indicates that the chemical was detected. The reported concentration is estimated.
= indicates that the chemical was detected. The reported value is the measured concentration.

Bold and boxed values exceed the MCL (or RBC where applicable) and the Zone I Background Concentration (inorganics).

Section 5.0

5.0 Risk Assessment

5.1 Introduction

AOC 722 is a newly identified site based on the detection of chlorinated VOCs in a background grid well. In an effort to identify the potential source for the detected VOCs, an RFI was conducted. Additional wells were installed and soil samples were collected from the vicinity of the Buildings 0028 and 1875 as described in Section 3.0. The analytical results were screened in Section 4.0 against conservative screening criteria.

5.2 Chemicals of Potential Concern

A total of 11 surface soil samples were collected from AOC 722. Ten of the soil samples were collected from surface sampling locations and one surface soil sample was collected from a well installation location. These samples were analyzed for VOCs, SVOCs, RCRA metals, pesticides, and PCBs. The initial screening for the analytical results are presented in Section 4.0.

Multiple groundwater sampling events were conducted at the site. The 1998 sampling of the wells included analysis for full suite analytes, including VOCs, SVOCs, PCBs, pesticides, and metals. The more recent sampling efforts in 2003 and 2004 were focused on VOCs and a select list of metals, as these are the chemicals identified as COPCs at the site.

For this risk assessment, maximum detected concentrations of chemicals in surface soil and groundwater were screened against reference concentrations (background) and residential RBCs for soil and tap water RBCs. The RBCs used for screening represent the carcinogenic compounds at an excess lifetime cancer risk (ELCR) of 1×10^{-6}, while non-carcinogenic compounds were screened at an hazard quotient (HQ)=0.1 (RBC/10). Background values were previously established for the inorganic chemicals and the PAHs.

Maximum concentrations of chromium, mercury, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(g,h,I)perylene in surface soil exceeded their respective residential RBCs and background levels. BEQs were detected in surface soil above the sitewide reference concentration of 1,304 µg/kg in 2 out of 10 surface soil samples. Additionally, dieldrin was detected above the leachability criteria, but it was not above its RBC value. Dieldrin was

included as a COPC to conservatively assess potential direct exposures and risks (see Table 5-1).

Groundwater at the site had lead, benzene, methylene chloride, trichloroethylene, 4-methylphenol (p-Cresol), dibenzofuran, naphthalene, and lindane (gamma-BHC) detected above their respective MCL, RBC, or target treatment action level, and thus were identified as COPCs for site groundwater (see Table 5-2). One detection of antimony from 1996 exceeded its MCL and was therefore included as a COPC. Most of the VOC levels, particularly for benzene and naphthalene, have decreased over time in the wells where they were originally detected. However, all the historical data since 1995 were included in the risk assessment for the COPC selection .

5.3 Exposure Assessment

AOC 722 and the adjacent area consist of an active industrial/commercial use area. Building 1875 is currently being used for appliance repair, including welding, painting and woodworking. Facility 1795 is transformer building operated by SCE&G and secured by a brick fence. Building 0028 is currently used by the U.S. Border Patrol. This area is identified as B-2, for business use. Thus primary human receptors in this area are various worker populations involved in the operations described for each of the buildings. Table 5-3 includes the potentially complete exposure pathways assumed for AOC 722.

Industrial Worker Scenario: An industrial worker exposure scenario was evaluated using the default exposure assumptions for future industrial land use. This worker is evaluated for potential exposure to site soil and groundwater. If the exposure to this conservatively assumed receptor is acceptable, then all other current worker exposures are expected to be protected. The current workers in the AOC 722 area are expected to include maintenance workers cutting grass, SCE&G workers occasionally visiting the transformer area, and other indoor workers such as border patrol staff in Building 0028 and repair, welding, and woodworking staff in Building 1875.

A **maintenance worker** is included for quantitative estimation. The maintenance worker is assumed to visit the site either to cut the grass or visit the transformers in Facility 1795. These workers are assumed to visit once a week and have an ingestion exposure to soil at a rate of 100 milligrams per day (mg/day).

An **industrial worker** at AOC 722 is assumed to be at the site for 250 days per year, with an ingestion rate of 50 mg/day. Table 5-4 presents all other exposure assumptions used for intake estimation for the human receptors.

Residential Scenario: The site is located near the edge of the property, close to the Cooper River, in a developed area that has been used to support various operations that were part of the former CNC. The zoning, developed nature of this area, and close proximity to the tidally influenced portion of the Cooper River precludes future redevelopment of this area into single family housing units. Thus, future use for this area will remain commercial. However, for comparison purposes, the site is assumed to be developed as a residential site. The results of this scenario were used to indicate if the site can be released for unrestricted land use. Potential exposures were estimated for an adult and a child (see Table 5-4).

The exposure assumptions are the default values representing the Reasonable Maximum Exposure (RME) scenario provided in the *Exposure Factors Handbook* (EPA, 1996) and incorporating Region IV common practices. The values are presented in Table 5-4.

For conservative risk assessment purposes, a future hypothetical residential scenario for this site is assumed and represents a "worst case" scenario for risk estimation. Both adult and child receptors are evaluated.

Exposure to soils is assumed to occur via incidental ingestion, dermal contact, and inhalation of soil particulates. Exposure Point Concentrations (EPCs) for each COPC were estimated as the normal or lognormal 95% Upper Confidence Limit (UCL_{95}) of the mean depending on the distribution of the sample population. If the appropriate UCL_{95} exceeded the maximum detected concentration, the maximum detected value was taken as the EPC. Table 5-5 includes the EPCs for groundwater. Table 5-6 includes the EPCs for soil.

For the workers and residential adult and child receptors identified in the exposure assessment as having a complete exposure pathway, chemical- and media-specific intakes, known as chronic daily intakes (CDIs), were estimated using the exposure factors and assumptions previously listed. Chronic exposure (represented by CDI) is expressed in terms of milligrams of chemicals contacting the body/kilogram of body weight/day (mg/kg/day). For the exposure routes evaluated, the following generic equation applies:

$$CDI(mg/kg/day) = \frac{CxIRxEDxEF}{BWxAT}$$

where

C = concentration of chemical in medium, or EPC
IR = intake or ingestion rate
EF = exposure frequency
ED = exposure duration

BW = body weight

AT = averaging time (period over which exposure is averaged)

Table 5-4 includes the exposure factors for the potential receptors, exposure routes, and exposure pathways. The dose estimates along with the associated risks and HI are included in Appendix D.

5.4 Toxicity Assessment

Toxicity values used in this risk assessment were obtained from the Integrated Risk Information System (IRIS) or, if unavailable from IRIS, the Health Affects Assessment Summary Tables (HEAST). Oral slope factors and reference doses were modified by oral-to-dermal adjustment factors to obtain dermal toxicity factors. Toxicity factors for COPCs are listed in Table 5-7.

- IRIS is a database available through the EPA National Center for Environmental Assessment (NCEA) in Cincinnati, Ohio. IRIS, prepared and maintained by the EPA, is an electronic database (http://www.epa.gov/iris/) containing health risk and EPA regulatory guidance information regarding specific chemicals. This database was the primary source of toxicity values used.
- HEAST are provided by the EPA Office of Solid Waste and Emergency Response (OSWER; EPA, 1997c); HEAST is a compilation of toxicity values published in various health effects documents issued by EPA.
- For chromium, a hexavalent chromium-based toxicity factor was used as a conservative risk evaluation measure.
- TCE provisional toxicity has been withdrawn by EPA, which recommends using the earlier toxicity criteria proposed prior to 2000. Therefore, toxicity criteria used for TCE are those that were in use before, as listed in the table.

5.5 Risk Characterization

The risk characterization process combines the results of the exposure and toxicity assessments to yield estimates of ELCRs for carcinogenic COPCs and a cumulative HI for noncarcinogenic COPCs. Table 5-8 presents the risks and HIs for receptors evaluated in this risk assessment. Complete risk calculation tables can be found in Appendix D.

For a **maintenance worker**, the ELCR for surface soils is 2.2×10^{-7} and the HI=0.0003. These risks and HI are well below the acceptable risk range of 1 to 100 in a million and HI of 1.0.

For a **hypothetical future industrial worker**, the ELCR for surface soils is 7.3×10^{-7} and the HI=0.001. These risks and HI are well below the acceptable risk range of 1 to 100 in a million and HI of 1.0. The ELCR and HI from ingestion of site groundwater while working in the area are estimated at 9.57×10^{-7} and HI=0.354. The combined ELCR from soil and groundwater are 1.7×10^{-6} and the HI = 0.35. Overall, the risks and HI to a future worker are well within acceptable limits.

For a **hypothetical future residential adult**, the ELCR for surface soils is 1.2×10^{-6} and the HI is 0.002. The calculated risks are within acceptable risk limits of 1 to 100 in a million. The HI is well below the acceptable value of 1.0. The ELCR and HI from potable use of site groundwater by a future residential adult are estimated at 4.1×10^{-6} and HI=0.98, respectively. The combined ELCR from soil and groundwater are 5.3×10^{-6} and the HI = 0.98. Overall, the cancer risks and HI to a future worker are well within acceptable limits.

For a **hypothetical future residential child**, the ELCR is typically not calculated for a child receptor. However, it was calculated for AOC 722, as the recent approach to the child receptor has changed within EPA Region IV. Table 5-8 presents the ELCR values estimated for a child receptor. The total ELCR for soil and groundwater combined is below the adult resident total ELCR value. The HI for a residential child from exposure to surface soil is 0.016. The HI from groundwater is estimated to be 2.3, from naphthalene in groundwater. The combined HI is 2.3, due to naphthalene in groundwater.

Risks for a future industrial worker and residential adult exposed to surface soil and groundwater fall within the acceptable risk range of 1 to 100 in a million, and the HIs are below the target level of 1.0. Non-carcinogenic health risk for a residential child is below the target level of 1.0 for soil; however, groundwater ingestion and inhalation exposures result in HI >1.0 from naphthalene in groundwater. The most recent sampling event for SVOCs (2000) indicated naphthalene at 0.54 µg/L and 9.4 µg/L in normal and duplicate samples, respectively, from well IGDIGW011. The RBC for naphthalene is 6.2 µg/L at HI=1.0. The average concentration of normal and duplicate samples from the 2000 sampling event indicates that current naphthalene levels could be below the RBC levels. There is no MCL for naphthalene. For this reason, site soils do not need any land use restrictions. Groundwater at the site does not pose significant risks to current or future industrial receptors. Groundwater can be considered for unrestricted use, once the petroleum

constituents reach acceptable limits. Table 5-9 includes a comparison of the most recent monitoring data for the COPCs from the risk assessment with RBCs and MCLs.

TABLE 5-1
COPCs in Surface Soil for Residential and Industrial Risk Assessment
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Soil Boring Location of Maximum Detect	Best Estimate of the Mean (1/2 RL for NDs)	EPA Region III RBC[a] (HI=0.1) Residential	EPA Region III RBC[a] (HI=0.1) Industrial	SSL[b] (DAF=10)	Zone I Background Concentration[c]
Metals										
Chromium, Total	11	11	8.92	32.0	722SB005		**23**	610 [d]	**19** [d]	**6.3**
Mercury	11	10	0.015	6.03	722SB008		**2.3**	61 [e]	**1**	**0.47**
Semivolatile Organic Compounds										
Benzo(a)Pyrene	11	5	0.144	0.964	722SB006		**0.087**	**0.78**	4	**0.598**
Benzo(b)Fluoranthene	11	5	0.157	1.840	722SB005		**0.87**	7.8	2.5	**0.608**
Benzo(g,h,i)Perylene	11	3	0.256	0.536	722SB005		**0.087** [f]	0.78 [f]	4 [f]	NA
BEQs	10	5	0.384	2.10	722SB006		**0.087**	**0.78**	4	**1.304**
Pesticides										
Dieldrin	11	5	0.00022	0.0104	722SB004		0.04	0.36	**0.002**	NA

[a] Residential and Industrial risk-based concentration (RBC) from the U.S. EPA Region III RBC table (10/2000), based on a hazard index (HI) of 0.1 for non-carcinogenic chemicals.
[b] U.S. EPA Soil Screening Guidance: Technical Background Document (5/1996) based on a dilution attenuation factor (DAF) of 10 (1 for VOCs).
[c] Project Team Notebook and Instructions, Charleston Naval Complex, Environmental Restoration Project. Revision 1A (CH2M-Jones, 12/2001).
[d] Chromium criteria is based on the hexavalent (Cr^{+6}) species.
[e] Mercuric chloride screening criterion.
[f] Benzo(a)pyrene used as a surrogate.

EN - Essential nutrient.
NA - Not applicable or not available.

Bold and boxed values exceed either RBC and/or the SSL, and the Zone I Background Concentration (inorganics).

TABLE 5-2
COPCs in Groundwater for Industrial Risk Assessment
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Monitoring Well or DPT Location of Maximum Detect	Best Estimate of the Mean (1/2 RL for NDs)	MCL[a]	EPA Region III RBC[b] (HI=0.1)	Zone I Background Concentration[c]
Metals									
Antimony	1	1	6.1	6.1	IGDIGW011		**6**	NA	**6**
Lead	17	3	4	51.4	IGDIGW11D		**15**	NA	**16**
Volatile Organic Compounds									
Benzene	33	8	0.37	8.40	IG11GW005		**5**	NA	
Methylene Chloride	8	1	8.00	8.00	IGDIGP002		NA	**4.1**	
Trichloroethylene (TCE)	33	14	0.5	72.5	IG11GW005		**5**	NA	NA
Semivolatile Organic Compounds									
4-Methylphenol (p-Cresol)	9	2	3.00	19.00	IGDIGW011		NA	**18**	NA
Dibenzofuran	9	5	2.00	13.00	IGDIGW011		NA	**2.4**	NA
Naphthalene	11	5	0.58	23.00	GDIGW011		NA	**0.65**	NA
Pesticides									
Gamma BHC (Lindane)	8	1	0.62	0.62	IGDIGW011		0.2	NA	NA

[a] U.S. EPA National Primary Drinking Water Standards (3/2001).
[b] Tap water risk-based concentration (RBC) from the U.S. EPA Region III RBC table (10/2000), based on a hazard index (HI) of 0.1 for non-carcinogenic chemicals.
[c] Project Team Notebook and Instructions, Charleston Naval Complex, Environmental Restoration Project. Revision 1A (CH2M-Jones, 12/2001).

Bold and boxed values exceed the MCL (or RBC where applicable) and the Zone I Background Concentration (inorganics).

TABLE 5-3
Potentially Complete Exposure Pathways and Receptors in Risk Assessment
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Future Receptor	Media	Exposure Route and Point of Exposure	Pathway Selected for Evaluation	Reason for Selection or Exclusion
Maintenance Worker	Surface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface soils	Yes	Scenario is protective of a worker performing an occasional maintenance work.
Industrial Worker	Surface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface soils	Yes	Both site soil and groundwater exposure is assumed for a future worker.
	Groundwater	Ingestion, dermal contact exposure to COPCs in groundwater	Yes	Groundwater is not suitable for potable/industrial use due to the shallow aquifer that is in close proximity to the river that is tidally influence. However, for conservative risk estimation, groundwater was included as a potential exposure medium.
Residents (adult and child)	Surface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface soils	Yes	Although the site is unlikely to be considered for residential development, this is a worst-case scenario for comparison purposes.
	Groundwater	Ingestion and dermal contact exposure to COPCs in site surface soils	Yes	Although the site is unlikely to be considered for residential development, and groundwater is not suitable for potable use, this is a worst-case scenario for comparison purposes.

TABLE 5-4
Exposure Factor Used in Intakes Estimations for Worker and Residential Receptors
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Pathway Variable	Units	Maintenance Worker	Industrial Worker	Onsite Adult Resident	Onsite Child Resident
Exposure frequency (EF)	Days/year	52[b]	250[a]	350[a]	350[a]
Exposure duration (ED)	Years	25[b]	25[a]	30[a]	6[a]
Body weight (BW)	Kilograms	70[a]	70[a]	70[a]	15[a]
Averaging time – noncancer (ATn)[a]	Days	9,125	365	10,950	2,190
Averaging time-cancer (ATc) [a]	Days	25,550	25,550	25,550	25,550
Inhalation rate (IRair)	m^3/day	20	20	20	15
Incidental ingestion rate (IRsoil)	Mg/day	100[a]	50	100[a]	200[a]
Body surface area exposed	cm^2	3,300[c]	3,300[c]	5,700[c]	2,800[c]
Soil-to-skin adherence factor (AF)	mg/cm^2	0.2[c]	0.2[c]	0.07[c]	0.2[c]
Dermal absorption factor (ABS)[c]	Unitless	Csv	Csv	Csv	Csv
Fraction exposed to contaminated medium (FI)	Unitless	1	1	1	1
Drinking water ingestion rate (IRgw)	L/day	NA	1	2[a]	1[a]
Body surface area exposed – groundwater dermal exposure	cm^2	NA	4,100[c]	18,000[c]	6,600[c]
Permeability coefficient (PC)[c]	Cm/hour	Csv	Csv	Csv	Csv
Exposure time (ET) – dermal exposure while using site groundwater	Hour/day	0.25[d]	0.25[d]	0.25[c]	0.45[c]

[a] EPA, 1997. *Exposure Factors Handbook*. Office of Health and Environmental Assessment, Washington, DC, EPA/600/P-95/002F.

[b] Based on best-professional judgement.

EPA, 1995. *Supplemental Guidance to RAGS: Region IV Bulletins, Human Health Risk Assessment,* EPA Region 4, Atlanta, GA, November.

[c] EPA, 2001. *Risk Assessment Guidance for Superfund (RAGS) Volume I· Human Health Evaluation Manual.* Part E Supplemental Guidance for Dermal Risk Assessment) Interim.

[d] Reflects best professional judgement based on the size of the site and the amount of time a receptor could spend in the area per event.

cm/hour = Centimeter per hour
cm^2 = square centimeter
csv = Chemical-specific value
kg/day = Kilogram per day
L/day = Liter per day
m^3/hour = Cubic meters per hour
mg/cm^2 = Milligram per square centimeter
mg/day = Milligram per day
NA = Pathway not applicable for receptor

TABLE 5-5
Exposure Point Concentration (EPCs) for Groundwater
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Samples	Detects	Min Detect (µg/L)	Max Detect (µg/L)	Avg Detect (µg/L)	W-Test	UCL_{95} Norm (µg/L)	UCL_{95} Log (µg/L)	UCL_{95} Nonparm (µg/L)	UCL_{95} Bootstrap (µg/L)	EPC (mg/L)
4-Methylphenol (p-Cresol)	9	2	3	19	11	NONPARAMETRIC	11.49	13.60	3.0	11.033	0.003
Antimony	8	1	6.1	6.1	6.1	NONPARAMETRIC	3.17	3.60	0.95	2.976	0.00095
Benzene	34	6	0.4	8.4	1.9	NONPARAMETRIC	2.90	3.40	2.5	2.873	0.003
Dibenzofuran	9	5	2	13	5.8	LOGNORMAL	7.41	8.52	2	7.059	0.0085
Lead	18	3	4	51.4	22.8	NONPARAMETRIC	10.10	7.43	1.07	9.789	0.00107
Lindane	8	1	0.62	0.62	0.62	NONPARAMETRIC	0.24	0.30	0.015	0.206	0.000015
Methylene Chloride	33	1	8	8	8	NONPARAMETRIC	4.31	4.10	2.5	4.287	0.0025
Napthalene	11	5	0.58	23	10.12	LOGNORMAL	10.36	34.52	0.5	9.751	0.023
Trichloroethylene (TCE)	33	13	0.52	72.5	9.67	NONPARAMETRIC	8.94	5.87	2.5	8.917	0.0025

mg/L = milligram per liter

TABLE 5-6
Exposure Point Concentrations (EPCs) for Surface Soil
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Samples	Detects	Min Detect (mg/kg)	Max Detect (mg/kg)	Avg Detect (mg/kg)	Mean (mg/kg)	W-Test	UCL_{95} Norm (mg/kg)	UCL_{95} Log (mg/kg)	UCL_{95} Nonparm (mg/kg)	UCL_{95} Bootstrap (mg/kg)	EPC (mg/kg)
Chromium (Total)	11	11	8.92	32	15.54	15.54	LOGNORMAL	19.21	19.84	9.02	18.599	19.84
Mercury	11	10	0.015	6.03	0.64	0.586	NONPARAMETRIC	1.57	1.87	0.018	1.431	0.018
BEQs	10	5	0.384	2.10	1.01	0.618	NONPARAMETRIC	0.98	1.29	0.221	0.947	0.221
Dieldrin	11	5	0.0002	0.01	0.0041	0.007	LOGNORMAL	0.01	0.04	0.0009	0.011	0.010

TABLE 5-7
Toxicity Factors for COPCs
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	EPA Carcinogen Group	Slope Factor (SF)		Reference Dose (RfD)		HI Target Organ	Source(s)
		Oral (Kg-day/mg)	Inhalation (Kg-day/mg)	Oral (mg/kg-day)	Inhalation (mg/kg-day)		
4-Methylphenol (p-Cresol)	NA	NA	NA	5.0E-03	3.725E-03	Maternal Death, Neurological, Respiratory	HEAST
Benzene	A	5.5E-02	2.73E-02	4.0E-03	8.57E-03	Carcinogen	IRIS, 2004
Benzo(a)pyrene (BEQs)	B2	7.3E+00	3.1E+00	NA	NA	Carcinogen	IRIS, 2004
Chromium, Total [a]	NA	NA	NA	1.5E+00	1.95E-02	NA	IRIS, 2004
Dibenzofuran	NA	NA	NA	4.0E-03	4.0E-03	NA	NCEA, 2002
Dieldrin	B2	1.6E+01	1.61E+01	5.0E-05	5.0E-05	Carcinogen, Liver	IRIS, 2004
Lindane (gamma-BHC)	NA	NA	NA	3.0E-04	2.98E-04	Carcinogen, Kidney, Liver	IRIS, 2004
Mercury	NA	NA	NA	3.0E-04	8.57E-05	Neurological	IRIS, 2004
Methylene Chloride	B2	7.5E-03	1.645E-03	6.0E-02	8.57E-01	Carcinogen, Liver	IRIS, 2004
Napthalene	NA	NA	NA	2.0E-02	8.57E-04	Body Weight, Nasal	IRIS, 2004
Trichloroethene (TCE)	B2	1.1E-02	4.00E-01	3.0E-04	1.0E-02	CNS, Liver, Endocrine	NCEA, 2002

[a] Rfd for chromium (trivalent)

HEAST = US EPA's 1997 Health Effects Assessment Summary Tables
HI = Hazard Index
IRIS = Integrated risk information system (EPA online database at http://www.epa.gov/iris/subst/index.html)
mg/kg = milligrams per kilogram
NCEA = National Center for Environmental Assessment

TABLE 5-8
Risk Assessment Summary for Soil and Groundwater at AOC 722
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

	ELCR					HI				
Receptor - Soil	**Ingestion**	**Dermal**	**Inhalation**	**Total**	**Risk Driver**	**Ingestion**	**Dermal**	**Inhalation**	**Total**	**Risk Driver**
Risks from Chemicals Associated with AOC 722										
Maintenance Worker	1.295E-07	8.548E-08	1.4847E-09	2.2E-07	None	5.7E-05	2.9E-05	2.3E-04	0.0003	None
Industrial Worker	3.11E-07	4.11E-07	7.14E-09	7.3E-07	None	1.4E-04	1.4E-04	1.1E-03	0.001	None
Residential Adult	8.37E-07	3.34E-07	8.76E-09	1.2E-06	None	3.9E-04	1.2E-04	1.4E-03	0.002	None
Residential Child	1.95E-06	5.47E-07	1.71E-08	2.5E-06	None	3.6E-03	7.7E-04	1.1E-02	0.016	None
Receptor - Groundwater										
Industrial Worker	6.42E-07	9.56E-09	3.05E-07	9.57E-07	None	4.91E-02	6.62E-03	2.99E-01	3.54E-01	None
Residential Adult	2.73E-06	8.17E-08	1.30E-06	4.11E-06	Benzene	1.37E-01	4.73E-03	8.37E-01	9.79E-01	None
Residential Child	1.01E-06	4.40E-08	4.79E-07	1.53E-06	None	3.21E-01	1.46E-02	1.95E+00	2.29E+00	Naphthalene

ELCR = Excess Lifetime Cancer Risk
HI = Hazard Index

Risk and Hazard Drivers are those chemicals contributing an ELCR above 1E-6 and an HQ greater than 1, respectively

TABLE 5-9
Comparison of Historical, Current Concentrations of COPCs with RBCs and MCLs
RFI Report and CMS Work Plan, AOC 722, Zone I, Charleston Naval Complex

Chemical	Historical Max Detect	Recent Monitoring Result from Same Well	Sample Date	RBC (HI=1) (µg/L)	MCL (µg/L)
4-Methylphenol (p-Cresol)	19	10 U	7/1/00	180	NA
Antimony	6.1	2.1 UJ	5/28/96	15	6
Benzene	8.4	0.4 J	10/13/03	0.34	5
Dibenzofuran	13	13 =	7/20/00	24	NA
Lead	51.4	2.14 U	10/13/03	NA	15
Lindane	0.62	0.043 U	5/23/96	0.052	0.2
Methylene Chloride	8	7.2 U	7/20/00	4.1	NA
Naphthalene	23	0.58 J	7/20/00	6.5	NA
Trichloroethylene (TCE)	72.5	5 U	10/13/03	1.6	5

6.0 Summary of Information Related to Site Closeout Issues

6.1 RFI Status

The *Zone I RFI Report, Revision 0* (EnSafe, 1999) addressed SWMUs and AOCs within Zone I of the Naval Complex. However, AOC 722 had not been identified at the time of the original RFI. Therefore, this RFI is intended to address environmental issues at AOC 722.

6.2 Presence of Inorganics in Groundwater

For the purpose of site closeout documentation, the inorganics in groundwater issue refers to the occasional or intermittent detection of several metals (primarily arsenic, thallium, and antimony) in groundwater at concentrations above the applicable MCL, preceded or followed by detections of these same metals below the MCL or below the practicable quantitation limit.

