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Final
Site 6 Closeout Report and Site 3 Removal Summary

St. Juliens Creek Annex
Chesapeake, Virginia

Prepared for:

Department of the Navy
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Naval Facilities Engineering Command
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Acronyms and Abbreviations

bgs	below ground surface
BTAG	Biological Technical Assistance Group
CNRMA	Commander, Navy Region Mid-Atlantic
CQCP	Construction Quality Control Plan
cy	cubic yards
EE/CA	Engineering Evaluation/Cost Analysis
EPIC	Environmental Photographic Interpretation Center
ft	feet
FY	fiscal year
HASP	Health and Safety Plan
MCL	Maximum Contaminant Level
NFA	no further action
NNSY	Norfolk Naval Shipyard
NTCRA	non-time-critical removal action
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PRAP	Proposed Remedial Action Plan
QA/QC	quality assurance/quality control
RAC	Remedial Action Construction
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI	Remedial Investigation
ROD	Record of Decision
ROICC	Resident Office In Charge of Construction
SJCA	St. Juliens Creek Annex
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characterization Leaching Procedure

USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit
UXO	unexploded ordnance
VOC	volatile organic compound
XRF	X-Ray Fluorescence

1 Introduction

This report documents closeout of Site 6 Small Arms Unit (also referred to as "Caged Pit"), and presents a summary of the removal activities conducted at Site 3 at St Juliens Creek Annex (SJCA), Chesapeake, Virginia. The location of SJCA is shown on Figure 1-1. The recommended closure of Site 6 is based on complete removal of waste and soil followed by clean backfill in the vicinity of the former small arms unit. This report also summarizes the completion of the Site 3 Phase I removal of the northern portion of the waste followed by backfilling with clean fill. Site 3 removal activities will continue in a phased approach.

The non-time-critical removal action (NTCRA) activities at Sites 3 and 6 at SJCA were conducted by the Navy's Remedial Action Construction (RAC) Contractor OHM Remediation Services Corporation (OHM/SHAW) of Virginia Beach, Virginia. Site work was initiated on August 21, 2002 in accordance with the *Work Plan, RAC Action* prepared by OHM/SHAW in 2002 (OHM/SHAW, 2002a). CH2M HILL performed confirmatory sampling as well as provide guidance to OHM/SHAW on the extent of the removal. The *Remedial Action Construction Closeout Report, RAC Action* prepared by OHM/SHAW in 2003 (OHM/SHAW, 2003) documents the activities conducted at Sites 3 and 6 and is provided as Appendix A.

This report is organized in five sections. Section 1 presents background information, including site history and previous investigations conducted at Sites 3 and 6. Section 2 includes an overview of removal action activities. Demonstration of site cleanup and mitigation of risk is presented in Section 3 and Section 4 presents conclusion and recommendations for Sites 3 and 6. References are provided as Section 5. Appendix A presents the *Remedial Action Construction Closeout Report, RAC Action* prepared by OHM Remediation Services Corporation (OHM/SHAW, 2003), and the complete analytical results of the confirmatory samples are provided in Appendix B.

1.1 Site Description

1.1.1 Site 3

Site 3 is located in the northeast portion of SJCA (Figure 1-2). The site is located on dredge fill material, which reportedly originated from Blows Creek and the Southern Branch of the Elizabeth River. Site 3 covers approximately 2.1 acres. It is bordered to the north by the Norfolk and Western Railroad and the City of Portsmouth, to the south by Blows Creek, to the west by Site 5, and to the east by the Southern Branch of the Elizabeth River.

The Site 3 disposal area was originally a mudflat where refuse was dumped and allowed to burn; the ash was then used to fill in the area. The Site 3 disposal area was not lined. Operation began in 1940 and continued until 1970. After 1970, the area was graded level and covered with grass. Review of historical aerial photographs, interpreted by the United States Environmental Protection Agency's (USEPA) Environmental Photographic Interpretation Center (EPIC), indicated that prior to 1940, the site and much of the adjacent area was used for placement of dredge spoil material (USEPA, 1995). Refuse burned at Site 3 included solvents, acids, bases, and mixed municipal waste. The total volume of waste disposed of was estimated to be about 750,000 cubic feet (27,800 cubic yards) prior to burning. Salvageable materials were removed from the site daily and every 2 weeks the site was bulldozed for compaction and leveling (CH2M HILL, 2002a).

Two pits at Site 3 were used for disposal of oil and oily sludge and for periodic burning. The locations of the waste disposal pit and area were outlined based on historical aerial photographs taken in 1958, 1961, 1964, and 1970 as interpreted by the USEPA (USEPA, 1995). As identified in the photographs, the disposal pits were located along the north side of the access road that diagonally crosses the site. The USEPA also interpreted ground scarring along the road as possible waste disposal areas.

Findings of a 2001 Waste Delineation Investigation and interviews with former SJCA employees revealed that the extent of waste at Site 3 was smaller than reported in the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) (A.T. Kearney, 1989) and the site was not an established landfill area. Metals and polycyclic aromatic hydrocarbons (PAHs) were identified in soil and sediment at concentrations that may pose ecological or human health risk.

1.1.2 Site 6

Site 6 is also located in the northeast portion of SJCA (Figure 1-2) on dredge fill material. Site 6 covers approximately 0.6 acres adjacent to the eastern portion of Site 5 Burning Grounds. Due to the close proximity of Sites 5 and 6, Site 6 was included as part of Site 5 in the Remedial Investigation (RI) for this area.

Site 6 was operated as part of the ordnance disposal operations at SJCA and consisted of a caged metal container underlain by a concrete pad. No date of operation of the small arms unit was found in the historical records. However, a review of the historical aerial photographs indicated that activities at Site 6 began around 1949 and continued to the early 1980s. According to the 1989 RFA report, small items such as igniters and fuses were burned at Site 6 “during recent years”. Interviews with former employees, conducted in December 2001 by Commander, Navy Region Mid-Atlantic (CNRMA), indicated that small items were transported into a steel container via a conveyor belt for destruction. The container was estimated to be 8 feet (ft) wide, 20 ft long, and 12 ft high. Geophysical investigations indicate potential buried remains of this container. A trenching investigation conducted in June 2001 did not find the remains of the container, however, reinforced concrete was encountered near the surface. Prior to removal activities, Site 6 was covered with grass and there was no surface evidence of the caged container.

1.1.3 Previous Investigations at Sites 3 and 6

A RI was conducted at Sites 3 and 6 and the results were presented in the *Draft Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Sites 3, 4, 5, and 6* (CH2M HILL, 2002a). Constituents of potential concern at Sites 3 and 6 were defined as compounds that pose a potential risk based on human health and ecological risk assessments, and are present at concentrations above the background 95 percent upper tolerance limit (UTL). The UTLs were determined in the *Final Background Investigation Report* (CH2M HILL,

2001) and the evaluation of potential risk was included in the RI (CH2M HILL, 2002a). Statistical comparison of site and background data and risk management considerations were used to better define potential site risks. These studies concluded that chemicals that pose potential risks at Sites 3 and 6 are metals and PAHs. The RI also concluded that there are miscellaneous pockets of burnt materials and spent ordnance shells at Site 3.

A *Final Engineering Evaluation/Cost Analysis (EE/CA) for Sites 3 and 6* (CH2M HILL, 2002b) was completed to address waste / debris, and impacted soils and sediment at Site 3 and waste / debris at Site 6. Based upon the alternatives presented, Alternative 3 was selected based on the remedial action's effectiveness, implementability, and cost. Alternative 3 included the excavation of burnt / stained soils and debris at Sites 3 and 6, as well as excavation of sediment in drainage swales adjacent to Site 3, and soils adjacent to the waste and localized "hot spot" at Site 3 that pose a potential risk to human health or ecological receptors. The volume of waste, soil, and sediment to be removed, based on the detected concentrations from previous investigations at Site 3, was estimated to be 9,204 cubic yards (cy), while the volume of waste expected to be removed at Site 6 was estimated to be 42 cy. All material to be excavated for disposal was considered non-hazardous as determined through pre-removal waste characterization, and acceptable for disposal at a local Subtitle D landfill. Other materials (concrete and steel) were anticipated to be recycled upon removal from the site.

2 Removal Action Activities

This section presents a summary of the removal action activities at Sites 3 and 6 at SJCA. OHM Remediation Services Corporation (OHM/SHAW) mobilized to began removal activities on August 21, 2002. CH2M HILL provided oversight and performed confirmatory sampling of the excavation sidewalls and floors as support documentation for the mitigation of risk. An overview of the primary tasks performed as part of removal action is presented below; details on each activity, are provided in the *Remedial Action Construction Closeout Report RAC Action* (OHM/SHAW, 2003) included as Appendix A.

2.1 Preliminary Activities

A work plan, *Work Plan RAC Action, St. Juliens Creek Annex IRA Sites 3, 6, and 7, Chesapeake Virginia* (OHM/SHAW, September 2002), outlined all proposed activities for the project, including a Site Specific Health and Safety Plan (HASP), Construction Quality Control Plan (CQCP), and schedule. In addition to site-specific preparation detailed in the work plan, a pre-construction meeting was held with the Norfolk Naval Shipyard (NNSY) Resident Office In Charge of Construction (ROICC) on August 20, 2002. A second meeting was held on August 27, 2002. The purpose of these meetings was to discuss the work plan and proposed removal action with the stakeholders. A summary of the pre-construction meetings is provided in Appendix A of the OHM/SHAW Closeout Report.

Specific site preparation included the installation of construction fencing, erosion and sediment controls, posting of signs, delivery of removal equipment, and construction of a truck decontamination wash area. Additionally, OHM/SHAW contracted Accutest to locate any existing buried utilities in the areas of proposed work. OHM/SHAW secured a digging permit through Miss Utility and a hot works permit through the base fire department.

The potential presence of spent ordnance and/or Unexploded Ordnance (UXO) required that all excavated soils be pre-screened to identify and remove potential UXO fragments. Screening was conducted by OHM/SHAW UXO technicians.

The removal activities conducted at each site are summarized below and detailed in Appendix A.

2.2 Site 3 Removal Action Activities

2.2.1 Extent of Excavation

The proposed extent of excavation at Site 3 was documented in the Final EE/CA (CH2M HILL, 2002b) and was based on soil sampling results presented in the RI report (CH2M HILL, 2002a). The proposed extent of the area to be removed included waste, soil, and sediment that posed a potential risk to human health and the environment. The EE/CA calculated that approximately 9,204 cy of waste, soil, and sediment would be removed from

Site 3 in a phased approach, with the northern portion of Site 3 removal in 2002 (Phase I) and the remainder of Site 3 removal in 2003 (Phase II).

Due to limited funds available in fiscal year 2002 (FY02), approximately 3,300 cy of waste and soil were removed in FY02. Material excavated in FY02 consisted of waste and soil in the northern part of the site. The extent of the Phase I removal performed at Site 3 is shown on Figure 2-1**.** In addition to funding restraints, the limit of excavation was determined based on achieving soil field screening results below the background 95% UTL followed by offsite laboratory confirmation analyses. Results of the confirmation samples are discussed in the Section 3. Details of the excavation performed by OHM/SHAW are documented in the Construction Closeout Report included as Appendix A. The remaining waste, soil, and sediment are scheduled for removal in fiscal year 2003 (FY03), followed by confirmatory sampling and site closure.

2.2.2 Field Screening

Field screening of soil was conducted during excavation activities at Site 3 through the use of a X-Ray Fluorescence (XRF) instrument and PAH test kit. The screening was conducted to qualitatively assess the effectiveness of the removal action on mitigating risk and permitted OHM/SHAW to adjust the extent of excavation accordingly. Target cleanup levels were based on comparison to the 95% background UTLs for risk drivers identified in the RI (CH2M HILL, 2002a). The field screening results are included in the OHM Closeout Report in Appendix A.

2.2.3 Confirmatory Soil Sampling

At Site 3, four co-located surface and subsurface soil samples were collected from the wall of the excavation and six subsurface soil samples were collected from the floor of the excavation on September 27, 2002 (Figure 2-1). The data management and tracking from the time of field collection to receipt of validated electronic analytical results is of primary importance and reflects the overall quality of the analytical results. Field samples and their corresponding analytical tests were recorded on chain-of-custody forms, which were submitted with the samples to the laboratory. Quality assurance/quality control (QA/QC) samples were collected to ensure credibility of the analytical results, and included; field blanks, equipment blanks, trip blanks, duplicates, matrix spikematrix spike duplicates (MS/MSD) samples, and laboratory blanks. Hard copies and electronic versions of the analytical data report were submitted to Environmental Data Quality, Inc. for third-party validation. Validation procedures established by the Region III Modification to the National Functional Guidelines for Organic (USEPA, 1994) and Inorganic Analyses (USEPA, 1993) were adhered to during the validation process.

These confirmation soil samples were sent to an offsite laboratory (CompuChem) to be analyzed. The surface soil samples were analyzed for Target Compound List (TCL) semivolatile organic compounds (SVOCs) and Target Analyte List (TAL) total metals and the subsurface soil samples were analyzed for TAL total metals. All wall samples submitted for confirmatory analysis were from the final perimeter of excavation at Site 3. Confirmation sample results are discussed in Section 3.

2.3 Site 6 Removal Action Activities

2.3.1 Extent of Excavation

The proposed extent of excavation at Site 6 was documented in the Final EE/CA (CH2M HILL, 2002b) and was based on soil sampling results and geophysical survey data presented in the RI (CH2M HILL, 2002a). The Tier I SJCA Partnering Team reached consensus that closure for Site 6 would be achieved by removing all remnants of the caged container (concrete and soil).

The extent of removal performed at Site 6 was based on complete removal of remnants of the caged container and associated soil and is shown on Figure 2-2. Approximately 180 cy of concrete/soil were excavated at Site 6 during the removal action. This removal activity constitutes complete removal of Site 6. Details of the excavation performed by OHM/SHAW are documented in the Construction Closeout Report included as Appendix A.

2.3.2 Field Screening

Field screening of soil was conducted during excavation activities at Site 6 through the use of a XRF instrument and PAH test kit. The screening was conducted to qualitatively assess the effectiveness of the removal action on mitigating risk and permitted OHM/SHAW to adjust the extent of excavation accordingly. Target cleanup levels were based on comparison to the 95% UTL of background and risk screening criteria for risk drivers identified in the RI Report (CH2M HILL, 2002a). The field screening results are included in the OHM Closeout Report (Appendix A).

2.3.3 Confirmatory Soil Sampling

At Site 6, a total of eight surface soil samples were collected from the walls of the excavation (four initial excavation samples and four final excavation samples) and one subsurface soil sample was collected from the floor of the excavation. These confirmation soil samples were sent to an offsite laboratory (CompuChem) to be analyzed. The data management and tracking from the time of field collection to receipt of validated electronic analytical results is of primary importance and reflects the overall quality of the analytical results. Field samples and their corresponding analytical tests were recorded on chain-of-custody forms, which were submitted with the samples to the laboratory. Quality assurance/quality control (QA/QC) samples were collected to ensure credibility of the analytical results, and included; field blanks, equipment blanks, trip blanks, duplicates, matrix spikematrix spike duplicates (MS/MSD) samples, and laboratory blanks. Hard copies and electronic versions of the analytical data report were submitted to Environmental Data Quality, Inc. for third-party validation. Validation procedures established by the Region III Modification to the National Functional Guidelines for Organic (USEPA, 1994) and Inorganic Analyses (USEPA, 1993) were adhered to during the validation process.

The surface soil samples were analyzed for TCL SVOCs and TAL total metals. The subsurface soil sample was analyzed for TAL total metals. The first four surface soil samples were collected at the initial limits (60 cy) of the excavation on September 6, 2002 and the results indicated metals elevated above the 95% background UTL. Therefore, additional soil was removed and four additional surface soil samples were collected on

November 4, 2002 at the final limits (180 cy) of excavation. Because the former small arme unit (Site 6) had been completely excavated with the initial excavation, and the area lies just east of the Site 5 Burning Grounds, the Tier I SJCA Partnering Team agreed that the final four excavation wall samples would be incorporated into supplemental investigations at Site 5. As a result, the analytical results from the four surface soil samples collected from the final perimeter of excavation at Site 6 are included in Appendix B but are not discussed further in this report.

The subsurface soil sample results collected on September 27, 2002 from the excavation floor are discussed in Section 3; the sample location is shown on Figure 2-2.

2.3.4 Groundwater Sampling

Groundwater was encountered during the excavation at Site 6 at approximately 7 ft below ground surface (bgs). Field personnel noted the groundwater was fluorescent green in appearance. It was suspected that the source of the fluorescent green nature of the groundwater was a harmless fluorescence dye frequently used in search and rescue operations by the Navy. The dye used by the Navy for search and rescue does not pose a risk to human health and the environment. To confirm the presence of fluorescence dye in the groundwater, a sample was subjected to a black light and a groundwater sample was collected and submitted to the laboratory (CompuChem) for analysis of TCL volatile organic compounds (VOCs), TCL SVOCs, TCL pesticides/polychlorinated biphenyls (PCBs), explosives, and TAL total and dissolved metals. The groundwater sample was collected from the excavation using dedicated polyethylene tubing through a peristaltic pump in the same manner that is used for sampling monitoring wells. The sample fluoresced under the black light suggesting the green color is due to the presence of fluorescence dye. The sample location is shown on Figure 2-2 and the laboratory results are discussed in Section 3.

2.4 Waste Disposal

Five 5-point composite samples were collected at Site 3 and one 5-point composite sample was collected from Site 6 to characterize the soil prior to disposal to ensure excavated waste was properly managed and disposed of at an appropriate facility. The soil samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) and determined to be non-hazardous. Characterization sampling results are presented in Appendix F of the OHM/SHAW closeout report (Appendix A). The removed waste and soil was delivered to a RCRA Subtitle D landfill; the King and Queen County Landfill located in Little Plymouth, Virginia.

2.5 Backfill and Site Restoration

The excavations at Sites 3 and 6 were backfilled upon completion of the removal action. Fill was placed and spread with a bulldozer. The surface was then seeded for erosion control and the site was restored to original conditions. Confirmatory analysis of the material used as backfill was performed prior to placement to ensure that the backfill material was free of contamination. Those analytical results are presented in the OHM/SHAW closeout report Table 9, included as Appendix A.

Following the site restoration, a site walk through was conducted by CH2M HILL, NNSY ROICC, and OHM/SHAW on November 1, 2002. Construction activities were considered complete following the walk through.

3 Demonstration of Cleanup Activities

This section presents the analytical results of the confirmation data collected during the removal activities at Sites 3 and 6 and documents the mitigation of risk. The analytical data generated was validated by an independent data validation subcontractor (Edata, Inc.) according to USEPA Region III validation procedures. The complete data tables, including the QA/QC sample results, are included in Appendix B. Tables 3-1 through 3-4 show constituents that were detected in one or more confirmation samples.

Confirmation samples along the northern perimeter of the Site 3 excavation show that, with few exceptions, removal activities reduced concentrations to background levels. Risk management considerations are warranted for three confirmation sample results. Demonstration of cleanup at Site 6 is based on complete removal of the former small arms unit, subsurface floor confirmation results below background levels, and placement of clean fill in the Site 6 excavation.

3.1 Site 3 Analytical Results

This section discusses the analytical results obtained from the offsite laboratory analyses of the confirmation samples collected during Phase I of the Site 3 removal action. All samples submitted for confirmatory analysis were collected from the final northern perimeter of the excavation at Site 3 (Figure 2-1).

3.1.1 Surface Soil

Four surface soil samples (SJS03-CS2-SS07 through SJS03-CS2-SS10) were collected from the excavation walls at Site 3 and submitted to the laboratory for confirmatory analysis. These samples were analyzed for TCL SVOCs and TAL total metals. The parameters detected at Site 3 that were identified in the RI as surface soil ecological risk drivers are antimony, arsenic, barium, copper, lead, and zinc. There were no human health risks identified for surface soils at Site 3. The confirmatory sample results for the risk drivers were compared to the 95% background UTL for dredge fill surface soils (Table 3-1). All surface soil confirmation results were below the 95% background UTLs with the exception of zinc (214 mg/kg) at one surface soil sampling location (SJS03-CS2-SS07) as shown on Figure 2-1. The average zinc concentration (96 mg/kg) of the four confirmatory sample results is well below the background UTL for zinc (137 mg/kg).

3.1.2 Subsurface Soil

Ten subsurface soil samples (SJS03-CS1-SB01 through SJS03-CS1-SB10), six from the floor of the excavation and four from the excavation side walls, were collected and submitted to the laboratory for confirmatory analysis. These samples were analyzed for TAL total metals. The parameters detected in Site 3 subsurface soil do not pose an ecological risk, and the parameters in subsurface soil that pose a potential human health risk as identified in the RI are arsenic and iron. The confirmatory sample results for arsenic and iron were compared to the 95% background UTL for dredge fill subsurface soils (Table 3-2). In one sample each, arsenic and iron exceeded the 95% background UTLs. Both of these samples (SJS03-CS1-SB05 and SJS03-CS1-SB06) were collected from the excavation floor just south of the gravel road (Figure 2-1). The arsenic and iron results were only slightly above the background UTLs and the average concentrations of all ten samples were well below the background UTLs (Table 3-2).

The Tier I SJCA Partnering Team has agreed to conduct additional soil sampling at Site 3 as part of a supplemental remedial investigation to support effective implementation of Phase II of the EE/CA for a NTCRA, as presented in the *Draft Technical Memorandum Site Delineation/Supplemental Remedial Investigation for Site 3*, (CH2M HILL, January, 2003). The Phase I removal activity completes remediation of the northern perimeter of Site 3, and the supplemental RI data for Site 3 will provide additional information for effective remediation of the remainder of Site 3 during the Phase II NTCRA. Following the completion of the Phase II removal action, all Phase I and Phase II confirmation sample data will be evaluated for mitigation of risk and Site Closure.

3.2 Site 6 Analytical Results

This section discusses the analytical results obtained from the offsite laboratory analyses of the Subsurface soil confirmation sample and groundwater sample collected during the Site 6 removal action and demonstrates site cleanup for closure of Site 6.

3.2.1 Subsurface Soil

One subsurface soil sample (SJS06-CS1-SB05) was collected from the excavation floor at Site 6 and submitted to the laboratory for analysis. The sample was analyzed for total metals. The parameters detected in subsurface soil at Site 6 that posed a potential human health risk, as identified in the RI, are arsenic and iron. The confirmatory sample results for these compounds are below the 95% background UTL for dredge fill subsurface soils (Table 3-3).

The remnants of the former small arms unit (Site 6) was completely excavated and replaced with clean backfill (Appendix A). The area beyond the limits of the excavation will be included in future supplemental investigations conducted at Site 5 (Burning Grounds). Therefore, the Tier I SJCA Partnering Team reached consensus for closure of Site 6 based on complete removal of the site.

3.2.2 Groundwater

One groundwater sample (SJS06-CS2-GW01) was collected from the initial 60 cy excavation and submitted to the laboratory for analysis of TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, explosives, and TAL total and dissolved metals. The groundwater sample location is shown on Figure 2-2. Concentrations were compared to federal Maximum Contaminant Levels (MCLs), adjusted tap water risk-based concentrations (RBCs), and Biological Technical Assistance Group (BTAG) surface water screening values adjusted times 10 to account for dilution when groundwater discharge occurs (Table 3-4).

There are no exceedances of the MCL in the Site 6 groundwater sample. The Site 6 groundwater sample results are below the maximum, and for most parameters even below the mean groundwater concentrations reported in the RI for Sites 5/6, where no human health risks were identified for shallow groundwater. Although total arsenic and total and dissolved manganese concentrations exceeded the adjusted tap water RBCs, concentrations are less than those reported for upgradient groundwater (SJS03-MW01S) in this dredged filled portion of SJCA, and are consistent with concentrations reported for facility wide background groundwater (CH2M HILL, October 2001). These data show that historical activities at Site 6 have not impacted groundwater beneath the site.

Although, total aluminum and total and dissolved manganese concentrations exceeded the adjusted BTAG surface water screening values, as demonstrated above, groundwater has not been impacted by Site 6. Groundwater beneath Site 6 flows south to Blose Creek and is further monitored by several downgradient wells associated with Site 5. As discussed in the RI for Sites 5/6, an ecological risk assessment of Blows Creek is planned for FY03 and further evaluation of Site 5 groundwater is planned for FY03.

4 Conclusions and Recommendations

The following conclusions are based upon the removal actions conducted at Sites 3 and 6.

4.1 Site 3

This document serves as a summary of the Phase I removal action at Site 3. The Phase I confirmatory sample results are presented in their entirety in Appendix B and summarized in Section 3. Confirmation samples along the northern perimeter of the Site 3 excavation show that, with the exception of three results, removal activities reduced concentrations to background levels, and average concentrations across Site 3 to below background levels. The Phase I removal activity completes remediation of the northern portion of Site 3. A *Draft Technical Memorandum for the Site Delineation/Supplemental Remedial Investigation for Site 3* was completed in January 2002, and the analytical data collected will be used to clearly define the limits of excavation to be implemented as Phase II of the NTCRA, (CH2M HILL, 2002c). Following the completion of the Phase II removal action, all Phase I and Phase II confirmation sample data will be evaluated for mitigation of risk and Site Closure.

4.2 Site 6

Based upon the complete removal of waste/soil at Site 6, it is recommended that Site 6 be closed with no further action (NFA), and a no action Proposed Remedial Action Plan (PRAP) and Record of Decision (ROD) be prepared for Site 6.

