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SITE MANAGEMENT PLAN FOR FISCAL YEARS 2012 THROUGH 2016 ST JULIENS CREEK
ANNEX CHESAPEAKE VA
09/01/2011
CH2M HILL

Site Management Plan Fiscal Years 2012 through 2016

**St. Juliens Creek Annex
Chesapeake, Virginia**



Prepared for

Department of the Navy

**Naval Facilities Engineering Command
Mid-Atlantic**

Contract No.
N62470-08-D-1000
CTO-0063

September 2011

Prepared by

CH2MHILL

Final

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Contract Task Order 0063

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Virginia Beach, Virginia

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Acronyms and Abbreviations

ABM	abrasive blast media
AOC	Area of Concern
BERA	Baseline Ecological Risk Assessment
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIP	Community Involvement Plan
DGM	digital geophysical mapping
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
ERA	Ecological Risk Assessment
ERD	enhanced reductive dechlorination
ERP	Environmental Restoration Program
ERS	ecological risk screening
ESS	Explosives Safety Submission
FFA	Federal Facility Agreement
FS	Feasibility Study
FY	fiscal year
GIS	geographical information system
HHRA	Human Health Risk Assessment
HHRS	human health risk screening
HRS	Hazard Ranking System
IAS	Initial Assessment Study
IRACR	Interim Remedial Action Completion Report
IRP	Installation Restoration Program
ISCR	<i>In Situ</i> Chemical Reduction
LUC	land use control
MCL	maximum contaminant level
MD	munitions debris
MEC	munitions and explosives of concern
MIP	membrane interface probe
MNA	monitored natural attenuation
MPPEH	material potentially presenting an explosive hazard
MRP	Munitions Response Program
NACIP	Navy Assessment and Control of Installation Pollutants
NAVFAC	Naval Facilities Engineering Command
NCP	National Oil and Hazardous Substance Pollution Control Contingency Plan

NEESA	Navy Engineering and Environmental Support Activity
NFA	no further action
NPL	National Priorities List
NTCRA	non-time-critical removal action
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
POL	petroleum, oil, and lubricant
PP	Proposed Plan
RA	Remedial Action
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RAO	Remedial Action Objective
RC	Response Complete
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDX	cyclotrimethylenetrinitramine
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RIP	Remedy-in-Place
ROD	Record of Decision
RRR	Relative Risk Ranking
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SJCA	St. Juliens Creek Annex
SMP	Site Management Plan
SSA	Site Screening Assessment
SWMU	Solid Waste Management Unit
TCE	trichloroethene
TCRA	time-critical removal action
USEPA	United States Environmental Protection Agency
UU/UE	unrestricted use and unlimited exposure
UXO	unexploded ordnance
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound
VSI	visual site inspection
yd ³	cubic yard

Introduction

This document presents the Site Management Plan (SMP) for St. Juliens Creek Annex (SJCA), Chesapeake, Virginia, for fiscal years (FYs) 2012 through 2016. The SMP meets the requirements of the Federal Facility Agreement (FFA) between the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Region III of the United States Environmental Protection Agency (USEPA), and the Virginia Department of Environmental Quality (VDEQ) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to address environmental contamination at applicable SJCA sites.

The SMP is intended to be used in the planning, scheduling, and implementing of environmental remedial response activities at SJCA. The SMP provides brief site descriptions, summaries of previous investigations, statuses of CERCLA activities, and conceptual schedules for SJCA Installation Restoration Program (IRP) and Munitions Response Program (MRP) sites. The prioritization of activities and the conceptual schedules were developed by the SJCA Environmental Restoration Program (ERP) Partnering Team, which includes representatives from NAVFAC, USEPA, and VDEQ, and are based on several factors:

- The SJCA ERP Partnering Team's relative ranking of the sites with regard to the potential risks that they may pose to human health and the environment
- NAVFAC's internal funding goal of having remedies in place at all IRP sites by FY 2014 and at all MRP sites by FY 2020.
- Goals set by the SJCA ERP Partnering Team to meet requirements of USEPA, VDEQ, NAVFAC, and the public

The drafting of this SMP was completed in September 2011 with concurrence from the USEPA and VDEQ; however, in accordance with the FFA, this SMP will not be considered as a Final document until funds authorized and appropriated by Congress are received by the Environmental Restoration, Navy Account, so that the planned work for this fiscal year, as defined in this SMP, can be accomplished. The SMP is a working document that is updated yearly to maintain current documentation and summaries of environmental actions at SJCA. This SMP updates and supersedes the FYs 2011 through 2015 SMP (CH2M HILL, 2010a).

St. Juliens Creek Annex Description and Environmental History

2.1 St. Juliens Creek Annex Description

The SJCA facility 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 2-1). Most surrounding areas are developed and include residences, schools, recreational areas, and shipping facilities for several large industries.

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; 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 various administrative and warehousing facilities and light industrial shops for nearby Norfolk Naval Shipyard and other local naval activities. 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 are currently located within SJCA.

2.2 Environmental History

In 1975, the Department of Defense (DoD) began the Navy Assessment and Control of Installation Pollutants (NACIP) 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.

In 1976, the Resource Conservation and Recovery Act (RCRA) was passed by Congress to address potentially adverse human health and environmental impacts from hazardous waste management and disposal practices. RCRA was legislated to manage the present and future disposal of hazardous wastes.

To meet the objectives of the NACIP Program, an Initial Assessment Study (IAS) was conducted at SJCA in 1981 [Navy Engineering and Environmental Support Activity (NEESA), 1981]. Results of this study revealed that low-level concentrations of ordnance materials still existed throughout the eastern portion of the facility. These areas are associated with buildings that handled loose ordnance materials. Decontamination conducted at the facility in 1977 lowered the concentrations of these materials. However, visual inspections and analytical tests performed after decontamination indicated that low concentrations of ordnance materials still existed in some buildings. Residues were also suspected from waste burning at the Burning Grounds (IRP Site 5) and near the swamp between Buildings 257 and 130 (IRP Site 2), pesticide and herbicide rinsate disposal at Cross Street and Mine Road (IRP Site 8), and ordnance waste and rinse waters released to the sediments of Blows Creek. However, the IAS (NEESA, 1981) concluded that the sites identified were determined not to pose a threat to human health and the environment, and no confirmation study was recommended.

In 1980, CERCLA, or “Superfund,” was passed to investigate and remediate areas impacted by past hazardous waste management practices. This program is administered by USEPA or state agencies.

In 1983, a Preliminary Assessment (PA), the first step in the CERCLA process (described in Section 2.3) was conducted at SJCA. Ambient air at Sites 1, 2, 3, 4, 8, and 13 was monitored for volatile organic compounds (VOCs) and radiation with an organic vapor meter and radiation meter, respectively. No readings above background were encountered and no significant signs of contamination were observed at the sites. However, the PA report mentioned that various locations on the facility were contaminated with low-level residues of pesticide and herbicide materials. A confirmation study was not recommended.

The NACIP Program was revised in 1986 to reflect the requirements of CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA). SARA established the IRP to address releases of hazardous substances, pollutants, and contaminants on installations and former properties resulting from past practices that may pose risks to human health and the environment. The IRP is currently addressed under the ERP.

The first step under the RCRA corrective action process, a RCRA Facility Assessment (RFA), was conducted at SJCA in 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). Twenty-three SWMUs (1, 2, 3, 4, 5, 6, 8, 9, 13, 14, 15, 16, 17, 19, 20, 23, 24, 25, 27, 30, 32, 33, and 41) and nine AOCs (B, C, D, E, G, H, I, J, and L) were recommended for further action. Detailed subsurface investigations, such as RCRA Facility Investigations (RFIs), were recommended at 10 of the SWMUs (1, 2, 3, 4, 5, 6, 8, 24, 30, and 32) and one of the AOCs (AOC L) based on the potential for a release to have occurred in association with the waste management activities at these units. Investigations less detailed than RFIs, including integrity testing and verification investigations, were recommended for the other SWMUs and AOCs.

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. 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.

In association with the inclusion of SJCA on the NPL, the SJCA IRP Partnering Team, now referred to as the SJCA ERP Partnering Team, was chartered to streamline the cleanup of former disposal sites by using consensus-based site management strategies throughout the CERCLA process (described in Section 2.3). The Team consists of representatives from NAVFAC, USEPA, and VDEQ, and meetings are held quarterly or more frequently as necessary.

As part of the FY 2002 Defense Authorization Act, Congress mandated that DoD develop a program to address military munitions. As a result, the MRP was developed under the ERP. The DoD and the Navy are establishing policy and guidance for munitions 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 National Oil and Hazardous Substance Pollution Control Contingency Plan (NCP), as authorized by CERCLA. Therefore, the SJCA ERP Partnering Team is following the CERCLA process to address MRP sites identified at SJCA. To-date, only one MRP site, MRP Area UXO 1, has been identified at SJCA.

The 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 ERP 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 SMP.

2.3 Comprehensive Environmental Response, Compensation, and Liability Act Process

The objectives of the CERCLA process are to evaluate and, if determined necessary, remediate environmental releases or threatened releases to air, surface water, groundwater, sediment, and soil. The major elements of the CERCLA process are:

- PA/Site Inspection (SI)
- Remedial Investigation (RI)/Feasibility Study (FS)
- Engineering Evaluation/Cost Analysis (EE/CA) and Removal Action (may be implemented at any time in the CERCLA process)
- Proposed Plan (PP)/Record of Decision (ROD)
- Remedial Design (RD)/Remedial Action (RA)
- Post-RA Monitoring and Reporting
- Response Complete (RC)/Remedy-in-Place (RIP)
- Community Involvement (implemented throughout the CERCLA process)

A brief description of each element is provided in the following subsections.

2.3.1 Preliminary Assessment/Site Inspection

The PA is a limited-scope assessment designed to distinguish between sites that clearly pose little or no threat to human health or the environment and those that may pose a threat and require further investigation. This stage typically involves a review of historical documents and a VSI. Based on the results, the PA may result in a determination of no further action (NFA), completion of an SI if there is insufficient information to reach an NFA decision, an EE/CA and removal action if significant threat to human health or the environment exists, or an RI/FS if remediation is deemed necessary.

If the PA recommends further investigation, an SI is conducted to eliminate from further consideration those releases that pose no significant threat to human health and the environment, to determine the potential need for a removal action, to collect or develop data to evaluate the release pursuant to the HRS, and to collect data to better characterize a release for more effective and rapid initiation of the RI/FS. If the SI identifies significant threat to human health or the environment, an EE/CA and removal action may be recommended. If the SI recommends further investigation and remediation, an RI/FS may be recommended. The sites that do not require further investigation or response are designated as NFA sites.

