UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

SUBJECT: Five Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

DATE: 6-28-2010

FROM: Henry J. Sokolowski, P.E., Associate Director
Office of Federal Facility Remediation and Site Assessment (3HS10)

TO: Kathyrn A. Hodgkiss, Acting Director
Hazardous Site Cleanup Division (3HS00)

Attached for your signature is a letter conveying EPA's concurrence on the U.S. Navy's five-year review report for the St. Juliens Creek Annex Site. The report, entitled "Five Year Review Report St. Juliens Creek Annex", was signed by the Commanding Officer of the Norfolk Naval Shipyard on May 18, 2010. The Commanding Officer of the Norfolk Naval Shipyard is the signator for St. Juliens Creek.

The requirement for this five-year review was triggered by the initiation of the Site 4 remedial action (on–site mobilization for the remedial actions construction phase for Site 4), on March 21, 2005. The next five year review will be due five years from the date of the concurrence letter.

The five-year review report concludes that the remedy at Site 4 is protective of human health and the environment. All threats at the site have been addressed through installation of a soil cover over the contaminated waste, the removal of contaminated sediments, the installation of fencing and warning signs and the implementation of institutional controls. The exposure assumptions and toxicity data used at the time of the final remedy selection are still valid.

The report meets the requirements of EPA's June 2001 guidance document, *Comprehensive Five-Year Review Guidance* (OSWER No. 9355.7-03B-P, EPA 540-R-01-007). Furthermore, the Navy's protectiveness statements are well supported. I recommend that you sign the attached letter.

Attachment

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Captain W.C. Keistler
Commanding Officer
Norfolk Naval Shipyard
Code 100
Portsmouth, VA 23709-5000

Re: Five-Year Review Report
St. Juliens Creek Annex, Site 4
Chesapeake, Virginia

Dear Captain Keistler:

The U.S. Environmental Protection Agency (EPA) Region III has reviewed the report entitled " Five-Year Review Report St. Juliens Creek Annex". The report was prepared to address the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 (c) five-year review requirements. EPA has reviewed this five-year review report and has determined that it adheres to the OSWER Directive 9355.7-03B-P, *Comprehensive Five-Year Review Guidance* (EPA, June 2001). EPA has determined that the five-year review report meets the intent of EPA's Five-Year Review Guidance. The remedy at Site 4 is protective of human health and the environment. All threats at the site have been addressed through installation of a soil cover over the contaminated soil and waste, the removal of contaminated sediments, the installation of fencing and warning signs and the implementation of institutional controls. The exposure assumptions and toxicity data used at the time of the final remedy selection are still valid.

The requirement for this five-year review was triggered by the initiation of the Site 4 Remedial Action (on-site mobilization for commencement of the remedial action construction phase for Site 4), on March 21, 2005. The next five year review will be due five years from the date of this concurrence letter.

If you have any questions, please contact Robert W. Stroud at (410) 305-2748.

Sincerely,

Kathryn A. Hodgkiss, Acting Director
Hazardous Site Cleanup Division

cc: Karen Doran (VDEQ)

Final

Five-Year Review Report

St. Juliens Creek Annex
Chesapeake, Virginia

Contract Task Order 0063

May 2010

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Under the

NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000

Prepared by

CH2MHILL

Virginia Beach, Virginia

Final

Five-Year Review Report

St. Juliens Creek Annex
Chesapeake, Virginia

May 2010

This report documents the Five-Year Review for St. Juliens Creek Annex as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations.

Approved by:

WC Kiestler 5/18/10

W. C. Kiestler
Captain, U.S. Navy
Commander, Norfolk Naval Shipyard
Portsmouth, Virginia

Date

Executive Summary

The United States Navy conducted this Five-Year Review for St. Juliens Creek Annex (SJCA) in Chesapeake, Virginia, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA Section 121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations. The report has been prepared in accordance with the *Navy/Marine Corps Policy for Conducting CERCLA Statutory Five-Year Reviews* (Department of the Navy, 2001) and United States Environmental Protection Agency (USEPA) *Comprehensive Five-Year Review Guidance* (2001), and provides a description of the site, the results of the Five-Year Review, and recommendations. The report summarizes the evaluation of the remedy and remedial action for Site 4, Landfill D, which resulted in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unrestricted use and unlimited exposure, and for which the Final Record of Decision (ROD) was signed in September 2004 (NAVFAC, 2004).

The objective of this Five-Year Review is to evaluate the performance of the implemented remedy at Site 4 and verify that the remedy remains protective of human health and the environment in accordance with the requirements stated in the ROD. This evaluation was accomplished through a review of various documents pertaining to site activities, analytical data, and findings; and through a site inspection and interviews. The methods, findings, and conclusions from the document reviews are presented in this Five-Year Review report. The Five-Year Review report is intended to identify any issues that may prevent a remedy from functioning as designed or providing sufficient protection of human health and the environment. The overall evaluation of the effectiveness of the remedy is presented as a protectiveness statement in the Five-Year Review Summary Form provided below.

Five-Year Review Summary Form

Activity Identification

Site Name: St. Juliens Creek Annex — USEPA ID: VA5170000181

Region: 03 State: Virginia — City/County: Chesapeake

Activity Status

National Priorities List Status: Final

Remediation Status: Ongoing Operation

Multiple Sites: Yes

Construction Completion Date: Not applicable

Has the site(s) been put into reuse? No.

Review Status

Lead Agency: United States Navy

Who conducted the review? (USEPA Region, State, Federal Agency): U.S. Navy

Author Name: CH2M HILL

Author Title: Comprehensive Long-term Environmental Action—Navy (CLEAN) Contractor

Author Affiliation: U.S. Navy Contractor

Review Period: From: 2005 — To: 2010

Date(s) of Site Inspection: September 21, 2009

Type of Review: Statutory — Review Number: 1

Triggering Action: Initiation of Site 4 Remedial Action (on-site mobilization for commencement of the remedial action-construction phase for Site 4)

Trigger Action Date: March 21, 2005

Due Date: March 21, 2010

Five-Year Review Summary Form, cont'd.

Issues:

No issues were identified.

Recommendations and Follow-up Actions:

No recommendations and follow-up actions were identified.

Protectiveness Statement:

The remedy at Site 4 is protective of human health and the environment.

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Appendixes

Tables

Figures

Acronyms and Abbreviations

AOC	Area of Concern
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
COC	constituent of concern
DoD	Department of Defense
ERA	Ecological Risk Assessment
ERP	Environmental Restoration Program
FFA	Federal Facilities Agreement
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HRS	Hazard Ranking System
IAS	Initial Assessment Study
IDW	investigation-derived waste
IR	Installation Restoration
IRP	Installation Restoration Program
LUC	land use control
MCL	maximum contaminant level
MEC	munitions of explosive concern
MRP	Munitions Response Program
msl	mean sea level
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCP	National Contingency Plan
NPL	National Priorities List
NTCRA	non-time-critical removal action
O&M	operation and maintenance
PA	Preliminary Assessment
PAH	polynuclear aromatic hydrocarbon
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RAO	Remedial Action Objective
RD	Remedial Design
RFA	Resource Conservation and Recovery Act Facility Assessment
RI	Remedial Investigation

ROD	Record of Decision
SJCA	St. Juliens Creek Annex
SWMU	solid waste management unit
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit
UU/UE	unrestricted use and unlimited exposure
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound
VSI	Visual Site Inspection
WW	World War

SECTION 1

Introduction

This document presents the results of the Five-Year Review for St. Juliens Creek Annex (SJCA), Chesapeake, Virginia (**Figure 1-1**). This Five-Year Review Report was prepared by CH2M HILL under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-term Environmental Action—Navy (CLEAN) Program, Contract N62470-08-D-1000, Contract Task Order 0063, for submittal to NAVFAC Mid-Atlantic, United States Environmental Protection Agency (USEPA), and the Virginia Department of Environmental Quality (VDEQ).

SJCA is a federal facility at which Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activities are funded and implemented by the Department of the Navy (Navy) under the Navy Installation Restoration Program (IRP). The Navy implements CERCLA at SJCA in partnership with the USEPA and the VDEQ.

The purpose of a Five-Year Review is to evaluate the performance of remedies for sites with a Record of Decision (ROD) leaving hazardous substances, pollutants, or contaminants on site above levels that would allow for unrestricted use and unlimited exposure (UU/UE) and to verify that the remedy remains protective of human health and the environment as stated in the ROD. The Five-Year Review was conducted by CH2M HILL on behalf of the Navy in accordance with the *Navy/Marine Corps Policy for Conducting CERCLA Statutory Five-Year Reviews* (Department of the Navy, 2001) and the *Comprehensive Five-Year Review Guidance* (USEPA, 2001) and pursuant to CERCLA Section 121(c) and the National Oil and Hazardous Substances Pollution Contingency Plan, or National Contingency Plan (NCP).

In accordance with Navy policy, the triggering action of the statutory review process is the on-site mobilization for commencement of the remedial action-construction phase for Site 4 – Landfill D in March 2005. This first Five-Year Review for SJCA consisted of a review of various reports and documents pertaining to pre- and post-remedy-implementation activities, analytical data, and findings; and through a site inspection and interviews. An inspection at the site was conducted on September 21, 2009 by representatives of the Navy, USEPA, VDEQ, and CH2M HILL.

Five sites; Site 2, Site 4, Site 5, Site 21, and Area UXO 001; are currently active in the Environmental Restoration Program (ERP) at SJCA (**Figure 1-2** and **Figure 1-3**). Of these, Site 4 is the only site being addressed by this Five-Year Review. A Remedial Design (RD) for Site 21 is currently being developed to implement a remedy selected in an interim ROD to address shallow groundwater contamination; the site is not included in this Five-Year Review because the remedial action has not yet been initiated. Additionally, Sites 2 and 5 are not included in this Five-Year Review because Site 2 is currently in the Proposed Plan phase of the CERCLA process and Site 5 is being addressed under an Engineering Evaluation/Cost Analysis (EE/CA). Area UXO 0001 is currently undergoing a Site Inspection; therefore, it is not included in this Five-Year Review. Details of the active ERP sites not being addressed by this Five-Year Review are provided in Section 2.3.

SJCA has elected to follow the Navy recommendation to conduct installation-wide Five-Year Reviews, which include all sites with remedies in place. A Five-Year Review is required 5 years from the initiation of the first remedial action where hazardous substances, pollutants, or contaminants remain onsite above levels that allow for UU/UE. If a site contains multiple remedies, all are subject to a Five-Year Review when at least one remedy is initiated.

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SJCA Boundary

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Figure 1-1
Location of St. Juliens Creek Annex
Five-Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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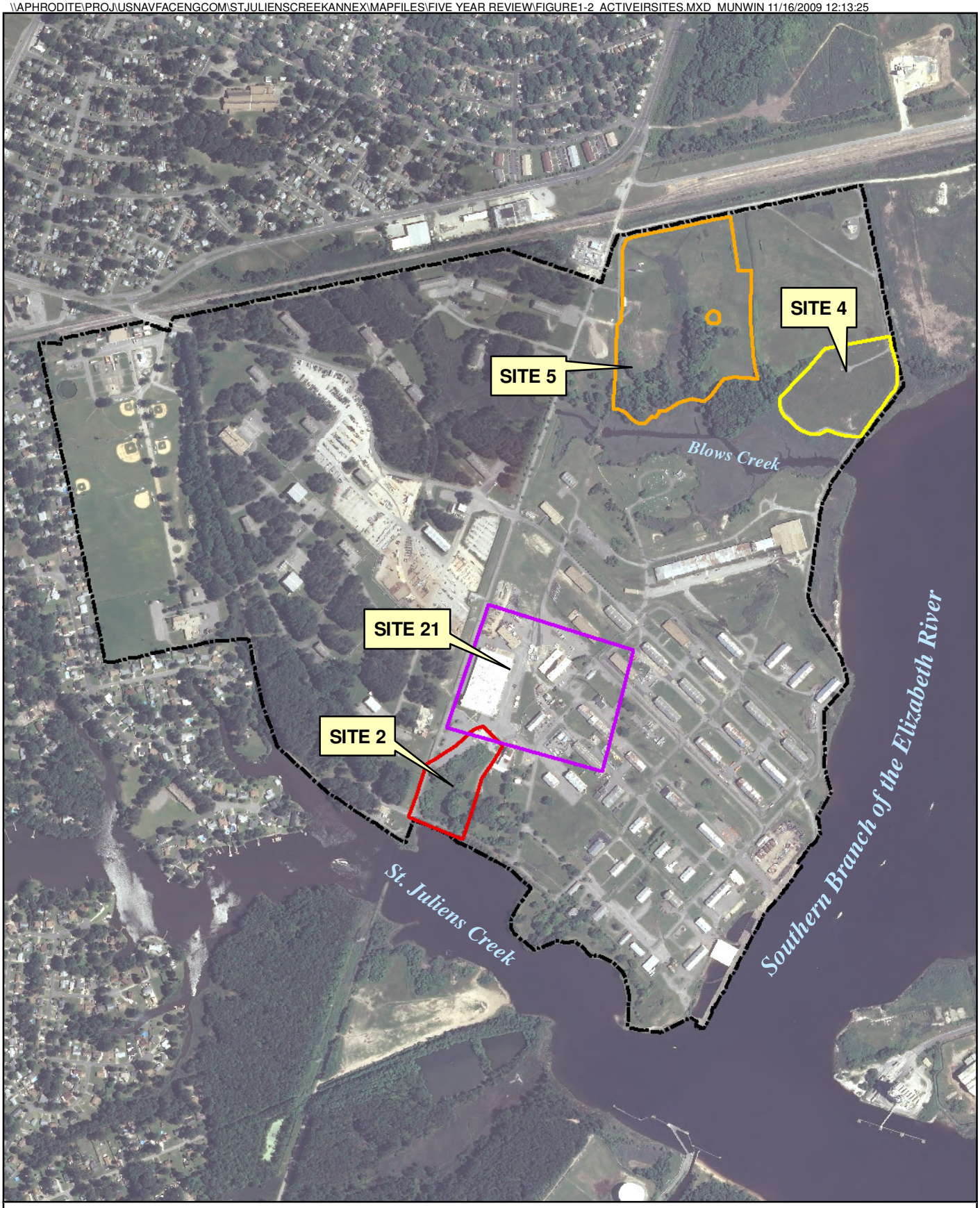

Legend

- SJCA Boundary
- PP/ROD Site
- Remedial Design Site
- Response Complete - Site with LUCs
- EE/CA/Removal Action Site

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Figure 1-2
Location of Active IRP Sites
Five-Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

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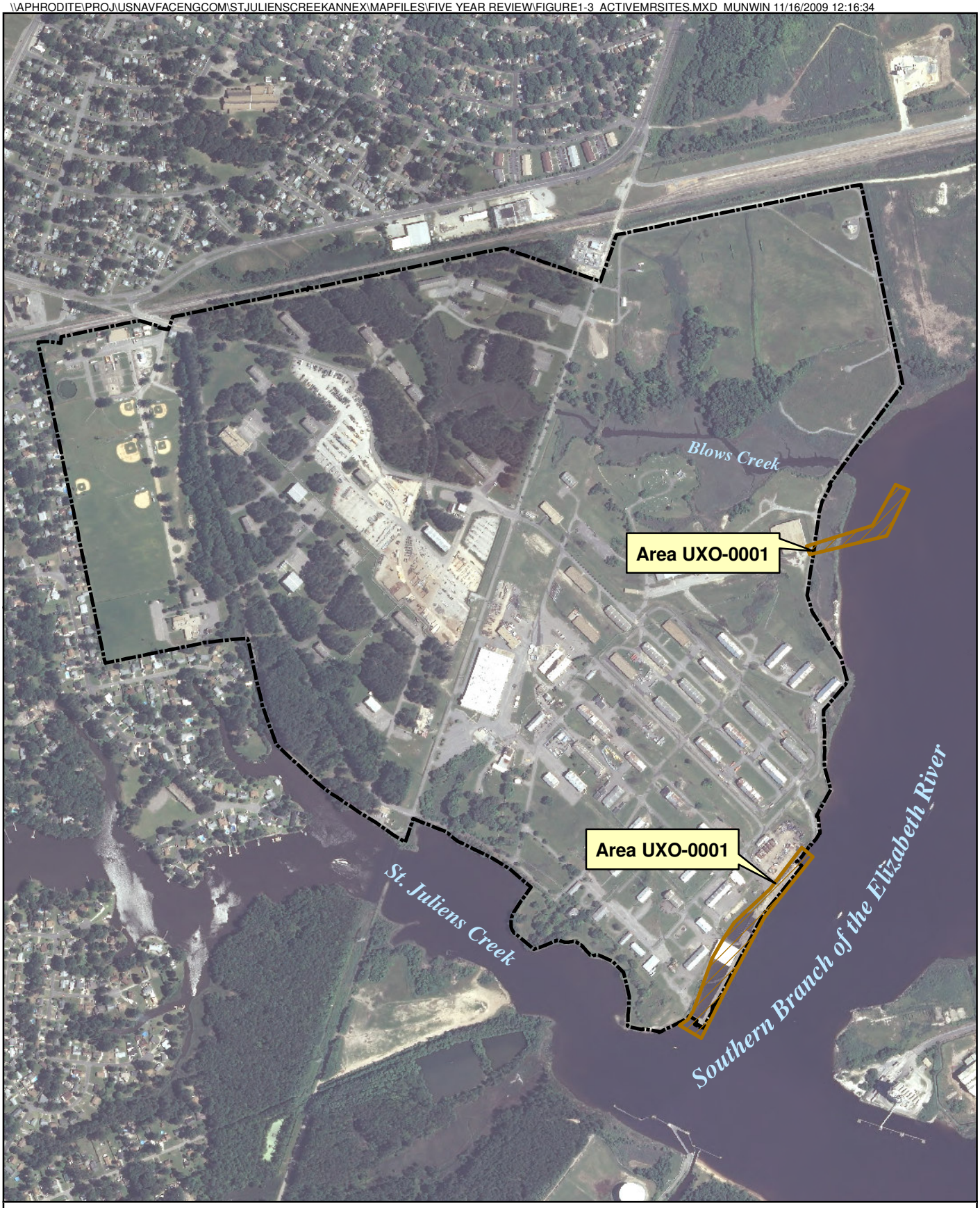
\\APHRODITE\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\FIVE YEAR REVIEW\FIGURE1-3_ACTIVEMRSITES.MXD MUNWIN 11/16/2009 12:16:34



Legend
- SJCA Boundary
- PA/SI Site

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Figure 1-3
Location of Active MRP Sites
Five-Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

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SECTION 2

Facility Background

2.1 Physical Characteristics

SJCA is approximately 490 acres and is situated at the confluence of St. Juliens Creek and the Southern Branch of the Elizabeth River in the City of Chesapeake, in southeastern Virginia (**Figure 1-1**). Most surrounding areas are developed and include residences, schools, recreational areas, and shipping facilities for several large industries.

SJCA is located in the Atlantic Coastal Plain, which is characterized by unconsolidated sediments several thousand feet in thickness (NEESA, 1981). The Southern Branch of the Elizabeth River defines the eastern boundary of SJCA. St. Juliens Creek, a tributary of the Southern Branch of the Elizabeth River, defines the southern boundary of SJCA. Blows Creek, also a tributary of the Southern Branch of the Elizabeth River, flows through the center of SJCA and drains into the Southern Branch of the Elizabeth River. The Southern Branch of the Elizabeth River and its tributaries (including Blows Creek and St. Juliens Creek) are part of a tidal estuary system.

Land surface elevations at SJCA are generally low, ranging from sea level to approximately 20 feet above mean sea level (msl) in the northeastern portion of the facility. The majority of surface water on SJCA drains to Blows Creek, St. Juliens Creek, and the Southern Branch of the Elizabeth River. St. Juliens Creek and the Southern Branch of the Elizabeth River are used for commercial, industrial, and recreational purposes. All of these surface water bodies eventually discharge to the Chesapeake Bay, also used for commercial, industrial, and recreational purposes.

The aquifers most relevant to CERCLA investigations at SJCA are the shallow water-table aquifer (Columbia aquifer) and the underlying aquifer (Yorktown aquifer). These aquifers are separated by an approximately 35-foot thick confining unit, the Yorktown confining unit. Groundwater flow directions for the aquifers are controlled by topography and surface water bodies with the primary discharge direction being towards St. Juliens Creek, Blows Creek, and the Southern Branch of the Elizabeth River.

2.2 Land and Resource Use

SJCA began operations as a naval facility in 1849. The annex was one of the largest ammunition depots in the United States involving wartime transfer of ammunitions to various other naval facilities. Specific ordnance operations and processes conducted at SJCA included stockpiling Explosive D (ammonium picrate or picrate acid) for use in projectiles, manufacturing Mark VI mines, assembling small caliber guns and ammunition, storing torpedoes, filling shells, and testing ordnance. In 1975, all ordnance operations were transferred to the Yorktown Naval Weapons Station. As a result, decontamination was performed in, around, and under ordnance-handling facilities at SJCA in 1977.

SJCA has also provided non-ordnance services, including degreasing operations, operation of paint shops, machine shops, vehicle and locomotive maintenance shops, pest control shops, battery shops, print shops, electrical shops, boiler plants, wash racks, and potable water and salt water fire-protection systems, fire-fighter training, and storage of oil and chemicals.

Activity at SJCA has decreased in recent years and many of the aging structures are being demolished. The current primary mission of SJCA is to provide a radar-testing range and administrative and warehousing facilities for nearby Norfolk Naval Shipyard and other local naval activities. SJCA also provides light industrial shops and storage facilities for several tenant commands; including Defense Reutilization and Marketing Office storage, Space and Naval Warfare Systems Command, Fleet and Industrial Supply Center, Norfolk Integrated Logistics Support, and a cryogenics school. Portions of the base remain undeveloped and include grassy, wooded, or wetland areas.

Groundwater is not used as a potable resource at SJCA. Public water is supplied to SJCA and the surrounding area by the City of Chesapeake Waterworks. Private deep wells permitted for irrigation exist locally; however, the closest wells are approximately 1.5 miles upgradient of SJCA within the cities of Chesapeake and Portsmouth. No surrounding water bodies serve as a water supply to the surrounding areas.

The SJCA mission and current land and resource use at the facility are not expected to change in the foreseeable future.

2.3 Environmental and Munitions Response History

In 1975, the Department of Defense (DoD) began the Navy Assessment and Control of Installation Pollutants Program to assess past hazardous and toxic materials storage and disposal activities at military installations. The goals of this program were to identify environmental contamination resulting from past hazardous materials management practices, to assess the impacts of the contamination on public health and the environment, and to provide corrective measures as required to mitigate adverse impacts.

Given the nature and extent of its operations, the Navy activities have involved toxic and hazardous materials for several decades. The DoD, as well as general industry, has realized that previously acceptable methods of disposal are no longer sufficient, and actions are being taken, through these programs, to clean up Navy sites that pose a threat to human health or the environment. Current Navy waste management operations are expected to comply with all federal, state, and Navy regulations to ensure safe operation and disposal of hazardous substances.

SJCA initiated its environmental investigation efforts by conducting an Initial Assessment Study (IAS) in 1981 (NEESA, 1981) followed by a Preliminary Assessment in 1983 (NUS Corporation, 1983) and Resource Conservation and Recovery Act Facility Assessment (RFA) in 1989 (A. T. Kearney, 1989). The RFA included a preliminary review of all available relevant documents and a Visual Site Inspection (VSI) that identified 34 Solid Waste Management Units (SWMUs) and 12 Areas of Concern (AOCs), including Site 4 which was referred to as Dump D or SWMU 6. The current status of all ERP sites is provided in **Table 2-1**.

To assess whether SJCA should be proposed for the National Priorities List (NPL), the USEPA completed a Hazard Ranking System (HRS) evaluation in January 2000 (Tetra Tech, 2000). SJCA was assigned a score of 50 based on the potential for surface water migration. Those facilities with HRS scores exceeding 28.5 are proposed for the NPL. Therefore, on February 3, 2000, USEPA proposed that SJCA be added to the NPL. The proposed listing was followed by a minimum 60-day review and comment period prior to the inclusion of SJCA on the NPL on July 27, 2000.

The Federal Facilities Agreement (FFA) (DoD, 2004), negotiated between the Navy, USEPA, and VDEQ, was signed in July 2004. In accordance with the FFA, all past and future work at IRP sites, SWMUs, and AOCs will be reviewed, and a course of action for future work requirements at each site will be developed. The FFA also includes specific requirements for the preparation and contents of the Site Management Plan.

Background soil and groundwater chemical concentrations were addressed for SJCA as part of the basewide *Final Background Investigation* (CH2M HILL, 2001) and *Final Background Investigation Report Addendum for Groundwater* (CH2M HILL, 2004c). The investigations objective was to establish background concentrations of inorganics, pesticides, and polynuclear aromatic hydrocarbons (PAHs) in surface and subsurface soil and groundwater for use in comparison to IRP site data to better identify release-related constituents of concern (COCs). Background levels are due to naturally occurring (those chemicals expected at a site in the absence of human influence) or anthropogenic (chemicals present in the environment due to manmade, non-CERCLA-activity-related) sources.

The DoD established the Munitions Response Program (MRP) under the Defense ERP to address munitions and explosives of concern (MEC) and munitions constituents at sites other than operational ranges. The DoD and the Navy are establishing policy and guidance for munitions and response actions under the MRP; however, the key program drivers developed to date conclude that munitions response actions will be conducted under the process outlined in the NCP, as authorized by CERCLA. Therefore, the Navy will work with the SJCA IR Partnering Team to follow the CERCLA process to address MRP sites identified at SJCA.

Fifty-nine potentially contaminated IRP sites, MRP sites, SWMUs, and AOCs have been identified for evaluation at SJCA based on the previous assessments and investigations. Four sites; Site 2, Site 4, Site 5, and Site 21; are currently active in the IRP at SJCA; and one site, UXO 0001, is currently active in the MRP at SJCA (**Figure 1-2**). Fifty-four sites at SJCA have been considered no further action under the IRP by the SJCA IR Partnering Team following desktop audits, site inspections, and/or removal actions (**Figure 2-1**). The status of all the ERP sites at SJCA is presented in **Table 2-1.** The following subsections present a brief site description of each active IRP and MRP site. The site description for Site 4, the basis for this report, is provided in Section 3.

IRP Site 2 – Waste Disposal Area B

Site 2 is a former waste disposal area, operated from 1921 until sometime after 1947, covering approximately 5.7 acres in the southcentral portion of SJCA (**Figure 1-2**). Initially, refuse was burned openly onsite and used to fill an adjacent swampy area (Site 2 inlet) that is tidally connected to St. Juliens Creek. Mixed municipal wastes, organics, inorganics, solvents, waste ordnance, and abrasive blast media were reportedly disposed of at Site 2. In

1942, an incinerator was installed to replace the open burning practices, and was operated until sometime after 1947.

Remedial Investigation (RI) activities have indicated potential risks to human health and the environment from exposure to chemicals in waste, soil, sediment, surface water, and shallow aquifer groundwater (CH2M HILL, 2008b). The primary contaminants are chlorinated volatile organic compounds (VOCs) in shallow groundwater and surface water and inorganics and PAHs in soil and sediment. Eight remedial alternatives were identified and evaluated in Feasibility Study (FS) (CH2M HILL, 2009e). The Proposed Plan, which identifies the preferred remedial alternative, is currently under review.

IRP Site 5 – Former Burning Grounds

Site 5 consists of approximately 23 acres located in the northeastern portion of SJCA (**Figure 1-2**). The site currently consists of an open field with a wetland in the center and a forested area and Blows Creek to the south. Much of the Site 5 area was historically used for placement of dredge spoil material that reportedly originated from Blows Creek and the Southern Branch of the Elizabeth River. Operations began at the Burning Grounds in the 1930s when waste ordnance materials, including black powder (mixture of charcoal, nitrate, and sulfur), smokeless powder (nitrocellulose), Explosive D (ammonium picrate), and Composition A-3 (contains RDX and wax), were disposed of by open burning on three main pads. Tetryl, trinitrotoluene, fuzes, solvents, paint sludge, pesticides, and various types of refuse were also disposed of. In mid-1977, the Burning Grounds was used for facility-wide ordnance and equipment decontamination. The decontamination process included filling equipment from buildings with oil and straw and igniting them. Afterwards, the ground surface was reportedly covered with oil and straw and burned. The top 6 inches of soil was then diced, and the ground surface was covered with oil and straw and burned again. A 4.3-acre unlined waste disposal area is located in the center of the site. Blows Creek, a tidally-influenced brackish water tributary to the Southern Branch of the Elizabeth River, runs along the southern extent of Site 5 and through the center of SJCA. Several IRP sites are located within the Blows Creek drainage basin and have been identified as potential historical sources to Blows Creek; however, it has been associated with Site 5 under the IRP.

A Baseline Ecological Risk Assessment was completed for Blows Creek and recommended no further action. RI activities indicated potential risks to human health and the environment from exposure to chemicals in waste, soil, and drainage sediment (CH2M HILL, 2006; 2007b). The primary contaminants are inorganics and pesticides. An EE/CA was conducted to evaluate alternatives to address the waste/burnt soil area and impacted surface soil and drainage sediment areas and recommended a removal action (CH2M HILL, 2007a). An Action Memorandum was signed on March 20, 2007 to implement the non-time-critical removal action (NTCRA) as specified in the EE/CA. The NTCRA activities were initiated in December 2007 and are currently ongoing.

IRP Site 21 – Industrial Area

Site 21 is located in the central industrial portion of SJCA (**Figure 1-2**). Buildings at Site 21 were historically used for machine, vehicle and locomotive maintenance, and electrical shops; and munitions loading facilities. Railroad tracks were present throughout the industrial area and a fuel service station was located in the vicinity. Many of the older

buildings at the site have been demolished. The existing buildings and the Site 21 area are currently used for storage and maintenance activities.

RI activities indicated potential risks to human health from exposure to chlorinated VOCs from potable use of shallow aquifer groundwater and recommended an FS (CH2M HILL, 2008a). Potential risk associated with vapor intrusion into onsite buildings was also identified. However, because of uncertainties associated with the evaluation methodology, the RI recommended further evaluation of the potential vapor intrusion pathway. Four remedial alternatives to address risks associated with potable use of shallow aquifer groundwater were developed and evaluated in an FS (CH2M HILL, 2009a). The Interim Proposed Plan identified the preferred alternative for addressing the risk associated with chlorinated VOCs from potable use of shallow groundwater (CH2M HILL, 2009d); and the Interim ROD is awaiting final signature. The Proposed Plan and ROD are "interim" because they do not address the vapor intrusion pathway. The RI addendum report documenting the vapor intrusion investigation is currently under review. A subsequent Proposed Plan and ROD will be prepared to address the site as a whole, including the vapor intrusion pathway, based on the conclusions and recommendations of the RI addendum report.

MRP Area UXO 001 – Wharf Area Sediments

Area UXO 0001 includes the current and former wharf areas and piers along the shoreline of the Southern Branch of the Elizabeth River, comprising approximately 1,520 linear feet. The northern wharf area, located in the northeast portion of SJCA, is no longer present, with the exception of remaining pilings. The northern wharf area was in operation less than 10 years, and evidence suggests it was primarily used to load Mark VI mines produced at SJCA during World War (WW) I. The southern wharf area was used at some capacity throughout multiple wars (Spanish-American, WW I, WW II, Korean, and Vietnam) to supply the Naval fleet with significant amounts of ammunition. Ordnance loading activities continued until the early 1970s. The wharf was damaged when two ships struck the wharf in 1975; however, it is still functional.

A Preliminary Assessment (PA), consisting of a desktop and archive search on site activities, was conducted in 2009 (CH2M HILL, 2009c). Although no documentation was found to confirm the presence of munitions in the vicinity of the wharf areas, anecdotal evidence indicated there is a potential for munitions to have been dropped during loading operations, which may have resulted in the presence of MEC or munitions constituents in the sediment beneath the wharf areas. The majority of potential munitions constituents are inorganics and explosive compounds. The PA recommended further investigation, including a magnetic investigation and anomaly identification. A Site Investigation is currently ongoing.