5 References

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Table 3-1
Site 3 Surface Soil Excavation Wall
Confirmatory Sampling Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**Dredge Fill 95% UTL**	SJS03-CS2-SS07	SJS03-CS2-SS08		SJS03-CS2-SS09	SJS03-CS2-SS10
Sample ID		SJS03-CS2-SS07-000	SJS03-CS2-SS08P-000	SJS03-CS2-SS08-000	SJS03-CS2-SS09-000	SJS03-CS2-SS10-000
Sample Date		09/27/02	09/27/02	09/27/02	09/27/02	09/27/02
Chemical Name						
Semivolatile Organic Compounds (UG/KG)						
2-Methylnaphthalene	--	74 J	430 U	380 U	430 U	570 U
Acenaphthylene	246	32 J	20 J	21 J	430 U	48 J
Anthracene	462	37 J	23 J	17 J	430 U	45 J
Benzaldehyde	--	71 J	430 U	380 U	430 U	570 U
Benzo(a)anthracene	2,027	79 J	82 J	52 J	19 J	78 J
Benzo(a)pyrene	1,785	95 J	69 J	52 J	20 J	76 J
Benzo(b)fluoranthene	3,197	170 J	62 J	45 J	33 J	230 J
Benzo(g,h,i)perylene	1,655	150 J	430 U	380 U	430 U	83 J
Benzo(k)fluoranthene	2,038	200 J	63 J	64 J	26 J	170 J
Caprolactam	--	850 U	160 J	380 U	170 J	270 J
Chrysene	3487	120 J	110 J	59 J	32 J	220 J
Di-n-octylphthalate	--	850 U	430 U	86 J	430 U	200 J
Dibenz(a,h)anthracene	714	37 J	17 J	18 J	430 U	47 J
Fluoranthene	2,766	100 J	100 J	56 J	21 J	120 J
Indeno(1,2,3-cd)pyrene	1,829	91 J	36 J	26 J	14 J	87 J
Naphthalene	485	36 J	10 J	10 J	430 U	570 U
Phenanthrene	913	73 J	110 J	35 J	430 U	29 J
Phenol	--	25 J	430 U	380 U	430 U	570 U
Pyrene	2,590	190 J	180 J	92 J	24 J	99 J
Total Metals (MG/KG)						
Aluminum	22,786	4,760	9,290	8,670	6,750	26,300
Antimony	147	0.42 B	0.38 U	0.34 U	0.39 U	0.81 B
Arsenic	24	8.4	3	4.5	5	19.4
Barium	98	31.9 J	53.6	44.3	36.6 J	89.4
Calcium	3,251	4,850	1,320	1,350	4,780	2,640
Chromium	45	9.7	13.2	14.5	13	53
Cobalt	13	10.7 J	1.2 J	1.2 J	5.6 J	6.3 J
Copper	58	23.6	14.5	23.5	20.5	35.5
Iron	45,805	8,390	6,420	7,540	12,900	46,900
Lead	147	74.2	38.7	47.6	36.2	53
Magnesium	4,507	773 J	610 J	633 J	1,290	5,760
Manganese	198	245 J	38.7	41.7	131	148
Mercury	1.3	0.17 L	0.054 U	0.052 U	0.1 J	0.48
Nickel	19	17	4.9 J	4.6 J	10.1	15.9
Potassium	4,577	364 J	369 J	389 J	854 J	3,950
Vanadium	70	17.9	17.2	18.3	17	61.3
Zinc	137	214	30.1 J	52.7 J	68.1	116

Notes:

Bold Italic Text Identifies Risk Drivers

Risk Driver (Eco) Exceeding the Background UTL

B - Possible blank contamination

J - Analyte present, reported result is estimated

L - Reported value is biased low

U - Not detected

Table 3-2
Site 3 Subsurface Soil
Confirmatory Sampling Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Dredge Fill 95% UTL	SJS03-CS1-SB01	SJS03-CS1-SB02	SJS03-CS1-SB03	SJS03-CS1-SB04	SJS03-CS1-SB05	SJS03-CS1-SB06	SJS03-CS1-SB07
Sample ID		SJS03-CS1-SB01-003	SJS03-CS1-SB02-003	SJS03-CS1-SB03-003	SJS03-CS1-SB04-003	SJS03-CS1-SB05-003	SJS03-CS1-SB06-003	SJS03-CS1-SB07-003
Sample Date		09/27/02	09/27/02	09/27/02	09/27/02	09/27/02	09/27/02	09/27/02
Sample Location		Floor	Floor	Floor	Floor	Floor	Floor	Wall
Chemical Name								
Total Metals (MG/KG)								
Aluminum	18,839	12,800	3,850	13,800	7,510	17,800	18,800	16,000
Antimony	147	0.56 U	0.42 U	0.54 U	0.43 U	0.63 U	0.58 U	0.57 U
Arsenic	14	9.3	4.7	9.2	6.4	14.4	11.8	11.3
Barium	50	33.5 J	15.9 J	41.2 J	36.7 J	47.8 J	52.9 J	39.7 J
Calcium	3,251	2,810	1,150 J	4,850	3,100	3,900	4,290	2,980
Chromium	39	26.9	9.5	27.2	16	34.6	35.4	32
Cobalt	13	7.3 J	4.6 J	8.4 J	4.7 J	18 J	10.5 J	9.8 J
Copper	40	21	28.1	31.7	110	39.8	35.1	26.4
Iron	36,585	27,900	9,370	28,800	17,700	36,200	41,700	31,300
Lead	86	36.3	22.2	41.9	48.9	57.5	66.9	45.3
Magnesium	3,847	4,250	1,190 J	4,200	2,250	5,130	5,020	5,230
Manganese	151	267	68.9	271	158	341	340	292
Mercury	0.62	0.46	0.17	0.28	0.25	0.46	0.45	0.56
Nickel	15	13.3 J	5.9 J	15	8.4 J	26.7	19.5	17.6
Potassium	3,465	1,930	741 J	2,140	1,300 J	2,500	2,420	2,410
Sodium	203	1,280 J	446 J	380 B	445 J	980 J	254 B	1,550 J
Vanadium	42	31.3	11.3 J	32.6	18.8	40.2	42.2	36.6
Zinc	87	76.2	60.3	96.7	84.6	291	134	106

Notes:

Bold Italic Text Identifies Risk Drivers

Risk Driver (HH) Exceeding the Background UTL

B - Possible blank contamination

J - Analyted detected, reported value is estimated

U - Not detected

South of Gravel Road

Table 3-2
Site 3 Subsurface Soil
Confirmatory Sampling Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**Dredge Fill 95% UTL**	SJS03-CS1-SB08	SJS03-CS1-SB09	SJS03-CS1-SB10
Sample ID		SJS03-CS1-SB08-003	SJS03-CS1-SB09-003	SJS03-CS1-SB10-003
Sample Date		09/27/02	09/27/02	09/27/02
Sample Location		Wall	Wall	Wall
Chemical Name				
Total Metals (MG/KG)				
Aluminum	18,839	7,790	2,540	4,460
Antimony	147	0.42 U	0.41 U	0.44 U
Arsenic	14	6.4	4.8	1.9 J
Barium	50	23.9 J	14.7 J	48 J
Calcium	3,251	1,890	595 J	595 J
Chromium	39	16	6.3	10
Cobalt	13	13.3	3.7 J	1.1 J
Copper	40	10.1	24.8	10.9
Iron	36,585	20,800	8,290	4,670
Lead	86	11.5	37	22.8
Magnesium	3,847	2,640	628 J	850 J
Manganese	151	115	54.5	25.5
Mercury	0.62	0.13	0.077 J	0.14
Nickel	15	20.4	4.5 J	3.1 J
Potassium	3,465	1,320 J	474 J	560 J
Sodium	203	347 J	109 B	211 B
Vanadium	42	18.4	6.5 J	10.9 J
Zinc	87	135	64.6	13.8

Notes:

Bold Italic Text Identifies Risk Drivers

Risk Driver (HH) Exceeding the Background UTL

B - Possible blank contamination

J - Analyted detected, reported value is estimated

U - Not detected

Table 3-3
Site 6 Subsurface Soil
Confirmatory Sampling Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	**Dredge Fill 95% UTL**	SJS06-CS1-SB05	
Sample ID		SJS06-CS1-SB05-003	
Sample Date		09/27/02	
Chemical Name			
Total Metals (MG/KG)			
Aluminum	18,839	7,510	
Antimony	1.47	0.37	U
Arsenic	14	3.2	
Barium	50	36.7	J
Beryllium	0.81	0.47	B
Cadmium	--	0.046	U
Calcium	3,251	3,860	
Chromium	39	14.2	
Cobalt	13	3.4	B
Copper	40	15.8	
Iron	36,585	12,100	
Lead	86	22.4	
Magnesium	3,847	1,720	
Manganese	151	105	
Mercury	0.62	0.068	J
Nickel	15	6.8	J
Potassium	3,465	823	J
Selenium	1.5	0.68	B
Silver	0.67	0.16	U
Sodium	203	112	B
Thallium	--	0.6	U
Vanadium	42	16.6	
Zinc	87	58.7	

Notes:

Bold Italic Text Identifies Risk Drivers

Risk Driver (HH) Exceeding the Background UTL

B - Possible blank contamination

J - Analyted detected, reported value is estimated

U - Not detected

Table 3-4
Site 6 Groundwater
Sampling Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID / Sample ID / Sample Date	Screening Criteria: MCL-Ground water	Screening Criteria: Tap Water Adjusted RBC	Screening Criteria: BTAG-Surface Water Screening Value x10*	Max Concentration from Sites 5/6 RI for Shallow GW	Mean Concentration from Sites 5/6 RI for Shallow GW	SJS06-CS2-GW01 / SJS06-CS2-GW01 / 09/10/02
Chemical Name						
Volatile Organic Compounds (UG/L)						
Toluene	1,000	75	370	0.2	0.5	1 J
Semivolatile Organic Compounds (UG/L)						
Di-n-butylphthalate	--	370	34	4	5	0.5 J
bis(2-Ethylhexyl)phthalate	6	4.8	300	2	5	1 J
Pesticide/Polychlorinated Biphenyls (UG/L)						
No Detections						
Explosives (UG/L)						
No Detections						
Total Metals (UG/L)						
Aluminum	--	3,700	870	87,400	15,910	957
Arsenic	10	0.045	360	27.3	6.9	2.7 J
Barium	2,000	260	10,000	359	112	128 J
Calcium	--	--	--	257,000	115,218	239,000
Cobalt	--	220	230	257	56	2 J
Copper	1,300	150	28.5	124	23	1.1 J
Iron	--	1,100	3,200	83,700	45,227	1,080
Lead	15	15	5.4	26.1	8.2	2 J
Magnesium	--	--	--	278,000	106,182	120,000
Manganese	--	73	100	4,320	2,703	642
Nickel	--	73	83	360	85	2.4 J
Potassium	--	--	--	96,300	33,460	34,700
Sodium	--	--	--	1,480,000	547,818	97,300
Vanadium	--	26	100,000	82.8	10.7	6.5 J
Zinc	--	1,100	370	2,020	512	51.7
Dissolved Metals (UG/L)						
Barium	2,000	260	10,000	371	106	127 J
Calcium	--	--	--	211,000	111,646	235,000
Cobalt	--	220	--	270	62	1.8 J
Copper	1,300	150	2.9	149	27	1.4 J
Magnesium	--	--	--	276,000	105,855	118,000
Manganese	--	73	10	4,200	2,708	628
Nickel	--	73	8.3	353	85	1.5 J
Potassium	--	--	--	94,700	32,286	33,800
Sodium	--	--	--	1,450,000	597,546	96,000
Vanadium	--	26	10,000	8.8	3.3	4.9 J
Zinc	--	1,100	86	1,980	508	43.3

Notes:

J - Analyte present, reported value is estimated

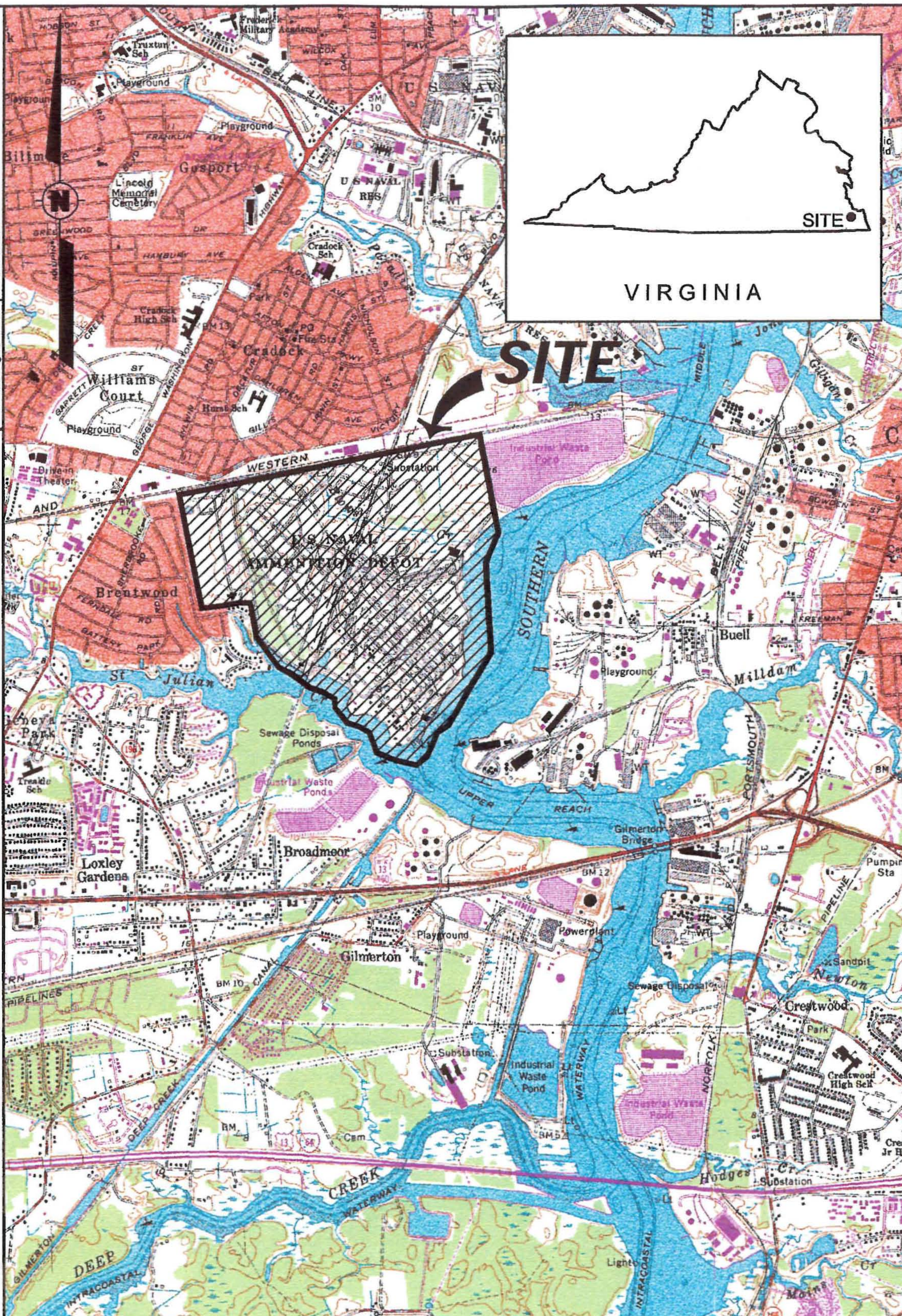
Table 3-4
Site 6 Groundwater
Sampling Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID Sample ID Sample Date	MCL-Ground water	Tap Water Adjusted RBC	BTAG-Surface Water Screening Value x10*	Max Concentration from Sites 5/6 RI for Shallow GW	Mean Concentration from Sites 5/6 RI for Shallow GW	SJS06-CS2-GW01 SJS06-CS2-GW01 09/10/02
Chemical Name						

* - Adjusted times 10 to account for dilution through groundwater discharge

Figures

OFFICE Pittsburgh, PA | DRAWING NUMBER 836067-A2



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U.S.G.S. 7.5 MIN TOPOGRAPHIC MAP OF NORFOLK SOUTH VIGINIA, DATED 1965, PHOTOREVISED 1986, SCALE: 1" = 1/2 MILE.

SCALE

0 .5 1 Mile

REV	DATE	BY	CHK'D	APRV'D	DESCRIPTION/ISSUE
1	1/24/03	ACS	LWS	PTS	FINAL CLOSE OUT REPORT

REVISIONS

OHM Remediation Services Corp.

Shaw Environmental & Infrastructure, Inc.

DESIGNED BY	TS	8/2/02	CHECKED BY	P. Verma	8/2/02
DRAWN BY	TFR/LDB	8/2/02	APPROVED BY	J. Sloss	8/2/02

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND

NAVAL STATION ATLANTIC DIVISION NORFOLK, VIRGINIA

ST. JULIENS CREEK ANNEX CHESAPEAKE, VIRGINIA

REMEDIAL ACTION SITES 3, 6, AND 7

SITE LOCATION MAP

SCALE: AS SHOWN | SIZE: A

DELIVERY ORDER NO. 085

CONSTR. CONTRACT NO. N62470-97-D-5000

NAVFAC DRAWING NO. ?

SHEET I.D. FIGURE 1

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Plotted By: SMITH_A

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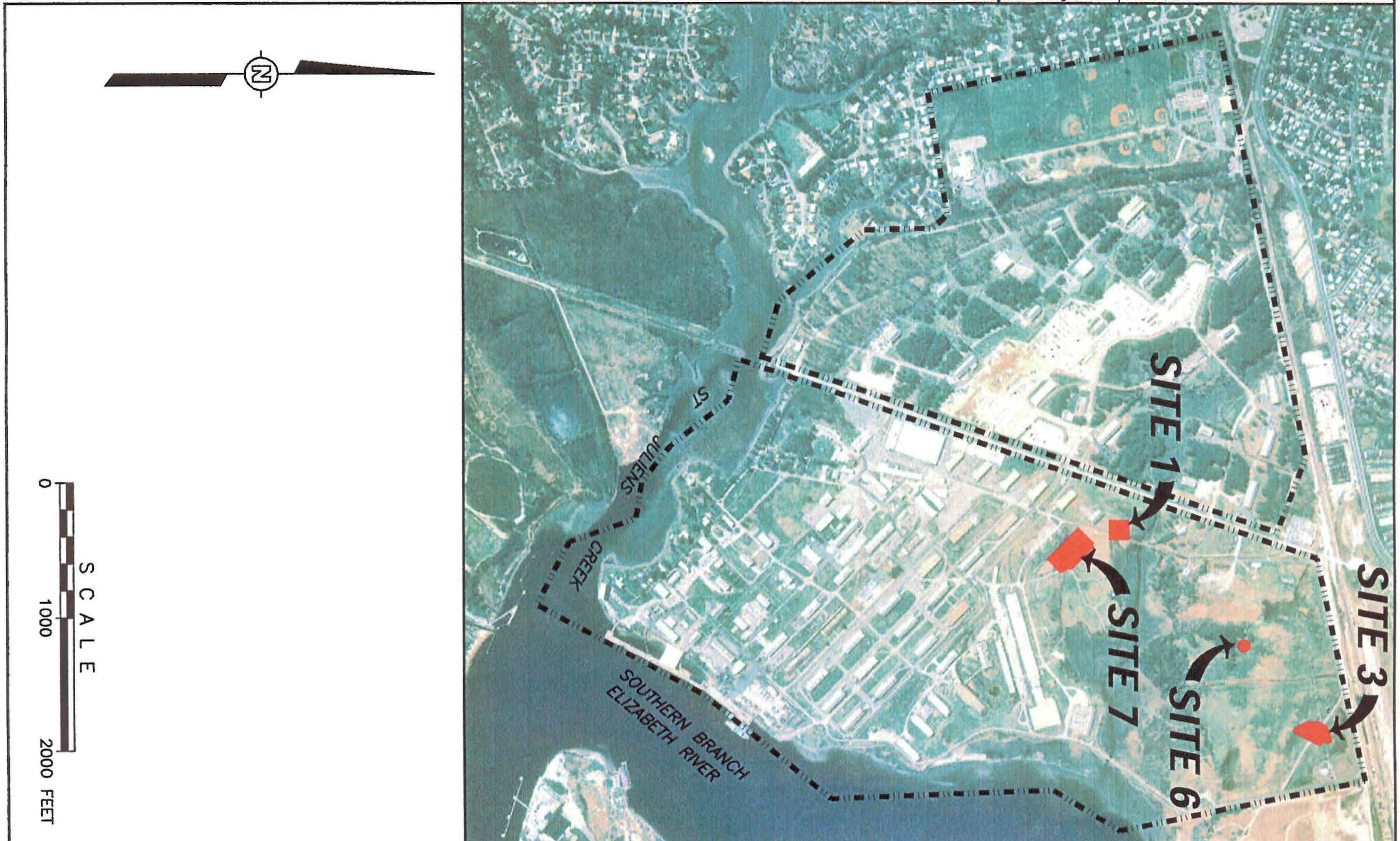
Plotted By: SMITH_A

OFFICE	DRAWING NUMBER
Pittsburgh, PA	838067-A3



1	1/24/03	ACS	LWS	PTS	FINAL CLOSE OUT REPORT
REV	DATE	BY	CHK'D	APPR'VD	DESCRIPTION/ISSUE

REVISIONS

OHM Remediation Services Corp.
Shaw Environmental & Infrastructure, Inc.

DESIGNED BY	JS	8/2/02	CHECKED BY	P. Verma	8/2/02
DRAWN BY	LDB	8/2/02	APPROVED BY	J. Sloss	8/2/02

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION — ATLANTIC DIVISION — NORFOLK, VIRGINIA
ST. JULIENS CREEK ANNEX — CHESAPEAKE, VIRGINIA

REMEDIAL ACTION
SITES 1, 3, 6, AND 7

St. JULIENS CREEK ANNEX PROPERTY BOUNDARY

SCALE: AS SHOWN
SIZE: A
DELIVERY ORDER NO. 085
CONSTR. CONTRACT NO. N62470-97-D-5000
NAVFAC DRAWING NO.

FIGURE 2

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Plotted By: SMITH_A

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Pittsburgh, PA		

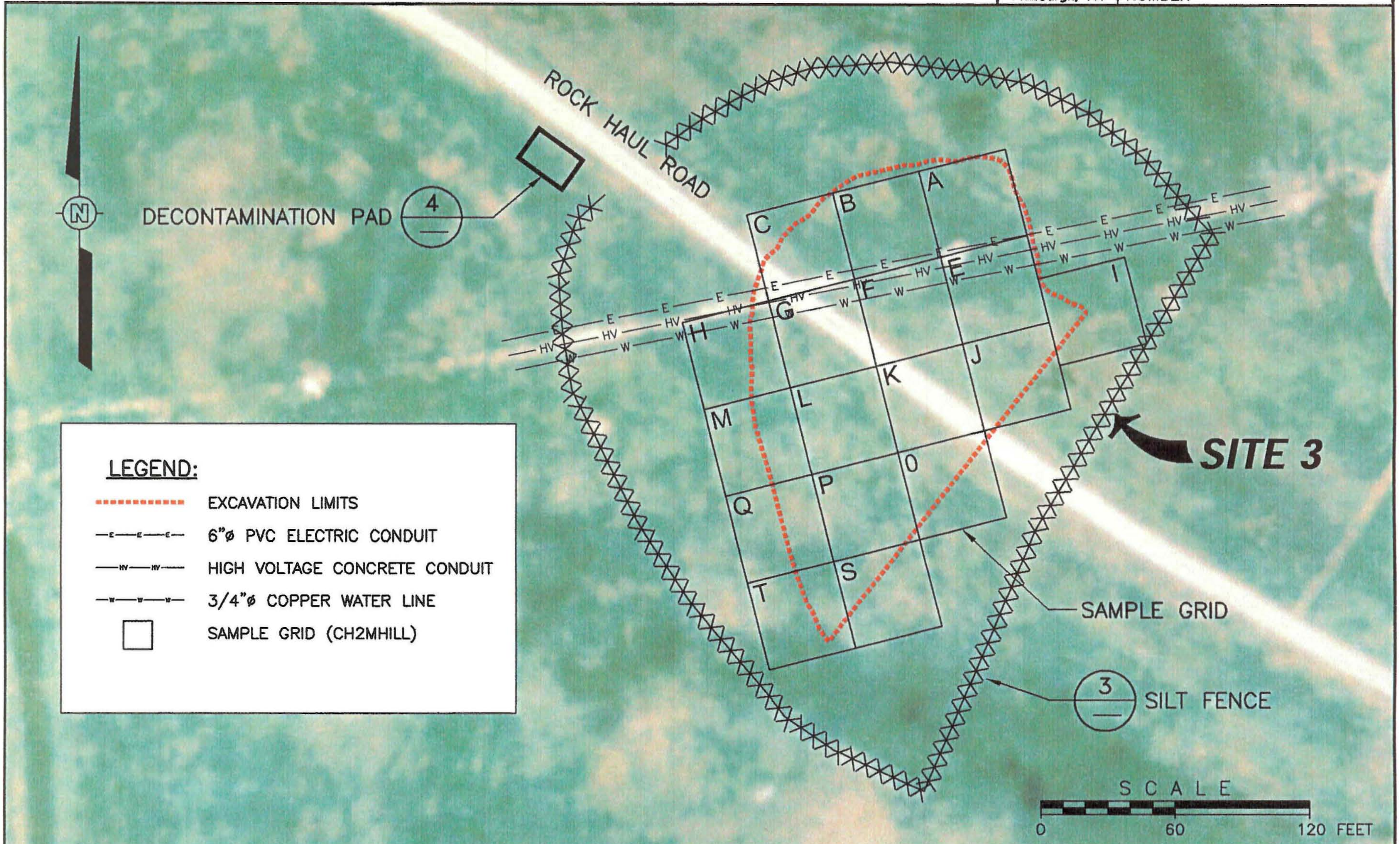

FIGURE 3

NAVFAC DRAWING NO.
CONSTR. CONTRACT NO. N62470-97-D-5000
DELIVERY ORDER NO. 085
SCALE: AS SHOWN
SIZE: A

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NAVAL STATION — NORFOLK, VIRGINIA
ST. JULIENS CREEK ANNEX — CHESAPEAKE, VIRGINIA

REMEDIAL ACTION
SITE 3

FINAL CONFIRMATION SAMPLE LOCATIONS

OHM Remediation Services Corp.
Shaw Environmental & Infrastructure, Inc.