Based on the sampling results presented herein, the presence of arsenic, thallium, and antimony in AOC 722 groundwater does not appear to be an issue. Arsenic and thallium were not detected in groundwater at concentrations above their respective MCLs. Antimony was detected in one sample collected from monitoring well IGDIGW011 at a concentration of 6.1 µg/L, which marginally exceeds its MCL (6.0 µg/L) and background concentration (6.0 µg/L). Antimony was not detected in the two previous or the one subsequent sample collected from this well. The presence of antimony above its MCL is addressed in this RFI Report. Therefore, additional discussion of inorganics in site groundwater is not warranted.

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

AOC 722 consists of Building 1875, which is a one-story concrete block structure that was built in 1981 to serve as the storage and supply warehouse for the BOQ located in nearby Building 0028. AOC 722 is approximately 800 feet from the closest location investigated as part of the SWMU 37 RFI. There is no evidence to suggest that wastewater or sanitary wastewater was generated at Building 1875, and no apparent access to a sewer system was

found (Davis and Floyd, 1998.) Therefore, there is no linkage between AOC 722 and the investigated sanitary sewers, and further evaluation of this issue is not warranted.

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

Investigated segments of the storm sewer were identified in the *Zone L RFI Report, Revision 0* (EnSafe, 1998b). The nearest investigated storm sewers to AOC 722 are over 1 mile to the northwest of the site in Zone E. Therefore, there is no known linkage between AOC 722 and the investigated sanitary sewers of AOC 699, and further evaluation of this issue is not warranted.

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

The potential linkage of a SWMU or AOC to a railroad potentially applies only to SWMUs or AOCs at which an investigated portion of the railroad system, identified as AOC 504 in the *Zone L RFI Work Plan* (EnSafe, 1995), passes through or is directly adjacent to the AOC or SWMU.

The nearest investigated railroad line to AOC 722 is over 1 mile to the northwest in Zone G. There is no known linkage between AOC 722 and the investigated railroad lines of AOC 504, and further evaluation of this issue is not warranted.

6.6 Potential Migration Pathways to Surface Water Bodies at the CNC

AOC 722 is located adjacent to the Cooper River and stormwater is routed to the river in the area of the site. However, because the contaminants in surface soil are not readily soluble in water, there is little potential for contaminant migration via stormwater runoff, and further investigation of this issue at this site is not warranted.

6.7 Potential Contamination in Oil/Water Separators (OWSs)

The issue of potential contamination of OWSs refers to the possible presence of an OWS that has not yet been investigated at a SWMU or AOC as part of the RCRA or UST process.

Neither the RFA nor the EBS reports refer to the presence or possible presence of an OWS at AOC 722. In addition, there is no reference to an OWS at this facility made in the base-wide OWS report prepared by the Navy in Y2000. The closest known OWS is located at Building 681, approximately 900 feet to the northwest. Therefore, further evaluation of this issue is not warranted.

6.8 Land Use Controls (LUCs)

AOC 722 is planned for future industrial land use. The evaluation presented in this report was based on meeting industrial standards. Therefore, AOC 722 will have LUCs applied as part of the CMS. At a minimum, the LUCs are expected to include restrictions against unrestricted (i.e., residential) land use, installation of wells, and the use of the shallow groundwater.

Section 7.0

7.0 Recommendations

The information presented in this RFI Report and CMS Work Plan supports the conclusion that further investigation is not warranted at AOC 722 and that further action is not warranted for site soil. The site groundwater was evaluated by repeated sampling of site monitoring wells. The analytical results indicate that COPC concentrations are generally decreasing over time.

Maximum concentrations of chromium, mercury, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,I)perylene in surface soil exceeded their respective residential RBCs and background levels. BEQs exceeded the sitewide reference concentration in surface soil at a limited number of locations. Additionally, dieldrin was detected above the leachability criteria, but it was not above RBC value. Groundwater at the site contained antimony, lead, benzene, methylene chloride, trichloroethylene, 4-methylphenol (p-Cresol), dibenzofuran, naphthalene, and lindane (gamma-BHC) above RBCs and thus were identified as COPCs for site groundwater. A risk assessment was performed on these chemicals that indicated that risks are within acceptable limits for current and future industrial receptors. Therefore, based on the current and likely future land use of the site, further action is not warranted. The risk and hazard to hypothetical future residents was above acceptable levels.

Benzene and naphthalene were identified as COCs for site groundwater. A CMS Work Plan is included in Section 8 of this document to describe the steps for a focused CMS for groundwater at AOC 722.

Consistent with previous decisions of the BCT, BEQs in surface soil will be retained as a COC for the unrestricted land use scenario because at least one surface soil sample exceeded the sitewide reference concentration of 1,304 µg/kg.

Section 8.0

8.0 CMS Work Plan for AOC 722 Groundwater

The purpose of this CMS Work Plan is to identify and evaluate potential remedial alternatives for preventing unacceptable exposure to organic chemicals in the shallow groundwater at AOC 722. A focused CMS will be performed to evaluate two principle actions for shallow groundwater: 1) long-term groundwater monitoring with LUCs, and 2) groundwater remediation. BEQs in surface soil will also be addressed due to their limited occurrence in two surface soil samples above the sitewide reference concentration.

8.1 Remedial Action Objectives

Remedial action objectives (RAOs) are medium-specific goals that the remedial actions will be designed to accomplish in order to protect human health and the environment by preventing or reducing exposures under current and future land use conditions. The RAOs identified for shallow groundwater at AOC 722 are to prevent ingestion and direct/dermal contact with groundwater having unacceptable carcinogenic risk and noncarcinogenic hazards and to restore the shallow aquifer to beneficial use conditions.

8.2 Remedial Goal Options and Proposed Media Cleanup Standards

Typically after RAOs have been established and the risk assessment is complete, remedial goal options (RGOs) are developed for each RAO. The RGOs are based on assumptions about a particular land use scenario and include different residual risk levels for comparison. For example, to remediate surface soils to protect an onsite maintenance worker, RGOs might include remediating to anthropogenic background levels or to one of a variety of specific risk levels (such as 1E-06 or 1E-04). For each RGO, a specific media cleanup standard (MCS) is determined for specific chemicals. These MCSs are expressed in conventional concentration units, such as mg/kg or mg/L, for specific chemicals. Remediating the site to those specific MCSs would be suitable to demonstrate that the RAO has been achieved.

The exposure medium of concern for AOC 722 is shallow groundwater. Proposed MCSs for COCs are identified in the table below. In addition, although recent concentrations of chlorinated solvents such as TCE have been below their respective MCLs, chlorinated VOCs, such as TCE, will also be monitored and compared to their respective MCLs.

Chemical of Concern	Proposed MCS (µg/L)	Comment
Benzene	5	MCL
Naphthalene	6.2	RBC at HI = 1.0

8.3 Corrective Measure Technology Focused Evaluation

This focused CMS will evaluate the options for preventing direct contact or ingestion by future site workers or residents, including LUCs. Corrective measures alternatives associated with groundwater that will be evaluated will include long-term monitoring.

8.4 Focused CMS Approach

This focused CMS will consist of the following three tasks. These tasks will be performed in the order presented below:

1. The corrective measure alternatives described above will be screened using several criteria and decision factors. Other corrective measure alternatives may also be evaluated in the CMS.
2. A preferred corrective measure alternative will be selected for each medium.
3. The CMS and preferred corrective measure alternatives will be documented in the CMS report.

8.5 Approach to Evaluating Corrective Measure Alternatives

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

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

Each of the five criteria is defined in more detail below.

8.5.1 Protect Human Health and the Environment

The alternatives will be evaluated on the basis of their ability to protect human health and the environment. The ability of an alternative to achieve this standard may or may not be independent of its ability to achieve the other standards. For example, an alternative may be protective of human health, but may not be able to attain the MCSs, if the MCSs are not directly tied to protecting human health.

8.5.2 Attain Media Cleanup Standards (RGOs)

The alternatives will be evaluated on the basis of their ability to achieve the RGOs defined in this CMSWP. Another aspect of this is the time frame to achieve the RGOs. Estimates of the time frame for the alternatives to achieve RGOs will be provided.

8.5.3 Control the Source of Releases

This deals with the control of releases of contamination from the source (the area in which the contamination originated). For example, blast media may be considered a source under the unrestricted land use exposure scenario, but be within RGOs under industrial land use.

8.5.4 Comply with Applicable Standards for the Management of Wastes

This deals with the management of wastes derived from implementing the alternatives (e.g., treatment or disposal of excavated material). The removal alternative will be designed to comply with all standards for management of wastes. Consequently, this will not be explicitly included in the detailed evaluation presented in the CMS.

8.5.5 Other Factors

Five other factors must be considered if an alternative is found to meet the four criteria described above. These other factors are as follows:

a. Long-term reliability and effectiveness

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

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

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

c. Short-term effectiveness

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

d. Implementability

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

e. Cost

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

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

8.6 Focused CMS Report

The focused CMS Report will present the identification, development, and evaluation of potential corrective measures for AOC 722 groundwater. A proposed outline of the report, 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 722
RFI Report and CMS Work Plan, AOC 722, Zone I, 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 Options**
3.0	**Detailed Analysis of Focused Alternatives**
3.1	Approach
3.2	Evaluation Criteria
3.3	Description of Groundwater Alternatives [a]
3.3.1	Alternative 1: Land Use Controls Only
3.3.2	Alternative 2: LUCs with Long Term Monitoring
3.4	Comparative Analysis of Groundwater Alternatives
4.0	**Recommended Remedial Alternatives**
5.0	**References**
Appendix A	**Corrective Measure Alternative Cost Estimates[b]**
List of Tables	
List of Figures	

[a] Additional alternatives will be analyzed, if necessary.
[b] Additional appendices will be added, if necessary.

Section 9.0

9.0 References

CH2M-Jones. *Project Team Notebook and Instructions: Charleston Naval Complex, Environmental Restoration Project*. Revision 1A. December 2001a.

CH2M-Jones. *Background PAHs Study Report, Technical Information for Development of Background BEQ Values, Charleston Naval Complex, North Charleston, South Carolina*. February 2001b.

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Davis and Floyd. *Evaluation of Wastewater System Serving Charleston Naval Complex*, Charleston Naval Complex Redevelopment Authority. June 1998.

Davis and Floyd. *Evaluation of Drainage System Serving Charleston Naval Complex*, Charleston Naval Complex Redevelopment Authority. September 1998.

EnSafe Inc. *Zone L RCRA Facility Investigation Work Plan*. Revision 0. October 18, 1995.

EnSafe Inc. *Draft Zone L RCRA Facility Investigation Report, Charleston Naval Complex*. December 18, 1998.

EnSafe Inc. *Zone I RCRA Facility Investigation Report, Department of the Navy, Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina*. March 1, 1999.

U.S. Environmental Protection Agency. *Soil Screening Guidance: Technical Background Document*. Office of Solid Waste and Emergency Response. May 1996.

U.S. Environmental Protection Agency, Region III. *Risk Based Concentration Table*. October 6, 2000.

Appendix A

	StationID	I722GW001		I722GW001		I722GW002		I722GW002	
	SampleID	722GW001N1		722GW001P1		722GW002N1		722GW002P1	
	DateCollected	14-Oct-03		21-Apr-04		13-Oct-03		21-Apr-04	
	DateAnalyzed	27-Oct-03		29-Apr-04		27-Oct-03		30-Apr-04	
	DateExtracted	27-Oct-03		29-Apr-04		27-Oct-03		30-Apr-04	
	SDGNumber	89961		111526		89961		111526	
1,1,1-Trichloroethane	ug/L	5	U	5	U	5	U	5	U
1,1,2,2-Tetrachloroethane	ug/L	5	U	5	U	5	U	5	U
1,1,2-Trichloroethane	ug/L	5	U	5	U	5	U	5	U
1,1-Dichloroethane	ug/L	5	U	5	U	5	U	5	U
1,1-Dichloroethene	ug/L	5	U	5	U	5	U	5	U
1,2,3-Trichlorobenzene	ug/L	5	U	5	U	5	U	5	U
1,2,4-Trichlorobenzene	ug/L	5	U	5	U	5	U	5	U
1,2-Dichlorobenzene	ug/L	5	U	5	U	5	U	5	U
1,2-Dichloroethane	ug/L	5	U	5	U	5	U	5	U
1,2-Dichloroethene (total)	ug/L	5	U	0.59	J	5	U	5	U
1,2-Dichloropropane	ug/L	5	U	5	U	5	U	5	U
1,3-Dichlorobenzene	ug/L	5	U	5	U	5	U	5	U
1,4-Dichlorobenzene	ug/L	5	U	5	U	5	U	5	U
2-Chloroethyl vinyl ether	ug/L	10	UJ	10	U	10	UJ	10	UJ
2-Hexanone	ug/L	10	U	10	U	10	U	10	U
Acetone	ug/L	24.3	U	10	U	18.2	U	10	UJ
Benzene	ug/L	5	U	5	U	5	U	0.89	J
Bromodichloromethane	ug/L	5	U	5	U	5	U	5	U
Bromoform	ug/L	5	U	5	U	5	U	5	U
Bromomethane	ug/L	10	UJ	10	U	10	UJ	10	U
Carbon Disulfide	ug/L	3.5	J	5	U	2.3	J	5	U
Carbon Tetrachloride	ug/L	5	U	5	U	5	U	5	U
Chlorobenzene	ug/L	5	U	5	U	5	U	5	U
Chloroethane	ug/L	10	U	10	U	10	U	10	U
Chloroform	ug/L	5	U	5	U	5	U	5	U
Chloromethane	ug/L	10	UJ	10	U	10	UJ	10	U
cis-1,2-Dichloroethylene	ug/L	5	U	0.59	J	5	U	5	U
cis-1,3-Dichloropropene	ug/L	5	U	5	U	5	U	5	U
Dibromochloromethane	ug/L	5	U	5	U	5	U	5	U
Ethylbenzene	ug/L	5	U	5	U	5	U	5	U

	StationID	I722GW003		I722GW003	
	SampleID	722GW003N1		722GW003P1	
	DateCollected	14-Oct-03		21-Apr-04	
	DateAnalyzed	27-Oct-03		29-Apr-04	
	DateExtracted	27-Oct-03		29-Apr-04	
	SDGNumber	89961		111526	
1,1,1-Trichloroethane	ug/L	5	U	5	U
1,1,2,2-Tetrachloroethane	ug/L	5	U	5	U
1,1,2-Trichloroethane	ug/L	5	U	5	U
1,1-Dichloroethane	ug/L	5	U	5	U
1,1-Dichloroethene	ug/L	5	U	5	U
1,2,3-Trichlorobenzene	ug/L	5	U	5	U
1,2,4-Trichlorobenzene	ug/L	5	U	5	U
1,2-Dichlorobenzene	ug/L	5	U	5	U
1,2-Dichloroethane	ug/L	5	U	5	U
1,2-Dichloroethene (total)	ug/L	5	U	5	U
1,2-Dichloropropane	ug/L	5	U	5	U
1,3-Dichlorobenzene	ug/L	5	U	5	U
1,4-Dichlorobenzene	ug/L	5	U	5	U
2-Chloroethyl vinyl ether	ug/L	10	UJ	10	U
2-Hexanone	ug/L	10	U	10	U
Acetone	ug/L	10	U	10	U
Benzene	ug/L	5	U	5	U
Bromodichloromethane	ug/L	5	U	5	U
Bromoform	ug/L	5	U	5	U
Bromomethane	ug/L	10	UJ	10	U
Carbon Disulfide	ug/L	5	U	5	U
Carbon Tetrachloride	ug/L	5	U	5	U
Chlorobenzene	ug/L	5	U	5	U
Chloroethane	ug/L	10	U	10	U
Chloroform	ug/L	5	U	5	U
Chloromethane	ug/L	10	UJ	10	U
cis-1,2-Dichloroethylene	ug/L	5	U	5	U
cis-1,3-Dichloropropene	ug/L	5	U	5	U
Dibromochloromethane	ug/L	5	U	5	U
Ethylbenzene	ug/L	5	U	5	U

	StationID	I722GW001		I722GW001		I722GW002		I722GW002	
	SampleID	722GW001N1		722GW001P1		722GW002N1		722GW002P1	
	DateCollected	14-Oct-03		21-Apr-04		13-Oct-03		21-Apr-04	
	DateAnalyzed	27-Oct-03		29-Apr-04		27-Oct-03		30-Apr-04	
	DateExtracted	27-Oct-03		29-Apr-04		27-Oct-03		30-Apr-04	
	SDGNumber	89961		111526		89961		111526	
m+p Xylene	ug/L	5	U	5	U	5	U	5	U
Methyl ethyl ketone (2-Butanone)	ug/L	10	U	10	U	10	U	10	U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/L	10	U	10	U	10	U	10	U
Methylene Chloride	ug/L	5	U	5	U	5	U	5	U
o-Xylene	ug/L	5	U	5	U	5	U	5	U
Styrene	ug/L	5	U	5	U	5	U	5	U
Tetrachloroethylene (PCE)	ug/L	5	U	5	U	5	U	5	U
Toluene	ug/L	5	U	5	U	5	U	5	U
trans-1,2-Dichloroethene	ug/L	5	U	5	U	5	U	5	U
trans-1,3-Dichloropropene	ug/L	5	U	5	U	5	U	5	U
Trichloroethylene (TCE)	ug/L	5	U	5	U	5	U	5	U
Vinyl acetate	ug/L	10	U	10	U	10	U	10	U
Vinyl chloride	ug/L	10	U	10	U	10	U	10	U
Xylenes, Total	ug/L	5	U	5	U	5	U	5	U

	StationID	I722GW003		I722GW003	
	SampleID	722GW003N1		722GW003P1	
	DateCollected	14-Oct-03		21-Apr-04	
	DateAnalyzed	27-Oct-03		29-Apr-04	
	DateExtracted	27-Oct-03		29-Apr-04	
	SDGNumber	89961		111526	
m+p Xylene	ug/L	5	U	5	U
Methyl ethyl ketone (2-Butanone)	ug/L	10	U	10	U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/L	10	U	10	U
Methylene Chloride	ug/L	5	U	5	U
o-Xylene	ug/L	5	U	5	U
Styrene	ug/L	5	U	5	U
Tetrachloroethylene (PCE)	ug/L	5	U	5	U
Toluene	ug/L	5	U	5	U
trans-1,2-Dichloroethene	ug/L	5	U	5	U
trans-1,3-Dichloropropene	ug/L	5	U	5	U
Trichloroethylene (TCE)	ug/L	5	U	5	U
Vinyl acetate	ug/L	10	U	10	U
Vinyl chloride	ug/L	10	U	10	U
Xylenes, Total	ug/L	5	U	5	U

	StationID	I722GW001		I722GW002		I722GW003	
	SampleID	722GW001N1		722GW002N1		722GW003N1	
	DateCollected	14-Oct-03		13-Oct-03		14-Oct-03	
	DateAnalyzed	25-Oct-03		25-Oct-03		28-Oct-03	
	DateExtracted	17-Oct-03		17-Oct-03		17-Oct-03	
	SDGNumber	89961		89961		89961	
Lead	ug/L	2.14	U	2.14	U	4.28	U
Thallium	ug/L	4.08	U	4.08	U	4.08	U

Analytical Data Summary

	StationID	I722GW001		I722GW002		I722GW003	
	SampleID	722GW001N1		722GW002N1		722GW003N1	
	DateCollected	14-Oct-03		13-Oct-03		14-Oct-03	
	DateAnalyzed	25-Oct-03		25-Oct-03		28-Oct-03	
	DateExtracted	17-Oct-03		17-Oct-03		17-Oct-03	
	SDGNumber	89962		89962		89962	
Lead, Dissolved	ug/L	2.14	U	2.14	U	4.28	U
Thallium, Dissolved	ug/L	4.08	U	4.08	U	4.08	U

	StationID	I722SB001		I722SB002		I722S
	SampleID	722SB00101 (0-1ft)		722SB00201 (0-1ft)		722SB00
	DateCollected	07/11/2003		07/11/2003		07/11
	DateExtracted	07/12/2003		07/12/2003		07/12
	DateAnalyzed	07/17/2003		07/17/2003		07/17
	SDGNumber	83917		83917		83
Parameter	**Units**					
Chloromethane	ug/kg	10.2	U	11.3	U	11
Vinyl chloride	ug/kg	10.2	U	11.3	U	11
Bromomethane	ug/kg	10.2	U	11.3	U	11
Chloroethane	ug/kg	10.2	U	11.3	U	11
1,1-Dichloroethene	ug/kg	5.1	U	5.6	U	5.5
Acetone	ug/kg	10.2	U	11.3	U	11
Carbon Disulfide	ug/kg	5.1	U	5.6	U	5.5
Methylene Chloride	ug/kg	5.1	U	5.6	U	5.5
trans-1,2-Dichloroethene	ug/kg	5.1	U	5.6	U	5.5
1,1-Dichloroethane	ug/kg	5.1	U	5.6	U	5.5
Vinyl acetate	ug/kg	10.2	U	11.3	U	11
Methyl ethyl ketone (2-Butanone)	ug/kg	10.2	U	11.3	U	11
cis-1,2-Dichloroethylene	ug/kg	5.1	U	5.6	U	5.5
1,2-Dichloroethene (total)	ug/kg	5.1	U	5.6	U	5.5
Chloroform	ug/kg	5.1	U	5.6	U	5.5
1,1,1-Trichloroethane	ug/kg	5.1	U	5.6	U	5.5
Carbon Tetrachloride	ug/kg	5.1	U	5.6	U	5.5
1,2-Dichloroethane	ug/kg	5.1	U	5.6	U	5.5
Benzene	ug/kg	5.1	U	5.6	U	5.5
Trichloroethylene (TCE)	ug/kg	5.1	U	5.6	U	5.5
1,2-Dichloropropane	ug/kg	5.1	U	5.6	U	5.5
Bromodichloromethane	ug/kg	5.1	U	5.6	U	5.5
2-Chloroethyl vinyl ether	ug/kg	10.2	U	11.3	U	11
cis-1,3-Dichloropropene	ug/kg	5.1	U	5.6	U	5.5
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/kg	10.2	U	11.3	U	11
Toluene	ug/kg	5.1	U	5.6	U	5.5
trans-1,3-Dichloropropene	ug/kg	5.1	U	5.6	U	5.5
1,1,2-Trichloroethane	ug/kg	5.1	U	5.6	U	5.5
2-Hexanone	ug/kg	10.2	U	11.3	U	11
Tetrachloroethylene (PCE)	ug/kg	5.1	U	5.6	U	5.5

	StationID	B003	I722SB004		I722SB005	
	SampleID	301 (0-1ft)	722SB00401 (0-1ft)		722SB00501 (0-1ft)	
	DateCollected	/2003	07/11/2003		07/11/2003	
	DateExtracted	/2003	07/12/2003		07/12/2003	
	DateAnalyzed	/2003	07/17/2003		07/17/2003	
	SDGNumber	917	83917		83917	
Parameter	**Units**					
Chloromethane	ug/kg	U	11.5	U	11.3	U
Vinyl chloride	ug/kg	U	11.5	U	11.3	U
Bromomethane	ug/kg	U	11.5	U	11.3	U
Chloroethane	ug/kg	U	11.5	U	11.3	U
1,1-Dichloroethene	ug/kg	U	5.8	U	5.6	U
Acetone	ug/kg	U	11.5	U	11.3	U
Carbon Disulfide	ug/kg	U	5.8	U	5.6	U
Methylene Chloride	ug/kg	U	5.8	U	5.6	U
trans-1,2-Dichloroethene	ug/kg	U	5.8	U	5.6	U
1,1-Dichloroethane	ug/kg	U	5.8	U	5.6	U
Vinyl acetate	ug/kg	U	11.5	U	11.3	U
Methyl ethyl ketone (2-Butanone)	ug/kg	U	11.5	U	11.3	U
cis-1,2-Dichloroethylene	ug/kg	U	5.8	U	5.6	U
1,2-Dichloroethene (total)	ug/kg	U	5.8	U	5.6	U
Chloroform	ug/kg	U	5.8	U	5.6	U
1,1,1-Trichloroethane	ug/kg	U	5.8	U	5.6	U
Carbon Tetrachloride	ug/kg	U	5.8	U	5.6	U
1,2-Dichloroethane	ug/kg	U	5.8	U	5.6	U
Benzene	ug/kg	U	5.8	U	5.6	U
Trichloroethylene (TCE)	ug/kg	U	5.8	U	5.6	U
1,2-Dichloropropane	ug/kg	U	5.8	U	5.6	U
Bromodichloromethane	ug/kg	U	5.8	U	5.6	U
2-Chloroethyl vinyl ether	ug/kg	U	11.5	U	11.3	U
cis-1,3-Dichloropropene	ug/kg	U	5.8	U	5.6	U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/kg	U	11.5	U	11.3	U
Toluene	ug/kg	U	5.8	U	5.6	U
trans-1,3-Dichloropropene	ug/kg	U	5.8	U	5.6	U
1,1,2-Trichloroethane	ug/kg	U	5.8	U	5.6	U
2-Hexanone	ug/kg	U	11.5	U	11.3	U
Tetrachloroethylene (PCE)	ug/kg	U	5.8	U	5.6	U