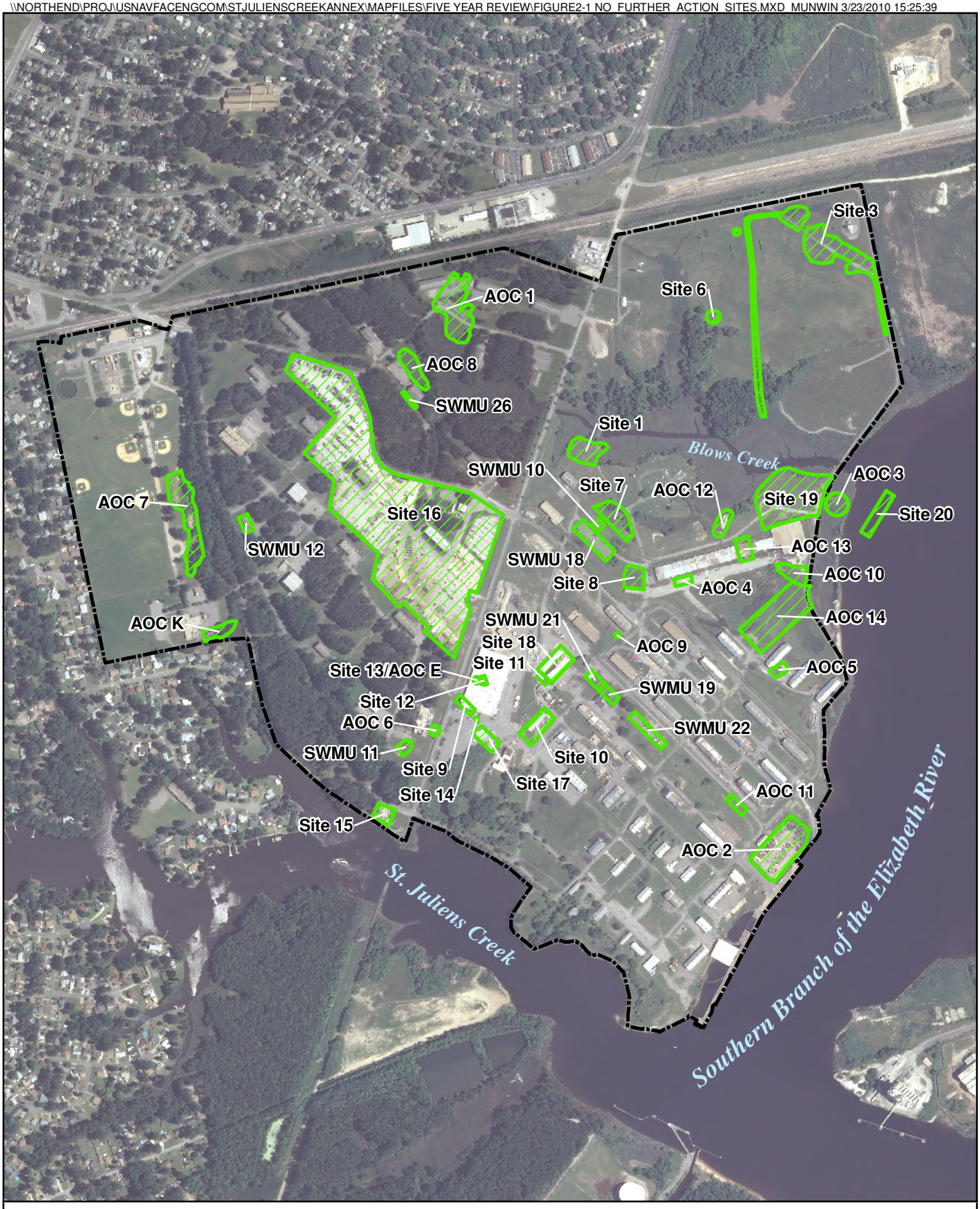
Table 2-1
Site Status Summary Table
Five-Year Review
St. Juliens Creek Annex
Chesapeake, Virginia

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure
MRP Sites					
Area UXO 0001	Wharf Area Sediments	Residual Ordnance at wharf area; RFA - AOC I; Site 20	PA/SI	PA conducted in FY 2009. SI will be completed FY 2010.	
IRP Sites					
Site 2	Waste Disposal Area B	Dump B; Dump B Incinerator; Dump B Blast Grit; RFA - SWMU 2, SWMU 3, SWMU 4	PP/ROD	Final Site 2 RI completed February 2004; Final Expanded RI completed November 2008; and Final FS submitted October 2009. Draft PP submitted November 2009.	
Site 5	Burning Grounds	RFA - SWMU 8	EE/CA/Removal Action	Final RI completed March 2003; Final Expanded RI Report completed June 2006 recommending additional groundwater sampling; Final EE/CA for NTCRA of Waste/Burnt Soil Area submitted February 2007. Final Expanded RI addendum recommending NFA for groundwater submitted December 2007. NTCRA began December 2007 and is currently ongoing.	
Site 21	Industrial Area	None	RD/RA	Final SI submitted in June 2004; Draft Supplemental SI Report submitted April 2006; RI finalized July 2008. Final FS completed February 2009. Final Interim PP completed July 2009. Final Interim ROD signature in FY 2010. Vapor intrusion investigation ongoing.	
Site 4	Landfill D	Dump D; Old Tanks at Dump D; RFA - SWMU 6, AOC L	Response Complete - LUCs	Final RI completed March 2003; Final FS completed March 2004; PRAP finalized June 2004; ROD signed September 2004, RD submitted November 2004; RA completed in October 2005; RACR signed October 2006. LUCs implemented, site inspections continuing annually.	Final ROD signed September 2004.
Site 1	Waste Disposal Area A	Dump A; RFA - SWMU 1	NFA	Consensus for NFA by Navy, VDEQ, and EPA in November 2002 based on RRR data and September 2002 test pit information.	Consensus for NFA as documented in an Addendum to the SSA in January 2003.
Site 3	Waste Disposal Area C	Dump C; Dump C Waste Disposal Pits; RFA - SWMU 5, SWMU 30	NFA	Final RI completed March 2003; Final EECA/Action Memorandum completed August 2002; Phase I Removal conducted September 2002; Phase II Removal conducted 2004; Final Construction Closeout Report completed March 2003; PRAP finalized January 2005; NFA ROD signed February 2006.	Final NFA ROD signed February 2006.
Site 4	Dumpster Storage at Landfill D	Dumpster storage at Dump D; RFA - SWMU 7	NFA	RFA indicated that the dumpsters were no longer present.	Final ROD signed September 2004.
Site 6	Small Items Pit	Caged Pit, RFA - SWMU 24	NFA	Final RI completed March 2003; Final EE/CA and Action Memorandum completed August 2002; Removal Action completed September 2002; Final Close-Out Report in March 2003; PRAP finalized July 2003; NFA ROD signed September 2003.	NFA Final ROD signed September 2003.
Site 7	Old Storage Yard	Old Storage Yard #1; RFA - SWMU 17	NFA	Consensus for NFA in July 2001 by Navy, VDEQ, and EPA pending debris removal. Debris removal was conducted FY 2002 and is documented in a construction removal document completed FY 2003.	July 2001 Tier I Partnering Meeting Minutes and documented in FFA.
Site 8	Cross and Mine	RFA - SWMU 9; FFA - PSA Site 8	NFA	Final SSA completed April 2002 recommending an SI to further investigate potential release to groundwater; Identified in the FFA as Preliminary Screening Area (FFA Appendix B) March 2004; Final SI completed June 2004 recommending NFA; Consensus for NFA by Navy, VDEQ, and EPA July 2004.	Signature Page in Final SI (June 2004).
Site 9	Pest. Control Bldg. 249	PA - SWMU 13	NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 9	Oil Water Separator at Bldg. 249	RFA - SWMU 23	NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 9	Washrack Bldg. 249	RFA - SWMU 25	NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 10	Waste Disposal at Railroad Tracks	Hazardous Waste Disposal Area at Bldg. 13 (Railroad Tracks); RFA - SWMU 14	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
Site 10	Swale beneath Bldg. 13	RFA - SWMU 31	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
Site 11	Waste Disposal at Building 53 (formerly referenced to Bldg. 266)	RFA - SWMU 15	NFA	Consensus by Navy, VDEQ, and EPA for NFA during a site visit in July 2001 for Site 11 and groundwater underlying site will be investigated as part of Site 21.	Consensus for NFA as documented in the November 2002 SSA.
Site 12	Sand Blast Area Bldg. 323	RFA - SWMU 16	NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 13	Waste Generation Area	RFA - SWMU 20	NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 14	Washrack Bldg. 266	None	NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 15	Fire Training Area	Fire Training Area at Bldg. 271; RFA - SWMU 27	NFA	Will be investigated under the Navy's Underground Storage Tank (UST) program and therefore, NFA under CERCLA consensus by Navy, VDEQ, and EPA in July 2002.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
Site 16	DRMO Storage/Salvage Yard	RFA - SWMU 28	NFA	While active, the DRMO does not fall under CERCLA and therefore, NFA under CERCLA consensus by Navy, VDEQ, and EPA in July 2002. Regional inspections are conducted for storm water management.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
Site 17	Storage Pad at Building 279	Satellite storage at Bldg. 279; RFA - AOC A	NFA	The roof and walls of Building 278/279 were demolished in early 2003, the flooring and concrete pilings are still in place awaiting final removal. Based upon the proximity to Site 2, consensus in February 2003 by Navy, VDEQ, and EPA that further action related to Site 17 will be addressed as part of Site 2.	February 2003 Tier I Partnering Meeting Minutes and documented in FFA.
Site 18	Blasting Grit at Building 47	RFA - AOC C	NFA	During the July 2001 SJCA Partnering Team site visit, no blast grit was observed in several hand auger borings therefore, consensus for NFA was reached by Navy, VDEQ, and EPA.	Consensus for NFA as documented in the November 2002 SSA.
Site 18	Air Compressor at Bldg. 47	RFA - AOC B	NFA	NFA consensus by Navy, VDEQ, and EPA in July 2002. Regional inspections are conducted for storm water management.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
Site 19	Building 190	Residual Ordnance at Bldg. M-5 & 190 RFA - AOC H	NFA	Final SI submitted in June 2004 recommending Supplemental SI to further investigate soil and groundwater; Final Supplemental SI submitted in September 2005 recommending EE/CA for a soil hotspot NTCRA; Final EE/CA for NTCRA submitted in November 2005; Final Action Memorandum signed in January 2006; NTCRA conducted in May 2006; Final Site Closeout Report signed December 2006.	Final Site Closeout Report signed December 2006.
Site 20	Wharf Area Sediments	Residual Ordnance at wharf area; RFA - AOC I; Site 20	NFA	During the July 2001 site visit, the Navy, VDEQ and EPA reached consensus for NFA under CERCLA. Site will be managed under the MR Program.	Consensus for NFA as documented in the November 2002 SSA.
SWMU 10	Hazardous Waste Container Storage Bldg. 254Y	None	NFA	Recommended for NFA in the RFA as SWMU 10 was assigned to RCRA Program as a >90 day storage bunker. Consensus by Navy, VDEQ, and EPA for NFA under CERCLA in July 2002, as SWMU 10 was managed under RCRA.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
SWMU 11	Hazardous Waste Container Storage Bldg. 163Y	None	NFA	Recommended for NFA in the RFA as SWMU 11 was assigned to RCRA Program as a >90 day storage bunker. Consensus by Navy, VDEQ, and EPA for NFA under CERCLA in July 2002, as SWMU 11 is managed under the Virginia Hazardous Waste Management Regulations (VHWMR).	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.

Table 2-1
Site Status Summary Table
Five-Year Review
St. Juliens Creek Annex
Chesapeake, Virginia

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure
SWMU 12	PCB Storage Bldg. 198	None	NFA	Recommended for NFA in the RFA. SWMU 12 is a current storage facility managed under Toxic Substances Control Act (TSCA) therefore, consensus by Navy, VDEQ, and EPA for NFA under CERCLA in July 2002.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
SWMU 18	Old Storage Yard # 2	None	NFA	Recommended for NFA in the RFA. Currently in operation and Regional inspections are conducted for storm water management. Consensus by Navy, VDEQ, and EPA for NFA under CERCLA.	FFA
SWMU 19	Old Storage Yard # 3	None	NFA	RFA recommended action for better management practice. A site visit was performed in November 2002 by Navy, VDEQ, and EPA to confirm status and consensus for NFA under CERCLA was reached.	FFA
SWMU 21	Hazardous Waste Accumulation Area (SIMA # 2)	None	NFA	The RFA recommended NFA for this SWMU. A site visit was performed in November 2002 by Navy, VDEQ, and EPA to confirm status and consensus for NFA under CERCLA was reached. The Navy submitted a closure notification letter to VDEQ for SWMU 21.	Closure letter submitted to VDEQ and documented in FFA.
SWMU 22	Repair Shop Satellite Storage Area NE of Bldg. 40	None	NFA	The RFA recommended NFA for this SWMU. A site visit was performed in November 2002 by Navy, VDEQ, and EPA to confirm status and consensus for NFA under CERCLA was reached. The Navy submitted a closure notification letter to VDEQ for SWMU 22.	Closure letter submitted to VDEQ and documented in FFA.
SWMU 26	Scrap Metal Storage in Railroad Cars near Bldg. 176	None	NFA	Based on a site visit in November 2002, NFA consensus was reached by Navy, VDEQ, and EPA, as the SWMU is managed under RCRA.	FFA
SWMU 29	Dumpsters (throughout the facility)	None	NFA	Based on a site visit in November 2002, NFA consensus was reached by Navy, VDEQ, and EPA, as the SWMU is managed under RCRA.	FFA
SWMU 32	Overland Drainage Ditches	None	NFA	Navy, VDEQ, and EPA reached consensus for NFA under CERCLA, as drainage ditches associated with individual sites, AOCs, or SWMUs will be investigated on a site-specific basis. Site-specific investigations will identify the exact boundaries of the drainage ditch and samples will be collected at all locations where there is either visible evidence of release or suspicion that past releases may have occurred.	FFA
SWMU 33	Sewer Drainage System	None	NFA	Navy, VDEQ, and EPA reached consensus for NFA under CERCLA, as the sewer drainage system associated with individual sites, AOCs, or SWMUs will be investigated on a site-specific basis. Site-specific investigations will include evaluating the integrity of the subsurface system and may include soil sampling to determine if hazardous constituents have been released.	FFA
SWMU 34	Operational Waste Accumulation Areas	None	NFA	Based on a site visit in November 2002, NFA consensus was reached by Navy, VDEQ, and EPA, as the SWMU is managed under RCRA.	FFA
AOC D	Storm Water Outfalls	None	NFA	Navy, VDEQ, and EPA reached consensus for NFA under CERCLA, as the storm water outfalls will be investigated under CERCLA on a site-specific basis. Site-specific investigations may include sampling various outfalls to determine whether there has been a release of hazardous constituents.	FFA
AOC E	Temporary Pump Storage	None	NFA	AOC E was remediated during a removal action conducted as part of the SIMA facility construction. Therefore, the SJCA Partnering Team reached consensus for NFA for AOC E based on the removal action.	Closed out during the construction of the SIMA building and documented in FFA.
AOC F	Underground Storage Tanks	None	NFA	Navy, VDEQ, and EPA reached consensus for NFA under CERCLA in July 2002, as AOC F is managed under the Navy's UST Program.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
AOC G	Former Process Buildings	None	NFA	Navy, VDEQ, and EPA reached consensus for NFA under CERCLA in July 2002 however, as new information becomes available on the locations and processes conducted at former process buildings, the SJCA Partnering Team will determine if new AOCs should be added. Any former process buildings identified for further evaluation will be evaluated on a site-specific basis.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
AOC J	Former Ammunition Manufacturing Areas	None	NFA	Navy, VDEQ, and EPA reached consensus for NFA under CERCLA, however, as new information becomes available on the manufacturing areas, the SJCA Partnering Team will determine if new AOCs should be added. Any former ammunition manufacturing areas identified for further evaluation will be evaluated on a site-specific basis.	FFA
AOC K	Former Sewage Treatment Plant	FFA - SSA AOC K	NFA	Identified in the FFA as Site Screening Area (FFA Appendix A) March 2004; Final SSA completed June 2004 recommending NFA; Consensus for NFA by Navy, VDEQ, and EPA July 2004.	Signature Page in Final SSA Addendum (June 2004).
EPIC AOC 1	E Street and Marsh Road Ground Scarring	AOC 1; FFA - PSA AOC 1	NFA	Final SSA completed April 2002 recommending an SI to further investigate soil; Identified in the FFA as Preliminary Screening Area (FFA Appendix B) March 2004; Final SI completed June 2004 recommending NFA; Consensus for NFA by Navy, VDEQ, and EPA July 2004.	Signature Page in Final SI (June 2004).
EPIC AOC 2	Piers in front of Building 83	AOC 2	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 3	Ground Scarring at Building M5	AOC 3	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 4	Parking Area South of Building M-1	AOC 4	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 5	Possible Soil Staining Between Buildings 87 and 88	AOC 5	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 6	Ground Scarring East of Site 2	AOC 6	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 7	City of Portsmouth Outgrant Area	AOC 7	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 8	Possible Waste Disposal/Bulk Storage Area	AOC 8	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 9	Ground Scarring Southwest of Building 74	AOC 9	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 10	Ground Scarring in Wharf Area	AOC 10	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 11	Open Storage Area Northeast of Building 55	AOC 11	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 12	Sandy Flat	AOC 12	NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
AOC 13	PCP Dip Tank	AOC 13; FFA - SSA AOC 13	NFA	Identified in the FFA as Site Screening Area (FFA Appendix A) March 2004; Final SSA completed June 2004 recommending NFA; Consensus for NFA by Navy, VDEQ, and EPA July 2004.	Signature Page in Final SSA Addendum (June 2004).
AOC 14	Building 89	AOC 14; FFA - SSA AOC 14	NFA	Identified in the FFA as Site Screening Area (FFA Appendix A) March 2004; Final SSA completed June 2004 recommending NFA; Consensus for NFA by Navy, VDEQ, and EPA July 2004.	Signature Page in Final SSA Addendum (June 2004).

\\NORTHEND\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\FIVE YEAR REVIEW\FIGURE2-1 NO_FURTHER_ACTION_SITES.MXD MUNWIN 3/23/2010 15:25:39



Legend

SJCA Boundary

NFA Site, SWMU, or AOC

N
W E
S

0 450 900
Feet

Figure 2-1
Location of NFA Sites, SWMUs, and AOCs
Five-Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

SECTION 3

Site 4—Landfill D

This section presents background information and the Five-Year Review evaluation for Site 4, the only site at SJCA currently requiring a Five-Year Review.

3.1 Site Chronology

A timeline of the site-specific documents and activities associated with the remedy for Site 4 are provided below.

Date	Event
March 2003	Remedial Investigation (RI)/Human Health Risk Assessment (HHRA)/Ecological Risk Assessment (ERA) for Sites 3, 4, 5, and 6 (CH2M HILL, 2003)
March 2004	Feasibility Study (CH2M HILL, 2004a)
May 2004	Proposed Remedial Action Plan (CH2M HILL, 2004b)
September 2004	ROD (NAVFAC, 2004)
November 2004	Final RD (JV I, 2004)
March 2005	Initiated Remedial Action
October 2005	Completed Remedial Action
December 2005	Initiated Land Use Control (LUC) Inspections
February 2006	ROD Modification (CH2M HILL, 2006a)
June 2006	LUC RD (NAVFAC, 2006b)
September 2006	Remedial Action Completion Report (RACR) (NAVFAC, 2006c)
April 2009	Voluntary Groundwater Performance Monitoring Report (CH2M HILL, 2009b)

3.2 Site Background

3.2.1 Physical Characteristics

Site 4 is located in the northeastern portion of SJCA at the confluence of Blows Creek and the Southern Branch of the Elizabeth River (**Figure 3-1**). The site is located on dredge fill material that reportedly originated from Blows Creek and the Southern Branch of the Elizabeth River. Grass-lined drainage ditches run along the eastern and western sides of Site 4 and transport surficial runoff from the area to the adjacent wetland area and Blows Creek. The adjacent wetland area was incorporated into a separate investigation of the Blows Creek watershed and is not part of Site 4.

The Columbia aquifer in the vicinity of Site 4 ranges in thickness from 25 feet, in the northern portion of the site, to approximately 32 feet, at the southern portion of the site. The aquifer consists predominantly of fine to coarse sands with some silt and clay. The Yorktown

aquifer is predominantly sandy and typically encountered at an average depth of 50 feet bgs. The Yorktown confining unit separating the aquifers consists of a series of interbedded clay and fine sand layers overlying a clay layer. The Yorktown confining unit is continuous across the base and impedes the downward migration of Columbia aquifer groundwater to the Yorktown aquifer. Columbia aquifer groundwater at Site 4 is locally influenced by nearby surface water bodies (Southern Branch of Elizabeth River and Blows Creek) and generally flows in a southern direction with elevations ranging from 1 to 6 feet above msl (**Figure 3-2**). The predominant flow direction in the Yorktown aquifer at SJCA is to the east, towards the Southern Branch of the Elizabeth River (**Figure 3-3**).

3.2.2 Land and Resource Use

Currently, Site 4 is maintained as a controlled closed landfill with a vegetated soil cover. Construction and excavation activities at the site are prohibited and controlled through site signs, fencing, notation in the Internet Navy Facility Assets Data Store (iNFADS) maintained by Commander Naval Region Mid-Atlantic, and a survey plat filed with the City of Chesapeake. Additionally, Section 4 of the annually-updated Site Management Plan for SJCA addresses land use planning at the Base. This section includes a compact disc which provides maps and geographic information system layers in Arcview® of the ERP sites with LUCs. This information is provided to facility personnel for environmental considerations during operational planning and decision-making, and to ensure that LUCs are maintained at sites where they are identified in the ROD as part of the remedy. Anticipated future land use for the site is to remain as a controlled closed landfill.

3.2.3 History of Contamination

Site 4 is an approximately 8.3–acre landfill. In earlier documents, Site 4 was referred to as Dump D or SWMU 6 and included SWMU 7 and AOC L and was reported to consist of only 5 acres. The first indication of activity at Site 4 is trenching identified on a historical aerial photograph from 1961. The trenches were filled with trash, wet garbage, and soil. The IAS (NEESA, 1981) indicated that around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek and continued until 1976, at which time trash and garbage were hauled to an offsite facility. Inert construction debris continued to be disposed of at the landfill until 1981. The wastes managed were primarily trash, wet garbage, construction material, and outdated civil defense stores. Although the RFA indicated that some solvents, acids, bases, and polychlorinated biphenyls were disposed of at Site 4, it is assumed that these materials were disposed of prior to 1976 because the IAS states that only inert material was disposed of after that date. Wastes disposed of at Site 4 were estimated at 56,000 cubic yards.

3.2.4 Initial Response

No environmental cleanup activities occurred before the signature of the ROD in September 2004.

3.2.5 Basis for Remedial Action

An HHRA and an ERA were conducted to evaluate the risks to human health and the environment from exposure to surface soil, subsurface soil, sediment, and groundwater at Site 4 during the RI (CH2M HILL, 2003). The HHRA and ERA concluded that there was potential risk to human and ecological receptors from exposure to waste, COCs (inorganics

and PAHs) in soil, and an inorganic (mercury) in the eastern drainage ditch sediment. Because surface water is transient and the upland ditches provide minimal ecological habitat, there was no significant risk to human health and the environment identified from direct exposure to surface water. No human health risk drivers were identified for the shallow Columbia aquifer groundwater. Although human health risk drivers (primarily inorganics) were identified for the deeper Yorktown aquifer, the SJCA IR Partnering Team determined the risks to be acceptable based on the concentrations of chemicals, the risks identified with these chemicals, and the nature of the groundwater flow conditions.

Based on the results of the investigations, remedial action was warranted to prevent potential unacceptable human health and ecological risks from exposure to waste, soil and sediment at Site 4.

3.3 Remedial Actions

3.3.1 Remedy Selection

A ROD for Site 4 was signed in September 2004. The selected remedy consisted of a soil cover, removal of eastern drainage ditch sediment, and implementation of LUCs to meet the following remedial action objectives (RAOs):

- Prevent or minimize direct contact of human and ecological receptors with landfill contents.
- Reduce infiltration and any resulting leaching of contaminants from the landfill into groundwater.
- Prevent overland flow entering the site (surface water run-on) and control surface water run-off and erosion.

The following LUC objectives for Site 4 were identified in the ROD:

- Prohibit digging into or disturbing the soil cover or landfill contents.
- Prohibit residential use and development of the site.

The cleanup level for mercury in the eastern drainage ditch was established and based on the site-specific background 95 percent upper tolerance limit (UTL) for dredge fill (CH2M HILL, 2001).

The LUCs shall be maintained within the boundaries of the landfill indefinitely, or until all parties (Navy, USEPA, and Commonwealth of Virginia) agree that waste left in place is at such levels to allow for UU/UE.

3.3.2 Remedy Implementation

The RD for the Selected Remedy at Site 4 was completed in November 2004. LUC implementation and maintenance actions were developed in an RD for LUCs (NAVFAC, 2006a). The Navy will implement, maintain, monitor, report on, and enforce the LUCs according to the LUC RD. The remedial action construction was conducted from March through October of 2005 and included the following activities:

- Removal of surface debris from the ground surface and wetland area adjacent to Blows Creek with consolidation of inert debris under the landfill cover and offsite disposal of all other debris.
- Installation of a minimum 2-foot soil cover graded to a minimum of 2% slopes to promote drainage and reduce infiltration.
- Removal and offsite disposal of 1foot of sediment from the floor and sidewalls of the eastern drainage ditch adjacent to the landfill and extending through the wetland to Blows Creek to prevent direct contact of human and ecological receptors with mercury in sediment. The one foot excavation depth and lateral extent was based on pre-confirmation samples collected from one to two feet bgs for mercury analysis and compared to the cleanup level. The cleanup level was based on the site-specific background 95% UTL for dredge fill (CH2M HILL, October 2001). Confirmation sample results are shown on **Figure 3-4**.
- Reshaping of the eastern drainage ditch and construction of a new drainage ditch along the western boundary.
- Compensatory wetland mitigation for permanent impacts to 0.023 acres of the wetland area adjacent to Blows Creek by planting of wetland grasses at nearby Norfolk Navy Shipyard Site 9.
- Installation of a fence and signs around the perimeter of the landfill indicating the access restrictions and the presence of buried waste. The language used on the site signs is as follows:

> Site 4 – Landfill D
> No Access Allowed
>
> Construction and Excavation
> Strictly Prohibited
>
> Environmental Hazard Onsite
>
> Contact NAVFAV Mid Lant at 757-445-6638

- Registration of the survey plat with the City of Chesapeake in the Commonwealth of Virginia to provide public notice of the environmental conditions and limitations on the use of the property.

Minor modifications to the Selected Remedy in the ROD were documented in a Technical Memorandum in February 2006 (CH2M HILL, 2006a). The minor modifications consisted of extension of the soil cover to the west and compensatory mitigation for permanent wetland impacts. In September 2006, a RACR for Site 4 was signed to document the remedy was in place, operating and functioning as intended, and protective of human health and the environment (NAVFAC, 2006c). A copy of the survey plat is included in the RACR. Within the CERCLA process, Site 4 is currently in the Response Complete phase.

3.3.3 Operation and Maintenance

Inspections to verify the continued integrity of the soil cover; ensure appropriate surface water runoff and erosion control measures are functioning; ensure adequate vegetation is maintained; and verify LUCs are in place were initiated in December 2005. Inspections were conducted quarterly for the first year until an adequate vegetative cover was present over the landfill, and annually in subsequent years. The findings from the inspections are documented in annual letter reports submitted to the Navy and regulatory stakeholders. The annual inspection reports are provided in **Appendix A**.

Several bare areas in the vegetation were identified in June 2006. The areas were re-seeded in June 2007 and vegetative re-growth has been successful. In September 2006, surface water was observed pooling in the northeast corner of the site as a result of the culvert from the Site 3 drainage ditch having no identifiable outlet. The culvert was replaced in June 2007 and built up sediment was removed from the drainage ditch to prevent pooling of water against the landfill, which may have impacted the integrity of the cover over time. Tire ruts created on the soil cover during the November 2006 voluntary groundwater monitoring event were regraded and reseeded in June 2007 and vegetative re-growth was successful.

Throughout the inspections, the monitoring wells, signs, fencing, riprap landfill toe, and drainage ditches have remained in good condition. Several items of debris were reported along the edge of perimeter road and quickly removed following the site inspections. No signs of unauthorized intrusive activities, investigation-derived waste (IDW) storage, or dumping within the site have been observed. Additionally, no signs of erosion have been reported during the inspections.

A compensatory mitigation plan to plant wetland grasses at nearby Norfolk Naval Shipyard Site 9 to compensate for the wetland impacts at Site 4 (JV I, July 2005) was submitted and the approach was approved by the USACE. The plan did not require monitoring of the wetland compensatory mitigation. Although a formal monitoring plan was not implemented, visual observation confirmed the site is currently a vegetated wetland.

3.4 Five-Year Review Process

3.4.1 Community Involvement

Community participation at SJCA includes a Restoration Advisory Board (RAB), public meetings, information repository, fact sheets, public notices, and a Web site. The RAB was formed in 1999 and consists of community members and representatives of the Navy, VDEQ, and USEPA. RAB meetings are held semiannually and are open to the public to provide opportunity for comment and input on the ERP. RAB meetings have included site visits in the past. The documents prepared as part of the IRP are maintained in the Administrative Record and listed at an information repository (Major Hillard Library, Chesapeake, Virginia) for review by the public. For the majority of this five-year review period, the public Web site was a contractor-operated Web site (http://public.lantops.ir.org/sites/public/sjca/). That Web site was recently closed down and the information has been migrated to the Navy Installation Restoration Information System and is available to the public at http://portal.navfac.navy.mil/portal/page/portal/navfac/navfac_ww_pp/navfac_hq_pp

/navfac_env_pp/env_restoration_installations/lant/midlant/sjca. The Administrative Record and IR Web sites are updated on a regular basis.

The community was informed of the initiation of the Five-Year Review during the August 11, 2009, RAB meeting. Prior to this meeting, a public notice was placed in *The Virginian-Pilot* informing the public of the RAB meeting. Additionally, a public notice was placed in *The Virginian-Pilot* on July 11, 2009, to inform the community of the initiation of the Five-Year Review.

3.4.2 Document Review

This Five-Year Review consisted of a review of the following:

- RI
- ROD (including toxicity values and risk characteristics)
- Applicable or relevant and appropriate requirements (ARARs) (provided in **Table 3-1**)
- ROD Modification
- Construction Closeout Report
- RACR
- LUC RD
- Site Inspection Letter Reports
- Voluntary Groundwater Monitoring Reports
- State and Federal Environmental Laws and Regulations

3.4.3 Site Inspection

The Navy, USEPA, and VDEQ conducted a Site Inspection to support the Five-Year Review on September 21, 2009. The purpose of the inspection was to assess the protectiveness of the remedy. The Five-Year Review checklist is provided in **Appendix B**.

No significant issues were identified during the site inspection. Vegetation was observed throughout the extent of the soil cover and within the drainage ditches. The signs, fencing, riprap landfill toe, and drainage ditches were observed to be in good condition. No signs of unauthorized intrusive activities, IDW storage, or dumping within the site were observed. Additionally, no low-lying areas, or signs of erosion were observed.

3.4.4 Interviews and Surveys

Community members were contacted in order to obtain the community's views about current site conditions, problems, or related concerns. Persons who live within neighborhoods adjacent to SJCA and employees of SJCA were selected for interviews and surveys. Interviews were conducted either in person or over the phone. Thirteen local residents and one employee were mailed a survey; of these, five surveys were returned from local residents (one of which is an active RAB member) and one from an employee. Two local residents and six employees were contacted for an interview. Of these, one local resident (the RAB member who completed a survey) and five employees (one of which was the employee who completed a survey) agreed to be interviewed. The interview logs and completed surveys are provided in **Appendix C**.

No significant problems or concerns regarding the site were identified during the interviews or surveys. The answers indicated that the more awareness a community member has of the

remedial action, the more confident they are that it is protective of human health and the environment.

3.4.5 Data Review

Although not required in the ROD, quarterly voluntary groundwater performance monitoring was conducted between November 2006 through August 2008 to evaluate the site's impact on groundwater quality and the potential for future releases to pose unacceptable risk. Four monitoring wells (three downgradient and one upgradient) were sampled for the human health COCs identified in surface soil (arsenic and iron) during the RI and the inorganics that were detected at concentrations that exceeded the Maximum Contaminant Level (MCL) or Federal action limit in groundwater (arsenic, cadmium, lead, and thallium) data collected as part of the RI (CH2M HILL, 2003). No statistical exceedance of downgradient concentrations of total and dissolved cadmium, lead, and thallium or total iron over the upgradient concentrations was observed. Total and dissolved arsenic and dissolved iron concentrations were identified to be present in downgradient monitoring wells at levels that statistically exceed concentrations in the upgradient monitoring well; however, all iron concentrations were below the 95% background UTL. There are no significant increases of concentrations in any monitoring well based on the results of the time trend analysis conducted. Although no increasing trends of concentrations were evident, the most recent (2006 to 2008) arsenic concentrations detected at SJS04-MW04S were somewhat greater than the historical (1997 and 1999) concentrations (CH2M HILL, 2009b) (**Figure 3-5**). Therefore, the SJCA Project Management Team elected to conduct additional voluntary groundwater monitoring for arsenic to further evaluate the site conditions and discontinue voluntary groundwater monitoring of iron, cadmium, lead, and thallium.

The additional voluntary groundwater performance monitoring was conducted in August 2009 and is documented in a technical memorandum provided in **Appendix D**. The same monitoring well network included in the previous voluntary groundwater monitoring events was sampled for total and dissolved arsenic only. Total and dissolved arsenic concentrations were identified to be present in one downgradient monitoring well (SJS04-MW04S) at concentrations that statistically exceed concentrations in the upgradient monitoring well. The results of the time trend analysis conducted indicated a significant increase of dissolved arsenic concentration in downgradient monitoring well SJS04-MW05S; however, all arsenic concentrations are below the MCL and the trend was heavily influenced by nondetect proxy values. Therefore, the results do not appear to be indicative of a site release and offsite migration of landfill contaminants does not appear to be occurring.

3.5 Technical Assessment

The technical assessment of a remedy is based on the following three questions, which provide a framework for organizing and evaluating data and information and ensure that all relevant issues are considered when determining the protectiveness of the remedy.

Question A: Is the remedy functioning as intended by the decision document?

Remedial Action Performance Based on the review of documents, ARARs, risk assumptions, inspections, and voluntary groundwater performance monitoring results, the Site 4 remedy

is functioning as intended by the ROD and ROD modification. Installation of the soil cover over the landfill waste and contaminated soil achieved the remedial objectives. Inspections conducted at the site have confirmed that the soil cover is intact; preventing or minimizing direct contact of human health and ecological receptors with landfill contents. The as-built survey confirmed that the minimum 2 percent slope, which was designed to reduce infiltration and resulting leaching of contaminants from the landfill into groundwater, was achieved. Additionally, the inspections, which did not identify any sign of erosion or sediment buildup within the upland drainage ditches, and the as-built survey, have confirmed that overland flow entering the site is being prevented and surface water run-off and erosion are being controlled.

Implementation of LUCs LUCs have achieved the LUC objectives. A call to the City of Chesapeake's Circuit Court Office confirmed that a survey plat was filed and has been maintained. Annual site inspections have ensured that the soil cover integrity is maintained and exposure to landfill contents is prevented. Site signs and fencing have remained intact and restrict access to the site. Minor soil cover maintenance has been conducted per recommendations of the annual letter reports.

Monitoring Results Although groundwater monitoring at the site was not required in the ROD, nine rounds of voluntary groundwater performance monitoring have been conducted. Evaluation of the data indicates that concentrations in groundwater at Site 4 appear to be steady over time and no site release or offsite migration of landfill contaminants has occurred.

Operation and Maintenance Activities Operation and maintenance (O&M) of the soil cover and drainage ditches has been effective. Issues that could have potentially affected the protectiveness of the remedy, bare areas on the vegetative cover and pooling of water against the landfill, were identified during site inspections and have been corrected. O&M annual costs are consistent with original estimates and there are no indications of any difficulties with the remedy.

Optimization Maintenance costs were minimized through the team decision to not mow the vegetation of the landfill cover. For continued optimization, the cover should remain vegetated and no mowing operations at the site should be conducted. No new opportunities for optimization were identified.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Changes in Exposure Pathways No changes in the site conditions that would affect exposure pathways have been identified. No new contaminants, sources, or routes of exposure have been identified. There is no indication that hydrologic or hydrogeologic conditions have changed in a way to affect the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics Although there have been some changes in toxicity values, regulatory levels, and risk characteristics of some constituents detected in Site 4, these changes would not affect the protectiveness of the selected remedy as it would not substantially change the results of the risk assessment.

The landfill contents and contaminated soil have been covered and the contaminated drainage ditch sediment has been excavated, eliminating potential transport/exposure

pathways. Additionally, LUCs restrict unauthorized activities which may result in exposure to landfill waste and/or contaminated soil. Therefore, any changes in toxicity would not affect the protectiveness of the remedy.

Changes in Risk Assessment Methodologies Although there have been some procedural changes to how risk assessments are conducted, none of these changes affect the protectiveness of the remedy. The elimination of risk from exposure to waste and COCs in soil occurred through the direct elimination of exposure pathways. Elimination of risk to mercury in sediment occurred through removal of the contaminated sediment to background levels; therefore, risk assessment methodology changes would not change the cleanup level for mercury. No additional COCs have been identified and there is no clear increasing trend of constituents analyzed for as part of the voluntary groundwater performance monitoring.

Question C: Has any other information come to light that could question the protectiveness of the remedy?

No new risks were identified during the Five-Year Review. No weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

3.5.1 Technical Assessment Summary

According to the data reviewed and the site inspection, the remedy is functioning as intended by the ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Changes in the toxicity factors that were used in the risk assessments or to the standardized risk assessment methodology (subsequent to the completion of the remedial action) do not affect the protectiveness of the remedy.

3.6 Site 4 Issues and Associated Recommendations, and Follow Up Actions

No issues or follow up actions have been identified for Site 4 based on this Five-Year Review.

3.7 Protectiveness Statement

The remedy at Site 4 is protective of human health and the environment. All threats at the site have been addressed through installation of a soil cover over the contaminated soil and waste and removal of contaminated sediments, the installation of fencing and warning signs, and the implementation of institutional controls.

3.8 Next Review

In accordance with Navy policy, the next Five-Year Review should be signed no later than five-years after the signature date of this report.