2.3.2 Remedial Investigation/Feasibility Study

Based on the results of the PA/SI, an RI may be conducted. The RI is designed to characterize site conditions, determine the nature and extent of contamination, assess the risk to human health and the environment posed by site contamination, and provide a basis for decisions on further response actions or NFA. During the RI, environmental samples are usually collected from all the media present at the site. The RI should provide information to refine the conceptual site model and form the basis for the development of RA objectives (RAOs) and remedial strategies that will comprise the FS.

The FS is the mechanism for the development, screening, and detailed evaluation of remedial alternatives to meet environmental requirements and protect human health and the environment. The overall objectives of an FS are to develop and evaluate potential remedies that permanently and significantly reduce the threat to public health, welfare, and the environment; select a cost-effective RA alternative that mitigates the threat(s); and provide the basis for achieving consensus regarding the selected response action.

The RI and FS can be conducted concurrently; data collected in the RI influences the development of remedial alternatives in the FS, which in turn affect the data needs and scope of potential treatability studies and additional field investigations. This phased approach encourages the continual scoping of the site characterization effort, which minimizes the collection of unnecessary data and maximizes data quality.

Generally, the need for a treatability study is identified during the FS. Treatability studies are performed to assist in the evaluation of a potentially promising remedial technology. The primary objectives of treatability studies are to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the FS and to support the RD of a selected alternative. Treatability studies may be conducted at any time during the process.

Treatability studies may be classified as either bench-scale (laboratory study) or pilot-scale (field studies). For technologies that are well-developed and tested, bench-scale studies are often sufficient to evaluate performance. For innovative technologies, pilot-scale tests may be required to obtain the desired information. Pilot-scale tests simulate the physical and chemical parameters of the full-scale process and are designed to bridge the gap between bench-scale and full-scale operations. Generally, a pilot-scale system is deployed onsite to collect the required information. Treatability studies may also be needed during the RD/RA phase to obtain more detailed information about operations, performance, and cost associated with designing a full-scale treatment system.

2.3.3 Engineering Evaluation/Cost Analysis and Removal Action

A removal action is a response implemented in an expedited manner to address releases or threatened releases in order to mitigate the spread of contamination. Removal actions may be implemented at any time during the CERCLA process. Removal actions are classified as either time-critical removal actions (TCRAs) or non-time-critical removal actions (NTCRAs). Actions taken immediately to mitigate an imminent threat to human health or the environment, such as the removal of corroded or leaking drums, are classified as TCRAs. Removal actions that may be delayed for 6 months or more without significant additional harm to human health or the environment are classified as NTCRAs.

For an NTCRA, an EE/CA is prepared rather than the more extensive FS. An EE/CA focuses only on the substances to be removed rather than all contaminated substances at the site. For EE/CAs, the public is provided an opportunity to comment during an announced formal public comment period. A removal action can be either the final remedy or an interim action followed by an RA as the final remedy, depending on the extent to which the threats are mitigated by the action. A removal action, when implemented as the final remedy, can be used for fast and significant reductions in risk and for mitigating long-term threats. In cases where the removal action is the final remedy, the removal action may lead to NFA for the site. If the removal action was accomplished during the RI/FS phase, any final determination of NFA must be documented in a ROD. If the nine NCP criteria were not addressed as part of the EE/CA or Action Memorandum, a focused FS would be needed, followed by a ROD.

2.3.4 Proposed Plan/Record of Decision

The remedy selection process involves identifying a preferred response action strategy from those alternatives evaluated in the FS. The preferred alternative is based first on each alternative's ability to satisfy the threshold criteria, and then on trade-offs among alternatives considering the primary balancing criteria. Further, results of the risk assessment need to be factored into the selection of the remedy. The remedy selection process includes a PP and a ROD.

A PP presents the remedial alternatives developed in the FS and recommends a preferred remedial method. The public has an opportunity to comment on the PP during an announced formal public comment period. During the public comment period for a PP, a public meeting is also held to provide supporting information. At the end of the public comment period, an appropriate remedial alternative is chosen to protect human health and the environment.

The ROD documents the remedy selection process and the selected remedy, including NFA determinations for sites that were addressed during the RI/FS phase. All parties directly involved in the ERP (Navy, USEPA, VDEQ, and the public) must agree on the selected alternative. Any public comments received are addressed as part of the responsiveness summary in the ROD. A public notice is issued after the ROD is signed and available for public inspection. A public notice is also published for any significant post-ROD changes. Once the ROD has been signed, the RD/RA process is initiated.

An interim RA may be selected for a site in order to take quick action to protect human health and the environment from an imminent threat in the short term, while a final remedial solution is being developed; or to institute temporary measures to stabilize the site and/or prevent further migration of contaminants or further environmental degradation. If an interim RA is selected, an Interim PP and an Interim ROD are developed in accordance with the process detailed above. Because an interim action is limited in scope and may not address all site areas or media, the interim action is followed by a final PP and ROD for the site.

2.3.5 Remedial Design/Remedial Action

Subsequent to the ROD, RD/RA activities are implemented for sites requiring further action. The technical specifications for cleanup remedies and technologies are designed in the RD phase. The purpose of the RD phase is to convert the conceptual design for the selected remedy from the FS into a full-scale detailed design for implementation. The RD phase includes preparation of technical RD work plans, drawings, specifications, and RA work plans.

The RA phase is the actual construction or implementation of the cleanup process. The RA start date is defined as the date the contractor has mobilized and begun substantial and continuous physical onsite RA. The start date is important because it triggers the beginning of the Five-Year Review cycle if one is required. The RA phase involves two main components – RA construction and RA operation.

Interim RAs are implemented to provide temporary mitigation of human health risks or to mitigate the spread of contamination in the environment. Similar to removal actions, they may be implemented at any time during the process. Examples of interim RAs include installing a pump-and-treat system for product recovery from the groundwater or installing a fence to prevent direct contact with hazardous materials. For interim RAs, a focused FS is sometimes prepared rather than the more extensive FS. As with the removal action, an interim RA may become the final RA if the results of the risk assessment indicate that no further RA is required to protect human health and the environment.

2.3.6 Response Complete/Remedy-in-Place

At any point during the CERCLA process, a decision can be made that no further response action is required; properly documented (necessary regulatory notification or application for concurrence has occurred), these decisions constitute RC and/or site closeout. RC is the point at which the remedy has achieved the required reduction in risks to human health and the environment (cleanup goals/RAOs have been met). Once RC has been achieved for a site, an RA Completion Report (RACR) is prepared to demonstrate that the remedy is complete and the RAOs are met. RC is followed by individual site closeout.

For long-term remedies where it is anticipated that RAOs will be achieved over a long period, the RIP milestone signifies the completion of the RA construction phase and that the remedy has been implemented and has been demonstrated to be functioning as designed (for example, all testing has been accomplished and the remedy will function properly). Once RIP is completed for a site, an Interim RACR (IRACR) is prepared to document that the remedy is constructed and operating successfully.

Once RCs or RIPs have been documented for every site at the facility and the terms of the FFA (DoD, 2004) have been met, site closeout and NPL deletion is requested.

2.3.7 Post-Remedial Action Monitoring and Reporting

Five-year reviews are required by CERCLA when hazardous substances remain on site above levels permitting unrestricted use and unlimited exposure (UU/UE). Five-year reviews provide an opportunity to evaluate the implementation and performance of a remedy to determine whether it remains protective of human health and the environment. Generally, reviews are performed 5 years after the initiation of a CERCLA response action and are conducted every 5 years as long as future uses remain restricted. Five-year reviews for SJCA are performed by the Navy, the lead agency for the site, but USEPA retains responsibility for determining the protectiveness of the remedy.

2.3.8 Community Involvement

To learn how the public would like to be involved in the CERCLA process, community interviews were conducted and a Community Relations Plan was developed based on the responses in 2000 (CH2M HILL, 2000). The plan, now called the Community Involvement Plan (CIP), is updated every 3 to 5 years or if significant community concerns or a major change in the ERP at SJCA occur. The most recent update was performed in 2010 (CH2M HILL, 2010b). Community participation at SJCA includes a Restoration Advisory Board (RAB), public meetings, information repository, fact sheets, public notices, and a Web site (https://portal.navfac.navy.mil/portal/page/portal/navfac/navfac_ww_pp/navfac_hq_pp/navfac_env_pp/env_restoration_installations/lant/midlant/sjca). The RAB was formed in 1999 and is co-chaired by the Navy and a community member from the Geneva Shores neighborhood. The RAB consists of community members and representatives of the Navy, VDEQ, and USEPA. RAB meetings are held semiannually (normally every May and November) and are open to the public to provide opportunity for comment and input on the ERP. Representatives of the City of Chesapeake and the Elizabeth River Project and employees at SJCA frequently participate in the RAB.

The documents prepared as part of the ERP are maintained in the Administrative Record. An information repository consisting of a reference collection of general and SJCA ERP site information, including documents for public review, the CIP, Superfund information, and fact sheets, is maintained at the Major Hillard Library in Chesapeake, Virginia, for review by the public. The Administrative Record, information repository, and ERP public Web site are updated as needed.



Legend

 St. Juliens Creek Annex Boundary



0 1,000 2,000
Feet

Figure 2-1
Location of St. Juliens Creek Annex
St. Juliens Creek Annex
Chesapeake, Virginia

Site Descriptions

Fifty-nine potentially contaminated IRP sites, MRP sites, SWMUs, and AOCs have been identified for evaluation at SJCA based on previous assessments and investigations. Five sites are currently active in the SJCA ERP: IRP Sites 2, 4, 5, and 21, and MRP Area UXO 1 (Figure 3-1 and Figure 3-2, respectively). Fifty-four sites have been categorized as NFA sites by the SJCA ERP Partnering Team following desktop audits, SIs, and/or removal actions (Figure 3-3). Table 3-1 lists the status of each site.

Several facility-wide investigations were previously completed through the ERP, including:

- IAS (NEESA, 1981)
- PA (NUS Corporation, 1983)
- Phase II RFA (A. T. Kearney, 1989)
- Aerial Photographic Site Analysis (USEPA, 1995)
- Relative Risk Ranking (RRR) System Data Collection Report (CH2M HILL, 1996)
- HRS Documentation Record (Tetra Tech, 2000)
- Basewide Background Investigation (CH2M HILL, 2001a; 2004a)
- Site Screening Assessment (SSA) (CH2M HILL, 2002)
- Five-Year Review (CH2M HILL, 2010c)

The following subsections present a brief site history, site description, summary of the site-specific investigations conducted, and planned future CERCLA activities at each active IRP and MRP site and are divided based on the site's current CERCLA phase. The findings from the Five-Year Review are detailed in the site-specific subsection for Site 4 because it was the only site with a RIP resulting in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for UU/UE when the Five-Year Review was completed and is therefore the only site included in the Five-Year Review.