	StationID	I722SB006		I722SB007		I722S
	SampleID	722SB00601 (0-1ft)		722SB00701 (0-1ft)		722SB00
	DateCollected	07/11/2003		07/11/2003		07/11
	DateExtracted	07/12/2003		07/12/2003		07/12
	DateAnalyzed	07/17/2003		07/17/2003		07/17
	SDGNumber	83917		83917		83
Parameter	**Units**					
Chloromethane	ug/kg	11.1	U	11.2	U	11.4
Vinyl chloride	ug/kg	11.1	U	11.2	U	11.4
Bromomethane	ug/kg	11.1	U	11.2	U	11.4
Chloroethane	ug/kg	11.1	U	11.2	U	11.4
1,1-Dichloroethene	ug/kg	5.6	U	5.6	U	5.7
Acetone	ug/kg	11.1	U	76.8	=	7.1
Carbon Disulfide	ug/kg	5.6	U	5.6	U	5.7
Methylene Chloride	ug/kg	5.6	U	5.6	U	5.7
trans-1,2-Dichloroethene	ug/kg	5.6	U	5.6	U	5.7
1,1-Dichloroethane	ug/kg	5.6	U	5.6	U	5.7
Vinyl acetate	ug/kg	11.1	U	11.2	U	11.4
Methyl ethyl ketone (2-Butanone)	ug/kg	11.1	U	15.5	=	11.4
cis-1,2-Dichloroethylene	ug/kg	5.6	U	5.6	U	5.7
1,2-Dichloroethene (total)	ug/kg	5.6	U	5.6	U	5.7
Chloroform	ug/kg	5.6	U	5.6	U	5.7
1,1,1-Trichloroethane	ug/kg	5.6	U	5.6	U	5.7
Carbon Tetrachloride	ug/kg	5.6	U	5.6	U	5.7
1,2-Dichloroethane	ug/kg	5.6	U	5.6	U	5.7
Benzene	ug/kg	5.6	U	5.6	U	5.7
Trichloroethylene (TCE)	ug/kg	5.6	U	5.6	U	5.7
1,2-Dichloropropane	ug/kg	5.6	U	5.6	U	5.7
Bromodichloromethane	ug/kg	5.6	U	5.6	U	5.7
2-Chloroethyl vinyl ether	ug/kg	11.1	U	11.2	U	11.4
cis-1,3-Dichloropropene	ug/kg	5.6	U	5.6	U	5.7
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/kg	11.1	U	11.2	U	11.4
Toluene	ug/kg	5.6	U	5.6	U	5.7
trans-1,3-Dichloropropene	ug/kg	5.6	U	5.6	U	5.7
1,1,2-Trichloroethane	ug/kg	5.6	U	5.6	U	5.7
2-Hexanone	ug/kg	11.1	U	11.2	U	11.4
Tetrachloroethylene (PCE)	ug/kg	5.6	U	5.6	U	5.7

	StationID	B008	I722SB009		I722SB010	
	SampleID	01 (0-1ft)	722SB00901 (0-1ft)		722SB01001 (0-1ft)	
	DateCollected	/2003	07/11/2003		07/11/2003	
	DateExtracted	/2003	07/12/2003		07/12/2003	
	DateAnalyzed	/2003	07/17/2003		07/17/2003	
	SDGNumber	17	83917		83917	
Parameter	**Units**					
Chloromethane	ug/kg	U	11.6	U	11.9	U
Vinyl chloride	ug/kg	U	11.6	U	11.9	U
Bromomethane	ug/kg	U	11.6	U	11.9	U
Chloroethane	ug/kg	U	11.6	U	11.9	U
1,1-Dichloroethene	ug/kg	U	5.8	U	6	U
Acetone	ug/kg	J	11.6	U	11.9	U
Carbon Disulfide	ug/kg	U	5.8	U	6	U
Methylene Chloride	ug/kg	U	5.8	U	6	U
trans-1,2-Dichloroethene	ug/kg	U	5.8	U	6	U
1,1-Dichloroethane	ug/kg	U	5.8	U	6	U
Vinyl acetate	ug/kg	U	11.6	U	11.9	U
Methyl ethyl ketone (2-Butanone)	ug/kg	U	11.6	U	11.9	U
cis-1,2-Dichloroethylene	ug/kg	U	5.8	U	6	U
1,2-Dichloroethene (total)	ug/kg	U	5.8	U	6	U
Chloroform	ug/kg	U	5.8	U	6	U
1,1,1-Trichloroethane	ug/kg	U	5.8	U	6	U
Carbon Tetrachloride	ug/kg	U	5.8	U	6	U
1,2-Dichloroethane	ug/kg	U	5.8	U	6	U
Benzene	ug/kg	U	5.8	U	6	U
Trichloroethylene (TCE)	ug/kg	U	5.8	U	6	U
1,2-Dichloropropane	ug/kg	U	5.8	U	6	U
Bromodichloromethane	ug/kg	U	5.8	U	6	U
2-Chloroethyl vinyl ether	ug/kg	U	11.6	U	11.9	U
cis-1,3-Dichloropropene	ug/kg	U	5.8	U	6	U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/kg	U	11.6	U	11.9	U
Toluene	ug/kg	U	5.8	U	6	U
trans-1,3-Dichloropropene	ug/kg	U	5.8	U	6	U
1,1,2-Trichloroethane	ug/kg	U	5.8	U	6	U
2-Hexanone	ug/kg	U	11.6	U	11.9	U
Tetrachloroethylene (PCE)	ug/kg	U	5.8	U	6	U

	StationID	I722SB001		I722SB002		I722S
	SampleID	722SB00101 (0-1ft)		722SB00201 (0-1ft)		722SB00
	DateCollected	07/11/2003		07/11/2003		07/11
	DateExtracted	07/12/2003		07/12/2003		07/12
	DateAnalyzed	07/17/2003		07/17/2003		07/17
	SDGNumber	83917		83917		83
Parameter	**Units**					
Dibromochloromethane	ug/kg	5.1	U	5.6	U	5.5
Chlorobenzene	ug/kg	5.1	U	5.6	U	5.5
Ethylbenzene	ug/kg	5.1	U	5.6	U	5.5
m+p Xylene	ug/kg	5.1	U	5.6	U	5.5
o-Xylene	ug/kg	5.1	U	5.6	U	5.5
Xylenes, Total	ug/kg	5.1	U	5.6	U	5.5
Styrene	ug/kg	5.1	U	5.6	U	5.5
Bromoform	ug/kg	5.1	U	5.6	U	5.5
1,1,2,2-Tetrachloroethane	ug/kg	5.1	U	5.6	U	5.5
1,3-Dichlorobenzene	ug/kg	5.1	U	5.6	U	5.5
1,4-Dichlorobenzene	ug/kg	5.1	U	5.6	U	5.5
1,2-Dichlorobenzene	ug/kg	5.1	U	5.6	U	5.5
1,2,4-Trichlorobenzene	ug/kg	5.1	U	5.6	U	5.5
1,2,3-Trichlorobenzene	ug/kg	5.1	U	5.6	U	5.5

	StationID	B003	I722SB004		I722SB005	
	SampleID	301 (0-1ft)	722SB00401 (0-1ft)		722SB00501 (0-1ft)	
	DateCollected	/2003	07/11/2003		07/11/2003	
	DateExtracted	/2003	07/12/2003		07/12/2003	
	DateAnalyzed	/2003	07/17/2003		07/17/2003	
	SDGNumber	917	83917		83917	
Parameter	**Units**					
Dibromochloromethane	ug/kg	U	5.8	U	5.6	U
Chlorobenzene	ug/kg	U	5.8	U	5.6	U
Ethylbenzene	ug/kg	U	5.8	U	5.6	U
m+p Xylene	ug/kg	U	5.8	U	5.6	U
o-Xylene	ug/kg	U	5.8	U	5.6	U
Xylenes, Total	ug/kg	U	5.8	U	5.6	U
Styrene	ug/kg	U	5.8	U	5.6	U
Bromoform	ug/kg	U	5.8	U	5.6	UJ
1,1,2,2-Tetrachloroethane	ug/kg	U	5.8	U	5.6	UJ
1,3-Dichlorobenzene	ug/kg	U	5.8	U	5.6	UJ
1,4-Dichlorobenzene	ug/kg	U	5.8	U	5.6	UJ
1,2-Dichlorobenzene	ug/kg	U	5.8	U	5.6	UJ
1,2,4-Trichlorobenzene	ug/kg	U	5.8	U	5.6	UJ
1,2,3-Trichlorobenzene	ug/kg	U	5.8	U	5.6	UJ

	StationID	I722SB006		I722SB007		I722S
	SampleID	722SB00601 (0-1ft)		722SB00701 (0-1ft)		722SB00
	DateCollected	07/11/2003		07/11/2003		07/11
	DateExtracted	07/12/2003		07/12/2003		07/12
	DateAnalyzed	07/17/2003		07/17/2003		07/17
	SDGNumber	83917		83917		83
Parameter	**Units**					
Dibromochloromethane	ug/kg	5.6	U	5.6	U	5.7
Chlorobenzene	ug/kg	5.6	U	5.6	U	5.7
Ethylbenzene	ug/kg	5.6	U	5.6	U	5.7
m+p Xylene	ug/kg	5.6	U	5.6	U	5.7
o-Xylene	ug/kg	5.6	U	5.6	U	5.7
Xylenes, Total	ug/kg	5.6	U	5.6	U	5.7
Styrene	ug/kg	5.6	U	5.6	U	5.7
Bromoform	ug/kg	5.6	U	5.6	U	5.7
1,1,2,2-Tetrachloroethane	ug/kg	5.6	U	5.6	U	5.7
1,3-Dichlorobenzene	ug/kg	5.6	U	5.6	U	5.7
1,4-Dichlorobenzene	ug/kg	5.6	U	5.6	U	5.7
1,2-Dichlorobenzene	ug/kg	5.6	U	5.6	U	5.7
1,2,4-Trichlorobenzene	ug/kg	5.6	U	5.6	U	5.7
1,2,3-Trichlorobenzene	ug/kg	5.6	U	5.6	U	5.7

	StationID	B008	I722SB009		I722SB010	
	SampleID	301 (0-1ft)	722SB00901 (0-1ft)		722SB01001 (0-1ft)	
	DateCollected	/2003	07/11/2003		07/11/2003	
	DateExtracted	/2003	07/12/2003		07/12/2003	
	DateAnalyzed	/2003	07/17/2003		07/17/2003	
	SDGNumber	917	83917		83917	
Parameter	**Units**					
Dibromochloromethane	ug/kg	U	5.8	U	6	U
Chlorobenzene	ug/kg	U	5.8	U	6	U
Ethylbenzene	ug/kg	U	5.8	U	6	U
m+p Xylene	ug/kg	U	5.8	U	6	U
o-Xylene	ug/kg	U	5.8	U	6	U
Xylenes, Total	ug/kg	U	5.8	U	6	U
Styrene	ug/kg	U	5.8	U	6	U
Bromoform	ug/kg	U	5.8	U	6	U
1,1,2,2-Tetrachloroethane	ug/kg	U	5.8	U	6	U
1,3-Dichlorobenzene	ug/kg	U	5.8	U	6	U
1,4-Dichlorobenzene	ug/kg	U	5.8	U	6	U
1,2-Dichlorobenzene	ug/kg	U	5.8	U	6	U
1,2,4-Trichlorobenzene	ug/kg	U	5.8	U	6	UJ
1,2,3-Trichlorobenzene	ug/kg	U	5.8	U	6	UJ

	StationID	I722SB001		I722SB002		I722SB003	
	SampleID	722SB00101 (0-1ft)		722SB00201 (0-1ft)		722SB00301 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/16/2003		07/16/2003		07/18/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Benzo(g,h,i)Perylene	ug/kg	383	UJ	256	J	384	UJ
Phenol	ug/kg	383	U	380	U	384	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/kg	383	U	380	U	384	U
Bis(2-Chloroisopropyl)Ether	ug/kg	383	U	380	U	384	U
2-Chlorophenol	ug/kg	383	U	380	U	384	U
Benzyl alcohol	ug/kg	383	U	380	U	384	U
2-Methylphenol (o-Cresol)	ug/kg	383	U	380	U	384	U
N-Nitrosodi-n-propylamine	ug/kg	383	U	380	U	384	U
3-Methylphenol/4-Methylphenol (mp-Cresol)	ug/kg	383	U	380	U	384	U
Hexachloroethane	ug/kg	383	U	380	U	384	U
Nitrobenzene	ug/kg	383	U	380	U	384	U
Isophorone	ug/kg	383	U	380	U	384	U
2-Nitrophenol	ug/kg	383	U	380	U	384	U
2,4-Dimethylphenol	ug/kg	383	U	380	U	384	U
bis(2-Chloroethoxy) Methane	ug/kg	383	UJ	380	UJ	384	U
2,4-Dichlorophenol	ug/kg	383	U	380	U	384	U
Benzoic acid	ug/kg	1850	U	1840	U	1860	U
Naphthalene	ug/kg	383	U	380	U	384	U
4-Chloroaniline	ug/kg	383	U	380	U	384	U
Hexachlorobutadiene	ug/kg	383	U	380	U	384	U
4-Chloro-3-methylphenol	ug/kg	348	U	346	U	349	U
2-Methylnaphthalene	ug/kg	383	U	380	U	384	U
Hexachlorocyclopentadiene	ug/kg	383	U	380	U	384	U
2,4,6-Trichlorophenol	ug/kg	383	U	380	U	384	U
2,4,5-Trichlorophenol	ug/kg	1850	U	1840	U	1860	U
2-Chloronaphthalene	ug/kg	383	U	380	U	384	U
2-Nitroaniline	ug/kg	1850	U	1840	U	1860	U
3-Nitroaniline	ug/kg	1850	U	1840	U	1860	U
Dimethyl Phthalate	ug/kg	383	U	380	U	384	U
2,6-Dinitrotoluene	ug/kg	383	U	380	U	384	U

	StationID	I722SB004		I722SB005		I722SB006	
	SampleID	722SB00401 (0-1ft)		722SB00501 (0-1ft)		722SB00601 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/16/2003		07/16/2003		07/16/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Benzo(g,h,i)Perylene	ug/kg	300	J	536	J	1620	UJ
Phenol	ug/kg	396	U	395	U	1620	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/kg	396	U	395	U	1620	U
Bis(2-Chloroisopropyl)Ether	ug/kg	396	U	395	U	1620	U
2-Chlorophenol	ug/kg	396	U	395	U	1620	U
Benzyl alcohol	ug/kg	396	U	395	U	1620	U
2-Methylphenol (o-Cresol)	ug/kg	396	U	395	U	1620	U
N-Nitrosodi-n-propylamine	ug/kg	396	U	395	U	1620	U
3-Methylphenol/4-Methylphenol (mp-Cresol)	ug/kg	396	U	395	U	1620	U
Hexachloroethane	ug/kg	396	U	395	U	1620	U
Nitrobenzene	ug/kg	396	U	395	U	1620	U
Isophorone	ug/kg	396	U	395	U	1620	U
2-Nitrophenol	ug/kg	396	U	395	U	1620	U
2,4-Dimethylphenol	ug/kg	396	U	395	U	1620	U
bis(2-Chloroethoxy) Methane	ug/kg	396	UJ	395	UJ	1620	UJ
2,4-Dichlorophenol	ug/kg	396	U	395	U	1620	U
Benzoic acid	ug/kg	1920	U	1910	U	7840	U
Naphthalene	ug/kg	396	U	395	U	1620	U
4-Chloroaniline	ug/kg	396	U	395	U	1620	U
Hexachlorobutadiene	ug/kg	396	U	395	U	1620	U
4-Chloro-3-methylphenol	ug/kg	360	U	359	U	1470	U
2-Methylnaphthalene	ug/kg	396	U	21.8	J	1620	U
Hexachlorocyclopentadiene	ug/kg	396	U	395	U	1620	U
2,4,6-Trichlorophenol	ug/kg	396	U	395	U	1620	U
2,4,5-Trichlorophenol	ug/kg	1920	U	1910	U	7840	U
2-Chloronaphthalene	ug/kg	396	U	395	U	1620	U
2-Nitroaniline	ug/kg	1920	U	1910	U	7840	U
3-Nitroaniline	ug/kg	1920	U	1910	U	7840	U
Dimethyl Phthalate	ug/kg	396	U	395	U	1620	U
2,6-Dinitrotoluene	ug/kg	396	U	395	U	1620	U

	StationID	I722SB007		I722SB008		I722SB009	
	SampleID	722SB00701 (0-1ft)		722SB00801 (0-1ft)		722SB00901 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/16/2003		07/16/2003		07/16/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Benzo(g,h,i)Perylene	ug/kg	410	UJ	393	UJ	394	UJ
Phenol	ug/kg	410	U	393	U	394	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/kg	410	U	393	U	394	U
Bis(2-Chloroisopropyl)Ether	ug/kg	410	U	393	U	394	U
2-Chlorophenol	ug/kg	410	U	393	U	394	U
Benzyl alcohol	ug/kg	410	U	393	U	394	U
2-Methylphenol (o-Cresol)	ug/kg	410	U	393	U	394	U
N-Nitrosodi-n-propylamine	ug/kg	410	U	393	U	394	U
3-Methylphenol/4-Methylphenol (mp-Cresol)	ug/kg	410	U	393	U	394	U
Hexachloroethane	ug/kg	410	U	393	U	394	U
Nitrobenzene	ug/kg	410	U	393	U	394	U
Isophorone	ug/kg	410	U	393	U	394	U
2-Nitrophenol	ug/kg	410	U	393	U	394	U
2,4-Dimethylphenol	ug/kg	410	U	393	U	394	U
bis(2-Chloroethoxy) Methane	ug/kg	410	UJ	393	UJ	394	UJ
2,4-Dichlorophenol	ug/kg	410	U	393	U	394	U
Benzoic acid	ug/kg	1990	U	1900	U	1910	U
Naphthalene	ug/kg	410	U	393	U	394	U
4-Chloroaniline	ug/kg	410	U	393	U	394	U
Hexachlorobutadiene	ug/kg	410	U	393	U	394	U
4-Chloro-3-methylphenol	ug/kg	373	U	358	U	358	U
2-Methylnaphthalene	ug/kg	410	U	393	U	394	U
Hexachlorocyclopentadiene	ug/kg	410	U	393	U	394	U
2,4,6-Trichlorophenol	ug/kg	410	U	393	U	394	U
2,4,5-Trichlorophenol	ug/kg	1990	U	1900	U	1910	U
2-Chloronaphthalene	ug/kg	410	U	393	U	394	U
2-Nitroaniline	ug/kg	1990	U	1900	U	1910	U
3-Nitroaniline	ug/kg	1990	U	1900	U	1910	U
Dimethyl Phthalate	ug/kg	410	U	393	U	394	U
2,6-Dinitrotoluene	ug/kg	410	U	393	U	394	U

	StationID	I722SB010	
	SampleID	722SB01001 (0-1ft)	
	DateCollected	07/11/2003	
	DateExtracted	07/14/2003	
	DateAnalyzed	07/18/2003	
	SDGNumber	83917	
Parameter	**Units**		
Benzo(g,h,i)Perylene	ug/kg	397	UJ
Phenol	ug/kg	397	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/kg	397	U
Bis(2-Chloroisopropyl)Ether	ug/kg	397	U
2-Chlorophenol	ug/kg	397	U
Benzyl alcohol	ug/kg	397	U
2-Methylphenol (o-Cresol)	ug/kg	397	U
N-Nitrosodi-n-propylamine	ug/kg	397	U
3-Methylphenol/4-Methylphenol (mp-Cresol)	ug/kg	397	U
Hexachloroethane	ug/kg	397	U
Nitrobenzene	ug/kg	397	U
Isophorone	ug/kg	397	U
2-Nitrophenol	ug/kg	397	U
2,4-Dimethylphenol	ug/kg	397	U
bis(2-Chloroethoxy) Methane	ug/kg	397	U
2,4-Dichlorophenol	ug/kg	397	U
Benzoic acid	ug/kg	1920	U
Naphthalene	ug/kg	397	U
4-Chloroaniline	ug/kg	397	U
Hexachlorobutadiene	ug/kg	397	U
4-Chloro-3-methylphenol	ug/kg	361	U
2-Methylnaphthalene	ug/kg	397	U
Hexachlorocyclopentadiene	ug/kg	397	U
2,4,6-Trichlorophenol	ug/kg	397	U
2,4,5-Trichlorophenol	ug/kg	1920	U
2-Chloronaphthalene	ug/kg	397	U
2-Nitroaniline	ug/kg	1920	U
3-Nitroaniline	ug/kg	1920	U
Dimethyl Phthalate	ug/kg	397	U
2,6-Dinitrotoluene	ug/kg	397	U

	StationID	I722SB001		I722SB002		I722SB003	
	SampleID	722SB00101 (0-1ft)		722SB00201 (0-1ft)		722SB00301 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/16/2003		07/16/2003		07/18/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Acenaphthylene	ug/kg	383	U	380	U	384	U
Acenaphthene	ug/kg	348	U	346	U	349	U
2,4-Dinitrophenol	ug/kg	1850	U	1840	U	1860	U
Dibenzofuran	ug/kg	383	U	380	U	384	U
2,4-Dinitrotoluene	ug/kg	348	U	346	U	349	U
Diethyl Phthalate	ug/kg	383	U	380	U	384	U
4-Nitrophenol	ug/kg	1850	U	1840	U	1860	U
Fluorene	ug/kg	383	U	380	U	384	U
4-Chlorophenyl Phenyl Ether	ug/kg	383	U	380	U	384	U
4,6-Dinitro-2-methylphenol	ug/kg	1850	U	1840	U	1860	U
4-Nitroaniline	ug/kg	1850	U	1840	U	1860	U
Diphenylamine	ug/kg	383	U	380	U	384	U
4-Bromophenyl Phenyl Ether	ug/kg	383	U	380	U	384	U
Hexachlorobenzene	ug/kg	383	U	380	U	384	U
Pentachlorophenol	ug/kg	1850	U	1840	U	1860	U
Phenanthrene	ug/kg	383	U	75	J	384	U
Anthracene	ug/kg	383	U	380	U	384	U
Di-n-butyl Phthalate	ug/kg	383	U	380	U	384	U
Fluoranthene	ug/kg	383	U	256	J	20.2	J
Pyrene	ug/kg	383	U	269	J	384	U
Benzyl Butyl Phthalate	ug/kg	383	U	380	U	384	U
Benzo(a)Anthracene	ug/kg	383	U	187	J	384	U
3,3'-Dichlorobenzidine	ug/kg	765	U	760	U	768	U
Chrysene	ug/kg	383	U	188	J	384	U
bis(2-Ethylhexyl) Phthalate	ug/kg	383	U	380	U	384	U
Di-n-octylphthalate	ug/kg	383	U	380	U	384	U
Benzo(b)Fluoranthene	ug/kg	383	U	385	=	384	UJ
Benzo(k)Fluoranthene	ug/kg	383	U	380	U	384	UJ
Benzo(a)Pyrene	ug/kg	383	U	259	J	384	UJ
Indeno(1,2,3-c,d)pyrene	ug/kg	383	U	256	J	384	UJ

	StationID	I722SB004		I722SB005		I722SB006	
	SampleID	722SB00401 (0-1ft)		722SB00501 (0-1ft)		722SB00601 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/16/2003		07/16/2003		07/16/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Acenaphthylene	ug/kg	396	U	395	U	1620	U
Acenaphthene	ug/kg	38.1	J	28.4	J	1470	U
2,4-Dinitrophenol	ug/kg	1920	U	1910	U	7840	U
Dibenzofuran	ug/kg	396	U	22.6	J	1620	U
2,4-Dinitrotoluene	ug/kg	360	U	359	U	1470	U
Diethyl Phthalate	ug/kg	396	U	395	U	1620	U
4-Nitrophenol	ug/kg	1920	U	1910	U	7840	U
Fluorene	ug/kg	36.5	J	37	J	20	J
4-Chlorophenyl Phenyl Ether	ug/kg	396	U	395	U	1620	U
4,6-Dinitro-2-methylphenol	ug/kg	1920	U	1910	U	7840	U
4-Nitroaniline	ug/kg	1920	U	1910	U	7840	U
Diphenylamine	ug/kg	396	U	395	U	1620	U
4-Bromophenyl Phenyl Ether	ug/kg	396	U	395	U	1620	U
Hexachlorobenzene	ug/kg	396	U	395	U	1620	U
Pentachlorophenol	ug/kg	1920	U	1910	U	7840	U
Phenanthrene	ug/kg	444	=	974	=	528	J
Anthracene	ug/kg	75.7	J	82.9	J	1620	U
Di-n-butyl Phthalate	ug/kg	396	U	395	U	1620	U
Fluoranthene	ug/kg	730	=	1790	=	1120	J
Pyrene	ug/kg	590	=	2370	=	1370	J
Benzyl Butyl Phthalate	ug/kg	396	U	395	U	1620	U
Benzo(a)Anthracene	ug/kg	292	J	710	=	1620	U
3,3'-Dichlorobenzidine	ug/kg	792	U	789	U	3230	U
Chrysene	ug/kg	362	J	1110	=	752	J
bis(2-Ethylhexyl) Phthalate	ug/kg	396	U	499	U	1620	U
Di-n-octylphthalate	ug/kg	396	U	395	U	1620	U
Benzo(b)Fluoranthene	ug/kg	472	=	1840	J	1570	J
Benzo(k)Fluoranthene	ug/kg	396	U	395	UJ	1620	U
Benzo(a)Pyrene	ug/kg	378	J	832	J	964	J
Indeno(1,2,3-c,d)pyrene	ug/kg	318	J	529	J	1620	U