Table 3-1
Summary of ARARs and To Be Considered Criteria
Five-Year Review
St. Juliens Creek Annex
Chesapeake, Virginia

Requirement	Prerequisite	Citation	ARAR Determination
Chemical Specific			
Soil			
Chemical-specific risk-based concentration (RBC) screening levels	CERCLA site	EPA Region III RBC Tables	TBC
Groundwater			
Chemical-specific RBC screening levels	Public water system	EPA Region III RBC Tables	TBC
Virginia Hazardous Waste Management Regulations (VHWMRs)			
Definition and management of RCRA hazardous waste	Waste soil	9 VAC 20-60 et seq	Relevant and Appropriate
These regulations and laws define the requirements for the management of hazardous wastes. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of hazardous waste	9 VAC 20-60-12 et seq	Relevant and Appropriate
Virginia Solid Waste Management Regulations (VSWMRs)			
Specific regulations for the handling of “special wastes"	Waste must meet the determination of a Virginia “special waste”	9 VAC 20-80 et seq	Relevant and Appropriate
These regulations and laws define the requirements for the management of solid wastes. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of solid waste	9 VAC 20-80 et seq	Applicable
Provides criteria for determining if solid waste disposal facility poses an adverse effect on human health or environment	Permitted solid waste / municipal waste landfill	9 VAC 20-80 et seq	Applicable

Table 3-1
Summary of ARARs and To Be Considered Criteria
Five-Year Review
St. Juliens Creek Annex
Chesapeake, Virginia

Requirement	Prerequisite	Citation	ARAR Determination
Location-Specific			
Clean Water Act as Amended by the Chesapeake Bay Restoration Act of 2000*			
Actions taken should expand and strengthen cooperative efforts to restore and protect the Chesapeake Bay and to achieve the goals established in the Chesapeake Bay Agreement	Applies to sites located within the Chesapeake Bay watershed	Chesapeake Restoration Act of 2000	Applicable
Protection of Floodplain*			
Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas	40 CFR Part 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Applicable
Protection of Wetlands*			
Action to minimize the destruction, loss, or degradation of wetlands	Wetland	40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302 Clean Water Act (CWA) of 1972 Section 404	Applicable
Federal Fish and Wildlife Conservation Act			
Requires that activities avoid, minimize, or compensate for impacts to fish and wildlife and their habitats	Applies to actions that affect fish and wildlife and their habitat	16 USC §662 et seq	Applicable
Coastal Zone and Management Act			
Requires that activities conducted within a coastal zone be consistent with an approved state management program	Applies to sites located within a coastal zone	16 USC §1451 et seq	Relevant and Appropriate
Coastal Zone Management Act; NOAA Regulations of Federal Consistency with approved State Coastal Zone Management			
Conduct activities within a coastal management zone in a manner consistent with local requirements	Activities affecting the coastal zone including lands thereunder and adjacent shore land	Section 307(c) of 16 USC 1456(c); also see 15 CFR 930 and 923.45	Relevant and Appropriate
Virginia State Water Control Laws and Virginia Wetlands Regulations*			
Action to minimize the destruction, loss, or degradation of wetlands	Wetland as defined by Virginia statutory provision	General Provisions Relating to Marine Resources Commission, Va. Code Ann. 28.2-1300 to 1320 (1998); Wetlands Mitigation Compensation Policy, 4 VAC 20-390-10 to 50	Applicable
Chesapeake Bay Preservation Act and Chesapeake Bay Preservation Area Designation and Management Regulations*			
Under these requirements, certain locally designated tidal and nontidal wetlands, as well as other sensitive land areas, may be subject to limitations regarding land-disturbing activities, removal of vegetation, use of impervious cover, erosion and sediment control, stormwater management, and other aspects of land use that may have effects on water quality.	Federally owned area designated as a Chesapeake Bay preservation area	Chesapeake Bay Preservation Act, Va. Code Ann. 10.1-2100 to 2116; Chesapeake Bay Preservation Area Designation and Management Regulations, 9 VAC 10-20-10 to 280	Relevant and Appropriate

Table 3-1
Summary of ARARs and To Be Considered Criteria
Five-Year Review
St. Juliens Creek Annex
Chesapeake, Virginia

Requirement	Prerequisite	Citation	ARAR Determination
Action-Specific			
Clean Air Act (CAA) 40 USC 7401 et seq*			
National Primary and Secondary Ambient Air Quality Standards (NAAQS) - standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead)	Contamination of air affecting public health and welfare	40 CFR Sections 50.4 - 50.12	Relevant and Appropriate
Virginia Air Pollution Control Regulations*			
Fugitive dust/emissions may not be discharged to the atmosphere at amounts in excess of standards	Any source of fugitive dust/ emissions	9 VAC 5-50-60 to 90	Applicable
Virginia Stormwater Management Regulations and Virginia Erosion and Sediment Control Regulations			
Regulates stormwater management and erosion/ sedimentation control practice	Land disturbing activities	Stormwater Management Act, VA Code Ann. §§ 10.1-603.1 to 603.15 (1998) Stormwater Management Regulations, 4 VAC 3-20-10 to 251 Erosion and Sediment Control Law, Va. Code Ann .§§ 10.1-560 to 571 (1998); Erosion and Sediment Control Regulations, 4 VAC 50-30-10 to 110 Virginia Storm Water Construction Activity, 9 VAC 25-180-10 to 70	Applicable

*Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

\\APHRODITE\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\SITE 4\FIGURE3-1_LOCATION_SITE4.MXD MUNWIN 12/9/2009 14:30:42

Legend
- SJCA Boundary
- Site/LUC Boundary
- IR Site LUC Fence
- IR Site LUC Signs
- Access Road

N
W E
S

0 75 150
Feet

Figure 3-1
Location of Site 4
Five-Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

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\\APHRODITE\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\FIVE YEAR REVIEW\FIGURE3-2_SITE4_GW_ELEVATION.MXD MUNWIN 11/16/2009 11:44:08

Legend

- Shallow Monitoring Well
- SJCA Boundary
- Site/LUC Boundary
- Fence
- Access Road
- General Flow Direction
- Potentiometric Surface Contours (August 2009)
- 3.0 Groundwater Elevation (feet above mean sea level)

N
W E
S

0 75 150

Feet

Figure 3-2
Columbia Aquifer Groundwater Surface Elevations
Five-Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

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\\APHRODITE\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\FIVE YEAR REVIEW\FIGURE3-3_YORKTOWN_POTSURF_GWFLOW.MXD MUNWIN 11/17/2009 12:06:30

Legend

- SJCA Boundary
- Yorktown Aquifer Monitoring Well
- Yorktown Potentiometric Surface Contour (April 2005)
- Inferred Potentiometric Surface Contour
- Groundwater Flow Direction
- 3.0 Groundwater Elevation
- * Not used for contouring

N
W E
S

0 700 1,400 Feet

Figure 3-3
Yorktown Aquifer Potentiometric Surface and Groundwater Flow Map
Five-Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

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\\NORTHEND\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\SITE 4\FIVE-YEAR REVIEW REPORT\FIGURE3-4_SD_CONFIRMATION_RESULTS.MXD MUNWIN 3/24/10

Legend
- SJCA Boundary
- Site 4/LUC Boundary
- Fence Boundary
- Access Road
- Pre-Confirmation Samples

J - reported value is estimated

N W E S

0 75 150 Feet

Figure 3-4
Sediment Confirmation Sample Results
Five-Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

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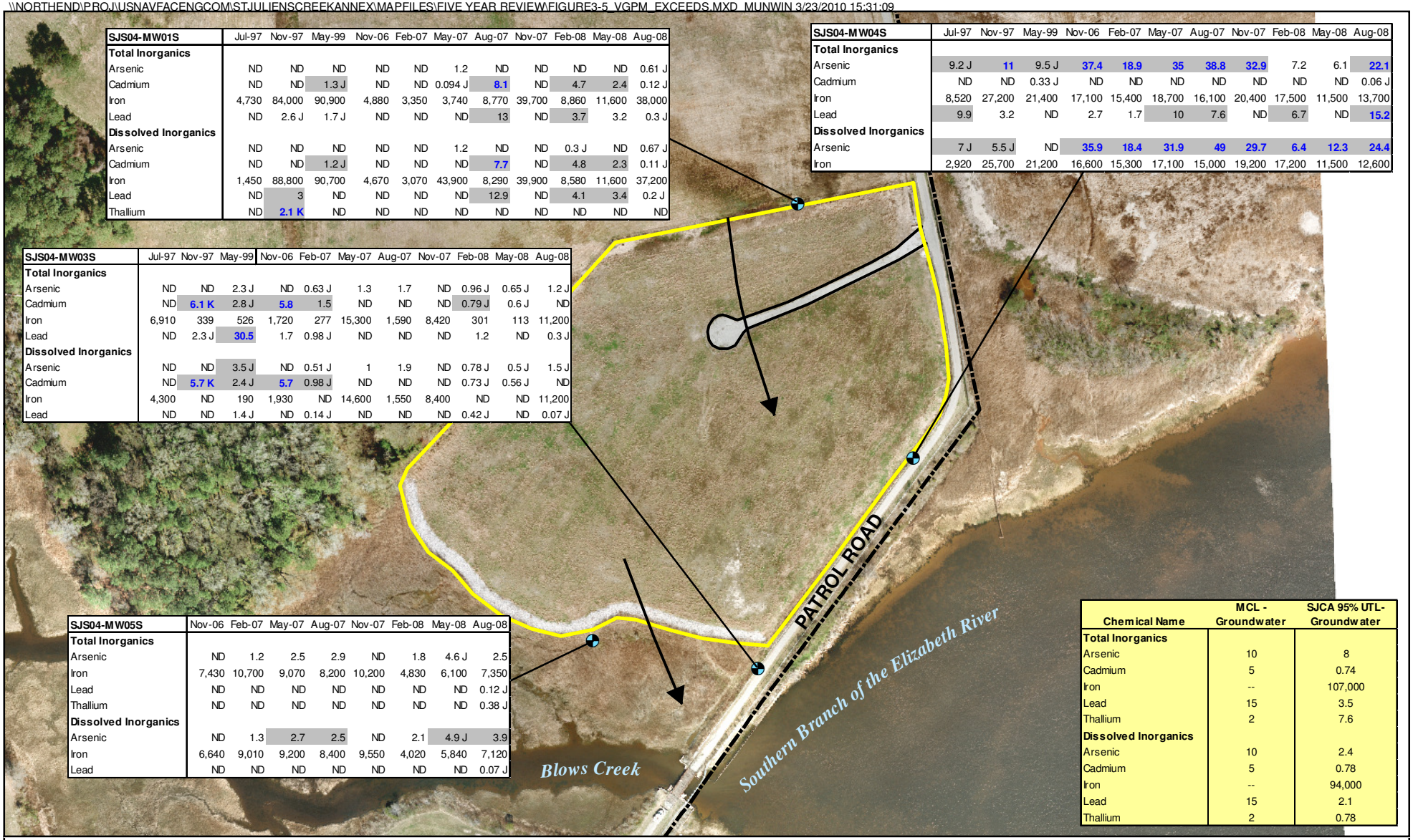
\\NORTHEND\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\FIVE YEAR REVIEW\FIGURE3-5_VGPM_EXCEEDS.MXD MUNWIN 3/23/2010 15:31:09



SJS04-MW01S	Jul-97	Nov-97	May-99	Nov-06	Feb-07	May-07	Aug-07	Nov-07	Feb-08	May-08	Aug-08
Total Inorganics											
Arsenic	ND	ND	ND	ND	ND	1.2	ND	ND	ND	ND	0.61 J
Cadmium	ND	ND	1.3 J	ND	ND	0.094 J	8.1	ND	4.7	2.4	0.12 J
Iron	4,730	84,000	90,900	4,880	3,350	3,740	8,770	39,700	8,860	11,600	38,000
Lead	ND	2.6 J	1.7 J	ND	ND	ND	13	ND	3.7	3.2	0.3 J
Dissolved Inorganics											
Arsenic	ND	ND	ND	ND	ND	1.2	ND	ND	0.3 J	ND	0.67 J
Cadmium	ND	ND	1.2 J	ND	ND	ND	7.7	ND	4.8	2.3	0.11 J
Iron	1,450	88,800	90,700	4,670	3,070	43,900	8,290	39,900	8,580	11,600	37,200
Lead	ND	3	ND	ND	ND	ND	12.9	ND	4.1	3.4	0.2 J
Thallium	ND	2.1 K	ND	ND	ND	ND	ND	ND	ND	ND	ND

SJS04-MW04S	Jul-97	Nov-97	May-99	Nov-06	Feb-07	May-07	Aug-07	Nov-07	Feb-08	May-08	Aug-08
Total Inorganics											
Arsenic	9.2 J	11	9.5 J	37.4	18.9	35	38.8	32.9	7.2	6.1	22.1
Cadmium	ND	ND	0.33 J	ND	ND	ND	ND	ND	ND	ND	0.06 J
Iron	8,520	27,200	21,400	17,100	15,400	18,700	16,100	20,400	17,500	11,500	13,700
Lead	9.9	3.2	ND	2.7	1.7	10	7.6	ND	6.7	ND	15.2
Dissolved Inorganics											
Arsenic	7 J	5.5 J	ND	35.9	18.4	31.9	49	29.7	6.4	12.3	24.4
Iron	2,920	25,700	21,200	16,600	15,300	17,100	15,000	19,200	17,200	11,500	12,600

SJS04-MW03S	Jul-97	Nov-97	May-99	Nov-06	Feb-07	May-07	Aug-07	Nov-07	Feb-08	May-08	Aug-08
Total Inorganics											
Arsenic	ND	ND	2.3 J	ND	0.63 J	1.3	1.7	ND	0.96 J	0.65 J	1.2 J
Cadmium	ND	6.1 K	2.8 J	5.8	1.5	ND	ND	ND	0.79 J	0.6 J	ND
Iron	6,910	339	526	1,720	277	15,300	1,590	8,420	301	113	11,200
Lead	ND	2.3 J	30.5	1.7	0.98 J	ND	ND	ND	1.2	ND	0.3 J
Dissolved Inorganics											
Arsenic	ND	ND	3.5 J	ND	0.51 J	1	1.9	ND	0.78 J	0.5 J	1.5 J
Cadmium	ND	5.7 K	2.4 J	5.7	0.98 J	ND	ND	ND	0.73 J	0.56 J	ND
Iron	4,300	ND	190	1,930	ND	14,600	1,550	8,400	ND	ND	11,200
Lead	ND	ND	1.4 J	ND	0.14 J	ND	ND	ND	0.42 J	ND	0.07 J

SJS04-MW05S	Nov-06	Feb-07	May-07	Aug-07	Nov-07	Feb-08	May-08	Aug-08
Total Inorganics								
Arsenic	ND	1.2	2.5	2.9	ND	1.8	4.6 J	2.5
Iron	7,430	10,700	9,070	8,200	10,200	4,830	6,100	7,350
Lead	ND	ND	ND	ND	ND	ND	ND	0.12 J
Thallium	ND	ND	ND	ND	ND	ND	ND	0.38 J
Dissolved Inorganics								
Arsenic	ND	1.3	2.7	2.5	ND	2.1	4.9 J	3.9
Iron	6,640	9,010	9,200	8,400	9,550	4,020	5,840	7,120
Lead	ND	ND	ND	ND	ND	ND	ND	0.07 J

Chemical Name	MCL - Groundwater	SJCA 95% UTL-Groundwater
Total Inorganics		
Arsenic	10	8
Cadmium	5	0.74
Iron	--	107,000
Lead	15	3.5
Thallium	2	7.6
Dissolved Inorganics		
Arsenic	10	2.4
Cadmium	5	0.78
Iron	--	94,000
Lead	15	2.1
Thallium	2	0.78

Legend

- SJCA Boundary
- Site 4 Boundary
- Shallow Monitoring Well
- Estimated Groundwater Flow Direction
- Access Road

Notes:

Units are in micrograms per liter (µg/L)

Bold blue font represents MCL exceedances

Shaded cells represent background UTL exceedance

J - Reported value is estimated

ND - Analyte not detected

N W E S

0 100 200 Feet

Figure 3-5
Groundwater Detections and Exceedances of Screening Criteria
Five-Year Review Report
St. Juliens Creek Annex
Chesapeake, Virginia

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SECTION 4

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Appendix A
Annual Inspection Reports

Site 4 Annual Inspection Report – Fiscal Year 2006

PREPARED FOR: SJCA Tier I Partnering Team

PREPARED BY: CH2M HILL

DATE: November 13, 2006

This annual inspection report documents the results of fiscal year (FY) 2006 site inspection activities at Site 4, Landfill D, St. Juliens Creek Annex (SJCA), Chesapeake, Virginia (Figure 1). This technical memorandum was prepared under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-Term Environmental Action Navy (CLEAN) III, Contract N62470-02-D-3052, Contract Task Order (CTO) 0010 for submittal to NAVFAC Mid-Atlantic, U.S. Environmental Protection Agency Region III (EPA), and Virginia Department of Environmental Quality (VDEQ).

Background

SJCA was placed on the National Priorities List (NPL) on July 27, 2000 (EPA ID: VA5170000181). Investigations and remedies have been conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or "Superfund"), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

A Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report was completed for Site 4 in March 2003. A subsequent Feasibility Study was completed in March 2004. A Proposed Plan was completed in June 2004 and a Record of Decision (ROD) was signed in September of 2004. These reports identified the risks to human and ecological receptors, established Remedial Action Objectives (RAOs), and defined the Selected Remedy. The Selected Remedy for Site 4 included a soil cover, removal of eastern drainage ditch sediment, and land use controls (LUCs) to meet the following RAOs:

- Prevent or minimize direct contact of human and ecological receptors with landfill contents
- Reduce infiltration and any resulting leaching of contaminants from the landfill into groundwater
- Prevent overland flow entering the site (surface water run-on) and control surface water run-off and erosion

To further define and implement the RAOs, the ROD specified the following LUC objectives for Site 4:

- Prohibit digging into or disturbing the soil cover or landfill contents

- Prohibit residential use and development of the site

The Remedial Design (RD) for the Selected Remedy was completed in November 2004 and the Remedial Action. Construction was conducted from March through October of 2005. LUC implementation and maintenance actions were documented in a RD for LUCs, finalized in June 2006. The Navy implements, maintains, monitors, and enforces the LUCs according to the RD. The LUCs shall be maintained within the boundaries of the landfill (Figure 1) indefinitely, or until all parties (Navy, EPA, and Commonwealth of Virginia) agree that waste left in-place is at such levels to allow for unlimited use and unrestricted exposure. A Remedial Action Completion Report, documenting that the remedy at Site 4 is operational and functional in accordance with CERCLA and memorializing the Response Complete, was signed in October 2006.

Inspections

In accordance with the ROD and RD for LUCs, quarterly landfill inspections were conducted in FY 2006 to verify the continued integrity of the soil cover, confirm appropriate surface run-off features and erosion controls are functioning, and ensure that adequate vegetation is maintained. In addition to the quarterly inspections, an inspection was conducted after Tropical Storm Ernesto, which was considered to be a major storm event in the area. Site-specific inspection checklists (Attachment 1) were used for quarterly inspections and the findings are summarized below.

During the December 14, 2005 site inspection, no signs of unauthorized intrusive activities, investigation derived waste (IDW) storage, or dumping within the site or in the vicinity were observed. Damage to the perimeter road in the vicinity of SJS04-MW04S and south of SJS04-MW03 was observed. The perimeter road leads to an impassible bridge and is therefore not regularly used in this location. Additionally, the road is not within the site boundary and is not affecting the remedy in place; therefore, no corrective action was necessary. The drainage ditches, monitoring wells, signs, and fencing were all in good condition.

During the March 7, 2006 site inspection, no signs of unauthorized intrusive activities, IDW storage, or dumping within the site or in the vicinity were observed. The drainage ditches, monitoring wells, signs, and fencing were all in good condition.

During the June 7, 2006 site inspection, no signs of unauthorized intrusive activities, IDW storage, or dumping within the site or in the vicinity were observed. The drainage ditches, monitoring wells, and signs were in good condition. However, while the fence was secured, the left side of the gate could not be opened. The gate was repaired in July 2006. The soil cover was free of notable defects that would require corrective action to ensure the effectiveness of the remedy. Numerous bare spots were observed throughout the soil cover where vegetative growth had not yet occurred. The seeding subcontractor was contacted to discuss whether re-seeding was necessary. The seeding subcontractor recommended allowing the area to continue to self-seed, as documented in Attachment 2.

A site inspection was conducted following Tropical Storm Ernesto on September 5, 2006. Surface water was pooled in the northeast corner of the site. The pooling is a result of the culvert from the Site 3 drainage ditch having no identifiable outlet. It is recommended that

the culvert be replaced to prevent pooling of the water against the landfill, which may impact the integrity of the cover over time. The storm event did not cause any erosion to the cover or accumulation of sediment in the drainage ditches. The riprap landfill toe adjacent to the wetland was not impacted by the storm.

During the September 20, 2006 site inspection, no signs of unauthorized intrusive activities, IDW storage, or dumping within the site or in the vicinity were observed. The soil cover, monitoring wells, signs, and fencing were all in good condition.

In accordance with the ROD and RD for LUCs, annual landfill inspections will be conducted at Site 4 to verify the continued integrity of the soil cover, confirm appropriate surface run-off features and erosion controls are functioning, and ensure that adequate vegetation is maintained. Annual inspection reports will be submitted to EPA and the Commonwealth of Virginia.

References

CH2M HILL, September 2006. *Final Remedial Action Completion Report, Site 4 –Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

NAVFAC, June 2006. *Remedial Design for Land Use Controls, Site 4, Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

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LEGEND

- SJCA Boundary
- Site 4/LUC Boundary
- Fence Boundary
- Access Road
- 6' x 3' Sign
- 2' x 2' Sign
- Monitoring Well - Deep
- Monitoring Well - Shallow

N

0 60 120 180 Feet

Figure 1
Site 4
St. Juliens Creek Annex
Chesapeake, Virginia

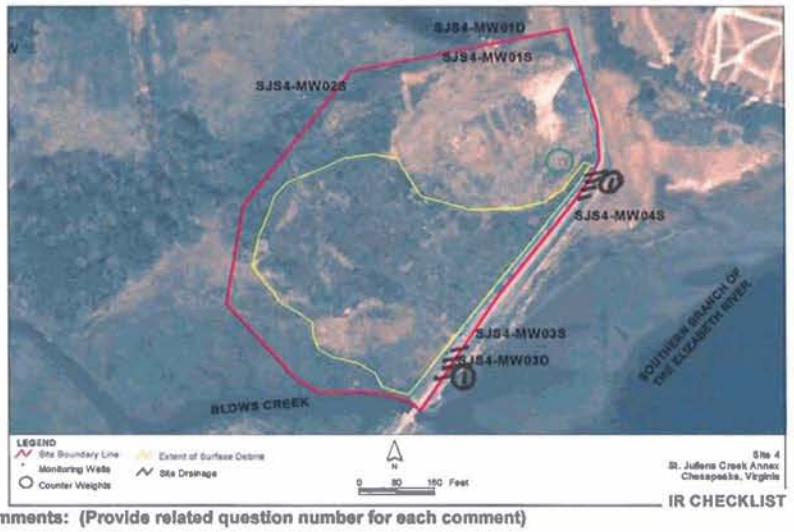
CH2MHILL

Attachment 1

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 10.1 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material which reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was then disposed of at the landfill. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly disposed. Wastes disposed of at Site 4 were estimated at 1,500,000 cubic ft.

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; is currently being conducted and is expected for completion by October 2005. Fencing is installed around the perimeter of the site with signs posted.



IR CHECKLIST

Comments: (Provide related question number for each comment)

① Road needs repair - Quest. 3

		Yes	No
	General Questionnaire		
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below:	X	

Investigative Derived Waste
Purge water from Site 4
January 28, 2003
Do not handle, analysis pending
Contact Agnes Sullivan, NAVFAC MID LANT, (757) 444-4120

3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	

Inspection performed by: (Print and sign)

Date: 12/14/05 Rebekah Ives Rebekah Ives

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 10.1 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material which reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was then disposed of at the landfill. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly disposed. Wastes disposed of at Site 4 were estimated at 1,5(

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; is currently being conducted and is expected for completion by October 2005. Fencing is installed around the perimeter of the site with signs posted.

Comments: (Provide related question number for each comment)

Note: signs were in good condition - Question #5

		Yes	No
	General Questionnaire		
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below: Investigative Derived Waste Purge water from Site 4 January 28, 2003 Do not handle, analysis pending Contact Agnes Sullivan, NAVFAC MID LANT, (757) 444-4120	X	
3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.	X	
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	

Inspection performed by: (Print and sign) Rebekah Ives Rebekah Ives

Date: 3/7/2006

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 10.1 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material that reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was continued to be disposed of at Site 4 until 1981. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly disposed. Wastes disposed of at Site 4 were esti

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; was completed in 2005. Fencing is installed around the perimeter of the site with signs posted.

IR CHECKLIST

Comments: (Provide related question number for each comment)

① - Unable to visually locate sign due to vegetation - Quest. 5

② - Bare spots are present throughout soil cover where vegetative regrowth has not occurred - Quest. 8

③ - Left side of fence will not open

		Yes	No
General Questionnaire			
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below:	X	

Investigative Derived Waste
Purge water from Site 4
January 28, 2003
Do not handle, analysis pending
Contact Agnes Sullivan, NAVFAC MID LANT, (757) 444-4120

3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
Site Specific Questionnaire			
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.		X
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	
7	Is the soil cover free of notable defects that would require corrective action to ensure the effectiveness of the remedy?	X	
8	Is the site free of signs of stressed vegetation or bare spots that may lead to erosion of the soil cover?		X
9	In the case of a sever weather event, is the integrity of the soil cover intact (no erosion by surface runoff)?	X	

Inspection performed by: (Print and sign) Rebekah Ives Rebekah Ives

Date: 06/07/06

SITE 4 INSPECTION
SEPTEMBER 5, 2006
(AFTER TROPICAL STORM ERNESTO)

Site 4 - Landfill D

St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 10.1 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material that reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was continued to be disposed of at Site 4 until 1981. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly disposed. Wastes dis

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; was completed in 2005. Fencing is installed around the perimeter of the site with signs posted.

Comments: (Provide related question number for each comment)

① WATER POOLED IN LOCATION MARKED. CULVERT AT OUTLET OF SITE 3 DRAINAGE DITCH IS CLOGGED/DOES NOT OUTLET. RECOMMEND FIXING CULVERT TO PREVENT POOLING OF WATER AT LANDFILL TOE. COULD AFFECT INTEGRITY OF COVER OVER TIME.

	General Questionnaire	Yes	No
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below: Investigative Derived Waste Purge water from Site 4 January 28, 2003 Do not handle, analysis pending Contact Agnes Sullivan, NAVFAC MID LANT, (757) 444-4120	X	
3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.		X ①
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.	X	
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	
7	Is the soil cover free of notable defects that would require corrective action to ensure the effectiveness of the remedy?	X	
8	Is the site free of signs of stressed vegetation or bare spots that may lead to erosion of the soil cover?	X	
9	In the case of a severe weather event, is the integrity of the soil cover intact (no erosion by surface runoff)?	X	

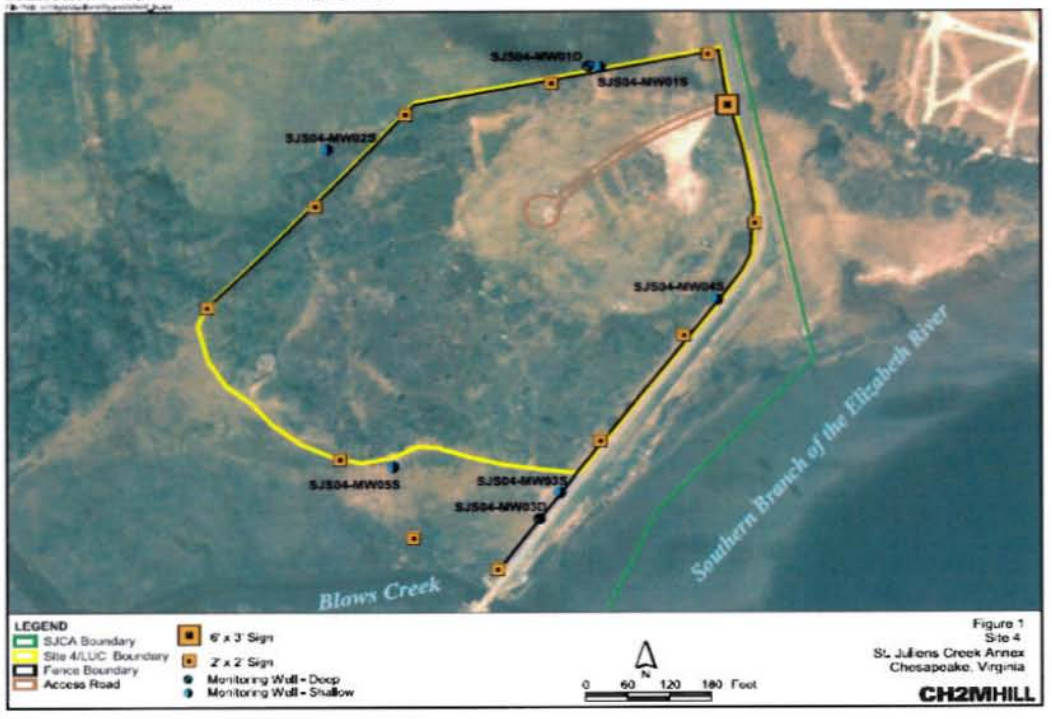
Inspection performed by: (Print and sign) JANNA STASZAK Janna Staszak

Date: SEPTEMBER 5, 2006

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 10.1 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material that reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was continued to be disposed of at Site 4 until 1981. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly disposed. Wastes dis

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; was completed in 2005. Fencing is installed around the perimeter of the site with signs posted.



Comments: (Provide related question number for each comment)

No comments

		Yes	No
	General Questionnaire		
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below: Investigative Derived Waste Purge water from Site 4 January 28, 2003 Do not handle, analysis pending Contact Agnes Sullivan, NAVFAC MID LANT, (757) 444-4120	X	
3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.	X	
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	
7	Is the soil cover free of notable defects that would require corrective action to ensure the effectiveness of the remedy?	X	
8	Is the site free of signs of stressed vegetation or bare spots that may lead to erosion of the soil cover?	X	
9	In the case of a severe weather event, is the integrity of the soil cover intact (no erosion by surface runoff)?	X	

Inspection performed by: (Print and sign) Rebekah Ives Rebekah Ives

Date: 9/20/06

Attachment 2

QS&L, INC.
2499 NUMBER TEN LANE
CHESAPEAKE, VA 23323
(757) 558-6003
FAX (757) 558-6034

JULY 18, 2006

AGVIQ ENVIRONMENTAL SERVICES
4663 HAYGOOD ROAD, SUITE 201
VA BEACH, VA 23455

REF: SOIL COVER AT SITE 4 OF
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VA

ATTN: CRAIG MILLER

GENTLEMEN:

In response to your inquiry as to the lack of germination of the seed on the above referenced project, we are suggesting the following:

1. We recommend not cutting the grass for the next three months as the area is self-seeding itself.

2. We suggest that you do not put out more seed at this time, give the grass time to come together on its own.

If you have any questions or comments, please do not hesitate to contact this office.

Sincerely,

Andy Anderson
Vice President

cc: file

Site 4 Annual Inspection Report – Fiscal Year 2007

PREPARED FOR: SJCA Tier I Partnering Team

INSPECTION CONDUCTED BY: Tim Reisch/NAVFAC Mid-Atlantic
Karen Doran/VDEQ
Janna Staszak/CH2M HILL
Adrienne Jones/CH2M HILL

PREPARED BY: CH2M HILL

DATE: October 30, 2007

REVISION DATE: December 5, 2007

This annual inspection report documents the results of fiscal year (FY) 2007 annual inspection at Site 4, Landfill D, St. Juliens Creek Annex (SJCA), Chesapeake, Virginia (Figure 1). This technical memorandum was prepared under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-Term Environmental Action Navy (CLEAN) III, Contract N62470-02-D-3052, Contract Task Order (CTO) 0151, for submittal to NAVFAC Mid-Atlantic, U.S. Environmental Protection Agency Region III (EPA), and Virginia Department of Environmental Quality (VDEQ).

Background

SJCA was placed on the National Priorities List (NPL) on July 27, 2000 (EPA ID: VA5170000181). Investigations and remediations have been conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or "Superfund"), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

A Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report was completed for Site 4 in March 2003 (CH2M HILL, March 2003). A subsequent Feasibility Study was completed in March 2004 (CH2M HILL, March 2004). A Proposed Plan was completed in June 2004 (NAVFAC, June 2004) and a Record of Decision (ROD) was signed in September of 2004 (NAVFAC, Septemeber 2004). These reports identified the risks to human and ecological receptors, established Remedial Action Objectives (RAOs), and defined the Selected Remedy. The Selected Remedy for Site 4 included a soil cover, removal of eastern drainage ditch sediment, and land use controls (LUCs) to meet the following RAOs:

- Prevent or minimize direct contact of human and ecological receptors with landfill contents
- Reduce infiltration and any resulting leaching of contaminants from the landfill into groundwater

- Prevent overland flow entering the site (surface water run-on) and control surface water run-off and erosion

To further define and implement the RAOs, the ROD specified the following LUC objectives for Site 4:

- Prohibit digging into or disturbing the soil cover or landfill contents
- Prohibit residential use and development of the site

The Remedial Design (RD) for the Selected Remedy was completed in November 2004 [Agviq-CH2M HILL Joint Venture (JVI), Novemeber 2004]. The Remedial Action construction was conducted from March through October of 2005. LUC implementation and maintenance actions were documented in a RD for LUCs, finalized in June 2006 (CH2M HILL, June 2006). The Navy implements, maintains, monitors, and enforces the LUCs according to the RD. The LUCs shall be maintained within the boundaries of the landfill (Figure 1) indefinitely, or until all parties (Navy, EPA, and Commonwealth of Virginia) agree that waste left in-place is at such levels to allow for unlimited use and unrestricted exposure. A Remedial Action Completion Report, documenting that the remedy at Site 4 is operational and functional in accordance with CERCLA and memorializing the Response Complete, was signed in October 2006 (CH2M HILL, October 2006).

Inspection

In accordance with the ROD and RD for LUCs, the FY 2007 annual landfill inspection was conducted on October 10, 2007 to verify the continued integrity of the soil cover, confirm appropriate surface water drainage features and erosion controls are functioning, and ensure that adequate vegetation is maintained. No major storm events, requiring additional inspections, occurred in the area during FY 2007. The site-specific inspection checklist (Attachment 1) was used for the annual inspection and the findings are summarized below.

During the FY 2007annual inspection, no signs of unauthorized intrusive activities, investigation derived waste (IDW) storage, or dumping within the site was observed. A car battery was found in the site vicinity along the perimeter road; facility operations was contacted to remove the battery, and it was reported that the battery was removed from the site on October 11, 2007. The monitoring wells, signs, and fencing were all in good condition.

The soil cover was free of notable defects that would require corrective action to ensure the effectiveness of the remedy. In June 2007, several of the bare spots, identified during the FY 2006 annual inspection (CH2M HILL, November 2006) where vegetative growth had not yet occurred, were reseeded. In addition, tire ruts created on the soil cover during the November 2006 voluntary groundwater monitoring event were graded and reseeded. The tire ruts were no longer evident during this inspection. Bare areas were still evident in the southeast portion of the site, though some new growth was evident (Attachment 1). The bare areas will continue to be monitored to ensure vegetative growth in the area is successful and additional seeding will be conducted if needed.

The site drainage ditches were in good condition, and no sediment buildup or debris was observed. The surface water previously pooling in the northeast corner of the site, which was noted during the inspection conducted following Tropical Storm Ernesto in late FY 2006, was no longer evident. The pooling was a result of the culvert from the Site 3 drainage ditch having no identifiable outlet. In June 2007, the culvert was replaced and built up sediment was removed from the drainage ditch to prevent pooling of the water against the landfill, which might have impacted the integrity of the cover over time. The riprap landfill toe adjacent to the wetland was not impacted by the storm and is in good condition.

References

CH2M HILL, March 2003. *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Sites 3, 4, 5, and 6*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, March 2004. *Final Feasability Study for Site 4*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, June 2006. *Remedial Design for Land Use Controls, Site 4, Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, September 2006. *Final Remedial Action Completion Report, Site 4 –Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, November 2006. *Annual Inspection Report – Fiscal Year 2006*. St. Juliens Creek Annex, Chesapeake, Virginia.

JV I (AGVIQ-CH2M HILL Joint Venture I), November 2004. *Final Design Package, Site 4 – Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

NAVFAC, June 2004. *Final Proposed Remedial Action Plan for Site 4*. St. Juliens Creek Annex, Chesapeake, Virginia.

NAVFAC, September 2004. *Record of Decision, Site 4: Landfill D.* St. Juliens Creek Annex. Chesapeake, Virginia.