Table 3-2 provides a summary of the site-specific investigations that have been completed or are currently ongoing at each active site. The conceptual project schedule for IRP and MRP activities at SJCA through FY 2016 is presented in Figure 3-4. The review and comment periods for deliverables shown in the schedule were based on FFA guidelines; flow charts depicting the process are included as Figures 3-5 through 3-7.

3.1 Preliminary Assessment/Site Inspection Sites

3.1.1 MRP Area UXO 1—Wharf Area Sediments

Area UXO 1 includes the current and former wharf areas along the shoreline of the Southern Branch of the Elizabeth River, extending approximately 2,230 linear feet. The northern wharf (Wharf 3), located in the northeast portion of SJCA adjacent to Building M-5 and former Building 190, is no longer present, with the exception of remaining pilings. Wharf 3 was built in 1917 and 1918 and used primarily to load Mark VI mines produced in the mine plant at SJCA. The southern wharf area consists of Wharf 1 and Wharf 2. The southernmost

wharf, Wharf 1, was constructed around 1898 for ordnance loading during the Spanish-American War. Wharf 2 was constructed just north of Wharf 1 sometime between 1898 and 1903 to aid in ordnance loading. In 1944, an extension to Wharf 2 connected it to Wharf 1, a concrete extension to the wharf was constructed, and a dolphin pier/catwalk for lighter storage was built. Ordnance loading activities continued until the early 1970s, when production declined commensurate with the disengagement policy and the reduced operations in Southeast Asia. Wharf 1 (currently known as Dock 2) is now considered condemned, largely due to damage caused to this section of the wharf after it was struck by two vessels in 1975. Wharf 2 (currently known as Dock 1) is still used for the occasional mooring of contractor and cable supply ships (Kelly, 2009).

The northern wharf area was previously identified as Site 20 in the IRP. The IAS (NEESA, 1981) indicated that Explosive Ordnance Disposal team divers searched the Site 20 area and identified metal and thick silt deposits near the former pier. It was concluded that ordnance may have been dropped into the sediment adjacent to the former wharf area during loading and unloading operations. The ordnance items were not considered a hazard as long as the sediment was not disturbed. The IAS recommended that real estate records be annotated to indicate that unexploded ordnance (UXO) may be present.

During the RRR, a site reconnaissance, a magnetometer survey, and sediment sampling were conducted in the Site 20 (northern wharf, Wharf 3) area. Approximately 68 contacts were identified in the area surrounding the former wharf pilings; however, contacts indicate all types of buried metallic objects and do not necessarily indicate the presence of buried ordnance, and no visual confirmation of the contacts was made. One VOC, multiple semivolatile organic compounds, one pesticide, one explosive, and multiple inorganics were detected in the sediment.

As part of the SSA, the unvalidated analytical results from the sediment samples collected during the RRR were used to conduct a human health risk screening (HHRS) and ecological risk screening (ERS). No unacceptable risks were identified to human receptors. Potential unacceptable ecological risks from exposure to mercury, several polycyclic aromatic hydrocarbons (PAHs), and 1,3-dinitrobenzene were identified for benthic-dwelling organisms in the sediment. However, mercury and the PAHs were detected at concentrations similar to those detected in urban water bodies and no toxicity screening value was available for 1,3-dinitrobenzene. Therefore, the risks were considered minimal, and no further evaluation of ecological risk was recommended.

During the July 2001 SJCA ERP Partnering Team site visit, consensus was reached for NFA for Site 20 under CERCLA based on the findings of the HHRS and ERS and the fact that potential risk from buried ordnance would be addressed under the Navy's Range Program. The NFA decision was documented in the SSA. Based on recommendations made in the SSA, signs were posted in the area to prohibit intrusive activities and the United States Army Corps of Engineers was notified of the potential presence of buried ordnance. A note has been added to the internet Navy Facility Assets Data Store under the SJCA Wharf Property Record Cards stating: "Unexploded ordnance may exist along all of the St. Juliens Creek Annex Wharfs." The Navy's Range Program was never fully implemented, and ordnance sites are now addressed under the MRP. Because site history indicates a potential presence of buried ordnance, the wharf areas (northern and southern) were identified as Area UXO 1 in 2008 and included under the MRP.

Preliminary Assessment—2009 (CH2M HILL, 2009a)

A PA, consisting of a desktop and archive search on site activities, was conducted in 2009. Onsite and offsite sources were researched to determine the potential for munitions to have been dropped into the water during ordnance-loading operations at the wharfs from 1896 through the late 1970s. 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 munitions and explosives of concern (MEC), specifically discarded military munitions or munitions constituents, in the sediment beneath the wharf areas. The majority of potential munitions constituents are inorganics and explosive compounds. Potential complete human and biological receptor exposure pathways (food chain) exist for surface water and sediment. Investigation results from future actions may eliminate potentially impacted media, which may change the exposure scenarios. Area UXO 1 is located underwater and potential uses are limited; however, construction activities to demolish a section of the southern wharf and remove the remaining pilings in the northern wharf area are planned for the future. The PA recommended further investigation, including a geophysical investigation and anomaly identification in the northern and southern wharf areas, and no further investigation of the dolphin pier area with removal of that area from the MRP site boundary.

Site Inspection—2010 (CH2M HILL, 2010d)

An SI was conducted in February 2010 to determine whether or not there is evidence that the ordnance-loading activities at the wharfs in Area UXO 1 resulted in munitions being dropped into the Southern Branch of the Elizabeth River. The field activities included bathymetric, side-scan sonar, and digital geophysical mapping (DGM) surveys within the northern and southern wharf areas. The investigation identified geophysical anomalies, representing metallic items, within the sediment of both wharf areas. The SI report indicated that the presence of metallic items is evidence that munitions could potentially be present within the site and recommended an additional investigation to visually inspect the anomaly sources identified during the DGM survey from select locations. The additional investigation is expected to be conducted in FY 2012.

Future activities at Area UXO 1 consist of:

- Anomaly source investigation (SI Addendum)
- RI
- FS
- PP and ROD
- RD

3.2 Engineering Evaluation/Cost Analysis and Removal Action Sites

3.2.1 IRP Site 5—Burning Grounds

Site 5 is the former Burning Grounds, consisting of approximately 23 acres located in the northeastern portion of SJCA. In earlier documents, Site 5 was also referred to as SWMU 8 and was reported to consist of approximately 3 acres. Review of historical aerial

photographs indicates that prior to use as a disposal area, the site and much of the adjacent area had been used for the 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 (a mixture of charcoal, nitrate, and sulfur), smokeless powder (nitrocellulose), Explosive D (ammonium picrate), and Composition A-3 (which contains cyclotrimethylenetrinitramine [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. Reports stated that the Burning Grounds spontaneously caught fire several times in the 1970s. The amount of ordnance disposed of varied from year to year and there is insufficient information to calculate the waste volume. Interviews conducted with former employees in December 2001 indicated that asbestos piping was buried 10 feet below ground surface (although investigation activities have only identified shallow waste) and that other material disposed included tables and metal from buildings. In 1974, 427 tons of ordnance items were reportedly disposed.

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 the equipment. Afterwards, the ground surface was reportedly covered with oil and straw and burned. The top 6 inches of soil were then diced, and the ground surface was covered with oil and straw and burned again. After the decontamination was completed, the Naval Ammunition Production Engineering Center collected samples for chemical analyses and certified decontamination; however, the level of decontamination was not specified.

The site currently consists of an open field with a wetland in the central portion and a forested area in the southern portion. A significant portion of the site's southwestern area is covered with a layer of gravel. The Site 5 topography is generally level and slopes gently toward Blows Creek. Groundwater flow follows the topography and flows toward Blows Creek. Vegetated drainage ditches (1 to 3 feet deep) are reducing runoff to the site from adjacent areas. Site 6, located within the east-central portion of Site 5, is a former IRP site that was closed under a NFA ROD in September 2003 after a removal action.

Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment—1997 through 2003 (CH2M HILL, 2003)

The RI field investigation activities included geophysical investigations; monitoring well installation; water-level monitoring; waste delineation; and the collection and analysis of surface and subsurface soil samples, groundwater samples, drainage sediment samples, and drainage surface water samples. Based on the waste delineation investigation conducted, it was determined that the extent of waste was greater than previously identified and the Site 5 boundaries were adjusted to reflect the extent of waste encountered.

The Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) conducted as part of the RI concluded that there are potential risks to human and ecological receptors from exposure to chemicals in soil and upland drainage ditch sediment (primarily inorganics and PAHs). Because surface water is transient at the site and the upland ditches provide minimal ecological habitat, there are no significant risks to human health and the environment identified from direct exposure to surface water. Groundwater samples

collected from the shallow monitoring wells at Site 5 indicated isolated detections of inorganics at concentrations above maximum contaminant levels (MCLs). In addition, an isolated detection of RDX was found in a sample collected from a deep monitoring well. The RI did not identify any human health risks in shallow groundwater; however, only the construction worker scenario was evaluated.

The RI recommended additional soil and groundwater sampling to further define the nature and extent of contamination in support of evaluating remedial alternatives for Site 5. Further evaluation of the potential for adverse effects to aquatic life in Blows Creek sediment was also recommended based on chemical concentrations of inorganics and pesticides in upland drainage ditch sediment/soil.

Baseline Ecological Risk Assessment, Blows Creek Watershed—2003 to 2006 (CH2M HILL, 2006a)

A separate Baseline Ecological Risk Assessment (BERA) for Blows Creek was conducted to identify potential risks associated with possible historical contributions to Blows Creek from upland Navy IRP sites, including Site 5. Investigation activities included the collection and analysis of sediment and fish tissue samples. Results indicated limited potential for adverse effects to benthic-dwelling organisms from exposure to Blows Creek sediment based on the low frequency and magnitude of chemical concentrations exceeding ecological screening values; limited effects based on bioassay organism response; and no potential for adverse effects to avian piscivores (belted kingfisher) from the presence of mercury in Blows Creek fish or sediment. The Final BERA report documented that Blows Creek requires NFA under CERCLA. This NFA decision will be incorporated into the ROD for Site 5.

Expanded Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment and Addendum—2003 through 2007 (CH2M HILL, 2006b, 2007a)

An Expanded RI was conducted in December 2003 and included the collection and analysis of surface soil samples to fill spatial data gaps, better evaluate areas posing potential ecological risks, and evaluate potential remedial alternatives. Additionally, groundwater samples were collected from the existing monitoring wells to confirm or deny MCL exceedances of inorganics in shallow groundwater and the presence or absence of RDX in deep groundwater identified during the RI. In addition, the HHRA from the RI was revised to evaluate residential scenarios. Based on the new and historical data, the revised HHRA indicated that shallow groundwater presented potential human health risks to future residents. Because of the variability in analytical results in shallow groundwater over time, additional groundwater samples were collected in 2006. After reviewing all of the shallow groundwater data, the SJCA ERP Partnering Team agreed that the risks are acceptable and NFA is needed for shallow groundwater. The shallow groundwater HHRA was revised and the results and risk management rationale were documented in an addendum to the Expanded RI.