	StationID	I722SB007		I722SB008		I722SB009	
	SampleID	722SB00701 (0-1ft)		722SB00801 (0-1ft)		722SB00901 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/16/2003		07/16/2003		07/16/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Acenaphthylene	ug/kg	410	U	393	U	394	U
Acenaphthene	ug/kg	373	U	358	U	358	U
2,4-Dinitrophenol	ug/kg	1990	U	1900	U	1910	U
Dibenzofuran	ug/kg	410	U	393	U	394	U
2,4-Dinitrotoluene	ug/kg	373	U	358	U	358	U
Diethyl Phthalate	ug/kg	410	U	393	U	394	U
4-Nitrophenol	ug/kg	1990	U	1900	U	1910	U
Fluorene	ug/kg	410	U	393	U	394	U
4-Chlorophenyl Phenyl Ether	ug/kg	410	U	393	U	394	U
4,6-Dinitro-2-methylphenol	ug/kg	1990	U	1900	U	1910	U
4-Nitroaniline	ug/kg	1990	U	1900	U	1910	U
Diphenylamine	ug/kg	410	U	393	U	394	U
4-Bromophenyl Phenyl Ether	ug/kg	410	U	393	U	394	U
Hexachlorobenzene	ug/kg	410	U	393	U	394	U
Pentachlorophenol	ug/kg	1990	U	1900	U	1910	U
Phenanthrene	ug/kg	21.5	J	393	U	394	U
Anthracene	ug/kg	410	U	393	U	394	U
Di-n-butyl Phthalate	ug/kg	410	U	393	U	394	U
Fluoranthene	ug/kg	46.9	J	393	U	40.2	J
Pyrene	ug/kg	65.7	J	47.4	J	53.4	J
Benzyl Butyl Phthalate	ug/kg	410	U	393	U	394	U
Benzo(a)Anthracene	ug/kg	410	U	393	U	394	U
3,3'-Dichlorobenzidine	ug/kg	819	U	786	U	786	U
Chrysene	ug/kg	410	U	393	U	394	U
bis(2-Ethylhexyl) Phthalate	ug/kg	410	U	393	U	394	U
Di-n-octylphthalate	ug/kg	410	U	393	U	394	U
Benzo(b)Fluoranthene	ug/kg	410	U	393	U	394	U
Benzo(k)Fluoranthene	ug/kg	410	U	393	U	394	U
Benzo(a)Pyrene	ug/kg	410	U	393	U	394	U
Indeno(1,2,3-c,d)pyrene	ug/kg	410	U	393	U	394	U

	StationID	I722SB010	
	SampleID	722SB01001 (0-1ft)	
	DateCollected	07/11/2003	
	DateExtracted	07/14/2003	
	DateAnalyzed	07/18/2003	
	SDGNumber	83917	
Parameter	**Units**		
Acenaphthylene	ug/kg	397	U
Acenaphthene	ug/kg	361	U
2,4-Dinitrophenol	ug/kg	1920	U
Dibenzofuran	ug/kg	397	U
2,4-Dinitrotoluene	ug/kg	361	U
Diethyl Phthalate	ug/kg	397	U
4-Nitrophenol	ug/kg	1920	U
Fluorene	ug/kg	397	U
4-Chlorophenyl Phenyl Ether	ug/kg	397	U
4,6-Dinitro-2-methylphenol	ug/kg	1920	U
4-Nitroaniline	ug/kg	1920	U
Diphenylamine	ug/kg	397	U
4-Bromophenyl Phenyl Ether	ug/kg	397	U
Hexachlorobenzene	ug/kg	397	U
Pentachlorophenol	ug/kg	1920	U
Phenanthrene	ug/kg	21.2	J
Anthracene	ug/kg	397	U
Di-n-butyl Phthalate	ug/kg	397	U
Fluoranthene	ug/kg	60.4	J
Pyrene	ug/kg	54.5	J
Benzyl Butyl Phthalate	ug/kg	397	U
Benzo(a)Anthracene	ug/kg	38.7	J
3,3'-Dichlorobenzidine	ug/kg	794	U
Chrysene	ug/kg	36.8	J
bis(2-Ethylhexyl) Phthalate	ug/kg	397	U
Di-n-octylphthalate	ug/kg	397	U
Benzo(b)Fluoranthene	ug/kg	157	J
Benzo(k)Fluoranthene	ug/kg	397	UJ
Benzo(a)Pyrene	ug/kg	144	J
Indeno(1,2,3-c,d)pyrene	ug/kg	397	UJ

	StationID	I722SB001		I722SB002		I722SB003	
	SampleID	722SB00101 (0-1ft)		722SB00201 (0-1ft)		722SB00301 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/16/2003		07/16/2003		07/18/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Dibenz(a,h)anthracene	ug/kg	383	U	380	U	384	UJ
Carbazole	ug/kg	383	U	380	U	384	UJ

	StationID	I722SB004		I722SB005		I722SB006	
	SampleID	722SB00401 (0-1ft)		722SB00501 (0-1ft)		722SB00601 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/16/2003		07/16/2003		07/16/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Dibenz(a,h)anthracene	ug/kg	396	U	395	UJ	1620	U
Carbazole	ug/kg	60.2	J	85.8	J	1620	U

	StationID	I722SB007		I722SB008		I722SB009	
	SampleID	722SB00701 (0-1ft)		722SB00801 (0-1ft)		722SB00901 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/16/2003		07/16/2003		07/16/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Dibenz(a,h)anthracene	ug/kg	410	U	393	U	394	U
Carbazole	ug/kg	410	U	393	U	394	U

	StationID	I722SB010	
	SampleID	722SB01001 (0-1ft)	
	DateCollected	07/11/2003	
	DateExtracted	07/14/2003	
	DateAnalyzed	07/18/2003	
	SDGNumber	83917	
Parameter	**Units**		
Dibenz(a,h)anthracene	ug/kg	397	UJ
Carbazole	ug/kg	397	UJ

	StationID	I722SB001		I722SB002		I722SB003	
	SampleID	722SB00101 (0-1ft)		722SB00201 (0-1ft)		722SB00301 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/15/2003		07/15/2003		07/15/2003	
	DateAnalyzed	07/17/2003		07/17/2003		07/17/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Aldrin	ug/kg	1.5	U	1.49	U	7.54	U
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/kg	1.5	U	1.49	U	7.54	U
Alpha-chlordane	ug/kg	1.5	U	1.49	U	7.54	U
Beta BHC (Beta Hexachlorocyclohexane)	ug/kg	1.5	U	1.49	U	7.54	U
Chlordane	ug/kg	15	U	14.9	U	75.4	U
Delta BHC (Delta Hexachlorocyclohexane)	ug/kg	1.5	U	1.49	U	7.54	U
Dieldrin	ug/kg	0.226	J	2.88	U	14.5	U
Endosulfan I	ug/kg	1.5	U	1.49	U	7.54	U
Endosulfan II	ug/kg	2.9	U	2.88	U	14.5	U
Endosulfan Sulfate	ug/kg	2.9	U	2.88	U	14.5	U
Endrin Aldehyde	ug/kg	0.364	J	2.88	U	14.5	U
Endrin Ketone	ug/kg	2.9	U	2.88	U	14.5	U
Endrin	ug/kg	2.9	U	2.88	U	14.5	U
Gamma BHC (Lindane)	ug/kg	1.5	U	1.49	U	7.54	U
Gamma-chlordane	ug/kg	1.5	U	1.49	U	7.54	U
Heptachlor Epoxide	ug/kg	1.5	U	1.49	U	7.54	U
Heptachlor	ug/kg	1.5	U	1.49	U	7.54	U
Methoxychlor	ug/kg	15	U	14.9	U	75.4	U
p,p'-DDD	ug/kg	2.24	J	11.4	=	14.5	U
p,p'-DDE	ug/kg	3.53	=	9	=	6.08	J
p,p'-DDT	ug/kg	0.927	J	13.4	=	14.5	U
Toxaphene	ug/kg	96	U	95.4	U	482	U

	StationID	I722SB004		I722SB005		I722SB005	
	SampleID	722SB00401 (0-1ft)		722SB00501 (0-1ft)		722SB00501RE (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/15/2003		07/15/2003		07/15/2003	
	DateAnalyzed	07/17/2003		07/17/2003		07/30/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Aldrin	ug/kg	7.78	U	31	U		
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/kg	7.78	U	31	U		
Alpha-chlordane	ug/kg	7.78	U	51.7	J	48.2	R
Beta BHC (Beta Hexachlorocyclohexane)	ug/kg	7.78	U	31	U		
Chlordane	ug/kg	77.8	U	310	U		
Delta BHC (Delta Hexachlorocyclohexane)	ug/kg	7.78	U	31	U		
Dieldrin	ug/kg	10.4	J	6.28	J		
Endosulfan I	ug/kg	7.78	U	31	U		
Endosulfan II	ug/kg	15	U	59.8	U		
Endosulfan Sulfate	ug/kg	15	U	59.8	U		
Endrin Aldehyde	ug/kg	15	U	59.8	U		
Endrin Ketone	ug/kg	15	U	59.8	U		
Endrin	ug/kg	15	U	59.8	U		
Gamma BHC (Lindane)	ug/kg	7.78	U	31	U		
Gamma-chlordane	ug/kg	8.96	=	26.6	J		
Heptachlor Epoxide	ug/kg	7.78	U	31	U		
Heptachlor	ug/kg	7.78	U	31	U		
Methoxychlor	ug/kg	77.8	U	310	U		
p,p'-DDD	ug/kg	15	U	59.8	U		
p,p'-DDE	ug/kg	15	U	59.8	U		
p,p'-DDT	ug/kg	15	U	59.8	U		
Toxaphene	ug/kg	497	U	1980	U		

	StationID	I722SB006		I722SB007		I722SB008	
	SampleID	722SB00601 (0-1ft)		722SB00701 (0-1ft)		722SB00801 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/15/2003		07/15/2003		07/15/2003	
	DateAnalyzed	07/17/2003		07/17/2003		07/18/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Aldrin	ug/kg	31.8	U	8.05	U	7.72	U
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/kg	31.8	U	8.05	U	7.72	U
Alpha-chlordane	ug/kg	14.1	J	8.05	U	117	J
Beta BHC (Beta Hexachlorocyclohexane)	ug/kg	31.8	U	8.05	U	7.72	U
Chlordane	ug/kg	318	U	80.5	U	420	J
Delta BHC (Delta Hexachlorocyclohexane)	ug/kg	31.8	U	8.05	U	7.72	U
Dieldrin	ug/kg	61.2	U	2.4	J	14.9	U
Endosulfan I	ug/kg	31.8	U	8.05	U	7.72	U
Endosulfan II	ug/kg	61.2	U	15.5	U	14.9	U
Endosulfan Sulfate	ug/kg	61.2	U	15.5	U	14.9	U
Endrin Aldehyde	ug/kg	61.2	U	15.5	U	14.9	U
Endrin Ketone	ug/kg	61.2	U	15.5	U	14.9	U
Endrin	ug/kg	61.2	U	15.5	U	14.9	U
Gamma BHC (Lindane)	ug/kg	31.8	U	8.05	U	7.72	U
Gamma-chlordane	ug/kg	31.6	J	1.16	J	47.5	=
Heptachlor Epoxide	ug/kg	18	J	8.05	U	7.72	U
Heptachlor	ug/kg	31.8	U	8.05	U	7.72	U
Methoxychlor	ug/kg	318	U	80.5	U	77.2	U
p,p'-DDD	ug/kg	61.2	U	15.5	U	14.9	U
p,p'-DDE	ug/kg	61.2	U	3.7	J	4.59	J
p,p'-DDT	ug/kg	61.2	U	15.5	U	14.9	U
Toxaphene	ug/kg	2030	U	514	U	493	U

	StationID	I722SB009		I722SB009		I722SB010	
	SampleID	722SB00901 (0-1ft)		722SB00901RE (0-1ft)		722SB01001 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/15/2003		07/15/2003		07/15/2003	
	DateAnalyzed	07/17/2003		07/28/2003		07/17/2003	
	SDGNumber	83917		83917		83917	
Parameter	**Units**						
Aldrin	ug/kg	1.54	U			7.8	U
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/kg	1.54	U			7.8	U
Alpha-chlordane	ug/kg	1.54	U			7.8	U
Beta BHC (Beta Hexachlorocyclohexane)	ug/kg	1.54	U			7.8	U
Chlordane	ug/kg	15.4	U			78	U
Delta BHC (Delta Hexachlorocyclohexane)	ug/kg	1.54	U			7.8	U
Dieldrin	ug/kg	1.26	J			15	U
Endosulfan I	ug/kg	1.54	U			7.8	U
Endosulfan II	ug/kg	2.98	U			15	U
Endosulfan Sulfate	ug/kg	2.98	U			15	U
Endrin Aldehyde	ug/kg	2.98	U			15	U
Endrin Ketone	ug/kg	2.98	U			15	U
Endrin	ug/kg	2.98	U			15	U
Gamma BHC (Lindane)	ug/kg	1.54	U			7.8	U
Gamma-chlordane	ug/kg	1.54	U			7.8	U
Heptachlor Epoxide	ug/kg	1.54	U			7.8	U
Heptachlor	ug/kg	1.54	U			7.8	U
Methoxychlor	ug/kg	15.4	U			78	U
p,p'-DDD	ug/kg	0.573	J			15	U
p,p'-DDE	ug/kg	2.95	J	2.4	R	4.64	J
p,p'-DDT	ug/kg	4.89	=			15	U
Toxaphene	ug/kg	98.7	U			498	U

	StationID	I722SB001		I722SB002		I722SB003		I722SB004	
	SampleID	722SB00101 (0-1ft)		722SB00201 (0-1ft)		722SB00301 (0-1ft)		722SB00401 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/18/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/17/2003		07/21/2003		07/17/2003		07/17/2003	
	SDGNumber	83917		83917		83917		83917	
Parameter	**Units**								
PCB-1016 (Arochlor 1016)	ug/kg	3.9	U	3.8	U	3.9	U	20	U
PCB-1221 (Arochlor 1221)	ug/kg	3.9	U	3.8	U	3.9	U	20	U
PCB-1232 (Arochlor 1232)	ug/kg	3.9	U	3.8	U	3.9	U	20	U
PCB-1242 (Arochlor 1242)	ug/kg	3.9	U	3.8	U	3.9	U	20	U
PCB-1248 (Arochlor 1248)	ug/kg	3.9	U	3.8	U	3.9	U	20	U
PCB-1254 (Arochlor 1254)	ug/kg	3.9	U	15.6	=	4.3	=	20	U
PCB-1260 (Arochlor 1260)	ug/kg	3	J	4.5	=	2.1	J	274	=

	StationID	I722SB005		I722SB006		I722SB007		I722SB008	
	SampleID	722SB00501 (0-1ft)		722SB00601 (0-1ft)		722SB00701 (0-1ft)		722SB00801 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003		07/14/2003		07/14/2003	
	DateAnalyzed	07/17/2003		07/17/2003		07/17/2003		07/17/2003	
	SDGNumber	83917		83917		83917		83917	
Parameter	**Units**								
PCB-1016 (Arochlor 1016)	ug/kg	19.9	U	4.1	U	4.1	U	4	U
PCB-1221 (Arochlor 1221)	ug/kg	19.9	U	4.1	U	4.1	U	4	U
PCB-1232 (Arochlor 1232)	ug/kg	19.9	U	4.1	U	4.1	U	4	U
PCB-1242 (Arochlor 1242)	ug/kg	19.9	U	4.1	U	4.1	U	4	U
PCB-1248 (Arochlor 1248)	ug/kg	19.9	U	4.1	U	4.1	U	4	U
PCB-1254 (Arochlor 1254)	ug/kg	19.9	U	4.1	U	4.1	U	4	U
PCB-1260 (Arochlor 1260)	ug/kg	38.4	J	11.9	=	18.1	=	4.1	J

	StationID	I722SB009		I722SB010	
	SampleID	722SB00901 (0-1ft)		722SB01001 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003	
	DateExtracted	07/14/2003		07/14/2003	
	DateAnalyzed	07/17/2003		07/17/2003	
	SDGNumber	83917		83917	
Parameter	Units				
PCB-1016 (Arochlor 1016)	ug/kg	4	U	4	U
PCB-1221 (Arochlor 1221)	ug/kg	4	U	4	U
PCB-1232 (Arochlor 1232)	ug/kg	4	U	4	U
PCB-1242 (Arochlor 1242)	ug/kg	4	U	4	U
PCB-1248 (Arochlor 1248)	ug/kg	4	U	4	U
PCB-1254 (Arochlor 1254)	ug/kg	4	U	46.4	=
PCB-1260 (Arochlor 1260)	ug/kg	3.5	J	16.3	J

	StationID	I722SB001		I722SB001		I722SB002		I722SB002	
	SampleID	722SB00101 (0-1ft)		722SB00101 (0-1ft)		722SB00201 (0-1ft)		722SB00201 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/15/2003		07/17/2003		07/15/2003		07/17/2003	
	DateAnalyzed	07/16/2003		07/19/2003		07/16/2003		07/19/2003	
	SDGNumber	83917		83917		83917		83917	
Parameter	**Units**								
Arsenic	mg/kg	1.47	J			1.18	J		
Barium	mg/kg	25.5	J			29.1	J		
Cadmium	mg/kg	0.075	U			0.096	U		
Chromium, Total	mg/kg	17.3	=			10.1	=		
Lead	mg/kg	15.7	=			15.3	=		
Selenium	mg/kg	0.385	U			0.372	U		
Silver	mg/kg	0.193	U			0.186	U		
Mercury	mg/kg			0.015	J			0.018	J

	StationID	I722SB003		I722SB003		I722SB004		I722SB004	
	SampleID	722SB00301 (0-1ft)		722SB00301 (0-1ft)		722SB00401 (0-1ft)		722SB00401 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/15/2003		07/17/2003		07/15/2003		07/17/2003	
	DateAnalyzed	07/17/2003		07/19/2003		07/17/2003		07/19/2003	
	SDGNumber	83917		83917		83917		83917	
Parameter	**Units**								
Arsenic	mg/kg	2.13	J			2.5	=		
Barium	mg/kg	24.7	J			29.7	J		
Cadmium	mg/kg	0.096	U			0.487	J		
Chromium, Total	mg/kg	9.02	=			19.5	=		
Lead	mg/kg	21.4	=			67.4	=		
Selenium	mg/kg	0.387	U			0.395	U		
Silver	mg/kg	0.194	U			0.232	U		
Mercury	mg/kg			0.025	J			0.052	J

	StationID	I722SB005		I722SB005		I722SB006		I722SB006	
	SampleID	722SB00501 (0-1ft)		722SB00501 (0-1ft)		722SB00601 (0-1ft)		722SB00601 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/15/2003		07/17/2003		07/15/2003		07/17/2003	
	DateAnalyzed	07/17/2003		07/19/2003		07/17/2003		07/19/2003	
	SDGNumber	83917		83917		83917		83917	
Parameter	**Units**								
Arsenic	mg/kg	4.19	=			2.42	=		
Barium	mg/kg	31.3	J			24.5	J		
Cadmium	mg/kg	0.862	J			0.307	J		
Chromium, Total	mg/kg	32	=			18.1	=		
Lead	mg/kg	123	=			45.9	=		
Selenium	mg/kg	0.382	U			0.449	J		
Silver	mg/kg	0.192	U			0.195	U		
Mercury	mg/kg			0.111	J			0.024	J

	StationID	I722SB007		I722SB007		I722SB008		I722SB008	
	SampleID	722SB00701 (0-1ft)		722SB00701 (0-1ft)		722SB00801 (0-1ft)		722SB00801 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/15/2003		07/17/2003		07/15/2003		07/17/2003	
	DateAnalyzed	07/17/2003		07/19/2003		07/17/2003		07/19/2003	
	SDGNumber	83917		83917		83917		83917	
Parameter	**Units**								
Arsenic	mg/kg	2.52	=			3.83	=		
Barium	mg/kg	15.5	J			25.6	J		
Cadmium	mg/kg	0.079	U			0.072	U		
Chromium, Total	mg/kg	8.92	=			13.2	=		
Lead	mg/kg	17.3	=			11.6	=		
Selenium	mg/kg	0.405	U			0.37	U		
Silver	mg/kg	0.203	U			0.186	U		
Mercury	mg/kg			0.053	J			6.03	=

	StationID	I722SB009		I722SB009		I722SB010		I722SB010	
	SampleID	722SB00901 (0-1ft)		722SB00901 (0-1ft)		722SB01001 (0-1ft)		722SB01001 (0-1ft)	
	DateCollected	07/11/2003		07/11/2003		07/11/2003		07/11/2003	
	DateExtracted	07/15/2003		07/17/2003		07/15/2003		07/17/2003	
	DateAnalyzed	07/17/2003		07/19/2003		07/17/2003		07/19/2003	
	SDGNumber	83917		83917		83917		83917	
Parameter	**Units**								
Arsenic	mg/kg	2.52	=			2.55	=		
Barium	mg/kg	18.4	J			19.9	J		
Cadmium	mg/kg	0.408	J			0.113	U		
Chromium, Total	mg/kg	18.6	=			11.7	=		
Lead	mg/kg	22.4	=			20.8	=		
Selenium	mg/kg	0.683	J			0.385	U		
Silver	mg/kg	0.205	U			0.227	U		
Mercury	mg/kg			0.024	J			0.03	J

Appendix B

Data Validation Summary - Charleston Naval Complex - Zone I, AOC 722

TO: Jim Edens/CH2M HILL/GNV

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

DATE: May 25, 2004

The purpose of this memorandum is to present the results of the data validation process for the samples collected in Zone I, AOC 722. The samples were collected between the dates of July 20, 2000 and April 22, 2004.

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 was validated for compliance with the analytical method requirements. This process also included a review of the data to assess the accuracy, precision, and completeness based upon procedures described in the guidance documents such as the Environmental Protection Agency (EPA) *National Functional Guidelines for Inorganic Data Review (EPA 2002) 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 8260 Volatile Organic Compounds (VOC), SW-846 8270 Semivolatile Organic Compounds (SVOC), SW-846 8081 Organochlorine Pesticides, SW-846 8082 Polychlorinated Biphenyls, and Metals following SW-846 6010/7000 Series methodology.

Samples were submitted to Severn Trent Services, STL Savannah Laboratories, Inc., in Savannah, Georgia, for the following analyses: SW-846 8260 Volatile Organic Compounds (VOC), SW-846 8270 Semivolatile Organic Compounds (SVOC.

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

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

The following primary flags were used to qualify the data:

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

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

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

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

[R] Rejected. The data is not useable.

Secondary Data Validation Qualifiers

Code	Definition
2C	Second Column (Confirmation)
2S	Second Source
2SH	Second Source Accuracy High
2SL	Second Source Accuracy Low
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BL	Blank
BS	Blank Spike/LCS
BSH	Blank Spike/LCS Recovery High
BSL	Blank Spike/LCS Recovery Low
CC	Continuing Calibration Verification
CCH	Continuing Calibration Verification Accuracy High
CCL	Continuing Calibration Verification Accuracy Low
DL	Dilution
FD	Field Duplicate
HT	Holding Time
IB	In-Between (metals - B's → J's)
IC	Initial Calibration
ICH	Initial Calibration High
ICL	Initial Calibration Low
IS	Internal Standard
ISH	Internal Standard Area Response High
ISL	Internal Standard Area Response Low
LD	Lab Duplicate
LR	Linear Range (Exceeded calibration range)
MD	Matrix Spike/Matrix Spike Duplicate Precision
MS	Matrix Spike/Matrix Spike Duplicate Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate Recovery High
MSL	Matrix Spike and/or Matrix Spike Duplicate Recovery Low
OT	Other
PD	Pesticide Degradation

Code	Definition
PS	Post Spike Recovery
PSH	Post Spike Recovery High
PSL	Post Spike Recovery Low
RE	Re-extraction/Re-analysis
SD	Serial Dilution
SS	Spiked Surrogate Recovery
SSH	Spiked Surrogate Recovery High
SSL	Spiked Surrogate Recovery Low
TD	Dissolved metal concentration exceeds total metal concentration.
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 I, AOC 722, Charleston, SC

SDG	Station ID	Sample ID	Lab Sample ID	Matrix	Sample Type	LR Type	Upper Depth	Lower Depth	Date Collected	VOC SW8260B	SVOC SW8270C	Pesticides SW8081A	PCB SW8082	Total Metals SW6010B	Dissolved Metals SW6010B	Mercury SW7471A
111526	IG11GW004	G11GW004P1	111526001	WG	N				04/21/04	X						
111526	I722GW001	722GW001P1	111526002	WG	N				04/21/04	X						
111526	I722GW002	722GW002P1	111526003	WG	N				04/21/04	X						
111526	I722GW003	722GW003P1	111526004	WG	N				04/21/04	X						
111526	IG11GW001	G11GW001P1	111526005	WG	N				04/21/04	X						
111526	IG11GW002	G11GW002P1	111526006	WG	N				04/21/04	X						
111526	IG11GW003	G11GW003P1	111526007	WG	N				04/21/04	X						
111526	IG11GW005	G11GW005P1	111526008	WG	N				04/22/04	X						
111526	IG11GW005	G11HW005P1	111526009	WG	FD				04/22/04	X						
111526	IGDIGW011	GDIGW011P1	111526010	WG	N				04/22/04	X						
111526	IGDIGW11D	GDIGW11DP1	111526011	WG	N				04/22/04	X						
111526	FIELDQC	722EW001P1	111526012	WQ	EB				04/22/04	X						
111526	FIELDQC	722TW001P1	111526013	WQ	TB				04/22/04	X						
111526	LABQC	1200615968	1200615968	WQ	LB					X						
111526	LABQC	1200615969	1200615969	WQ	BS					X						
111526	IG11GW004	G11GW004P1MS	1200615970	WG	MS				04/21/04	X						
111526	IG11GW004	G11GW004P1SD	1200615971	WG	SD				04/21/04	X						
111526	LABQC	1200618612	1200618612	WQ	LB					X						
111526	LABQC	1200618613	1200618613	WQ	BS					X						