DESIGNED BY	JS	8/27/02	CHECKED BY	P. Verma	8/27/02
DRAWN BY	LDB	8/27/02	APPROVED BY	J. Sloss	8/27/02

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1	1/24/03	ACS	LWS	PTS	FINAL CLOSE OUT REPORT

REVISIONS

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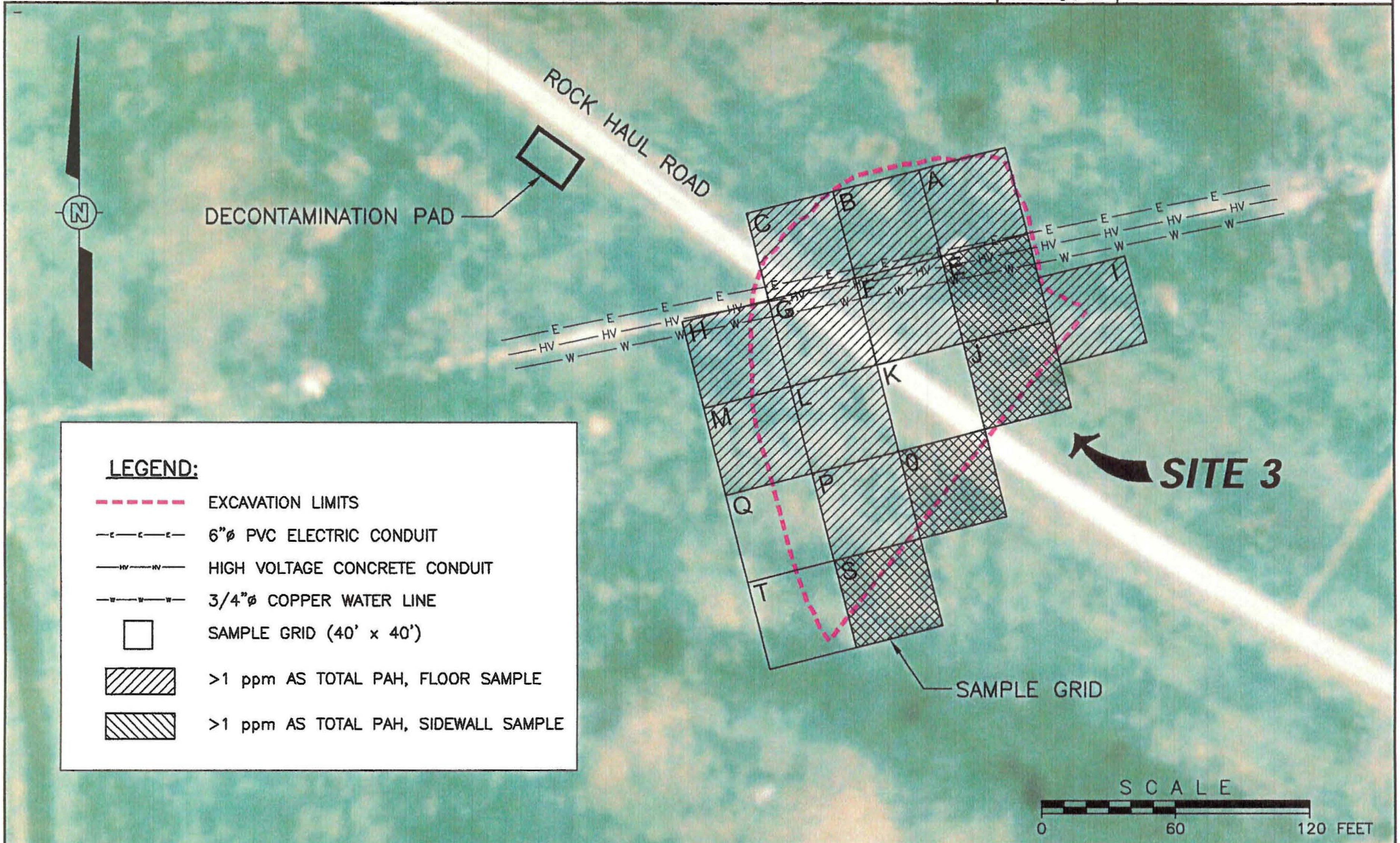

FIGURE 4

NAVFAC DRAWING NO.
N62470-97-D-5000
CONSTR. CONTRACT NO.
DELIVERY ORDER NO. 085
SCALE: AS SHOWN
SIZE: A

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION — ATLANTIC DIVISION — NORFOLK, VIRGINIA
ST. JULIENS CREEK ANNEX — CHESAPEAKE, VIRGINIA

REMEDIAL ACTION
SITE 3

SITE 3 XRF SAMPLE LOCATIONS

OHM Remediation Services Corp.
Shaw Environmental & Infrastructure, Inc.

DESIGNED BY	JS	8/27/02	CHECKED BY	P. Verma	8/27/02
DRAWN BY	LDB	8/27/02	APPROVED BY	J. Sloss	8/27/02

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	1/24/03	ACS	LWS	PTS	FINAL CLOSE OUT REPORT

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Pittsburgh, PA		

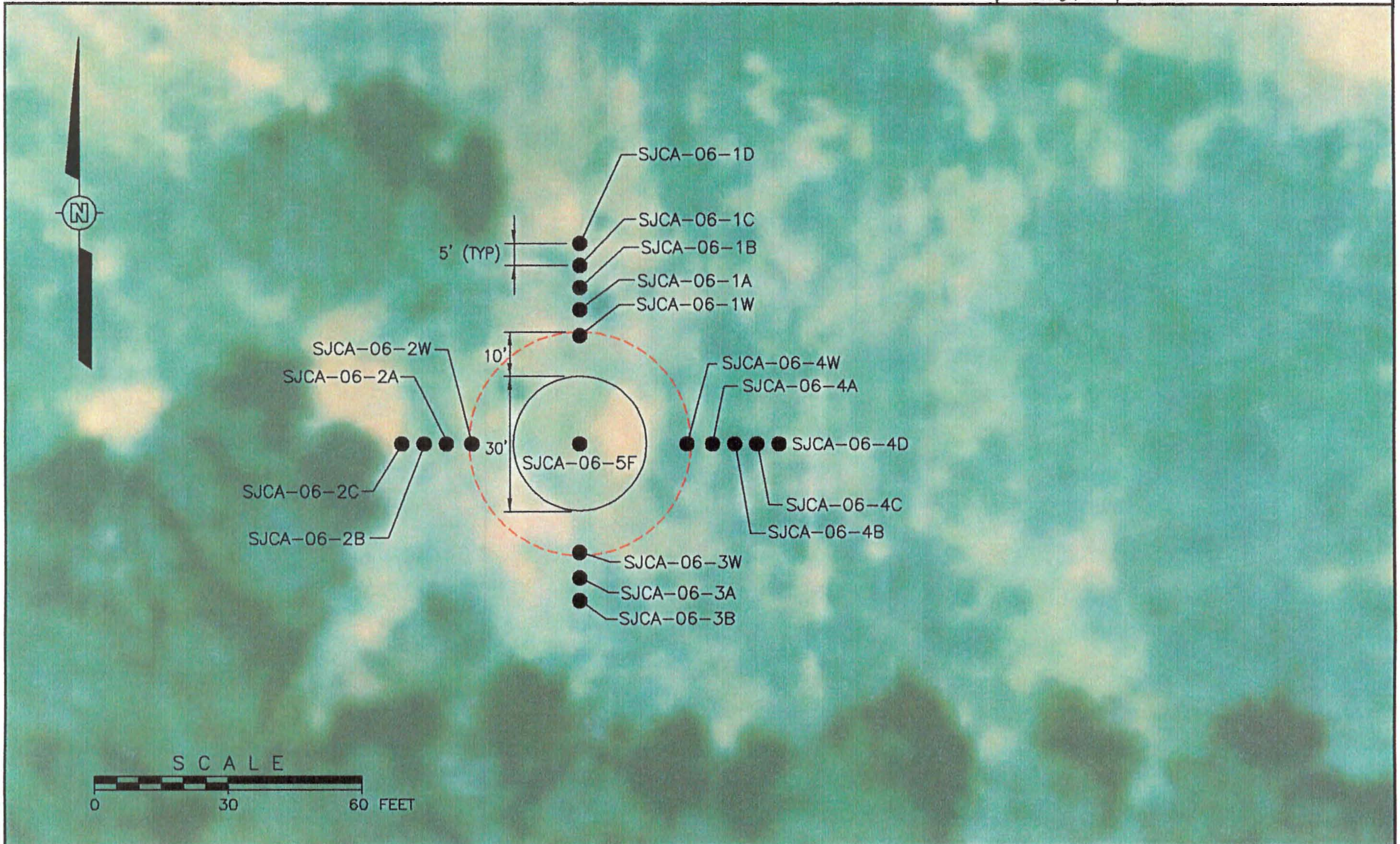

FIGURE 5

NAVFAC DRAWING NO. N62470-97-D-5000
CONSTR. CONTRACT NO. 085
DELIVERY ORDER NO.
SCALE: AS SHOWN
SIZE: A

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION — ATLANTIC DIVISION — NORFOLK, VIRGINIA
ST. JULIENS CREEK ANNEX — CHESAPEAKE, VIRGINIA

REMEDIAL ACTION
SITES 6

SITE 6 XRF SAMPLE LOCATIONS

OHM Remediation Services Corp.
Shaw Environmental & Infrastructure, Inc.

DESIGNED BY			CHECKED BY	L. Stapf	1/23/03
DRAWN BY	ACS	1/23/03	APPROVED BY	T. Sword	1/23/03

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
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REVISIONS

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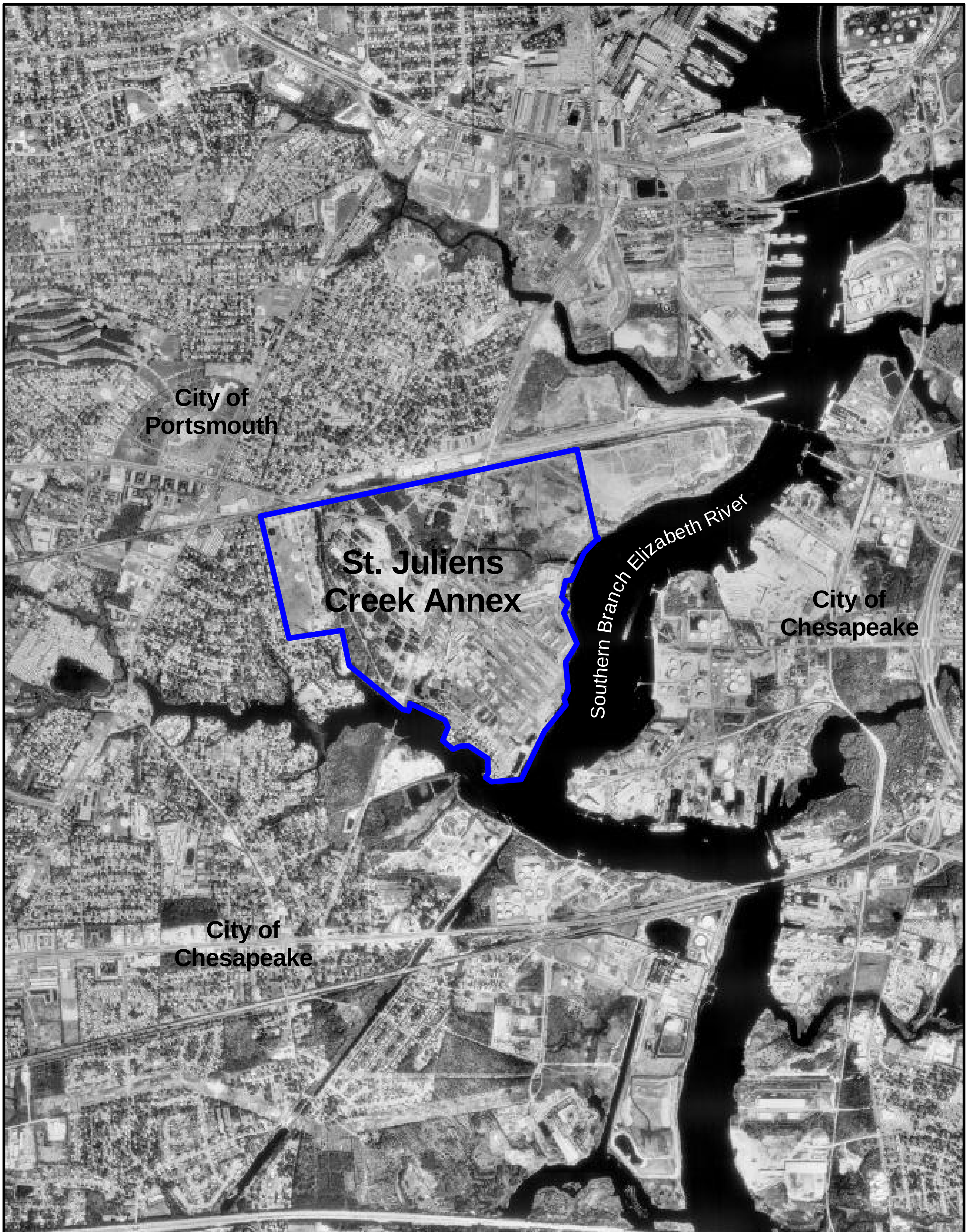

LEGEND

St. Juliens Creek Annex

N

0 2000 4000 Feet

Figure 1-1
Location of St. Juliens Creek Annex
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

LEGEND

- Site Locations
- Roads
- Railroads
- Activity Boundary

N

0 800 1600 Feet

Figure 1-2
Location of Sites 3, 5, and 6
Sites 3 and 6 Removal Action
St. Juliens Creek Annex
Chesapeake, Virginia

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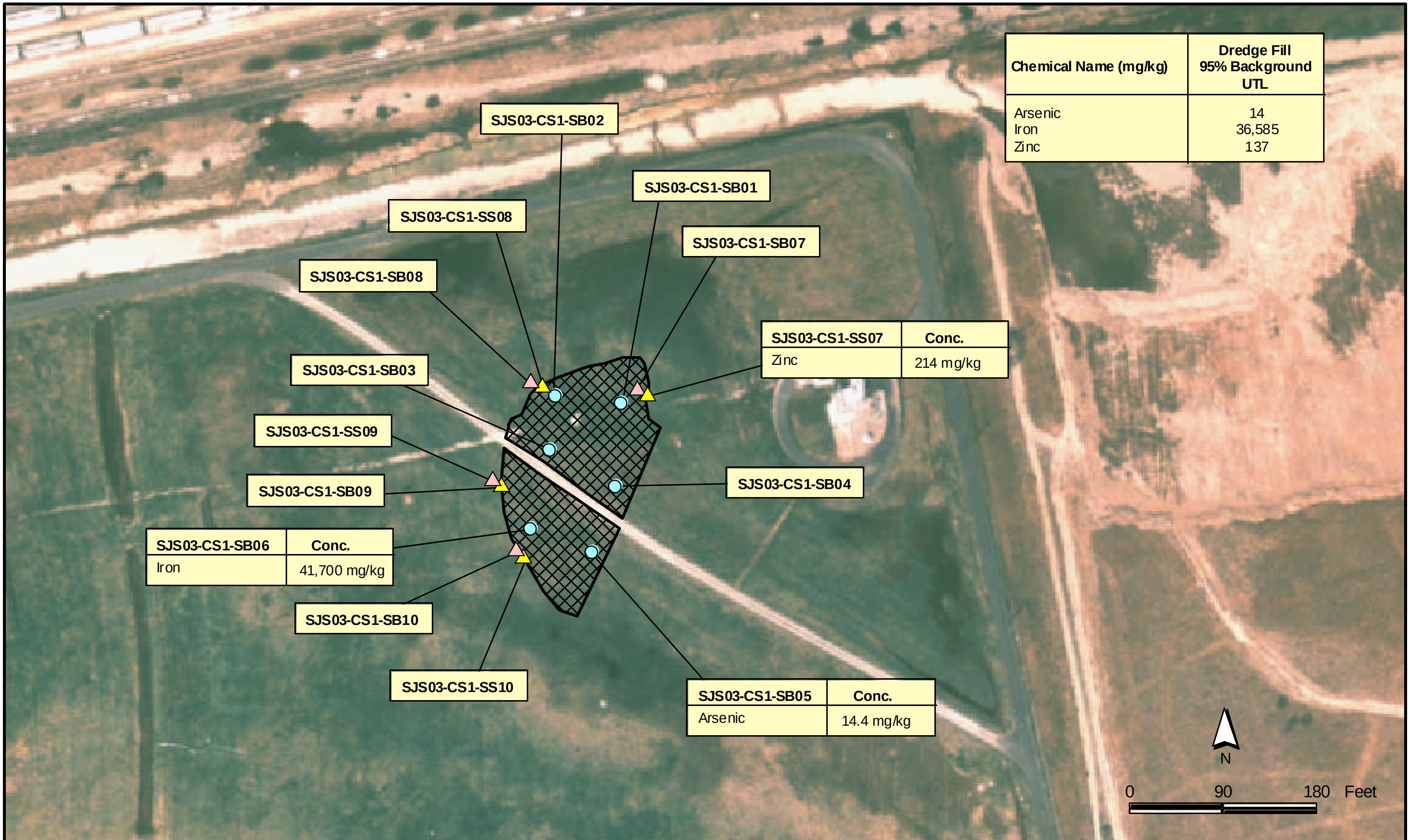

Chemical Name (mg/kg)	Dredge Fill 95% Background UTL
Arsenic	14
Iron	36,585
Zinc	137

LEGEND

- Extent of Removal
- Floor Subsurface Soil Sample Location
- Sidewall Surface Soil Sample Location (0-6" bgs)
- Sidewall Subsurface Soil Sample Location (1-3" bgs)

Note:
Concentrations of all parameters posing potential risk at Site 3 are below the 95% background UTLs except as shown.

Figure 2-1
Extent of Site 3 Removal and Confirmation Sample Locations
Sites 3 and 6 Removal Action
St. Juliens Creek Annex
Chesapeake, Virginia

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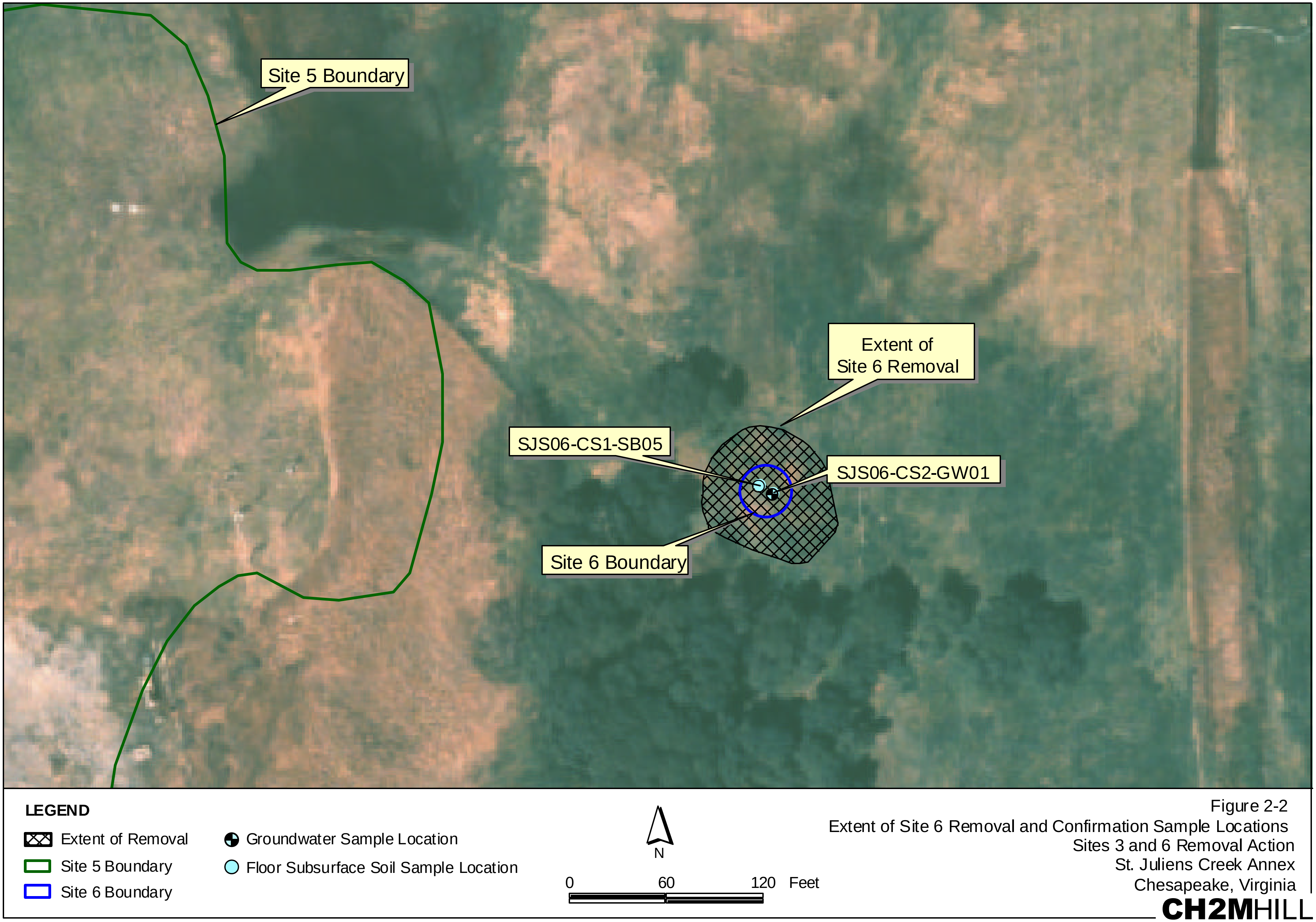

Figure 2-2
Extent of Site 6 Removal and Confirmation Sample Locations
Sites 3 and 6 Removal Action
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

Appendix A
Remedial Action Construction Closeout Report, RAC Action by OHM/SHAW

Remedial Action
Construction Closeout Report
RAC Action
St. Juliens Creek Annex
IRA at Sites 1, 3, 6, and 7
Chesapeake, Virginia

Prepared for:

DEPARTMENT OF THE NAVY – ATLANTIC DIVISION
Naval Facilities Engineering Command
Norfolk, Virginia
Contract No. N62470-97-D-5000

Task Order No. 0085

Prepared by:

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November 15, 2002, revised January 27, 2003
Project No. 838067

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LIST OF ACRONYMS

AH	Activity Hazard
AHA	Activity Hazard Analysis
B	resulting value is less than the method reporting limit
BFI	Browning Ferris Industries
CDM	Camp Dresser & McGee
CFR	Code of Federal Regulations
CPR	Daily Contractor Production Reports
CQC	Contractor Quality Control
DRMO	Defense Recyclable Materials Office
Ft^3	cubic feet
H	Value is above the 95% UTL dredge fill cleanup criteria
HASP	Health and Safety Plan
IR	Installation Restoration
IRA	Interim Remedial Action
J	estimated value
Kg	kilograms
LANTDIV	United States Navy, Atlantic Division
mg	miligrams
mg/l	miligrams per liter
mg/kg	miligrams per kilogram
MPR	Monthly Progress Reports
NAVFACENGCOM	Atlantic Division Naval Facilities Engineering Command
ND	not detected
NNSY	Norfolk Naval Shipyard
NT	not tested
OHM/SHAW	OHM Remediation Services
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PBA	project buyer and accountant
PPE	personal protective equipment
ppm	parts per million
QA	Quality Assurance
RAC	Remedial Action Contract
RCRA	Resource Conservation and Recovery Act
RFA	Resource Conservation and Recovery Act Facilities Assessment
RI	Remedial Investigation
RL	reporting limit
RNV	result not valid
ROICC	Resident Officer in Charge of Construction
S/S	surface soils and sediment
SJCA	St. Juliens Creek Annex
SRF	surface fill
SSO	Site Safety Officer

STD	Standard deviation
SUB	subsurface soils
SUS	suspect value
TCLP	Toxicity Characteristic Leaching Procedure
U	Quantity was below detection limit
ug	micrograms
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit
UXO	unexploded ordnance
VDEQ	Virginia Department of Environmental Quality
WBS	work breakdown structure
XRF	X-ray fluorescence

1.0 Introduction

OHM Remediation Services Corporation (OHM/SHAW), was contracted by the United States Navy, Atlantic Division Naval Facilities Engineering Command [LANTDIV NAVFACENGCOM] to provide environmental remediation services at the Navy's St. Juliens Creek Annex (SJCA), Interim Remedial Action (IRA), Sites 1, 3, 6, and 7, Chesapeake, Virginia. This work which has now been completed and is the subject of this Construction Closeout Report, was performed under Task Order 85 of LANTDIV Contract Number 62470-97-D-5000. This report is not intended to be the Installation Restoration (IR) Closure Report required for Sites 3 and 6. The Navy will be preparing the formal Closure Report for both sites based on the final sampling results of this action (described herein), and at Site 3, a reevaluation of the potential for human health and ecological exposure to contaminants remaining above the screening/cleanup levels. Sampling data returned after removal at Site 6 indicates the levels for all contaminants are below the cleanup levels and are protective of human health and the environment.

St. Juliens Creek Annex (SJCA) is a 490-acre parcel of Navy owned land located in the City of Chesapeake, Virginia. It is situated at the confluence of St. Juliens Creek and the Southern Branch of the Elizabeth River. Over the years, the property has served as an area providing various support functions to the nearby Norfolk Naval Shipyard (NNSY), including storage, staging, and landfill disposal. A Site Location Map is provided on **Figure 1**. **Figure 2** shows the property boundaries and locations of Sites 1, 3, 6, and 7.

1.1 Site Background

There are four sites where work was conducted and documented in this report. The background and history of these sites is provided below:

1.1.1 Background Site 1

Site 1 is immediately adjacent to Site 7 and consists of an out door grassy area. Historical reports suggest this area was once used as a landfill. Investigations to date show no evidence of a landfill. The Navy, in concurrence with the EPA and VDEQ agreed to dig test pits to confirm the presence or lack of debris and to further determine if the remnants of a former landfill were present below the surface. The Navy requested that three 4-foot deep test pits be dug at Site 1 to assess the subsurface condition of the site. Shaw arranged for the heavy equipment and operator, while CH2MHill documented the subsurface conditions as each excavation was advanced in the digging of test pits at Site 1.

1.1.2 Background Site 3

Installation Restoration (IR) Site 3 Waste Disposal Area C is located in the northeastern corner of the SJCA. The site covers approximately 2.1 acres. The northeast extent of the site is approximately 125 feet south of a patrol road, which extends around the perimeter of the base. Drainage ditches are situated on the north, west, and eastside of the site. Previously, Site 3 was reported to be a landfill consisting of approximately 10 acres. Prior to development as a disposal site, the Site 3 area was originally a mudflat where refuse was dumped and allowed to burn. The ash was then used to fill in the area. Due to the time period when the site was used for disposal, the site is unlined. Operations began in 1940 and continued intermittently until 1970.