Based on the RI and Expanded RI results, the areas posing potential human health and/or ecological risks warranting additional investigation and/or RA to achieve the RAO of UU/UE consisted of the waste and burnt soil, and sporadic inorganics and pesticides in surface soil and drainage ditch sediment.

Engineering Evaluation/Cost Analysis and Action Memorandum—2006 to 2007 (CH2M HILL, 2007b)

Based on the findings of the RI and Expanded RI, an EE/CA was conducted to identify and analyze removal action alternatives to mitigate potential risks in the waste/burnt soil area and impacted surface soil and drainage sediment areas. The following four alternatives were identified, evaluated, and ranked: no action; cover installation; excavation and backfill; and excavation, restoration, and creation of wetlands. Based on a comparative analysis of the alternatives, the recommended NTCRA involved excavation, disposal characterization, disposal of waste/burnt soil and impacted surface soil and drainage sediment, and restoration of the site as a mixed wetland/upland habitat. The volume of the material that will be removed was estimated to be 24,930 cubic yards (yd³).

The determination of the limits of the excavations varies based on the different areas, dependent on the media and whether or not they are driven by human health or ecological risks. The waste/burnt soil will be excavated to visible limits and confirmatory samples will be collected to verify that cleanup goals are met. The impacted surface soil and sediment will be excavated to a depth of 1 foot based on subsurface soil data from the RI. The horizontal extent of the impacted surface soil and sediment areas has been defined by existing sample locations, with the exception of three areas which were delineated by pre-confirmation samples. Confirmation sampling will be conducted for the impacted surface soil and sediment areas that are being removed based on human health risks; those removals driven by ecological risks do not require confirmation sampling. Site restoration was to include: the placement of a minimum of 6 inches of topsoil to provide a suitable planting base; vegetative stabilization of the upland portion of the site with native grasses, shrubs, trees, and wildflowers; establishment of an emergent wetland in the eastern portion of the site by planting emergent wetland plants; and establishment of transitional wetland areas between the upland and emergent wetland by planting wetland shrubs and trees, as well as seeding the area with emergent vegetation.

A public notice of availability of the draft EE/CA was issued on February 8, 2007, and the EE/CA was made available to the public for comment from January 19 to February 18, 2007. No comments were received during the public comment period. Therefore, the Navy signed an Action Memorandum on March 20, 2007, to implement the NTCRA as specified in the EE/CA.

Supplemental Action Memorandum—2010 (CH2M HILL, 2010e)

A supplemental Action Memorandum to document a change in the scope of the response and ceiling increase from the previously-approved action memorandum for the NTCRA was signed in November 2010. This Action Memorandum documents the selection of Alternative #3 for the remaining portions of the NTCRA to allow for more flexible future land use and to increase the project ceiling to account for a variance in cost between the alternatives, inflation, and the cost of protective measures and procedures necessary due to the discovery of MEC at the site. Alternative #3 differs from the previously selected removal action alternative only in the restoration approach. Rather than placing only 6 inches of topsoil and planting additional shrubs and trees in the waste/burnt soil area as in the previously-selected alternative, Alternative #3 includes backfilling the waste/burnt soil to pre-removal action grade and restoring it with the same vegetation present prior to the removal action. A public notice of the change in scope of the response and ceiling increase and the availability

of the EE/CA was issued on June 3, 2010. The Navy provided a public comment period from June 3 to July 5, 2010. No comments were received during the public comment period. Therefore, the Navy signed the supplemental Action Memorandum on November 29, 2010.

Removal Action—2007 (Ongoing)

The NTCRA activities were initiated in December 2007; however, work was stopped following discovery of MEC during mobilization. An Explosives Safety Submission (ESS) was submitted for the Phase 1 area and the portion of the Phase 3 areas adjacent to the Phase 1 area. The NTCRA in the Phase 2 and 3 areas not adjacent to the Phase 1 area was completed in 2008 under an ESS determination. Following approval of the ESS, the NCTRA was reinitiated in February 2009; however, MEC outside the scope of the ESS was discovered during excavation and activities were placed on hold until the ESS was amended. The ESS amendment was approved in May 2010 and the NTCRA was reinitiated in November 2010. The NTCRA is expected to be completed in FY 2012.

Future activities at Site 5 consist of:

- NTCRA completion
- NFA PP and ROD

3.3 Remedial Design/Remedial Action Sites

3.3.1 IRP Site 2—Waste Disposal Area B

Site 2 is a former waste disposal area covering approximately 5.7 acres at the intersection of St. Juliens Road and Cradock Street in the southern portion of SJCA. In earlier documents, Site 2 was referred to as Dump B, Landfill B, and/or SWMUs 2, 3, and 4. Operations at the site began in 1921. Initially, refuse was burned openly onsite and used to fill an adjacent swampy area (Site 2 inlet). Mixed municipal wastes, organics, inorganics, solvents, waste ordnance, and abrasive blast media (ABM) 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. The total volume of waste prior to burning is reported to have been approximately 35,000 yd³.

Former Buildings 278 and 279, located just north of and adjacent to the Site 2 inlet, were designated as former IRP Site 17. Lead-acid battery maintenance reportedly began at Building 279 in 1954 and the waste acid electrolyte was collected and hauled offsite for disposal. Two 55-gallon drums of PD-680, a commercial degreaser, were observed stored on the concrete storage pad located just outside of Building 279. Oily stains were observed on the soil adjacent to Building 279, indicating a release may have occurred. Ordnance wastewater and rinse water were reportedly discharged into the inlet in the vicinity of former Buildings 130 and 257. In 1989, the site was used to store heavy equipment and machinery.

Currently, Site 2 is bounded on the north by a parking lot, on the east by a grass-covered field, on the west by a stormwater drainage ditch and Cradock Street, and on the south by St. Juliens Road and St. Juliens Creek. In the center of Site 2 is a water body surrounded by brush, trees, and grass directly connected to St. Juliens Creek. This water body, commonly referred to as the inlet, is tidally influenced and drains surface water from adjoining land into the creek. Grassed drainage ditches (approximately 2 to 3 feet deep) originate north of

Site 2 along Cradock Street and discharge stormwater runoff to the inlet. Surface runoff from an adjacent parking lot to the northwest of the inlet also drains directly into the inlet. An underground storm drainage system originates approximately 1,000 feet northeast of the Site 2 area, within IRP Site 21, and also outlets to the northernmost culvert to the inlet. The Site 2 topography ranges from 0 to 8 feet above mean sea level, sloping towards the inlet and St. Juliens Creek. Groundwater flow follows the topography and flows towards the inlet and creek. Concrete, brick, asphalt, and ABM are visible on the ground surface.

Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment—1997 through 2004 (CH2M HILL, 2004b)

The RI field activities at Site 2 began in June 1997 and continued through August 2001. Activities included a geophysical investigation; waste delineation trenching; monitoring well installation; water-level monitoring; and the collection and analysis of surface and subsurface soil, groundwater, sediment, and surface water samples. Based on the waste delineation trenching results and historical aerial photograph reviews, it was determined that Site 2 had not been operated as a cut-and-fill landfill. Therefore, Site 2 was reclassified as a waste disposal area and the site boundary was adjusted to reflect the extent of waste.

The HHRA and ERA conducted as part of the RI concluded that there are potential risks to human and ecological receptors from exposure to chemicals in soil and sediment (primarily inorganics, pesticides, and PAHs). Elevated concentrations of VOCs were present in the surface water but because surface water is transient, there were no significant risks to human health or the environment identified. No human health risk drivers were identified in shallow or deep groundwater.

The RI recommended further evaluation of the potential for adverse effects to aquatic life in the inlet sediment, investigation of the potential source of VOCs to surface water, and additional investigation of shallow groundwater because the existing shallow monitoring wells were located outside of, or on the outer limits of, the waste disposal area and did not sufficiently characterize potential groundwater contamination associated with the waste area.

Site 17 Expanded Site Inspection—2001 (CH2M HILL, 2001b)

SI activities were conducted in February 2001 to determine if there was contamination at Site 17 that required further investigation. The field investigation activities consisted of surface soil sample collection.

The qualitative HHRA and ERA conducted as part of the SI concluded that there are potential risks to human and ecological receptors from exposure to chemicals in soil (PAHs, pesticides, polychlorinated biphenyls [PCBs], and inorganics). Due to the proximity of Site 17 to Site 2, the SJCA ERP Partnering Team agreed during the November 2003 partnering meeting to address the potential risks to human health and the environment identified during previous investigations at Site 17 as part of Site 2, and classified Site 17 as closed with NFA necessary.

Expanded Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment—2004 to 2008 (CH2M HILL, 2008a, Revised 2010)

Based on the results of the Site 2 RI (CH2M HILL, 2004b) and data gaps identified, an Expanded RI was conducted. The Expanded RI activities were conducted in phases from December 2003 through July 2007. Field activities included membrane interface probe (MIP) investigation, monitoring well installation, and groundwater sampling to further define the nature and extent of the shallow groundwater VOC plume and source area; deep aquifer testing to determine if VOCs have impacted the deep groundwater; stormwater and surface water sampling to assess the source of VOCs in inlet surface water; sediment and sediment pore water sampling to further characterize ecological risks and to evaluate potential impacts to St. Juliens Creek; soil sampling to determine the presence or absence of natural attenuation parameters; direct-push technology waste delineation to further delineate the horizontal and vertical extent of waste under the parking lot area; and a surface debris delineation to determine the spatial extent and type of surface debris in the wetland area.

The HHRA and ERA conducted as part of the Expanded RI concluded that there are potential risks to human and ecological receptors from exposure to chemicals in soil (primarily PAHs and inorganics), shallow groundwater (chlorinated VOCs), sediment (inorganics and PAHs), and surface water (VOCs and inorganics). In addition, based on the nature of waste materials, the waste, which has not been fully characterized, is assumed to pose a potential risk to human health and the environment. The Expanded RI did not identify any human health risk in deep groundwater.

The Final Expanded RI recommended a FS to evaluate potential remedial alternatives to mitigate unacceptable human health and/or ecological risks in soil and waste, shallow groundwater, sediment, and surface water at Site 2.