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LEGEND

- SJCA Boundary
- Site 4/LUC Boundary
- Fence Boundary
- Access Road
- 6' x 3' Sign
- 2' x 2' Sign
- Monitoring Well - Deep
- Monitoring Well - Shallow

N

0 60 120 180 Feet

Figure 1
Site 4
St. Juliens Creek Annex
Chesapeake, Virginia

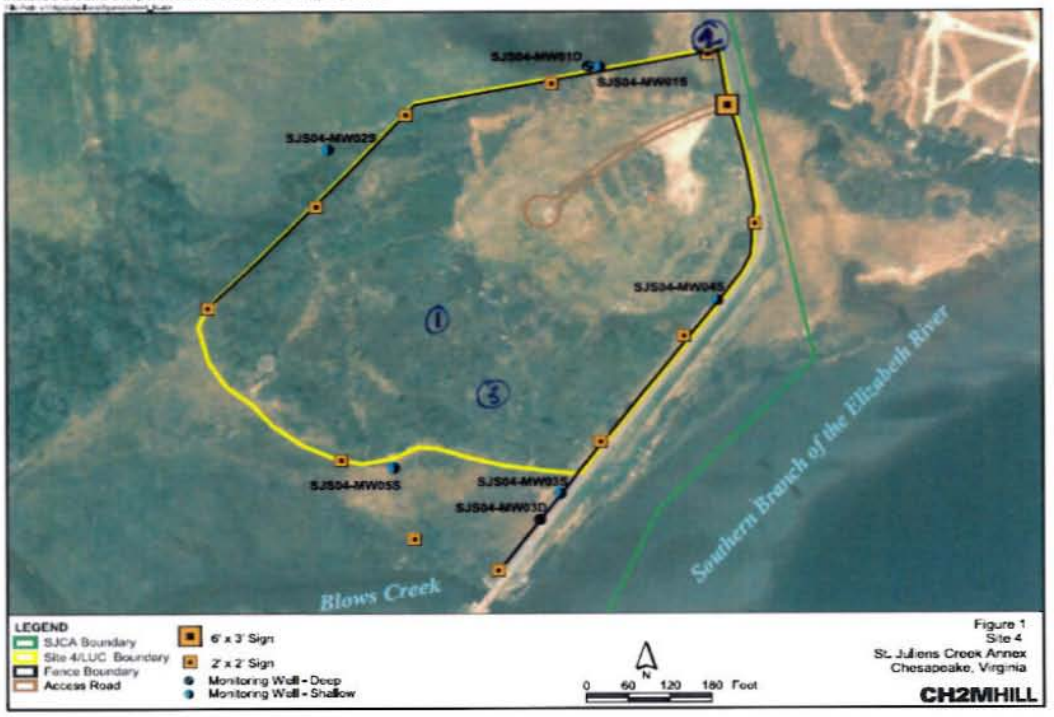
CH2MHILL

Attachment 1

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 8.3 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material that reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was continued to be disposed of at Site 4 until 1981. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly disposed. Wastes dis

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; was completed in 2005. Fencing is installed around the perimeter of the site with signs posted.



Comments: (Provide related question number for each comment)

① Tire ruts created during November 2006 Voluntary Groundwater Monitoring, have been reseeded and are no longer visible - Question #1

② Culvert and drainage ditch repaired to prevent "pooling" of surface water - Question #4

③ Bare areas evident in southeast portion of site - Question #8

		Yes	No
	General Questionnaire		
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below: Investigative Derived Waste Purge water from Site 4 January 28, 2007 Do not handle, analysis pending Contact Tim Reisch, NAVFAC MID LANT, (757) 444-6890	X	
3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.	X	
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	
7	Is the soil cover free of notable defects that would require corrective action to ensure the effectiveness of the remedy?	X	
8	Is the site free of signs of stressed vegetation or bare spots that may lead to erosion of the soil cover?	X	
9	In the case of a severe weather event, is the integrity of the soil cover intact (no erosion by surface runoff)?	X	

Inspection performed by: (Print and sign)	Antwan Jones Antwan Jones
Date:	10/10/2007

Site 4 Annual Inspection Report – Fiscal Year 2008

PREPARED FOR: SJCA Tier I Partnering Team

INSPECTION CONDUCTED BY: Walt Bell/NAVFAC Mid-Atlantic
Janna Staszak/CH2M HILL
Tim Wenk/CH2M HILL

PREPARED BY: CH2M HILL

DATE: December 8, 2008

This annual inspection report documents the results of fiscal year (FY) 2008 annual inspection at Site 4, Landfill D, St. Juliens Creek Annex (SJCA), Chesapeake, Virginia (Figure 1). This technical memorandum was prepared under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-Term Environmental Action Navy (CLEAN) III, Contract N62470-02-D-3052, Contract Task Order (CTO) 0213, for submittal to NAVFAC Mid-Atlantic, U.S. Environmental Protection Agency Region III (EPA), and Virginia Department of Environmental Quality (VDEQ).

Background

SJCA was placed on the National Priorities List (NPL) on July 27, 2000 (EPA ID: VA5170000181). Investigations and remediations have been conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or "Superfund"), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

A Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report was completed for Site 4 in March 2003 (CH2M HILL, March 2003). A subsequent Feasibility Study was completed in March 2004 (CH2M HILL, March 2004). A Proposed Plan was completed in June 2004 (NAVFAC, June 2004) and a Record of Decision (ROD) was signed in September of 2004 (NAVFAC, Septemeber 2004). These reports identified the risks to human and ecological receptors, established Remedial Action Objectives (RAOs), and defined the Selected Remedy. The Selected Remedy for Site 4 included a soil cover, removal of eastern drainage ditch sediment, and land use controls (LUCs) to meet the following RAOs:

- Prevent or minimize direct contact of human and ecological receptors with landfill contents
- Reduce infiltration and any resulting leaching of contaminants from the landfill into groundwater
- Prevent overland flow entering the site (surface water run-on) and control surface water run-off and erosion

To further define and implement the RAOs, the ROD specified the following LUC objectives for Site 4:

- Prohibit digging into or disturbing the soil cover or landfill contents
- Prohibit residential use and development of the site

The Remedial Design (RD) for the Selected Remedy was completed in November 2004 [Agviq-CH2M HILL Joint Venture (JVI), Novemeber 2004]. The Remedial Action construction was conducted from March through October of 2005. LUC implementation and maintenance actions were documented in a RD for LUCs, finalized in June 2006 (CH2M HILL, June 2006). The Navy implements, maintains, monitors, and enforces the LUCs according to the RD. The LUCs shall be maintained within the boundaries of the landfill (Figure 1) indefinitely, or until all parties (Navy, EPA, and Commonwealth of Virginia) agree that waste left in-place is at such levels to allow for unlimited use and unrestricted exposure. A Remedial Action Completion Report, documenting that the remedy at Site 4 is operational and functional in accordance with CERCLA and memorializing the Response Complete, was signed in October 2006 (CH2M HILL, October 2006).

Inspection

In accordance with the ROD and RD for LUCs, the FY 2008 annual landfill inspection was conducted on September 30, 2008 to verify the continued integrity of the soil cover, confirm appropriate surface water drainage features and erosion controls are functioning, and ensure that adequate vegetation is maintained. No major storm events, requiring additional inspections, occurred in the area during FY 2008. The site-specific inspection checklist (Attachment 1) was used for the annual inspection and the findings are summarized below.

During the FY 2008 annual inspection, no signs of unauthorized intrusive activities, investigation derived waste (IDW) storage, or dumping within the site was observed. Miscellaneous debris, including wood and chairs, was found in the site vicinity along the perimeter road; facility operations was contacted to remove the debris on September 30, 2008 and completed the removal on October 24, 2008. The monitoring wells, signs, and fencing were all in good condition.

Previously identified (June 2006) bare areas, which had been reseeded in June 2007, were still evident in the southeast portion of the site, though new growth was visible (Attachment 1). No erosion was observed in the vicinity. These areas will continue to be monitored to ensure vegetative growth in the area is successful and additional seeding will be conducted if needed.

The site drainage ditches were in good condition, and no sediment buildup or debris was observed. The riprap landfill toe adjacent to the wetland also appears to be in good condition.

References

CH2M HILL, March 2003. *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Sites 3, 4, 5, and 6*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, March 2004. *Final Feasability Study for Site 4*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, June 2006. *Remedial Design for Land Use Controls, Site 4, Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, September 2006. *Final Remedial Action Completion Report, Site 4 –Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, November 2006. *Annual Inspection Report – Fiscal Year 2006*. St. Juliens Creek Annex, Chesapeake, Virginia.

JV I (AGVIQ-CH2M HILL Joint Venture I), November 2004. *Final Design Package, Site 4 – Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

NAVFAC, June 2004. *Final Proposed Remedial Action Plan for Site 4*. St. Juliens Creek Annex, Chesapeake, Virginia.

NAVFAC, September 2004. *Record of Decision, Site 4: Landfill D*. St. Juliens Creek Annex. Chesapeake, Virginia.

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Legend

- SJCA Boundary
- Site 4 Boundary
- Fence
- Access Road
- Shallow Monitoring Well
- Deep Monitoring Well
- Small Signs
- Large Signs

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Feet

Figure 1
Site 4
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

Attachment 1

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 10.1 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material that reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was continued to be disposed of at Site 4 until 1981. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly disposec

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal, was completed in 2005. Fencing is installed around the perimeter of the site with signs posted.

Comments: (Provide related question number for each comment)
① DEBRIS (WOOD, CHAIRS) OBSERVED ADJACENT TO SITE - QUESTION 3
② OCCASSIONAL BARE SPOTS - VEG. GROWTH OBSERVED.

		Yes	No
	General Questionnaire		
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below: Investigative Derived Waste Purge water from Site 4 January 28, 2003 Do not handle, analysis pending Contact Agnes Sullivan, NAVFAC MID LANT, (757) 444-4120	X	
3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.		X
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.	X	
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	
7	Is the soil cover free of notable defects that would require corrective action to ensure the effectiveness of the remedy?	X	
8	Is the site free of signs of stressed vegetation or bare spots that may lead to erosion of the soil cover?	X	
9	In the case of a severe weather event, is the integrity of the soil cover intact (no erosion by surface runoff)?	X	

Inspection performed by: (Print and sign) JANINA STASZAK Janina Staszak
Date: 9/30/2008

Site 4 Annual Inspection Report – Fiscal Year 2009

PREPARED FOR: SJCA Tier I Partnering Team

INSPECTION CONDUCTED BY: Adam Forshey/CH2M HILL
Mark Ost/CH2M HILL

PREPARED BY: CH2M HILL

DATE: October 2, 2009

This annual inspection report documents the results of fiscal year (FY) 2009 annual inspection at Site 4, Landfill D, St. Juliens Creek Annex (SJCA), Chesapeake, Virginia. This technical memorandum was prepared under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-Term Environmental Action Navy 1000, Contract N62470-08-D-1000, Contract Task Order 0063, for submittal to NAVFAC Mid-Atlantic, U.S. Environmental Protection Agency Region III (EPA), and Virginia Department of Environmental Quality (VDEQ).

Background

SJCA was placed on the National Priorities List on July 27, 2000 (EPA ID: VA5170000181). Investigations and remediation have been conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or "Superfund"), as amended by Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan.

A Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report was completed for Site 4 in March 2003 (CH2M HILL, March 2003). A subsequent Feasibility Study was completed in March 2004 (CH2M HILL, March 2004). A Proposed Plan was completed in June 2004 (NAVFAC, June 2004) and a Record of Decision (ROD) was signed in September of 2004 (NAVFAC, September 2004). These reports identified the risks to human and ecological receptors, established Remedial Action Objectives (RAOs), and defined the Selected Remedy. The Selected Remedy for Site 4 included a soil cover, removal of eastern drainage ditch sediment, and land use controls (LUCs) to meet the following RAOs:

- Prevent or minimize direct contact of human and ecological receptors with landfill contents
- Reduce infiltration and any resulting leaching of contaminants from the landfill into groundwater
- Prevent overland flow entering the site (surface water run-on) and control surface water run-off and erosion

To further define and implement the RAOs, the ROD specified the following LUC objectives for Site 4:

- Prohibit digging into or disturbing the soil cover or landfill contents
- Prohibit residential use and development of the site

The Remedial Design (RD) for the Selected Remedy was completed in November 2004 (Agviq-CH2M HILL Joint Venture [JVI], November 2004]. The Remedial Action construction was conducted from March through October of 2005. LUC implementation and maintenance actions were documented in a RD for LUCs, which was finalized in June 2006 (CH2M HILL, June 2006). The Navy implements, maintains, monitors, and enforces the LUCs according to the RD. The LUCs shall be maintained within the boundaries of the landfill (Figure 1) indefinitely, or until all parties (Navy, EPA, and Commonwealth of Virginia) agree that waste left in-place is at such levels to allow for unlimited use and unrestricted exposure. A Remedial Action Completion Report, documenting that the remedy at Site 4 is operational and functional in accordance with CERCLA and memorializing the Response Complete, was signed in October 2006 (CH2M HILL, October 2006).

Inspection

In accordance with the ROD and RD for LUCs, the FY 2009 annual landfill inspection was conducted on September 21, 2009 to verify the continued integrity of the soil cover, confirm appropriate surface water drainage features and erosion controls are functioning, and ensure that adequate vegetation is maintained. The site-specific inspection checklist (Attachment 1) was used for the annual inspection and the findings are summarized below.

During the FY 2009 annual inspection, no signs of unauthorized intrusive activities, investigation derived waste storage, or dumping within the site was observed. The monitoring wells, signs, and fencing were all in good condition. All accessible signs have been updated with current contact information. As noted in Attachment 1, four signs were not inspected because they could not be accessed at the time of the site inspection (overgrown with vegetation or located within Blows Creek).

Dense vegetation is growing throughout the site. No stressed vegetation or bare spots in the vegetation were observed during the inspection. Vegetative regrowth in the bare areas previously identified during the 2006 annual inspection was successful and no additional seeding is necessary.

The site drainage ditches were in good condition, and no sediment buildup or debris was observed. Dense vegetation was observed in the drainage ditches, and is preventing erosion of the ditches while not adversely impacting the functionality of the ditches. The riprap landfill toe adjacent to the wetland also appears to be in good condition.

In addition to the annual inspection, one other inspection was performed in FY 2009 to document the site condition after a major storm event. This report was submitted separately to the partnering team and is included as Attachment 2 of this document.

References

CH2M HILL, March 2003. *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Sites 3, 4, 5, and 6*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, March 2004. *Final Feasibility Study for Site 4*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, June 2006. *Remedial Design for Land Use Controls, Site 4, Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, September 2006. *Final Remedial Action Completion Report, Site 4 –Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

CH2M HILL, November 2006. *Annual Inspection Report – Fiscal Year 2006*. St. Juliens Creek Annex, Chesapeake, Virginia.

JV I (AGVIQ-CH2M HILL Joint Venture I), November 2004. *Final Design Package, Site 4 – Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia.

NAVFAC, June 2004. *Final Proposed Remedial Action Plan for Site 4*. St. Juliens Creek Annex, Chesapeake, Virginia.

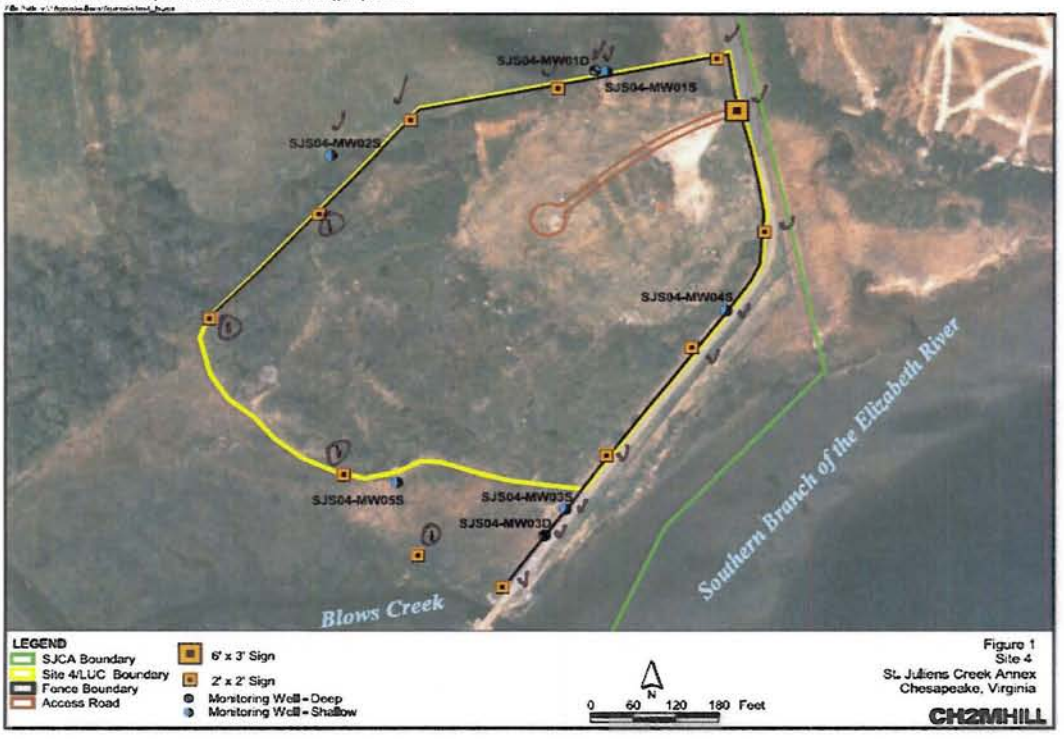
NAVFAC, September 2004. *Record of Decision, Site 4: Landfill D*. St. Juliens Creek Annex. Chesapeake, Virginia.

Attachment 1 – Site 4 Annual Inspection Checklist

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 10.1 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material that reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was continued to be disposed of at Site 4 until 1981. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly dispose

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; was completed in 2005. Fencing is installed around the perimeter of the site with signs posted.



Comments: (Provide related question number for each comment)

① CONTACT NUMBER NOT UPDATED, NO ACCESS TO SIGNS

NOTE: DENSE VEGETATION (OVER 8' TALL) ACROSS ENTIRE CAP VEGETATION IN DRAINAGE DITCHES, BUT DITCHES APPEAR TO STILL BE FULLY FUNCTIONAL.

	General Questionnaire	Yes	No
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below: Investigative Derived Waste Purge water from Site 4 January 28, 2003 Do not handle, analysis pending Contact Agnes Sullivan, NAVFAC MID LANT, (757) 444-4120	X	
3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.	X	
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	
7	Is the soil cover free of notable defects that would require corrective action to ensure the effectiveness of the remedy?	X	
8	Is the site free of signs of stressed vegetation or bare spots that may lead to erosion of the soil cover?	X	
9	In the case of a severe weather event, is the integrity of the soil cover intact (no erosion by surface runoff)?	X	

Inspection performed by: (Print and sign) ADAM FORSHEY Adam Forshey

Date: 9/21/09

Attachment 2 – Site 4 Post-Storm Inspection Report

Site 4 Inspection Report – Post-Storm Inspection

PREPARED FOR: SJCA Tier I Partnering Team

INSPECTION CONDUCTED BY: Adam Forshey/CH2M HILL

PREPARED BY: CH2M HILL

DATE: May 22, 2009

This inspection report documents the results of the post-storm inspection of Site 4, Landfill D, St. Juliens Creek Annex (SJCA), Chesapeake, Virginia conducted on May 18, 2009. The inspection was performed following a significant rainfall event that occurred on May 17, 2009 resulting in approximately 1.2-inches of rainfall in the Chesapeake area.

The post-storm inspection was conducted to verify the continued integrity of the soil cover, confirm appropriate surface water drainage features and erosion controls are functioning, and ensure that adequate vegetation is maintained to prevent erosion after significant rainfall events. The site-specific inspection checklist (Attachment 1) was used during the post-storm inspection and the findings are summarized below.

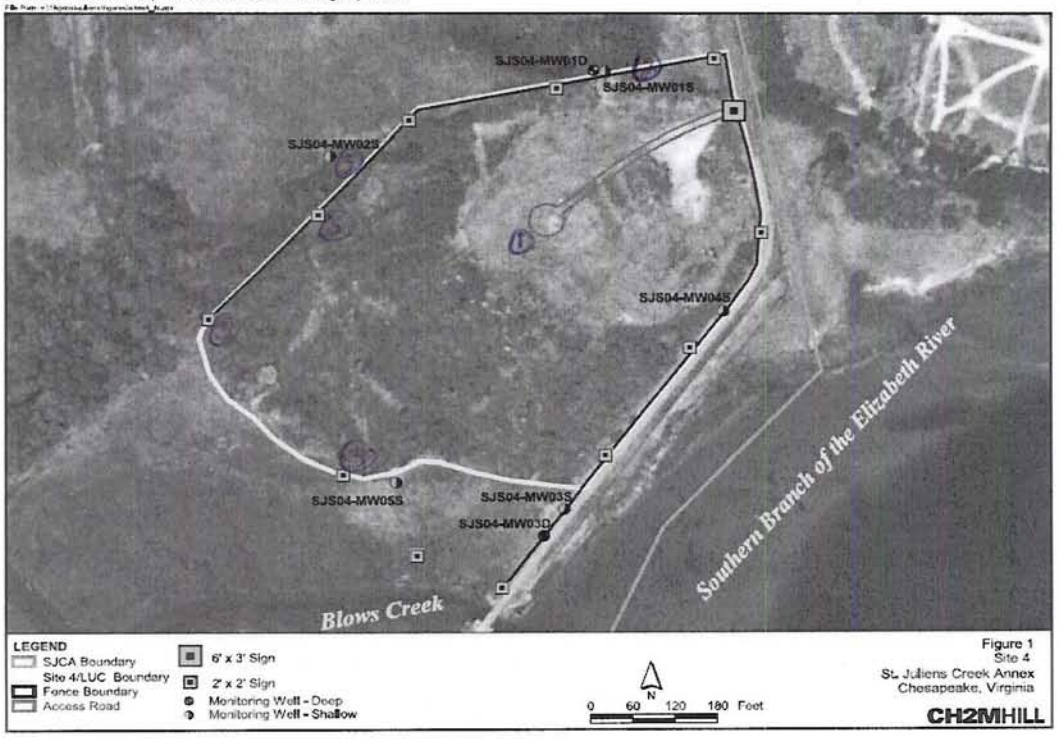
During the inspection, no signs of unauthorized intrusive activities were observed. One bare area was identified at the end of the construction access road (Attachment 1). The area is approximately 10' x 10', with sparse vegetation. This area does not appear to have been disturbed. No evidence of erosion was observed near this bare spot and vegetation is present around the area. This area will continue to be monitored to ensure vegetative growth in the area is successful and additional seeding will be conducted if needed. All other areas were covered with dense vegetation ranging from knee to shoulder high. No signs of sediment buildup, rilling, or other evidence of erosion were identified during the inspection.

The site drainage ditches were in good condition, and no sediment buildup or debris was observed. The riprap landfill toe adjacent to the wetland also appeared to be in good condition. An area located along the northern edge of the site was identified as a low spot, which was holding water (Attachment 1). The majority of the low spot is located outside the boundaries of the site but does extend beneath the fence and onto the site. The ponded water does not appear to have negatively impacted the integrity of the landfill; no erosion or signs of landfill slope failure were observed.

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 10.1 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material that reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was continued to be disposed of at Site 4 until 1981. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly disposec

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; was completed in 2005. Fencing is installed around the perimeter of the site with signs posted.



Comments: (Provide related question number for each comment)

(1) SMALL PATCH OF BARE GROUND (~10'X10'), NO SIGNS OF EROSION - SEE QUESTION 6

(2) STANDING WATER FROM RECENT RAIN EVENT (~2-4") ADJACENT TO THE SITE AND EXTENDING PARTIALLY UNDER FENCE ONTO THE SITE. - COMMENT 9

(3) SIGN(S) WOULD NOT BE LOCATED BECAUSE OF VEGITATIVE GROWTH - SEE QUESTIONS 5

	General Questionnaire	Yes	No
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below: Investigative Derived Waste Purge water from Site 4 January 28, 2003 Do not handle, analysis pending Contact Agnes Sullivan, NAVFAC MID LANT, (757) 444-4120	X	
3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.	X(3)	
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X(6)	
7	Is the soil cover free of notable defects that would require corrective action to ensure the effectiveness of the remedy?	X	
8	Is the site free of signs of stressed vegetation or bare spots that may lead to erosion of the soil cover?	X	
9	In the case of a severe weather event, is the integrity of the soil cover intact (no erosion by surface runoff)?	X	

Inspection performed by: (Print and sign) ADAM FORSHEY Adam Forshey

Date: 5-18-09

Site 4 Inspection Report – Post-Storm Inspection

PREPARED FOR: SJCA Tier I Partnering Team

INSPECTION CONDUCTED BY: Adam Forshey/CH2M HILL
Patrick Murphy/CH2M HILL

PREPARED BY: CH2M HILL

DATE: December 15, 2009

This inspection report documents the results of the post-storm inspection of Site 4, Landfill D, St. Juliens Creek Annex (SJCA), Chesapeake, Virginia. This technical memorandum was prepared under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-Term Environmental Action Navy 1000, Contract N62470-08-D-1000, Contract Task Order 0063, for submittal to NAVFAC Mid-Atlantic, U.S. Environmental Protection Agency Region III (EPA), and Virginia Department of Environmental Quality (VDEQ).

The site inspection was conducted on November 17, 2009, following the "November Nor' Easter", which was a significant storm event that occurred November 11 through 13, 2009 and resulted in over 8-inches of rainfall in the Chesapeake area. The post-storm inspection was conducted to verify the continued integrity of the soil cover, confirm appropriate surface water drainage features and erosion controls are functioning, and ensure that adequate vegetation is maintained to prevent erosion after significant storm events. The annual site inspection checklist was used during the post-storm inspection and is included as an attachment, and the findings are summarized below.

During the inspection several small stressed vegetative areas were identified along the southern edge of the site, parallel to the riprap landfill toe. These stressed areas were located between 50 and 100 feet from the riprap landfill toe and ranged in size from 2'x2' up to approximately 10'x15'. These areas were not bare and showed no signs of erosion; however, the vegetation was thin and the soil was soft and saturated. These areas should continue to be monitored to ensure vegetative growth continues and additional seeding should be conducted, if necessary. All other areas were covered with dense vegetation. A potential erosion rill was identified along the southeast side of the site approximately 30-feet west of the fence line, adjacent to the drainage ditch. The rill was approximately 4- to 6-inches deep, 8-inches wide, and 30- to 50-feet long. The rill was fully vegetated and showed no signs of recent erosion. However, it may result in concentrated flows down-gradient and should be monitored during future inspections and repaired if necessary. No signs of sediment buildup or other evidence of erosion were identified during the inspection as a result of the recent storm.

The site drainage ditches contained dense vegetation and showed signs of significant flow during the recent storm (vegetation bent in the direction of surface water flow). The drainage pipe beneath the construction access onto the cap was functional. Standing water

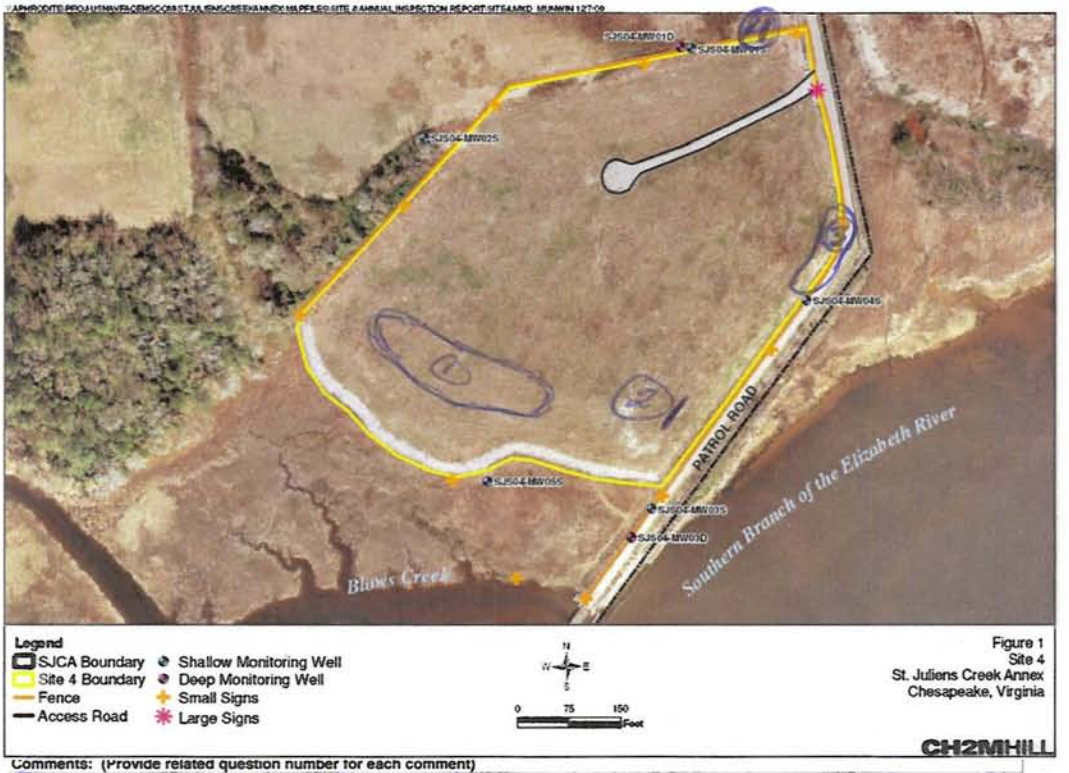
was present in the eastern drainage ditch in the central portion of the site. The riprap landfill toe adjacent to the wetland also appeared to be in good condition.

The low spot located along the northern edge of the site, which was previously identified during the May 2009 Post-Storm Inspection, was still present. The majority of the low spot is located outside the boundaries of the site but does extend beneath the fence and onto the site. The depth of water within the low spot ranges from approximately 1- to 4-inches deep. The ponded water does not appear to have negatively impacted the integrity of the landfill; no erosion or signs of landfill slope failure were observed.

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 8.3 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material that reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was continued to be disposed of at Site 4 until 1981. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly dispose

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; was completed in 2005. Fencing is installed around the perimeter of the site with signs posted.



Legend
- SJCA Boundary
- Site 4 Boundary
- Fence
- Access Road
- Shallow Monitoring Well
- Deep Monitoring Well
- Small Signs
- Large Signs

N
0 75 150 Feet

Figure 1
Site 4
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

Comments: (Provide related question number for each comment)

1) MULTIPLE AREAS OF STRESSED VEGETATION (NOT BARE, BUT THIN) NO EROSION WAS OBSERVED BUT AREAS WERE SOFT AND SATURATED. STRESSED AREAS WERE BETWEEN 50' NORTH OF RIPRAP. MONITOR FOR GROWTH-08
2) 30-50 OFF FENCELINE (PARALLEL TO DITCH) A "RILL" WAS OBSERVED THE DIMENSIONS = 4-6" DEEP X 8" WIDE X 50' LONG. THE RILL WAS VEGETATED AND SHOWED NO SIGNS OF RECENT EROSION - 04
3) STANDING WATER OBSERVED IN DRAINAGE DITCH - 04
4) LARGE POOL OF STANDING WATER 1-4" DEEP ADJACENT TO & JUST UNDER SITE FENCE (SEE PREVIOUS POST STORM REPORT)

	General Questionnaire	Yes	No
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below: Investigative Derived Waste Purge water from Site 4 January 28, 2003 Do not handle, analysis pending Contact Walter Bell, NAVFAC MID LANT, (757) 445-6638	X	
3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.	X	
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	
7	Is the soil cover free of notable defects that would require corrective action to ensure the effectiveness of the remedy?	X	
8	Is the site free of signs of stressed vegetation or bare spots that may lead to erosion of the soil cover?		X
9	In the case of a severe weather event, is the integrity of the soil cover intact (no erosion by surface runoff)?	X	

Inspection performed by: (Print and sign)	ADAM FORSHEY Adam Forshey
Date:	11/17/09

POST NOVEMBER "NOR-EASTER" 2009

Appendix B
Five-Year Review Checklist

I. SITE INFORMATION

Site Name: Site 4	**Date of Inspection:** September 21, 2009
Location and Region: St. Juliens Creek Annex	**EPA ID:** VA5170000181
Agency, office, or company leading the five-year review: Navy in partnership with USEPA and VDEQ	**Weather/ temperature: Clear & Warm 78 F**

Remedy Includes: (Check all that apply):

- Landfill cover/containment ☑
- Access controls ☑
- Institutional controls ☑
- Groundwater pump and treatment ☐
- Surface water collection and treatment ☐
- Monitored natural attenuation ☐
- Groundwater containment ☐
- Vertical barrier walls ☐

Attachments: Site map is provided as Figure B-1.

Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency	Contact Name	Title	Date	Phone #
NAVFAC	Walter Bell	RPM	9/21/2009	757.445.6638
EPA, Region III	Robert Stroud	RPM	9/21/2009	410.305.2748
VDEQ	Karen Doran	RPM	9/21/2009	804.698.4594

Problems, suggestions; Report attached : _____

II. INTERVIEWS - NOT APPLICABLE

III. ON-SITE DOCUMENTS & RECORD VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	Readily Available ☐	Up to date ☐	N/A ☑
	As-built drawings	Readily Available ☐	Up to date ☐	N/A ☑
	Maintenance logs	Readily Available ☐	Up to date ☐	N/A ☑
	Remarks:			
2.	**Site Specific Health and Safety Plan**	Readily Available ☐	Up to date ☐	N/A ☑
	Contingency/emergency response plan	Readily Available ☐	Up to date ☐	N/A ☑
	Remarks: Included as part of the Voluntary Groundwater Monitoring Project Plans			
3.	**O&M and OSHA Training Records**	Readily Available ☐	Up to date ☐	N/A ☐
	Remarks: Per contract with Navy			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily Available ☐	Up to date ☐	N/A ☑
	Effluent discharge	Readily Available ☐	Up to date ☐	N/A ☑
	Waste disposal, POTW	Readily Available ☐	Up to date ☐	N/A ☑
	Other permits_____	Readily Available ☐	Up to date ☐	N/A ☑

5.	**Gas Generation Records**	Readily Available ☐	Up to date ☐	N/A ☑
6.	**Settlement Monument Records**	Readily Available ☐	Up to date ☐	N/A ☑
7.	**Groundwater Monitoring Records**	Readily Available ☐	Up to date ☐	N/A ☑
	Remarks: Included in the Voluntary Groundwater Monitoring Report. Available upon request.			
8.	**Leachate Extraction Records**	Readily Available ☐	Up to date ☐	N/A ☑
9.	**Discharge Compliance Records**			
	Air	Readily Available ☐	Up to date ☐	N/A ☑
	Water (effluent)	Readily Available ☐	Up to date ☐	N/A ☑
10.	**Daily Access/Security Logs**	Readily Available ☐	Up to date ☐	N/A ☑

IV.O&M COST

1 **O&M Organization**

State in-house ☐ Contractor for State ☐
PRP in-house ☐ Contractor for PRP ☐
Federal Facility in-house ☐ Contractor for Federal Facility ☐
Other : In Remedial Action Completion Report for Site 4

2 **O&M Cost Records**

3 **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS

A. Fencing

1. **Fencing damaged** N/A ☐
Location shown on site map ☑
Gates secured ☑

Remarks : Site fence locked and in good condition.

B. Other Access Restrictions

1. **Signs and other security measures** N/A ☐
Locations shown on site map ☑

Remarks : Signs in good condition with correct contact information.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Conditions imply ICs not properly implemented
Yes ☐ No ☑ N/A ☐
Conditions imply ICs not being fully enforced
Yes ☐ No ☑ N/A ☐
Type of monitoring (e.g., self-reporting, drive by) : site inspections
Frequency yearly
Responsible party/agency : NAVFAC
Contact : Walter Bell (Name) RPM (Title) 757-445-6638 (Phone No.)

Reporting is up to date
Yes ☑ No ☐ N/A ☑
Reports are verified by the lead agency
Yes ☑ No ☐ N/A ☑
Specific reqs in deed or decision documents have been met
Yes ☑ No ☐ N/A ☑
Violations have been reported
Yes ☑ No ☐ N/A ☑
Other problems or suggestions: Report attached ☐
See comments provided in Section XI.

2 **Adequacy** N/A ☐
ICs are adequate ☑
ICs are inadequate ☐

D. General

1 **Vandalism/trespassing**
Location shown on site map ☐
No vandalism evident ☑

2 **Land use changes on site** N/A ☑

3 **Land use changes off site** N/A ☑

Remarks : None observed

VI. GENERAL SITE CONDITIONS

A. Roads Applicable ☑ N/A ☐

1 **Roads damaged** N/A ☐
Location shown on site map ☐
Roads adequate ☑ Site access road still present. Vegetation growing on road.