Two former pits at Site 3 were reportedly used for disposal of oil and oily sludge, as well as for periodic burning. The locations of the waste disposal pit and waste disposal area were outlined based on historical aerial photographs taken in 1958, 1961, 1964 and 1970 interpreted by USEPA [USEPA's Environmental Photographic Interpretation (USEPA, 1995)]. As identified in the photographs, the disposal pits were located along the north side of the dirt road that crosses the site diagonally. USEPA also interpreted ground scarring along the road to be possible waste disposal areas (CDM, 1999). After 1970, the landfill was graded level and covered with grass upon investigation in 2001. The photographs also indicated that prior to use as a landfill, the site, and much of the adjacent area, had been used for disposal of dredge spoil material (USEPA, 1995). Refuse disposed at Site 3 reportedly included solvents, acids, bases, and mixed municipal waste. The total volume of solvents, waste oil, and oil sludge disposed was estimated to be about 750,000 cubic feet (ft^3) prior to burning. During operation the site was bulldozed every two weeks for compaction and leveling. Reportedly, salvageable materials were removed from the site each day, which appears to have reduced the actual volume of waste managed through landfill disposal.

An intrusive investigation conducted in the Summer of 2001 as part of the 2001 Remedial Investigation (RI), confirmed that the extent of waste at Site 3 and likely volume historically disposed are substantially smaller than previously reported (Draft Remedial Investigation/Human Health Assessment/Ecological Risk assessment Report for Sites 3, 4, 5 & 6, CH2MHill, December 2001). In the RI, waste was identified north of the gravel road at Site 3. The RI also showed the site was not an established landfill area. During this investigation, the estimated areas requiring excavation were confirmed and revised, and are presented on **Figure 3**. It was anticipated that remnants of UXO scrap were likely buried at Site 3, thus UXO avoidance and screening procedures were implemented during the removal action. Some scrap was recovered, but no live UXO was found. Details on ordnance scrap are located in **Table 10** and **Appendix R.**

1.1.3 Background Site 6

Installation Restoration Site 6 was an ordnance disposal unit operated as part of the ordnance disposal operations at the Annex. It was located northeast of Site 5 (the Burning Grounds) and consisted of a metal container with a cage over it for the flashing of small arms munitions prior to disposal. The cage was designed to prevent the escape of projectiles that may result during a disposal operation. Review of historical aerial photographs during Phase III of the RI indicated that activities associated with Site 6 began around 1949. According to the Resource Conservation and Recovery Act (RCRA) Facilities Assessment (RFA) report, small items, such as igniters and fuses, were regularly burned in the pit. The small arms cage was used to capture any munitions fragments that might be propelled when ignition of fuses or munitions occurred in the burn pit. The 1989 RFA also reported that the Navy had filled in the pit “during recent years”. There was no surface evidence of the Caged Pit at Site 6, and the area was covered with grass. Earlier geophysical surveys indicated the presence of an anomaly in the vicinity of the reported location of the former caged pit. Excavation in the area confirmed the anomaly was due to an extensive amount of concrete debris and rebar, but no steel structure resembling the reported descriptions of the "cage" was identified. Site 6 was investigated during 1996-2001 to determine approximate extent of the former disposal area. The estimated area requiring excavation was delineated during these investigations and was limited to one small area.

1.1.4 Background Site 7

Site 7 (The Old Storage Yard) consists of an outdoor grassy area used historically to store a variety of materials including anchors, hydraulic oil, lubricating oil, lead paint, open drums of sand blast grit, and ship equipment. The startup date for the site is unknown. Site 7 was investigated in 1996 as part of the Relative Risk Ranking data collection. In 2001, the Partnering Team decided that based on the site not being part of the CERCLA process, as well as the 1996 results, the waste at the site would be removed and the site closed. Investigations conducted at Site 7 indicated no risk to human health or the environment. However, visible debris was present at the site and removal of the debris was required. It was expected and confirmed during field removal activities that this debris was non -hazardous waste and much of it could be recycled for beneficial reuse. All debris was planned to be removed from the site during this action.

1.2 Project Objectives

The objectives of the project were to implement the remedial requirements in accordance with the approved work plan and scope at Sites 3, 6, and 7 in a consistent manner that could be confirmed and documented. The specific work elements for the project were detailed in the work plan and are noted in the descriptions below. In addition to the originally listed tasks, 3 investigative test pits were dug to a depth of 4 feet at site 1 and documented. The additional work scope at Site 1 was added during project negotiations for Delivery Order 85-01, as it made economical sense to address Site 1 at the same time resources had been mobilized to the adjacent Site 7.

1.2.1 Cost Tracking and Charge Codes

Project costs were tracked against the charge codes established in the negotiated contract modification and approved scope, unless it was otherwise approved by the project manager. Each separate work element (task) had been assigned an associated work breakdown structure (WBS) cost charge code associated with it. Separation of each individual WBS code and cost are charged to and tracked as the work occurs. At each month end for each WBS, all accumulated cost charges were compiled and reported, tracking the original budget and any approved changes as the project progressed. The following is a task breakdown and description by charge code of the approved tasks.

2.0 Description of Closure Activities

This section describes and affirms the completion of the specific closure activities based on field logs, project QA documentation, laboratory and/or field analytical results, as built drawings, vendor receipts, and other project records.

2.1 Pre-Construction Meeting

In accordance with the work plan and contract requirements, a pre-construction meeting was held at 1400 hours on 20 August 2002, for Task Order 85 of Contract N62470-97-D-5000. The meeting was held in the Resident Officer in Charge of Construction (ROICC) offices at the Naval Shipyard in Portsmouth, VA. **Appendix A** provides a summary of the discussion points and action items from the meeting.

Additionally, on the morning of August 27, 2002, a meeting was held with the SJCA Fire Department and the OHM/SHAW site supervisor, in advance of cutting the steel encased anchor weights, ship rudders, large buoys/bumpers, and other steel debris at Site 7. Arrangements for obtaining hot work permits were made (copies of hot work permits are provided in **Appendix Y**). Also, during the meeting, OHM/SHAW was informed of a pull down latch box at the on-site radar station that could be rapidly deployed for emergencies instead of calling 911.

2.2 Existing Work Conditions and Utility Survey

Photographs depicting the pre remedial condition of the site and nature of the debris staged at Site 7 are provided in **Appendix B**. The general descriptions for the sites and site background are described in **Section 1.1** and were included provided in the approved work plan. The work plan was previously developed by OHM/SHAW and provided to the Navy for approval. OHM/SHAW followed the requirements of the work plan and instructions from the Navy's ROICC during the execution of this project. The general pre-construction/pre-excavation conditions of the site were consistent with what had been detailed in the work plan and were unremarkable.

Before commencing any invasive activity, in accordance with the work plan, a utility survey was performed to locate and mark the presence of any existing buried utilities in the area. Accutest was contacted and marked underground utilities in the vicinity of Site 1, Site 3 and Site 6. Sites 3 and 6 were also scanned with metal detectors on August 22, 2002. Miss Utility was contacted to obtain a dig permit for the major digging effort at Sites 3 and 6, which commenced in on September 7. Dig Permit Ticket # A224402856 was issued on 9/6/02 and updated on 9/20/02.

Despite a concerted effort to locate buried utilities in advance of excavation; a 4" underground conduit was struck on September 16, 2002 while excavating in the Site 3 area. The conduit was found to contain the wiring controlling the radar installation at the site. The wiring was not damaged and was tested by the Navy. The conduit was repaired to the Navy's satisfaction by OHM/SHAW.

Also, a small ¾ inch water line was also perforated with the excavator at Site 3. This line was also repaired to the Navy's satisfaction.

A discussion on problems encountered, remedies, and other scope changes is provided in **Section 2.15.**

2.3 Work Plan

The work plan was developed by OHM/SHAW and provided to the Navy for their approval, outlining all activities related to the project. Included were copies of the Site Specific Health and Safety Plan, Erosion Sediment and Control Plan, Field Sampling Plan, and Construction Quality Control Plan and other construction planning documentation. The scope of work was performed in conformance with the requirements of the work plan, and approved work directives/change authorizations and related construction plans such as the site Health and Safety Plan, Erosion and Sedimentation Plan, Sampling and Analysis Plan, etc. Conformance of the project execution to the requirements to these related plans is discussed in later sections of this report. Copies of the executed and approved work directives/change order authorizations are provided in **Appendix C**.

2.4 Mobilization

Personnel, equipment and materials were mobilized to the project from OHM/SHAW's Virginia Beach, Virginia Office on August 21, 2002. As noted above, a preconstruction meeting was held on August 20, 2002 in the office of the ROICC. The OHM/SHAW project manager, site supervisor, and assistant program manager met with the ROICC, and key Navy personnel to discuss the job setup and project execution.

During mobilization, the job site and support areas were set up. The pathway and routes for the movement of trucks were defined such that the disruption of traffic on local roads was minimized. The handling of waste transportation paperwork was also determined prior to removal of material to ensure that there was no disruption in the removal of waste. Characterization samples were collected and the pre-characterization and generator certification form was completed and submitted with the analytical results for acceptance at a disposal facility (discussed in **Section 2.8**). There was no hazardous waste generated or excavated so a system for tracking uniform hazardous waste manifests was not required. Transportation of excavated materials was performed under a standard bill of lading after the material had been screened to remove potential unexploded ordnance fragments.

2.5 Site Preparation

An office trailer was staged to serve as the field project office and a Connex box was delivered for the storage of small tools, materials, and supplies. A fuel tank was delivered and setup on-site for refueling heavy equipment.

The project began with mobilization on August 22, 2002.

2.5.1 Set-Up at Site 7

In preparing for the debris removal operation, oxy-acetylene torches and heavy lifting equipment were obtained to perform the work at Site 7, along with metal recycle/disposal bins and a concrete demolition hammer. A metals reclamation company was contacted to inspect the metal debris for the possibility of recovery.

2.5.2 Set-up at Sites 3 and 6

While the debris removal was progressing at Site 7. Setup work progressed at Sites 3 and 6. This included setup of the equipment, construction of the equipment decontamination pad, construction of the UXO screening station, staging of equipment, and construction of other necessary features for excavation at Sites 3 and 6. In preparation for excavation, the limits of excavation at Sites 3 and 6 were clearly marked with flagging and high visibility fence. A utility survey was conducted. Silt fencing and 40 hay bales were used to implement the erosion and sedimentation control measures around those excavation areas. Key support areas were established including the equipment decontamination pad and construction entrances, the UXO screening station, and designated staging areas for materials. The debris removal from Site 7 progressed rapidly, during the setup, delineation, precharacterization sampling, etc. that was progressing simultaneously at Sites 3 and 6. This allowed for the start of the excavation and removal at Sites 3 and 6 just after Labor Day.

2.5.3 Set Up at Site 1

The excavation of the test pits required little initial setup. A backhoe was obtained and staged by Shaw. CH2MHill reviewed the site investigation data and photos and marked the proposed location for the test pits. Field personnel prepared forms and obtained cameras to log and photograph each hole as they were advanced.

2.6 Erosion and Sedimentation Control

After completion of the site preparation and initial mobilization, provisions for erosion and sediment control were installed where required to prevent unwanted sediments from the leaving the site during a precipitation event or an accumulation of run off. Excavated soil was contained within the area of excavation until load out. A stone construction entrance prevented movement of significant amounts of soil out of the immediate area of removal. Sedimentation and erosion control measures were implemented according to the Sediment and Erosion Control Plan, which was an appendix to the original work plan.

2.7 Excavation Perimeter Definition at Sites 3 and 6

The initial excavation perimeter was defined based on soil sampling results provided by CH2M Hill. **Appendix D** contains figures and analysis result tables from Hill's RI report defining the extent up to where excavations should be performed. Field screening instruments were used to confirm the extent of excavation in the field, followed by the collection of laboratory confirmational samples.

2.7.1 Use of x-ray Fluorescence for Field Screening of Soils

An X-ray fluorescence (XRF) instrument was used to perform field screening for metals in soil, in order to determine/confirm excavation limits as excavation was advanced.

XRF is used for the measurement of element compositions of a wide variety of specimens. It is applicable simultaneously for all of the elements that comprise the top 90% of the periodic table and are present in concentrations greater than 10 ppm. The technique provides an elemental, not a chemical analysis. XRF is inapplicable to the first 11 elements of the periodic table. Inspection is typically limited by x-ray attenuation in the sample. Sample penetration varies from about 0.01mm to 1mm in depth depending on the sample material. XRF spectroscopy involves measuring the intensity of x-rays emitted from a specimen as a function of energy or wavelength. The energies of large intensity 'lines' are characteristic of atoms of the specimen. The intensities of observed lines for a given atom vary as the amount of that atom present in the specimen.

Qualitative analysis involves identifying atoms present in a specimen by associating observed characteristic lines with their atoms. Quantitative analysis involves determining the amount of each atom present in the specimen from the intensity of measured characteristic x-ray lines.

An X-ray, gamma ray, or charged particle beam is used to stimulate characteristic x-ray emission from the elements in the sample and are measured by the instrument's detector. The instrument used at SJCA contained a gamma radiation nuclear source to generate the X-ray emissions. Depending on the nature of the source and duration of use, a permit or license can be required for possession, use, and/or transportation. . Use of the instrument at SJCA was exempt from the State license requirement, as the unit was not going to remain in the State for more than 180 days

The detector sorts the X-rays that are emitted from the high energy bombarding of the sample into energy bins, and counts them. Analysis is occasionally complicated by interfering X-ray lines and by matrix effects. Examples of XRF applications include:

- Alloy sorting.
- Metallic-plating thickness measurement.
- Characterization of unique samples ranging from archaeological relics to filter paper residues.
- Environmental analysis

Samples require minimal preparation. They may be solid, liquid or even gaseous in form, and can be almost any size or shape. Routine alloy analyses take 10 minutes per sample. Non-routine inspections may take a day of setup time followed by 10 minutes to an hour of data acquisition and analysis time per sample. At SJCA, samples required about 10 to 15 minutes for analysis and could be collected faster than they could be analyzed. As a result, the short-term storage of samples was necessary at certain times during the excavation process. However, this delay was coordinated with field activities and did not result in over excavation.

The sampling and analysis daily reports, XRF daily sampling reports and PAH test kit daily sampling reports (combined) are provided in **Appendix E**. XRF screening result summary tables for Sites 3 and 6 are provided in **Appendix F**. **Appendix G** contains the XRF screening sample location figures.

The XRF instrument used at SJCA for the field screening of metals in soil was a TN Spectrace 9000, rented from HAZCO Service, Inc. **Appendix BB** contains the vendor's literature for the XRF unit along with literature from USEPA on the suitability of the method.

2.7.2 Use of PAH Test Kids for Field Screening of Soils

The EnviroGard™ PAH in soil test kits were used for field screening during excavation at Sites 3 and 6. The test kit involves immuno-assay technology which has been accepted as an approved analytical method by USEPA. The method involves the use of polyclonal antibodies that bind to either PAH or PAH-enzyme conjugate. These antibodies are immobilized on the walls of the test tubes contained in each test kit. When the PAHs are present, they compete with the PAH-enzyme conjugate for a limited number of PAH binding sites on the immobilized antibodies. A sample that contains a high concentration of PAHs will consume all the available binding sites. A sample that has a low concentration will leave some or a majority of the sites open. Following incubation, the unbound PAH-enzyme-conjugate molecules are washed away (part of the testing procedure). A chromatogenic substrate is then added to the kit test tube colorizing the clear substrate to a blue color. Since the test tubes are standardized, the amount of antibody binding sites is known. A low concentration solution will leave many sites open, which will convert a large amount of the chromatogenic substrate, producing an intense blue solution, the concentration of which can be measured spectroscopically in the colorometric light range of the substrate. Samples containing high concentrations of PAHs will consume all the sites, thus when the colorometric substrate is added, very few sites remain and the colorometric substrate is left clear and unconverted. In this way, the test is more sensitive at lower concentrations.

Appendix BB contains the vendor's literature for the test kits used for PAH screening at SJCA.

2.7.3 Perimeter Definition at Site 3

Excavation proceeded at Site 3 after completing the smaller excavation at Site 6. XRF and polycyclic aromatic hydrocarbon (PAH) test kit screening were used at Site 3 to determine the bottom depth of the excavation XRF screening was performed as the excavation was advanced. Target cleanup levels for the Sites 3 and 6 excerpted from the CH2MHill investigation report for the site, are provided in **Table 1.** **Table 2** provides a summary of the XRF screening results for samples collected while advancing the excavation at Site 3. As noted above, the complete XRF QA log, analysis summary tables, and sample location maps are provided in **Appendices E, F, and G.**

Table 1 (page 1 of 2)
Dredge and Fill Target Cleanup Levels
SJCA Sites 3 and 6
Chesapeake, Virginia

Chemical Name	S/S [1]	SRF [2]	SUB [3]
Metals (milligrams/kilogram)			
Silver	0.67		
Aluminum		22,786	18,839
Arsenic		24	14
Barium		98	50
Beryllium		1	0.81
Calcium	3,251		
Cobalt	13		
Chromium		45	39
Copper		58	40
Iron		45,805	36,585
Mercury		1.3	0.62
Potassium		4,577	3,465
Magnesium		4,507	3,847
Manganese		198	151
Sodium		620	203
Nickel		19	15
Lead		147	86
Antimony	1.47		
Selenium		2.2	1.5
Vanadium		70	42
Zinc		137	87

[1] S/S - UTL calculated from combined surface and subsurface soil data.
[2] SRF - UTL calculated from surface soil data only.
[3] SUB - UTL calculated from subsurface data only.

Table 1 (page 2 of 2)
Dredge and Fill Target Cleanup Levels
SJCA Sites 3 and 6
Chesapeake, Virginia

Chemical Name	S/S [4]	SRF [5]	SUB [6]
Semi-volatiles (micrograms/ kilogram)			
Acenaphthene	592		
Acenaphthylene		246	131
Anthracene	462		
Benzo(a)anthracene	2,027		
Benzo(a)pyrene	1,785		
Benzo(b)fluoranthene		3,197	2,335
Benzo(g,h,I)perylene		1,655	2,099
Benzo(k)fluoranthene	2,038		
Chrysene	3,487		
Dibenzo(a,h)anthracene		714	708
Fluoranthene	2,766		
Fluorene	602		
Indeno(1,2,3-cd)pyrene		1,829	1,769
Naphthalene	485		
Phenanthrene	913		
Pyrene	2,590		

4 S/S - UTL calculated from combined surface and subsurface soil data.
5 SRF - UTL calculated from surface soil data only.
6 SUB - UTL calculated from subsurface data only.

Table 2 (page 1 of 2) Summary of XRF Sample Results SJCA Site 3 Chesapeake, Virginia						
Sample ID	**SCJA-A001F**	**SCJA-A002S**	**SCJA-A004S**	**SCJA-A005B**	**SCJA-A001F**	**SCJA-A003B**
Date of Analysis	09/12/02	09/12/02	09/12/02	09/12/02	09/16/02	09/16/02
XRF Analysis						
Iron, Fe	22560	70770 H	36590 H	33390	21070	34820
Copper, Cu	ND	719 H	ND	(47) RNV	ND	ND
Zinc, Zn	210	958 H	251 H	147 H	85	51
Lead, Pb	(29) RNV	811 H	(28) RNV	58	(36) RNV	(22) RNV
Barium, Ba	NT	NT	NT	NT	NT	NT
PAH Analysis (ppm)						
Total PAHs	NT	NT	NT	NT	NT	NT

ND = Not detected.

H = Value is above the 95% UTL dredge fill cleanup criteria.

RNV = Result not valid. The intensity to STD ratio was not > 3:1. The value in () should be considered suspect.

NT = Not tested

Table 2 (continued - page 2 of 2)
Summary of XRF Sample Results
SJCA Site 3
Chesapeake, Virginia

Sample ID	**SCJA-B006F**	**SCJA-B007S**	**SCJA-B008B**	**SCJA-C009F**	**SCJA-C010S**	**SCJA-C011B**	**SCJA-CLAY**	**SCJA-A-PAH**	**SCJA-B-PAH**	**SCJA-C-PAH**
Date of Analysis	Sept 19, 2002	Sept 19, 2002	Sept 19, 2002	Sept 19, 2002	Sept 19, 2002	Sept 19, 2002	Sept 19, 2002	Sept 20, 2002	Sept 20, 2002	Sept 20, 2002
XRF Analysis										
Iron, Fe	10340	66660 H	28990	9500	38540	9280	17070	NT	NT	NT
Copper, Cu	ND	373 H	ND	(89) RNV	360 H	(66) RNV	(41) RNV	NT	NT	NT
Zinc, Zn	ND	992 H	(55) RNV	275 H	1329 H	164 H	98 H	NT	NT	NT
Lead, Pb	(30) RNV	764 H	ND	73	464 H	49	(24) RNV	NT	NT	NT
Barium, Ba	390 H	886 H	630 H	452 H	926 H	477 H	566 H	NT	NT	NT
PAH Analysis (ppm)										
Total PAHs	NT	NT	NT	NT	NT	NT	NT	> 1.0	> 1.0	> 1.0

ND = Not detected.

H = Value is above the 95% UTL dredge fill cleanup criteria.

RNV = Result not valid. The intensity to STD ratio was not > 3:1. The value in () should be considered suspect.

NT = Not tested

It was known in advance from the RI, that there might be as much as 10,000 tons of material impacted above cleanup levels at Site 3. The Interim Removal Action (IRA) was phased into two segments due to funding limitations. This phase of the IRA focused on the removal of impacted soils in the northern portion of Site 3 and did not remove all impacted soils. Remaining impacted soil related to Site 3 will be addressed as phase two of the IRA to be implemented at a later date under separate contract. The Navy will be preparing the formal IR closure report for the site and will be examining the risks posed by the remaining impacted soil. The Navy will be determining if any additional action may be required in the future to assure protection of human health and the environment at Site 3 provides a summary of XRF sampling data for Site 3. Soils removed were all prescreened to remove potential UXO fragments. Final confirmatory sampling of Site 3 is discussed in **Section 2.10.2**.

2.7.4 Perimeter Definition at Site 6

Excavation proceeded at Site 6 assuming only 50 or 60 cubic yards would be removed. XRF and PAH field test kit screening was used to confirm the perimeter limits of the excavation. After the initial removal of what had been confirmed by The Navy during their earlier site investigation to be above site target cleanup levels, additional soil was found to be impacted above site remediation target levels. A work directive was approved for additional removal, to advance the excavation in 10-foot concentric circles. The XRF and PAH test kits were then used for screening with each 10 foot advance to confirm if target cleanup levels had been reached. Back filling of the excavation required 180 cubic yards of imported fill. All impacted soils related to Site 6 were removed. Soil concentrations left in place above screening criteria will be addressed during RI activities related to Site 5. **Table 3** provides a summary of the XRF screening data collected while advancing the excavation at Site 6. As noted above, the complete XRF daily QA log, summaries of all XRF data, and sample location maps, **Appendices E, F, and G.** Final confirmatory sampling at Site 6 is discussed below in **Section 2.10.3**

Table 3 (page 1 of 6) Summary of XRF Sample Results SJCA Site 6 Chesapeake, Virginia							
Sample ID	**SCJA-06-4C**	**SCJA-06-4D**	**SCJA-06-1W**	**SCJA-06-2W**	**SCJA-06-3W**	**SCJA-06-4W**	**SCJA-06-5F**
Date of Analysis	Sept 17, 2002	Sept 17, 2002	Sept 16, 2002	Sept 16, 2002	Sept 16, 2002	Sept 16, 2002	Sept 16, 2002
XRF Analysis							
Iron, Fe	7990	9730	15200	18020	12550	19510	4380
Copper, Cu	ND	(105) RNV	587 H	234 H	579 H	992 H	ND
Zinc, Zn	488 H	378 H	1516 H	1565 H	4490 H	6560 H	160 H
Lead, Pb	192 H	154 H	254 H	218 H	2099 H	3017 H	ND
Barium, Ba	3498 H	2695 H	1672	925 H	16480 H	38870 H	380 H
PAH Analysis (ppm)							
Total PAHs	NT	NT	NT	NT	NT	NT	NT

ND = Not detected.

H = Value is above the 95% UTL dredge fill cleanup criteria.

RNV = Result not valid. The intensity to STD ratio was not > 3:1. The value in () should be considered suspect.

NT = Not tested

Table 3 (continued - page 2 of 6)
Summary of XRF Sample Results
SJCA Site 6
Chesapeake, Virginia

Sample ID	**SCJA-06-1A**	**SCJA-06-1B**	**SCJA-06-1C**	**SCJA-06-1D**	**SCJA-06-2A**	**SCJA-06-2B**	**SCJA-06-2C**	**SCJA-06-3A**	**SCJA-06-3B**	**SCJA-06-4A**	**SCJA-06-4B**
Date of Analysis	Sept 17, 2002	Sept 17, 2002	Sept 17, 2002	Sept 17, 2002	Sept 17, 2002	Sept 17, 2002	Sept 17, 2002	Sept 17, 2002	Sept 17, 2002	Sept 17, 2002	Sept 17, 2002
XRF Analysis											
Iron, Fe	12790	17110	11200	10860	21460	16970	22230	17660	19450	15370	6880
Copper, Cu	110 H	(104) RNV	(42) RNV	(63) RNV	267 H	581 H	545 H	102 H	258 H	140 H	291 H
Zinc, Zn	472	776 H	389 H	374 H	2122 H	2960 H	2750 H	1006 H	2181 H	3150 H	448 H
Lead, Pb	352 H	890 H	898 H	923 H	242 H	301 H	276 H	469 H	1010 H	1476 H	339 H
Barium, Ba	796 H	1080 H	1059 H	753 H	1292 H	5693 H	811 H	5845 H	14369 H	22200 H	7276 H
PAH Analysis (ppm)											
Total PAHs	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

ND = Not detected.

H = Value is above the 95% UTL dredge fill cleanup criteria.

RNV = Result not valid. The intensity to STD ratio was not > 3:1. The value in () should be considered suspect.

NT = Not tested

Table 3 (continued - page 3 of 6) Summary of XRF Sample Results SJCA Site 6 Chesapeake, Virginia										
Sample ID	**SCJA-E012S**	**SCJA-I013S**	**SCJA-J014S**	**SCJA-O015S**	**SCJA-S016S**	**SCJA-T017S**	**SCJA-Q018S**	**SCJA-M019S**	**SCJA-C020S**	**SCJA-T017S**
Date of Analysis	Sept 24, 2002	Sept 24, 2002	Sept 24, 2002	Sept 24, 2002	Sept 24, 2002	Sept 24, 2002	Sept 24, 2002	Sept 24, 2002	Sept 24, 2002	Sept 25, 2002
XRF Analysis										
Iron, Fe	13380	51690 H	68770 H	35530	26870	NT	NT	NT	NT	28450
Copper, Cu	(64) RNV	510 H	748 H	(87) RNV	ND	NT	NT	NT	NT	ND
Zinc, Zn	177 H	1211 H	3564 H	441 H	259 H	NT	NT	NT	NT	(52) RNV
Lead, Pb	94	795 H	1221 H	374 H	128	NT	NT	NT	NT	(36) SUS
Barium, Ba	429 H	1084 H	1489 H	687 H	444 H	NT	NT	NT	NT	496 H
PAH Analysis (ppm)										
Total PAHs	> 1.0	~1.0	> 1.0	1.0	~1.0	~1.0	< 1.0	< 1.0	< 1.0	NT

ND = Not detected.