Feasibility Study—2008 to 2009 (CH2M HILL, 2009b, Revised 2010)

Based on the findings of the Expanded RI (CH2M HILL, 2008a), an FS was conducted to identify and analyze remedial alternatives to mitigate potential risks associated with soil and waste, shallow groundwater, sediment, and surface water. The following eight alternatives were identified, evaluated, and ranked:

- **Alternative 1**—no action
- **Alternative 2**—cover (waste and soil), excavation (St. Juliens Creek sediment), and monitored natural attenuation (MNA) (high- and low-concentration, naphthalene, and heptachlor epoxide target areas)
- **Alternative 3**—cover (waste and soil), excavation (St. Juliens Creek sediment), sheet pile (high-concentration target area), and MNA (low-concentration, naphthalene, and heptachlor epoxide target areas)
- **Alternative 4**—cover (waste and soil), excavation (St. Juliens Creek sediment), enhanced reductive dechlorination (ERD) (high-concentration target area), and MNA (low-concentration, naphthalene, and heptachlor epoxide target areas)

- **Alternative 5**—cover (waste and soil), excavation (St. Juliens Creek sediment), ERD (high- and low-concentration target areas), and MNA (naphthalene and heptachlor epoxide target areas)
- **Alternative 6**—cover (waste and soil), excavation (St. Juliens Creek sediment), funnel and gate (high-concentration target area), and MNA (low-concentration, naphthalene, and heptachlor epoxide target areas)
- **Alternative 7**—cover (waste and soil), excavation (St. Juliens Creek sediment and high-concentration target area), and MNA (low-concentration, naphthalene, and heptachlor epoxide target areas)
- **Alternative 8**—cover (waste and soil), excavation (St. Juliens Creek sediment and high-concentration target area), ERD (low-concentration target area), and MNA (naphthalene and heptachlor epoxide target areas)

All alternatives (except Alternative 1) are expected to achieve NCP criteria. No recommendations were made as to which alternative was preferred.

Proposed Plan and Record of Decision—2010 to 2011 (CH2M HILL, 2010f; NAVFAC, 2011a)

The PP identified the preferred alternative for addressing human health and ecological risks at Site 2 as Alternative 4. A public notice of the availability of the PP for review and a meeting to present it to the public was issued on May 14, 2010. The Navy provided a public comment period from May 18 through July 2, 2010. The public meeting was held on May 18, 2010, at the Major Hillard Library. No changes were made to the preferred RA alternative identified in the PP as a result of the public meeting and comment period. The ROD documenting the selected remedy - excavation, soil cover, ERD, MNA, land use controls (LUCs), and a contingency permeable reactive barrier - was signed in January 2011.

Remedial Design—2009 to 2011 (Ongoing) (CH2M HILL, 2011a; NAVFAC, 2011b)

The RD for the soil cover, ERD, and MNA components of the selected remedy is currently under review. The excavation approach for the sediment area is still under evaluation because the vertical limits of the excavation are still being developed by the SJCA ERP Partnering Team. Once this is completed, the sediment excavation and restoration design details will be provided as an addendum to the RD. The RD for LUCs was completed in March 2011.

Future activities at Site 2 consist of:

- RA
- RD Addendum for St. Juliens Creek Sediment
- IRACR
- CERCLA Five-Year Site Remedy Review
- Possible RD Addendum for contingency permeable reactive barrier
- RACR

3.3.2 IRP Site 21—Industrial Area

Site 21 is located in the central industrial portion of SJCA. The site was initially identified as Building 187, a locomotive maintenance shed where trichloroethene (TCE) was used. Based

on investigations, the Site 21 area has been expanded to encompass an underlying VOC groundwater plume. Buildings at Site 21 were historically used for machine, vehicle, and locomotive maintenance, electrical shops, and munitions loading facilities. Railroad tracks were present throughout the industrial area and a fuel service station was located in the vicinity. Waste oils and degreasers (including TCE) were reportedly disposed on the ground surface and around the railroad tracks in the industrial area. Several of the buildings and/or surrounding areas were former IRP sites (Sites 9, 10, 11, 12, 13, 14, and 18 and AOC E). 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. An active warehouse was constructed in 1992 for use by the Mid-Atlantic Regional Maintenance Center. The building is now used for the Fleet and Industrial Supply Center, Norfolk Integrated Logistics Support. A storm sewer system runs through the site and drains to a downstream inlet (Site 2) to St. Juliens Creek.

Site Screening Assessment—2002 (CH2M HILL, 2002)

As part of the SSA, the unvalidated analytical results from soil and groundwater samples collected during the RRR were used to conduct HHRSs and ERSs. Based on elevated VOC concentrations detected in groundwater and potentially unacceptable human health risks identified, the SSA recommended further evaluation of Site 21 groundwater. Additionally, low level VOCs were detected at nearby Site 11 (former Building 53), an electrical shop where solvents were reportedly disposed of on the railroad track bed. Therefore, the SSA recommended that future investigations of groundwater at Site 21 encompass former Site 11 due to the proximity of the two sites. NFA was recommended for surface soil and for evaluating potential ecological effects.

Site Investigation—2003 (CH2M HILL, 2006c)

Based on the results of the SSA, an SI was conducted in August 2003. The SI field activities included a MIP investigation, monitoring well installation, and collection of groundwater samples to further define the nature and extent of contamination. Potentially unacceptable human health risks were identified from VOCs and RDX in shallow groundwater and chloroform, arsenic, and vanadium in deep groundwater. Although the SI recommended no further evaluation of potential ecological risks, because Site 21 provides little habitat for potential ecological receptors, an ERS was performed to determine if constituents were present in groundwater at concentrations that could represent a potential risk to aquatic life if they were to be transported and discharge to St. Juliens Creek and/or its tributaries. TCE was detected at concentrations exceeding its ecological screening value, indicating a potential risk. However; it was concluded that TCE concentrations were unlikely to pose risk to ecological receptors based on the transport distance before discharging to surface water, and the potential for mixing and dilution. Therefore, no further ecological evaluation was recommended.

The SI recommended further evaluation of VOCs in shallow groundwater through the installation and sampling of additional monitoring wells and resampling of select existing monitoring wells to confirm or deny elevated concentrations of inorganics and RDX.

Remedial Investigation—2003 to 2009 (CH2M HILL, 2008b)

The RI activities were conducted from December 2003 through February 2007. The investigation activities were initially identified as Supplemental SI activities; however, the

SJCA ERP Partnering Team concluded that the data collected were sufficient to satisfy the objectives of an RI. To expedite the site closeout approach, the draft Supplemental SI Report submitted in 2005 was not finalized, and the site data were incorporated into an RI Report. The field activities consisted of stormwater sampling and a storm sewer system video inspection to evaluate the potential for transport and release of chlorinated VOCs from shallow groundwater through the adjacent storm sewer system; depth-specific soil and groundwater sampling to confirm the presence or absence of dense non-aqueous phase liquid; and MIP investigation, groundwater sampling, and permanent monitoring well installation to further define the plume boundary and source areas and evaluate groundwater characteristics for remedial alternative evaluation.

The HHRA conducted as part of the RI concluded that there are potentially unacceptable risks to current and future human receptors from potable use of shallow groundwater and inhalation of indoor air impacted by shallow groundwater vapors. The unacceptable risks are associated with chlorinated VOCs in shallow groundwater. The HHRA also identified potential human health risks from exposure to arsenic and vanadium in deep groundwater; however, because arsenic and vanadium were not detected in the shallow aquifer in the area and the Yorktown confining unit appears to be competent in the area, it was concluded that the deep groundwater has not been impacted by Site 21 activities and requires NFA. An ERA was not conducted in the RI based on the recommendations of ERSs conducted during the SSA and SI. The ERSs concluded that Site 21 provides little terrestrial habitat; no aquatic habitat for potential ecological receptors; and based on the transport distance before discharging to surface water, and the potential for mixing and dilution, a minimal potential for adverse effects to aquatic life from the presence of TCE in groundwater. Therefore, no further ecological risk evaluation was required.

The RI recommended an FS to evaluate potential remedial alternatives to mitigate unacceptable human health risks from the site-related contaminants, chlorinated VOCs, in shallow groundwater. Because of uncertainties with the potential risk identified from inhalation of VOCs from vapor intrusion into buildings located within the site, the RI also recommended further evaluation of the potential vapor intrusion pathway.

Feasibility Study—2009 (CH2M HILL, 2009c)

Based on the findings of the RI, an FS was conducted to identify and analyze remedial alternatives to mitigate potential risks associated with shallow groundwater. The following four alternatives were identified, evaluated, and ranked: No Action, MNA, *In Situ* Chemical Reduction (ISCR) and ERD, and *In Situ* Chemical Oxidation and ERD. All alternatives (except Alternative 1) are expected to achieve NCP criteria. No recommendations were made as to which alternative was preferred.

Interim Proposed Plan and Record of Decision—2009 to 2010 (CH2M HILL, 2009d; NAVFAC, 2010)

The draft Interim PP identified the preferred RA alternative for addressing the chlorinated VOC plume in shallow groundwater as ISCR and ERD. A public notice of the availability of the Interim PP for review and a meeting to present it to the public was issued on July 18, 2009. The Navy provided a public comment period from August 1 through September 14, 2009. The public meeting was held on August 11, 2009, at the Major Hillard Library. No significant changes were made to the preferred Interim RA alternative identified in the

Interim PP as a result of the public meeting and comment period. The Interim ROD documenting the selected interim remedy to address the potable use of shallow groundwater was signed in May 2010. The PP and ROD were “interim” because they did not address the potential unacceptable risk to current and future building occupants from vapor intrusion through inhalation of indoor air, which was still being evaluated.

Remedial Investigation and Feasibility Study Addendum—2009 to 2010 (CH2M HILL, 2010g)

A vapor intrusion investigation was conducted in two phases in 2009 to evaluate the potential for the migration of the chlorinated VOCs in groundwater into the indoor air of overlying occupied buildings and to assess current and future potential risk to building occupants from potential vapor intrusion, as recommended in the RI report. The investigation included the collection and analysis of subslab vapor, indoor air, and outdoor air samples. The report recommended additional vapor intrusion monitoring and LUCs to maintain the current industrial building use and prevent activities that would compromise the integrity of the building foundations throughout the Interim RA; and discontinuation of the monitoring and LUCs upon completion of the Interim RA for groundwater.

Interim Remedial Design/Remedial Action—2009 to 2011 (CH2M HILL, 2010h)

The Interim RD for the Interim RA to achieve the RAOs through remediation of shallow groundwater at Site 21 was completed in May 2010. The Interim RA construction was initiated in November 2010 and completed in September 2011. Because no risk from vapor intrusion was identified in the RI and FS Addendum, the Interim RA will not change and will serve as the final RA and a final RD will not be necessary. The RD for LUCs is currently under review.