B. Other Site Conditions

1 Remarks : _____

VII. LANDFILL COVERS

A. Landfill Surface

1 **Settlement**
Location shown on site map ☐
Settlement not evident ☑

2 **Cracks**
Location shown on site map ☐
Cracking not evident ☑

3 **Erosion**
Location shown on site map ☐
Erosion not evident ☑

4 **Holes**
Location shown on site map ☐
Holes not evident ☑
Areal extent : _____ Depth : _____
Remarks :

5 **Vegetative Cover**
Grass ☑
Cover properly established ☑
No signs of stress ☑
Trees/Shrubs (indicate size and locations on a diagram) ☐
Remarks : Dense vegetative cover over cap 8' tall.

6 **Alternative Cover** (armored rock, concrete, etc.) N/A ☑

7 **Bulges**
Location shown on site map ☐
Bulges not evident ☑

8 **Wet Areas/Water Damage**
Wet areas/water damage not evident ☑
Wet areas ☐ Location shown on site map ☐ Areal extent : _____
Ponding ☐ Location shown on site map ☐ Areal extent : _____
Seeps ☐ Location shown on site map ☐ Areal extent : _____
Soft sub grade ☐ Location shown on site map ☐ Areal extent : _____
Remarks :

9 **Slope Instability**
No evidence of slope instability ☑
Slides ☐ Location shown on site map ☐
Areal extent : _____
Remarks :

B. Benches Applicable ☐ N/A ☑

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

C. Letdown Channels Applicable ☐ N/A ☑

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

D. Cover Penetrations Applicable ☐ N/A ☑

1 **Gas Vents** N/A ☑

2 **Gas Monitoring Probes** N/A ☑

3 **Monitoring Wells** (within surface area of landfill) N/A ☑

Properly secured/locked ☐
Functioning ☐
Routinely sampled ☐
Good condition ☐
Evidence of leakage at penetration ☐
Needs maintenance ☐

Remarks :

4 **Leachate Extraction Wells** N/A ☑

Properly secured/locked ☐
Functioning ☐
Routinely sampled ☐
Good condition ☐
Evidence of leakage at penetration ☐
Needs maintenance ☐

Remarks :

5 **Settlement Monuments** N/A ☑

Located ☐
Routinely Surveyed ☐

Remarks :

E. Gas Collection & Treatment Applicable ☐ N/A ☑

1 **Gas Treatment Facilities**

Flaring ☐
Thermal destruction ☐
Collection for reuse ☐
Good condition ☐
Needs maintenance ☐

Remarks :_____

2 **Gas Collection Wells, Manifold and Piping**

Good Condition ☐
Needs Maintenance ☐
N/A ☐

Remarks: _____

3 **Gas Monitoring Facilities (**e.g, gas monitoring of adjacent homes or buildings.)

Good Condition ☐
Needs Maintenance ☐
N/A ☐

Remarks: _____

F. Cover Drainage Layer Applicable ☑ N/A ☐

1 **Outlet Pipes Inspected**

Functioning ☐
N/A ☑

Remarks: _____

2 **Outlet Rock Inspected**

Functioning ☑
N/A ☐

Remarks: In good condition.

G. Detention/Sedimentation Ponds Applicable ☐ N/A ☑

1 **Siltation** Areal extent _____ Depth _____ N/A ☐

Siltation not evident ☐

Remarks: _____

2 **Erosion** Areal extent _____ Depth _____ N/A ☐

Erosion not evident ☐

Remarks: _____

3 **Outlet Works**

Functioning ☐
N/A ☐

Remarks: _____

4 **Dam**

Functioning ☐
N/A ☐

Remarks: _____

H. Retaining Walls Applicable ☐ N/A ☑

1 **Deformations**

Location shown on site map ☐

Deformation not evident ☐

Horizontal displacement_____

Vertical displacement _____

Rotational displacement _____

Remarks: _____

2 **Degradation**

Location shown on site map ☐

Degradation not evident ☐

Remarks _____

I. Perimeter Ditches/Off-Site Discharge Applicable ☑ N/A ☐

1 Siltation

Location shown on site map ☐

Siltation not evident ☑

Areal extent_____ Depth_____

Remarks _____

2 Vegetation Growth

Location shown on site map ☐ N/A ☐

Vegetation does not impede flow ☑

Areal extent _____ Type _____

Remarks: Vegetation throughout swalem but functionality of the ditch does not appear to be compromised.

3 Erosion

Location shown on site map ☐

Erosion not evident ☑

Areal extent _____ Depth _____

Remarks _____

4 Discharge Stucture

Functioning ☑ N/A ☐

Remarks _____

VII. VERTICAL BARRIER WALLS Applicable ☐ N/A ☑

1 Settlement

Location shown on site map ☐

Settlement not evident ☐

Areal extent _____ Depth _____

Remarks: _____

2 Performance Monitoring

Type of Monitoring _____

Performance not monitored ☐

Frequency _____

Evidence of breaching ☐

Head differential _____

Remarks _____

C. Treatment System Applicable ☐ N/A ☑

Treatment Train (Check components that apply

- Metals removal ☐
- Oil/Water separation ☐
- Bioremediation ☐
- Air stripping ☐
- Carbon absorbers ☐
- Filters ☐ _____
- Additive (e.g., chelation agent, flocculent _____
- Others _____
- Good condition ☐
- Needs Maintenance ☐
- Sampling ports properly marked and functional ☐
- Sampling/maintenance log displayed and up to date ☐
- Equipment properly identified ☐
- Quantity of groundwater treated annually ☐ _____
- Quantity of surfacewater treated annually ☐ _____

Remarks _____

2 Electrical Enclosures and Panels (properly rated and functional)

- N/A ☐
- Good condition ☐
- Needs Maintenance ☐

Remarks _____

3 Tanks, Vaults, Storage Vessels

- N/A ☐
- Good condition ☐
- Properly secondary containment ☐
- Needs Maintenance ☐

Remarks _____

4 Discharge Structure and Appurtenances

- N/A ☐
- Good condition ☐
- Needs Maintenance ☐

Remarks _____

5 Treatment Building(s)

- N/A ☐
- Good condition (esp. roof and doorways) ☐
- Needs repair ☐
- Chemicals and equipment properly stored ☐

Remarks _____

6 Monitoring Wells (pump and treatment remedy)

- Properly secured/locked ☐
- Functioning ☐
- Routinely sampled ☐
- Good condition ☐
- All required wells located ☐
- Needs Maintenance ☐
- N/A

Remarks _____

D. Monitoring Data

1 Monitoring Data

Is routinely submitted on time ☐

Is of acceptable quality ☐

2 Monitoring data suggests:

Groundwater plume is effectively contained ☐

Contaminant concentrations are declining ☐

D. Monitored Natural Attenuation

Monitoring Wells (natural attenuation remedy) ☐

Properly secured/locked ☐

Functioning ☐

Routinely sampled ☐

Good condition ☐

All required wells located ☐

Needs Maintenance ☐

N/A ☐

Remarks _____

X. OTHER REMEDIES Applicable ☐ N/A ☑

XI. OVERALL OBSERVATIONS

A. **Implementation of the Remedy**

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at Site 4 is intended to prevent unacceptable human health and ecological risks to exposure to waste, soil, and sediment at the site. Inspection of the site confirms that the cover is intact, erosion and sediment buildup in the drainage ditches is not occurring, and institutional controls are in place. The remedy is effective and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Issues that could have affected protectiveness of the remedy, bare areas on the vegetative cover and water pooling against the landfill, were corrected in 2006 and 2007. O&M of the soil cover and drainage ditches has been effective.

C. Early indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost of scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be comprised in the future.

No early indicators of a potential problem with the remedy were observed.

D. Opportunities for Optimization

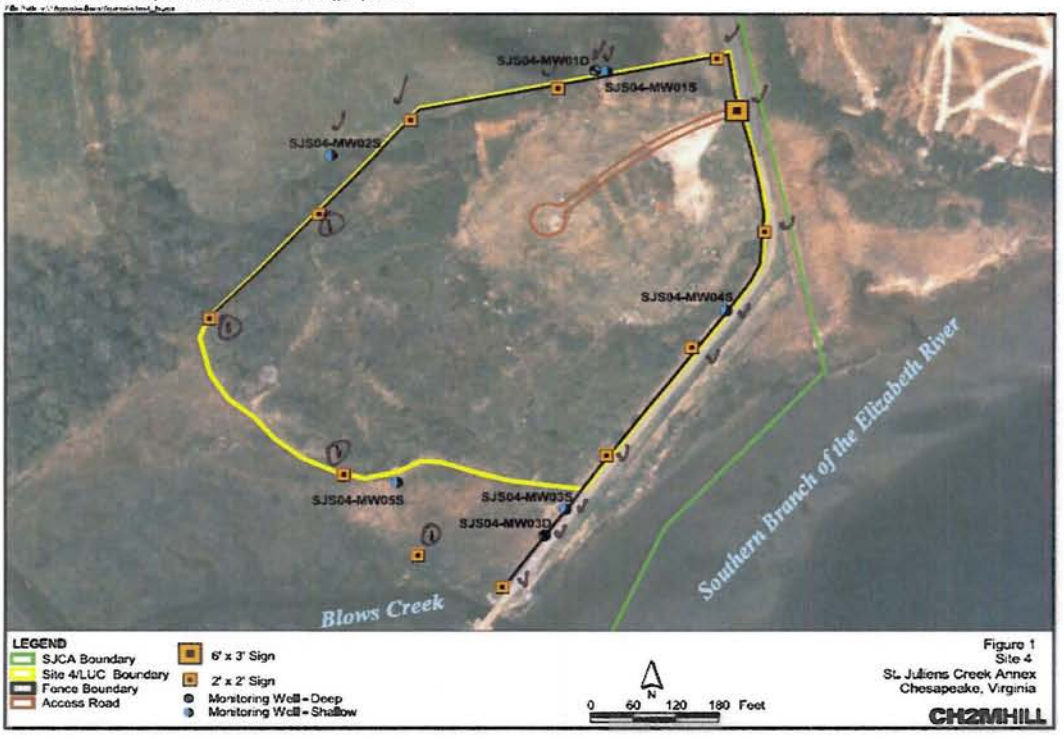
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

None identified.

Site 4 - Landfill D
St. Juliens Creek Annex, Chesapeake, Virginia

Description: Site 4 (Landfill D) covers an estimated 10.1 acres in the northeastern portion of the Annex just north of the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The site is located on fill material that reportedly originated from the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appear to be only two. Around 1970, sanitary landfill operations began at Site 4 in the marshes of Blows Creek. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an off-site facility and inert construction material was continued to be disposed of at Site 4 until 1981. The wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense materials. Some solvents, acids, bases, and polychlorinated biphenyls (PCBs) were reportedly dispose

The Selected Remedy for Site 4; soil cover, surface and wetland debris removal, and eastern drainage ditch removal; was completed in 2005. Fencing is installed around the perimeter of the site with signs posted.



Comments: (Provide related question number for each comment)

① CONTACT NUMBER NOT UPDATED, NO ACCESS TO SIGNS

NOTE: DENSE VEGETATION (OVER 8' TALL) ACROSS ENTIRE CAP VEGETATION IN DRAINAGE DITCHES, BUT DITCHES APPEAR TO STILL BE FULLY FUNCTIONAL.

	General Questionnaire	Yes	No
1	Is the area free of any indication of recent and/or current intrusive activities within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.	X	
2	Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section below, and notify activity coordinator. Indicate if IDW is properly labeled, per example below: Investigative Derived Waste Purge water from Site 4 January 28, 2003 Do not handle, analysis pending Contact Agnes Sullivan, NAVFAC MID LANT, (757) 444-4120	X	
3	Is the area free of identifiable concerns, such as, signs of dumping of chemicals or debris, with regards to this site? If no, annotate these concerns in the comments section above, mark location of concern on map, and notify activity coordinator.	X	
	Site Specific Questionnaire		
4	Are the drainage ditches, as depicted on the figure, in good condition (free of sediment buildup and debris)? If no, describe condition of the drainage ditch, mark deficient location(s) on map, and notify activity coordinator.	X	
5	Are the signs, depicted on the figure, in good condition (letters still visible, and standing upright)? If no, describe condition of the signs, mark location(s) on map, and notify activity coordinator.	X	
6	Are site monitoring wells, as depicted on the figure, in good condition and appear to be locked? (i.e. damaged protective posts and/or well head/casing) If no, describe condition of the deficient monitoring well(s), mark location of deficient monitoring well(s).	X	
7	Is the soil cover free of notable defects that would require corrective action to ensure the effectiveness of the remedy?	X	
8	Is the site free of signs of stressed vegetation or bare spots that may lead to erosion of the soil cover?	X	
9	In the case of a severe weather event, is the integrity of the soil cover intact (no erosion by surface runoff)?	X	

Inspection performed by: (Print and sign) ADAM FORSHEY Adam Forshey

Date: 9/21/09

Appendix C
Interviews and Surveys

INTERVIEW 1 LOG SHEET

Date and Location: 10/26/2009, Phone Interview

Interviewer: Walt Bell

Note: This record was not transcribed from a recorded conversation. It was reconstructed from interview notes, so the conversation is paraphrased. Based on the conversation, some interview questions may have been skipped.

Were you aware of the environmental cleanup that occurred at Site 4 – Landfill D?
No.

Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or this Remedial Action?
No.

Background information on Site 4 and the remedy was provided. Do you feel that the remedy selected for Site 4 – Landfill D will protect human health and the environment?
I am comfortable with what they did. I would like to know what the land could be used for. It would be a shame to do all that work and the Government not be able to use the land. Could a warehouse be built on Site 4?

INTERVIEW 2 LOG SHEET

Date and Location: 10/26/2009, Phone Interview

Interviewer: Walt Bell

Note: This record was not transcribed from a recorded conversation. It was reconstructed from interview notes, so the conversation is paraphrased. Based on the conversation, some interview questions may have been skipped.

Were you aware of the environmental cleanup that occurred at Site 4 – Landfill D? Do you feel well informed about progress at the site?
Yes. Yes.

Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or this Remedial Action?
No.

Do you feel that the remedy selected for Site 4 – Landfill D will protect human health and the environment?
Yes.

INTERVIEW 3 LOG SHEET

Date and Location: 10/26/2009, Phone Interview

Interviewer: Walt Bell

Note: This record was not transcribed from a recorded conversation. It was reconstructed from interview notes, so the conversation is paraphrased. Based on the conversation, some interview questions may have been skipped.

Were you aware of the environmental cleanup that occurred at Site 4 – Landfill D? Do you feel well informed about progress at the site?
No.

Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or this Remedial Action?
No.

Do you feel that the remedy selected for Site 4 – Landfill D will protect human health and the environment?
I can't answer the question because I am unaware of the remedial action.

INTERVIEW 4 LOG SHEET

Date and Location: 10/23/2009 (1300), Phone Interview

Interviewer: Walt Bell

Note: This record was not transcribed from a recorded conversation. It was reconstructed from interview notes, so the conversation is paraphrased. Based on the conversation, some interview questions may have been skipped.

Were you aware of the environmental cleanup that occurred at Site 4 – Landfill D? Do you feel well informed about progress at the site?
Yes. Where you put the dirt on top? I am aware through the RAB.

Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or this Remedial Action?
The public is unaware except what might have been in the paper. NAVALEX was BRAC'd and most people left jobs or moved to Charleston, South Carolina.

Background information on Site 4 and the remedy was provided. Do you feel that the remedy selected for Site 4 – Landfill D will protect human health and the environment?
I don't know. Like other sites, they have done all they can do. I wouldn't drink any water from there (I have my own water well in Suffolk) but I wouldn't drink the water from near the Elizabeth River anyway.

INTERVIEW 5 LOG SHEET

Date and Location: 11/2/2009, Phone Interview

Interviewer: Amy Brand

Note: This record was not transcribed from a recorded conversation. It was reconstructed from interview notes, so the conversation is paraphrased. Based on the conversation, some interview questions may have been skipped.

Were you aware of the environmental cleanup that occurred at Site 4 – Landfill D? Do you feel well informed about progress at the site?
Yes – did a windshield tour of all the sites a couple years ago – that was good.

Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or this Remedial Action?
No.

Background information on Site 4 and the remedy was provided. Do you feel that the remedy selected for Site 4 – Landfill D will protect human health and the environment?
Don't really know, not [my] area of expertise. Know that they're monitoring groundwater, but can't tell if they know what's filtering through to the river or not.

INTERVIEW 6 LOG SHEET

Date and Location: 11/5/2009, Phone Interview

Interviewer: Amy Brand

Note: This record was not transcribed from a recorded conversation. It was reconstructed from interview notes, so the conversation is paraphrased. Based on the conversation, some interview questions may have been skipped. Responses to some of the interview questions indicate that the interviewee may have been confusing the remedial actions being implemented at Site 5 with those associated with Site 4.

Were you aware of the environmental cleanup that occurred at Site 4 – Landfill D? Do you feel well informed about progress at the site?
I have seen that activity, they're doing some soil excavating and backfilling or something like that. I was contacted once to identify whether some electrical lines were energized. I don't really know what they're doing though.

Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or this Remedial Action?
No, not aware of any. Pretty sure there probably are some concerns if they're digging up soil and stuff, but don't know what.

Background information on Site 4 and the remedy was provided. Do you feel that the remedy selected for Site 4 – Landfill D will protect human health and the environment?
Yes, anything they're doing to identify a problem, find a solution, and implement it must be a plus.

2009 Community Questionnaire

I worked on SJCA Jan 1981 - Jul 2003 (NAVELEX / SPAWAR former employee)

1 How far do you live from SJCA? ___ < 2 miles ___ 5-10 miles ✓ > 10 miles ___ 2-5 miles

2 How long have you been a resident of the community? ___ < 1 year ___ years

3 How would you describe your "affiliation" with SJCA? *(check all that apply)*

✓ SJCA employee	___ business owner	___ representative of homeowners association
✓ SJCA former employee Retired	___ representative of civic or public interest organization	___ public or elected official
___ local resident	___ retired military person	✓ Other (please describe)

former employee & Manning family Ancestors owned SJCA land 1652-1800

4 a. Have you or your relatives ever worked at SJCA? ✓ yes, I have ___ no ✓ yes, a relative has

b. If yes, for how long? 22 years for me ___ years for relative

5 a. On a scale of 1 to 5, with 5 being Excellent and 1 being Poor, how would you rank SJCA's relationship with the surrounding community? *(If poor, please explain below.)*

	(5) Excellent	(4) Better than Satisfactory	(3) Satisfactory	(2) Less than Satisfactory	(1) Poor
Trusting Relationship			3		
Open Communication			3		
Involved in the Community			3		
Concerned for the Environment			3		

b. Comments:

6 a. How would you rate the public's attitude toward SJCA?

___Excellent ✓Satisfactory ___Poor (If poor, please explain below.)

b. How would you rate your attitude toward SJCA?

___Excellent ✓Satisfactory ___Poor (If poor, please explain below.)

c. Do you think the relationship between SJCA and the community needs to be improved?

✓ Yes ___ No (If yes, please explain below.)

d. Comments: Any blockage of St Julians Creek should be dredged out and removed. I understand that a train trestle was dropped into the creek and allowed to remain blocking free tidal flow and causing the creek to fill with sludge & sediments. Land at SJCA should be ~~kept~~ restored to it's original livable condition.

2009 Community Questionnaire

7 **a. Are you aware of or concerned about environmental issues at SJCA?** ✓ Yes ___ No

b. If yes, what issues? Waste dumping + burning for years.

8 **a. Do you feel that environmental contamination at SJCA has affected the surrounding community?** ✓ Yes ___ No

b. If yes, in what ways? (check all that apply)

✓ health	✓ economic loss	✓ perception of the community
✓ environmental impacts	✓ quality of life	___ other (please explain)

9 **a. Have you noticed anything on SJCA or in the surrounding area that would give you concerns about the SJCA activities affecting the environment?** ✓ Yes ___ No

b. If yes, what concerns you? Government toxic Waste storage + dump.

10 **a. Are you aware of the SJCA Environmental Restoration Program?** ✓ Yes ___ No

b. If yes, what is your understanding of the program? attend RAB meetings

11 **a. How do you get your daily news?**	*Check All That Apply*
The Virginian-Pilot newspaper	✓
Other newspaper (which one?)	
Television (which station?)	10, 13 + 3 ✓
Radio (which station?)	~~Some~~ ✓
Website (which site?)	CNN + FNC ✓
Other (please describe)	ADL News ✓
I don't follow daily news.	

b. How do you currently receive information about environmental issues at SJCA?	*Check All That Apply*
The Virginian-Pilot newspaper	✓
Other newspaper (which one?)	
Television (which station?) 10, 13 + 3	✓
Radio (which station?)	
Website (which site?)	
Restoration Advisory Board meetings	✓
Community meetings/open house	✓
Direct mailings	✓
Other (please describe)	
I don't receive any information about environmental issues at SJCA.	

2009 Community Questionnaire

12 **Have you ever seen newspaper announcements for public meetings concerning the SJCA Environmental Restoration Program?** ____ Yes ✓ No

13 **a. Do you know about the SJCA Restoration Advisory Board (RAB)?** ____Yes ____ No
The purpose of the RAB is to facilitate public participation in Environmental Restoration Program activities where local communities express interest in such activities.
b. If yes, how many meetings have you attended? ____ none ____ 1-2 ____ 2-5 ✓ >5
c. If no, why not? ____lack of child care ____bad time ____location ____too busy ____other

Note: *If you would like to receive information on when and where the SJCA RAB meetings will be held please contact the Navy Public Affairs officer at* 757-396-9550 or e-mail stephen.milner@navy.mil

14 **a. Are you aware of the SJCA information repository at the Major Hillard Branch Library in Chesapeake?** ✓ Yes ____ No
b. If yes, have you made use of this resource? ✓ Yes ____ No
c. Do you feel this is a convenient location? ✓ Yes ____ No
d. If no, where would you prefer it to be? _____

15 **a. Would you be interested in receiving information about the status of environmental cleanup at the base?** ✓ Yes ____ No

b. If yes, how frequently would you like to receive that information?
____ quarterly ✓ annually ____ Other:_____

c. How would you like to receive that information?

____ newsletters	____ newspaper articles	____ radio announcements
____ public access TV announcements	✓ email messages	____ SJCA tours
____ web site	____ other (please explain)_____	

_____

16 **a. How many times have you had contact with government officials (i.e, Navy, EPA, VDEQ, etc.) about the environmental cleanup program at SJCA?** ____ none ____ 1–5 ✓ >5_____
_____

b. How would you rate these officials' responsiveness to your concerns?
____Excellent ✓ Satisfactory ____Poor (If poor, please explain.)_____
_____

17 **a. Do you believe the public has confidence in the ability of the Navy and its contractors to investigate and clean up the former waste disposal sites at the base?** ✓ Yes ____ No
b. Why or Why Not? _____

18 **a. Are there individuals or organizations in the community that tend to take a lead on issues of community concern?**
✓ Yes ____ No (If yes, please identify.)_____
_____

b. Can you recommend others you think we should interview?

Name:_____	Name: _____
Phone: _____	Phone: _____

2009 Community Questionnaire

19 a. Were you aware that discarded military munitions items have been found at SJCA and removed?

✓ Yes ____ No

b. If yes, how did you become aware?

____newspaper ____TV/radio ____word of mouth ✓ Other (please explain) RAB

c. How concerned are you about discarded military munitions?

✓ very ____somewhat ____not very ____not at all ____not sure

A Record of Decision for Site 4 – Landfill D was finalized in 2004 outlining the selected environmental cleanup strategy (Remedial Action), which consisted of soil cover, removal of wetland debris, removal of the eastern drainage ditch, and land use controls. The construction activities to implement this remedial action were conducted from March to October 2005. To ensure that the soil cover and land use controls will continue to be effective, visual inspections are conducted each year. The Remedial Action for Site 4 was selected based on findings contained in documents that are part of the Administrative Record for SJCA.

20 a. Were you aware of this Remedial Action that occurred at Site 4 – Landfill D?

✓ Yes ____ No

b. If yes, how did you become aware?

____newspaper ____TV/radio ____word of mouth ✓ Other (please explain) RAB

c. Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or the Remedial Action? If so, please give details. No

d. Do you feel well informed about the environmental activities and progress at Site 4 - Landfill D?

____very ✓ somewhat ____not very ____not at all ____not sure

e. Do you feel that the remedy selected for this site will protect human health and the environment?

____very ✓ somewhat ____not very ____not at all ____not sure

Why or why not?

21 Please use the back of this survey to provide any additional comments about the environmental cleanup at SJCA.

THANK YOU for taking the time to complete this survey! This information will be used to promote and enhance relationships between SJCA and the community.

2009 Community Questionnaire

1 How far do you live from SJCA? ✓ < 2 miles ___ 5-10 miles ___ 2-5 miles ___ > 10 miles

2 How long have you been a resident of the community? ___ < 1 year ___ years almost ~~40~~ 50 years (1960

3 How would you describe your "affiliation" with SJCA? *(check all that apply)*

___ SJCA employee	___ business owner	___ representative of homeowners association
___ SJCA former employee	___ representative of civic or public interest organization	___ public or elected official
✓ local resident	___ retired military person	___ Other (please describe)

4 a. Have you or your relatives ever worked at SJCA? ~~✓~~ yes, I have ✗ no ✓ yes, a relative has brother-in-law

b. If yes, for how long? Ø years for me ✓ years for relative several, he's an electronics engineer

5 a. On a scale of 1 to 5, with 5 being Excellent and 1 being Poor, how would you rank SJCA's relationship with the surrounding community? *(If poor, please explain below.)*

	(5) Excellent	(4) Better than Satisfactory	(3) Satisfactory	(2) Less than Satisfactory	(1) Poor
Trusting Relationship		✓			
Open Communication	✓				
Involved in the Community		✓			
Concerned for the Environment		✓			

b. Comments: _____

6 a. How would you rate the public's attitude toward SJCA?

___Excellent ✓Satisfactory ___Poor (If poor, please explain below.)

b. How would you rate your attitude toward SJCA?

___Excellent ✓Satisfactory ___Poor (If poor, please explain below.)

c. Do you think the relationship between SJCA and the community needs to be improved?

✓ Yes ___ No (If yes, please explain below.)

d. Comments: There's always room for improvement. There has been some talk about continuing concerns about the dredge spoils in the creek (St. J) and of Cradock Little League losing their ball fields. It's the usual "rumor mill" stuff. I haven't heard or seen anything about BRAC status, recently, either. If I was really concerned, I could find out, though!

The new additions at the Fire Training Center near the gate seem to be first class!

2009 Community Questionnaire

7 **a. Are you aware of or concerned about environmental issues at SJCA?** ✓ Yes ___ No

b. If yes, what issues? I've been most concerned with sites 2 and 21 since living in Brentwood but I certainly would here been concerned with the burning practices at Site 5 since I lived on Dahlgren Ave in the 60's and 70's less than 1/4 mile away (I do remember the acrid smoke!)

8 **a. Do you feel that environmental contamination at SJCA has affected the surrounding community?** ✓ Yes ___ No

b. If yes, in what ways? (check all that apply)

✓ health	___ economic loss	___ perception of the community
✓ environmental impacts	✓ quality of life	___ other (please explain)

9 **a. Have you noticed anything on SJCA or in the surrounding area that would give you concerns about the SJCA activities affecting the environment?** ___ Yes ___ No

b. If yes, what concerns you? None at present time. SJCA and the U.S. Govermet seems to have gotten serious about environmental impact concerns

10 **a. Are you aware of the SJCA Environmental Restoration Program?** ✓ Yes ___ No

b. If yes, what is your understanding of the program? ___

11 **a. How do you get your daily news?**	*Check All That Apply*
The Virginian-Pilot newspaper	✓
Other newspaper (which one?)	
Television (which station?) all local stations	✓
Radio (which station? WHRV	✓
Website (which site?)	
Other (please describe)	
I don't follow daily news.	

b. How do you currently receive information about environmental issues at SJCA?	*Check All That Apply*
The Virginian-Pilot newspaper	
Other newspaper (which one?)	
Television (which station?)	
Radio (which station?)	
Website (which site?)	
Restoration Advisory Board meetings	✓
Community meetings/open house	
Direct mailings	✓
Other (please describe)	
I don't receive any information about environmental issues at SJCA.	

2009 Community Questionnaire

12 **Have you ever seen newspaper announcements for public meetings concerning the SJCA Environmental Restoration Program?** ____ Yes ✓ No

13 **a. Do you know about the SJCA Restoration Advisory Board (RAB)?** ✓ Yes ____ No
The purpose of the RAB is to facilitate public participation in Environmental Restoration Program activities where local communities express interest in such activities.

b. If yes, how many meetings have you attended? ____ none ✓ 1-2 ____ 2-5 ____ >5

c. If no, why not? ____lack of child care ____bad time ____location ____too busy ____other

Note: *If you would like to receive information on when and where the SJCA RAB meetings will be held please contact the Navy Public Affairs officer at* 757-396-9550 or e-mail stephen.milner@navy.mil

14 **a. Are you aware of the SJCA information repository at the Major Hillard Branch Library in Chesapeake?** ✓ Yes ____ No

b. If yes, have you made use of this resource? ✓ Yes ____ No

c. Do you feel this is a convenient location? ✓ Yes ____ No

d. If no, where would you prefer it to be? _____

15 **a. Would you be interested in receiving information about the status of environmental cleanup at the base?** ✓ Yes ____ No

b. If yes, how frequently would you like to receive that information?

✓ quarterly ____ annually ____ Other:_____

c. How would you like to receive that information?

✓ newsletters ____ newspaper articles ____ radio announcements
____ public access TV announcements ____ email messages ____ SJCA tours
____ web site ____ other (please explain)_____

_____

16 **a. How many times have you had contact with government officials (i.e, Navy, EPA, VDEQ, etc.) about the environmental cleanup program at SJCA?** ____ none ✓ 1–5 ____ >5_____

_____

b. How would you rate these officials' responsiveness to your concerns?

____Excellent ✓ Satisfactory ____Poor (If poor, please explain.)_____

_____

17 **a. Do you believe the public has confidence in the ability of the Navy and its contractors to investigate and clean up the former waste disposal sites at the base?** ✓ Yes ____ No

b. Why or Why Not? Continuing and ongoing best practices seem to be yielding good results

18 **a. Are there individuals or organizations in the community that tend to take a lead on issues of community concern?**

____ Yes ____ No (If yes, please identify.)_____

_____

b. Can you recommend others you think we should interview?

Name: Mike McCormick Name: _____

Phone: 485-2650 Phone: _____

2009 Community Questionnaire

19 a. Were you aware that discarded military munitions items have been found at SJCA and removed?

✓ Yes ___ No

b. If yes, how did you become aware?

___newspaper ___TV/radio ___word of mouth ✓ Other (please explain) RAB newsletters

c. How concerned are you about discarded military munitions? This problem is something I've been aware of since the 1960's. Keep looking, I'm sure you'll find more.

___very ___somewhat ✓ not very ___not at all ___not sure

A Record of Decision for Site 4 – Landfill D was finalized in 2004 outlining the selected environmental cleanup strategy (Remedial Action), which consisted of soil cover, removal of wetland debris, removal of the eastern drainage ditch, and land use controls. The construction activities to implement this remedial action were conducted from March to October 2005. To ensure that the soil cover and land use controls will continue to be effective, visual inspections are conducted each year. The Remedial Action for Site 4 was selected based on findings contained in documents that are part of the Administrative Record for SJCA.

20 a. Were you aware of this Remedial Action that occurred at Site 4 – Landfill D?

✓ Yes ___ No

b. If yes, how did you become aware?

___newspaper ___TV/radio ___word of mouth ✓ Other (please explain) RAB meetings

c. Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or the Remedial Action? If so, please give details. People in Brentwood and Creedock and Corvera Shores tend to be aware of what's happening at St. J. As new problems arise, fears are assuaged when realization of proper remedial solutions are proposed and carried out.

d. Do you feel well informed about the environmental activities and progress at Site 4 - Landfill D?

✓ very ___somewhat ___not very ___not at all ___not sure

e. Do you feel that the remedy selected for this site will protect human health and the environment?

___very ✓ somewhat ___not very ___not at all ___not sure

Why or why not? I'm aware that all remedial actions are cost driven. "Perfect and pristine" are never possible. The best "bang for the buck" practices tend to be, over time, sufficient to protect all concerns

21 Please use the back of this survey to provide any additional comments about the environmental cleanup at SJCA.

THANK YOU for taking the time to complete this survey! This information will be used to promote and enhance relationships between SJCA and the community.

Thank you for this opportunity to express mine, as well as several of my neighbors, concerns about the cleanup activities at SJCA. Keep up the good work!

I look forward to attending another RAB meeting when I am able. I've missed the last several due to other demands; I do apologize.

SMG

2009 Community Questionnaire

1. **How far do you live from SJCA?** ___ < 2 miles ___ 5-10 miles ___ 2-5 miles ✓ > 10 miles 19 ESC

2. **How long have you been a resident of the community?** ___ < 1 year, 15 years

3. **How would you describe your "affiliation" with SJCA?** *(check all that apply)*

✓ SJCA employee	___ business owner	___ representative of homeowners association
___ SJCA former employee	___ representative of civic or public interest organization	___ public or elected official
✓ local resident	___ retired military person	___ Other (please describe)

4. **a. Have you or your relatives ever worked at SJCA?** ✓ yes, I have ___ no ___ yes, a relative has

   b. If yes, for how long? 15 years for me ___ years for relative

5. **a. On a scale of 1 to 5, with 5 being Excellent and 1 being Poor, how would you rank SJCA's relationship with the surrounding community?** *(If poor, please explain below.)*

	(5) Excellent	(4) Better than Satisfactory	(3) Satisfactory	(2) Less than Satisfactory	(1) Poor
Trusting Relationship		✓			
Open Communication		✓			
Involved in the Community		✓			
Concerned for the Environment	✓				

   b. Comments: _____

6. **a. How would you rate the public's attitude toward SJCA?**

   ___Excellent ✓Satisfactory ___Poor (If poor, please explain below.)

   b. How would you rate your attitude toward SJCA?

   ___Excellent ✓Satisfactory ___Poor (If poor, please explain below.)

   c. Do you think the relationship between SJCA and the community needs to be improved?

   ✓ Yes ___ No (If yes, please explain below.)

   d. Comments: REGULAR COMMUNITY MEETINGS.

2009 Community Questionnaire

7 a. Are you aware of or concerned about environmental issues at SJCA? ✓ Yes ___ No

b. If yes, what issues? WATER/AIR QUALITY.

8 a. Do you feel that environmental contamination at SJCA has affected the surrounding community? ✓ Yes ___ No

b. If yes, in what ways? (check all that apply)

___ health	___ economic loss	✓ perception of the community
✓ environmental impacts	___ quality of life	___ other (please explain)

9 a. Have you noticed anything on SJCA or in the surrounding area that would give you concerns about the SJCA activities affecting the environment? ___ Yes ✓ No

b. If yes, what concerns you? _____

10 a. Are you aware of the SJCA Environmental Restoration Program? ✓ Yes ___ No

b. If yes, what is your understanding of the program? THE SJCA ENVIRONMENTAL RESTORATION PROGRAM IS ON-GOING & COMMITTED TO CLEANING SJCA.

11 a. How do you get your daily news?	Check All That Apply
The Virginian-Pilot newspaper	✓
Other newspaper (which one?)	
Television (which station?)	
Radio (which station?	
Website (which site?) USATODAY, PGH.TRIB, PGH.POSTGAZETTE.	✓
Other (please describe)	
I don't follow daily news.	

b. How do you currently receive information about environmental issues at SJCA?	Check All That Apply
The Virginian-Pilot newspaper	
Other newspaper (which one?)	
Television (which station?)	
Radio (which station?)	
Website (which site?) HTTP://PUBLIC.LANTOPS-IR.ORG/SITES/	✓
Restoration Advisory Board meetings PUBLIC/SJCA/DEFAULT.ASPX	✓
Community meetings/open house	
Direct mailings	✓
Other (please describe)	
I don't receive any information about environmental issues at SJCA.	