TABLE 1
Chemical Analytical Methods – Field and Quality Control Samples
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Station ID	Sample ID	Lab Sample ID	Matrix	Sample Type	LR Type	Upper Depth	Lower Depth	Date Collected	VOC SW8260B	SVOC SW8270C	Pesticides SW8081A	PCB SW8082	Total Metals SW6010B	Dissolved Metals SW6010B	Mercury SW7471A
111526	LABQC	1200618614	1200618614	WQ	LB					X						
111526	LABQC	1200618615	1200618615	WQ	BS					X						
56538	IG11GW001	G11GW001M1	56538001	WG	N				02/22/02	X						
56538	IG11GW002	G11GW002M1	56538002	WG	N				02/22/02	X						
56538	IG11GW003	G11GW003M1	56538003	WG	N				02/22/02	X						
56538	IG11GW003	G11HW003M1	56538004	WG	FD				02/22/02	X						
56538	IGDIGW011	GDGW011M1	56538005	WG	N				02/22/02	X						
56538	IGDIGW11D	GDGW11DM1	56538006	WG	N				02/22/02	X						
56538	FIELDQC	G11EW001M1	56538007	WQ	EB				02/22/02	X						
56538	LABQC	1200173276	1200173276	WQ	LB					X						
56538	LABQC	1200173277	1200173277	WQ	BS					X						
60962	IG11GW005	G11GW005M2	60962001	WG	N				05/23/02	X						
60962	IG11GW005	G11HW005M2	60962002	WG	FD				05/23/02	X						
60962	IG11GP001	G11GP001M2	60962003	WG	N				05/23/02	X						
60962	IG11GP002	G11GP002M2	60962004	WG	N				05/23/02	X						
60962	IG11GP003	G11GP003M2	60962005	WG	N				05/23/02	X						
60962	IG11GW004	G11GW004	60962006	WG	N				05/23/02	X						
60962	LABQC	1200223961	1200223961	WQ	LB					X						
60962	LABQC	1200223962	1200223962	WQ	BS					X						
83917	I722SB001	722SB00101	83917001	SO	N		0	1	07/11/03	X	X	X	X	X		X
83917	I722SB002	722SB00201	83917002	SO	N		0	1	07/11/03	X	X	X	X	X		X

TABLE 1
Chemical Analytical Methods – Field and Quality Control Samples
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Station ID	Sample ID	Lab Sample ID	Matrix	Sample Type	LR Type	Upper Depth	Lower Depth	Date Collected	VOC SW8260B	SVOC SW8270C	Pesticides SW8081A	PCB SW8082	Total Metals SW6010B	Dissolved Metals SW6010B	Mercury SW7471A
83917	I722SB003	722SB00301	83917003	SO	N		0	1	07/11/03	X	X	X	X	X		X
83917	I722SB004	722SB00401	83917004	SO	N		0	1	07/11/03	X	X	X	X	X		X
83917	I722SB005	722SB00501	83917005	SO	N		0	1	07/11/03	X	X	X	X	X		X
83917	I722SB005	722SB00501RE	83917005	SO	LR	RE	0	1	07/11/03			X				
83917	I722SB005	722CB00501	83917006	SO	FD		0	1	07/11/03	X	X	X	X	X		X
83917	I722SB005	722CB00501RE	83917006	SO	LR	RE	0	1	07/11/03			X				
83917	I722SB006	722SB00601	83917007	SO	N		0	1	07/11/03	X	X	X	X	X		X
83917	I722SB007	722SB00701	83917008	SO	N		0	1	07/11/03	X	X	X	X	X		X
83917	I722SB008	722SB00801	83917009	SO	N		0	1	07/11/03	X	X	X	X	X		X
83917	I722SB009	722SB00901	83917010	SO	N		0	1	07/11/03	X	X	X	X	X		X
83917	I722SB009	722SB00901RE	83917010	SO	LR	RE	0	1	07/11/03			X				
83917	I722SB010	722SB01001	83917011	SO	N		0	1	07/11/03	X	X	X	X	X		X
83917	LABQC	1200454265	1200454265	SQ	LB								X			
83917	I722SB010	722SB01001MS	1200454266	SO	MS		0	1	07/11/03				X			
83917	I722SB010	722SB01001SD	1200454268	SO	SD		0	1	07/11/03				X			
83917	LABQC	1200454270	1200454270	SQ	BS								X			
83917	LABQC	1200454285	1200454285	SQ	LB						X					
83917	I722SB010	722SB01001MS	1200454286	SO	MS		0	1	07/11/03		X					
83917	I722SB010	722SB01001SD	1200454288	SO	SD		0	1	07/11/03		X					
83917	LABQC	1200454290	1200454290	SQ	BS						X					
83917	LABQC	1200454291	1200454291	SQ	LB							X				

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SDG	Station ID	Sample ID	Lab Sample ID	Matrix	Sample Type	LR Type	Upper Depth	Lower Depth	Date Collected	VOC SW8260B	SVOC SW8270C	Pesticides SW8081A	PCB SW8082	Total Metals SW6010B	Dissolved Metals SW6010B	Mercury SW7471A
83917	LABQC	1200454292	1200454292	SQ	BS							X				
83917	I722SB010	722SB01001MS	1200454293	SO	MS		0	1	07/11/03			X				
83917	I722SB010	722SB01001SD	1200454294	SO	SD		0	1	07/11/03			X				
83917	LABQC	1200454430	1200454430	SQ	LB									X		
83917	I722SB010	722SB01001LR	1200454431	SO	LR	D	0	1	07/11/03					X		
83917	I722SB010	722SB01001MS	1200454433	SO	MS		0	1	07/11/03					X		
83917	I722SB010	722SB01001SD	1200454434	SO	SD		0	1	07/11/03					X		
83917	LABQC	1200454435	1200454435	SQ	BS									X		
83917	LABQC	1200454803	1200454803	SQ	LB											X
83917	LABQC	1200454804	1200454804	SQ	BS											X
83917	I722SB010	722SB01001MS	1200454805	SO	MS		0	1	07/11/03							X
83917	I722SB010	722SB01001SD	1200454806	SO	SD		0	1	07/11/03							X
83917	LABQC	1200456126	1200456126	SQ	LB								X			
83917	LABQC	1200456127	1200456127	SQ	BS								X			
83917	LABQC	1200457743	1200457743	SQ	LB					X						
83917	LABQC	1200457744	1200457744	SQ	BS					X						
83917	I722SB010	722SB01001MS	1200457756	SO	MS		0	1	07/11/03	X						
83917	I722SB010	722SB01001SD	1200457757	SO	SD		0	1	07/11/03	X						
89961	I722GW001	722GW001N1	89961001	WG	N				10/14/03	X				X		
89961	I722GW002	722GW002N1	89961002	WG	N				10/13/03	X				X		
89961	I722GW003	722GW003N1	89961003	WG	N				10/14/03	X				X		

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Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

Spec	Station ID	Sample ID	Lab Sample ID	Matrix	Sample Type	LR Type	Upper Depth	Lower Depth	Date Collected	VOC SW8260B	SVOC SW8270C	Pesticides SW8081A	PCB SW8082	Total Metals SW6010B	Dissolved Metals SW6010B	Mercury SW7471A
89961	IG11GW001	G11GW001N1	89961004	WG	N				10/13/03	X				X		
89961	IG11GW002	G11GW002N1	89961005	WG	N				10/14/03	X				X		
89961	IG11GW003	G11GW003N1	89961006	WG	N				10/13/03	X				X		
89961	IG11GW005	G11GW005N1	89961007	WG	N				10/13/03	X				X		
89961	IG11GW005	G11HW005N1	89961008	WG	FD				10/13/03	X				X		
89961	IGDIGW011	GDIGW011N1	89961009	WG	N				10/13/03	X				X		
89961	IGDIGW11D	GDIGW11DN1	89961010	WG	N				10/13/03	X				X		
89961	IG11GW004	G11GW004N1	89961011	WG	N				10/14/03	X				X		
89961	FIELDQC	722EW001N1	89961012	WQ	EB				10/14/03	X				X		
89961	FIELDQC	722TW001N1	89961013	WQ	TB				10/14/03	X						
89961	LABQC	1200508638	1200508638	WQ	LB									X		
89961	LABQC	1200508639	1200508639	WQ	BS									X		
89961	IG11GW004	G11GW004N1MS	1200508640	WG	MS				10/14/03					X		
89961	IG11GW004	G11GW004N1SD	1200508641	WG	SD				10/14/03					X		
89961	LABQC	1200515299	1200515299	WQ	LB					X						
89961	LABQC	1200515300	1200515300	WQ	BS					X						
89961	IG11GW004	G11GW004N1MS	1200515301	WG	MS				10/14/03	X						
89961	IG11GW004	G11GW004N1SD	1200515302	WG	SD				10/14/03	X						
89961	LABQC	1200516402	1200516402	WQ	LB					X						
89961	LABQC	1200516403	1200516403	WQ	LB					X						
89961	LABQC	1200516404	1200516404	WQ	BS					X						

TABLE 1
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Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Station ID	Sample ID	Lab Sample ID	Matrix	Sample Type	LR Type	Upper Depth	Lower Depth	Date Collected	VOC SW8260B	SVOC SW8270C	Pesticides SW8081A	PCB SW8082	Total Metals SW6010B	Dissolved Metals SW6010B	Mercury SW7471A
89961	LABQC	1200516405	1200516405	WQ	BS					X						
89962	I722GW001	722GW001N1	89962001	WG	N				10/14/03						X	
89962	I722GW002	722GW002N1	89962002	WG	N				10/13/03						X	
89962	I722GW003	722GW003N1	89962003	WG	N				10/14/03						X	
89962	IG11GW001	G11GW001N1	89962004	WG	N				10/13/03						X	
89962	IG11GW002	G11GW002N1	89962005	WG	N				10/14/03						X	
89962	IG11GW003	G11GW003N1	89962006	WG	N				10/13/03						X	
89962	IG11GW005	G11GW005N1	89962007	WG	N				10/13/03						X	
89962	IG11GW005	G11HW005N1	89962008	WG	FD				10/13/03						X	
89962	IGDIGW011	GDIGW011N1	89962009	WG	N				10/13/03						X	
89962	IGDIGW11D	GDIGW11DN1	89962010	WG	N				10/13/03						X	
89962	IG11GW004	G11GW004N1	89962011	WG	N				10/14/03						X	
89962	FIELDQC	722EW001N1	89962012	WQ	EB				10/14/03						X	
89962	LABQC	1200508652	1200508652	WQ	LB									X		
89962	LABQC	1200508653	1200508653	WQ	BS									X		
89962	IG11GW004	G11GW004N1MS	1200508654	WG	MS				10/14/03						X	
89962	IG11GW004	G11GW004N1SD	1200508655	WG	SD				10/14/03						X	
CNC09	IGDIGW011	0Z1GGW1110	S004870*1	WG	N				07/20/00	X	X					
CNC09	FIELDQC	021TGW1110	S004870*2	WQ	TB				07/20/00	X						
CNC09	LABQC	048703LB	S004870*3	WQ	LB					X	X					
CNC09	LABQC	048704BS	S004870*4	WQ	BS					X	X					

TABLE 1
Chemical Analytical Methods – Field and Quality Control Samples
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Station ID	Sample ID	Lab Sample ID	Matrix	Sample Type	LR Type	Upper Depth	Lower Depth	Date Collected	VOC SW8260B	SVOC SW8270C	Pesticides SW8081A	PCB SW8082	Total Metals SW6010B	Dissolved Metals SW6010B	Mercury SW7471A

MATRIX CODE

WQ – Water QC Sample
WG – Ground Water Sample
SO – Soil
SQ – Soil QC Sample

SAMPLE TYPE CODE

BS - Blank Spike
EB - Equipment Blank
TB – Trip Blank
N - Native Sample
FD – Field Duplicate
LB - Laboratory Blank
LR – Laboratory Replicate
MS – Matrix Spike
SD – Matrix Spike Duplicate

LR TYPE

RE – Re-extraction / Re-analysis

ANALYSIS CODE

VOC – Volatile Organic Compounds
SVOC - Semivolatile Organic Compounds
PCB – Polychlorinated Biphenyls

Organic Parameters

Quality Control Review

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

- **Holding Times** – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- **Blank samples** – Method blanks, equipment blanks, and trip 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.
- **Lab Control Sample (LCS)** – This sample is a "controlled matrix", either laboratory reagent water or Ottawa sand, in which target compounds have been added prior to extraction/analysis. The recoveries serve as a monitor of the overall performance of each step during the analysis, including sample preparation.
- **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – Spike recovery is used to evaluate potential matrix interferences, as well as accuracy. Precision information is also determined by calculating the reproducibility between the recoveries of each spiked parameter.
- **Field Duplicate Samples** – These samples are collected to determine precision between a native and its duplicate. This information can only be determined when target compounds are detected.
- **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.

Volatile Organic Compounds (VOC) Analyses

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

Blanks

The VOC target parameters detected in blank samples are listed in Table 2.

TABLE 2
Blank Contamination: VOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample ID	Lab Sample ID	Sample Type	Parameter	Lab Result	Units	Flag Concentration less than the reporting limit
56538	1200173276	1200173276	LB	1,4-Dichlorobenzene	0.18	µg/L	0.9 µg/L
56538	G11EW001M1	565380074	EB	Acetone	5.6	µg/L	56.0 µg/L
56538	G11EW001M1	565380074	EB	Methylene chloride	0.81	µg/L	8.1 µg/L
56538	G11EW001M1	565380074	EB	1,4-Dichlorobenzene	0.35	µg/L	1.8 µg/L
60962	1200223961	1200223961	LB	Acetone	5.5	µg/L	55.0 µg/L
60962	1200223961	1200223961	LB	Methylene chloride	7.7	µg/L	77.0 µg/L
89961	722EW001N1	89961012	EB	Acetone	6.6	µg/L	66.0 µg/L
89961	722TW001N1	89961013	TB	Acetone	3.7	µg/L	37.0 µg/L
111526	722EW001P1	111526012	EB	Toluene	0.50	µg/L	2.5 µg/L
111526	722TW001P1	111526013	TB	Acetone	5.4	µg/L	54.0 µg/L
111526	722TW001P1	111526013	TB	Toluene	0.51	µg/L	2.55 µg/L
111526	1200618614	1200618614	LB	Toluene	0.46	µg/L	2.3 µg/L
CNC09	048703LB	S004870*3	LB	Methylene chloride	3.0	µg/L	30.0 µg/L
CNC09	021TGW1110	S004870*2	TB	Methylene chloride	3.2	µg/L	32.0 µg/L

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

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

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

Recoveries - Surrogate, MS/MSD and LCS

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

TABLE 3
Surrogate, MS/MSD, and LCS Recoveries Out of QC Limits: VOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Flag
56538	1200173277 LCS	Carbon disulfide	150*	70-130	56538 – All	Detects only – J
60962	1200223962 LCS	1,2,3-Trichlorobenzene	137.8*	70-130	60962 – All	Detects only – J
83917	722SB01001 MS/MSD	Bromoform	135.4* / 145*	70-130	722SB01001	Detects only – J
		1,2,4-Trichlorobenzene	56.2* / 60*	70-130	722SB01001	Detects-J, non-detects-UJ
		1,2,3-Trichlorobenzene	49.8* / 57.2*	70-130		
83917	722SB00501	Bromofluorobenzene	141*	59-113	722SB00501	Detects only – J
83917	722CB00501	Bromofluorobenzene	140*	59-113	722CB00501	Detects only – J
89961	G11GW004N1 MS/MSD	Chloromethane	60* / 55.8*	70-130	G11GW004N1	Detects-J, non-detects-UJ
		Vinyl chloride	61.6* / 54.2*	70-130		
		Bromomethane	60.2* / 55.4*	70-130		
		Acetone	67.6* / 64.4*	70-130		
		Vinyl acetate	68* / 64.4*	70-130		
		2-Chloroethyl vinyl ether	0* / 0*	70-130	G11GW004N1	Detects-J, non-detects-R
89961	1200515300 LCS	2-Chloroethyl vinyl ether	352*	70-130	89961 – 006, 007, 008	Detects only – J
89961	1200516405 LCS	2-Chloroethyl vinyl ether	284*	70-130	89961 – 005, 011	Detects only – J
111526	1200615969 LCS	Acetone	131.6*	70-130	111526 – 001, 002, 004, 007, 012, 013	Detects only – J
111526	G11GW004P1 MS/MSD	2-Chloroethyl vinyl ether	4.4* / 4.8*	70-130	G11GW004P1	Detects-J, non-detects-UJ

* - out of control limits

Field Duplicate Samples

All Field Duplicate Samples were within acceptable quality control limits, except as noted in Table 4 below. No flags are applied due to Field Duplicate precision.

TABLE 4
Field Duplicate RPDs Out of QC Limits: VOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample	Parameter	Native Concentration	Field Duplicate Concentration	RPD	RPD Limits
56538	G11GW003M1 / G11HW003M1	1,2-Dichlorobenzene	3.8 ug/L	6.1 ug/L	46.5*	20
* - out of control limits						

Initial and Continuing Calibration Criteria

All initial calibration criteria and continuing calibration criteria were met, except as listed in Table 5.

TABLE 5
Exceptions to Initial and Continuing Calibration Criteria: VOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

Instrument/Calibration Date	Analyte	% Relative Standard Deviation or R^2 (ICAL) / % Difference (CCAL)	Associated Samples
VOA1-ICAL-02/28/02, 2310	Carbon disulfide	R^2=0.984	56538 – All
VOA1-CCAL-2/28/02, 2310	Chloromethane	21.7% high	56538 – All
	Carbon disulfide	50.2% high	
	4-Methyl-2-pentanone	22.5% high	
VOA2-CCAL-5/25/02, 1247	Chloroethane	25.8% high	60962 – All
	Dibromochloromethane	21.9% high	
	1,2,4-Trichlorobenzene	27.7% high	
	1,2,3-Trichlorobenzene	37.8% high	
VOA9-CCAL-7/17/03, 0955	Vinyl acetate	25.1% high	83917 – All
VOA1-ICAL-9/25/03, 1751	Chloromethane	R^2=0.983	89961 – 005, 006, 007, 008, 010
	2-Chloroethyl vinyl ether	0.0199 Ave RRF	
VOA1-CCAL-10/25/03, 0825	Bromomethane	22.1% low	89961 – 006, 007, 008
	Acetone	25.7% high	

TABLE 5
Exceptions to Initial and Continuing Calibration Criteria: VOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

Instrument/Calibration Date	Analyte	Relative Standard Deviation or R^2 (ICAL) / % Difference (CCAL)	Associated Samples
VOA1-CCAL-10/25/03, 0825	Carbon tetrachloride	24.9% high	89961 – 006, 007, 008
	2-Chloroethyl vinyl ether	252.0% high	
VOA9-CCAL-10/27/03, 0931	Chloromethane	25.6% low	89961 – 001, 002, 003, 004, 009, 010, 012, 013
	Bromomethane	24.6% low	
	2-Chloroethyl vinyl ether	20.6% low	
VOA1-CCAL-10/28/03, 0852	Acetone	23.4% high	89961 – 005, 011
	Carbon tetrachloride	28.8% high	
	2-Chloroethyl vinyl ether	198.0% high	
	2-Hexanone	22.5% high	
	o-Xylene	20.7% high	
	Styrene	22.6% high	
VOA8-CCAL-04/29/04, 0809	Acetone	29.0% low	111526 – 001, 002, 004, 007, 012, 013
	Carbon tetrachloride	23.9% high	
	Bromodichloromethane	24.9% high	
	2-Chloroethyl vinyl ether	24.9% high	
VOA8-CCAL-04/30/04, 1046	Acetone	20.4% low	111526 – 003, 005, 008, 009, 010
	Carbon tetrachloride	21.0% high	
	Bromodichloromethane	23.6% high	
	2-Chloroethyl vinyl ether	21.5% low	
VOA8-CCAL-05/03/04, 1006	2-Chloroethyl vinyl ether	25.6% low	111526 – 006, 011
ICAL-06/02/00	2-Butanone	R^2 =0.988	CNC09 – All
CCAL – 07/31/00, 0924	Bromomethane	70.3% low	CNC09 – All
	Chloroethane	21.0% low	
	Bromoform	26.3% low	
	1,1,2,2-Tetrachloroethane	17.9% low	
	Acetone	20.0% low	
	Vinyl acetate	20.4% low	

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

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

Internal Standard Area

All internal standard areas were within QC limits, except as noted in Table 6 below.

TABLE 6
Internal Standard Area out of Criteria: VOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample	Internal Standards	Flags applied to compounds associated with IS out
83917	83917005	1,4-Dichlorobenzene – 35.6% low	Detects-J, non-detects-UJ
83917	83917006	1,4-Dichlorobenzene – 33.4% low	Detects-J, non-detects-UJ

Semivolatile Organic Compounds (SVOC) Analyses

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

Blanks

The SVOC target parameters detected in blank samples are listed in Table 7.

TABLE 7
Blank Contamination: SVOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample ID	Lab Sample ID	Sample Type	Parameter	Lab Result	Units	Flag (Concentrations less than the value listed below)
83917	722EB002N1	83928001	EB	Bis(2-ethylhexyl)phthalate	1.6	µg/L	528.0 µg/Kg

TABLE 7
Blank Contamination: SVOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample ID	Lab Sample ID	Sample Type	Parameter	Lab Result	Units	Flag Concentration less than Reporting Limit (RL)
CNC09	017E000110	CNC07-001	EB	Di-n-butyl phthalate	0.3	µg/L	1.5 ug/L
CNC09	017E000110	CNC07-001	EB	Benzo(a)anthracene	1.2	µg/L	6.0 ug/L
CNC09	017E000110	CNC07-001	EB	Chrysene	1.3	µg/L	6.5 ug/L
CNC09	017E000110	CNC07-001	EB	Bis(2-ethylhexyl)phthalate	2.7	µg/L	27 ug/L
CNC09	017E000110	CNC07-001	EB	Din-n-octylphthalate	0.47	µg/L	2.35 ug/L
CNC09	017E000110	CNC07-001	EB	Benzo(b)fluoranthene	1.2	µg/L	6.0 ug/L
CNC09	017E000110	CNC07-001	EB	Benzo(k)fluoranthene	1.5	µg/L	7.5 ug/L
CNC09	017E000110	CNC07-001	EB	Benzo(a)pyrene	0.98	µg/L	4.9 ug/L
CNC09	048703LB	S004870*3	LB	Bis(2-ethylhexyl)phthalate	2.2	µg/L	22 ug/L

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

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

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

Field Duplicate Samples

All Field Duplicate Samples were within acceptable quality control limits, except as noted in Table 8 below. No flags are applied due to Field Duplicate precision.

TABLE 8
Field Duplicate RPDs Out of QC Limits: SVOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample	Parameter	Native Concentration	Field Duplicate Concentration	RPD	RPD Limits
83917	722SB00501 / 722CB00501	Benzo(b)fluoranthene	1840 ug/Kg	1260 ug/Kg	37.4*	35
* - out of control limits						

Initial and Continuing Calibration Criteria

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

TABLE 9
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: SVOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

Instrument/Calibration Date	Analyte	%Relative Standard Deviation or R (ICAL) %Difference (CCAL)	Associated Samples
MSD4-ICAL-07/01/03, 0927	Benzo(ghi)perylene	R^2 =0.989	83917 – All
MSD4-CCAL-07/16/03, 1159	Bis(2-chloroethyl)ether	23.6% low	83917 – 001, 002, 004 thru 010
	2,4-Dinitrophenol	23.9% high	
	2-Methyl-4,6-dinitrophenol	34.1% high	
MSD4-CCAL-07/18/03, 1306	Indeno(1,2,3-cd)pyrene	23.7% high	83917 – 003, 011
	Dibenzo(a,h)anthracene	25.3% high	
	Benzo(ghi)perylene	24.0% high	

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

- When the percent Relative Standard Deviation (%RSD) or correlation coefficient (R^2) was out in the initial calibration, all associated samples were qualified. Detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.
- When the percent difference (%D) was low in the continuing calibration standards, detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.

Internal Standard Area

All internal standard areas were within QC limits, except as noted in Table 10 below.

TABLE 10
Internal Standard Area out of Criteria: SVOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample	Internal Standards	Flags applied to compounds associated with ISTD
83917	83917003	Perylene-d12 – 37.2% low	Detects-J, non-detects-UJ
83917	83917005	Perylene-d12 – 49.0% low	Detects-J, non-detects-UJ

TABLE 10
Internal Standard Area out of Criteria: SVOC
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

Site	Sample	Internal Standards	Flags applied to compounds associated with IS out
83917	83917006	Perylene-d12 – 40.6% low	Detects-J, non-detects-UJ
83917	83917011	Perylene-d12 – 44.2% low	Detects-J, non-detects-UJ
CNC09	CNC09 – 001	Phenanathrene-d10 – 48.2% low	Detects-J, non-detects-UJ

Organochlorine Pesticide Analyses

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

Blanks

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

TABLE 11
Blank Contamination: Pesticides
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

Site	Sample ID	Lab Sample ID	Sample Type	Parameter	Lab Result	Units	Flag Concentration (as reported value times 10.00)
83917	1200454291	1200454291	LB	gamma-Chlordane	0.2	µg/L	1.0 ug/L

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

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

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

Initial and Continuing Calibration Criteria

All initial calibration criteria and continuing calibration criteria were met, except as listed in Table 12.

TABLE 12
Exceptions to Continuing Calibration Criteria: Pesticides
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

Instrument/Calibration Date	Analyte	%Relative Standard Deviation or R (ICAL) %Difference (CCAL)	Associated Samples
ECD1A-CCAL-07/17/03, 0911	Chlordane (tech)	22.3% high	83917 – 001 thru 008, 010, 011
ECD1A-CCAL-07/17/03, 1208	Alpha-BHC	17.2% high	83917 – 001 thru 008
	Delta-BHC	20.5% high	
ECD1A-CCAL-07/17/03, 1338	Alpha-BHC	21.4% high	83917 – 001 thru 008, 010, 011
	Beta-BHC	18.8% high	
	Delta-BHC	26.7% high	
	Gamma-BHC	18.1% high	
	Alpha-Chlordane	16.2% high	
ECD1A-CCAL-07/17/03, 1425	Alpha-BHC	20.0% high	83917 – 010, 011
	Delta-BHC	23.8% high	
	Gamma-BHC	15.4% high	
	4,4'-DDE	15.9% high	
	Alpha-Chlordane	15.9% high	
ECD1A-CCAL-07/18/03, 1002	Toxaphene	19.0% high	83917 – 009
ECD1A-CCAL-07/18/03, 1011	Chlordane (tech)	24.7% high	83917 – 009
ECD1A-CCAL-07/28/03, 1126	Toxaphene	16.9% high	83917 – 010RR
ECD1A-CCAL-07/28/03, 1142	Chlordane (tech)	19.0% high	83917 – 010RR
ECD1A-CCAL-07/28/03, 1159	4,4'-DDT	21.0% high	83917 – 010RR
	Endrin ketone	18.5% low	
ECD1A-CCAL-07/30/03, 1020	Endosulfan I	17.3% low	83917 – 005RR, 006RR
	Endosulfan sulfate	21.5% low	
	Endrin ketone	24.5% low	

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

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

Second Column Confirmation

The second column confirmation percent difference (%D) for some detected parameters, exceeded the 40 %D criteria. Those results were flagged "J", as estimated. The laboratory reported the lower of the two concentrations. The individual samples and specific compounds that were flagged are listed in Table 13 below.