Proposed Plan and Record of Decision—2011 (Ongoing) (CH2M HILL, 2011b; NAVFAC, 2011c)

The draft PP identifies the final site preferred alternative for Site 21 as ISCR and ERD. A public notice of the availability of the PP for review and a meeting to present it to the public was issued on April 30, 2011. The Navy provided a public comment period from May 1 through June 15, 2011. The public meeting to present the PP for Site 21 was held on May 12, 2011, at the Major Hillard Library. No significant changes were made to the preferred RA alternative identified in the PP as a result of the public meeting and comment period. The ROD documenting the final site selected remedy to address the potable use of shallow groundwater is currently under review and signature is expected in FY 2011.

Remedial Action-Operation—2011 to To-Be-Determined (Ongoing)

The RA-operation was initiated in September 2011 and is currently ongoing. The RA-operation includes groundwater monitoring to evaluate remedy effectiveness and vapor intrusion monitoring to evaluate whether the RA or building deterioration have resulted in potential unacceptable inhalation risks or explosive hazards. LUCs to prevent unacceptable exposure and control changes in site use will be maintained until the RAOs have been met.

Future activities at Site 21 consist of:

- IRACR
- RA operation continuation
- CERCLA Five-Year Site Remedy Review
- RACR

3.4 Response Complete/Remedy-in-Place Sites

3.4.1 IRP Site 4—Landfill D

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. The site is located on dredge fill material that reportedly originated from Blows Creek and the Southern Branch of the Elizabeth River. In earlier documents, Site 4 was referred to as Dump D or SWMU 6, 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. Disposal included primarily trash and wet garbage. Sanitary landfill operations continued until 1976, at which time trash and garbage were hauled to an offsite facility and inert construction material was then disposed of at the landfill. The RFA indicates that refuse disposal continued 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 PCBs 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 yd³. Sample results from the RI do not indicate the presence of chlorinated solvents or hazardous materials in soil or groundwater at Site 4. Based on the findings of the RI and historic disposal dates, Site 4 does not require closure as a hazardous waste landfill.

Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment—1997 through 2003 (CH2M HILL, 2003)

The RI field activities at Site 4 began in 1997 and continued through 2003. Activities included a geophysical investigation; monitoring well installation; water level monitoring; and the collection and analysis of surface and subsurface soil samples, groundwater samples, sediment samples, and surface water samples. Based on a review of historical aerial photographs and site reconnaissance, it was determined that the extent of waste was greater than previously reported, extending west from the original site boundary. Therefore, the Site 4 boundary was adjusted to reflect the extent of waste.

The HHRA and ERA conducted as part of the RI concluded that there were potentially unacceptable risks to human and ecological receptors from exposure to chemicals in soil (primarily inorganics and PAHs) and elevated mercury concentrations in the adjacent drainage ditch. Because surface water is transient and the upland ditches provide minimal ecological habitat, there were no significant risks 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 ERP 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.

The RI recommended an FS be prepared to evaluate remedial alternatives to mitigate unacceptable risks from soil, waste, and sediment at Site 4 and eliminate concern for continued transport of potential contaminants to Blows Creek via the site-related drainage ditches.

Feasibility Study—2004 (CH2M HILL, 2004c)

As part of the FS for Site 4, remedial alternatives were evaluated to minimize contact between human and ecological receptors and landfill contents, reduce infiltration and leaching of contaminants from the landfill to the groundwater, and prevent surface water run-on and control surface water runoff and erosion. The remedial alternatives evaluated were no action, soil cover, RCRA Subtitle D Cap, and excavation and offsite disposal. Based on the comparative analysis, the preferred alternative recommended for Site 4 consisted of a soil cover with removal of wetland debris, removal of the eastern drainage ditch, and LUCs.

Proposed Plan and Record of Decision—2004 (CH2M HILL, 2004d; NAVFAC, 2004)

The PP for Site 4 identified the preferred alternative for addressing potential contamination at Site 4. A public notice of availability of the PP for review and a meeting to present it to the public was issued on April 29, 2004. The Navy provided a public comment period from May 12 through June 12, 2004. The public meeting was held on May 17, 2004, at the Major Hillard Library. No significant changes were made to the preferred RA alternative identified in the PP as a result of the public meeting and comment period. The ROD documenting the selected remedy - soil cover with removal of wetland debris, removal of the eastern drainage ditch, and LUCs - was signed in September 2004.

Remedial Design/Remedial Action—2004 through 2006 (JVI, 2004; JV I, 2005; NAVFAC, 2006a, NAVFAC, 2006b)

The RD for the soil cover and drainage ditch components of the selected remedy was completed in November 2004. The RA was conducted from March through October 2005 and is documented in the Final Construction Closeout Report (JV 1, 2005). The RD for LUCs was completed in June 2006. The RACR was prepared in 2006 to document the completion of the RA and demonstrate that the RAOs identified in the ROD have been met to achieve RC in accordance with CERCLA.

Annual visual soil cover and LUC inspections are conducted to ensure the effectiveness of the cover is maintained. The LUCs are detailed on Table 3-3. Additionally, because waste will remain onsite above levels that allow for UU/UE, LUCs will be maintained at the site, and CERCLA Five-Year Site Remedy Reviews will be conducted.

Voluntary Groundwater Performance Monitoring—2009 (CH2M HILL, 2009e)

The SJCA ERP Partnering Team agreed to conduct voluntary post-ROD groundwater monitoring at Site 4 to evaluate the site's impact on groundwater quality to confirm no potential future releases will pose unacceptable risk. The groundwater monitoring was conducted quarterly between November 2006 and August 2008.

Four monitoring wells (three downgradient and one upgradient) were monitored for total and dissolved arsenic, cadmium, iron, lead, and thallium. 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 are below the background upper-tolerance limit. 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 in downgradient monitoring well SJS04-MW04S were somewhat greater than the historical (1997 and 1999) concentrations. Therefore, additional voluntary groundwater monitoring in association with the Five-Year Review was recommended to further evaluate the site conditions. Additionally, yearly inspections will continue to be conducted to confirm the soil cover is adequately maintained and LUCs will continue to be enforced.

Five-Year Review—2010 (CH2M HILL, 2010c)

A Five-Year Review was conducted 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. The evaluation was accomplished through a review of various documents pertaining to site activities, analytical data, and findings; and through a site inspection and community interviews. The evaluation included a review of the additional round of voluntary groundwater performance monitoring recommended in the Voluntary Groundwater Performance Monitoring Report. A public notice informing the community of the initiation of the Five-Year Review was published on July 11, 2009. The results of the Five-Year Review indicate that the remedy at Site 4 remains protective of human health and the environment; the report was signed in May 2010.

Future activities at Site 4 consist of:

- Annual visual soil cover and LUC inspections
- CERCLA Five-Year Site Remedy Review, including additional groundwater monitoring for arsenic

TABLE 3-1
 Site Status Summary Table
 Site Management Plan (FY 2012 - 2016)
 St. Juliens Creek Annex
 Chesapeake, Virginia

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure
Munitions Response Program Sites					
Area UXO 1	Wharf Area Sediments	Residual Ordnance at wharf area; RFA: AOC 1; Site 20	PA/SI	PA completed June 2009 and SI completed September 2010. Anomaly investigation planning currently ongoing; investigation expected in FY 2012.	
Installation Restoration Program Sites					
Site 5	Burning Grounds	RFA: SWMU 8; EPA: OU-5	EE/CA/Removal Action	Final RI completed March 2003; Final Expanded RI Report completed June 2006 recommending additional groundwater sampling; Final EE/CA for non-time-critical removal action of Waste/Burnt Soil Area submitted February 2007. Final Expanded RI addendum recommending NFA for groundwater submitted December 2007. Removal action began December 2007 and is currently ongoing due to a delay resulting from munitions and explosives of concern discovery; expected to be completed FY 2012.	
Site 2	Waste Disposal Area B	Dump B; Dump B Incinerator; Dump B Blast Grit; RFA: SWMU 2, SWMU 3, SWMU 4; EPA: OU-2, Landfill B	RD/RA	Final Site 2 RI completed February 2004, Final Expanded RI completed November 2008, and Final Expanded RI revised January 2010. Final FS completed October 2009 and Final FS revised January 2010. PP completed July 2010 and ROD signed January 2011. RD currently ongoing; expected to be finalized in FY 2012. RA planning currently ongoing; RA initiation expected in FY 2012.	Final ROD (signed January 2011).
Site 21	Industrial Area	FFA: Site Staining at Building 187; EPA: OU-12, Site 21 - Bldg 187	RD/RA	Final SI submitted in June 2004; Draft Supplemental SI Report submitted April 2006; RI finalized July 2008. Final FS completed February 2009. Interim PP completed July 2009 and Interim ROD signed May 2010. RD completed May 2010. RI and FS Addendum completed October 2010. Interim RA initiated November 2010 and is currently ongoing. PP completed in May 2011. ROD currently ongoing; expected to be signed in FY 2011.	
Site 4	Landfill D	Dump D; Old Tanks at Dump D; RFA: SWMU 6, AOC L; EPA: OU-4	RC - 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; RA Completion Report signed October 2006. LUCs implemented, site inspections continuing annually. First five-year review conducted FY 2010.	Final ROD (signed September 2004).
Site 1	Waste Disposal Area A	Dump A; RFA: SWMU 1	Response Complete - NFA	Consensus for NFA by Navy, VDEQ, and EPA in November 2002 based on RRR data and September 2002 test pit information.	SSA Addendum (signed July 2004).
Site 3	Waste Disposal Area C	Dump C; Dump C Waste Disposal Pits; RFA: SWMU 5, SWMU 30; EPA: OU-3, Landfill C	Response Complete - 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; PP 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; EPA: OU-4, Landfill D	Response Complete - 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; FFA: Caged Pit at the Burning Grounds; EPA: OU-8, Caged Pit Disposal	Response Complete - 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; PP 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	Response Complete - 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.	FFA (signed July 2004).
Site 8	Cross and Mine	RFA: SWMU 9; FFA: PSA Site 8	Response Complete - 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.	SI (signed July 2004).
Site 9	Pest. Control Bldg. 249	PA: SWMU 13	Response Complete - NFA	Removed/remediated during construction of the SIMA building (currently referred to as the Fleet and Industrial Supply Center [FISC], Norfolk Integrated Logistics Support building).	FFA (signed July 2004)
Site 9	Oil Water Separator at Bldg. 249	RFA: SWMU 23	Response Complete - NFA	Removed/remediated during construction of the SIMA building (currently referred to as the FISC, Norfolk Integrated Logistics Support building).	FFA (signed July 2004)
Site 9	Washrack Bldg. 249	RFA: SWMU 25	Response Complete - NFA	Removed/remediated during construction of the SIMA building (currently referred to as the FISC, Norfolk Integrated Logistics Support building).	FFA (signed July 2004)
Site 10	Waste Disposal at Railroad Tracks	Hazardous Waste Disposal Area at Bldg. 13 (Railroad Tracks); RFA: SWMU 14	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).