2009 Community Questionnaire

12 **Have you ever seen newspaper announcements for public meetings concerning the SJCA Environmental Restoration Program?** ✓ Yes ___ No

13 **a. Do you know about the SJCA Restoration Advisory Board (RAB)?** ✓ Yes ___ No
The purpose of the RAB is to facilitate public participation in Environmental Restoration Program activities where local communities express interest in such activities.
b. If yes, how many meetings have you attended? ___ none ___ 1-2 ___ 2-5 ✓ >5
c. If no, why not? ___lack of child care ___bad time ___location ___too busy ___other

Note: *If you would like to receive information on when and where the SJCA RAB meetings will be held please contact the Navy Public Affairs officer at* 757-396-9550 or e-mail stephen.milner@navy.mil

14 **a. Are you aware of the SJCA information repository at the Major Hillard Branch Library in Chesapeake?** ✓ Yes ___ No
b. If yes, have you made use of this resource? ___ Yes ✓ No
c. Do you feel this is a convenient location? ✓ Yes ___ No
d. If no, where would you prefer it to be? _____

15 **a. Would you be interested in receiving information about the status of environmental cleanup at the base?** ✓ Yes ___ No

b. If yes, how frequently would you like to receive that information?
✓ quarterly ___ annually ___ Other:_____

c. How would you like to receive that information?

___ newsletters	___ newspaper articles	___ radio announcements
___ public access TV announcements	✓ email messages	___ SJCA tours
✓ web site	✓ other (please explain) EMAIL MESSAGES WITH LINKS TO WEB SITE AND/OR FTP DOC REPOSITORY.	

16 **a. How many times have you had contact with government officials (i.e, Navy, EPA, VDEQ, etc.) about the environmental cleanup program at SJCA?** ___ none ___ 1–5 ✓ >5_____

b. How would you rate these officials' responsiveness to your concerns?
✓ Excellent ___Satisfactory ___Poor (If poor, please explain.)_____

17 **a. Do you believe the public has confidence in the ability of the Navy and its contractors to investigate and clean up the former waste disposal sites at the base?** ✓ Yes ___ No
b. Why or Why Not? BASED ON FEED BACK AT RAB MEETINGS.

18 **a. Are there individuals or organizations in the community that tend to take a lead on issues of community concern?**
✓ Yes ___ No (If yes, please identify.)_____

b. Can you recommend others you think we should interview?
Name:_____ Name: _____
Phone: _____ Phone: _____

2009 Community Questionnaire

19 **a. Were you aware that discarded military munitions items have been found at SJCA and removed?**

✓ Yes ____ No

b. If yes, how did you become aware?

____newspaper ____TV/radio ____word of mouth ✓ Other (please explain) RAB.

c. How concerned are you about discarded military munitions?

✓ very ____somewhat ____not very ____not at all ____not sure

A Record of Decision for Site 4 – Landfill D was finalized in 2004 outlining the selected environmental cleanup strategy (Remedial Action), which consisted of soil cover, removal of wetland debris, removal of the eastern drainage ditch, and land use controls. The construction activities to implement this remedial action were conducted from March to October 2005. To ensure that the soil cover and land use controls will continue to be effective, visual inspections are conducted each year. The Remedial Action for Site 4 was selected based on findings contained in documents that are part of the Administrative Record for SJCA.

20 **a. Were you aware of this Remedial Action that occurred at Site 4 – Landfill D?**

✓ Yes ____ No

b. If yes, how did you become aware?

____newspaper ____TV/radio ____word of mouth ✓ Other (please explain) RAB.

c. Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or the Remedial Action? If so, please give details. No.

d. Do you feel well informed about the environmental activities and progress at Site 4 - Landfill D?

✓ very ____somewhat ____not very ____not at all ____not sure

e. Do you feel that the remedy selected for this site will protect human health and the environment?

✓ very ____somewhat ____not very ____not at all ____not sure

Why or why not? REASONABLE RESPONSE BASED ON AVAILABLE DATA.

21 **Please use the back of this survey to provide any additional comments about the environmental cleanup at SJCA.**

THANK YOU for taking the time to complete this survey! This information will be used to promote and enhance relationships between SJCA and the community.

2009 Community Questionnaire

1. **How far do you live from SJCA?** ✓ < 2 miles ___ 5-10 miles ___ 2-5 miles ___ > 10 miles

2. **How long have you been a resident of the community?** ___ < 1 year 35 years

3. **How would you describe your "affiliation" with SJCA?** *(check all that apply)*

___ SJCA employee	___ business owner	___ representative of homeowners association
___ SJCA former employee	___ representative of civic or public interest organization	___ public or elected official
✓ local resident	___ retired military person	___ Other (please describe)

4. **a. Have you or your relatives ever worked at SJCA?** ___ yes, I have ✓ no ___ yes, a relative has

   b. If yes, for how long? ___ years for me ___ years for relative

5. **a. On a scale of 1 to 5, with 5 being Excellent and 1 being Poor, how would you rank SJCA's relationship with the surrounding community?** *(If poor, please explain below.)*

	(5) Excellent	(4) Better than Satisfactory	(3) Satisfactory	(2) Less than Satisfactory	(1) Poor
Trusting Relationship		✓ 4			
Open Communication	✓				
Involved in the Community	✓				
Concerned for the Environment		✓			

   b. Comments: _____

6. **a. How would you rate the public's attitude toward SJCA?**

   ___Excellent ✓ Satisfactory ___Poor (If poor, please explain below.)

   b. How would you rate your attitude toward SJCA?

   ✓ Excellent ___Satisfactory ___Poor (If poor, please explain below.)

   c. Do you think the relationship between SJCA and the community needs to be improved?

   ___ Yes ✓ No (If yes, please explain below.)

   d. Comments: _____

2009 Community Questionnaire

7 **a. Are you aware of or concerned about environmental issues at SJCA?** ✓ Yes ___ No

b. If yes, what issues?

8 **a. Do you feel that environmental contamination at SJCA has affected the surrounding community?** ___ Yes ___ No UNK

b. If yes, in what ways? (check all that apply)

_____health _____economic loss _____perception of the community
_____environmental impacts _____quality of life _____other (please explain)

9 **a. Have you noticed anything on SJCA or in the surrounding area that would give you concerns about the SJCA activities affecting the environment?** ___ Yes ✓ No

b. If yes, what concerns you? _____

_____

10 **a. Are you aware of the SJCA Environmental Restoration Program?** ✓ Yes ___ No

b. If yes, what is your understanding of the program? _____

11 **a. How do you get your daily news?**	*Check All That Apply*
The Virginian-Pilot newspaper	✓
Other newspaper (which one?)	
Television (which station?)	✓
Radio (which station?	✓
Website (which site?)	✓
Other (please describe)	
I don't follow daily news.	

b. How do you currently receive information about environmental issues at SJCA?	*Check All That Apply*
The Virginian-Pilot newspaper	✓
Other newspaper (which one?)	
Television (which station?)	
Radio (which station?)	
Website (which site?)	
Restoration Advisory Board meetings	
Community meetings/open house	
Direct mailings	✓
Other (please describe)	
I don't receive any information about environmental issues at SJCA.	

2009 Community Questionnaire

12 **Have you ever seen newspaper announcements for public meetings concerning the SJCA Environmental Restoration Program?** ____ Yes ✓ No

13 **a. Do you know about the SJCA Restoration Advisory Board (RAB)?** ✓ Yes ____ No
The purpose of the RAB is to facilitate public participation in Environmental Restoration Program activities where local communities express interest in such activities.

b. If yes, how many meetings have you attended? ✓ none ____ 1-2 ____ 2-5 ____ >5

c. If no, why not? ____lack of child care ____bad time ____location ✓ too busy ____other

Note: *If you would like to receive information on when and where the SJCA RAB meetings will be held please contact the Navy Public Affairs officer at* 757-396-9550 or e-mail stephen.milner@navy.mil

14 **a. Are you aware of the SJCA information repository at the Major Hillard Branch Library in Chesapeake?** ____ Yes ✓ No

b. If yes, have you made use of this resource? ____ Yes ____ No

c. Do you feel this is a convenient location? ✓ Yes ____ No

d. If no, where would you prefer it to be? _____

15 **a. Would you be interested in receiving information about the status of environmental cleanup at the base?** ✓ Yes ____ No

b. If yes, how frequently would you like to receive that information?

____ quarterly ✓ annually ____ Other:_____

c. How would you like to receive that information?

✓ newsletters ____ newspaper articles ____ radio announcements
____ public access TV announcements ✓ email messages ____ SJCA tours
✓ web site ____ other (please explain)_____

_____

16 **a. How many times have you had contact with government officials (i.e, Navy, EPA, VDEQ, etc.) about the environmental cleanup program at SJCA?** ✓ none ____ 1–5 ____ >5_____

_____

b. How would you rate these officials' responsiveness to your concerns?

____Excellent ____Satisfactory ____Poor (If poor, please explain.)_____

_____

17 **a. Do you believe the public has confidence in the ability of the Navy and its contractors to investigate and clean up the former waste disposal sites at the base?** ____ Yes ✓ No

b. Why or Why Not? Long History/news 60's cover-ups & BAD Press, etc.

18 **a. Are there individuals or organizations in the community that tend to take a lead on issues of community concern?**

✓ Yes ____ No (If yes, please identify.)_____

_____

b. Can you recommend others you think we should interview?

Name:_____ Name: _____

Phone: _____ Phone: _____

2009 Community Questionnaire

19 **a. Were you aware that discarded military munitions items have been found at SJCA and removed?**

✓ Yes ____ No

b. If yes, how did you become aware?

____newspaper ____TV/radio ✓ word of mouth ____Other (please explain)_____

c. How concerned are you about discarded military munitions?

____very ✓ somewhat ____not very ____not at all ____not sure

A Record of Decision for Site 4 – Landfill D was finalized in 2004 outlining the selected environmental cleanup strategy (Remedial Action), which consisted of soil cover, removal of wetland debris, removal of the eastern drainage ditch, and land use controls. The construction activities to implement this remedial action were conducted from March to October 2005. To ensure that the soil cover and land use controls will continue to be effective, visual inspections are conducted each year. The Remedial Action for Site 4 was selected based on findings contained in documents that are part of the Administrative Record for SJCA.

20 **a. Were you aware of this Remedial Action that occurred at Site 4 – Landfill D?**

✓ Yes ____ No

b. If yes, how did you become aware?

____newspaper ____TV/radio ✓ word of mouth ____Other (please explain) Neighbors

c. Are you aware of any community concerns regarding Site 4, the activities conducted at the site in the past, or the Remedial Action? If so, please give details._____

d. Do you feel well informed about the environmental activities and progress at Site 4 - Landfill D?

____very ✓ somewhat ____not very ____not at all ____not sure

e. Do you feel that the remedy selected for this site will protect human health and the environment?

____very ____somewhat ✓ not very ____not at all ____not sure

Why or why not? LACK of Knowledge — How much, How Long, WHAT Dumped EXTENT of PAST CLEAN-ups, Probable "LOST" PAPERWORK

21 **Please use the back of this survey to provide any additional comments about the environmental cleanup at SJCA.**

THANK YOU for taking the time to complete this survey! This information will be used to promote and enhance relationships between SJCA and the community.

Appendix D
Site 4 Voluntary Groundwater Monitoring Report Addendum

Site 4 Voluntary Groundwater Performance Monitoring Report Addendum, St. Juliens Creek Annex, Chesapeake, Virginia

PREPARED FOR: SJCA Tier I Partnering Team

PREPARED BY: CH2M HILL

DATE: March 4, 2010

1 Introduction

This memorandum summarizes the field activities, analytical results, and data evaluation of the additional voluntary groundwater performance monitoring conducted in August 2009 at Site 4 – Landfill D, St. Juliens Creek Annex (SJCA), Chesapeake, Virginia. Additional groundwater monitoring was conducted in order to further evaluate site conditions in association with the Five-Year Review conducted for the site.

This memorandum was prepared under the United States Navy, Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-term Environmental Action Navy (CLEAN) 3, Contract N62470-05-D-3052, Contract Task Order 0129.

2 Site Description and Background

Site 4 is an approximately 8.3-acre landfill in the northeastern portion of SJCA located at the confluence of Blows Creek and the Southern Branch of the Elizabeth River (**Figure 1**). The site is located in an area of dredge fill material that reportedly originated from Blows Creek and the Southern Branch of the Elizabeth River. Grass-lined drainage ditches are located along the eastern and western sides of Site 4 and transport surficial runoff from the area to the adjacent wetland area and Blows Creek. The adjacent wetland area was incorporated into a separate investigation of the Blows Creek watershed and is not part of Site 4.

Waste disposed at Site 4 included primarily trash and wet garbage from 1961 to 1976, followed by disposal of inert construction material until 1981. The total volume of waste disposed at the site is estimated at 56,000 cubic yards. Within the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, Site 4 is currently in the Response Complete phase and is maintained as a controlled closed landfill with a vegetated soil cover.

Several investigations, including the Remedial Investigation (RI) (CH2M HILL, 2003), have been conducted in order to characterize the nature and extent of contamination at the site. The RI human health and ecological risk assessments concluded that there was potential unacceptable risk to human and ecological receptors from exposure to waste and chemicals of concern in soil (inorganics and polycyclic aromatic hydrocarbons) and mercury in the

eastern drainage ditch. Because surface water is transient and the upland ditches provide minimal ecological habitat, there was no significant risk to human health and the environment identified from direct exposure to surface water. No human health risk drivers were identified for the shallow Columbia aquifer groundwater. Although human health risk drivers (primarily inorganics) were identified for the deeper Yorktown aquifer, the SJCA Tier 1 Project Management Team determined the risks to be acceptable based on the concentrations of chemicals, the risks identified associated with these chemicals, and the nature of the groundwater flow conditions. Based on the RI results, a Feasibility Study (CH2M HILL, 2004a) was conducted to evaluate remedial alternatives to mitigate risks from Site 4 and eliminate concern for continued or future transport of potential contaminants to Blows Creek via the site drainage ditches.

The Selected Remedy for Site 4 identified in the Proposed Remedial Action Plan (CH2M HILL, 2004b) and Record of Decision (ROD) (CH2M HILL, 2004c) was a soil cover over the landfill with removal of adjacent wetland debris, removal of the eastern drainage ditch sediment, and land use controls (LUCs). A minor modification to the ROD to address extension of the soil cover to the west and compensatory mitigation for permanent wetland impacts was documented in a Technical Memorandum (CH2M HILL, 2006). The Remedial Action was conducted from March through October 2005 and documented in the Remedial Action Construction Report (NAVFAC, 2006).

Quarterly voluntary groundwater performance monitoring was conducted between November 2006 through August 2008, based on the consensus of the SJCA Installation Restoration (IR) Partnering Team, which includes representatives of the Navy, U.S. Environmental Protection Agency (USEPA), and Virginia Department of Environmental Quality. The team agreed to conduct the post-ROD groundwater monitoring at Site 4 to evaluate the site's impact on groundwater quality and the potential for future releases to pose unacceptable risk. Concentrations of total and dissolved arsenic, cadmium, iron, lead, and thallium in groundwater collected from upgradient and downgradient wells at Site 4 were evaluated as part of the voluntary groundwater performance monitoring. Although no increasing trends of concentrations were evident, the most recent (2006 to 2008) arsenic concentrations detected at SJS04-MW04S were somewhat greater than the historical (1997 and 1999) concentrations (CH2M HILL, 2009a). Therefore, the SJCA Tier 1 Partnering Project Management Team elected to conduct additional voluntary groundwater monitoring to further evaluate the site conditions.

3 Field Investigation Activities

The field activities described below were conducted in accordance with the *Final Site 4 Voluntary Groundwater Performance Monitoring Plan Addendum, St. Juliens Creek Annex, Chesapeake, Virginia* (CH2M HILL, 2009b).

3.1 Groundwater Sampling

Groundwater samples were collected from four existing shallow (Columbia aquifer) monitoring wells: SJS04-MW01S, MW03S, MW04S, and MW05S (**Figure 2**). Prior to sample collection, depth to groundwater was measured and recorded at each monitoring well (**Table 1**). Groundwater at Site 4 generally flows southeast towards the Southern Branch of the Elizabeth River as shown on **Figure 2**.

Groundwater samples were collected using a peristaltic pump following a low-flow sampling protocol (USEPA, 1996). All samples were collected by placing the sample tubing intake in the middle of the screened interval. Water quality parameters (dissolved oxygen [DO], oxidation reduction potential (ORP), pH, temperature, conductivity, turbidity, and salinity) were field-measured with a Horiba U-22 and flow-through cell to confirm aquifer stability prior to sample collection and recorded in the field notebook. The field notes are provided in **Attachment A**. Additionally, Chemets DO field test kits were used to obtain more accurate DO measurements than those collected from a Horiba U-22 at all monitoring wells. The aquifer was considered stable after at least one well volume was purged and water quality readings collected 5 minutes apart were stabilized to within 10 percent of one another, with the exception of turbidity, which was reduced to the extent practical. If all water quality parameters did not stabilize, at least one well volume was purged prior to sample collection in order to ensure a sample representative of the aquifer was collected. The water quality parameters at the time of sample collection are noted in **Table 2**.

The groundwater samples were collected into laboratory-prepared sample containers, submitted to an offsite laboratory, and analyzed for total and dissolved arsenic. Appropriate quality assurance (QA) and quality control (QC) samples were collected in accordance with Navy CLEAN and CH2M HILL protocols, including duplicates, equipment blanks, field blanks, and matrix spike and matrix spike duplicates. The QA/QC data collected are provided in **Attachment B**.

3.2 Investigative-Derived Waste Management

Investigation-derived waste (IDW) generated during the groundwater sampling consisted of purge water. IDW was containerized in an approved 55-gallon drum, stored on secondary containment at the approved IDW staging location located at IR Site 2, and properly labeled. The IDW was disposed of as nonhazardous aqueous waste based on previous groundwater monitoring results.

4 Data Management

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 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. Chain-of-custody entries were checked against the site-specific project instructions and work plans to verify that all designated field samples were collected and submitted for the appropriate analysis. Upon receipt of the samples by the laboratories, a comparison to the field information to verify that each sample was analyzed for the correct parameters and appropriate QA/QC samples were collected was performed.

Analytical data reports, in hardcopy and electronic format were submitted to Navy-approved third-party data validators. The procedures in the *Region III Modifications to Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis* (USEPA, 1993) were used for validation. The data validation summary is provided in **Attachment C**.

Data Validation Qualifiers

The data validation qualifiers, or flags, used for the data are the following:

- A "B" flag by the data validator indicates that the analytes have also been detected in a field, equipment, or trip blank, or in a laboratory QA/QC sample.
- A "J" flag indicates that the analyte is present but the value is estimated.
- A "U" flag indicates that the analyte was not detected and the associated value indicates the approximate sample concentration necessary to be detected.

Laboratory and Sample Blank Contamination

In some instances, constituents detected in samples may have been introduced during field sampling, transportation to the analytical laboratory, or during laboratory procedures. A variety of blank samples were analyzed and used in the QA/QC process to determine which of the constituents may or may not be attributed to the field sample.

Typically, a field blank is collected to account for ambient conditions during sample collection. An equipment/rinsate blank is collected to determine if the equipment used to collect the samples (for example, tubing) was adequately clean. Additionally, the laboratory analyzes a method blank in each batch of 20 samples to verify instrument cleanliness and function.

When blank samples are found to contain common laboratory contaminants, each of the aqueous field samples associated with that blank that contain up to 10 times the concentrations in the blanks are qualified during data validation with a "B" for that compound. A "B" qualifier means that the compound may not be attributed to the site at that sample location. When a sampling or laboratory blank contains contaminants other than the common laboratory contaminants, each of the aqueous field samples associated with that blank that contain up to five times the concentrations is qualified during data validation with a "B" for that compound.

5 Data Results and Evaluation

5.1 Data Results

Total and dissolved arsenic were detected in the shallow groundwater at monitoring well SJS04-MW04S, located on the eastern perimeter of the landfill, along Patrol Road (**Table 3**). To identify constituents present in groundwater reflective of a potential site related release, inorganics detected in shallow groundwater were compared to the shallow groundwater background 95 percent upper tolerance levels (UTLs) established for SJCA to determine if they could be CERCLA-site related or were more likely naturally occurring. The findings of the facility-wide background groundwater investigation were presented in the *Final Background Investigation Report Addendum for Groundwater* (CH2M HILL, 2004d). The arsenic concentrations detected in SJS04-MW04S exceeded the corresponding background UTL and maximum contaminant level (MCL) (**Figure 3**). The total and dissolved arsenic concentrations from the voluntary groundwater performance monitoring are graphically presented in **Figure 4** and **Figure 5**, respectively.

Inorganic concentrations in this downgradient well are likely influenced by the migration of groundwater under reducing conditions (typical in the vicinity of landfills) into this area. The ORP level in this well was -27 and is lower than the ORP level in the upgradient well. Since downgradient groundwater is under more reducing conditions, inorganics such as arsenic are more soluble and present at higher concentrations in the dissolved matrix.

5.2 Data Evaluation

A nonparametric analysis of variance (ANOVA) comparison of all the voluntary groundwater performance monitoring arsenic data collected to date was performed to determine whether arsenic concentrations in the downgradient monitoring wells (SJS04-MW03S, -MW04S, and -MW05S) statistically exceed concentrations in the upgradient monitoring well (SJS04-MW01S) (USEPA, 1992). Specifically, the Kruskal-Wallis test was used for the comparison. This approach tests for average (central tendency) shifts in downgradient concentrations above upgradient.

The calculated probabilities from the initial ANOVA step were compared with a significance level of 0.05. When the probability is below this level, a significant difference between the central tendencies of the well groups is suggested. This comparison only indicates significant differences between one or more well groups, but does not identify which well or well group has higher concentrations. Therefore, for any instance in which a significant difference was seen, a post hoc test (multiple comparison test) was employed to determine which downgradient well concentrations, if any, exceed the upgradient well concentrations. The results of these tests are shown in **Table 4**. The total and dissolved arsenic concentrations from downgradient monitoring well SJS04-MW04S significantly exceeded upgradient concentrations.

Because there were downgradient concentrations that statistically exceeded upgradient concentrations, a time trend analysis was used to determine whether concentrations have increased or decreased over time for each well. The nonparametric Mann-Kendall test was used for this time trend analysis. This is a nonparametric method, so there are no distributional assumptions, missing data values (non-detects) are easily handled (Proxy values of one-half of the reporting limit were substituted for non-detects), and irregularly spaced sampling intervals are permitted. The RI data (collected between 1997 through 1999) and voluntary groundwater performance monitoring data (2006 through 2009) were included in the time trend analysis with the exception of the analysis performed for monitoring well SJS04-MW05S, which was installed after the RI. Therefore, the analysis for monitoring well SJS04-MW05S was performed using only the voluntary groundwater performance monitoring data.

The results of the Mann-Kendall test for intrawell time trends in the groundwater data are shown in **Table 5**. The calculated probability for the test represents the probability that any observed trend would occur purely by chance (given the variability and sample size of the data set). A significance level of 0.05 was used for comparisons with this probability and the resulting decision is reported. This could be a significantly increasing or decreasing trend or no significant change.

Applying the Mann-Kendall test to the 12 RI and voluntary groundwater performance monitoring data events for monitoring wells SJS04-MW01S, -MW03S, and -MW04S resulted in two cases in which a significant trend was demonstrated. These significant trends

consisted of a significantly decreasing trend of dissolved arsenic and total arsenic at the upgradient monitoring well SJS04-MW01S. It should be noted that these two cases of significant differences contained only three dissolved arsenic detections and two total arsenic detections; and thus, these trend evaluations were heavily influenced by non-detect proxies. No significant increasing or decreasing trends were identified for SJS04-MW03S and -MW04S.

Applying the Mann-Kendall test to the nine quarterly voluntary groundwater performance monitoring events for monitoring well SJS04-MW05S revealed no significant trend for total arsenic, but a significantly increasing trend for dissolved arsenic. For dissolved arsenic, however, the most recent result was 7.5 µg/L and "B" qualified. Therefore, the result is considered a non-detect due to blank contamination and thus the proxy value (one half of 7.5) had an influence on the trend conclusion (since no significant trend was concluded prior to the acquisition of the last result). Additionally, concentrations detected at SJS04-MW05S did not exceed background values or the MCL.

The three cases in which significant trends were identified through the Mann-Kendall test, along with the time series patterns for each of the wells, can be observed visually in the time plots presented as **Figure 6**. For the two cases of significant decreasing trends via the Mann-Kendall tests (all in upgradient monitoring well SJS04-MW01S), the plots suggest that the detected concentrations do not verify a decreasing trend, but instead that the nondetect proxies largely influenced the conclusions. For the one significantly increasing trend (dissolved arsenic at SJS04-MW05S), the plot reveals that the latest result was a nondetect and the proxy value for that nondetect is influential in that trend conclusion. Therefore, the results of the Mann-Kendall test and a visual inspection of the plots indicate that the arsenic concentrations in these monitoring wells do not exhibit a significant temporal trend.

6 Recommendations

Concentrations of total and dissolved arsenic were evaluated in upgradient and downgradient wells. Although total and dissolved arsenic concentrations were identified to be present in one downgradient monitoring well (SJS04-MW04S) that statistically exceed concentrations in the upgradient monitoring well, the results of the time trend analysis indicate that concentrations in this well are steady over time. Additionally, although the results of the time trend analysis indicated a significant increase of dissolved arsenic concentration in downgradient monitoring well SJS04-MW05S; all arsenic concentrations are below the MCL and the trend was heavily influenced by nondetect proxy values. However, because the most recent (2006 to 2009) arsenic concentrations detected at SJS04-MW04S are somewhat greater than the historical (1997 and 1999) concentrations it is recommended groundwater monitoring for arsenic be conducted prior to the next Five-Year Review. The site conditions, trends, and path forward will then be re-evaluated in light of the pending Tier II Guidance on Pre-Regulated Landfill Monitoring Management for Federal CERCLA Sites.. Additionally, yearly inspections will continue to be conducted to confirm the soil cover is adequately maintained and LUCs will continue to be enforced.

7 References

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CH2M HILL, 2004a. *Final Feasibility Study for Site 4*. St. Juliens Creek Annex. Chesapeake, Virginia. March.

CH2M HILL, 2004b. *Final Proposed Plan*, *Site 4: Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia. April

CH2M HILL, 2004c. *Final Record of Decision*, *Site 4: Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia. September

CH2M HILL, 2004d. *Final Background Investigation Report Addendum for Groundwater. St. Juliens Creek Annex, Chesapeake, Virginia.* October.

CH2M HILL, 2006. *Minor Modifications to the Selected Remedy Presented in the Record of Decision for Site 4 - Landfill D*, St. Juliens Creek Annex, Chesapeake, Virginia. February.

CH2M HILL. 2009a. *Final Site 4 Voluntary Groundwater Performance Monitoring Report*. St. Juliens Creek Annex. Chesapeake, Virginia. April.

CH2M HILL. 2009b. *Final Site 4 Voluntary Groundwater Performance Monitoring Plan Addendum*. St. Juliens Creek Annex. Chesapeake, Virginia. August.

NAVFAC. 2006. *Final Remedial Action Completion Report, Site 4 - Landfill D.* St. Juliens Creek Annex, Chesapeake, Virginia. June.

United States Environmental Protection Agency (USEPA). 1993. *Region III Modifications to Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*. April.

USEPA. 1996. *Low Flow (Minimal Drawdown) Groundwater Sampling Procedures*. April.

Table 1
Groundwater Elevations
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Monitoring Well	Top of PVC Elevation (ft amsl)	Nov-06		Feb-07		May-07		Aug-07		Nov-07		Feb-08		May-08		Aug-08		Aug-09	
		Depth to Water (ft)	Water Elevation (ft amsl)	Depth to Water (ft)	Water Elevation (ft amsl)	Depth to Water (ft)	Water Elevation (ft amsl)	Depth to Water (ft)	Water Elevation (ft amsl)	Depth to Water (ft)	Water Elevation (ft amsl)	Depth to Water (ft)	Water Elevation (ft amsl)	Depth to Water (ft)	Water Elevation (ft amsl)	Depth to Water (ft)	Water Elevation (ft amsl)	Depth to Water (ft)	Water Elevation (ft amsl)
SJS04-MW01S	13.02	2.66	10.36	2.68	10.34	12.08	0.94	4.5	8.52	6.75	6.27	2.76	10.26	2.82	10.2	6.15	6.87	4.29	8.73
SJS04-MW03S	6.67	4.44	2.23	4.35	2.32	5.38	1.29	4.25	2.42	4.95	1.72	3.87	2.8	4.0	2.7	6.1	0.57	4.15	2.52
SJS04-MW04S	8.60	4.36	4.24	4.74	3.86	5.5	3.10	5.3	3.30	5.83	2.77	4.1	4.50	4.4	4.20	5.9	2.70	4.71	3.89
SJS04-MW05S	6.21	2.41	3.8	2.6	3.61	3.2	3.01	3.01	3.2	3.45	2.76	2.81	3.4	2.72	3.49	3.6	2.61	3.1	3.11

Notes:
amsl - above mean sea level
ft - feet

Table 2
Groundwater Quality Parameters
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS04-MW01S									SJS04-MW03S								
Sample Date	11/28/06	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09	11/28/06	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09
Parameters																		
Dissolved Oxygen (ppm)	0.4	1.0	4.0	4.0	1.0	1.0	0.3	1.0	1.0[a]	1.0	4.0	0.8	0.0	2.0	1.0	1.0	1.0	1.0[a]
Oxidation Reduction Potential (mV)	140	195	126	272	-12	373	2.67	128	173	-32	146	-129	-150	-135	131	264	-165	-292
pH	5.14	5.36	6.9	4.07	5.36	3.65	3.59	3.99	3.84	7.12	7.03	6.76	7.2	6.63	6.65	6.84	7.26	7.16
Temperature (°C)	15.75	10.75	20.1	22.06	18.2	11.3	18.74	20.56	28.52	17.51	11.14	17.71	24.75	18.1	12.2	18.9	22.9	22.79
Conductivity (ms/cm)	0.495	--	4.65	1.36	2.82	1.05	0.795	1.43	0.654	3.82	1.85	2.7	2.09	15.9	1.66	1.45	2.49	3.33
Turbidity (NTU)	45.9	31.2	41.9	252	0.0	0.0	50.1	315	21.6	45.8	5.9	55.9	171	0.0	0.0	36.8	0.0	66.6
Salinity (%)	0.02	4.0	0.24	0.06	0.1	0.05	0.0	0.1	0	0.2	0.1	0.13	0.2	0.9	0.08	0.1	0.1	0.2

Notes:
[a] Dissolved Oxygen measured using Chemets Test Kits

[b] Horiba was malfunctioning during measurement of conductivity and salinity

Table 2
Groundwater Quality Parameters
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS04-MW04S									SJS04-MW05S								
Sample Date	11/28/06	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09	11/28/06	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09
Parameters																		
Dissolved Oxygen (ppm)	5.08[a]	2.0	0.6	1.5	0.35[a]	1.0	1.0	1.0	2.0[a]	4.78[a]	1.0	1.5	4.5	1.0	1.0	1.5	1.0	1.0[a]
Oxidation Reduction Potential (mV)	-155	-134	-158	-176	-119	-154	-134	-129	-27	-182	-128	-163	-185	-142	-138	-143	-183	-174
pH	7.15	6.92	6.7	7.07	6.71	6.7	6.87	7.27	6.78	7.47	6.93	6.81	7.21	6.79	6.79	6.89	7.55	7.14
Temperature (°C)	17.16	12.8	19.59	25.02	19	13.21	18.99	23.39	26.49	15.92	10.79	21.08	21.84	17.3	12.42	16.24	21.21	24.9
Conductivity (ms/cm)	2.43	30.6[b]	2.1	2.38	4.64	1.98	2.0	2.12	0	10.2	--	12.2	13.8	11.2	4.95	12	18.9	27.5
Turbidity (NTU)	20.6	15	87.1	78.3	11.1	1.6	34.4	137	127	123	166	49.4	527	30.6	8.8	105	274	130
Salinity (%)	0.12	1.9[b]	0.1	0.12	0.2	0.09	0.1	0.1	0	0.56	4.0	0.69	0.69	0.6	0.25	0.7	1.2	1.7

Notes:
[a] Dissolved Oxygen measured using Chemets Test Kits

[b] Horiba was malfunctioning during measurement of conductivity and salinity

Table 3
Groundwater Arsenic Detections and Exceedances of Screening Criteria
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	MCL-Groundwater	SJCA 95% UTL Groundwater	SJS04-MW01S											
Sample ID			SJS04-GW1S-001	SJS04-GW1S-002	SJS04-GW1S-003	SJS04-MW01S-06D	SJS04-MW01S-07A*	SJS04-MW01S-07B	SJS04-MW01S-07C	SJS04-MW01S-07D	SJS04-MW01S-08A	SJS04-MW01S-08B	SJS04-MW01S-08C	SJS04-MW01S-09C
Sample Date			07/21/97	11/03/97	05/18/99	11/28/06	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09
Chemical Name														
Total Metals (UG/L)														
Arsenic	10	8	3 U	3.2 U	2 U	2 B	1 U	1.2	1 UJ	0.7 B	1 U	0.3 B	0.61 J	1.5 B
Dissolved Metals (UG/L)														
Arsenic	10	2.4	3 U	3.2 U	2 U	1.9 B	1 U	1.2	1 UJ	0.78 B	0.3 J	1 U	0.67 J	1.8 B

Notes:

* A duplicate sample was collected at this location; the most conservative result is shown.

Bold Blue font represents MCL exceedance

Shaded cells represent SJCA 95% UTL exceedance

B - Analyte not detected above the level reported in blanks

J - Reported value is estimated

U - Analyte not detected

UG/L - micrograms per liter

UTL - Upper Tolerance Limit

MCL - Maximum Contaminant Level

Table 3
Groundwater Arsenic Detections and Exceedances of Screening Criteria
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	MCL-Groundwater	SJCA 95% UTL Groundwater	SJS04-MW03S												
Sample ID			SJS04-GW3S-001	SJS04-GW3S-002	SJS04-GW3S-003	SJS04-MW03S-06D	SJS04-MW03S-07A	SJS04-MW03S-07B	SJS04-MW03S-07C*	SJS04-MW03S-07D	SJS04-MW03S-08A*	SJS04-MW03S-08B*	SJS04-MW03S-08C*	SJS04-MW03S-09C
Sample Date			07/21/97	11/03/97	05/18/99	11/28/06	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09
Chemical Name														
Total Metals (UG/L)														
Arsenic	10	8	3 U	3.2 U	2.30 J	1.9 B	0.63 J	1.3	1.7	2.8 B	0.96 J	0.65 J	1.2 J	1.7 B
Dissolved Metals (UG/L)														
Arsenic	10	2.4	3 U	3.2 U	3.5 J	1.8 B	0.51 J	1	1.9	1.8 B	0.78 J	0.5 J	1.5 J	1.6 B

Notes:

* A duplicate sample was collected at this location; the most conservative result is shown.

Bold Blue font represents MCL exceedance

Shaded cells represent SJCA 95% UTL exceedance

B - Analyte not detected above the level reported in blanks

J - Reported value is estimated

U - Analyte not detected

UG/L - micrograms per liter

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Table 3
Groundwater Arsenic Detections and Exceedances of Screening Criteria
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	MCL-Groundwater	SJCA 95% UTL Groundwater	SJS04-MW04S											
Sample ID			SJS04-GW4S-001	SJS04-GW4S-002	SJS04-GW4S-003	SJS04-MW04S-06D*	SJS04-MW04S-07A	SJS04-MW04S-07B*	SJS04-MW04S-07C	SJS04-MW04S-07D*	SJS04-MW04S-08A	SJS04-MW04S-08B	SJS04-MW04S-08C	SJS04-MW04S-09C*
Sample Date			07/21/97	11/04/97	05/18/99	11/27/06	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09
Chemical Name														
Total Metals (UG/L)														
Arsenic	10	8	9.2 J	**11**	9.5 J	**37.4**	**18.9**	**35**	**38.8**	**32.9**	7.2	6.1	**22.1**	**21.8 J**
Dissolved Metals (UG/L)														
Arsenic	10	2.4	7 J	5.5 J	7.90 B	**35.9**	**18.4**	**31.9**	**49**	**29.7**	6.4	**12.3**	**24.4**	**21.7**

Notes:

* A duplicate sample was collected at this location; the most conservative result is shown.