TABLE 13
Second Column Confirmation out of Criteria: Pesticides
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample ID	Lab Sample ID	Parameter
83917	722SB00101	83917001	Dieldrin
83917	722SB00101	83917001	4,4'-DDT
83917	722SB00501	83917005	Dieldrin
83917	722SB00501	83917005	Alpha-Chlordane
83917	722SB00501RR	83917005	Dieldrin
83917	722SB00501RR	83917005	Alpha-Chlordane
83917	722CB00501	83917006	Dieldrin
83917	722CB00501	83917006	Alpha-Chlordane
83917	722CB00501RR	83917006	Dieldrin
83917	722CB00501RR	83917006	Alpha-Chlordane
83917	722SB00701	83917008	Gamma-Chlordane
83917	722SB00801	83917009	Alpha-Chlordane
83917	722SB00801	83917009	Chlordane (tech)
83917	722SB00901RR	83917010	4,4'-DDD

Polychlorinated Biphenyls (PCBs) Analyses

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

Recoveries - Surrogate, MS/MSD and LCS

All Surrogate, Matrix Spike (MS), Matrix Spike Duplicate (MSD), and Laboratory Control Sample (LCS) recoveries were within acceptable quality control limits, except as noted in Table 14 below.

TABLE 14
Surrogate, MS/MSD and LCS Recoveries Out of QC Limits: PCBs
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Flag
83917	722SB01001	Aroclor-1260	52* / 60	60-150	722SB01001	Detects-J, non-detects-UJ
* - out of control limits						

Second Column Confirmation

The second column confirmation percent difference (%D) for some detected parameters, exceeded the 40 %D criteria. Those results were flagged "J", as estimated. The laboratory reported the lower of the two concentrations. The individual samples and specific compounds that were flagged are listed in Table 15 below.

TABLE 15
Second Column Confirmation out of Criteria: PCBs
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample ID	Lab Sample ID	Parameter
83917	722SB00101	83917001	Aroclor-1260
83917	722SB00501	83917005	Aroclor-1260
83917	722SB00801	83917009	Aroclor-1260

Inorganic Parameters

Quality Control Review

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

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

Metals Analyses

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

Blanks

The metals target parameters detected in blank samples are listed in Table 16.

TABLE 16
Blank Contamination: Metals
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample ID	Lab Sample ID	Sample Type	Parameter	Lab Result	Units	Flag Concentration less than the value listed below
83917	CCB		CCB	Barium	0.904	µg/L	0.226 mg/Kg
83917	CCB		CCB	Cadmium	0.695	µg/L	0.174 mg/Kg
83917	CCB		CCB	Chromium	3.19	µg/L	0.7975 mg/Kg
83917	CCB		CCB	Lead	3.88	µg/L	0.97 mg/Kg
83917	CCB		CCB	Silver	3.93	µg/L	0.9825 mg/Kg
83917	1200454430	1200454430	LB	Barium	0.040	µg/L	0.20 mg/Kg
83917	1200454430	1200454430	LB	Silver	0.176	µg/L	0.88 mg/Kg
89961	CCB		CCB	Thallium	4.93	µg/L	24.65 µg/L
89961	CCB		CCB	Lead	2.33	µg/L	11.65 µg/L
89962	CCB		CCB	Thallium	4.93	µg/L	24.65 µg/L
89962	CCB		CCB	Lead	2.33	µg/L	11.65 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.

Rejected Data

The majority of rejected data were associated with re-runs and dilutions (there can only be a single valid result per parameter per sample). However, there was a selected result qualified as "R", rejected, due to associated QC parameters out of criteria, such that there is not a valid result for that parameter in that sample. The rejected data is summarized in Table 17 below.

TABLE 17
Data Qualification Summary: Rejected Data
Charleston Naval Complex, Zone I, AOC 722, Charleston, SC

SDG	Sample ID	Parameter Class	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reason
89961	G11GW004N1	VOA	2-Chloroethyl vinyl ether	10	U	10	R	µg/L	MS

Conclusion

A review of the analytical data submitted regarding the investigation of Zone I, AOC 722 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.

As discussed above, there was a specific result that was rejected, in which the data cannot be used. With the exception of this result, the validation review demonstrated that the analytical systems were generally in control and the data can be used in the decision making process.

Attachment 1 - Changed Qualifiers and Results
Zone I, AOC 722 - Data Validation

Parameter Class	Analytical Method	Parameter	SDG	Lab Sample ID	Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
FLTMET	SW6010B	THALLIUM, Dissolved	89962	G11GW001N1	89962004	WG	4.75	B	4.75	U	ug/L	BL
METAL	SW6010B	ARSENIC	83917	722SB00101	83917001	SO	1.47	B	1.47	J	mg/kg	IB
METAL	SW6010B	ARSENIC	83917	722SB00201	83917002	SO	1.18	B	1.18	J	mg/kg	IB
METAL	SW6010B	ARSENIC	83917	722SB00301	83917003	SO	2.13	B	2.13	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722CB00501	83917006	SO	33.5	B	33.5	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB00101	83917001	SO	25.5	B	25.5	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB00201	83917002	SO	29.1	B	29.1	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB00301	83917003	SO	24.7	B	24.7	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB00401	83917004	SO	29.7	B	29.7	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB00501	83917005	SO	31.3	B	31.3	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB00601	83917007	SO	24.5	B	24.5	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB00701	83917008	SO	15.5	B	15.5	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB00801	83917009	SO	25.6	B	25.6	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB00901	83917010	SO	18.4	B	18.4	J	mg/kg	IB
METAL	SW6010B	BARIUM	83917	722SB01001	83917011	SO	19.9	B	19.9	J	mg/kg	IB
METAL	SW6010B	CADMIUM	83917	722CB00501	83917006	SO	0.969	B	0.969	J	mg/kg	IB
METAL	SW6010B	CADMIUM	83917	722SB00201	83917002	SO	0.096	B	0.096	U	mg/kg	BL
METAL	SW6010B	CADMIUM	83917	722SB00301	83917003	SO	0.096	B	0.096	U	mg/kg	BL
METAL	SW6010B	CADMIUM	83917	722SB00401	83917004	SO	0.487	B	0.487	J	mg/kg	IB
METAL	SW6010B	CADMIUM	83917	722SB00501	83917005	SO	0.862	B	0.862	J	mg/kg	IB
METAL	SW6010B	CADMIUM	83917	722SB00601	83917007	SO	0.307	B	0.307	J	mg/kg	IB
METAL	SW6010B	CADMIUM	83917	722SB00901	83917010	SO	0.408	B	0.408	J	mg/kg	IB
METAL	SW6010B	CADMIUM	83917	722SB01001	83917011	SO	0.113	B	0.113	U	mg/kg	BL
METAL	SW7471A	MERCURY	83917	722SB00101	83917001	SO	0.015	B	0.015	J	mg/kg	IB
METAL	SW7471A	MERCURY	83917	722SB00201	83917002	SO	0.018	B	0.018	J	mg/kg	IB
METAL	SW7471A	MERCURY	83917	722SB00301	83917003	SO	0.025	B	0.025	J	mg/kg	IB
METAL	SW7471A	MERCURY	83917	722SB00401	83917004	SO	0.052	B	0.052	J	mg/kg	IB
METAL	SW7471A	MERCURY	83917	722SB00501	83917005	SO	0.111	B	0.111	J	mg/kg	IB
METAL	SW7471A	MERCURY	83917	722SB00601	83917007	SO	0.024	B	0.024	J	mg/kg	IB
METAL	SW7471A	MERCURY	83917	722SB00701	83917008	SO	0.053	B	0.053	J	mg/kg	IB
METAL	SW7471A	MERCURY	83917	722SB00901	83917010	SO	0.024	B	0.024	J	mg/kg	IB
METAL	SW7471A	MERCURY	83917	722SB01001	83917011	SO	0.03	B	0.03	J	mg/kg	IB
METAL	SW6010B	SELENIUM	83917	722CB00501	83917006	SO	0.531	B	0.531	J	mg/kg	IB

Parameter Class	Analytical Method	Parameter	SDG	Lab Sample ID	Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reason
METAL	SW6010B	SELENIUM	83917	722SB00601	83917007	SO	0.449	B	0.449	J	mg/kg	IB
METAL	SW6010B	SELENIUM	83917	722SB00901	83917010	SO	0.683	B	0.683	J	mg/kg	IB
METAL	SW6010B	SILVER	83917	722CB00501	83917006	SO	0.251	B	0.251	U	mg/kg	BL
METAL	SW6010B	SILVER	83917	722SB00401	83917004	SO	0.232	B	0.232	U	mg/kg	BL
METAL	SW6010B	SILVER	83917	722SB00901	83917010	SO	0.205	B	0.205	U	mg/kg	BL
METAL	SW6010B	SILVER	83917	722SB01001	83917011	SO	0.227	B	0.227	U	mg/kg	BL
PCB	SW8082	PCB-1260 (AROCHLOR 1260)	83917	722SB00101	83917001	SO	3	JP	3	J	ug/kg	2C
PCB	SW8082	PCB-1260 (AROCHLOR 1260)	83917	722SB00501	83917005	SO	38.4	P	38.4	J	ug/kg	2C
PCB	SW8082	PCB-1260 (AROCHLOR 1260)	83917	722SB00801	83917009	SO	4.1	P	4.1	J	ug/kg	2C
PCB	SW8082	PCB-1260 (AROCHLOR 1260)	83917	722SB01001	83917011	SO	16.3	=	16.3	J	ug/kg	MS
PEST	SW8081A	ALPHA-CHLORDANE	83917	722CB00501	83917006	SO	39.1	=	39.1	J	ug/kg	CC
PEST	SW8081A	ALPHA-CHLORDANE	83917	722CB00501RE	83917006	SO	40.3	P	40.3	R	ug/kg	RE
PEST	SW8081A	ALPHA-CHLORDANE	83917	722SB00501	83917005	SO	51.7	P	51.7	J	ug/kg	CC,2C
PEST	SW8081A	ALPHA-CHLORDANE	83917	722SB00501RE	83917005	SO	48.2	P	48.2	R	ug/kg	RE
PEST	SW8081A	ALPHA-CHLORDANE	83917	722SB00801	83917009	SO	117	P	117	J	ug/kg	2C
PEST	SW8081A	Chlordane	83917	722SB00801	83917009	SO	420	P	420	J	ug/kg	CC,2C
PEST	SW8081A	DIELDRIN	83917	722CB00501	83917006	SO	4.75	JP	4.75	J	ug/kg	2C
PEST	SW8081A	DIELDRIN	83917	722SB00101	83917001	SO	0.226	JP	0.226	J	ug/kg	2C
PEST	SW8081A	DIELDRIN	83917	722SB00501	83917005	SO	6.28	JP	6.28	J	ug/kg	2C
PEST	SW8081A	GAMMA-CHLORDANE	83917	722CB00501	83917006	SO	23.4	JB	23.4	J	ug/kg	2C
PEST	SW8081A	GAMMA-CHLORDANE	83917	722SB00701	83917008	SO	1.16	JB	1.16	J	ug/kg	2C
PEST	SW8081A	GAMMA-CHLORDANE	83917	722SB00901	83917010	SO	0.923	JPB	1.54	U	ug/kg	BL
PEST	SW8081A	p,p'-DDE	83917	722SB00901RE	83917010	SO	2.4	JP	2.4	R	ug/kg	RE
PEST	SW8081A	p,p'-DDT	83917	722SB00101	83917001	SO	0.927	JP	0.927	J	ug/kg	2C
SVOA	SW8270	4,6-DINITRO-2-METHYLPHENOL	CNC09	0Z1GGW1110	S004870*1	WG	50	U	50	UJ	ug/L	IS
SVOA	SW8270	4-BROMOPHENYL PHENYL ETHER	CNC09	0Z1GGW1110	S004870*1	WG	10	U	10	UJ	ug/L	IS
SVOA	SW8270	4-CHLORO-3-METHYLPHENOL	CNC09	0Z1GGW1110	S004870*1	WG	10	U	10	UJ	ug/L	IC
SVOA	SW8270	ANTHRACENE	CNC09	0Z1GGW1110	S004870*1	WG	1.8	J	1.8	J	ug/L	IS
SVOA	SW8270C	BENZO(a)PYRENE	83917	722CB00501	83917006	SO	698	=	698	J	ug/kg	IS
SVOA	SW8270C	BENZO(a)PYRENE	83917	722SB00301	83917003	SO	384	U	384	UJ	ug/kg	IS
SVOA	SW8270C	BENZO(a)PYRENE	83917	722SB00501	83917005	SO	832	=	832	J	ug/kg	IS
SVOA	SW8270C	BENZO(a)PYRENE	83917	722SB01001	83917011	SO	144	J	144	J	ug/kg	IS
SVOA	SW8270C	BENZO(b)FLUORANTHENE	83917	722CB00501	83917006	SO	1260	=	1260	J	ug/kg	IS

Attachment 1 - Changed Qualifiers and Results
Zone I, AOC 722 - Data Validation

Parameter Class	Analytical Method	Parameter	SDG	Lab Sample ID	Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
SVOA	SW8270C	BENZO(b)FLUORANTHENE	83917	722SB00301	83917003	SO	384	U	384	UJ	ug/kg	IS
SVOA	SW8270C	BENZO(b)FLUORANTHENE	83917	722SB00501	83917005	SO	1840	=	1840	J	ug/kg	IS
SVOA	SW8270C	BENZO(b)FLUORANTHENE	83917	722SB01001	83917011	SO	157	J	157	J	ug/kg	IS
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722CB00501	83917006	SO	508	=	508	J	ug/kg	IC,IS
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB00101	83917001	SO	383	U	383	UJ	ug/kg	IC
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB00201	83917002	SO	256	J	256	J	ug/kg	IC
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB00301	83917003	SO	384	U	384	UJ	ug/kg	IC,IS
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB00401	83917004	SO	300	J	300	J	ug/kg	IC
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB00501	83917005	SO	536	=	536	J	ug/kg	IC,IS
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB00601	83917007	SO	1620	U	1620	UJ	ug/kg	IC
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB00701	83917008	SO	410	U	410	UJ	ug/kg	IC
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB00801	83917009	SO	393	U	393	UJ	ug/kg	IC
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB00901	83917010	SO	394	U	394	UJ	ug/kg	IC
SVOA	SW8270C	BENZO(g,h,i)PERYLENE	83917	722SB01001	83917011	SO	397	U	397	UJ	ug/kg	IC,IS
SVOA	SW8270C	BENZO(k)FLUORANTHENE	83917	722CB00501	83917006	SO	384	U	384	UJ	ug/kg	IS
SVOA	SW8270C	BENZO(k)FLUORANTHENE	83917	722SB00301	83917003	SO	384	U	384	UJ	ug/kg	IS
SVOA	SW8270C	BENZO(k)FLUORANTHENE	83917	722SB00501	83917005	SO	395	U	395	UJ	ug/kg	IS
SVOA	SW8270C	BENZO(k)FLUORANTHENE	83917	722SB01001	83917011	SO	397	U	397	UJ	ug/kg	IS
SVOA	SW8270C	bis(2-CHLOROETHOXY) METHANE	83917	722CB00501	83917006	SO	384	U	384	UJ	ug/kg	CC
SVOA	SW8270C	bis(2-CHLOROETHOXY) METHANE	83917	722SB00101	83917001	SO	383	U	383	UJ	ug/kg	CC
SVOA	SW8270C	bis(2-CHLOROETHOXY) METHANE	83917	722SB00201	83917002	SO	380	U	380	UJ	ug/kg	CC
SVOA	SW8270C	bis(2-CHLOROETHOXY) METHANE	83917	722SB00401	83917004	SO	396	U	396	UJ	ug/kg	CC
SVOA	SW8270C	bis(2-CHLOROETHOXY) METHANE	83917	722SB00501	83917005	SO	395	U	395	UJ	ug/kg	CC
SVOA	SW8270C	bis(2-CHLOROETHOXY) METHANE	83917	722SB00601	83917007	SO	1620	U	1620	UJ	ug/kg	CC
SVOA	SW8270C	bis(2-CHLOROETHOXY) METHANE	83917	722SB00701	83917008	SO	410	U	410	UJ	ug/kg	CC
SVOA	SW8270C	bis(2-CHLOROETHOXY) METHANE	83917	722SB00801	83917009	SO	393	U	393	UJ	ug/kg	CC
SVOA	SW8270C	bis(2-CHLOROETHOXY) METHANE	83917	722SB00901	83917010	SO	394	U	394	UJ	ug/kg	CC
SVOA	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	CNC09	0Z1GGW1110	S004870*1	WG	2.8	JB	10	U	ug/L	BL
SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	83917	722SB00201	83917002	SO	122	J	380	U	ug/kg	BL
SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	83917	722SB00501	83917005	SO	499	=	499	U	ug/kg	BL
SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	83917	722SB00701	83917008	SO	133	J	410	U	ug/kg	BL
SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	83917	722SB00901	83917010	SO	260	J	394	U	ug/kg	BL
SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	83917	722SB01001	83917011	SO	227	J	397	U	ug/kg	BL

Parameter Class	Analytical Method	Parameter	SDG	Lab Sample ID	Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
SVOA	SW8270C	CARBAZOLE	83917	722CB00501	83917006	SO	80.4	J	80.4	J	ug/kg	IS
SVOA	SW8270C	CARBAZOLE	83917	722SB00301	83917003	SO	384	U	384	UJ	ug/kg	IS
SVOA	SW8270C	CARBAZOLE	83917	722SB00501	83917005	SO	85.8	J	85.8	J	ug/kg	IS
SVOA	SW8270C	CARBAZOLE	83917	722SB01001	83917011	SO	397	U	397	UJ	ug/kg	IS
SVOA	SW8270C	DIBENZ(a,h)ANTHRACENE	83917	722CB00501	83917006	SO	384	U	384	UJ	ug/kg	IS
SVOA	SW8270C	DIBENZ(a,h)ANTHRACENE	83917	722SB00301	83917003	SO	384	U	384	UJ	ug/kg	IS
SVOA	SW8270C	DIBENZ(a,h)ANTHRACENE	83917	722SB00501	83917005	SO	395	U	395	UJ	ug/kg	IS
SVOA	SW8270C	DIBENZ(a,h)ANTHRACENE	83917	722SB01001	83917011	SO	397	U	397	UJ	ug/kg	IS
SVOA	SW8270	DI-n-BUTYL PHTHALATE	CNC09	0Z1GGW1110	S004870*1	WG	1.2	J	10	UJ	ug/L	BL,IS
SVOA	SW8270	FLUORANTHENE	CNC09	0Z1GGW1110	S004870*1	WG	2.9	J	2.9	J	ug/L	IS
SVOA	SW8270	HEXACHLOROBENZENE	CNC09	0Z1GGW1110	S004870*1	WG	10	U	10	UJ	ug/L	IS
SVOA	SW8270C	INDENO(1,2,3-c,d)PYRENE	83917	722CB00501	83917006	SO	412	=	412	J	ug/kg	IS
SVOA	SW8270C	INDENO(1,2,3-c,d)PYRENE	83917	722SB00301	83917003	SO	384	U	384	UJ	ug/kg	IS
SVOA	SW8270C	INDENO(1,2,3-c,d)PYRENE	83917	722SB00501	83917005	SO	529	=	529	J	ug/kg	IS
SVOA	SW8270C	INDENO(1,2,3-c,d)PYRENE	83917	722SB01001	83917011	SO	397	U	397	UJ	ug/kg	IS
SVOA	SW8270	N-NITROSODIPHENYLAMINE	CNC09	0Z1GGW1110	S004870*1	WG	10	U	10	UJ	ug/L	IS
SVOA	SW8270	PENTACHLOROPHENOL	CNC09	0Z1GGW1110	S004870*1	WG	50	U	50	U	ug/L	IS
SVOA	SW8270	PHENANTHRENE	CNC09	0Z1GGW1110	S004870*1	WG	9.4	J	9.4	J	ug/L	IS
VOA	SW8260	1,1,2,2-TETRACHLOROETHANE	CNC09	0Z1GGW1110	S004870*1	WG	5	U	5	UJ	ug/L	CC
VOA	SW8260B	1,1,2,2-TETRACHLOROETHANE	83917	722CB00501	83917006	SO	5.4	U	5.4	UJ	ug/kg	IS
VOA	SW8260B	1,1,2,2-TETRACHLOROETHANE	83917	722SB00501	83917005	SO	5.6	U	5.6	UJ	ug/kg	IS
VOA	SW8260B	1,2,3-Trichlorobenzene	83917	722CB00501	83917006	SO	5.4	U	5.4	UJ	ug/kg	IS
VOA	SW8260B	1,2,3-Trichlorobenzene	83917	722SB00501	83917005	SO	5.6	U	5.6	UJ	ug/kg	IS
VOA	SW8260B	1,2,3-Trichlorobenzene	83917	722SB01001	83917011	SO	6	U	6	UJ	ug/kg	MS
VOA	SW8260B	1,2,4-TRICHLOROBENZENE	83917	722CB00501	83917006	SO	5.4	U	5.4	UJ	ug/kg	IS
VOA	SW8260B	1,2,4-TRICHLOROBENZENE	83917	722SB00501	83917005	SO	5.6	U	5.6	UJ	ug/kg	IS
VOA	SW8260B	1,2,4-TRICHLOROBENZENE	83917	722SB01001	83917011	SO	6	U	6	UJ	ug/kg	MS
VOA	SW8260B	1,2-DICHLOROBENZENE	83917	722CB00501	83917006	SO	5.4	U	5.4	UJ	ug/kg	IS
VOA	SW8260B	1,2-DICHLOROBENZENE	83917	722SB00501	83917005	SO	5.6	U	5.6	UJ	ug/kg	IS
VOA	SW8260B	1,3-DICHLOROBENZENE	83917	722CB00501	83917006	SO	5.4	U	5.4	UJ	ug/kg	IS
VOA	SW8260B	1,3-DICHLOROBENZENE	83917	722SB00501	83917005	SO	5.6	U	5.6	UJ	ug/kg	IS
VOA	SW8260B	1,4-DICHLOROBENZENE	83917	722CB00501	83917006	SO	5.4	U	5.4	UJ	ug/kg	IS
VOA	SW8260B	1,4-DICHLOROBENZENE	83917	722SB00501	83917005	SO	5.6	U	5.6	UJ	ug/kg	IS

Attachment 1 - Changed Qualifiers and Results
Zone I, AOC 722 - Data Validation

Parameter Class	Analytical Method	Parameter	SDG	Lab Sample ID	Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
VOA	SW8260B	1,4-DICHLOROBENZENE	56538	G11GW001M1	56538001	WG	1.4	JB	5	U	ug/L	BL
VOA	SW8260B	1,4-DICHLOROBENZENE	56538	G11GW003M1	56538003	WG	0.7	JB	5	U	ug/L	BL
VOA	SW8260B	1,4-DICHLOROBENZENE	56538	G11HW003M1	56538004	WG	0.9	JB	5	U	ug/L	BL
VOA	SW8260B	1,4-DICHLOROBENZENE	56538	GDGW011M1	56538005	WG	0.24	JB	5	U	ug/L	BL
VOA	SW8260B	1,4-DICHLOROBENZENE	56538	GDGW11DM1	56538006	WG	0.27	JB	5	U	ug/L	BL
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	722GW001N1	89961001	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	722GW002N1	89961002	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	2-Chloroethyl vinyl ether	111526	722GW002P1	111526003	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	722GW003N1	89961003	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	G11GW001N1	89961004	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	2-Chloroethyl vinyl ether	111526	G11GW001P1	111526005	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	G11GW002N1	89961005	WG	10	U	10	UJ	ug/L	IC
VOA	SW8260B	2-Chloroethyl vinyl ether	111526	G11GW002P1	111526006	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	G11GW003N1	89961006	WG	10	U	10	UJ	ug/L	IC
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	G11GW004N1	89961011	WG	10	U	10	R	ug/L	MS
VOA	SW8260B	2-Chloroethyl vinyl ether	111526	G11GW004P1	111526001	WG	10	U	10	UJ	ug/L	MS
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	G11GW005N1	89961007	WG	10	U	10	UJ	ug/L	IC
VOA	SW8260B	2-Chloroethyl vinyl ether	111526	G11GW005P1	111526008	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	G11HW005N1	89961008	WG	10	U	10	UJ	ug/L	IC
VOA	SW8260B	2-Chloroethyl vinyl ether	111526	G11HW005P1	111526009	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	GDIGW011N1	89961009	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	2-Chloroethyl vinyl ether	111526	GDIGW011P1	111526010	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260B	2-Chloroethyl vinyl ether	89961	GDIGW11DN1	89961010	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	2-Chloroethyl vinyl ether	111526	GDIGW11DP1	111526011	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260	ACETONE	CNC09	0Z1GGW1110	S004870*1	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	ACETONE	89961	722GW001N1	89961001	WG	24.3	=	24.3	U	ug/L	BL
VOA	SW8260B	ACETONE	89961	722GW002N1	89961002	WG	18.2	=	18.2	U	ug/L	BL
VOA	SW8260B	ACETONE	111526	722GW002P1	111526003	WG	2.8	J	10	UJ	ug/L	BL, CCL
VOA	SW8260B	ACETONE	89961	722GW003N1	89961003	WG	9	J	10	U	ug/L	BL
VOA	SW8260B	ACETONE	60962	G11GP001M2	60962003	WG	9.1	JB	10	U	ug/L	BL
VOA	SW8260B	ACETONE	60962	G11GP002M2	60962004	WG	9	JB	10	U	ug/L	BL
VOA	SW8260B	ACETONE	60962	G11GP003M2	60962005	WG	6.8	JB	10	U	ug/L	BL
VOA	SW8260B	ACETONE	56538	G11GW001M1	56538001	WG	39.8	=	39.8	U	ug/L	BL