H = Value is above the 95% UTL dredge fill cleanup criteria.

RNV = Result not valid. The intensity to STD ratio was not > 3:1. The value in () should be considered suspect.

NT = Not tested

SUS = suspect value. The intensity to STD ratio was >3:1 but < 5:1.

Table 3 (continued - page 4 of 6) Summary of XRF Sample Results SJCA Site 6 Chesapeake, Virginia											
Sample ID	**SCJA-Q018S**	**SCJA-M019S**	**SCJA-C020S**	**SCJA-I021F**	**SCJA-S032F**	**SCJA-M034F**	**SCJA-F026F**	**SCJA-J022F**	**SCJA-E024F**	**SCJA-T030F**	**SCJA-Q028F**
Date of Analysis	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002
XRF Analysis											
Iron, Fe	13340	14240	22850	15030	9320	8860	18990	16070	12580	4120	5350
Copper, Cu	ND	ND	(120) SUS	ND	ND	ND	ND	ND	ND	ND	ND
Zinc, Zn	(46) RNV	(100) SUS	547 H	(51) RNV	(44) RNV	(70) SUS	(110) SUS	(46) RNV	(77) SUS	ND	ND
Lead, Pb	(38) SUS	(36) SUS	307 H	ND	ND	ND	45	(24) RNV	(12) RNV	ND	ND
Barium, Ba	380 H	370 H	748 H	402 H	353 H	389 H	540 H	480 H	391 H	289 H	282 H
PAH Analysis (ppm)											
Total PAHs	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

ND = Not detected.

H = Value is above the 95% UTL dredge fill cleanup criteria.

RNV = Result not valid. The value in () should be considered suspect.

NT = Not tested

Table 3 (continued - page 5 of 6)
Summary of XRF Sample Results
SJCA Site 6
Chesapeake, Virginia

Sample ID	**SCJA-P027F**	**SCJA-Q029B**	**SCJA-T031B**	**SCJA-J023B**	**SCJA-S030B**	**SCJA-M035B**	**SCJA-G037F**	**SCJA-H039B**	**SCJA-K036F**	**SCJA-L040F**	**SCJA-O041F**
Date of Analysis	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 25, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002
XRF Analysis											
Iron, Fe	16750	5230	9200	7310	15690	4700	11330	14850	22620	22100	22050
Copper, Cu	ND	ND	ND	ND	(33) RNV	ND	(28) RNV	ND	(97) SUS	ND	ND
Zinc, Zn	(78) SUS	(33) RNV	(33) RNV	(46) RNV	(47) RNV	ND	(73) SUS	(29) RNV	707 H	(106) SUS	177 H
Lead, Pb	(25) RNV	ND	(20) RNV	ND	(30) RNV	ND	63	(12) RNV	231 H	77	(58) SUS
Barium, Ba	442 H	477 H	476 H	487 H	528 H	415 H	423 H	431 H	605 H	536 H	496 H
PAH Analysis (ppm)											
Total PAHs	NT	NT	NT	NT	NT	NT	> 1.0	NR	< 1.0	> 1.0	> 1.0

ND = Not detected.

H = Value is above the 95% UTL dredge fill cleanup criteria.

RNV = Result not valid. The value in () should be considered suspect.

NT = Not tested

NR = Not recorded. Field data form claims analysis was made but the result does not appear.

Table 3 (continued - page 6 of 6) Summary of XRF Sample Results SJCA Site 6 Chesapeake, Virginia										
Sample ID	**SCJA-H038F**	**SCJA-I021F**	**SCJA-S032F**	**SCJA-M034F**	**SCJA-F026F**	**SCJA-J022F**	**SCJA-E024F**	**SCJA-T030F**	**SCJA-P027F**	**SCJA-Q028F**
Date of Analysis	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002	Sept 26, 2002
XRF Analysis										
Iron, Fe	28640	NT	NT	NT	NT	NT	NT	NT	NT	NT
Copper, Cu	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT
Zinc, Zn	(87) SUS	NT	NT	NT	NT	NT	NT	NT	NT	NT
Lead, Pb	(34) RNV	NT	NT	NT	NT	NT	NT	NT	NT	NT
Barium, Ba	560 H	NT	NT	NT	NT	NT	NT	NT	NT	NT
PAH Analysis (ppm)										
Total PAHs	> 1.0	> 1.0	> 1.0	> 1.0	> 1.0	> 1.0	> 1.0	< 1.0	> 1.0	< 1.0

ND = Not detected.

H = Value is above the 95% UTL dredge fill cleanup criteria.

RNV = Result not valid. The value in () should be considered suspect.

NT = Not tested

NR = Not recorded. Field data form claims analysis was made but the result does not appear.

2.8 Pre-Excavation Waste Characterization and/or Sampling for Soil and Debris Disposal

2.8.1 Site 1

There was no pre-excavation sampling conducted at Site 1. A visual reconnaissance was conducted to locate appropriate locations for the test pits. A summary of the test pit investigation conducted at Site 1 is detailed in **Section 2.9.1.**

2.8.2 Site 3

Five 5-pint composite samples were collected at Site 3 on 8/22/02 for predisposal characterization of soil. Soil samples were submitted to the Accutest Analytical Laboratories for full Toxicity Characteristic Leaching Procedure (TCLP) analysis. Laboratory analysis confirmed the soil as being non-hazardous. The testing results, the chain of custody log, and disposal characterization sample map are provided in **Appendix I.** A summary of the analytical results for predisposal waste characterization at Site 3 is provided below in **Table 4**.

Table 4 (page 1 of 2) Summary of Waste Characterization Sample Results SJCA Site 3 Chesapeake, Virginia August 22, 2002								
Constituent	**EPA Method SW846**	**SJCA-3-WDC-02**	**SJCA-3-WDC-03**	**SJCA-3-WDC-04**	**SJCA-3-WDC-05**	**SJCA-3-WDC-06**	**Regulatory MCL [7]**	**HW # [7]**
Metals (mg/liter)								
Arsenic	6010B	.00283 U	.00283 U	.00283 U	.00283 U	.00283 U	5.0	D004
Barium	6010B	1.1	0.44 B	0.53 B	1.9	2.1	100	D005
Cadmium	6010B	0.022	0.038	.0036 B	0.043	0.056	1.0	D006
Chromium	6010B	.00043 U	.00043 U	0.0043 U	.00043 U	0.0037 B	5.0	D007
Lead	6010B	0.23	0.28	0.047	1.4	1.2	5.0	D008
Mercury	7470A	0.0055 B	.00022 U	.00037 B	.00022 U	.00022 U	0.20	D009
Selenium	6010B	.00198 U	.00198 U	.00198 U	.00198 U	.00198 U	1.0	D010
Silver	6010B	.00055 U	.00055 U	.00055 U	.00055 U	.00055 U	5.0	D011
Other								
Ignitability (^{O}F)	1010	> 200	> 200	> 200	> 200	> 200	--	--
Corrosivity as pH	Chapter 7	7.6	5.5	6.7	7.1	7.3	--	--
Contaminants (mg/liter)								
2-methylphenol	8270C	ND	ND	ND	ND	ND	200	D023
3&4-methylphenol	8270C	ND	ND	ND	ND	ND	200	D024
Pentachlorophenol	8270C	ND	ND	ND	ND	ND	100	D037
2,4,5-trichlorophenol	8270C	ND	ND	ND	ND	ND	400	D041
2,4,6-trichlorophenol	8270C	ND	ND	ND	ND	ND	2.0	D042
1,4-dichlorobenzene	8270C	ND	ND	ND	ND	ND	7.5	D027
2,4-dinitrotoluene	8270C	ND	ND	ND	ND	ND	0.13	D030
Hexachlorobenzene	8270C	ND	ND	ND	ND	ND	0.13	D032
Hexachlorobutadiene	8270C	ND	ND	ND	ND	ND	0.50	D033
Hexachloroethane	8270C	ND	ND	ND	ND	ND	3.0	D034
Nitrobenzene	8270C	ND	ND	ND	ND	ND	2.0	D036
Pyridine	8270C	ND	ND	ND	ND	ND	5.0	D038

mg/liter = milligrams per liter

U = Quantity was below the detection limit.

B = Resulting value is less than the method RL.

ND = Not detected.

[7] From reference 40 CFR 261 (June 1996).

Table 4 (continued - page 2 of 2)
Summary of Waste Characterization Sample Results
SJCA Site 3
Chesapeake, Virginia
August 22, 2002

Constituent	EPA Method SW846	SJCA-3-WDC-02	SJCA-3-WDC-03	SJCA-3-WDC-04	SJCA-3-WDC-05	SJCA-3-WDC-06	Regulatory MCL [8]	HW # [8]
Benzene	8260B	ND	ND	ND	ND	ND	0.50	D018
chlorobenzene	8260B	ND	ND	ND	ND	ND	100	D021
Chloroform	8260B	ND	ND	ND	ND	ND	6.0	D022
carbon tetrachloride	8260B	ND	ND	ND	ND	ND	0.50	D019
1,1-dichlorethylene	8260B	ND	ND	ND	ND	ND	0.70	D029
1,2-dichlorothane	8260B	ND	ND	ND	ND	ND	0.50	D028
p-dichlorobenzene	8260B	ND	ND	ND	ND	ND	7.5	D027
methyl ethyl ketone	8260B	ND	ND	ND	ND	ND	200	D035
tetrachloroethylene	8260B	ND	ND	ND	ND	ND	0.70	D039
trichloroethylene	8260B	ND	ND	ND	ND	ND	0.50	D040
vinyl chloride	8260B	ND	ND	ND	ND	ND	0.20	D043
2,4-d	8151	ND	ND	ND	ND	ND	10	D016
2,4,5-TP (Silvex)	8151	ND	ND	ND	ND	ND	1.0	D017
gamma-BHC (Lindane)	8081A	ND	ND	ND	ND	ND	0.40	D013
Chlordane	8081A	ND	ND	ND	ND	ND	0.030	D020
Endrin	8081A	ND	ND	ND	ND	ND	0.020	D012
Heptachlor	8081A	ND	ND	ND	ND	ND	0.0080	D031
heptachlor epoxide	8081A	ND	ND	ND	ND	ND	0.0080	D031
methoxychlor	8081A	ND	ND	ND	ND	ND	10	D014
Toxaphene	8081A	ND	ND	ND	ND	ND	0.50	D015

mg/liter = milligrams per liter
U = Quantity was below the detection limit.
B = Resulting value is less than the method RL.
ND = Not detected.

[8] From reference 40 CFR 261 (June 1996).

2.8.3 Site 6

One 5-pint composite sample was collected at Site 6 on 8/22/02 for predisposal characterization of soil. Soil samples were submitted to the Accutest Analytical Laboratories for full Toxicity Characteristic Leaching Procedure (TCLP) analysis. Laboratory analysis confirmed the soil as being non-hazardous. The testing results and chain of custody log are provided in **Appendix I.** A summary of the analytical results for predisposal waste characterization at Site 6 is provided below in **Table 5**.

Table 5 (page 1 of 2)
Summary of Waste Characterization Sample Results
SJCA Site 6
Chesapeake, Virginia
August 22, 2002

Organics	EPA Method SW846	SJCA-6-WDC-01	Regulatory MCL [9]	HW # [9]
Metals (mg/liter)		0.041		
Arsenic	6010B		5.0	D004
Barium	6010B	9.1	100	D005
Cadmium	6010B	0.024	1.0	D006
Chromium	6010B	0.00048 B	5.0	D007
Lead	6010B	0.68	5.0	D008
Mercury	7470A	0.00022 U	0.20	D009
Selenium	6010B	0.00198 U	1.0	D010
Silver	6010B	0.00055 U	5.0	D011
Other				
Ignitability (^{O}F)	1010	> 200	--	--
Corrosivity as pH	Chapter 7	7.4	--	--
Contaminants (mg/liter)				
2-methylphenol	8270C	ND	200	D023
3&4-methylphenol	8270C	ND	200	D024
pentachlorophenol	8270C	ND	100	D037
2,4,5-trichlorophenol	8270C	ND	400	D041
2,4,6-trichlorophenol	8270C	ND	2.0	D042
1,4-dichlorobenzene	8270C	ND	7.5	D027
2,4-dinitrotoluene	8270C	ND	0.13	D030
hexachlorobenzene	8270C	ND	0.13	D032
Hexachlorobutadiene	8270C	ND	0.50	D033
hexachloroethane	8270C	ND	3.0	D034
nitrobenzene	8270C	ND	2.0	D036
Pyridine	8270C	ND	5.0	D038

mg/liter = milligrams per liter
U = Quantity was below the detection limit.
B = Resulting value is less than the method RL.
ND = Not detected.

[9] From reference 40 CFR 261 (June 1996).

Table 5 (continued - page 2 of 2) Summary of Waste Characterization Sample Results SJCA Site 6 Chesapeake, Virginia August 22, 2002				
Organics	**EPA Method SW846**	**SJCA-6-WDC-01**	**Regulatory MCL [10]**	**HW # [10]**
Benzene	8260B	ND	0.50	D018
chlorobenzene	8260B	ND	100	D021
Chloroform	8260B	ND	6.0	D022
carbon tetrachloride	8260B	ND	0.50	D019
1,1-dichloroethylene	8260B	ND	0.70	D029
1,2-dichloroethane	8260B	ND	0.50	D028
p-dichlorobenzene	8260B	ND	7.5	D027
methyl ethyl ketone	8260B	ND	200	D035
tetrachloroethylene	8260B	ND	0.70	D039
trichloroethylene	8260B	ND	0.50	D040
vinyl chloride	8260B	ND	0.20	D043
2,4-D	8151	ND	10	D016
2,4,5-TP (Silvex)	8151	ND	1.0	D017
Gamma-BHC (Lindane)	8081A	ND	0.40	D013
Chlordane	8081A	ND	0.030	D020
Endrin	8081A	ND	0.020	D012
Heptachlor	8081A	ND	0.0080	D031
Heptachlor epoxide	8081A	ND	0.0080	D031
Methoxychlor	8081A	ND	10	D014
Toxaphene	8081A	ND	0.50	D015

mg/liter = milligrams per liter

U = Quantity was below the detection limit.

B = Resulting value is less than the method RL.

ND = Not detected.

[10] From reference 40 CFR 261 (June 1996).

2.8.4 Site 7

An initial reconnaissance of the site was performed to examine the nature of the debris and confirm the level of effort and type of equipment that would be needed to remove the debris. There were no samples of the debris collected. As noted previously in **Section 2.2**, the photo log of this site reconnaissance is provided in **Appendix B**. Following the site survey, United Winner Metals was contacted to inspect the metal debris for visual characterization and assessment of recycling potential. They agreed to accept all the steel debris for disposal at the return scrap value, with no incurred cost by the Navy. Other debris was disposed as construction debris at a secure RCRA Subtitle D landfill.

2.9 Excavation process

OHM/SHAW planned the excavation process to maximize efficiency and reduce labor and equipment cost. While setup work was being conducted at Sites 3 and 6, OHM/SHAW had work crews begin removing and staging the debris as Site 7 and digging the test pits at Site 1. This resulted in a highly productive workforce. Equipment operators then moved from Site 7 to Sites 3 and 6 to conduct the excavation activities after the initial site setup in those areas had been conducted. By the time most of the debris had been removed, staged, and transported off-site, the decon station, construction entrances, high visibility fencing, the UXO screening station, staging areas, and other features had been constructed. Also, by the time heavy equipment moved over to Sites 3 and 6, the utility clearance was completed and the predisposal characterization sample results had been returned. This type of planning allowed timely progress to the main remedial effort of excavation at Site 3.

2.9.1 Test Pit Investigation at Site 1

During the course of the remedial action while heavy equipment was available on-site, three test pits were dug at Site 1 to evaluate sub-surface conditions. The locations were selected based on a visual inspection of the surface, which because of variability from the surroundings or appearance could have been an indication of anomalies below. CH2MHill documented the excavation of the test pits. The field investigative record is provided in **Appendix K** along with the location map of the test pits and excavation photos from CH2Mhill.

Test pit excavation at Site 1 was performed on September 5, 2002. . The first test pit was dug to a total depth of 8 feet. Groundwater was encountered at approximately 7 feet. No signs of debris were reported. The second test pit was dug to a total depth of 10 feet. Concrete chunks and some metal debris were found on the surface. Similar steel debris as was found on the surface was also found at a depth of around 3 feet. Test pit 3 was dug to a depth of 8 feet. No debris or other anomalies were encountered. The test pits were then closed and the disturbed areas were seeded and mulched. Based on the trenching, no visible evidence supports the existence of a landfill at this location.

2.9.2 Excavation at Site 3

Excavation was advanced in accordance with the work plan using XRF as a field- screening tool to determine the extent to remove contaminated soil. Excavated materials were power screened to assure removal of UXO, with exception of heavy clay soil that could not be power screened. This change was documented as an approved work directive, which is provided for reference in **Appendix C**. A total of 2634 tons was received at the Browning Ferris Industries King & Queen Landfill over the period of September 4 through September 25 from Sites 3 and 6. The log of the weight receipts and a copy of the receiving facility's permit are provided in **Appendix L**. Certified surveys by registered State of Virginia Land Surveyors documenting the profile of the open cut excavation at Site 3 are provided in **Appendix J.** A profile of the open excavation at Site 6 is also provided in **Appendix J**. This was figure was prepared by onsite field operations and QA personnel. Due to the small area involved at Site 6, a licensed land surveyor was not required to generate a certified profile. The excavation at site 6 involved a total of approximately 180 cubic yards.

Excavation proceeded at Site 3 after completing the smaller excavation at Site 6. Excavation work began at Site 3 on September 11, 2002 and was completed on September 27, 2002. As noted before, work progress was strategically planned so that an efficient construction sequence could be implemented. XRF and PAH test kit screening were used at Site 3 to determine the bottom depth of the excavation XRF screening was performed as the excavation was advanced. XRF screening results are discussed in **Section 2.7** and **Table 2**. Final confirmatory sampling results at Site 3 are discussed in **Section 2.10.2**. Due to funding limitations, perimeter soils with contaminant levels above site remediation targets were left for later possible removal. Approximately 3312 cubic yards of certified clean fill were placed to fill the open excavation. The analysis of the fill material is discussed below in **Section 2.11**. It is estimated that more than 6000 cubic yards of impacted soil remains at Site 3 above target cleanup levels (**Table 1)**. Following placement of the soil, the surface was hydroseeded with an appropriate grass seed mix for the region to control erosion. Originally, all soils removed for disposal were to be 100% prescreened to remove potential UXO fragments. During the excavation in certain areas, a layer of natural clay was encountered. This material was blinding off the screen separator and significantly slowing down the screening of unconsolidated soil, which needed to be examined for UXO fragments. After evaluating potential options, the procedure was changed to allow for visual inspection of the clay material as it was excavated to determine if it had been disturbed in any way. It was felt that there was little chance UXO would be found in the undisturbed clay whereas there was likelihood it would be present in the unconsolidated fill soil. This procedural scope change was approved and is provided in **Appendix C**. UXO fragments that were recovered from the screening operation were properly characterized and disposed as discussed below in **Section 2.13.**

2.9.3 Excavation at Site 6

Excavation started at Site 6 on September 4, 2002 and was completed by September 7, 2002. Backfilling of the excavation required approximately 180 cubic yards of certified clean fill (15 loads). The analysis of the fill is discussed in **Section 2.11**. The volume excavated was about 3 times the originally estimated volume. An approved work directive was issued and provided in **Appendix C,** to allow expanded excavation at Site 6 beyond the originally prescribed extent waste. Excavation was advanced outward radially an additional 30 feet in all directions, The XRF as noted above in **Section 2.7**, was used to field screen soils to determine the limits of excavation.

XRF sampling results are also discussed above in **Section 2.7** and in **Table 3**. Final confirmatory sampling results for excavation at Site 6 are discussed below in **Section 2.10.3**.

2.9.4 Excavation at Site 7

Deep excavation was not performed at Site 7. Visually apparent surface debris was removed, which in some instances disturbed the surface. After completing the removal of the debris, the surface where disturbed was contoured, the land fill surface was dressed and hydroseeded with and appropriate grass mix for the region. The specifications for the grass mix used by the hydroseeding subcontractor are provided in **Appendix P.**

In accordance with the work plan, surface debris and junk equipment designated by the Navy were removed from the surface of Site 7. The debris staged for removal included:

- (10) 8600 pound steel encased concrete weights (as demolished material)
- (4) 17,000 pound steel encased concrete weights (as demolished material)
- (1) air compressor and tank
- (1) large generator
- (6) large Navy buoys/bumpers (cut up for scrap metal)
- (2) ship rudders
- (4) steel plates of various size (cut up for scrap metal)
- (6) 4 foot square concrete blocks
- (10) yards of miscellaneous concrete debris
- Assorted rubber tires and foam rubber material
- Miscellaneous wood debris

The steel encased concrete weights were torch-cut, then the concrete demolished using a hydraulic demolition hammer. The large rudders were cut in half and removed on a flat bed truck for scrap recycle. While cutting up one rudder, a leak of an oily tar material occurred which resulted in the spilling of less than 1-gallon of oil onto the ground. The material and impacted soil were manually dug up, containerized, and properly disposed.

All recyclable steel was accepted at United Winner Metals for disposal at the cost of the recycle value resulting in no net cost to the Navy.

The large multi-ton concrete crane weights were demolished using a hydraulic demolition hammer mounted on a track excavator. The concrete was crushed to 6" diameter chunks or smaller and hauled off-site as clean construction debris to the BFI Kings and Queen Landfill, along with the impacted soil from Sites 3 and 6.

Other steel was also cut up and recycled which included some large buoys/bumpers and two large ship rudders. The rudders were cut in half so they could be loaded on a flat bed and handled to the least extent possible. This reduced labor cost by cutting them in large sections and arranging for the scrap dealer to take them as large pieces rather than cut up scrap sufficiently small for a scrap recycle bin. The rudders along with other steel scrap were all disposed for the salvage value at no net cost to the Navy.

2.9.5 General Excavation Process and Decon of Equipment

The general excavation process start to finish involved the use of heavy equipment to excavate impacted soils at Sites 3 and 6. Field screening methods were used to determine how far to advance the excavation both laterally and vertically. Excavated soils were transferred to the screening station. All soil was screened with the exception of the heavy clay native soil that was visually screened. As material was removed from the excavation, the excavator broke soil and contents up in the removal process. Secondary transport of these soils to the screener location was made with the front-end loader. The soil was then stockpiled or fed directly into the screening station. The screening station broke the soil down into the smallest possible particles to release any trapped UXO. The screening station separated the UXO by the gravity/density difference between soil and metallic objects such as lead, brass, steel, and iron. The power screener segregated the material down by size decreasing 1-inch mesh with each succeeding screen. Each segregated sized material through the power screener fell out of the screener at different locations dependent upon the smallest size that was achieved. The load up process and the screening operation screens were directly observed by a UXO technician to check for larger fragments. When potential UXO material seen on a screen and was initially identified, the screener would be stopped, and the UXO material inspected and classified and removed from the screening apparatus. Further segregation was realized based upon the density of the same sized material, as they fell at different rates. This process allowed for segregation of brass and other metallic UXO components as wells as soils and rocks to be sorted. Although not expected, UXO technicians were constantly on the alert to the potential of finding large UXO or pieces that might be shock sensitive. It was anticipated from previous site history and site characterization that small arms materials and flashed ordnance components would be what were most likely to be present. This was confirmed in actual practice as no live UXO was found. However, technicians were constantly on the alert for UXO that would require more extensive measures to disarm and dispose. Once materials were screened and segregated loading of the native soils into transport over the road end dumps was accomplished using the front-end loader. The contaminated soils were then transported to the disposal facility. Trucks as they exited the facility drove over the designated haul roads. Upon leaving the working area, they passed over the entrance to the decontamination station, where the tires and underbody of each truck was washed and visually inspected. The trucks then exited the area through the stone construction entrance and on to the designated travel route.

2.10 Confirmation Sampling of Excavation Area and Soil Sampling Results

2.10.1 Photographic Visual Confirmation Record and Test Pit Log for Site 1

There were no analytical samples collected at Site 1. Observations were made visually as to the subsurface conditions. CH2MHill provided a visual photographic log to confirm observations made during the test pit excavation. This record is provided in **Appendix K**. Of the three test pits excavated, Test Pits 1 and 3 showed no signs of buried debris or other anomalies. Test Pit 2 was found to have surface rubble and some metallic steel debris. Steel debris was also found at a depth of about 3 feet, but nothing else was logged down to a depth of 10 feet. Analytical from the SSA report illustrates no significant threat to human health or the environment is present at Site 1.

2.10.2 Final Survey and Confirmational Sampling Results at Site 3

Upon completion of excavation activities as confirmed by field screening with the XRF 10-bottom floor and 10-side wall samples confirmatory samples were collected and submitted for laboratory analysis. Chain of custody forms, a sampling location map, and laboratory results are provided in **Appendix M**. **Table 6** provides a summary of the bottom floor confirmatory laboratory results and **Table 7** presents a summary of the side wall confirmatory laboratory results for Site 3. The results for the bottom of the excavation were confirmed to be within acceptable limits as defined in the work plan. Perimeter limits were found to be elevated above the site target cleanup standards (**Table 1**), but excavation was limited to the approximately 2625 tons removed and disposed due to the funding limitations of this current scope of work.