Bold Blue font represents MCL exceedance

Shaded cells represent SJCA 95% UTL exceedance

B - Analyte not detected above the level reported in blanks

J - Reported value is estimated

U - Analyte not detected

UG/L - micrograms per liter

UTL - Upper Tolerance Limit

MCL - Maximum Contaminant Level

Table 3
Groundwater Arsenic Detections and Exceedances of Screening Criteria
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	MCL-Groundwater	SJCA 95% UTL Groundwater	SJS04-MW05S								
Sample ID			SJS04-MW05S-06D	SJS04-MW05S-07A	SJS04-MW05S-07B	SJS04-MW05S-07C	SJS04-MW05S-07D	SJS04-MW05S-08A	SJS04-MW05S-08B	SJS04-MW05S-08C	SJS04-MW05S-09C
Sample Date			11/27/06	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	8/21/2008	8/24/2009
Chemical Name											
Total Metals (UG/L)											
Arsenic	10	8	1.9 B	1.2	2.5	2.9	3.6 B	1.8	4.6 J	2.5	3 B
Dissolved Metals (UG/L)											
Arsenic	10	2.4	1.8 B	1.3	2.7	2.5	2.3 B	2.1	4.9 J	3.9	7.5 B

Notes:

* A duplicate sample was collected at this location; the most conservative result is shown.

Bold Blue font represents MCL exceedance

Shaded cells represent SJCA 95% UTL exceedance

B - Analyte not detected above the level reported in blanks

J - Reported value is estimated

U - Analyte not detected

UG/L - micrograms per liter

UTL - Upper Tolerance Limit

MCL - Maximum Contaminant Level

Table 4
Kruskal Wallis (Nonparametric) ANOVA Comparison
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St Juliens Creek Annex
Chesapeake, Virginia

Chemical Class	Constituent	Calculated Probability	Decision	Specific Wells Exceeding Upgradient Concentrations
Dissolved Inorganics	Arsenic	0.000	Significant Difference	MW04S
Total Inorganics	Arsenic	0.000	Significant Difference	MW04S

Table 5
Mann-Kendall Trend Evaluation
Site 4 Volunatry Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical Class	Well	Parameter	Calculated Probability	Decision	Number of Detects	Number of Samples	Percent Detects
Dissolved Inorganics	MW01S	Arsenic	0.026	Significantly Decreasing	3	12	25
Dissolved Inorganics	MW03S	Arsenic	0.151	No Significant Change	7	12	58
Dissolved Inorganics	MW04S	Arsenic	0.731	No Significant Change	11	12	92
Dissolved Inorganics	MW05S	Arsenic	0.038	Significantly Increasing	6	9	67
Total Inorganics	MW01S	Arsenic	0.022	Significantly Decreasing	2	12	17
Total Inorganics	MW03S	Arsenic	0.075	No Significant Change	7	12	58
Total Inorganics	MW04S	Arsenic	0.527	No Significant Change	12	12	100
Total Inorganics	MW05S	Arsenic	0.179	No Significant Change	6	9	67

\\APHRODITE\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\SITE 4\FIGURE1_LOCATION_SITE4.MXD MUNWIN 11/10/2009 16:48:52

Legend
- SJCA Boundary
- Site 4 Boundary
- Fence
- Access Road

N
W E
S

0 75 150
Feet

Figure 1
Location of Site 4
Site 4 Voluntary Groundwater Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

Legend

- Shallow Monitoring Well
- SJCA Boundary
- Site/LUC Boundary
- Fence
- Access Road
- General Flow Direction
- Potentiometric Surface Contours (August 2009)
- 3.0 Groundwater Elevation (feet above mean sea level)

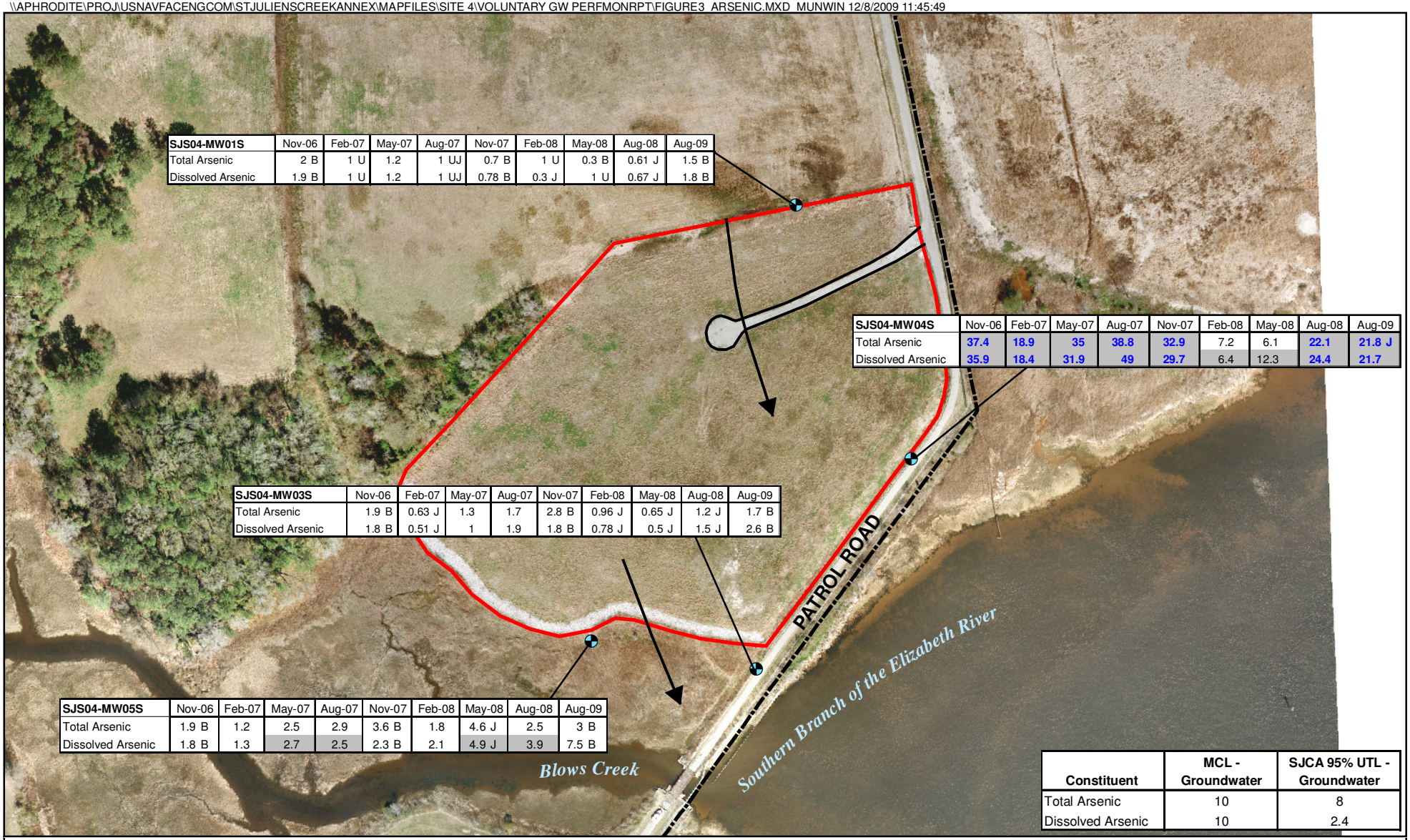
N
W E
S

0 75 150
Feet

Figure 2
Columbia Aquifer Groundwater Surface Elevations
Site 4 Voluntary Groundwater
Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

\\APHRODITE\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\SITE 4\VOLUNTARY GW PERFMONRPT\FIGURE3_ARSENIC.MXD MUNWIN 12/8/2009 11:45:49



SJS04-MW01S	Nov-06	Feb-07	May-07	Aug-07	Nov-07	Feb-08	May-08	Aug-08	Aug-09
Total Arsenic	2 B	1 U	1.2	1 UJ	0.7 B	1 U	0.3 B	0.61 J	1.5 B
Dissolved Arsenic	1.9 B	1 U	1.2	1 UJ	0.78 B	0.3 J	1 U	0.67 J	1.8 B

SJS04-MW04S	Nov-06	Feb-07	May-07	Aug-07	Nov-07	Feb-08	May-08	Aug-08	Aug-09
Total Arsenic	**37.4**	**18.9**	**35**	**38.8**	**32.9**	7.2	6.1	**22.1**	**21.8 J**
Dissolved Arsenic	**35.9**	**18.4**	**31.9**	**49**	**29.7**	6.4	12.3	**24.4**	**21.7**

SJS04-MW03S	Nov-06	Feb-07	May-07	Aug-07	Nov-07	Feb-08	May-08	Aug-08	Aug-09
Total Arsenic	1.9 B	0.63 J	1.3	1.7	2.8 B	0.96 J	0.65 J	1.2 J	1.7 B
Dissolved Arsenic	1.8 B	0.51 J	1	1.9	1.8 B	0.78 J	0.5 J	1.5 J	2.6 B

SJS04-MW05S	Nov-06	Feb-07	May-07	Aug-07	Nov-07	Feb-08	May-08	Aug-08	Aug-09
Total Arsenic	1.9 B	1.2	2.5	2.9	3.6 B	1.8	4.6 J	2.5	3 B
Dissolved Arsenic	1.8 B	1.3	2.7	2.5	2.3 B	2.1	4.9 J	3.9	7.5 B

Constituent	MCL - Groundwater	SJCA 95% UTL - Groundwater
Total Arsenic	10	8
Dissolved Arsenic	10	2.4

Legend

- SJCA Boundary
- Site 4 Boundary
- Shallow Monitoring Well
- Estimated Groundwater Flow Direction
- Access Road

Notes:

MCL - Maximum Contaminant Level
UTL - Upper Tolerance Limit
UG/L - micrograms per Liter
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
U - Analyte not detected
Concentrations reported in micrograms per liter (µg/L)
Bold Blue text indicates an exceedance of the MCL
Shaded Text indicates an exceedance of SJCA 95% UTL

N
W E
S

0 100 200
Feet

Figure 3
Arsenic Concentrations
Site 4 Voluntary Groundwater
Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

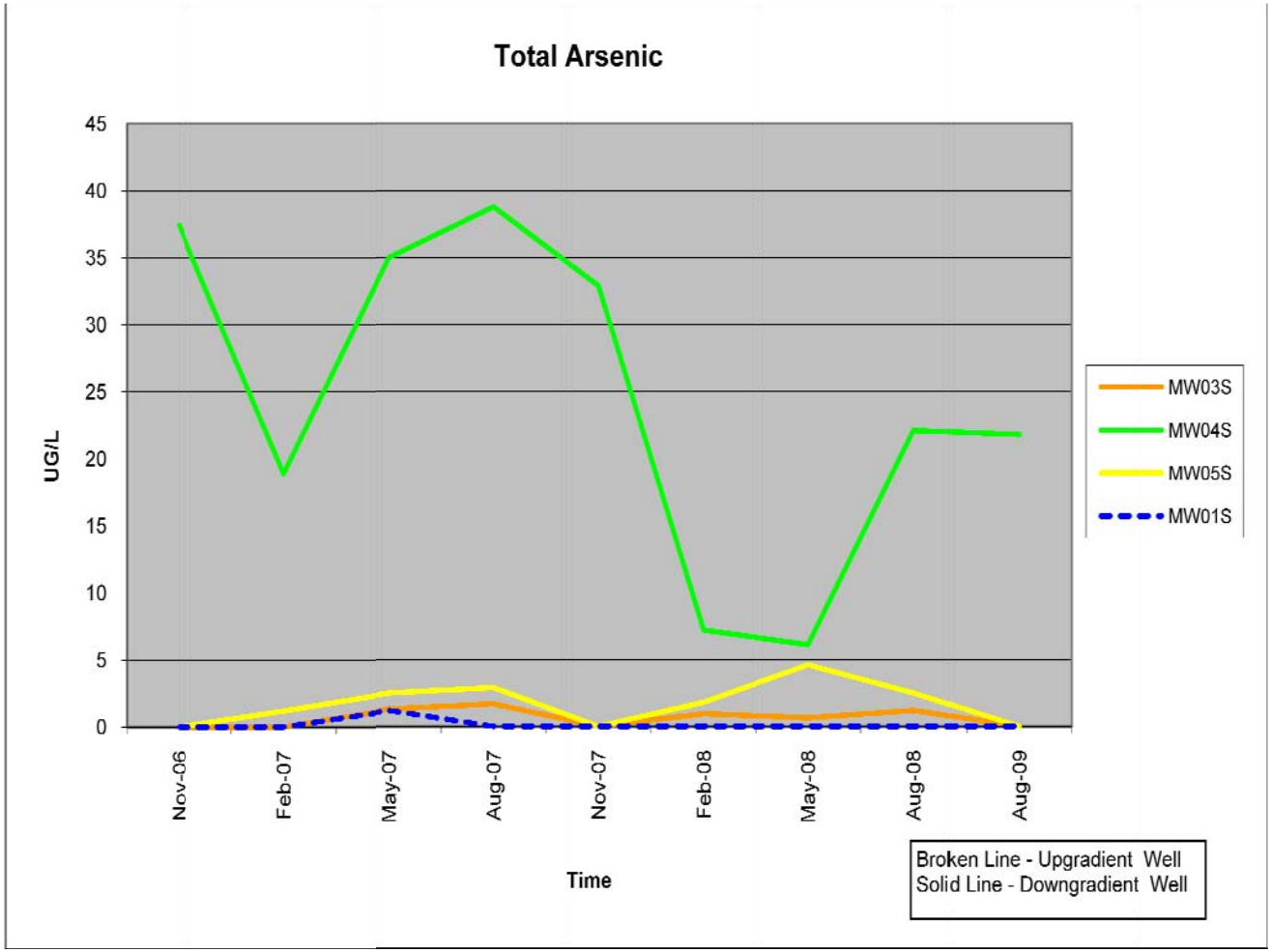


Figure 4
Total Arsenic Concentrations – November 2006 through August 2009
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virgina

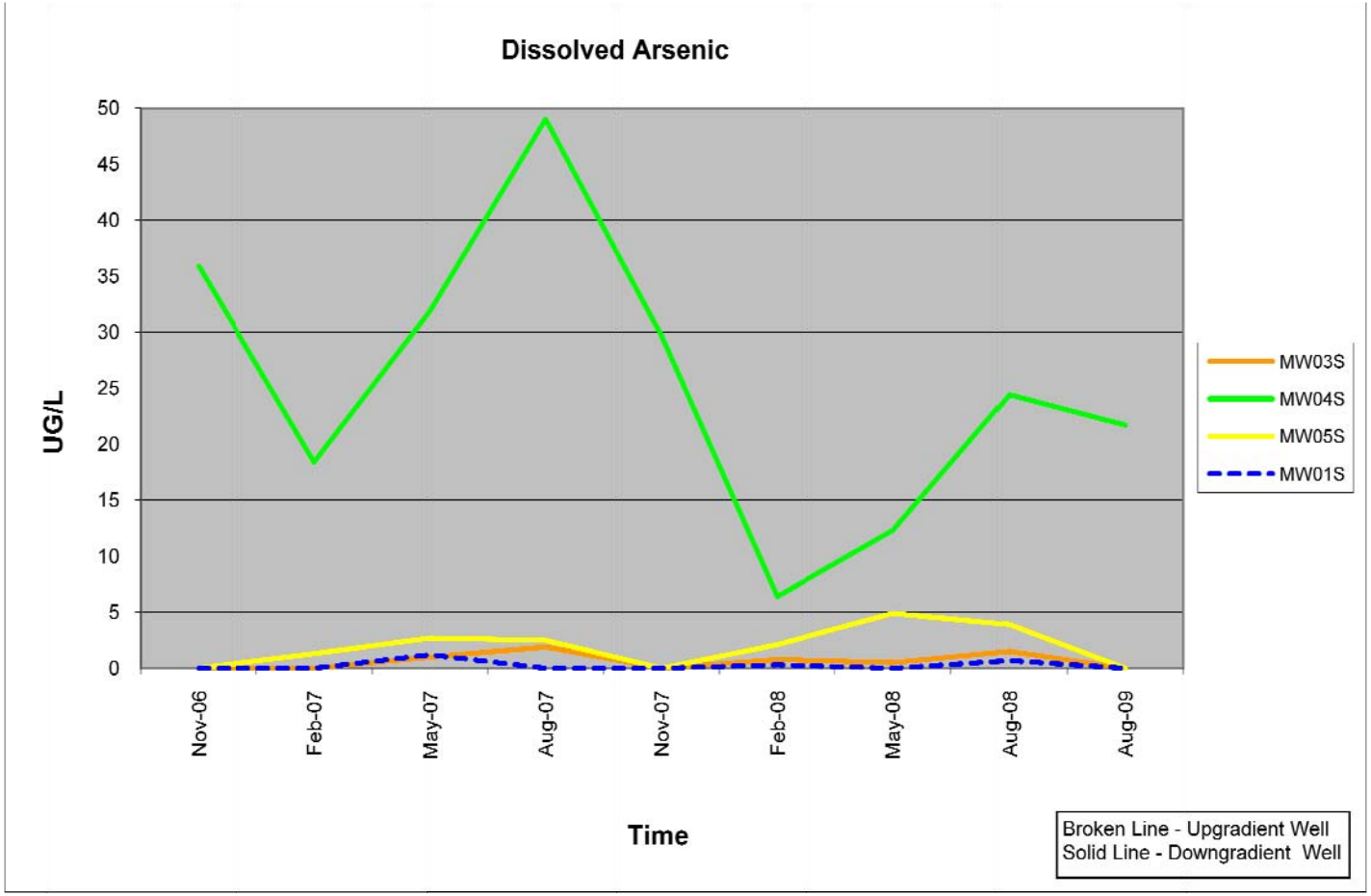
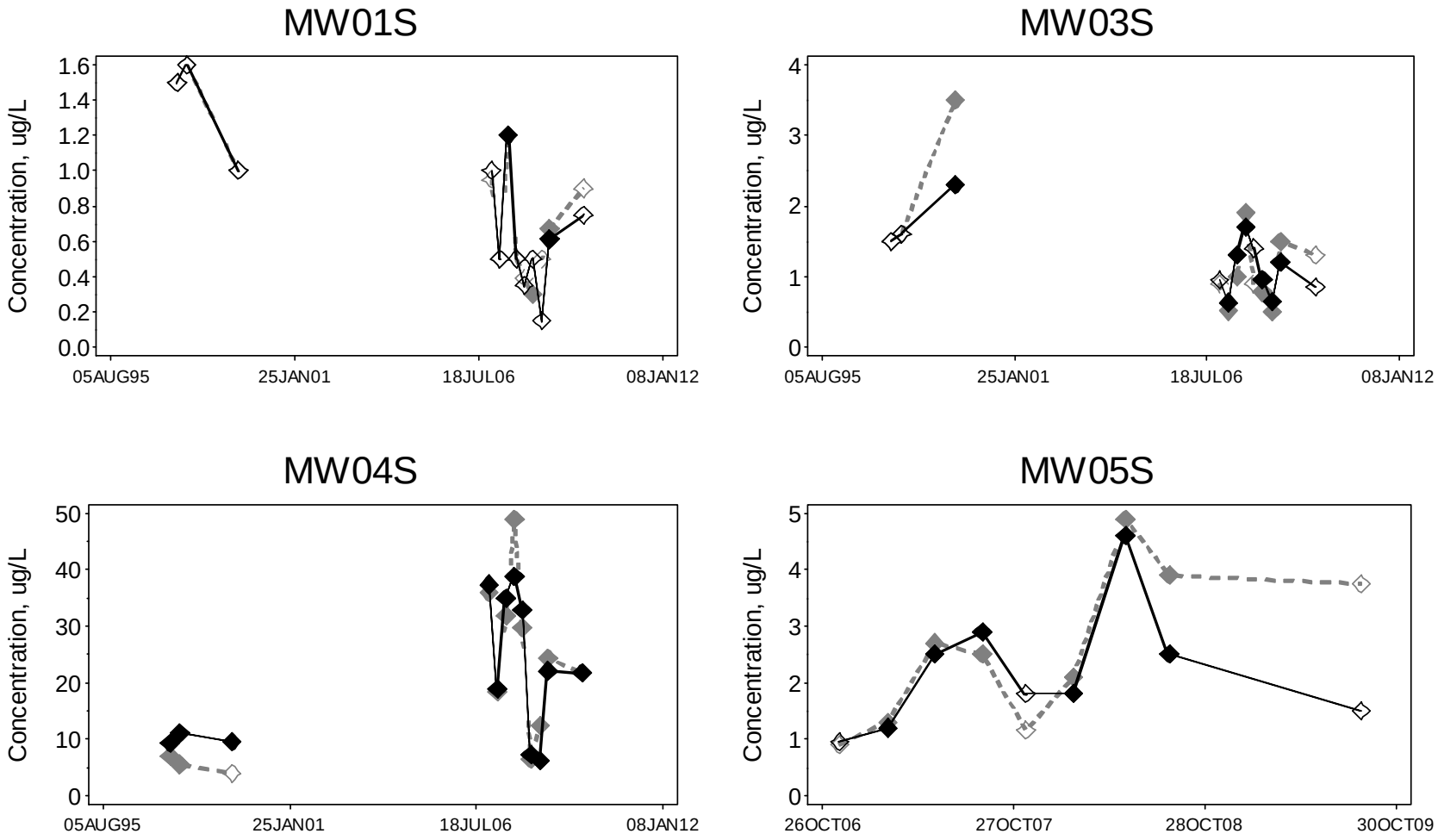


Figure 5
Dissolved Arsenic Concentrations – November 2006 through August 2009
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virgina

Figure 6: Time Plots of Arsenic Concentrations



Black Solid Line Represents Total Concentration; Gray Dashed Line Represents Dissolved Concentrations
Open Symbols Represent Non-Detect Values

Attachment A
Field Notes

Location ST Julienz Creek Date 8/20/09

Project / Client Site 14 GW Sampling

0800 Arrive onsite:
Pers: ML OST G. Moore CH2M
Wx: 90 HOT
obj: Sample Wells

0810 Held Safety Brief

0815 offsite To get Brush Axe
To Clear Well

0915 Calibrate Horiba 102248
Cal fluid LoT 2901171 12/10
PH: 4.0 Turb: 0.0 Temp: –
Cond: 4.45 DO: –
Meter Has #2 Malfunction
And Reading Vary Widely

1030 Commence Cutting Plants
To find wells.

1430 Secure Cutting Plants
offsite.

Location ST Julienz Creek Date 8/24/09

Project / Client Site 4 GW Sampling

0700 Arrive AT office
Pers: ML OST, G. Moore
Wx: 85°
obj: Find and Sample Wells

0715 Conduct Safety Brief.

0730 Calibrate New Horiba: 11974
Cal fluid LoT 7207 Exp. 6/10
pH: 3.98 Turb: 0.0 Temp: 23.96
Cond: 4.52 DO: 8.61

0917 Mob To MW03S
DTW: 4.15 DTB: 13.8 Vol: 1.5 gal

0955 Commence Purge MW03S

Time	PH	Cond (mS/cm)	Turb (NTU)	DO (mg/L)	Temp (C°)	Sal (%)	ORP (mV)
1000	7.26	6.63	45.8	5.25	22.24	0.4	-291
1005	7.24	5.27	35.8	5.24	22.37	0.3	-291
1010	7.20	3.94	44.0	5.26	22.55	0.2	-292
1015	7.17	3.29	46.8	5.29	22.54	0.2	-29
1020	7.16	3.32	53.3	5.30	22.43	0.2	-29
1025	7.16	3.35	61.5	5.29	22.57	0.2	-29
1030	7.16	3.33	66.6	5.29	22.79	0.2	-29

DO by CHEMets = 1.0 mg/L
2.3 Gallons purged 238 mL/min

1100 Mob To MW04S
DTB: 14 DTW: 4.71 Vol: 1.51 gal

Late Note
* 1035 Collect [GJ604-MW03S-09G] [MS] [DS]

Location: ST Juliens Creek Date: 8/24/09

Project / Client: Sites 4 LTM

* Black Part.

1123 Commences Purge MW04S

Time	Ph	Cond mS/cm	Turb NTU	Do mg/L	Temp C°	Sal o/o	ORP mV
1125	6.73	0.00	119.0	7.51	29.01	0.0	-15
1130	6.72	0.00	120.0	7.80	27.25	0.0	-14
1135	6.73	0.00	121.0	7.99	27.00	0.0	-15
1140	6.77	0.00	123.0	7.94	26.95	0.0	-21
1145	6.78	0.00	123.0	7.93	26.84	0.0	-25
1150	6.78	0.00	123.0	7.99	26.51	0.0	-26
1155	6.78	0.00	122.0	7.99	26.49	0.0	-27

1200 Collect SJS04-MW04S-09C

1205 Collect SJS04-MW04SP-09C

for Total and Dissolved Ar

Do by Chemets; 2.0

2.5 gallons Purged 295 mL/min

1331 Mob To MW05S

DTW: 2.1 DTB: 15' Vol: 2 gal

1333 Commence Purge MW05S

Time	Ph	Cond mS/cm	Turb NTU	Do mg/L	Temp C°	Sal o/o	ORP mV
1335	7.09	28.1	34.1	4.52	26.74	1.7	-169
1340	7.09	27.9	59.2	4.43	25.03	1.7	-169
1345	7.09	27.6	78.4	4.31	24.68	1.7	-170
1350	7.10	27.6	100.0	4.24	24.55	1.7	-170
1355	7.11	27.5	110.0	4.19	24.58	1.7	-171
1400	7.13	27.0	122	4.15	24.54	1.7	-174

Location: ST Juliens Creek Date: 8/24/09

Project / Client: Sites 4 LTM

Time	Ph	Cond mS/cm	Turb NTU	Do mg/L	Temp C°	Sal o/o	ORP mV
1405	7.14	~~25.7~~ 27.5	130.0	4.14	24.90	1.7	-174

1410 Collect SJS04-MW05S-09C

2.5 gallons Purged 295 mL/min

for Total and Dissolved Ar

Do By Chemets: 1.0 mg/L

1437 Mob To MW01S

DTW: 4.27 DTB: 14.5' Vol: 1.6 gal

1445 Commences Purge MW01S.

Time	Ph	Cond	Turb	Do	Temp	Sal	ORP
1450	3.97	0.649	27.1	4.45	25.07	0.0	152
1455	3.96	0.650	34.0	4.41	25.20	0.0	153
1500	3.92	0.642	23.3	4.42	24.88	0.0	162
1505	3.92	0.638	22.8	4.41	24.79	0.0	163
1510	3.88	0.636	22.2	4.41	24.79	0.0	162
1515	3.85	0.636	11.0	4.35	25.10	0.0	164
1520	3.86	0.638	12.0	4.01	27.87	0.0	167
1525	3.86	0.639	13.7	3.99	28.54	0.0	170
1530	3.84	0.654	21.6	4.00	28.52	0.0	173

1535 Collect SJS04-MW05S-09C

for Ar Total and Dissolved.

Do by Chemets; 1.0 mg/L

2.5 gallons Purge 210 mL/min

1550 Collect SJS04-EB082409 2 x Ar

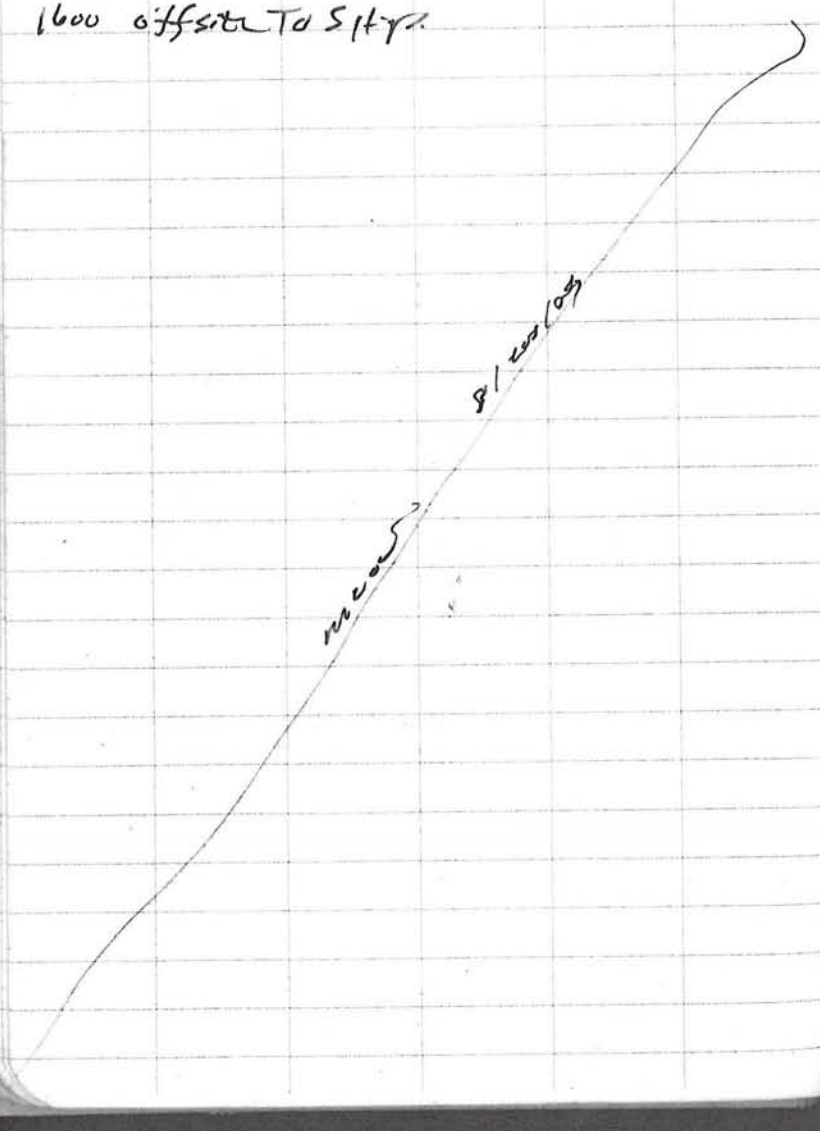
Location St Juliens Creek Date 8/24/09

Project / Client Site 4 LTM

1555 Collect SJS04-FB082409

1x Arsenic

1600 offsite To Site



Location St Juliens Creek Date 10/22/09

Project / Client Site 21 Bldg 47 & 1556

Phase II VI Investigation

Weather: High 78°F, Sunny

Objective: Install (1) subslab soil gas probe at SJS21-SV03; confirm VOC-containi sources have been removed from Buildings; confirmed equipment shipments.

Staff: Kim Stokes/DFW Angie Petree/VBC

1030 Arrived onsite (Site 21) after obtaining temporary pass; Attended tailgate H&S meeting- moment: Ergonomics while drilling.

1200 Drilled subslab soil gas boring and placed probe at 14" below slab surface.

1215 Walked both buildings to ensure VOC-containing items were removed as requested - confirmed. Added extra portland cement to each subslab probe to encourage passing of the helium leak checks to be performed on 10/23/09

1400 Off-site to return drill to Bay Equipment and pick up isobutylene calibration gas at VBO storage unit

Kimberly Stokes

10/22/09

Attachment B
Analytical Results

Table B-1
Groundwater Raw Analytical Data
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS04-MW01S													
Sample ID	SJS04-GW1S-001	SJS04-GW1S-002	SJS04-GW1S-003	SJS04-MW01S-06D	SJS04-MW01S-07A	SJS04-MW01SP-07A*	SJS04-MW01S-07B	SJS04-MW01S-07C	SJS04-MW01S-07D	SJS04-MW01S-08A	SJS04-MW01S-08B	SJS04-MW01S-08C	SJS04-MW01S-09C
Sample Date	07/21/97	11/03/97	05/18/99	11/28/06	02/28/07	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09
Chemical Name													
Total Metals (UG/L)													
Arsenic	3 U	3.2 U	2 U	2 B	1 U	1 U	1.2	1 UJ	0.7 B	1 U	0.3 B	0.61 J	1.5 B
Dissolved Metals (UG/L)													
Arsenic	3 U	3.2 U	2 U	1.9 B	1 U	1 U	1.2	1 UJ	0.78 B	0.3 J	1 U	0.67 J	1.8 B

Notes:

* Indicates duplicate sample

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

U - Analyte not detected

Table B-1
Groundwater Raw Analytical Data
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS04-MW03S															
Sample ID	SJS04-GW3S-001	SJS04-GW3S-002	SJS04-GW3S-003	SJS04-MW03S-06D	SJS04-MW03S-07A	SJS04-MW03S-07B	SJS04-MW03S-07C	SJS04-MW03SP-07C*	SJS04-MW03S-07D	SJS04-MW03S-08A	SJS04-MW03SP-08A*	SJS04-MW03S-08B	SJS04-MW03SP-08B*	SJS04-MW03S-08C	SJS04-MW03SP-08C*	SJS04-MW03S-09C
Sample Date	07/21/97	11/03/97	05/18/99	11/28/06	02/28/07	05/29/07	08/28/07	08/28/07	11/20/07	02/19/08	02/19/08	05/29/08	05/29/08	08/21/08	08/21/08	08/24/09
Chemical Name																
Total Metals (UG/L)																
Arsenic	3 U	3.2 U	2.30 J	1.9 B	0.63 J	1.3	1.7	1.7	2.8 B	0.96 J	0.93 J	0.59 J	0.65 J	1.2 J	1 J	1.7 B
Dissolved Metals (UG/L)																
Arsenic	3 U	3.2 U	3.5 J	1.8 B	0.51 J	1	1.9	1.7	1.8 B	0.78 J	0.76 J	0.46 J	0.5 J	1.1 J	1.5 J	2.6 B

Notes:

* Indicates duplicate sample

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

U - Analyte not detected

Table B-1
Groundwater Raw Analytical Data
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS04-MW04S															
Sample ID	SJS04-GW4S-001	SJS04-GW4S-002	SJS04-GW4S-003	SJS04-MW04S-06D	SJS04-MW04SP-06D*	SJS04-MW04S-07A	SJS04-MW04S-07B	SJS04-MW04SP-07B*	SJS04-MW04S-07C	SJS04-MW04S-07D	SJS04-MW04SP-07D*	SJS04-MW04S-08A	SJS04-MW04S-08B	SJS04-MW04S-08C	SJS04-MW04S-09C	SJS04-MW04SP-09C
Sample Date	07/21/97	11/04/97	05/18/99	11/27/06	11/27/06	02/28/07	05/29/07	05/29/07	08/28/07	11/20/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09	08/24/09
Chemical Name																
Total Metals (UG/L)																
Arsenic	9.2 J	11	9.5 J	37.4	36.1	18.9	35	33.5	38.8	32.7	32.9	7.2	6.1	22.1	21.8 J	21.8 J
Dissolved Metals (UG/L)																
Arsenic	7 J	5.5 J	7.90 B	35.9	35.2	18.4	29.5	31.9	49	29.4	29.7	6.4	12.3	24.4	20.8	21.7

Notes:

* Indicates duplicate sample

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

U - Analyte not detected

Table B-1
Groundwater Raw Analytical Data
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS04-MW05S								
Sample ID	SJS04-MW05S-06D	SJS04-MW05S-07A	SJS04-MW05S-07B	SJS04-MW05S-07C	SJS04-MW05S-07D	SJS04-MW05S-08A	SJS04-MW05S-08B	SJS04-MW05S-08C	SJS04-MW05S-09C
Sample Date	11/27/06	02/28/07	05/29/07	08/28/07	11/20/07	02/19/08	05/29/08	08/21/08	08/24/09
Chemical Name									
Total Metals (UG/L)									
Arsenic	1.9 B	1.2	2.5	2.9	3.6 B	1.8	4.6 J	2.5	3 B
Dissolved Metals (UG/L)									
Arsenic	1.8 B	1.3	2.7	2.5	2.3 B	2.1	4.9 J	3.9	7.5 B

Notes:

* Indicates duplicate sample

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

U - Analyte not detected

Table B-2
QA/QC Raw Analytical Voluntary Groundwater Performance Monitoring Data
Site 4 Voluntary Groundwater Performance Monitoring Report Addendum
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	STJ-QC																	
Sample ID	SJS04-FB112806	SJS04-EB112806	SJS04-FB022807	SJS04-EB022807	SJS04-EB052907	SJS04-FB052907	SJS04-FB082807	SJS04-EB082807	SJS04-FB112007	SJS04-EB112007	SJS04-EB021908	SJS04-FB021908	SJS04-FB052908	SJS04-EB052908	SJS04-FB082108	SJS04-EB082108	SJS04-FB082409	SJS04-EB082409
Sample Date	11/28/06	11/28/06	02/28/07	02/28/07	05/29/07	05/29/07	08/28/07	08/28/07	11/20/07	11/20/07	02/19/08	02/19/08	05/29/08	05/29/08	08/21/08	08/21/08	08/24/09	08/24/09
Chemical Name																		
Total Metals (UG_L)																		
Arsenic	0.53	0.62 J	1 U	NA	NA	1 U	1 U	NA	0.29 U	NA	NA	1 U	1 U	NA	1 U	NA	1.5	NA
Dissolved Metals (UG_L)																		
Arsenic	NA	0.5 J	NA	1 U	1 U	NA	NA	1 U	NA	0.29 U	1 U	NA	NA	1 U	NA	1 U	NA	1.8

Notes:

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high

U - Analyte not detected

NA - Analyte not analyzed for

Attachment C
Data Validation Summary Report

DataQual

Environmental Services, LLC

CH2M HILL-VBO
5700 Cleveland Street
Suite 101
Virginia Beach, Virginia 23462

September 2, 2009
SDG# SC4956, Katahdin Analytical Services
St. Julien's Creek Site 4

Dear Ms. Brynildsen,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG #SC4956 for total and dissolved Arsenic by ICP-MS. The data validation was performed in accordance with the quality control requirements of the USEPA CLP Statements of Work ILM05.3 and the Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Data Review, 4/93, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review) as applicable. Method QC limits were applied for QC standards (CRI and ICSA/ICSAB standards) because Region III doesn't have validation guidance for ILM05.3. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided. Please note: In the body of the report the symbol TM is used to indicate total metals and the symbol DM is used to indicate dissolved metals.