Parameter Class	Analytical Method	Parameter	SDG	Lab Sample ID	Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
VOA	SW8260B	ACETONE	89961	G11GW001N1	89961004	WG	18.5	=	18.5	U	ug/L	BL
VOA	SW8260B	ACETONE	111526	G11GW001P1	111526005	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260B	ACETONE	56538	G11GW002M1	56538002	WG	11.2	=	11.2	U	ug/L	BL
VOA	SW8260B	ACETONE	89961	G11GW002N1	89961005	WG	3.9	J	10	U	ug/L	BL
VOA	SW8260B	ACETONE	111526	G11GW002P1	111526006	WG	3.5	J	10	U	ug/L	BL
VOA	SW8260B	ACETONE	56538	G11GW003M1	56538003	WG	14.4	=	14.4	U	ug/L	BL
VOA	SW8260B	ACETONE	60962	G11GW004	60962006	WG	6.6	JB	10	U	ug/L	BL
VOA	SW8260B	ACETONE	89961	G11GW004N1	89961011	WG	2.6	J	10	UJ	ug/L	BL, MS
VOA	SW8260B	ACETONE	60962	G11GW005M2	60962001	WG	3.2	JB	10	U	ug/L	BL
VOA	SW8260B	ACETONE	89961	G11GW005N1	89961007	WG	3.1	J	10	U	ug/L	BL
VOA	SW8260B	ACETONE	111526	G11GW005P1	111526008	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260B	ACETONE	56538	G11HW003M1	56538004	WG	15.8	=	15.8	U	ug/L	BL
VOA	SW8260B	ACETONE	60962	G11HW005M2	60962002	WG	7	JB	10	U	ug/L	BL
VOA	SW8260B	ACETONE	89961	G11HW005N1	89961008	WG	2.5	J	10	U	ug/L	BL
VOA	SW8260B	ACETONE	111526	G11HW005P1	111526009	WG	10	U	10	UJ	ug/L	CCL
VOA	SW8260B	ACETONE	56538	GDGW011M1	56538005	WG	19.2	=	19.2	U	ug/L	BL
VOA	SW8260B	ACETONE	56538	GDGW11DM1	56538006	WG	4.3	J	10	U	ug/L	BL
VOA	SW8260B	ACETONE	89961	GDIGW011N1	89961009	WG	23.6	=	23.6	U	ug/L	BL
VOA	SW8260B	ACETONE	111526	GDIGW011P1	111526010	WG	2.3	J	10	UJ	ug/L	BL, CCL
VOA	SW8260B	ACETONE	89961	GDIGW11DN1	89961010	WG	10.8	=	10.8	U	ug/L	BL
VOA	SW8260B	ACETONE	111526	GDIGW11DP1	111526011	WG	3.9	J	10	U	ug/L	BL
VOA	SW8260	BROMOFORM	CNC09	0Z1GGW1110	S004870*1	WG	5	U	5	UJ	ug/L	CC
VOA	SW8260B	BROMOFORM	83917	722CB00501	83917006	SO	5.4	U	5.4	UJ	ug/kg	IS
VOA	SW8260B	BROMOFORM	83917	722SB00501	83917005	SO	5.6	U	5.6	UJ	ug/kg	IS
VOA	SW8260	BROMOMETHANE	CNC09	0Z1GGW1110	S004870*1	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	BROMOMETHANE	89961	722GW001N1	89961001	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	BROMOMETHANE	89961	722GW002N1	89961002	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	BROMOMETHANE	89961	722GW003N1	89961003	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	BROMOMETHANE	89961	G11GW001N1	89961004	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	BROMOMETHANE	89961	G11GW003N1	89961006	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	BROMOMETHANE	89961	G11GW004N1	89961011	WG	10	U	10	UJ	ug/L	MS
VOA	SW8260B	BROMOMETHANE	89961	G11GW005N1	89961007	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	BROMOMETHANE	89961	G11HW005N1	89961008	WG	10	U	10	UJ	ug/L	CC

Parameter Class	Analytical Method	Parameter	SDG	Lab Sample ID	Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
VOA	SW8260B	BROMOMETHANE	89961	GDIGW011N1	89961009	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	BROMOMETHANE	89961	GDIGW11DN1	89961010	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	CARBON DISULFIDE	56538	G11GW002M1	56538002	WG	5	U	5	UJ	ug/L	IC
VOA	SW8260B	CARBON DISULFIDE	56538	G11GW003M1	56538003	WG	23	=	23	J	ug/L	IC,CC,BS
VOA	SW8260B	CARBON DISULFIDE	56538	G11HW003M1	56538004	WG	22.8	=	22.8	J	ug/L	IC,CC,BS
VOA	SW8260B	CARBON DISULFIDE	56538	GDGW011M1	56538005	WG	66.6	=	66.6	J	ug/L	IC,CC,BS
VOA	SW8260B	CARBON DISULFIDE	56538	GDGW11DM1	56538006	WG	24.7	=	24.7	J	ug/L	IC,CC,BS
VOA	SW8260	CHLOROETHANE	CNC09	0Z1GGW1110	S004870*1	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	CHLOROMETHANE	89961	722GW001N1	89961001	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	CHLOROMETHANE	89961	722GW002N1	89961002	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	CHLOROMETHANE	89961	722GW003N1	89961003	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	CHLOROMETHANE	89961	G11GW001N1	89961004	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	CHLOROMETHANE	89961	G11GW002N1	89961005	WG	10	U	10	UJ	ug/L	IC
VOA	SW8260B	CHLOROMETHANE	89961	G11GW003N1	89961006	WG	10	U	10	UJ	ug/L	IC
VOA	SW8260B	CHLOROMETHANE	89961	G11GW004N1	89961011	WG	10	U	10	UJ	ug/L	MS, IC
VOA	SW8260B	CHLOROMETHANE	89961	G11GW005N1	89961007	WG	10	U	10	UJ	ug/L	IC
VOA	SW8260B	CHLOROMETHANE	89961	G11HW005N1	89961008	WG	10	U	10	UJ	ug/L	IC
VOA	SW8260B	CHLOROMETHANE	89961	GDIGW011N1	89961009	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	CHLOROMETHANE	89961	GDIGW11DN1	89961010	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	DIBROMOCHLOROMETHANE	60962	G11GP001M2	60962003	WG	0.41	J	0.41	J	ug/L	CC
VOA	SW8260B	DIBROMOCHLOROMETHANE	60962	G11GP002M2	60962004	WG	0.4	J	0.4	J	ug/L	CC
VOA	SW8260B	DIBROMOCHLOROMETHANE	60962	G11GW004	60962006	WG	5.4	=	5.4	J	ug/L	CC
VOA	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	CNC09	0Z1GGW1110	S004870*1	WG	10	U	10	UJ	ug/L	IC
VOA	SW8260	METHYLENE CHLORIDE	CNC09	0Z1GGW1110	S004870*1	WG	7.5	B	7.5	U	ug/L	BL
VOA	SW8260B	METHYLENE CHLORIDE	60962	G11GP001M2	60962003	WG	5.8	B	5.8	U	ug/L	BL
VOA	SW8260B	METHYLENE CHLORIDE	60962	G11GP002M2	60962004	WG	6.3	B	6.3	U	ug/L	BL
VOA	SW8260B	METHYLENE CHLORIDE	60962	G11GP003M2	60962005	WG	8.7	B	8.7	U	ug/L	BL
VOA	SW8260B	METHYLENE CHLORIDE	60962	G11GW004	60962006	WG	6	B	6	U	ug/L	BL
VOA	SW8260B	METHYLENE CHLORIDE	60962	G11GW005M2	60962001	WG	5.6	B	5.6	U	ug/L	BL
VOA	SW8260B	METHYLENE CHLORIDE	60962	G11HW005M2	60962002	WG	5.8	B	5.8	U	ug/L	BL
VOA	SW8260B	TOLUENE	111526	722GW001P1	111526002	WG	0.4	J	5	U	ug/L	BL
VOA	SW8260B	TOLUENE	111526	G11GW001P1	111526005	WG	0.41	J	5	U	ug/L	BL
VOA	SW8260B	TOLUENE	111526	G11GW002P1	111526006	WG	0.57	JB	5	U	ug/L	BL

Attachment 1 - Changed Qualifiers and Results
Zone I, AOC 7 Data Validation

Parameter Class	Analytical Method	Parameter	SDG	Lab Sample ID	Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
VOA	SW8260B	TOLUENE	111526	G11GW004P1	111526001	WG	0.42	J	5	U	ug/L	BL
VOA	SW8260B	TOLUENE	111526	GDIGW011P1	111526010	WG	0.42	J	5	U	ug/L	BL
VOA	SW8260B	TOLUENE	111526	GDIGW11DP1	111526011	WG	0.48	JB	5	U	ug/L	BL
VOA	SW8260	Vinyl acetate	CNC09	0Z1GGW1110	S004870*1	WG	10	U	10	UJ	ug/L	CC
VOA	SW8260B	Vinyl acetate	89961	G11GW004N1	89961011	WG	10	U	10	UJ	ug/L	MS
VOA	SW8260B	VINYL CHLORIDE	89961	G11GW004N1	89961011	WG	10	U	10	UJ	ug/L	MS

Appendix C

Development Water Quality Parameters

AOC 722, Zone I, Charleston Naval Complex

I722GW001

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature
10/02/2003 - 12:07	*	6.46	17.6	11	29.0
10/02/2003 - 12:09	*	6.49	17.6	10	28.9
10/02/2003 - 12:11	*	6.49	16.5	6	29.2

* 27 gallons purged prior to taking water quality readings due to high turbidity.

I722GW002

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature
10/02/2003 - 10:30	*	6.47	37.2	14	23.2
10/02/2003 - 10:35	*	6.60	37.4	10	23.3
10/02/2003 - 10:41	*	6.55	36.9	8	23.3

* 15 gallons purged prior to taking water quality readings due to high turbidity.

I722GW003

Date - Time	Volume	pH	Conductivity	Turbidity	Temperature
10/01/2003 - 14:47	*	6.43	5.61	8	24.7
10/01/2003 - 14:49	*	6.42	5.51	0	24.6
10/01/2003 - 14:51	*	6.42	5.38	0	24.7

* 27 gallons purged prior to taking water quality readings due to high turbidity.

Purge Water Quality Parameters

AOC 722, Zone I, Charleston Naval Complex

I722GW001

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
10/14/2003 - 09:35	I	8.76*	Error 5	342	23.85	2.13	-317
10/14/2003 - 09:43	1	9.24	-	0	23.85	0.80	-344
10/14/2003 - 09:50	2	9.15	-	0	23.82	0.62	-363
10/14/2003 - 09:58	3	9.12	-	0	23.80	0.54	-376

* Horiba indicating error 5 (pH reading inaccurate [high]).

I722GW002

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
10/13/2003 - 15:05	I	8.85*	87.1	172	28.40	2.54	-316
10/13/2003 - 15:13	1	8.88*	62.1	0	29.33	1.10	-367
10/13/2003 - 15:21	2	8.86	62.2	0	29.30	0.95	-387
10/13/2003 - 15:29	3	8.84	61.0	0	29.34	0.87	-400

* Horiba indicating error 5 (pH reading inaccurate [high]).

I722GW003

Date - Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
10/13/2003 - 09:50	I	6.65	13.4	63	24.5	0.3	-315
10/13/2003 - 09:58	1	6.55	8.31	42.2	24.8	1.8	-302
10/13/2003 - 10:06	2	6.52	8.29	19.2	24.9	0.3	-297
10/13/2003 - 10:15	3	6.54	8.23	2.5	24.9	0.3	-293

Purge Water Quality Parameters

AOC 722, Zone I, Charleston Naval Complex

I722GW001

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/21/2004 - 10:56	I	6.67	4.42	54.6	17.73	6.50	-206
04/21/2004 - 11:04	1	6.66	3.99	184	17.69	2.90	-229
04/21/2004 - 11:04	2	6.65	4.18	210	17.63	2.66	-238
04/21/2004 - 11:04	3	6.64	4.64	19.10	17.65	3.10	-254

Entrained air bubbles causing high turbidity.

I722GW002

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/21/2004 - 09:22	I	6.48	35.70	801	22.45	6.33	-294
04/21/2004 - 09:30	1	6.54	16.70	348	21.17	3.63	-359
04/21/2004 - 09:38	2	6.60	16.00	129	22.34	3.35	-374
04/21/2004 - 09:47	3	6.61	16.50	8.1	22.31	3.21	-389

I722GW003

Date - Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/21/2004 - 13:53	I	6.70	8.71	304	17.23	8.79	-148
04/21/2004 - 14:02	1	6.65	8.46	212	17.05	3.08	-149
04/21/2004 - 14:11	2	6.63	8.44	8.20	17.02	2.36	-164
04/21/2004 - 14:20	3	6.64	8.24	0	16.99	0.39	-179

IG11GW001

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/21/2004 - 14:29	I	6.40	30.70	14.1	19.26	2.45	-340
04/21/2004 - 14:38	1	6.67	8.08	96.0	19.06	0.64	-443
04/21/2004 - 14:47	2	6.54	10.50	0	18.77	1.01	-408
04/21/2004 - 14:56	3	6.41	20.40	0	18.78	1.31	-361

IG11GW002

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/21/2004 - 10:06	I	6.46	43.5	15.90	17.91	7.26	-354
04/21/2004 - 10:14	1	6.37	27.2	21.50	18.31	2.86	-338
04/21/2004 - 10:23	2	6.37	33.1	12.10	17.75	2.26	-344
04/21/2004 - 10:32	3	6.40	37.7	9.30	17.64	0.79	-357

IG11GW003

Date - Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/21/2004 - 15:07	I	6.42	26.2	57.1	19.62	4.59	-303
04/21/2004 - 15:16	1	6.46	3.95	15.6	19.50	3.43	-295
04/21/2004 - 15:25	2	6.41	5.28	25.90	19.31	3.56	-284
04/21/2004 - 15:34	3	6.37	6.35	20.7	19.19	3.76	-280

Purge Water Quality Parameters

AOC 722, Zone I, Charleston Naval Complex

IG11GW004

Date - Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/21/2004 - 15:47	I	6.83	1.82	89.1	16.74	7.57	-219
04/21/2004 - 15:56	1	6.72	1.88	15.2	17.09	3.59	-215
04/21/2004 - 16:05	2	6.78	1.87	7.0	16.78	3.61	-236
04/21/2004 - 16:14	3	6.80	1.89	6.0	16.73	3.66	-244

IG11GW005

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/22/2004 - 09:25	I	6.60	5.42	46.2	16.93	5.13	-302
04/22/2004 - 09:34	1	6.76	4.25	15.2	16.79	3.22	-350
04/22/2004 - 09:43	2	6.77	4.28	0	16.82	3.01	-352
04/22/2004 - 09:52	3	6.77	4.31	0	16.80	2.90	-352

IG11GW011

Date/Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/22/2004 - 10:02	I	6.20	30.4	136	19.47	5.98	-330
04/22/2004 - 10:11	1	6.32	22.1	69.8	19.52	2.93	-339
04/22/2004 - 10:20	2	6.24	24.5	58.5	19.10	2.67	-327
04/22/2004 - 10:29	3	6.23	25.7	0	19.07	2.40	-332

IG11GW11D

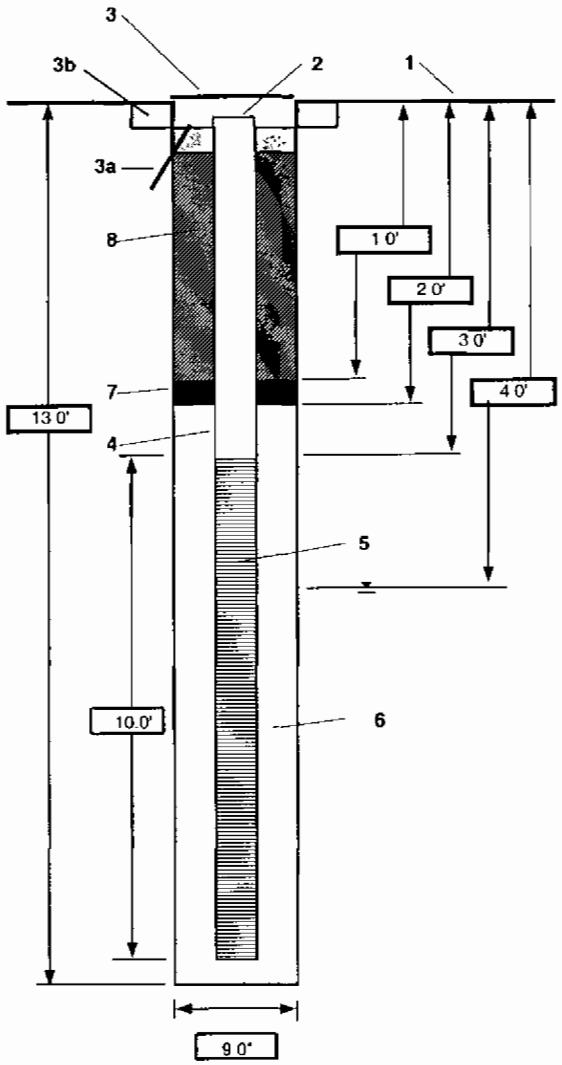
Date - Time	Volume	pH	Conductivity	Turbidity	Temperature	DO	ORP
04/22/2004 - 10:36	I	6.79	47.1	488	21.73	5.50	-258
04/22/2004 - 11:00	1	7.31	47.8	216	22.45	3.28	-218
04/22/2004 - 11:25	2	7.30	48.2	8.90	22.82	3.34	-218
04/22/2004 - 11:50	3	7.31	48.1	7.20	22.79	3.30	-220

PROJECT NUMBER	WELL NUMBER	
158814	I722GW001	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT : Charleston Naval Complex LOCATION AOC 722 Northing. 369823.7
DRILLING CONTRACTOR . Prosonic Drilling Corp. Easting 2326801.6
DRILLING METHOD AND EQUIPMENT USED Hollow-Stem Auger, Truck-Mounted Drill Rig
WATER LEVELS 2 64 START 18 September 03 / 0945 END 18 September 03 / 1045 LOGGER Darryl Gates



1- Ground elevation at well: Not obtained

2- Top of casing elevation: 5.57

3- Wellhead protection cover type: Bolt-down manhole cover
a) drain tube?: No
b) concrete pad dimensions: 2' X 2' X 6"

4- Dia /type of well casing: 2-inch / PVC

5- Type/slot size of screen: PVC / 010-slot

6- Type screen filter: 20/30 silica sand
a) Quantity used: 5 1/2 (50 lb) bags

7- Type of seal: Barroid bentonite chips
a) Quantity used: 3/4 (50 lb) bag

8- Grout
a) Grout mix used: Type I Portland cement w/ 5% bentonite
b) Method of placement: Hand

Development method: Surge block / Submersible pump

Development time: One hour

Estimated purge volume: 30 gallons

Comments: Well developed clear

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
158814	722-MW-01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Charleston Naval Complex LOCATION : AOC 722

ELEVATION : Not obtained DRILLING CONTRACTOR . Prosonic Drilling Corp.

DRILLING METHOD AND EQUIPMENT USED : Hollow-stem auger, truck-mounted drill ng

WATER LEVELS : 2.64 START : 18 September 03 / 0945 END : 18 September 03 / 1045

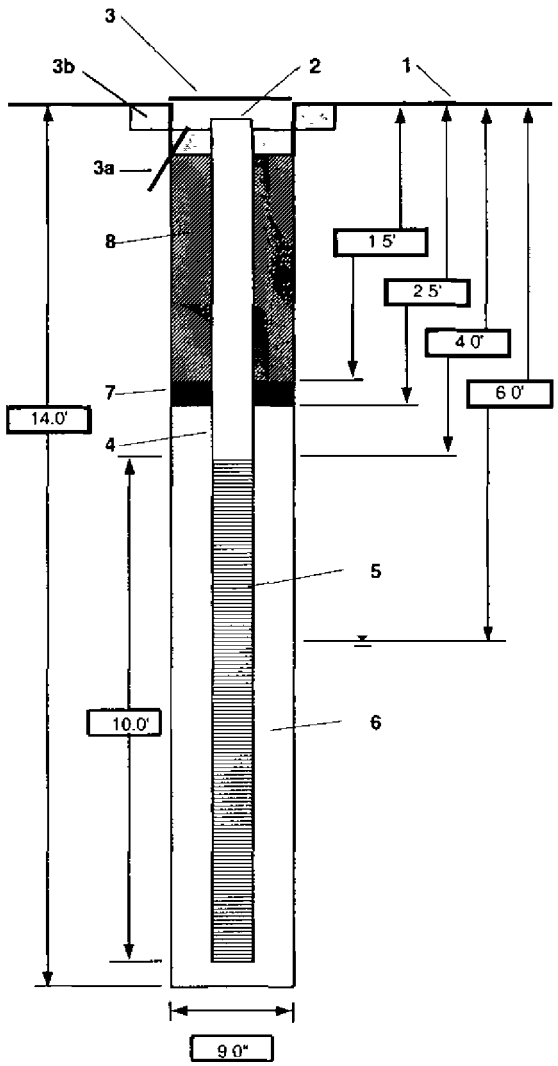
DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm) Breathing Zone Above Hole
	0-1.0'				Sand, brown, fine to medium grain, soft, dry	
	1.0-4.0'				Silty clay, gray, medium dense, saturated	
5						
10						
	4 0-13 0'				Silty clay, gray, medium dense, saturated End of boring	
15						
20						
25						

PROJECT NUMBER	WELL NUMBER	
158814	I722GW002	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT Charleston Naval Complex LOCATION · AOC 722 Northing: 369835.1
DRILLING CONTRACTOR : Prosonic Drilling Corp. Easting: 2326542 9
DRILLING METHOD AND EQUIPMENT USED Hollow-Stem Auger, Truck-Mounted Drill Rig
WATER LEVELS 3 20 START : 17 September 03 / 1400 END 17 September 03 / 1530 LOGGER Darryl Gates



1- Ground elevation at well	Not obtained
2- Top of casing elevation	5 83
3- Wellhead protection cover type	Bolt-down manhole cover
a) drain tube?	No
b) concrete pad dimensions	2' X 2' X 6"
4- Dia./type of well casing	2-inch / PVC
5- Type/slot size of screen	PVC / .010-slot
6- Type screen filter	20/30 silica sand
a) Quantity used	5 1/2 (50 lb) bags
7- Type of seal	Barroid bentonite chips
a) Quantity used	3/4 (50 lb) bag
8- Grout	
a) Grout mix used	Type I Portland cement w/ 5% bentonite
b) Method of placement	Hand
Development method	Surge block / Submersible pump
Development time	One hour
Estimated purge volume	30 gallons

Comments Well developed clear.

CH2MHILL

PROJECT NUMBER	BORING NUMBER
158814	722-MW-02 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Charleston Naval Complex LOCATION : AOC 722

ELEVATION : Not obtained DRILLING CONTRACTOR : Prosonic Drilling Corp.

DRILLING METHOD AND EQUIPMENT USED : Hollow-stem auger, truck-mounted drill rig

WATER LEVELS : 3.20 START : 17 September 03 / 1400 END : 17 September 03 / 1530

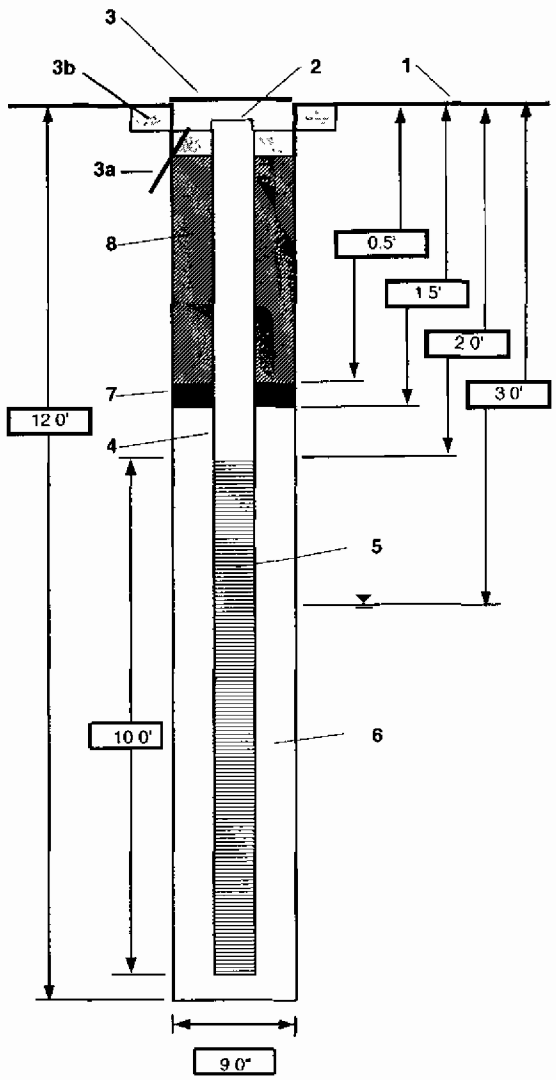
DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm) Breathing Zone Above Hole
	0-0.5'				Asphalt underlayment, lime roc	
	0.5-4 5'				Silty Clay, greenish gray, medium dense, moist	
5						
10						
	4 5-14'				Silty Clay, greenish gray, medium dense, saturatec End of Boring	
15						
20						
25						

PROJECT NUMBER	WELL NUMBER	
158814	I722GW003	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT · Charleston Naval Complex LOCATION AOC 722 Northing 369436.1
DRILLING CONTRACTOR · Prosonic Drilling Corp. Easting 2326768.0
DRILLING METHOD AND EQUIPMENT USED Hollow-Stem Auger, Truck-Mounted Drill Rig
WATER LEVELS 2.20 START 18 September 03 / 0800 END 18 September 03 / 0920 LOGGER Darryl Gates



1- Ground elevation at well	Not obtained
2- Top of casing elevation	4.83
3- Wellhead protection cover type	Bolt-down manhole cover
a) drain tube?	No
b) concrete pad dimensions	2' X 2' X 6"
4- Dia /type of well casing	2-inch / PVC
5- Type/slot size of screen	PVC / .010-slot
6- Type screen filter	20/30 silica sand
a) Quantity used	5 1/2 (50 lb) bags
7- Type of seal	Barroid bentonite chips
a) Quantity used	3/4 (50 lb) bag
8- Grout	
a) Grout mix used	(none used, due to high water table)
b) Method of placement	(not used)
Development method	Surge block / Submersible pump
Development time	One hour
Estimated purge volume	30 gallons

Comments Well developed clear

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
158814	722-MW-03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Charleston Naval Complex LOCATION : AOC 722

ELEVATION : Not obtained DRILLING CONTRACTOR : Prosonic Drilling Corp.