Table 6 (page 1 of 1)
Summary of Post Excavation Floor Sample Results
SJCA Site 3
Chesapeake, Virginia
September 27, 2002

Constituent	SJS03-CS1-SB01-003	SJS03-CS1-SB02-003	SJS03-CS1-SB03-003	SJS03-CS1-SB04-003	SJS03-CS1-SB05-003	SJS03-CS1-SB06-003	SJS03-CS1-SB07-003	SJS03-CS1-SB08-003	SJS03-CS1-SB09-003	SJS03-CS1-SB10-003	Regulatory MDL
Metals (mg/kg)											
Arsenic	9.3	4.7	9.2	6.4	14.4	11.8	11.3	6.4	4.8	1.9 J	0.64
Aluminum	12800	3850	13800	7510	17800	18800	16000	7790	2540	4460	2.0
Barium	33.5 J	15.9 J	41.2 J	36.7 J	47.8 J	52.9 J	39.7 J	23.9 J	14.7 J	48 J	0.051
Calcium	2810	1150 J	4850	3100	3900	4290	2980	1890	595 J	595 J	2.6
Chromium	26.9	9.5	27.2	16	34.6	35.4	32	16	6.3	10	0.1
Cobalt	7.3 J	4.6 J	8.4 J	4.7 J	18 J	10.5 J	9.8 J	13.3	3.7 J	1.1 J	0.1
Copper	21	28.1	31.7	110	39.8	35.1	26.4	10.1	24.8	10.9	0.2
Iron	27900	9370	28800	17700	36200	41700	31300	20800	8290	4670	2.2
Lead	36.3	22.2	41.9	48.9	57.5	66.9	45.3	11.5	37	22.8	0.33
Magnesium	4250	1190 J	4200	2250	5130	5020	5230	2640	628 J	850 J	1.4
Manganese	267	68.9	271	158	341	340	292	115	54.5	25.5	0.051
Mercury	0.46	0.17	0.28	0.25	0.46	0.45	0.56	0.13	0.077 J	0.14	0.064
Nickel	13.3 J	5.9 J	15	8.4 J	26.7	19.5	17.6	20.4	4.5 J	3.1 J	0.15
Potassium	1930	741 J	2140	1300 J	2500	2420	2410	1320 J	474 J	560 J	17.2
Sodium	1280 J	446 J	380 B	445 J	980 J	254 B	1550 J	347 J	109 B	211 B	18
Vanadium	31.3	11.3 J	32.6	18.8	40.2	42.2	36.6	18.4	6.5 J	10.9 J	0.077
Zinc	76.2	60.3	96.7	84.6	291	134	106	135	64.6	13.8	0.46

mg/kg = milligrams per kilogram
J= Estimated value.
B = Resulting value is less than the method RL.

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Table 7 (page 1 of 2) Summary of Post Excavation Wall Sample Results SJCA Site 3 Chesapeake, Virginia September 27, 2002						
Constituent	**SJS03-CS2-SS07-000**	**SJS03-CS2-SS08P-000**	**SJS03-CS2-SS08-000**	**SJS03-CS2-SS09-000**	**SJS03-CS2-SS10-000**	**Regulatory MDL**
Metals (mg/kg)						
Arsenic	8.4	3	4.5	5	19.4	0.64
Aluminum	4760	9290	8670	6750	26300	2.0
Barium	31.9 J	53.6	44.3	36.6 J	89.4	0.051
Calcium	4850	1320	1350	4780	2640	2.6
Chromium	9.7	13.2	14.5	13	53	0.1
Cobalt	10.7 J	1.2 J	1.2 J	5.6 J	6.3 J	0.1
Copper	23.6	14.5	23.5	20.5	35.5	0.2
Iron	8390	6420	7540	12900	46900	2.2
Lead	74.2	38.7	47.6	36.2	53	0.33
Magnesium	773 J	610 J	633 J	1290	5760	1.4
Manganese	245 J	38.7	41.7	131	148	0.051
Mercury	0.17 L	0.054 U	0.052 U	0.1 J	0.48	0.064
Nickel	17	4.9 J	4.6 J	10.1	15.9	0.15
Potassium	364 J	369 J	389 J	854 J	3950	17.2
Vanadium	17.9	17.2	18.3	17	61.3	0.077
Zinc	214	30.1 J	52.7 J	68.1	116	0.46

mg/kg = milligrams per kilogram

J = Estimated value.

U = Quantity was below the detection limit.

Table 7 (continued - page 2 of 2)
Summary of Post Excavation Wall Sample Results
SJCA Site 3
Chesapeake, Virginia
September 27, 2002

Constituent	**SJS03-CS2-SS07-000**	**SJS03-CS2-SS08P-000**	**SJS03-CS2-SS08-000**	**SJS03-CS2-SS09-000**	**SJS03-CS2-SS10-000**	**Regulatory MDL**
Semi-Volatile Organic Compounds (ug/kg)						
2-methylnaphthalene	74 J	430 U	380 U	430 U	570 U	10
Acenaphthylene	32 J	20 J	21 J	430 U	48 J	8
Anthracene	37 J	23 J	17 J	430 U	45 J	8
Benzaldehyde	71 J	430 U	380 U	430 U	570 U	4
Benzo(a)anthracene	79 J	82 J	52 J	19 J	78 J	9
Benzo(a)pyrene	95 J	69 J	52 J	20 J	76 J	8
Benzo(b)fluoranthene	170 J	62 J	45 J	33 J	230 J	13
Benzo(g,h,i)perylene	150 J	430 U	380 U	430 U	83 J	40
Benzo(k)fluoranthene	200 J	63 J	64 J	26 J	170 J	14
Chrysene	120 J	110 J	59 J	32 J	220 J	8
di-n-octylphthalate	850 U	430 U	86 J	430 U	200 J	9
Dibenz(a,h)anthracene	37 J	17 J	18 J	430 U	47 J	11
Fluoranthene	100 J	100 J	56 J	21 J	120 J	7
Indeno(1,2,3-cd)pyrene	91 J	36 J	26 J	14 J	87 J	8
Naphthalene	36 J	10 J	10 J	430 U	570 U	8
Phenanthrene	73 J	110 J	35 J	430 U	29 J	10
Phenol	25 J	430 U	380 U	430 U	570 U	8
Pyrene	190 J	180 J	92 J	24 J	99 J	13

ug/kg = micrograms per kilogram
U = Quantity was below the detection limit.
J = Estimated value.
B = Resulting value is less than the method RL.
ND = Not detected.

2.10.3 Final Survey and Confirmational Sampling Results at Site 6

Upon completion of excavation activities as confirmed by field screening with the XRF, four confirmatory samples were collected and submitted for laboratory analysis. Chain of custody forms, a sampling location map, and laboratory results are provided in **Appendix N**. After initial removal, perimeter limits were found to be elevated above the site target cleanup standards (**Table 1**). The excavation was advanced in 10-foot concentric circles until 180 cubic yards of material had been removed. Removal of the additional material over and above what was originally estimated was covered under an approved work order directive in **Appendix C**. **Table 8** contains the laboratory confirmational sampling results for samples collected from the Site 6 excavation.

Table 8 (page 1 of 4) Summary of Post Excavation Soil Sample Results SJCA Site 6 Chesapeake, Virginia September 2002								
Constituent	**SJS06-CS1-SB05-003**	**SJS06-CS2-SS01-000**	**SJS06-CS2-SS02-000**	**SJS06-CS2-SS02P-000**	**SJS06-CS2-SS03-000**	**SJS06-CS2-SS04-000**	**SJS06-CS2-SS06-000**	**Regulatory MDL**
Date	Sept 27, 2002	Sept 6, 2002	Sept 6, 2002	Sept 6, 2002	Sept 6, 2002	Sept 6, 2002	Nov 4, 2002	--
Metals (mg/kg)								
Arsenic	3.2	20	14.5 J	64.9 J	6	9.7	29.1	0.64
Aluminum	7510	6540	5320	5390	3700	4990	9930	2
Antimony	0.37 U	3.8 L	9.5 J	21.7	0.79 J	2.1 J	9.7 J	0.44
Barium	36.7 J	4950	3520	4390	277	1230	23900	0.051
Beryllium	0.47 B	0.28 J	0.35 J	0.29 J	0.17 B	0.22 B	0.42 J	0.051
Cadmium	0.046 U	4.8	9.5	8.9	1.7	2.4	7.5	0.1
Calcium	3860	5050	23900	27400	75400	13500	9080	2.6
Chromium	14.2	24	18.8	19.1	11.5	14.8	81.3	0.1
Cobalt	3.4 B	2.1 J	2.5 J	2.3 J	1.5 J	1.5 J	5.7 J	0.1
Copper	15.8	302	1160 J	292 J	98.3	101	690	0.2
Iron	12100	14200 J	10300	11500	6760	7450	13800	2.2
Lead	22.4	389 J	2300 J	1290 J	118	224	2210	0.33
Magnesium	1720	1840	1650	1850	1120 J	842 J	9820	1.4
Manganese	105	278 J	253 J	593 J	193	151	1870	0.051
Mercury	0.068 J	0.22 B	0.11 B	0.15 B	0.098 B	0.14 B	0.12 J	0.064
Nickel	6.8 J	7.5 J	10.1	9.7	8.1 J	5.6 J	11.2	0.15
Potassium	823 J	922 J	970 J	979 J	725 J	687 J	1120 J	17.2
Selenium	0.68 B	0.44 U	0.41 U	0.85 J	0.58 J	0.93 J	1.5	0.44
Silver	0.16 U	0.13 U	0.12 U	0.12 U	0.12 U	0.12 U	0.34 J	0.13
Sodium	112 B	18 U	16.7 U	17 U	321 J	39.2 J	79.2 U	18
Thallium	0.6 U	1.1 U	1 U	1 U	0.99 U	0.97 U	0.62 U	1.1
Vanadium	16.6	23.9	27.4	24.9	15.8	19.4	22.8	0.077
Zinc	58.7	1800	4130	4530	689	703	3850	0.46

ug/kg = micrograms per kilogram
U = Quantity was below the detection limit.
J = Estimated value
B = Possible blank contamination
ND = Not detected.

Table 8 (continued - page 2 of 4) Summary of Post Excavation Soil Sample Results SJCA Site 6 Chesapeake, Virginia September 2002								
Constituent	**SJS06-CS1-SS05-003**	**SJS06-CS2-SS01-000**	**SJS06-CS2-SS02-000**	**SJS06-CS2-SS02P-000**	**SJS06-CS2-SS03-000**	**SJS06-CS2-SS04-000**	**SJS06-CS2-SS06-000**	**Regulatory MDL**
Semi-Volatile Organic Compounds (ug/kg)								
2,4-dinitrotoluene	NA	420 U	410 U	260 J	420 U	410 U	68 J	7
2,6-dinitrotoluene	NA	420 U	410 U	20 J	420 U	410 U	440 U	10
4-nitroaniline	NA	1100 U	1000 U	1100 U	1100 U	1000 U	1100 U	7
Acenaphthylene	NA	17 J	12 J	15 J	11 J	410 U	21 J	8
Acetophenone	NA	420 U	410 U	420 U	420 U	12 J	47 B	10
Anthrecene	NA	11 J	410 U	10 J	420 U	410 U	23 J	8
Benzaldehyde	NA	10 J	10 J	13 J	10 J	11 J	50 B	4
Benzo(a)anthracene	NA	68 J	56 J	420 U	58 J	410 U	55 J	9
Benzo(a)pyrene	NA	69 J	43 J	61 J	43 J	16 J	72 J	8
Benzo(b)fluoranthene	NA	130 J	85 J	120 J	51 J	23 J	86 J	13
Benzo(g,h,i)perylene	NA	420 U	410 U	420 U	420 U	410 U	58 J	40
Benzo(k)fluoranthene	NA	140 J	88 J	130 J	61 J	27 J	89 J	14
Butylbenzylphthalate	NA	420 U	13 J	420 U	420 U	410 U	440 U	9
Carbazole	NA	420 U	410 U	420 U	420 U	410 U	440 U	9
Chrysene	NA	120 J	83 J	88 J	86 J	45 J	83 J	8
di-n-butylphthalate	NA	41 J	70 J	320 J	62 J	31 J	26 J	11
Dibenz(a,h)anthracene	NA	17 J	410 U	18 J	420 U	410 U	440 U	11
Fluoranthene	NA	65 J	43 J	61 J	36 J	31 J	80 J	7
Indeno(1,2,3-cd)pyrene	NA	63 J	40 J	53 J	39 J	17 J	71 J	8
Naphthalene	NA	420 U	410 U	10 J	420 U	410 U	440 U	8
Phenanthrene	NA	33 J	21 J	27 J	18 J	13 J	31 J	10
Pyrene	NA	110 J	84 J	91 J	74 J	51 J	61 J	13
n-nitrosodiphenylamine	NA	420 U	410 U	35 J	420 U	410 U	440 U	10

ug/kg = micrograms per kilogram
U = Quantity was below the detection limit.
J = Estimated value
B = Possible blank contamination
ND = Not detected.

Table 8 (continued page 3 of 4) Summary of Post Excavation Soil Sample Results SJCA Site 6 Chesapeake, Virginia November 2002					
Constituent	**SJS06-CS2-SS09-000**	**SJS06-CS2-SS07-000**	**SJS06-CS2-SS07P-000**	**SJS06-CS2-SS08-000**	**Regulatory MDL**
Date	Nov 4, 2002	Nov 4, 2002	Nov 4, 2002	Nov 4, 2002	--
Metals (mg/kg)					
Arsenic	1.8 J	18.8	16.9	37.7 J	0.64
Aluminum	3190	1920	2090	4920	2
Antimony	0.39 B	9.1 J	11.4 J	28 J	0.44
Barium	104	554	579	642	0.051
Beryllium	0.14 J	0.1 J	0.13 J	0.27 J	0.051
Cadmium	0.67 J	1.2 J	1.1 J	47.8 J	0.1
Calcium	1710	1630	1600	4420 J	2.6
Chromium	8.7	29.8	32.7	37.3 J	0.1
Cobalt	0.78 B	1.8 J	2 J	3.4 J	0.1
Copper	14.4	906 J	370 J	192	0.2
Iron	4040	7780	8170	66800 J	2.2
Lead	45.6	480	516	442	0.33
Magnesium	537 J	554 J	601 J	1240 J	1.4
Manganese	40.5	99.4	110	393 J	0.051
Mercury	0.067 U	0.089 J	0.12 J	0.11 J	0.064
Nickel	3.5 J	7 J	6.9 J	10.9	0.15
Potassium	413 J	303 J	332 J	899 J	17.2
Selenium	0.77 U	0.71 U	0.82 U	2.1 J	0.44
Silver	0.21 U	0.19 U	0.22 U	0.2 U	0.13
Sodium	78.3 U	71.8 U	82.8 U	77.6 U	18
Thallium	0.62 U	0.57 U	0.65 U	3.3 J	1.1
Vanadium	12.9	12.4	12.7 J	28.3	0.077
Zinc	66.5	2830	1550	1010	0.46

ug/kg = micrograms per kilogram

U = Quantity was below the detection limit.

J = Estimated value

B = Possible blank contamination

ND = Not detected.

Table 8 (continued - page 4 of 4) Summary of Post Excavation Soil Sample Results SJCA Site 6 Chesapeake, Virginia September 2002					
Constituent	**SJS06-CS2-SS09-000**	**SJS06-CS2-SS07-000**	**SJS06-CS2-SS07P-000**	**SJS06-CS2-SS08-000**	**Regulatory MDL**
Semi-Volatile Organic Compounds (ug/kg)					
2,4-dinitrotoluene	440 U	400 U	450 U	420 U	7
2,6-dinitrotoluene	440 U	400 U	450 U	420 U	10
4-nitroaniline	1100 U	43 J	460 J	1100 U	17
Acenaphthylene	440 U	79 J	95 J	18 J	8
Acetophenone	53 B	50 B	66 B	61 B	10
Anthracene	440 U	110 J	150 J	18 J	8
Benzaldehyde	57 B	61 B	73 B	48 B	4
Benzo(a)anthracene	27 J	190 J	230 J	55 J	9
Benzo(a)pyrene	35 J	180 J	210 J	62 J	8
Benzo(b)fluoranthene	31 J	220 J	240 J	77 J	13
Benzo(g,h,i)perylene	440 U	120 J	120 J	420 U	40
Benzo(k)fluoranthene	38 J	220 J	260 J	72 J	14
Butylbenzylphthalate	440 U	400 U	450 U	420 U	9
Carbazole	440 U	14 J	13 J	420 U	9
Chrysene	33 J	240 J	280 J	90 J	8
di-n-butylphthalate	440 U	21 J	450 U	37 J	11
Dibenz(a,h)anthracene	440 U	34 J	38 J	420 U	11
Fluoranthene	49 J	210 J	200 J	180 J	7
Indeno(1,2,3-cd)pyrene	28 J	160 J	150 J	52 J	8
Naphthalene	440 U	400 U	12 J	420 U	8
Phenanthrene	25 J	45 J	36 J	49 J	10
Pyrene	47 J	240 J	230 J	150 J	13
n-nitrosodiphenylamine	440 U	400 U	450 U	420 U	10

ug/kg = micrograms per kilogram
U = Quantity was below the detection limit.
J = Estimated value
B = Possible blank contamination
ND = Not detected.

2.10.4 Confirmation Results at Site 7

There were no analytical samples collected at Site 7. Prior investigations indicate no adverse effects to human health and the environment are present at Site 7.The criterion for completion of Site 7 remediation was a visual removal of the debris and surface restoration of the site to an aesthetic appearance. Staging and arrangement for the shipping of the various types and articles of debris, were ongoing through most of the project duration. Complete removal of all project- related debris from SJCA was accomplished by the time demobilization of the site commenced. After Site 7 was cleared, the site was contoured and dressed, and hydroseeded to establish adequate vegetative cover for the prevention of erosion. Specifications for the grass mix used to revegetate the surface of Site 7 are provided in **Appendix P.**

2.11 Backfill of Excavation and Surface Restoration

Fill dirt to restore excavated areas was imported by C & M Contracting, Inc. In accordance with the work plan Q/A requirements, a sample of the borrow fill was collected for chemical analysis. There were 291 deliveries of 12 cubic yards for a total of 3492 cubic yards. Fill was placed and then spread and compacted using a bulldozer, restoring the site to grade. The surface was then seeded for erosion control with an appropriate grass mix for the region in accordance with the Sedimentation and Erosion Control Plan. The specifications for the seed mixed used are provided in **Appendix P**. Copies of the fill delivery weight tickets for fill used at Sites 3 and 6 are provided in **Appendix O**. The certified sampling results for the borrow material used for back filling at Sites 3 and 6 are provided in **Appendix Q**. Also provided in **Appendix Q** are the certified analytical results for the imported stone used in the construction of the stone construction entrance providing access to the work areas.

2.11.1 Backfill Excavation and Surface Restoration of Site 1

After excavation of the test pits at site 1, the excavated material was returned to the hole and compacted. The surface was smoothed and dressed and seeded with suitable grass mix.

2.11.2 Backfill Excavation and Surface Restoration of Site 3

There were 285 deliveries of 12 cubic yards each for a total of 3312 cubic yards. The material was placed in the Site 3 excavation in 1 to 2 foot lifts, and compacted with a bulldozer. Following back filling, the area was graded and contoured to match the surrounding area and hydroseeded with an appropriate grass mix for the region. Sedimentation and erosion control measures were removed once viable cover had become established.

2.11.3 Backfill Excavation and Surface Restoration of Site 6

There were 15 deliveries of 12 cubic yards each for a total of 180 cubic yards. The material was placed in the Site 6 excavation in 1 to 2 foot lifts, and compacted with a bulldozer. Following back filling, the area was graded and contoured to match the surrounding area and hydroseeded with an appropriate grass mix for the region. Sedimentation and erosion control measures were removed once viable cover had become established. **Table 9** provides a summary of the confirmational analysis of the fill used for the restoration of Site 6. The same source of material was used for fill at both Site 3 and Site 6. The stone analysis provided in **Appendix Q** was for the stone used to build the construction entrance to the Site 3 and 6 area as required by the Erosion and Sedimentation Control Plan. This is presented along with the certified clean fill results to demonstrate that no contamination was imported to the site by any of the construction materials used.

2.11.4 Surface Restoration of Site 7

There was no major excavation at Site 7. However, the impressions left from the removal of the large debris and the established scrub vegetation made the site a visual eyesore. OHM/SHAW dressed the site where needed to a smooth appearance and contour, and hydroseeded scarified areas with an appropriate seed mix for the region.

2.11.5 Certified Clean Fill and Stone

The procurement specifications for construction materials imported and used onsite required the vendor to provide a certification that the materials are chemically clean. **Table 9** provides a summary of the confirmational analysis provided by the vendors of the soil fill and stone used for the restoration of Sites 3 and 6. The fill was used to clean backfill the excavations. The stone was used for the construction of the construction entrance where truck access was made to the work area at Sites 3 and 6. A stone entrance for trucks was required by the sedimentation and erosion control plan to prevent the spread of loose soil from the working area. The same source of borrow material and stone was used for fill and stone where needed at both Site 3 and Site 6. The fill was supplied by C&M Contracting, 530 Woodlake Circle, Chesapeake, VA 23320. Ron Curry was the contact at C & M. The fill was obtained from their common stockpile. The certified sampling results for the fill and stone are provided in **Appendix Q**.

Table 9 (page 1 of 2)
Summary of Soil Fill and Stone Characterization Sample Results
SJCA Sites 3 and 6
Chesapeake, Virginia

Constituent	EPA Method SW846	SCJA-WDC-FILL-01	SCJA-WDC-stone	Units	Method Reporting Limit	Regulatory Limit
Date	--	Sept 11, 2002	Sept 25, 2002	--	--	--
Metals						
Arsenic	6010B	.0028 U	.0029 B	Miligrams/liter	0.01	5
Barium	6010B	0.3	0.38 B	Miligrams/liter	1	100
Cadmium	6010B	.00026 U	.0023 B	Miligrams/liter	0.005	1
Chromium	6010B	0.00043 U	0.0079 B	Miligrams/liter	0.01	5
Lead	6010B	0.0063	0.28	Miligrams/liter	0.005	5
Mercury	7470A	0.00022 U	0.00022 U	Miligrams/liter	0.01	0.2
Selenium	6010B	0.0032 B	0.0046 B	Miligrams/liter	0.01	1
Silver	6010B	0.00055 U	0.00055 U	Miligrams/liter	0.01	5
Other						
Ignitability	1010	> 200	> 200	^{O}F	--	--
Corrosivity as pH	Chapter 7	5.9	6.6	unitless	--	--
Contaminants						
2-methylphenol	8270C	ND	ND	Miligrams/liter	0.05	200
3&4-methylphenol	8270C	ND	ND	Miligrams/liter	0.05	200
Pentachlorophenol	8270C	ND	ND	Miligrams/liter	0.25	100
2,4,5-trichlorophenol	8270C	ND	ND	Miligrams/liter	0.05	400
2,4,6-trichlorophenol	8270C	ND	ND	Miligrams/liter	0.05	2
1,4-dichlorobenzene	8270C	ND	ND	Miligrams/liter	0.05	7.5
2,4-dinitrotoluene	8270C	ND	ND	Miligrams/liter	0.05	0.13
Hexachlorobenzene	8270C	ND	ND	Miligrams/liter	0.05	0.13
Hexachlorobutadiene	8270C	ND	ND	Miligrams/liter	0.05	0.5
Hexachloroethane	8270C	ND	ND	Miligrams/liter	0.05	3
Nitrobenzene	8270C	ND	ND	Miligrams/liter	0.05	2
Pyridine	8270C	ND	ND	Miligrams/liter	0.05	5

U = Quantity was below the detection limit; B = Resulting value is less than the method RL; ND = Not detected.

Table 9 (continued – page 2 of 2)
Summary of Soil Fill and Stone Characterization Sample Results
SJCA Sites 3 and 6
Chesapeake, Virginia

Constituent	**EPA Method SW846**	**SCJA-WDC-FILL-01**	**SCJA-WDC-stone**	**Units**	**Method RL**	**Regulatory Limit**
Date	--	Sept 11, 2002	Sept 25, 2002	--	--	--
Benzene	8260B	ND	NM	Micrograms/kg	5.5	
Toluene	8260B	2.2 J	NM	Micrograms/kg	5.5	
Ethylbenzene	8260B	2.4 J	NM	Micrograms/kg	5.5	
Xylene (total)	8260B	18.4	NM	Micrograms/kg	17	
Benzene	8260B	ND	ND	Miligrams/liter	0.01	0.5
Chlorobenzene	8260B	ND	ND	Miligrams/liter	0.02	100
Chloroform	8260B	ND	ND	Miligrams/liter	0.02	6
Carbon tetrachloride	8260B	ND	ND	Miligrams/liter	0.02	0.5
1,1-dichlorethylene	8260B	ND	ND	Miligrams/liter	0.02	0.7
1,2-dichlorothane	8260B	ND	D	Miligrams/liter	0.02	0.5
p-dichlorobenzene	8260B	ND	ND	Miligrams/liter	0.02	7.5
Methyl ethyl ketone	8260B	ND	ND	Miligrams/liter	0.1	200
Tetrachloroethylene	8260B	ND	ND	Miligrams/liter	0.02	0.7
Trichloroethylene	8260B	ND	ND	Miligrams/liter	0.02	0.5
Vinyl chloride	8260B	ND	ND	Miligrams/liter	0.01	0.2
2,4-d	8151	ND	ND	Miligrams/liter	0.005	10
2,4,5-TP (Silverx)	8151	ND	ND	Miligrams/liter	0.001	1
Gamma-BHC (Lindane)	8081A	ND	ND	Miligrams/liter	0.0005	0.4
Chlordane	8081A	ND	ND	Miligrams/liter	0.005	0.03
Endrin	8081A	ND	ND	Miligrams/liter	0.001	0.02
Heptachlor	8081A	ND	ND	Miligrams/liter	0.0005	0.008
Heptachlor epoxide	8081A	ND	ND	Miligrams/liter	0.0005	0.008
Methoxychlor	8081A	ND	ND	Miligrams/liter	0.001	10
Toxaphene	8260B	ND	ND	Miligrams/liter	0.025	0.5

ND =Not Detected.
NM = Not measured.

2.12 Contaminated Soil and Water Manifests

There was no hazardous waste soil or liquid generated during this remedial action. Contaminated soil was acceptable for receipt at a Class D disposal facility as noted in **Section 2.9** and **Appendix L.**

2.13 UXO Waste Management

Thirty-three pieces of UXO materials were recovered during the screening process and were managed according to the Navy's Requirements. An inspection of these pieces by certified UXO technicians onsite indicated none of them were live or required inerting. They were transferred as obliterated material to the Defense Recyclable Materials Office (DRMO) at NNSY. **Table 10** below provides a summary of the items of UXO scrap that were recovered from the screening process.