Sample ID	Lab ID	Matrix	Total Metals	Dissolved Metals
SJS04-MW03S-09C	SC4956-001/-002	water	X	X
SJS04-MW03S-09CMS	SC4956-001/-002 MS	water	X	X
SJS04-MW03S-09CMD	SC4956-001/-002 MD	water	X	X
SJS04-MW04S-09C	SC4956-003/-004	water	X	X
SJS04-MW04SP-09C	SC4956-005/-006	water	X	X
SJS04-MW05S-09C	SC4956-007/-008	water	X	X
SJS04-MW01S-09C	SC4956-009/-010	water	X	X
SJS04-FB082409	SC4956-013	water	X	
SJS04-EB082409	SC4956-011/-012	water	X	X

The following quality control samples were used to validate this sample delivery group (SDG): sample SJS04-MW04SP-09C-field duplicate of SJS04-MW04S-09C. The field QC blanks were SJS04-EB082409 and SJS04-FB082409.

The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- ICP-MS Tune *

- Initial/Continuing Calibrations *
- CRI Standards *
- Interference Check Sample *
- Blanks
- Internal Standard Recoveries *
- Laboratory Control Samples *
- Matrix Spike Recoveries *
- Matrix Duplicate RPDs
- Post Digestion Spike Recoveries *
- Serial Dilutions *
- Field Duplicates *
- Identification/Quantitation *
- Reporting Limits *

*- Indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria. When more than one qualifier is associated with a compound/analyte the validator has chosen the qualifier that best indicates possible bias in the results and flagged the data accordingly. However, information regarding all quality control issues is provided in the body of the report and on the qualification summary page. Please note that the B qualifier (to indicate blank contamination) takes precedence over all other qualifiers except the R qualifier to indication unusable data.

Major Problems

There were no major problems in the validation of this SDG. No data required rejection.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues for each fraction is presented in the following paragraphs. All results qualified as estimated J/UJ or biased high, K or biased low, L/UL, should be considered usable but estimated.

Total and Dissolved ICP-MS Metals

Blank contamination was noted in the laboratory and field blanks associated with the samples in this batch. Qualifications were added to the data. Specific information is provided below.

The matrix duplicate analyzed for the total metals fraction exhibited non-compliant reproducibility. The reported results were qualified as estimated J.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 8/24/09 and samples were received at the laboratory 8/25/09. All sample preparation and analysis was performed within Region III holding time requirements.

Blanks

Total and Dissolved ICP Metals

Contamination was noted in the preparation and lab blanks. Qualification was required based on the lab blank contamination. Contamination and sample results qualifications are indicated in the following tables.

Blank ID	Analyte	Concentration	Action Level	Q Flag
PBW	arsenic	0.839J ug/L	4.195 ug/L	B
SJS04-EB082409Total	arsenic	1.6 ug/L	8.0 ug/L	B
SJS04-EB082409Dissolved	arsenic	1.8 ug/L	9.0 ug/L	B
SJS04-FB082409Total	arsenic	1.5 ug/L	7.5 ug/L	B

Note: Per CH2MHILL, field QC blanks were not qualified due to laboratory preparation blank contamination.

Sample ID	analyte	Q Flag	Q Code
SJS04-MW03S-09C TM, SJS04-MW03S-09C DM, SJS04-MW05S-09C TM, SJS04-MW05S-09C DM, SJS04-MW01S-09C TM, SJS04-MW01S-09C DM	arsenic	B+ up to action limit	BL

Matrix Duplicate

Total and Dissolved ICP Metals

The matrix duplicate analysis of the sample SJS04-MW03S-09C for the total metals fraction exhibited non-compliant reproducibility (>+/- RL) for the analyte arsenic. Specific action is noted in the following table.

MD	Analytes	Samples Affected	+/-RL (1)	Q Flag	Q Code
SJS04-MW03S-09C TM	arsenic	all total field samples	1.07	J/UJ	MDP

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Jacqueline Cleveland
Vice-President

St. Julien's Creek, Site 4
SDG SC4956
Arsenic Only

Summary of Data Qualifications

Total and Dissolved ICP-MS Metals

Sample ID	Analyte	Results	Q Flag	Q code
SJS04-MW03S-09C TM, SJS04-MW03S-09C DM, SJS04-MW05S-09C TM, SJS04-MW05S-09C DM, SJS04-MW01S-09C TM, SJS04-MW01S-09C DM	arsenic	+ up to action limit	B	BL
all total metals field samples	arsenic	+/-	J/UJ	MDP

St. Julien's Creek, Site 4
SDG SC4956
Arsenic Only

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

IDL	Instrument Detection Limit
MDL	Method Detection Limit
RL	Reporting Limit
Q Code	Qualifier Code
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report
%SOL	High moisture content

St. Julien's Creek, Site 4
SDG SC4956
Arsenic Only

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW03S-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-001

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	1.7	B	BL	MS	1	1.0	0.30

JMC 9209

Color Before: COLORLESS Clarity Before: CLEAR

Color After: COLORLESS Clarity After: CLEAR Bottle ID: A

Comments:

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW03S-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-002

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, DISSOLVED	2.6	B	BL	MS	1	1.0	0.30

JMC 9209

Color Before: COLORLESS Clarity Before: CLEAR

Color After: COLORLESS Clarity After: CLEAR Bottle ID: A

Comments:

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW04S-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-003

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	21.8	J	MDP	MS	1	1.0	0.30

JMC 9209

Color Before: COLORLESS Clarity Before: CLEAR

Color After: COLORLESS Clarity After: CLEAR Bottle ID: A

Comments:

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW04S-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-004

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, DISSOLVED	20.8			MS	1	1.0	0.30

JMC 9209

Color Before: COLORLESS Clarity Before: CLEAR

Color After: COLORLESS Clarity After: CLEAR Bottle ID: A

Comments:

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW04SP-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-005

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	21.8 J MDP*			MS	1	1.0	0.30

JMC 9209

Color Before: COLORLESS Clarity Before: CLEAR

Color After: YELLOW Clarity After: CLEAR Bottle ID: A

Comments:

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW04SP-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-006

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, DISSOLVED	21.7			MS	1	1.0	0.30

9209

Color Before: COLORLESS Clarity Before: CLEAR

Color After: YELLOW Clarity After: CLEAR Bottle ID: A

Comments:

I

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW05S-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-007

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	3.0		JB JBL	MS	5	5.0	1.50

9209

Color Before: YELLOW Clarity Before: CLEAR

Color After: YELLOW Clarity After: CLEAR Bottle ID: A

Comments:

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW05S-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-008

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, DISSOLVED	7.5	B	BL	MS	5	5.0	1.50

JMC 9309

Color Before: YELLOW Clarity Before: CLEAR

Color After: YELLOW Clarity After: CLEAR Bottle ID: A

Comments:

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW01S-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-009

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	1.5	B	BL	MS	1	1.0	0.30

JMC 4309

Color Before: COLORLESS Clarity Before: CLEAR

Color After: COLORLESS Clarity After: CLEAR Bottle ID: A

Comments:

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW01S-09C

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-010

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, DISSOLVED	1.8	B	BL	MS	1	1.0	0.30

JJC 9/29

Color Before: COLORLESS Clarity Before: CLEAR

Color After: COLORLESS Clarity After: CLEAR Bottle ID: A

Comments:

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-EB082409

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-011

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	1.6		J	MS	1	1.0	0.30

JJC 9209

Color Before: COLORLESS Clarity Before: CLEAR

Color After: COLORLESS Clarity After: CLEAR Bottle ID: A

Comments:

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-EB082409

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-012

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, DISSOLVED	1.8			MS	1	1.0	0.30

JAC 9309

Color Before: COLORLESS Clarity Before: CLEAR

Color After: COLORLESS Clarity After: CLEAR Bottle ID: A

Comments:

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-FB082409

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-013

Concentration Units : ug/L

CAS No.	Analyte	Concentration	C	Q	M	DF	Adjusted CRQL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	1.5		*	MS	1	1.0	0.30

JAC 9/30/09

Color Before: COLORLESS Clarity Before: CLEAR

Color After: COLORLESS Clarity After: CLEAR Bottle ID: A

Comments:

Katahdin
ANALYTICAL SERVICES

nelac
Cert No. E87604

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
CH2MHILL
CTO-129 SJCA
SC4956

Sample Receipt

The following samples were received on August 25, 2009 and were logged in under Katahdin Analytical Services work order number SC4956 for a hardcopy due date of August 27, 2009.

KATAHDIN Sample No.	CH2MHILL Sample Identification
SC4956-1	SJS04-MW03S-09C
SC4956-2	SJS04-MW03S-09C
SC4956-3	SJS04-MW04S-09C
SC4956-4	SJS04-MW04S-09C
SC4956-5	SJS04-MW04SP-09C
SC4956-6	SJS04-MW04SP-09C
SC4956-7	SJS04-MW05S-09C
SC4956-8	SJS04-MW05S-09C
SC4956-9	SJS04-MW01S-09C
SC4956-10	SJS04-MW01S-09C
SC4956-11	SJS04-EB082409
SC4956-12	SJS04-EB082409
SC4956-13	SJS04-FB082409

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

We certify that the test results provided in this report meet all the requirements of the NELAC standards unless otherwise noted in this narrative or in the Report of Analysis.

Sample analyses have been performed by the methods as noted herein.

Should you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact your Katahdin Analytical Services Project Manager, **Mrs. Andrea J. Colby**. This narrative is an integral part of the Report of Analysis.

Metals Analysis

The samples of Katahdin Work Order SC4956 were prepared and analyzed for total metals in accordance with the "USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis ILM05.3".

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www.katahdinlab.com

00070007

Inductively-Coupled Plasma Mass Spectrometry (ICP-MS)

Aqueous-matrix Katahdin Sample Numbers SC4956-(1-13) were digested for ICP-MS analysis on 08/25/09 (QC Batch ZH25ICW2). Katahdin Sample Numbers SB4956-(1 and 2) were prepared in duplicate and with matrix-spiked aliquots.

ICP-MS analyses were performed using an Agilent 7500 ICP-MS spectrometer. Results for all standards and samples are reported using the mean of 3 replicate measurements.

All samples were analyzed within holding times and all analytical run QC criteria were met.

Internal standard recoveries can be found in the raw data section of the accompanying data package. The following table indicates which analytes are associated with each internal standard element.

Internal Standard Element	Associated Analyte
Germanium	Arsenic

Instrument tuning information can also be found in the raw data section in the report labeled "200.8 QC Tune Report". The relative standard deviation was determined from 5 replicate measurements. The peak width was measured at 5% of the peak height.

Katahdin Sample Numbers SC4956-(7 and 8) were diluted during ICP-MS analysis to reduce matrix interference caused by the high levels of sodium and magnesium in the samples.

Matrix QC Summary

The recovery of arsenic in the matrix-spiked aliquots of Katahdin Sample Numbers SC4956-(1 and 2) are within the laboratory's acceptance limits (75% - 125% recovery of the added element, if the native concentration is less than four times the amount added).

The precision of the duplicate analysis of Katahdin Sample Number SC4956-1 is outside the laboratory's acceptance limit (<20% relative difference between duplicate aliquots) for arsenic.

The precision of the duplicate analysis of Katahdin Sample Number SC4956-2 is within the laboratory's acceptance limit (<20% relative difference between duplicate aliquots) for arsenic.

The serial dilution analyses of Katahdin Sample Numbers SC4956-(1 and 2) are within the laboratory's acceptance limit (<10% relative percent difference, if the concentration in the original sample is greater than 50 times the MDL) for arsenic. Conc < 50X MDL (0.3 ug/L)

Reporting of Metals Results

Analytical results for client samples, matrix QC samples (duplicates and matrix spikes), and batch QC samples (preparation blanks and laboratory control samples) have been reported down to the laboratory's method detection limits (MDLs) throughout the accompanying data package. These MDLs have been

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adjusted for each sample based on the sample amounts used in preparation and analysis. Analytical results that are below the MDLs are flagged with "U" in the C-qualifier column.

Analytical results for instrument run QC samples (ICVs, ICBs, etc.) have been reported down to the laboratory's instrument detection limits (IDLs).

IDLs, MDLs, and PQLs are listed on Form 10 of the accompanying data package

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Operations Manager or the Quality Assurance Officer as verified by the following signature.

Deborah J. Nadeau for 9/1/09

Leslie Dimond
Quality Assurance Officer

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CLU-121

Chain of Custody Record

48 hr TAT!

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

SC4956

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
CH2M HILL	Adrienne Jones	8/24/09	094323
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
5700 Cleveland St, Ste 101	757-671-6284		
City / State / Zip Code	**Site Contact**	**Lab Contact**	
Virginia Beach / VA / 23462			
Project Name and Location (State)	**Carrier/Waybill Number**		
St Juliens Site 4			
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: TOTAL Air	DISSOLVED Air	ICP/MS	Special Instructions/ Conditions of Receipt
SJS04-MW03S-09C	8/24/09	10:35											1	-		
SJS04-MW03S-09C-MS	8/24/09	10:35											1	1		
SJS04-MW03S-09C-SD	8/24/09	10:35											1	1		
SJS04-MW04S-09C	8/24/09	12:00											1	1		
SJS04-MW04SP-09C	8/24/09	12:05											1	1		
SJS04-MW05S-09C	8/24/09	14:10											1	1		
SJS04-MW01S-09C	8/24/09	15:35											1	1		
SJS04-EB082409	8/24/09	15:50											1	1		
SJS04-FB082409	8/24/09	15:55											1	-		

Possible Hazard Identification

☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal

☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required

☐ 24 Hours ☑ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By	8/24/09	1800	1. Received By	8/25/09	0950
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Katahdin Analytical Services, Inc. — Sample Receipt Condition Report

Client:	CH2M Hill	KAS PM:	AJC	Sampled By:	client
Project:		KIMS Entry By:	DD	Delivered By:	Fed Ex
KAS Work Order#:	SC4956	KIMS Review By:	MC	Received By:	DD
SDG #:	Cooler: 1 of 1			Date/Time Rec.:	8/25/09 0950

Receipt Criteria	Y	N	EX*	NA	Comments and/or Resolution
1. Custody seals present / intact?	✓				
2. Chain of Custody present in cooler?	✓				
3. Chain of Custody signed by client?	✓				
4. Chain of Custody matches samples?	✓				
5. Temperature Blanks present? If not, take temperature of any sample w/ IR gun.	✓				Temp (°C): 4.6
Samples received at <6 °C w/o freezing?	✓				Note: Not required for metals analysis.
Ice packs or ice present?	✓				The lack of ice or ice packs (i.e. no attempt to begin cooling process) may not meet certain regulatory requirements and may invalidate certain data.
If temp. out, has the cooling process begun (i.e. ice or packs present) and sample collection times <6hrs., but samples are not yet cool?				✓	Note: No cooling process required for metals analysis.
6. Volatiles free of headspace: **Aqueous:** No bubble larger than a pea				✓	
Soil/Sediment:					
Received in airtight container?				✓	
Received in methanol?				✓	
Methanol covering soil?				✓	
7. Trip Blank present in cooler?				✓	
8. Proper sample containers and volume?	✓				
9. Samples within hold time upon receipt?	✓				
10. Aqueous samples properly preserved? Metals, COD, NH3, TKN, O/G, phenol, TPO4, N+N, TOC, DRO, TPH – pH <2	✓				
Sulfide - >9				✓	
Cyanide – pH >12				✓	

* Log-In Notes to Exceptions: document any problems with samples or discrepancies or pH adjustments

This SDG contains total and dissolved arsenic only analysis using ILM05.3 ICP-MS. Validation performed using Region III flagging modifications as applicable.

HOLDING TIMES

Sampling Date: 8/24/09
Received Date: 8/25/09
Prep. Date: 8/25/09
Analysis Date: 8/25/09 & 8/27/09

Metals HT – 6 months

All holding time requirements were met.

CALIBRATIONS

The proper calibration procedures were followed for the metals analyses used by the laboratory. Tuning criteria was met. Internal standards criteria were met for all samples for the internal standard associated with the target analyte. All associated ICV/CCV criteria were met for the target analyte. The CRI check standards were analyzed. The method QC limits were applied because Region III doesn't have a validation guideline for ILM05.3. Method criteria for the CRI standards were met for target analytes. ICSA/ICSAB criteria were met. No qualifications were required.

INTERNAL STANDARDS

All internal standards associated with target analytes were within QC limits.

BLANK SUMMARY

Blank qualification guidelines:

- No action is taken if an analyte is found in the blank but not in the sample.
- **Sample weight, volume and/or dilution factors must be taken into consideration when applying the criteria.**
- Apply the same data validation guidelines to any associated calibration, preparation, and field QC blanks and all associated samples.
- Qualification/Action codes:
  Region III action limit of 5X the blank contamination concentration was used to validate the data.
  NA - The sample result is greater than the CRDL and greater than five times (5X) the blank value.
  B - The sample result is less than five times (5X) the blank value.

Blank Contamination and Qualification Summaries

Blank ID	Analyte	Concentration	Action Level	Q Flag
PBW	arsenic	0.839J ug/L	4.195 ug/L	B
SJS04-EB082409Total	arsenic	1.6 ug/L	8.0 ug/L	B
SJS04-EB082409Dissolved	arsenic	1.8 ug/L	9.0 ug/L	B
SJS04-FB082409Total	arsenic	1.5 ug/L	7.5 ug/L	B

Note: Per CH2MHILL, field QC blanks were not qualified due to laboratory preparation blank contamination.

The concentration noted for the CCBs is the highest concentration in all the CCBs. However, when qualifying samples for CCB contamination, associated samples are those just prior to or just following a CCB. Therefore, not all analytes in all samples are flagged for CCB contamination.
Negative contamination in a prep blank or CCB, if less than the negative analyte CRDL, is qualified based on professional judgement.

See validation report for specific samples and qualifications.

MATRIX SPIKE/DUPLICATE SUMMARY

The matrix spike results of sample SJS04-MW03S-09C were acceptable for both the total metals and the dissolved metals fractions. Matrix duplicate results were acceptable for the dissolved sample SJS04-MW03S-09C but the total sample was high (+1.07) using QC limit of +/-RL for concentrations less than 5X RL. Reported positive and non-detect results for arsenic in the total metals field samples were qualified as estimated J/UJ. The submitted LCS was acceptable.

SERIAL DILUTIONS

The serial dilution analyses of sample SJS04-MW03S-09C were acceptable.

FIELD DUPLICATE SAMPLE SUMMARY

Note: Field duplicate results are assessed only if both results are above the CRDL.

Sample ID: **SJS04-MW04S-09C total** **Duplicate Sample ID:** **SJS04-MW04SP-09C total**

Analyte	Sample Conc.	Duplicate Conc.	RPD
arsenic	21.8	21.8	0%

Sample ID: **SJS04-MW04S-09C dissolved** **Duplicate Sample ID:** **SJS04-MW04SP-09C dissolved**

Analyte	Sample Conc.	Duplicate Conc.	RPD
arsenic	20.8	21.7	4%

Comments: No qualifications were required.

SAMPLE RESULT VERIFICATION

Specific Comments:

All sample results were reported within the calibration/linear range of the instruments. Detection limits were acceptable. Raw data was verified. Sample concentrations were direct read from the instrument. Sample results were verified.

Reviewer _____ **Date:** 9/209

PREPARATION LOG

Lab Name: Katahdin Analytical Services **QC Batch ID:** ZH25ICW2

Matrix: WATER **SDG Name:** SC4956

Method: P **Prep Date:** 08/25/2009

Client ID	Lab Sample ID	Initial (L)	Final (L)
LCSWZH25ICW2	LCSWZH25ICW2	0.05	0.05
PBWZH25ICW2	PBWZH25ICW2	0.05	0.05
SJS04-MW03S-09C	SC4956-001	0.05	0.05
SJS04-MW03S-09CD	SC4956-001D	0.05	0.05
SJS04-MW03S-09CS	SC4956-001S	0.05	0.05
SJS04-MW03S-09C	SC4956-002	0.05	0.05
SJS04-MW03S-09CD	SC4956-002D	0.05	0.05
SJS04-MW03S-09CS	SC4956-002S	0.05	0.05
SJS04-MW04S-09C	SC4956-003	0.05	0.05
SJS04-MW04S-09C	SC4956-004	0.05	0.05
SJS04-MW04SP-09C	SC4956-005	0.05	0.05
SJS04-MW04SP-09C	SC4956-006	0.05	0.05
SJS04-MW05S-09C	SC4956-007	0.05	0.05
SJS04-MW05S-09C	SC4956-008	0.05	0.05
SJS04-MW01S-09C	SC4956-009	0.05	0.05
SJS04-MW01S-09C	SC4956-010	0.05	0.05
SJS04-EB082409	SC4956-011	0.05	0.05
SJS04-EB082409	SC4956-012	0.05	0.05
SJS04-FB082409	SC4956-013	0.05	0.05

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SC4956

Instrument ID: AGILENT 7500 ICP-MS **File Name:** JZH25A

Date: 8/25/2009 **Method:** MS

Lab Sample ID	Client ID	D.F.	Time	Elements						
6020 TUNE		1	16:01							
200.8 TUNE		1	16:07							
Cal Blank		1	17:06	Al	As	Ca	Fe	Mg	Mo	K	Na
Cal Std 1		1	17:15	Al	As	Ca	Fe	Mg	Mo	K	Na
Cal Std 2		1	17:23	Al	As	Ca	Fe	Mg	Mo	K	Na
Cal Std 3		1	17:32	Al	As	Ca	Fe	Mg	Mo	K	Na
Cal Std 4		1	17:40	Al	As	Ca	Fe	Mg	Mo	K	Na
ZZZZZZ		1	17:49							
ICV		1	17:57	Al	As	Ca	Fe	Mg	Mo	K	Na
ICB		1	18:06	Al	As	Ca	Fe	Mg	Mo	K	Na
PQL		1	18:14	Al	As	Ca	Fe	Mg	Mo	K	Na
CRI		1	18:23	Al	As	Ca	Fe	Mg	Mo	K	Na
CRI		1	18:31	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSA		1	18:40	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSAB		1	18:49	Al	As	Ca	Fe	Mg	Mo	K	Na
Blank		1	18:57	Al	As	Ca	Fe	Mg	Mo	K	Na
CCV		1	19:06	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	19:14	Al	As	Ca	Fe	Mg	Mo	K	Na
BLANK		1	19:23	Al	As	Ca	Fe	Mg	Mo	K	Na
BLANK		1	19:31	Al	As	Ca	Fe	Mg	Mo	K	Na
CCV		1	19:40	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	19:48	Al	As	Ca	Fe	Mg	Mo	K	Na
PBWZH25ICW2		1	19:57		As						
SC4956-001	SJS04-MW03S-09C	1	20:05		As						
SC4956-001L	SJS04-MW03S-09CL	5	20:14		As						
SC4956-001D	SJS04-MW03S-09CD	1	20:22		As						
SC4956-002	SJS04-MW03S-09C	1	20:31		As						
SC4956-002L	SJS04-MW03S-09CL	5	20:40		As						
SC4956-002D	SJS04-MW03S-09CD	1	20:48		As						
SC4956-001S	SJS04-MW03S-09CS	10	20:57		As						
SC4956-002S	SJS04-MW03S-09CS	10	21:05		As						
LCSWZH25ICW2		10	21:14		As						
CCV		1	21:22	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	21:31	Al	As	Ca	Fe	Mg	Mo	K	Na
SC4956-003	SJS04-MW04S-09C	1	21:40		As						
SC4956-004	SJS04-MW04S-09C	1	21:48		As						
SC4956-005	SJS04-MW04SP-09C	1	21:57		As						
SC4956-006	SJS04-MW04SP-09C	1	22:05		As						
ZZZZZZ		1	22:14								
ZZZZZZ		1	22:22								
CRI		1	22:31	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSA		1	22:39	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSAB		1	22:48	Al	As	Ca	Fe	Mg	Mo	K	Na
Blank		1	22:57	Al	As	Ca	Fe	Mg	Mo	K	Na
CCV		1	23:05	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	23:14	Al	As	Ca	Fe	Mg	Mo	K	Na
SC4956-009	SJS04-MW01S-09C	1	23:22		As						
SC4956-010	SJS04-MW01S-09C	1	23:31		As						
SC4956-011	SJS04-EB082409	1	23:40		As						
SC4956-012	SJS04-EB082409	1	23:48		As						

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SC4956

Instrument ID: AGILENT 7500 ICP-MS **File Name:** JZH25A

Date: 8/25/2009 **Method:** MS

Lab Sample ID	Client ID	D.F.	Time	Elements						
SC4956-013	SJS04-FB082409	1	23:57	As						
ZZZZZZ		1	0:05							
ZZZZZZ		1	0:14							
ZZZZZZ		1	0:22							
ZZZZZZ		5	0:31							
BLANK		1	0:39	Al	As	Ca	Fe	Mg	Mo	K	Na
CCV		1	0:48	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	0:56	Al	As	Ca	Fe	Mg	Mo	K	Na
ZZZZZZ		1	1:05							
ZZZZZZ		5	1:13							
ZZZZZZ		1	1:22							
ZZZZZZ		10	1:31							
ZZZZZZ		10	1:39							
ZZZZZZ		10	1:48							
CRI		1	1:56	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSA		1	2:05	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSAB		1	2:14	Al	As	Ca	Fe	Mg	Mo	K	Na
Blank		1	2:22	Al	As	Ca	Fe	Mg	Mo	K	Na
CCV		1	2:31	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	2:39	Al	As	Ca	Fe	Mg	Mo	K	Na

ANALYSIS RUN LOG

Lab Name: Katahdin Analytical Services **SDG Name:** SC4956

Instrument ID: AGILENT 7500 ICP-MS **File Name:** JZH27A

Date: 8/27/2009 **Method:** MS

Lab Sample ID	Client ID	D.F.	Time	Elements						
6020 TUNE		1	15:56							
200.8 TUNE		1	16:02							
Cal Blank		1	17:01	Al	As	Ca	Fe	Mg	Mo	K	Na
Cal Std 1		1	17:10	Al	As	Ca	Fe	Mg	Mo	K	Na
Cal Std 2		1	17:18	Al	As	Ca	Fe	Mg	Mo	K	Na
Cal Std 3		1	17:26	Al	As	Ca	Fe	Mg	Mo	K	Na
Cal Std 4		1	17:35	Al	As	Ca	Fe	Mg	Mo	K	Na
ZZZZZZ		1	17:44							
ICV		1	17:52	Al	As	Ca	Fe	Mg	Mo	K	Na
ICB		1	18:01	Al	As	Ca	Fe	Mg	Mo	K	Na
PQL		1	18:09	Al	As	Ca	Fe	Mg	Mo	K	Na
CRI		1	18:18	Al	As	Ca	Fe	Mg	Mo	K	Na
CRI		1	18:26	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSA		1	18:35	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSAB		1	18:43	Al	As	Ca	Fe	Mg	Mo	K	Na
Blank		1	18:52	Al	As	Ca	Fe	Mg	Mo	K	Na
CCV		1	19:01	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	19:09	Al	As	Ca	Fe	Mg	Mo	K	Na
BLANK		1	19:18	Al	As	Ca	Fe	Mg	Mo	K	Na
BLANK		1	19:26	Al	As	Ca	Fe	Mg	Mo	K	Na
CCV		1	19:35	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	19:43	Al	As	Ca	Fe	Mg	Mo	K	Na
SC4956-007	SJS04-MW05S-09C	5	19:52		As						
SC4956-008	SJS04-MW05S-09C	5	20:00		As						
ZZZZZZ		1	20:09							
ZZZZZZ		5	20:18							
ZZZZZZ		5	20:26							
ZZZZZZ		5	20:35							
ZZZZZZ		5	20:43							
ZZZZZZ		10	20:52							
ZZZZZZ		10	21:00							
ZZZZZZ		1	21:09							
CCV		1	21:17	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	21:26	Al	As	Ca	Fe	Mg	Mo	K	Na
ZZZZZZ		5	21:34							
ZZZZZZ		5	21:43							
ZZZZZZ		5	21:52							
ZZZZZZ		5	22:00							
ZZZZZZ		25	22:09							
CRI		1	22:17	Al	As	Ca	Fe	Mg	Mo	K	Na
CRI		1	22:26	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSA		1	22:34	Al	As	Ca	Fe	Mg	Mo	K	Na
ICSAB		1	22:43	Al	As	Ca	Fe	Mg	Mo	K	Na
Blank		1	22:52	Al	As	Ca	Fe	Mg	Mo	K	Na
CCV		1	23:00	Al	As	Ca	Fe	Mg	Mo	K	Na
CCB		1	23:09	Al	As	Ca	Fe	Mg	Mo	K	Na

3P

PREPARATION BLANKS

Lab Name: Katahdin Analytical Services **Sample ID:** PBWZH25ICW2

Matrix: WATER **SDG Name:** SC4956

QC Batch ID: ZH25ICW2

Concentration Units : ug/L

Analyte	RESULT	C
ARSENIC	0.839	J

✓ action level
5X - 4.195
B flag as necessary
See report
JAC 9209

3A

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SC4956

Concentration Units: ug/L

SAMPLE: ICB

File: JZH25A Aug 25, 2009 18:06

Analyte	Result	C
ALUMINUM	21.41	J
ARSENIC	-0.12	J
CALCIUM	16.47	J
IRON	20.98	J
MAGNESIUM	23.80	J
MOLYBDENUM	0.88	J
POTASSIUM	26.03	J
SODIUM	25.96	J

SAMPLE: CCB

File: JZH25A Aug 25, 2009 19:14

Analyte	Result	C
ALUMINUM	2.73	J
ARSENIC	-0.20	J
CALCIUM	-4.73	J
IRON	3.10	U
MAGNESIUM	5.37	J
MOLYBDENUM	2.41	J
POTASSIUM	8.80	U
SODIUM	6.50	U

SAMPLE: CCB

File: JZH25A Aug 25, 2009 19:48

Analyte	Result	C
ALUMINUM	9.22	J
ARSENIC	0.08	U
CALCIUM	3.90	U
IRON	9.20	J
MAGNESIUM	12.11	J
MOLYBDENUM	0.93	J
POTASSIUM	13.21	J
SODIUM	12.12	J

See PBlk & field QC blks for action

JLC 9209

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SC4956

Concentration Units: ug/L

SAMPLE: CCB
File: JZH25A Aug 25, 2009 21:31

Analyte	Result	C
ALUMINUM	18.53	J
ARSENIC	0.16	J
CALCIUM	154.20	J
IRON	21.44	J
MAGNESIUM	69.85	J
MOLYBDENUM	0.87	J
POTASSIUM	44.37	J
SODIUM	367.70	J

SAMPLE: CCB
File: JZH25A Aug 25, 2009 23:14

Analyte	Result	C
ALUMINUM	13.63	J
ARSENIC	0.08	U
CALCIUM	45.04	J
IRON	17.35	J
MAGNESIUM	61.61	J
MOLYBDENUM	2.29	J
POTASSIUM	34.55	J
SODIUM	356.70	J

SAMPLE: CCB
File: JZH25A Aug 26, 2009 0:56

Analyte	Result	C
ALUMINUM	3.29	J
ARSENIC	0.11	J
CALCIUM	3.90	U
IRON	3.40	J
MAGNESIUM	20.16	J
MOLYBDENUM	0.25	J
POTASSIUM	15.27	J
SODIUM	133.80	J

3A

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SC4956

Concentration Units: ug/L

SAMPLE: CCB

File: JZH25A Aug 26, 2009 2:39

Analyte	Result	C
ALUMINUM	11.39	J
ARSENIC	0.12	J
CALCIUM	3.90	U
IRON	12.73	J
MAGNESIUM	25.55	J
MOLYBDENUM	2.17	J
POTASSIUM	24.53	J
SODIUM	88.92	J

3A

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SC4956

Concentration Units: ug/L

SAMPLE: ICB

File: JZH27A Aug 27, 2009 18:01

Analyte	Result	C
ALUMINUM	2.20	U
ARSENIC	-0.12	J
CALCIUM	3.90	U
IRON	3.10	U
MAGNESIUM	2.00	U
MOLYBDENUM	0.41	J
POTASSIUM	8.80	U
SODIUM	6.50	U

SAMPLE: CCB

File: JZH27A Aug 27, 2009 19:09

Analyte	Result	C
ALUMINUM	10.40	J
ARSENIC	-0.08	J
CALCIUM	11.40	J
IRON	13.53	J
MAGNESIUM	11.55	J
MOLYBDENUM	2.30	J
POTASSIUM	14.17	J
SODIUM	10.16	J

SAMPLE: CCB

File: JZH27A Aug 27, 2009 19:43

Analyte	Result	C
ALUMINUM	20.06	J
ARSENIC	0.08	U
CALCIUM	19.28	J
IRON	21.14	J
MAGNESIUM	21.32	J
MOLYBDENUM	1.12	J
POTASSIUM	23.60	J
SODIUM	17.85	J

3A

INITIAL AND CONTINUING CALIBRATION BLANKS

Lab Name: Katahdin Analytical Services **SDG Name:** SC4956

Concentration Units: ug/L

SAMPLE: CCB

File: JZH27A Aug 27, 2009 21:26

Analyte	Result	C
ALUMINUM	5.13	J
ARSENIC	0.08	U
CALCIUM	17.88	J
IRON	6.41	J
MAGNESIUM	21.22	J
MOLYBDENUM	0.41	J
POTASSIUM	11.01	J
SODIUM	113.00	J

SAMPLE: CCB

File: JZH27A Aug 27, 2009 23:09

Analyte	Result	C
ALUMINUM	18.93	J
ARSENIC	0.08	U
CALCIUM	19.37	J
IRON	20.75	J
MAGNESIUM	21.77	J
MOLYBDENUM	2.50	J
POTASSIUM	21.68	J
SODIUM	29.69	J

6

DUPLICATES

Lab Name: Katahdin Analytical Services **Client Field ID:** SJS04-MW03S-09CD

Matrix: WATER **SDG Name:** SC4956

Percent Solids: 0.00 **Lab Sample ID:** SC4956-001D

Concentration Units : ug/L

Analyte	Control Limits	Sample Result	C	Duplicate Result	C	RPD	Q	M
ARSENIC, TOTAL	1	1.6800		2.7490		48.3	*	MS

Comments:

J/UJ in total field samples

JE 9209

933

FORM VI - IN