DRILLING METHOD AND EQUIPMENT USED : Hollow-stem auger, truck-mounted drill rig

WATER LEVELS : 2.20 START : 18 September 03 / 0800 END : 18 September 03 / 0920

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm) Breathing Zone Above Hole
	0-1'				Sand, brown, fine-medium grain, loose, dry	
5						
10						
	4-13'				Silty clay, gray, medium dense, med dense, moist End of Boring	
15						
20						
25						

Surface Soil - Hypothetical Future Industrial Worker Scenario
AOC 722, Zone I, Charleston Naval Complex

Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	RME	RME
IRing =	Ingestion Rate (mg/event)	100 a	100 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	52 a	52 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Dermal:

$$CDI = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
SA =	Surface Area (cm^2/event)	3300 b	3300 b
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0.2 h	0.2 h
ABS =	Absorption Factor (unitless)	(Chemical Specific) d	(Chemical Specific) d
EF =	Exposure Frequency (events/year)	52 a	52 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 h	9125 h

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
PEF =	Particulate Emission Factor (m^3/kg)	1.32E+09 e	1.32E+09 e
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific) f	(Chemical Specific) f
IRinh =	Inhalation Rate (m^3/event)	20 a	20 a
EF =	Exposure Frequency (events/year)	52 a	52 a
ED =	Exposure Duration (year)	25 h	25 h
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 h	9125 h

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.

b = Surface area of hands, 1/2 arms and 1/2 head (face) of an adult worker, adapted from CEHT, Technical Report: Soil Cleanup Target Levels for FDEP, September 2, 1997.

c = U.S. EPA Dermal Exposure Assessment: Principles and Application, January 1992.

d = Chemical-specific absorption factors are found in Appendix C.

e = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance: Technical Background Document, May 1996.

f = Chemical-specific volatilization factors are found in Appendix C.

Surface Soil - Hypothetical Future Industrial Worker Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFi**	**RME**	**ABS**	**VF**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	CHROMIUM	NA			1.98E+01	0.01		1.44E-06		9.52E-08			
MG/KG	MERCURY	NA			1.80E-02	0.01	3.71E+04	1.31E-09		8.64E-11		7.05E-09	
MG/KG	BEQS	B2	7.30E+00	3.10E+00	2.21E-01	0.1	2.72E+07	1.61E-08	1E-07	1.06E-08	8E-08	1.21E-10	4E-10
MG/KG	DIELDRIN	B2	1.60E+01	1.61E+01	1.04E-02	0.1	2.20E+06	7.56E-10	1E-08	4.99E-10	8E-09	6.90E-11	1E-09
	Total Risk								1.30E-07		8.55E-08		1.48E-09
											Total Risk =	**2.16E-07**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure Concentration;
ELCR = Excess Lifetime Cancer Exposure

Surface Soil - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDI**	**RME**	**ABS**	**VF**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	CHROMIUM	NA	1.50E+00	1.95E-02	1.98E+01	0.01		4.04E-06	2.69E-06	2.66E-07	1.78E-07		
MG/KG	MERCURY	NA	3.00E-04	8.57E-05	1.80E-02	0.01	3.71E+04	3.66E-09	1.22E-05	2.42E-10	8.06E-07	1.97E-08	2.30E-04
MG/KG	BEQS	B2			2.21E-01	0.1	2.72E+07	4.50E-08		2.97E-08		3.38E-10	
MG/KG	DIELDRIN	B2	5.00E-05	5.00E-05	1.04E-02	0.1	2.20E+06	2.12E-09	4.23E-05	1.40E-09	2.79E-05	1.93E-10	3.86E-06
	Hazard Index								5.72E-05		2.89E-05		2 34E-04
											Total HI=	**0.0003**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure Concentration; HQ = Hazard Quotient; HI = Hazard Index

Surface Soil - Hypothetical Future Industrial Worker Scenario
AOC 722, Zone I, Charleston Naval Complex

Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	RME	RME
IRing =	Ingestion Rate (mg/event)	50 a	50 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Dermal:

$$CDI = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
SA =	Surface Area (cm^2/event)	3300 b	3300 b
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0.2 h	0.2 h
ABS =	Absorption Factor (unitless)	(Chemical Specific) d	(Chemical Specific) d
EF =	Exposure Frequency (events/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 h	9125 h

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
PEF =	Particulate Emission Factor (m^3/kg)	1.32E+09 e	1.32E+09 e
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific) f	(Chemical Specific) f
IRinh =	Inhalation Rate (m^3/event)	20 a	20 a
EF =	Exposure Frequency (events/year)	250 a	250 a
ED =	Exposure Duration (year)	25 h	25 h
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 h	9125 h

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.

b = Surface area of hands, 1/2 arms and 1/2 head (face) of an adult worker, adapted from CEHT, Technical Report: Soil Cleanup Target Levels for FDEP, September 2, 1997.

c = U.S. EPA Dermal Exposure Assessment: Principles and Application, January 1992.

d = Chemical-specific absorption factors are found in Appendix C.

e = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance: Technical Background Document, May 1996.

f = Chemical-specific volatilization factors are found in Appendix C.

Surface Soil - Hypothetical Future Industrial Worker Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFI**	**RME**	**ABS**	**VF**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	CHROMIUM	NA			1.98E+01	0.01		3.47E-06		4.58E-07			
MG/KG	MERCURY	NA			1.80E-02	0.01	3.71E+04	3.15E-09		4.15E-10		3.39E-08	
MG/KG	BEQS	B2	7.30E+00	3.10E+00	2.21E-01	0.1	2.72E+07	3.87E-08	3E-07	5.10E-08	4E-07	5.80E-10	2E-09
MG/KG	DIELDRIN	B2	1.60E+01	1.61E+01	1.04E-02	0.1	2.20E+06	1.82E-09	3E-08	2.40E-09	4E-08	3.32E-10	5E-09
	Total Risk								3.11E-07		4.11E-07		7.14E-09
											Total Risk =	**7.29E-07**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure Concentration;
ELCR = Excess Lifetime Cancer Exposure

Surface Soil - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDi**	**RME**	**ABS**	**VF**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	CHROMIUM	NA	1.50E+00	1.95E-02	1.98E+01	0.01		9.70E-06	6.47E-06	1.28E-06	8.54E-07		
MG/KG	MERCURY	NA	3.00E-04	8.57E-05	1.80E-02	0.01	3.71E+04	8.81E-09	2.94E-05	1.16E-09	3.87E-06	9.49E-08	1.11E-03
MG/KG	BEQS	B2			2.21E-01	0.1	2.72E+07	1.08E-07		1.43E-07		1.62E-09	
MG/KG	DIELDRIN	B2	5.00E-05	5.00E-05	1.04E-02	0.1	2.20E+06	5.09E-09	1.02E-04	6.72E-09	1.34E-04	9.29E-10	1.86E-05
	Hazard Index								1.38E-04		1.39E-04		1.13E-03
											Total HI=	**0.0014**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure Concentration; HQ = Hazard Quotient; HI = Hazard Index

Surface Soil - Hypothetical Future Residential Adult Scenario
AOC 722, Zone I, Charleston Naval Complex

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds:			
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	RME	RME
IRing =	Ingestion Rate (mg/event)	100.0 g	100 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	350 a	350 a
ED =	Exposure Duration (year)	24 h	24 h
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 h	70 h
AT =	Averaging Time (days)	25550 h	8760 h
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	RME	RME
SA =	Surface Area (cm^2/event)	5700 h	5700 h
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0.07 h	0.07 h
ABS =	Absorption Factor (unitless)	(Chemical Specific) d	(Chemical Specific) d
EF =	Exposure Frequency (events/year)	350 a	350 a
ED =	Exposure Duration (year)	24 h	24 h
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 h	8760 h
Dust Inhalation:			
CDI =	$\frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	RME	RME
PEF =	Particulate Emission Factor (m^3/kg)	1.32E+09 e	1.32E+09 e
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific) f	(Chemical Specific) f
IRinh =	Inhalation Rate (m^3/event)	20 a	20 a
EF =	Exposure Frequency (events/year)	350 a	350 a
ED =	Exposure Duration (year)	24 h	24 h
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 h	8760 h

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.

b = Surface area of hands, 1/2 arms, 1/2 legs and feet of an adult, adapted from CEHT, Technical Report: Soil Cleanup Target Levels for FDEP, September 2, 1997.

c = U.S. EPA Dermal Exposure Assessment: Principles and Application, January 1992.

d = Chemical-specific absorption factors are found in Appendix C.

e = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance: Technical Background Document, May 1996.

f = Chemical-specific volatilization factors are found in Appendix C.

h = Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim, September 2001.

Surface Soil - Hypothetical Future Residential Adult Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFi**	**RME**	**ABS**	**VF**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	CHROMIUM	NA			1.98E+01	0.01		9.32E-06		3.72E-07			
MG/KG	MERCURY	NA			1.80E-02	0.01	4.06E+04	8.45E-09		3.37E-10		4.16E-08	
MG/KG	BEQS	B2	7.30E+00	3.10E+00	2.21E-01	0.1	2.98E+07	1.04E-07	7.6E-07	4.15E-08	3E-07	7.13E-10	2E-09
MG/KG	DIELDRIN	B2	1.60E+01	1.61E+01	1.04E-02	0.1	2.41E+06	4.88E-09	8E-08	1.95E-09	3E-08	4.07E-10	7E-09
	Total Risk								**8.37E-07**		**3.34E-07**		**8.76E-09**
											Total Risk =	**1.2E-06**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure Concentration;
ELCR = Excess Lifetime Cancer Exposure

Surface Soil - Hypothetical Future Residential Adult Non-Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDI**	**RME**	**ABS**	**VF**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	CHROMIUM	NA	1.50E+00	1.95E-02	1.98E+01	0 01		2.72E-05	1.81E-05	1.08E-06	7.23E-07		
MG/KG	MERCURY	NA	3.00E-04	8.57E-05	1.80E-02	0.01	4.06E+04	2.47E-08	8.22E-05	9.84E-10	3 28E-06	1.21E-07	1.42E-03
MG/KG	BEQS	B2			2.21E-01	0.1	2.98E+07	3.03E-07		1.21E-07		2.08E-09	
MG/KG	DIELDRIN	B2	5.00E-05	5.00E-05	1.04E-02	0.1	2.41E+06	1.42E-08	2.85E-04	5.68E-09	1.14E-04	1 19E-09	2.37E-05
	Hazard Index								3.85E-04		1.18E-04		1.44E-03
											Total HI=	**0.0019**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration; HQ = Hazard Quotient; HI = Hazard Index

Surface Soil - Hypothetical Future Residential Child Scenario
AOC 722, Zone I, Charleston Naval Complex

Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	RME	RME
IRing =	Ingestion Rate (mg/event)	200 a	200 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	350 b	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Dermal:

$$CDI = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
SA =	Surface Area (cm^2/event)	2800 h	2800 h
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0.2 h	0.2 h
ABS =	Absorption Factor (unitless)	(Chemical Specific) e	(Chemical Specific) d
EF =	Exposure Frequency (events/year)	350 b	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
PEF =	Particulate Emission Factor (m^3/kg)	1.32E+09 f	1.32E+09 e
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific) g	(Chemical Specific) f
IRinh =	Inhalation Rate (m^3/event)	15 a	15 a
EF =	Exposure Frequency (events/year)	350 b	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.

c = Surface area of hands, 1/2 arms, 1/2 legs and feet of a child (age 1-6 years), adapted from CEHT, Technical Re Soil Cleanup Target Levels for FDEP, September 2, 1997.

d = U.S. EPA Dermal Exposure Assessment: Principles and Application, January 1992.

e = Chemical-specific absorption factors are found in Appendix C.

f = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance: Technical Background Document, May 1996.

g = Chemical-specific volatilization factors are found in Appendix C.

h = Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim, September 2001.

Surface Soil - Hypothetical Future Residential Child Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFi**	**RME**	**ABS**	**VF**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	CHROMIUM	NA			1.98E+01	0.01							
MG/KG	MERCURY	NA			1.80E-02	0.01	1.82E+04	1.97E-08		5.52E-10		8.14E-08	
MG/KG	BEQS	B2	7.30E+00	3.10E+00	2.21E-01	0.1	1.33E+07	2.42E-07	1.77E-06	6.79E-08	4.96E-07	1.38E-09	4.27E-09
MG/KG	DIELDRIN	B2	1.60E+01	1.61E+01	1.04E-02	0.1	1.08E+06	1.14E-08	1.82E-07	3.19E-09	5.11E-08	7.96E-10	1.28E-08
	Total Risk								1.95E-06		5.47E-07		1.71E-08
											Total Risk =	**2.52E-06**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure Concentration;
ELCR = Excess Lifetime Cancer Exposure

Surface Soil - Hypothetical Future Residential Child Non-carcinogenic Scenario
AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDi**	**RME**	**ABS**	**VF**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	CHROMIUM	NA	1.50E+00	1.95E-02	1.98E+01	0.01		2.54E-04	1.69E-04	7.10E-06	4.73E-06		
MG/KG	MERCURY	NA	3.00E-04	8.57E-05	1.80E-02	0.01	1.82E+04	2.30E-07	7.67E-04	6.44E-09	2.15E-05	9.50E-07	1.11E-02
MG/KG	BEQS	B2			2.21E-01	0.1	1.33E+07	2.83E-06		7.92E-07		1.61E-08	
MG/KG	DIELDRIN	B2	5.00E-05	5.00E-05	1.04E-02	0.1	1.08E+06	1.33E-07	2.66E-03	3.72E-08	7.45E-04	9.28E-09	1.86E-04
	Hazard Index								3.60E-03		7.71E-04		1.13E-02
											Total HI=	**0.016**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure Concentration; HQ = Hazard Quotient; HI = Hazard Index

Groundwater (Potable Use) - Hypothetical Future Industrial Worker Scenario
AOC 722, Zone I, Charleston Naval Complex

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	RME	RME
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	RME	RME
SA =	Surface Area (cm^2)	4100 b,c	4100 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/event)	0.25 e	0.25 e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Inhalation:

CDI = ***Ingestion CDI from above*** [g]

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Default factors adapted from EPA Exposure Factors Handbook, August 1997.

c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker.

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.

e=Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim, September 2001.

g = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing

Groundwater (Potable Use) - Hypothetical Future Industrial Worker Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**RME**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	BENZENE	A	5.50E-02	6.11E-02	2.73E-02	2.50E-03	1.50E-02	8.74E-06	4.81E-07	1.34E-07	8.21E-09	2 39E-07
MG/L	DIBENZOFURAN	NA				8.52E-03		2.98E-05				
MG/L	LEAD	NA				1.07E-03		3.74E-06				
MG/L	LINDANE	NA				1.50E-05	1.10E-02	5.24E-08		5.91E-10		
MG/L	METHYLENE CHLORIDE	B2	7.50E-03	7.50E-03	1.65E-03	2.50E-03	3.50E-03	8.74E-06	6.55E-08	3.13E-08	2.35E-10	1.44E-08
MG/L	4-METHYLPHENOL (p-CRESOL)	NA				3.00E-03	7.70E-03	1.05E-05		8.27E-08		
MG/L	NAPTHALENE	NA				2.30E-02	4.70E-02	8.04E-05		3.87E-06		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	1.04E-02	6.00E-03	2.50E-03	1.20E-02	8.74E-06	9.61E-08	1.07E-07	1.12E-09	5.24E-08
	Total Risk								**6.42E-07**		**9.56E-09**	**3.05E-07**

Notes:

Total Risk = 9.57E-07

a - One-hit equation for high carcinogenic risk levels (1E-02) used Risk = 1 - $e^{(-CDI*SF)}$ (USEPA, 1989).
WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure;
ELCR = Excess Lifetime Cancer Risk, * = inhalation intake (CDI) = ingestion intake

Groundwater (Potable Use) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**RME**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**	**HQ**
MG/L	BENZENE	A	4.00E-03	3.60E-03	8.57E-03	2.50E-03	1.50E-02	2.45E-05	6.1E-03	3.76E-07	1.0E-04	2.9E-03
MG/L	DIBENZOFURAN	NA	4 00E-03	4.00E-03	4.00E-03	8 52E-03		8.34E-05	2.1E-02			2.1E-02
MG/L	LEAD	NA				1.07E-03		1.05E-05				
MG/L	LINDANE	NA	3.00E-04	2.98E-04	2.98E-04	1.50E-05	1.10E-02	1.47E-07	4.9E-04	1.65E-09	5.5E-06	4.9E-04
MG/L	METHYLENE CHLORIDE	B2	6.00E-02	6.00E-02	8.57E-01	2.50E-03	3.50E-03	2.45E-05	4.1E-04	8.78E-08	1.5E-06	2.9E-05
MG/L	4-METHYLPHENOL (p-CRESOL)	NA	5.00E-03	3.73E-03	3.73E-03	3.00E-03	7.70E-03	2.94E-05	5.9E-03	2.32E-07	6.2E-05	7.9E-03
MG/L	NAPTHALENE	NA	2.00E-02	2.00E-02	8.57E-04	2.30E-02	4.70E-02	2.25E-04	1.1E-02	1.08E-05	5.4E-04	2.6E-01
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	5.10E-05	6.00E-03	2.50E-03	1.20E-02	2.45E-05	4.1E-03	3.01E-07	5.9E-03	4.1E-03
	Hazard Index								**4.91E-02**		**6.6E-03**	**2.99E-01**
									Total Hazard Index =		**0.354**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure; HQ = Hazard Quotient; HI = Hazard Index; * = inhalation intake (CDI) = ingestion intake

Groundwater (Potable Use) - Hypothetical Future Residential Adult Scenario
AOC 722, Zone I, Charleston Naval Complex

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds:		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	RME	RME
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 e	30 e
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds:		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	RME	RME
SA =	Surface Area (cm^2)	N/A	18000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	8811 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/event)	0.250 e	0.250 e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 e	30 e
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = Ingestion CDI from above [f]

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (24-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6600 \times 6}{15} + \frac{18000 \times (24-6)}{70}$$

8811 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.

e=Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim, September 2001.

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Groundwater (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**RME**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	BENZENE	A	5.50E-02	6.11E-02	2.73E-02	2.50E-03	1.50E-02	3.72E-05	2.0E-06	1.13E-06	6.9E-08	1.0E-06
MG/L	DIBENZOFURAN	NA				8.52E-03		1.27E-04				
MG/L	LEAD	NA				1.07E-03		1.59E-05				
MG/L	LINDANE	NA				1.50E-05	1.10E-02	2.23E-07		4.98E-09		
MG/L	METHYLENE CHLORIDE	B2	7.50E-03	7.50E-03	1.65E-03	2.50E-03	3.50E-03	3.72E-05	2.8E-07	2.64E-07	2.0E-09	6.1E-08
MG/L	4-METHYLPHENOL (p-CRESOL)	NA				3.00E-03	7.70E-03	4.46E-05		6.97E-07		
MG/L	NAPTHALENE	NA				2.30E-02	4.70E-02	3.42E-04		3.26E-05		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	1.16E-02	6.00E-03	2.50E-03	1.20E-02	3.72E-05	4.1E-07	9.05E-07	1.1E-08	2.2E-07
	Total Risk								**2.73E-06**		**8.17E-08**	**1.30E-06**
									Total Risk =		**4.11E-06**	

Notes:

a - One-hit equation for high carcinogenic risk levels (1E-02) used Risk = 1 - e $^{(-CDI*SF)}$ (USEPA, 1989).
WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure;
ELCR = Excess Lifetime Cancer Risk, * = inhalation intake (CDI) = ingestion intake

Groundwater (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	RME	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BENZENE	A	4.00E-03	3.60E-03	8.57E-03	2.50E-03	1.50E-02	6.85E-05	1.7E-02	2.31E-06	6.4E-04	8.0E-03
MG/L	DIBENZOFURAN	NA	4.00E-03	4.00E-03	4.00E-03	8.52E-03		2.34E-04	5.8E-02			5.8E-02
MG/L	LEAD	NA				1.07E-03		2.93E-05				
MG/L	LINDANE	NA	3.00E-04	2.98E-04	2.98E-04	1.50E-05	1.10E-02	4.11E-07	1.4E-03	1.02E-08	3.4E-05	1.4E-03
MG/L	METHYLENE CHLORIDE	B2	6.00E-02	6.00E-02	8.57E-01	2.50E-03	3.50E-03	6.85E-05	1.1E-03	5.39E-07	9.0E-06	8.0E-05
MG/L	4-METHYLPHENOL (p-CRESOL)	NA	5.00E-03	3.73E-03	3.73E-03	3.00E-03	7.70E-03	8.22E-05	1.6E-02	1.42E-06	3.8E-04	2.2E-02
MG/L	NAPTHALENE	NA	2.00E-02	2.00E-02	8.57E-04	2.30E-02	4.70E-02	6.30E-04	3.2E-02	6.66E-05	3.3E-03	7.4E-01
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	5.67E-03	6.00E-03	2.50E-03	1.20E-02	6.85E-05	1.1E-02	1.85E-06	3.3E-04	1.1E-02
	Hazard Index								**1.37E-01**		**4.73E-03**	**8.37E-01**

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure; HQ = Hazard Quotient; HI = Hazard Index; * = inhalation intake (CDI) = ingestion intake

Total Hazard Index = 0.979

Groundwater (Potable Use) - Hypothetical Future Residential Child Scenario

AOC 722, Zone I, Charleston Naval Complex

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	RME	RME
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	RME	RME
SA =	Surface Area (cm^2)	6600 b, c	6600 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d,e	(Chemical Specific) d,e
ET =	Exposure Time (hr/event)	0.45 e	0.45 e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Inhalation:

CDI = Ingestion CDI from above [f]

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = US EPA Exposure Factors Handbook, August 1997.
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.

e=Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim, September 2001.

f = follows EPA Region IV guidance (i.e , inhalation of groundwater volatiles while showering/bathing

Groundwater (Potable Use) - Future Residential Child Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**RME**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	BENZENE	A	5.50E-02	6.11E-02	2.73E-02	2.50E-03	1.50E-02	1.37E-05	7.53E-07	6.10E-07	3.73E-08	3.74E-07
MG/L	DIBENZOFURAN	NA				8.52E-03		4.67E-05				
MG/L	LEAD	NA				1.07E-03		5.86E-06				
MG/L	LINDANE	NA				1.50E-05	1.10E-02	8.22E-08		2.69E-09		
MG/L	METHYLENE CHLORIDE	B2	7.50E-03	7.50E-03	1.65E-03	2.50E-03	3.50E-03	1.37E-05	1.03E-07	1.42E-07	1.07E-09	2.25E-08
MG/L	4-METHYLPHENOL (p-CRESOL)	NA				3.00E-03	7.70E-03	1.64E-05		3.76E-07		
MG/L	NAPTHALENE	NA				2.30E-02	4.70E-02	1.26E-04		1.76E-05		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	1 16E-02	6.00E-03	2.50E-03	1.20E-02	1.37E-05	1.51E-07	4.88E-07	5.68E-09	8.22E-08
	Total Risk								**1.01E-06**		**4.40E-08**	**4.79E-07**
										Total Risk =	**1.53E-06**	

Notes:

a - One-hit equation for high carcinogenic risk levels (1E-02) used Risk = 1 - $e^{(-CDI*SF)}$ (USEPA, 1989).
WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure;
ELCR = Excess Lifetime Cancer Risk, * = inhalation intake (CDI) = ingestion intake

Groundwater (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

AOC 722, Zone I, Charleston Naval Complex

								Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	RME	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BENZENE	A	4.00E-03	3.60E-03	8.57E-03	2.50E-03	1.50E-02	1.60E-04	4.00E-02	7.12E-06	1.98E-03	1.86E-02
MG/L	DIBENZOFURAN	NA	4.00E-03	4.00E-03	4.00E-03	8.52E-03		5.45E-04	1.36E-01			1.36E-01
MG/L	LEAD	NA				1.07E-03		6.84E-05				
MG/L	LINDANE	NA	3.00E-04	2.98E-04	2.98E-04	1.50E-05	1.10E-02	9.59E-07	3.20E-03	3.13E-08	1.05E-04	3.22E-03
MG/L	METHYLENE CHLORIDE	B2	6.00E-02	6.00E-02	8.57E-01	2.50E-03	3.50E-03	1.60E-04	2.66E-03	1.66E-06	2.77E-05	1.86E-04
MG/L	4-METHYLPHENOL (p-CRESOL)	NA	5.00E-03	3.73E-03	3.73E-03	3 00E-03	7.70E-03	1.92E-04	3.84E-02	4.39E-06	1.18E-03	5.15E-02
MG/L	NAPTHALENE	NA	2.00E-02	2.00E-02	8.57E-04	2.30E-02	4.70E-02	1.47E-03	7.35E-02	2.05E-04	1.03E-02	1.72E+00
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	5.67E-03	6.00E-03	2.50E-03	1.20E-02	1.60E-04	2.66E-02	5.70E-06	1.00E-03	2.66E-02
	Hazard Index								**3.21E-01**		**1.46E-02**	**1.95E+00**
									Total Hazard Index =		**2.29E+00**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure; HQ = Hazard Quotient; HI = Hazard Index; * = inhalation intake (CDI) = ingestion intake