Table 10 UXO Summary of Findings SJCA Sites 3 and 6 Chesapeake, Virginia	
Number of Pieces	**Description**
1	8-inch sawed-off brass cartridge to 4 inches long
15	20 mm expended brass cartridge
2	50 caliber brass cartridge
1	Mechanical time fuse - inert
5	Igniter tubes (various lengths)
2	Grenade halves – inert M1 percussion
1	Grenade fuse – expended inert
2	40 mm brass cartridge –expended inert
1	3-inch brass cartridge
1	6-inch brass cartridge
2	105 CTG modified with eyebolt and lead – modified cartridge inert

* All UXO identified came from the conveyor belts during the power screening operation. Excavated material was co-mingled so a record of where material was removed/recovered from does not exist. The exact procedures for UXO management that were followed were provided in the work plan under separate cover. **Appendix R** provides additional information and the proper disposal certification that allowed acceptance by the DRMO at Norfolk Naval Shipyard (NNSY). Also provided in the **Appendix R** are the certifications for the two UXO technicians that were onsite throughout the project.

Appendix R contains all the certification paperwork for the transfer of this material. The material was first certified inert by the onsite UXO certified technician John Honer. Upon review of his declaration, the material was accepted for disposal/recycling by the DRMO. The handwritten daily log from John Honor is also provided in **Appendix R,** along with the training certificates and certification for John Honer and Philip Conley who were the two certified UXO technicians onsite during the removal action. In addition to their training certifications, **Appendix R** contains the authorized personnel list from Huntsville of those individuals who have received the Navy's certified explosive ordnance training and through training and experience are authorized by DOD to conduct UXO abatement at DOD facilities.

2.14 Project Management and Construction Oversight

The project manager visited the site regularly to provide decision support and oversight of the on-site supervisor, and to review work progress relative to the schedule and budget. A copy of the revised schedule is provided in **Appendix S**.

The on-site supervisor managed daily field operations and was responsible for staff supervision and field resource planning. The on-site supervisor maintained a daily written log, which are provided in **Appendix T**.

The on-site supervisor in conjunction with the project buyer and accountant (PBA) prepared the Contractor's Daily Production Reports. These reports document the materials, resources, and labor used each day at the project site. Copies of the Contractors Daily Production Reports are provided in **Appendix U**

2.15 Implementation of Approved Contract Changes and Resolution of Problems

2.15.1 Broken Water Utility Line

During excavation in the Site 3 area, on September 23, a 3/4 inch copper water line was slightly damaged by the excavator. The water line supplied the exterior spigot next to radar tower. SJCA utilities were immediately notified. It was noted that there was no shut off valve for this particular line. OHM temporarily capped the line until repairs could be made. Initial repairs were made on October 2, 2002 - and the line was tested. During the testing another leak was discovered 15 feet further down the water line towards the radar tower. Shaw recommended that the entire line be excavated, inspected, and properly replaced so to avoid future maintenance or water loss On October 3, 2002 the water line was further excavated and exposed. Repairs were made by installing a temporary by pass and a section of 65 feet of copper water line was replaced. Testing of the water line again was performed with no further leaks detected. On October 4, 2002 the line was retested and flushed with the ROICC Peter Gorrell, and Con Rep Karen Beck as witnesses that the line was correctly repaired. This repair was authorized by Technical Directive TD-02 found in **Appendix C**

2.15.2 Broken Electrical Conduit to Radar Tower

On September 16, 2002 a 4 -inch diameter conduit running across the excavation at Site 3 was struck with an excavator bucket. The conduit was found to contain electrical wiring leading to the radar building. Despite a utility survey, notification, and review of drawings, the line was not mapped to be in this immediate vicinity. The impact of the excavator broke the PVC conduit casing. However, there was no damage to the wires within the conduit and equipment in the radar building was not impacted. Site personnel were immediately notified. Radar personnel were notified and subsequent testing of the signal line was performed. No integrity problems were noted in the signal line. In order to maintain the integrity of the conduit and assure protection of the wiring, a split duct repair conduit piece was installed after prepping the broken conduit for installation. This constituted a minor expenditure of materials, so a formal work directive was not issued. A vendor cut sheet describing the split duct repair system is provided in **Appendix C** with the approved work directives.

2.15.3 Oil Leakage from Cutting of the Rudder at Site 7

During the removal of debris at Site 7 there were large two rudders from some Navy ships that were to be disposed of. In order to break up the steel rudders, they were torch-cut in half and loaded / trucked away as scrap steel to be recycled. Upon the cutting of one of them, there was contained inside one of the internal voids of the rudder an oily tar like substance that leaked onto the ground. The substance was petroleum based and did not exceed a gallon in volume. In response to this release, the impacted soil was dug up with a hand shovel, containerized, and properly disposed. This was managed as part of the overall work scope for the cleanup of Site 7, was below any reportable quantity, and because it resulted in no significant cost impact to the project, no additional work directive was needed.

2.15.4 Management of Heavy Clay Soils

During the screening of soils at Site 3, production became limited due to the encountering of native clay. The clay was blinding the 1 inch screens, preventing the separation of >1 inch and < 1 inch material. The clay was found in a previously undisturbed layer of varying thickness between 0 and 4 feet. The inability to screen this material prevented adequate UXO screening of other soil materials that were not cohesive. An assessment was made and it was concluded that UXO would not be found in the native clay layer, but only in the fill material at the site. Approval was given to change the normal operational procedure of screening all soil to segregating out the previously undisturbed clay material when it was encountered. During excavation and stockpiling, the clay material was visually inspected for any evidence that would indicate the potential presence of UXO or evidence the clay layer had been previously disturbed. All other soil and fill was sent through the screens as originally described in the work plan. Segregating out the clay restored productivity. All the clay and excavated fill materials were handled without incident. The management of UXO fragments recovered by the screening process is described in **Section 2.13** above. The work directive authorizing the change in scope is provided in **Appendix C**.

2.15.5 Stockpiling of Screened Soil on Polyliners

Soil that was screened to remove UXO was stockpiled in prepared areas awaiting load out for disposal. To avoid any impacts to areas outside of the excavation, the area for staging the soil was prepared by grading, laying down some stone, and placing geotextile on top of the stone. A heavy layer of construction polyethylene (visqueen™) was then laid down over the geotextile. Following screening to remove UXO fragments, conveyors moved soil to the staging area for ultimate disposal. This is a standard practice implemented by Shaw at sites where materials are handled and processed, but still may have residual contamination that could impact the surroundings. It is not considered a modification of the work scope, but a preventative measure and a component also of prudent sedimentation and erosion control measures.

2.15.6 Over Excavation at Site 6

Originally it was estimated the volume of impacted soil at Site 6 requiring removal was approximately 50 to 60 cubic yards. During removal at Site 6, the field-screening sampling using the detector indicated a greater amount of soil than estimated required removal. Authorization was given to excavate beyond the originally prescribed limits, proceeding out in a circular radius at 10-foot intervals to a depth of 6 inches. This change in operational approach was approved in work directive TD-01 and is contained in **Appendix C**. The excavation radius was extended out approximately 30 feet, which resulted in the excavation of an additional 120 yards at Site 6. The cost was offset by reducing the amount of soil removed at Site 3. As a result, soil remaining at Site 6 was all below the required screening level requiring no further action.

2.15.7 Materials Remaining Above Screening Levels at Site 3

Before excavation began at Site 3, it was confirmed that as much as 10,000 cubic yards might require removal. In removing soil at Site 3, work advanced by removing soil to soil screening standards at the bottom of the excavation. Work progressed until the volume of material removed approached the authorized budget available. The Navy recognizes that additional action may be required at Site 3 to achieve formal closure, which may include excavation of additional material. If additional removal is required, excavation would be advanced from the perimeter of the back filled excavation. However, re-excavation of the area that was previously excavated would not be necessary as impacted soil above screening levels was removed to depth. With the removal of the most significantly impacted soil, the Navy will be evaluating the potential human health and ecological risks posed by the remaining soil left above screening standards. The Navy will fully evaluate all reasonable options that would achieve protection of human health and the environment, which may avoid further excavation and disposal.

2.15.8 Assessment of Groundwater Anomaly at Site 6

Groundwater was encountered during the excavation at Site 6. An apparent anomaly was observed as the groundwater was observed to contain a prominent fluorescent green color. This observation initially caused some concern. Groundwater samples were collected and analyzed to determine if any potential contaminants of concern (CPOCs) were present. No elevated levels of CPOCs were detected. The results for this sampling are provided in **Appendix H**. The Navy later concluded that the dye was likely the result of disposal at Site 6 of some quantities of a harmless fluorescene dye used for search and rescue operations and it was possible these materials could have been buried at the site. These types of dyes are widely used in sewer line inspections, river mixing studies, pollutant transport evaluations, tracer studies inside the body and eyes, etc. and do not pose a significant risk to human health or the environment.

3.0 Overview of Health and Safety

This section describes the policies for the contaminated soil excavation and disposal at the SJC Annex facility, Portsmouth, Virginia. The safety program implemented during the course of the remediation incorporated various policies, procedures and training OHM conducted, and daily safety management, awareness, and oversight during remedial projects. The Site Safety Officer (SSO) conducted a daily safety meeting and performed other Health and Safety inspections. The record of the daily safety meetings that were conducted is provided in **Appendix V**.

Personnel assigned to the project were current, with respect to medical surveillance and training per the Occupational Safety and Health Administration (OSHA) requirements of Part 29 Code of Federal Regulations (CFR) 1910.120. Chemical hazard Right to Know awareness records and training records for on-site personnel are provided in **Appendix W**. Primary areas of concern for this project included debris removal, heavy equipment operation, UXO avoidance, and hazard communication and awareness.

3.1 Overview of Health and Safety Plan

All on-site OHM personnel and subcontractors were thoroughly instructed and signed-off on all elements of the Site Specific Health and Safety Plan prior to the start of site work. The Project Specific Health and Safety Plan was provided earlier to the Navy as an appendix to the Work Plan.

A Sign In/Out Log was maintained on-site, maintaining a record of all persons entering or leaving the site. Those entering the site reviewed the Daily Tailgate Safety Meeting log and the Health and Safety Plan. Workers conducting activities that presented exposure to the contaminants on-site were trained in accordance with the requirements of 29 CFR 1910.120. The Site Health and Safety Officer was responsible to review personnel training and obtain/maintain the appropriate records as required by regulation, the HASP, and Shaw's Health and Safety Policies applicable to the scope of work being performed. Copies of the site access sign in/out logs are provided in **Appendix X.**

3.2 Site Safety Meeting and Other Training

Safety meetings were conducted at the beginning of each day on-site. As noted above, copies of the safety meeting sign in sheets and meeting minutes are filed with site records and provided for review in **Appendix V**

Site Specific Safety Controls

The site-specific safety controls utilized at the site include:

- Activity Hazard (AH) - A program to breakdown a task into its steps, identify the hazards of each step and determine methods of hazard control. Site specific AHA were prepared for the project.

- Chemical Hazard Analysis - A Program to determine the hazardous chemicals at the site, the concentrations of the chemicals and the action levels and emergency procedure for the chemical of concern.

- Physical Hazard Analysis - A Program to determine the physical hazards of each task and the implementation of control procedures.

- Environmental Hazard Analysis - A Program to determine the environmental hazards and method of control.

- Accident Prevention Programs
  - Safety Observer Program- A program where a member of the on-site staff is appointed to observe and record unsafe acts/conditions and present a report on the finding at the next day's safety meeting
  - Management Safety Improvement Report- A monthly report completed by the Project Manager to ensure compliance with OHM policies and procedures.

- Site specific PPE Program- A program to establish the proper PPE required for a specific task.
- Decontamination Procedures – A program to establish decontamination procedures for both personnel and equipment.
- Emergency Response Program – A program to establish the training required to perform specified project tasks.
- Medical Surveillance – A program to ensure that workers are medically qualified to perform specified tasks in compliance with OSHA 29 CFR 1910.120
- Hazard Communication Training – A program to familiarize employees with the chemical hazards of materials used during the project.
- Permit Programs – A program to document and control activities such as Excavation, Confined Space Entry, Hot Work and Lockout/Tagout. Confined space entry or lockout/tagout was not required as part of this action. Hot work permits were required for some activities discussed in **Section 3.3** below.

OHM established a Health and Safety Plan commensurate with the procedures and conditions that prevailed throughout the construction activities.

All OHM personnel and subcontractors on-site were 40-hour OSHA trained. In addition, all personnel on-site were required to sign the Site Specific Health and Safety Plan.

Before any equipment was placed into operation a checklist of all safety related equipment, such as backup alarms and lights, was reviewed and the equipment was verified to be operational.

3.3 Hot Work Permits

Welding and cutting of the steel encased anchor weights, the ship rudder, and other steel debris was necessary to arrange transportation of scrap and debris. Some welding/cutting was necessary which required a Hotwork Permit. A record of hotwork permit logs are provided in **Appendix Y**

3.4 Incidents

There were no safety incidents that required reporting. The job involved an effort of 2077 field man-hours with no OSHA reportable incidents, near misses, or lost time accidents.

4.0 Quality Control Summary Report

OHM adhered to the Quality Control Plan by commencing the project with a pre-construction meeting held on August 20, 2002. The submission of Daily Contractor Production Reports (CPRs), Quality Control (QC) Reports and Monthly Progress Reports (MPRs) were in accordance with the work plan and RAC Contract with the Navy.

As noted in **Section 2.14**, **Appendix U** contains copies of the daily Contractor Production Reports that were submitted to the Navy. These reports document the number and the type of personnel at the site, work performed, site safety, and other project quality control issues.

OHM met all Quality Control technical requirements, including analytical results for the disposal of debris removal. The disturbed areas of the site were seeded with an appropriate mixture, in accordance with the work plan and associated scope documents.

The Project Manger and Site Supervisor, who communicated with the Navy frequently, aptly handled quality concerns associated with field changes and additions/deletions. Bi-weekly Contractor Quality Control (CQC) meetings were held with the site supervisor, project manager, LANTDIV program manager and key Navy personnel. Copies of the meeting minutes are provided in **Appendix Z**. In both preplanning, day to day operation, documentation and record keeping and regular communication with the Navy, the intent of the Quality Control Program was fulfilled.

Photographs were taken of the site to document observations, work in progress and completed work. Work in progress photographs are to be included in **Appendix AA** upon release from the Navy pending a security review, which is still in progress. Photographs documenting the pre-construction conditions at Site 7 are contained in **Appendix B** as noted earlier **in Section 2.2.**

Appendix B
Complete Confirmatory Sample Analytical Results

Appendix B
Site 3 Surface Soil
Confirmatory Sample Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS03-CS2-SS07	SJS03-CS2-SS08		SJS03-CS2-SS09	SJS03-CS2-SS10
Sample ID	SJS03-CS2-SS07-000	SJS03-CS2-SS08P-000	SJS03-CS2-SS08-000	SJS03-CS2-SS09-000	SJS03-CS2-SS10-000
Sample Date	09/27/02	09/27/02	09/27/02	09/27/02	09/27/02
Chemical Name					
Semivolatile Organic Compounds (UG/KG)					
1,1-Biphenyl	850 U	430 U	380 U	430 U	570 U
2,2'-Oxybis(1-chloropropane)	850 U	430 U	380 U	430 U	570 U
2,4,5-Trichlorophenol	2,100 U	1,100 U	950 U	1,100 U	1,400 U
2,4,6-Trichlorophenol	850 U	430 U	380 U	430 U	570 U
2,4-Dichlorophenol	850 U	430 U	380 U	430 U	570 U
2,4-Dimethylphenol	850 U	430 U	380 U	430 U	570 U
2,4-Dinitrophenol	2,100 U	1,100 U	950 U	1,100 U	1,400 U
2,4-Dinitrotoluene	850 U	430 U	380 U	430 U	570 U
2,6-Dinitrotoluene	850 U	430 U	380 U	430 U	570 U
2-Chloronaphthalene	850 U	430 U	380 U	430 U	570 U
2-Chlorophenol	850 U	430 U	380 U	430 U	570 U
2-Methylnaphthalene	74 J	430 U	380 U	430 U	570 U
2-Methylphenol	850 U	430 U	380 U	430 U	570 U
2-Nitroaniline	2,100 U	1,100 U	950 U	1,100 U	1,400 U
2-Nitrophenol	850 U	430 U	380 U	430 U	570 U
3,3'-Dichlorobenzidine	850 U	430 U	380 U	430 U	570 U
3-Nitroaniline	2,100 U	1,100 U	950 U	1,100 U	1,400 U
4,6-Dinitro-2-methylphenol	2,100 U	1,100 U	950 U	1,100 U	1,400 U
4-Bromophenyl-phenylether	850 U	430 U	380 U	430 U	570 U
4-Chloro-3-methylphenol	850 U	430 U	380 U	430 U	570 U
4-Chloroaniline	850 U	430 U	380 U	430 U	570 U
4-Chlorophenyl-phenylether	850 U	430 U	380 U	430 U	570 U
4-Methylphenol	850 U	430 U	380 U	430 U	570 U
4-Nitroaniline	2,100 U	1,100 U	950 U	1,100 U	1,400 U
4-Nitrophenol	2,100 U	1,100 U	950 U	1,100 U	1,400 U
Acenaphthene	850 U	430 U	380 U	430 U	570 U
Acenaphthylene	32 J	20 J	21 J	430 U	48 J
Acetophenone	850 U	430 U	380 U	430 U	570 U
Anthracene	37 J	23 J	17 J	430 U	45 J
Atrazine	850 U	430 U	380 U	430 U	570 U
Benzaldehyde	71 J	430 U	380 U	430 U	570 U
Benzo(a)anthracene	79 J	82 J	52 J	19 J	78 J
Benzo(a)pyrene	95 J	69 J	52 J	20 J	76 J
Benzo(b)fluoranthene	170 J	62 J	45 J	33 J	230 J
Benzo(g,h,i)perylene	150 J	430 U	380 U	430 U	83 J
Benzo(k)fluoranthene	200 J	63 J	64 J	26 J	170 J
Butylbenzylphthalate	850 U	430 U	380 U	430 U	570 U
Caprolactam	850 U	160 J	380 U	170 J	270 J

Appendix B
Site 3 Surface Soil
Confirmatory Sample Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS03-CS2-SS07	SJS03-CS2-SS08		SJS03-CS2-SS09	SJS03-CS2-SS10
Sample ID	SJS03-CS2-SS07-000	SJS03-CS2-SS08P-000	SJS03-CS2-SS08-000	SJS03-CS2-SS09-000	SJS03-CS2-SS10-000
Sample Date	09/27/02	09/27/02	09/27/02	09/27/02	09/27/02
Chemical Name					
Carbazole	850 U	430 U	380 U	430 U	570 U
Chrysene	120 J	110 J	59 J	32 J	220 J
Di-n-butylphthalate	850 U	430 U	380 U	430 U	570 U
Di-n-octylphthalate	850 U	430 U	86 J	430 U	200 J
Dibenz(a,h)anthracene	37 J	17 J	18 J	430 U	47 J
Dibenzofuran	850 U	430 U	380 U	430 U	570 U
Diethylphthalate	850 U	430 U	380 U	430 U	570 U
Dimethyl phthalate	850 U	430 U	380 U	430 U	570 U
Fluoranthene	100 J	100 J	56 J	21 J	120 J
Fluorene	850 U	430 U	380 U	430 U	570 U
Hexachlorobenzene	850 U	430 U	380 U	430 U	570 U
Hexachlorobutadiene	850 U	430 U	380 U	430 U	570 U
Hexachlorocyclopentadiene	850 U	430 U	380 U	430 U	570 U
Hexachloroethane	850 U	430 U	380 U	430 U	570 U
Indeno(1,2,3-cd)pyrene	91 J	36 J	26 J	14 J	87 J
Isophorone	850 U	430 U	380 U	430 U	570 U
Naphthalene	36 J	10 J	10 J	430 U	570 U
Nitrobenzene	850 U	430 U	380 U	430 U	570 U
Pentachlorophenol	2,100 U	1,100 U	950 U	1,100 U	1,400 U
Phenanthrene	73 J	110 J	35 J	430 U	29 J
Phenol	25 J	430 U	380 U	430 U	570 U
Pyrene	190 J	180 J	92 J	24 J	99 J
bis(2-Chloroethoxy)methane	850 U	430 U	380 U	430 U	570 U
bis(2-Chloroethyl)ether	850 U	430 U	380 U	430 U	570 U
bis(2-Ethylhexyl)phthalate	260 B	110 B	73 B	23 B	140 B
n-Nitroso-di-n-propylamine	850 U	430 U	380 U	430 U	570 U
n-Nitrosodiphenylamine	850 U	430 U	380 U	430 U	570 U
Total Metals (MG/KG)					
Aluminum	4,760	9,290	8,670	6,750	26,300
Antimony	0.42 B	0.38 U	0.34 U	0.39 U	0.81 B
Arsenic	8.4	3	4.5	5	19.4
Barium	31.9 J	53.6	44.3	36.6 J	89.4
Beryllium	0.23 B	0.27 B	0.2 B	0.71 B	0.69 B
Cadmium	0.32 B	0.048 U	0.042 U	0.049 U	0.064 U
Calcium	4,850	1,320	1,350	4,780	2,640
Chromium	9.7	13.2	14.5	13	53
Cobalt	10.7 J	1.2 J	1.2 J	5.6 J	6.3 J
Copper	23.6	14.5	23.5	20.5	35.5
Iron	8,390	6,420	7,540	12,900	46,900

Appendix B
Site 3 Surface Soil
Confirmatory Sample Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS03-CS2-SS07	SJS03-CS2-SS08		SJS03-CS2-SS09	SJS03-CS2-SS10
Sample ID	SJS03-CS2-SS07-000	SJS03-CS2-SS08P-000	SJS03-CS2-SS08-000	SJS03-CS2-SS09-000	SJS03-CS2-SS10-000
Sample Date	09/27/02	09/27/02	09/27/02	09/27/02	09/27/02
Chemical Name					
Lead	74.2	38.7	47.6	36.2	53
Magnesium	773 J	610 J	633 J	1,290	5,760
Manganese	245 J	38.7	41.7	131	148
Mercury	0.17 L	0.054 U	0.052 U	0.1 J	0.48
Nickel	17	4.9 J	4.6 J	10.1	15.9
Potassium	364 J	369 J	389 J	854 J	3,950
Selenium	0.74 U	0.69 U	0.65 B	0.71 U	2.3 B
Silver	0.18 U	0.17 U	0.15 U	0.17 U	0.23 U
Sodium	108 B	280 B	204 B	193 B	181 B
Thallium	0.67 UL	0.62 U	0.55 U	0.63 U	0.83 U
Vanadium	17.9	17.2	18.3	17	61.3
Zinc	214	30.1 J	52.7 J	68.1	116

Notes:

B - Possible blank contamination

J - Analyte present, reported result is estimated

L - Reported value is biased low

U - Not detected

Appendix B
Site 3 Subsurface Soil
Confirmatory Sample Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS03-CS1-SB01	SJS03-CS1-SB02	SJS03-CS1-SB03	SJS03-CS1-SB04	SJS03-CS1-SB05	SJS03-CS1-SB06	SJS03-CS1-SB07	SJS03-CS1-SB08
Sample ID	SJS03-CS1-SB01-003	SJS03-CS1-SB02-003	SJS03-CS1-SB03-003	SJS03-CS1-SB04-003	SJS03-CS1-SB05-003	SJS03-CS1-SB06-003	SJS03-CS1-SB07-003	SJS03-CS1-SB08-003
Sample Date	09/27/02	09/27/02	09/27/02	09/27/02	09/27/02	09/27/02	09/27/02	09/27/02
Chemical Name								
Total Metals (MG/KG)								
Aluminum	12,800	3,850	13,800	7,510	17,800	18,800	16,000	7,790
Antimony	0.56 U	0.42 U	0.54 U	0.43 U	0.63 U	0.58 U	0.57 U	0.42 U
Arsenic	9.3	4.7	9.2	6.4	14.4	11.8	11.3	6.4
Barium	33.5 J	15.9 J	41.2 J	36.7 J	47.8 J	52.9 J	39.7 J	23.9 J
Beryllium	0.78 B	0.33 B	0.88 B	0.54 B	1.3 B	1.2 B	0.98 B	0.65 B
Cadmium	0.07 U	0.052 U	0.068 U	0.054 U	0.079 U	0.073 U	0.071 U	0.18 B
Calcium	2,810	1,150 J	4,850	3,100	3,900	4,290	2,980	1,890
Chromium	26.9	9.5	27.2	16	34.6	35.4	32	16
Cobalt	7.3 J	4.6 J	8.4 J	4.7 J	18 J	10.5 J	9.8 J	13.3
Copper	21	28.1	31.7	110	39.8	35.1	26.4	10.1
Iron	27,900	9,370	28,800	17,700	36,200	41,700	31,300	20,800
Lead	36.3	22.2	41.9	48.9	57.5	66.9	45.3	11.5
Magnesium	4,250	1,190 J	4,200	2,250	5,130	5,020	5,230	2,640
Manganese	267	68.9	271	158	341	340	292	115
Mercury	0.46	0.17	0.28	0.25	0.46	0.45	0.56	0.13
Nickel	13.3 J	5.9 J	15	8.4 J	26.7	19.5	17.6	20.4
Potassium	1,930	741 J	2,140	1,300 J	2,500	2,420	2,410	1,320 J
Selenium	1.8 B	0.76 U	1.9 B	1.3 B	2.6 B	2.6 B	2.4 B	1 B
Silver	0.24 U	0.18 U	0.24 U	0.19 U	0.28 U	0.26 U	0.25 U	0.18 U
Sodium	1,280 J	446 J	380 B	445 J	980 J	254 B	1,550 J	347 J
Thallium	0.91 U	0.68 U	0.88 U	0.7 U	1 U	0.95 U	0.92 U	0.69 U
Vanadium	31.3	11.3 J	32.6	18.8	40.2	42.2	36.6	18.4
Zinc	76.2	60.3	96.7	84.6	291	134	106	135

Notes:

B - Possible blank contamination

J - Analyte present, reported result is estimated

U - Not detected

Appendix B
Site 3 Subsurface Soil
Confirmatory Sample Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS03-CS1-SB09		SJS03-CS1-SB10	
Sample ID	SJS03-CS1-SB09-003		SJS03-CS1-SB10-003	
Sample Date	09/27/02		09/27/02	
Chemical Name				
Total Metals (MG/KG)				
Aluminum	2,540		4,460	
Antimony	0.41	U	0.44	U
Arsenic	4.8		1.9	J
Barium	14.7	J	48	J
Beryllium	0.17	B	0.18	B
Cadmium	0.051	U	0.055	U
Calcium	595	J	595	J
Chromium	6.3		10	
Cobalt	3.7	J	1.1	J
Copper	24.8		10.9	
Iron	8,290		4,670	
Lead	37		22.8	
Magnesium	628	J	850	J
Manganese	54.5		25.5	
Mercury	0.077	J	0.14	
Nickel	4.5	J	3.1	J
Potassium	474	J	560	J
Selenium	1.2	B	0.79	U
Silver	0.18	U	0.19	U
Sodium	109	B	211	B
Thallium	0.66	U	0.71	U
Vanadium	6.5	J	10.9	J
Zinc	64.6		13.8	