TABLE 3-1
 Site Status Summary Table
 Site Management Plan (FY 2012 - 2016)
 St. Juliens Creek Annex
 Chesapeake, Virginia

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure
Site 10	Swale beneath Bldg. 13	RFA: SWMU 31	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
Site 11	Waste Disposal at Building 53 (formerly referenced to Bldg. 266)	RFA: SWMU 15	Response Complete - 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.	SSA (signed February 2002).
Site 12	Sand Blast Area Bldg. 323	RFA: SWMU 16	Response Complete - NFA	Removed/remediated during construction of the SIMA building (currently referred to as the FISC, Norfolk Integrated Logistics Support building).	FFA (signed July 2004)
Site 13	Waste Generation Area	RFA: SWMU 20	Response Complete - NFA	Removed/remediated during construction of the SIMA building (currently referred to as the FISC, Norfolk Integrated Logistics Support building).	FFA (signed July 2004)
Site 14	Washrack Bldg. 266	None	Response Complete - NFA	Removed/remediated during construction of the SIMA building (currently referred to as the FISC, Norfolk Integrated Logistics Support building).	FFA (signed July 2004)
Site 15	Fire Training Area	Fire Training Area at Bldg. 271; RFA - SWMU 27	Response Complete - NFA	Consensus by Navy, VDEQ, and EPA in July 2002 for NFA under CERCLA, as the site was to be investigated under the Navy's Underground Storage Tank (UST) Program. The site is currently managed under the Navy's Petroleum, Oil, and Lubricant Program.	FFA (signed July 2004).
Site 16	DRMO Storage/Salvage Yard	RFA: SWMU 28	Response Complete - 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.	FFA (signed July 2004).
Site 17	Storage Pad at Building 279	Satellite storage at Bldg. 279; RFA: AOC A	Response Complete - 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. Final expanded SI submitted in September 2001. 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.	FFA (signed July 2004).
Site 18	Blasting Grit at Building 47	RFA: AOC C	Response Complete - 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.	SSA (signed February 2002).
Site 18	Air Compressor at Bldg. 47	RFA: AOC B	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA in July 2002. Regional inspections are conducted for storm water management.	FFA (signed July 2004).
Site 19	Building 190	Residual Ordnance at Bldg. M-5 & 190; RFA: AOC H; FFA: Wharf Area Building 190; EPA: OU-7, Site 19 - Bldg 190 EE/CA	Response Complete - 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.	Site Closeout Report (signed December 2006).
Site 20	Wharf Area Sediments	Residual Ordnance at wharf area; RFA: AOC I; Site 20	Response Complete - NFA	During the July 2001 site visit, the Navy, VDEQ and EPA reached consensus for NFA under CERCLA, as the site was to be managed under the MR Program. The site is currently managed under the MR Program as part of Area UXO 1.	SSA (signed February 2002).
SWMU 10	Hazardous Waste Container Storage Bldg. 154Y	None	Response Complete - 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. SWMU 10 has been closed under RCRA.	FFA (signed July 2004).
SWMU 11	Hazardous Waste Container Storage Bldg. 163Y	None	Response Complete - 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 was managed under RCRA. SWMU 11 has been closed under RCRA.	FFA (signed July 2004).
SWMU 12	PCB Storage Bldg. 198	None	Response Complete - NFA	Recommended for NFA in the RFA. SWMU 12 was used as a storage facility and managed under Toxic Substances Control Act therefore, consensus by Navy, VDEQ, and EPA for NFA under CERCLA in July 2002. PCBs are no longer stored at SWMU 12 and SWMU 12 has been closed under TSCA.	FFA (signed July 2004).
SWMU 18	Old Storage Yard # 2	None	Response Complete - 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 (signed July 2004).
SWMU 19	Old Storage Yard # 3	None	Response Complete - 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 (signed July 2004).
SWMU 21	Hazardous Waste Accumulation Area (SIMA # 2)	None	Response Complete - NFA	The RFA recommended NFA as the SWMU was managed under RCRA. A site visit was performed in November 2002 by Navy, VDEQ, and EPA to confirm status and consensus for NFA under CERCLA was reached, as the SWMU was remediated during a removal action conducted as part of the SIMA building (currently referred to as the FISC, Norfolk Integrated Logistics Support building) construction. The Navy submitted a closure notification letter to VDEQ for SWMU 21.	FFA (signed July 2004).
SWMU 22	Repair Shop Satellite Storage Area NE of Bldg. 40	None	Response Complete - NFA	The RFA recommended NFA as the SWMU was managed under a VDEQ program. 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.	FFA (signed July 2004).
SWMU 26	Scrap Metal Storage in Railroad Cars near Bldg. 176	None	Response Complete - NFA	Based on a site visit in November 2002, NFA consensus was reached by Navy, VDEQ, and EPA, as the SWMU was managed according to Virginia Solid Waste Management regulations. SWMU 26 is no longer present.	FFA (signed July 2004).

TABLE 3-1
 Site Status Summary Table
 Site Management Plan (FY 2012 - 2016)
 St. Juliens Creek Annex
 Chesapeake, Virginia

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure
SWMU 29	Dumpsters (throughout the facility)	None	Response Complete - NFA	Based on a site visit in November 2002, NFA consensus was reached by Navy, VDEQ, and EPA, as the SWMU is managed according to Virginia Solid Waste Management regulations.	FFA (signed July 2004).
SWMU 32	Overland Drainage Ditches	None	Response Complete - 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 (signed July 2004).
SWMU 33	Sewer Drainage System	None	Response Complete - 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 (signed July 2004).
SWMU 34	Operational Waste Accumulation Areas	None	Response Complete - 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 (signed July 2004).
AOC D	Storm Water Outfalls	None	Response Complete - 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 (signed July 2004).
AOC E	Temporary Pump Storage	None	Response Complete - NFA	AOC E was remediated during a removal action conducted as part of the SIMA building (currently referred to as the FISC, Norfolk Integrated Logistics Support building) construction. Therefore, the SJCA Partnering Team reached consensus for NFA for AOC E based on the removal action.	FFA (signed July 2004).
AOC F	Underground Storage Tanks	None	Response Complete - NFA	Navy, VDEQ, and EPA reached consensus for NFA under CERCLA in July 2002, as AOC F was managed under the Navy's UST Program. The USTs have been closed under the Navy's UST Program.	FFA (signed July 2004).
AOC G	Former Process Buildings	None	Response Complete - 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.	FFA (signed July 2004).
AOC J	Former Ammunition Manufacturing Areas	None	Response Complete - 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 (signed July 2004).
AOC K	Former Sewage Treatment Plant	FFA: SSA AOC K	Response Complete - 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.	SSA Addendum (signed July 2004).
EPIC AOC 1	E Street and Marsh Road Ground Scarring	AOC 1; FFA: PSA AOC 1	Response Complete - 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.	SI (signed July 2004).
EPIC AOC 2	Piers in front of Building 83	AOC 2	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 3	Ground Scarring at Building M5	AOC 3	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 4	Parking Area South of Building M-1	AOC 4	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 5	Possible Soil Staining Between Buildings 87 and 88	AOC 5	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 6	Ground Scarring East of Site 2	AOC 6	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 7	City of Portsmouth Outgrant Area	AOC 7	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 8	Possible Waste Disposal/Bulk Storage Area	AOC 8	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 9	Ground Scarring Southwest of Building 75	AOC 9	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 10	Ground Scarring in Wharf Area	AOC 10	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 11	Open Storage Area Northeast of Building 55	AOC 11	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).

TABLE 3-1

Site Status Summary Table
 Site Management Plan (FY 2012 - 2016)
 St. Juliens Creek Annex
 Chesapeake, Virginia

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure
EPIC AOC 12	Sandy Flat	AOC 12	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
AOC 13	Pentachlorophenol Dip Tank	AOC 13; FFA: SSA AOC 13	Response Complete - 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.	SSA Addendum (signed July 2004).
AOC 14	Building 89	AOC 14; FFA: SSA AOC 14	Response Complete - 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.	SSA Addendum (signed July 2004).

- RFA - RCRA Facility Assessment
- AOC - Area of Concern
- CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
- DRMO - Defense Reutilization and Marketing Office
- EE/CA - Engineering Evaluation and Cost Analysis
- EPA - Environmental Protection Agency
- EPIC - Environmental Photographic Interpretation Center
- FFA - Federal Facility Agreement
- FISC - Fleet and Industrial Supply Center
- FS - Feasibility Study
- FY - Fiscal Year
- LUC - land use control
- NFA - no further action
- OU - Operable Unit
- PA - Preliminary Assessment
- PP - Proposed Plan
- PSA - Preliminary Screening Area
- RA - Remedial Action
- RC - Response Complete
- RCRA - Resource Conservation and Recovery Act
- RD - Remedial Design
- RI - Remedial Investigation
- ROD - Record of Decision
- SI - Site Inspection
- SIMA - Shore Intermediate Maintenance Activity
- SJCA - St. Juliens Creek Annex
- SSA - Site Screening Assessment
- SWMU - Solid Waste Management Unit
- UST - underground storage tank
- VDEQ - Virginia Department of Environmental Quality

TABLE 3-2

Completed or Ongoing Environmental Studies, Investigations, and
 Actions at Active Environmental Restoration Program Sites
 Site Management Plan (Fiscal Years 2012 - 2016)
 St. Juliens Creek Annex
 Chesapeake, Virginia

ERP Site	Preliminary Studies			Preliminary Investigations	RI	FS	EE/CA	Removal Actions	PP/ROD	RD/RA
	IAS (1981)	PA (1983)	RFA (1989)							
PA/SI Sites										
MRP Area UXO 1	X		X	RRR - 1996 (IR Site 20) PA - 2009 SI - 2010 (Addendum ongoing)						
EE/CA/Removal Action Sites										
IRP Site 5	X		X	RRR - 1996	RI - 2003 Expanded RI - 2006 Expanded RI Addendum - 2007	N/A	2007	2007 to Present		N/A
RD/RA Sites										
IRP Site 2	X	X	X	RRR - 1996	RI - 2003 Expanded RI - 2008 Revised Expanded RI - 2010	2009 Revised FS - 2010	N/A	N/A	PP - 2010 ROD - 2011	LUC RD - 2011 RD - 2011 to Present
IRP Site 21	X		X	RRR - 1996 SSA - 2002 SI - 2004 Supplemental SI - 2006	2008	2009	N/A	N/A	Interim PP - 2009 Interim ROD - 2010 PP - 2011 ROD - 2011	RD - 2010 RA Construction - 2011 LUC RD - 2011
RC - LUC Sites										
IRP Site 4	X	X	X	RRR - 1996	2003	2004	N/A	N/A	2004	RD - 2004 RA - 2005 LUC RD - 2006