Notes:

B - Possible blank contamin

J - Analyte present, reporte

U - Not detected

Appendix B
Site 6 Surface Soil
Confirmatory Sample Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS06-CS2-SS06	SJS06-CS2-SS09	SJS06-SS07		SJS06-SS08
Sample ID	SJS06-CS2-SS06-000	SJS06-CS2-SS09-000	SJS06-CS2-SS07-000	SJS06-CS2-SS07P-000	SJS06-CS2-SS08-000
Sample Date	11/04/02	11/04/02	11/04/02	11/04/02	11/04/02
Chemical Name					
Semivolatile Organic Compounds (UG/KG)					
1,1-Biphenyl	440 U	440 U	400 U	450 U	420 U
2,2'-Oxybis(1-chloropropane)	440 U	440 U	400 U	450 U	420 U
2,4,5-Trichlorophenol	1,100 U	1,100 U	1,000 U	1,100 U	1,100 U
2,4,6-Trichlorophenol	440 U	440 U	400 U	450 U	420 U
2,4-Dichlorophenol	440 U	440 U	400 U	450 U	420 U
2,4-Dimethylphenol	440 U	440 U	400 U	450 U	420 U
2,4-Dinitrophenol	1,100 U	1,100 U	1,000 U	1,100 U	1,100 U
2,4-Dinitrotoluene	68 J	440 U	400 U	450 U	420 U
2,6-Dinitrotoluene	440 U	440 U	400 U	450 U	420 U
2-Chloronaphthalene	440 U	440 U	400 U	450 U	420 U
2-Chlorophenol	440 U	440 U	400 U	450 U	420 U
2-Methylnaphthalene	440 U	440 U	400 U	450 U	420 U
2-Methylphenol	440 U	440 U	400 U	450 U	420 U
2-Nitroaniline	1,100 U	1,100 U	1,000 U	1,100 U	1,100 U
2-Nitrophenol	440 U	440 U	400 U	450 U	420 U
3,3'-Dichlorobenzidine	440 U	440 U	400 U	450 U	420 U
3-Nitroaniline	1,100 U	1,100 U	1,000 U	1,100 U	1,100 U
4,6-Dinitro-2-methylphenol	1,100 U	1,100 U	1,000 U	1,100 U	1,100 U
4-Bromophenyl-phenylether	440 U	440 U	400 U	450 U	420 U
4-Chloro-3-methylphenol	440 U	440 U	400 U	450 U	420 U
4-Chloroaniline	440 U	440 U	400 U	450 U	420 U
4-Chlorophenyl-phenylether	440 U	440 U	400 U	450 U	420 U
4-Methylphenol	440 U	440 U	400 U	450 U	420 U
4-Nitroaniline	1,100 U	1,100 U	43 J	460 J	1,100 U
4-Nitrophenol	1,100 U	1,100 U	1,000 U	1,100 U	1,100 U
Acenaphthene	440 U	440 U	400 U	450 U	420 U
Acenaphthylene	21 J	440 U	79 J	95 J	18 J
Acetophenone	47 B	53 B	50 B	66 B	61 B
Anthracene	23 J	440 U	110 J	150 J	18 J
Atrazine	440 U	440 U	400 U	450 U	420 U
Benzaldehyde	50 B	57 B	61 B	73 B	48 B
Benzo(a)anthracene	55 J	27 J	190 J	230 J	55 J
Benzo(a)pyrene	72 J	35 J	180 J	210 J	62 J
Benzo(b)fluoranthene	86 J	31 J	220 J	240 J	77 J
Benzo(g,h,i)perylene	58 J	440 U	120 J	120 J	420 U
Benzo(k)fluoranthene	89 J	38 J	220 J	260 J	72 J

Appendix B
Site 6 Surface Soil
Confirmatory Sample Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS06-CS2-SS06	SJS06-CS2-SS09	SJS06-SS07		SJS06-SS08
Sample ID	SJS06-CS2-SS06-000	SJS06-CS2-SS09-000	SJS06-CS2-SS07-000	SJS06-CS2-SS07P-000	SJS06-CS2-SS08-000
Sample Date	11/04/02	11/04/02	11/04/02	11/04/02	11/04/02
Chemical Name					
Butylbenzylphthalate	440 U	440 U	400 U	450 U	420 U
Caprolactam	440 U	440 U	400 U	450 U	420 U
Carbazole	440 U	440 U	14 J	13 J	420 U
Chrysene	83 J	33 J	240 J	280 J	90 J
Di-n-butylphthalate	26 J	440 U	21 J	450 U	37 J
Di-n-octylphthalate	440 U	440 U	400 U	450 U	420 U
Dibenz(a,h)anthracene	440 U	440 U	34 J	38 J	420 U
Dibenzofuran	440 U	440 U	400 U	450 U	420 U
Diethylphthalate	440 U	440 U	400 U	450 U	420 U
Dimethyl phthalate	440 U	440 U	400 U	450 U	420 U
Fluoranthene	80 J	49 J	210 J	200 J	180 J
Fluorene	440 U	440 U	400 U	450 U	420 U
Hexachlorobenzene	440 U	440 U	400 U	450 U	420 U
Hexachlorobutadiene	440 U	440 U	400 U	450 U	420 U
Hexachlorocyclopentadiene	440 U	440 U	400 U	450 U	420 U
Hexachloroethane	440 U	440 U	400 U	450 U	420 U
Indeno(1,2,3-cd)pyrene	71 J	28 J	160 J	150 J	52 J
Isophorone	440 U	440 U	400 U	450 U	420 U
Naphthalene	440 U	440 U	400 U	12 J	420 U
Nitrobenzene	440 U	440 U	400 U	450 U	420 U
Pentachlorophenol	1,100 U	1,100 U	1,000 U	1,100 U	1,100 U
Phenanthrene	31 J	25 J	45 J	36 J	49 J
Phenol	440 U	440 U	400 U	450 U	420 U
Pyrene	61 J	47 J	240 J	230 J	150 J
bis(2-Chloroethoxy)methane	440 U	440 U	400 U	450 U	420 U
bis(2-Chloroethyl)ether	440 U	440 U	400 U	450 U	420 U
bis(2-Ethylhexyl)phthalate	37 B	47 B	31 B	55 B	44 B
n-Nitroso-di-n-propylamine	440 U	440 U	400 U	450 U	420 U
n-Nitrosodiphenylamine	440 U	440 U	400 U	450 U	420 U
Total Metals (MG/KG)					
Aluminum	9,930	3,190	1,920	2,090	4,920
Antimony	9.7 J	0.39 B	9.1 J	11.4 J	28 J
Arsenic	29.1	1.8 J	18.8	16.9	37.7 J
Barium	23,900	104	554	579	642
Beryllium	0.42 J	0.14 J	0.1 J	0.13 J	0.27 J
Cadmium	7.5	0.67 J	1.2 J	1.1 J	47.8 J
Calcium	9,080	1,710	1,630	1,600	4,420 J

Appendix B
Site 6 Surface Soil
Confirmatory Sample Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS06-CS2-SS06	SJS06-CS2-SS09	SJS06-SS07		SJS06-SS08
Sample ID	SJS06-CS2-SS06-000	SJS06-CS2-SS09-000	SJS06-CS2-SS07-000	SJS06-CS2-SS07P-000	SJS06-CS2-SS08-000
Sample Date	11/04/02	11/04/02	11/04/02	11/04/02	11/04/02
Chemical Name					
Chromium	81.3	8.7	29.8	32.7	37.3 J
Cobalt	5.7 J	0.78 B	1.8 J	2 J	3.4 J
Copper	690	14.4	906 J	370 J	192
Iron	13,800	4,040	7,780	8,170	66,800 J
Lead	2,210	45.6	480	516	442
Magnesium	9,820	537 J	554 J	601 J	1,240 J
Manganese	1,870	40.5	99.4	110	393 J
Mercury	0.12 J	0.067 U	0.089 J	0.12 J	0.11 J
Nickel	11.2	3.5 J	7 J	6.9 J	10.9
Potassium	1,120 J	413 J	303 J	332 J	899 J
Selenium	1.5	0.77 U	0.71 U	0.82 U	2.1 J
Silver	0.34 J	0.21 U	0.19 U	0.22 U	0.2 U
Sodium	79.2 U	78.3 U	71.8 U	82.8 U	77.6 U
Thallium	0.62 U	0.62 U	0.57 U	0.65 U	3.3 J
Vanadium	22.8	12.9	12.4	12.7 J	28.3
Zinc	3,850	66.5	2,830	1,550	1,010

Notes:

B - Possible blank contamination

J - Analyte present, reported result is estimated

U - Not detected

Appendix B
Site 6 Subsurface Soil
Confirmatory Sample Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS06-CS1-SB05	
Sample ID	SJS06-CS1-SB05-003	
Sample Date	09/27/02	
Chemical Name		
Total Metals (MG/KG)		
Aluminum	7,510	
Antimony	0.37	U
Arsenic	3.2	
Barium	36.7	J
Beryllium	0.47	B
Cadmium	0.046	U
Calcium	3,860	
Chromium	14.2	
Cobalt	3.4	B
Copper	15.8	
Iron	12,100	
Lead	22.4	
Magnesium	1,720	
Manganese	105	
Mercury	0.068	J
Nickel	6.8	J
Potassium	823	J
Selenium	0.68	B
Silver	0.16	U
Sodium	112	B
Thallium	0.6	U
Vanadium	16.6	
Zinc	58.7	

Notes:

B - Possible blank contamination

J - Analyte present, reported result is estimated

U - Not detected

Appendix B
Site 6 Groundwater Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID **Sample ID** **Sample Date**	SJS06-CS2-GW01 SJS06-CS2-GW01 09/10/02
Chemical Name	
Volatile Organic Compounds (UG/L)	
1,1,1-Trichloroethane	10 U
1,1,2,2-Tetrachloroethane	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U
1,1,2-Trichloroethane	10 U
1,1-Dichloroethane	10 U
1,1-Dichloroethene	10 U
1,2,4-Trichlorobenzene	10 U
1,2-Dibromo-3-chloropropane	10 U
1,2-Dibromoethane	10 U
1,2-Dichlorobenzene	10 U
1,2-Dichloroethane	10 U
1,2-Dichloropropane	10 U
1,3-Dichlorobenzene	10 U
1,4-Dichlorobenzene	10 U
2-Butanone	10 U
2-Hexanone	10 U
4-Methyl-2-pentanone	10 U
Acetone	10 U
Benzene	10 U
Bromodichloromethane	10 U
Bromoform	10 U
Bromomethane	10 U
Carbon disulfide	10 U
Carbon tetrachloride	10 U
Chlorobenzene	10 U
Chloroethane	10 U
Chloroform	10 U
Chloromethane	10 U
Cumene	10 U
Cyclohexane	10 U
Dibromochloromethane	10 U
Dichlorodifluoromethane(Freon-12)	10 U
Ethylbenzene	10 U
Methyl acetate	10 U
Methyl-tert-butyl ether (MTBE)	10 U
Methylcyclohexane	10 U
Methylene chloride	17 B
Styrene	10 U
Tetrachloroethene	10 U
Toluene	1 J
Trichloroethene	10 U
Trichlorofluoromethane(Freon-11)	10 U
Vinyl chloride	10 U
Xylene, total	10 U
cis-1,2-Dichloroethene	10 U
cis-1,3-Dichloropropene	10 U
trans-1,2-Dichloroethene	10 U
trans-1,3-Dichloropropene	10 U
Semivolatile Organic Compounds (UG/L)	
1,1-Biphenyl	10 U
2,2'-Oxybis(1-chloropropane)	10 U
2,4,5-Trichlorophenol	25 U
2,4,6-Trichlorophenol	10 U
2,4-Dichlorophenol	10 U
2,4-Dimethylphenol	10 U
2,4-Dinitrophenol	25 U

Appendix B
Site 6 Groundwater Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS06-CS2-GW01
Sample ID	SJS06-CS2-GW01
Sample Date	09/10/02
Chemical Name	
2,4-Dinitrotoluene	10 U
2,6-Dinitrotoluene	10 U
2-Chloronaphthalene	10 U
2-Chlorophenol	10 U
2-Methylnaphthalene	10 U
2-Methylphenol	10 U
2-Nitroaniline	25 U
2-Nitrophenol	10 U
3,3'-Dichlorobenzidine	10 U
3-Nitroaniline	25 U
4,6-Dinitro-2-methylphenol	25 U
4-Bromophenyl-phenylether	10 U
4-Chloro-3-methylphenol	10 U
4-Chloroaniline	10 U
4-Chlorophenyl-phenylether	10 U
4-Methylphenol	10 U
4-Nitroaniline	25 U
4-Nitrophenol	25 U
Acenaphthene	10 U
Acenaphthylene	10 U
Acetophenone	10 U
Anthracene	10 U
Atrazine	10 U
Benzaldehyde	10 U
Benzo(a)anthracene	10 U
Benzo(a)pyrene	10 U
Benzo(b)fluoranthene	10 U
Benzo(g,h,i)perylene	10 U
Benzo(k)fluoranthene	10 U
Butylbenzylphthalate	10 U
Caprolactam	10 U
Carbazole	10 U
Chrysene	10 U
Di-n-butylphthalate	0.5 J
Di-n-octylphthalate	10 U
Dibenz(a,h)anthracene	10 U
Dibenzofuran	10 U
Diethylphthalate	10 U
Dimethyl phthalate	10 U
Fluoranthene	10 U
Fluorene	10 U
Hexachlorobenzene	10 U
Hexachlorobutadiene	10 U
Hexachlorocyclopentadiene	10 U
Hexachloroethane	10 U
Indeno(1,2,3-cd)pyrene	10 U
Isophorone	10 U
Naphthalene	10 U
Nitrobenzene	10 U
Pentachlorophenol	25 U
Phenanthrene	10 U
Phenol	10 U
Pyrene	10 U
bis(2-Chloroethoxy)methane	10 U
bis(2-Chloroethyl)ether	10 U
bis(2-Ethylhexyl)phthalate	1 J
n-Nitroso-di-n-propylamine	10 U
n-Nitrosodiphenylamine	10 U

Appendix B
Site 6 Groundwater Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS06-CS2-GW01
Sample ID	SJS06-CS2-GW01
Sample Date	09/10/02
Chemical Name	
Pesticide/Polychlorinated Biphenyls (UG/L)	
4,4'-DDD	0.1 U
4,4'-DDE	0.1 U
4,4'-DDT	0.1 U
Aldrin	0.05 U
Aroclor-1016	1 U
Aroclor-1221	2 U
Aroclor-1232	1 U
Aroclor-1242	1 U
Aroclor-1248	1 U
Aroclor-1254	1 U
Aroclor-1260	1 U
Dieldrin	0.1 U
Endosulfan I	0.05 U
Endosulfan II	0.1 U
Endosulfan sulfate	0.1 U
Endrin	0.1 U
Endrin aldehyde	0.1 U
Endrin ketone	0.1 U
Heptachlor	0.05 U
Heptachlor epoxide	0.05 U
Methoxychlor	0.5 U
Toxaphene	5 U
alpha-BHC	0.05 U
alpha-Chlordane	0.05 U
beta-BHC	0.05 U
beta-Chlordane	0.05 U
delta-BHC	0.05 U
gamma-BHC (Lindane)	0.05 U
Explosives (UG/L)	
1,3,5-Trinitrobenzene	2.2 U
1,3-Dinitrobenzene	2.2 U
2,4,6-Trinitrotoluene	4.4 U
2,4-Dinitrotoluene	5.5 U
2,6-Dinitrotoluene	5.5 U
2-Amino-4,6-dinitrotoluene	6.6 U
2-Nitrotoluene	5.5 U
3-Nitrotoluene	4.4 U
4-Amino-2,6-dinitrotoluene	4.4 U
4-Nitrotoluene	5.5 U
HMX	4.4 U
Nitrobenzene	3.3 U
RDX	5.5 U
Tetryl	4.4 U
Total Metals (UG/L)	
Aluminum	957
Antimony	1.7 U
Arsenic	2.7 J
Barium	128 J
Beryllium	0.22 B
Cadmium	0.4 U
Calcium	239,000
Chromium	2.4 B
Cobalt	2 J
Copper	1.1 J
Cyanide	1.5 U
Iron	1,080

Appendix B
Site 6 Groundwater Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS06-CS2-GW01
Sample ID	SJS06-CS2-GW01
Sample Date	09/10/02
Chemical Name	
Lead	2 J
Magnesium	120,000
Manganese	642
Mercury	0.1 U
Nickel	2.4 J
Potassium	34,700
Selenium	1.7 U
Silver	0.5 U
Sodium	97,300
Thallium	4.2 UJ
Vanadium	6.5 J
Zinc	51.7
Dissolved Metals (UG/L)	
Aluminum	57.4 B
Antimony	1.7 U
Arsenic	2.5 U
Barium	127 J
Beryllium	0.2 U
Cadmium	0.4 U
Calcium	235,000
Chromium	1.1 B
Cobalt	1.8 J
Copper	1.4 J
Iron	8.6 U
Lead	1.3 U
Magnesium	118,000
Manganese	628
Mercury	0.1 U
Nickel	1.5 J
Potassium	33,800
Selenium	2.7 B
Silver	0.5 U
Sodium	96,000
Thallium	4.2 U
Vanadium	4.9 J
Zinc	43.3

Notes:

B - Possible blank contamination

J - Analyte present, reported result is estimated

U - Not detected

Appendix B
QA/QC Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC						
Sample ID	SJS06-EB090602	SJS06-FB090602	SJS06-TB091002	SJS03-FB092702	SJS03-EB092702	SJS06-FB110402	SJS06-EB110402
Sample Date	09/06/02	09/06/02	09/10/02	09/27/02	09/27/02	11/04/02	11/04/02
Chemical Name							
Volatile Organic Compounds (UG/L)							
1,1,1-Trichloroethane	NA	NA	10 U	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	10 U	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	10 U	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	10 U	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	10 U	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	10 U	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	10 U	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	10 U	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	10 U	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	10 U	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	10 U	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	10 U	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	10 U	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	10 U	NA	NA	NA	NA
2-Butanone	NA	NA	10 U	NA	NA	NA	NA
2-Hexanone	NA	NA	10 U	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	10 U	NA	NA	NA	NA
Acetone	NA	NA	10 U	NA	NA	NA	NA
Benzene	NA	NA	10 U	NA	NA	NA	NA
Bromodichloromethane	NA	NA	10 U	NA	NA	NA	NA
Bromoform	NA	NA	10 U	NA	NA	NA	NA
Bromomethane	NA	NA	10 U	NA	NA	NA	NA
Carbon disulfide	NA	NA	10 U	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	10 U	NA	NA	NA	NA
Chlorobenzene	NA	NA	10 U	NA	NA	NA	NA
Chloroethane	NA	NA	10 U	NA	NA	NA	NA
Chloroform	NA	NA	10 U	NA	NA	NA	NA
Chloromethane	NA	NA	10 U	NA	NA	NA	NA
Cumene	NA	NA	10 U	NA	NA	NA	NA
Cyclohexane	NA	NA	10 U	NA	NA	NA	NA
Dibromochloromethane	NA	NA	10 U	NA	NA	NA	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	10 U	NA	NA	NA	NA
Ethylbenzene	NA	NA	10 U	NA	NA	NA	NA
Methyl acetate	NA	NA	10 U	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	10 U	NA	NA	NA	NA
Methylcyclohexane	NA	NA	10 U	NA	NA	NA	NA
Methylene chloride	NA	NA	18 J	NA	NA	NA	NA
Styrene	NA	NA	10 U	NA	NA	NA	NA
Tetrachloroethene	NA	NA	10 U	NA	NA	NA	NA
Toluene	NA	NA	1 J	NA	NA	NA	NA
Trichloroethene	NA	NA	10 U	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	10 U	NA	NA	NA	NA
Vinyl chloride	NA	NA	10 U	NA	NA	NA	NA
Xylene, total	NA	NA	10 U	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	10 U	NA	NA	NA	NA

Station ID	STJ-QC						
Sample ID	SJS06-EB090602	SJS06-FB090602	SJS06-TB091002	SJS03-FB092702	SJS03-EB092702	SJS06-FB110402	SJS06-EB110402
Sample Date	09/06/02	09/06/02	09/10/02	09/27/02	09/27/02	11/04/02	11/04/02
Chemical Name							
cis-1,3-Dichloropropene	NA	NA	10 U	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	10 U	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	10 U	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/L)							
1,1-Biphenyl	10 U	10 U	NA	10 U	10 U	10 U	10 U
2,2'-Oxybis(1-chloropropane)	10 U	10 U	NA	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25 U	25 U	NA	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10 U	10 U	NA	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	NA	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	NA	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25 U	25 U	NA	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10 U	10 U	NA	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	NA	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10 U	10 U	NA	10 U	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	NA	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	NA	10 U	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	NA	10 U	10 U	10 U	10 U
2-Nitroaniline	25 U	25 U	NA	25 U	25 U	25 U	25 U
2-Nitrophenol	10 U	10 U	NA	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	NA	10 U	10 U	10 U	10 U
3-Nitroaniline	25 U	25 U	NA	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	NA	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10 U	10 U	NA	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	NA	10 U	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	NA	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	NA	10 U	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	NA	10 U	10 U	10 U	10 U
4-Nitroaniline	25 U	25 U	NA	25 U	25 U	25 U	25 U
4-Nitrophenol	25 U	25 U	NA	25 U	25 U	25 U	25 U
Acenaphthene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Acetophenone	10 U	10 U	NA	10 U	10 U	10 U	10 U
Anthracene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Atrazine	10 U	10 U	NA	10 U	10 U	10 U	10 U
Benzaldehyde	10 U	10 U	NA	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10 U	10 U	NA	10 U	10 U	10 U	10 U
Caprolactam	10 U	10 U	NA	10 U	10 U	10 U	10 U
Carbazole	10 U	10 U	NA	10 U	10 U	10 U	10 U
Chrysene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10 U	10 U	NA	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10 U	10 U	NA	10 U	10 U	10 U	10 U

Appendix B
QA/QC Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC						
Sample ID	SJS06-EB090602	SJS06-FB090602	SJS06-TB091002	SJS03-FB092702	SJS03-EB092702	SJS06-FB110402	SJS06-EB110402
Sample Date	09/06/02	09/06/02	09/10/02	09/27/02	09/27/02	11/04/02	11/04/02
Chemical Name							
Dibenz(a,h)anthracene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Dibenzofuran	10 U	10 U	NA	10 U	10 U	10 U	10 U
Diethylphthalate	10 U	10 U	NA	10 U	10 U	10 U	10 U
Dimethyl phthalate	10 U	10 U	NA	10 U	10 U	10 U	10 U
Fluoranthene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Fluorene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	NA	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Isophorone	10 U	10 U	NA	10 U	10 U	10 U	10 U
Naphthalene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Pentachlorophenol	25 U	25 U	NA	25 U	25 U	25 U	25 U
Phenanthrene	10 U	10 U	NA	10 U	10 U	10 U	10 U
Phenol	10 U	10 U	NA	10 U	10 U	10 U	10 U
Pyrene	10 U	10 U	NA	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10 U	10 U	NA	10 U	10 U	10 U	10 U
bis(2-Chloroethyl)ether	10 U	10 U	NA	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	0.7 J	10 U	NA	10 U	10 U	10 U	10 U
n-Nitroso-di-n-propylamine	10 U	10 U	NA	10 U	10 U	10 U	10 U
n-Nitrosodiphenylamine	10 U	10 U	NA	10 U	10 U	10 U	10 U
Total Metals (UG/L)							
Aluminum	19.4 J	15.2 J	NA	13.8 J	11.1 J	56.7 U	56.7 U
Antimony	1.7 U	1.7 U	NA	3.3 J	3.9 J	1.2 U	2.3 J
Arsenic	2.5 U	2.5 U	NA	2.5 U	2.5 U	3 U	3 U
Barium	0.73 J	1.2 J	NA	1.2 J	0.6 J	0.3 U	3.8 J
Beryllium	0.2 U	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.2 U
Cadmium	0.4 U	0.4 U	NA	0.4 U	0.4 U	0.3 U	0.3 U
Calcium	13.5 J	10.2 U	NA	15.7 J	16.6 J	15 U	15 U
Chromium	0.4 U	0.4 U	NA	0.4 U	0.4 U	0.8 U	0.8 U
Cobalt	0.4 U	0.4 U	NA	0.4 U	0.4 U	0.7 U	1 J
Copper	0.8 U	0.8 U	NA	0.8 U	0.8 U	1.5 U	1.5 U
Iron	8.6 U	8.6 U	NA	8.6 U	8.6 U	12.5 U	12.5 U
Lead	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.2 U	1.2 U
Magnesium	78 J	64.2 J	NA	71.6 J	69.3 J	12.3 U	12.3 U
Manganese	0.2 U	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.37 J
Mercury	0.13 J	0.1 U	NA	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	0.6 U	0.6 U	NA	0.6 U	0.6 U	1 U	1 U
Potassium	67.1 U	67.1 U	NA	67.1 U	67.1 U	40.1 U	40.1 U
Selenium	1.7 U	1.7 U	NA	1.7 U	1.7 U	3 U	3 U
Silver	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.8 U	0.8 U
Sodium	70.3 U	70.3 U	NA	102 J	228 J	304 U	304 U
Thallium	4.2 U	4.2 U	NA	4.2 U	4.2 U	2.4 U	2.4 U
Vanadium	0.3 U	0.3 U	NA	0.3 U	0.3 U	0.7 U	0.76 J

Appendix B
QA/QC Analytical Results
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC						
Sample ID	SJS06-EB090602	SJS06-FB090602	SJS06-TB091002	SJS03-FB092702	SJS03-EB092702	SJS06-FB110402	SJS06-EB110402
Sample Date	09/06/02	09/06/02	09/10/02	09/27/02	09/27/02	11/04/02	11/04/02
Chemical Name							
Zinc	42.8	1.8 U	NA	1.9 J	2.9 J	1.1 U	1.1 U

Notes:

J - Analyte present, reported result is estimated

U - Not detected

NA - Not analyzed