EE/CA - Engineering Evaluation/Cost Analysis
 ERP - Environmental Restoration Program
 FS - Feasibility Study
 IAS - Initial Assessment Study
 IRP - Installation Restoration Program
 LUC - Land Use Controls
 MRP - Munitions Response Program
 N/A - not applicable
 PA - Preliminary Assessment
 PP - Proposed Plan
 RA - Remedial Action
 RC - Response Complete
 RD - Remedial Design
 RFA - RCRA Facility Assessment
 RI - Remedial Investigation
 ROD - Record of Decision
 RRR - Relative Risk Ranking
 SI - Site Inspection
 SSA - Site Screening Assessment

TABLE 3-3

Land Use Controls

Site Management Plan (FY 2012 - 2016)

St. Juliens Creek Annex

Chesapeake, Virginia

Environmental Restoration Program Site	Site Name	Date of Final ROD	Location on SJCA	Estimated Area	LUC Objectives	LUC Implementation and Maintenance Actions
IRP Site 4	Landfill D	09/29/2004	Northeast portion of SJCA. North of Blows Creek at its confluence with the Southern Branch of the Elizabeth River.	8.32 acres	1) Prohibit digging into or disturbing the existing soil cover or contents of the landfill 2) Prohibit residential development on the site	<ul style="list-style-type: none"> ●5-year site remedy reviews ●Annual visual inspections of the soil cover ●Survey plat registered in the Commonwealth of Virginia ●Maintain posted signs ●Maintain a Regional Shore Infrastructure Plan or similar document that incorporates LUC objectives ●Notification to EPA and the Commonwealth of Virginia of any SJCA proposals for a major land use change at a site inconsistent with the use restrictions and exposure assumptions described in the ROD ●Notification to EPA and the Commonwealth of Virginia prior to any changes in the risk, remedy, or land use; including any LUC failures with proposed corrective action ●Obtain EPA and the Commonwealth of Virginia concurrence prior to modifying or terminating the LUC objectives or implementation actions ●Maintain a comprehensive list of LUCs with associated boundaries and expected durations at Environmental Restoration Program office

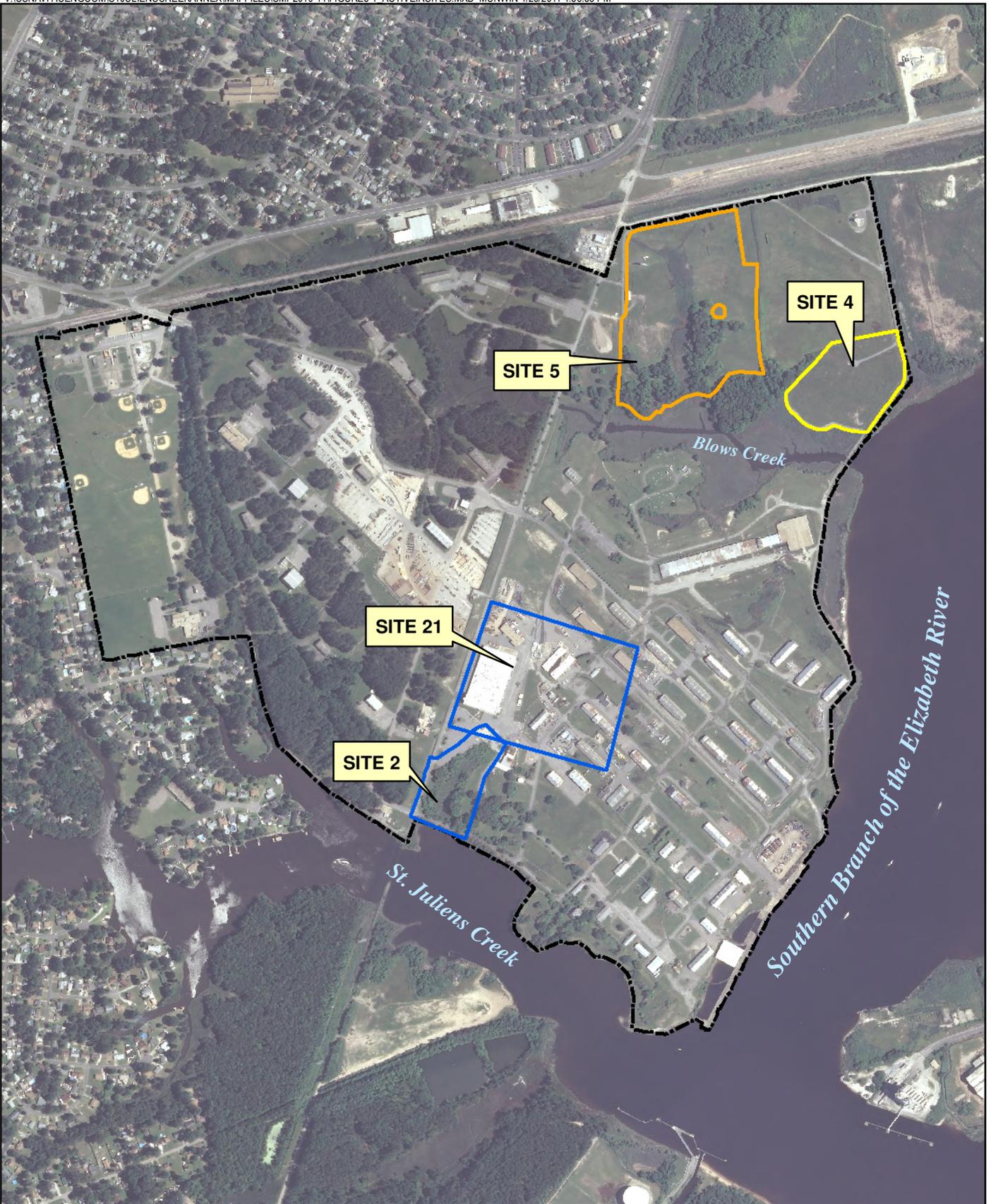
EPA - Environmental Protection Agency

IRP - Installation Restoration Program

LUC - land use control

ROD - Record of Decision

SJCA - St. Juliens Creek Annex



Legend

-  SJCA Boundary
-  Response Complete - Sites with LUCs
-  EE/CA/Removal Action Sites
-  RD/RA Sites

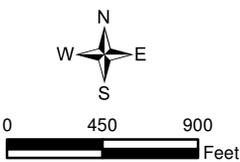
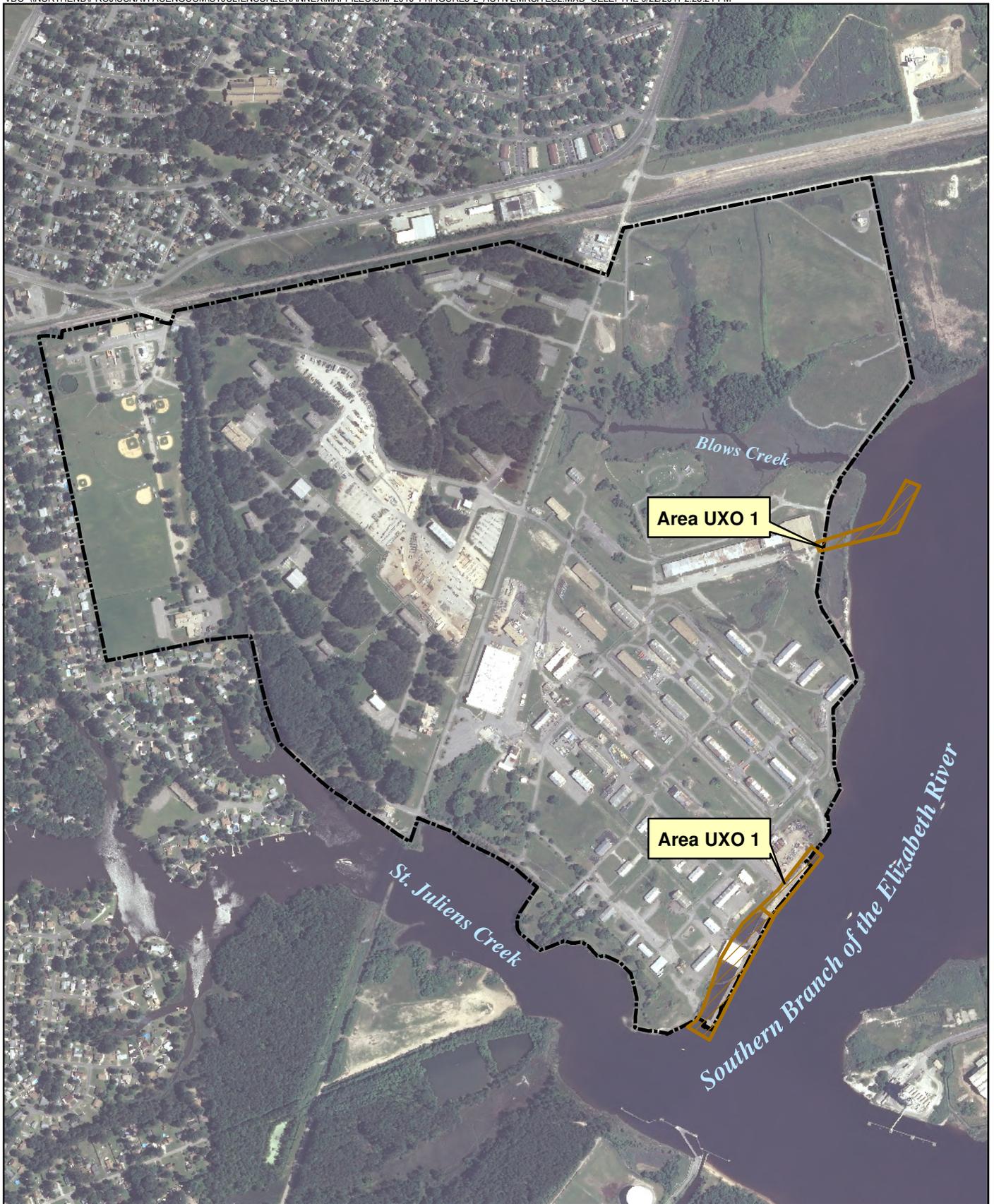


Figure 3-1
Location of Active IRP Sites
St. Juliens Creek Annex
Chesapeake, Virginia



Legend

 SJCA Boundary

 PA/SI Sites

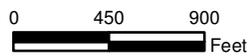
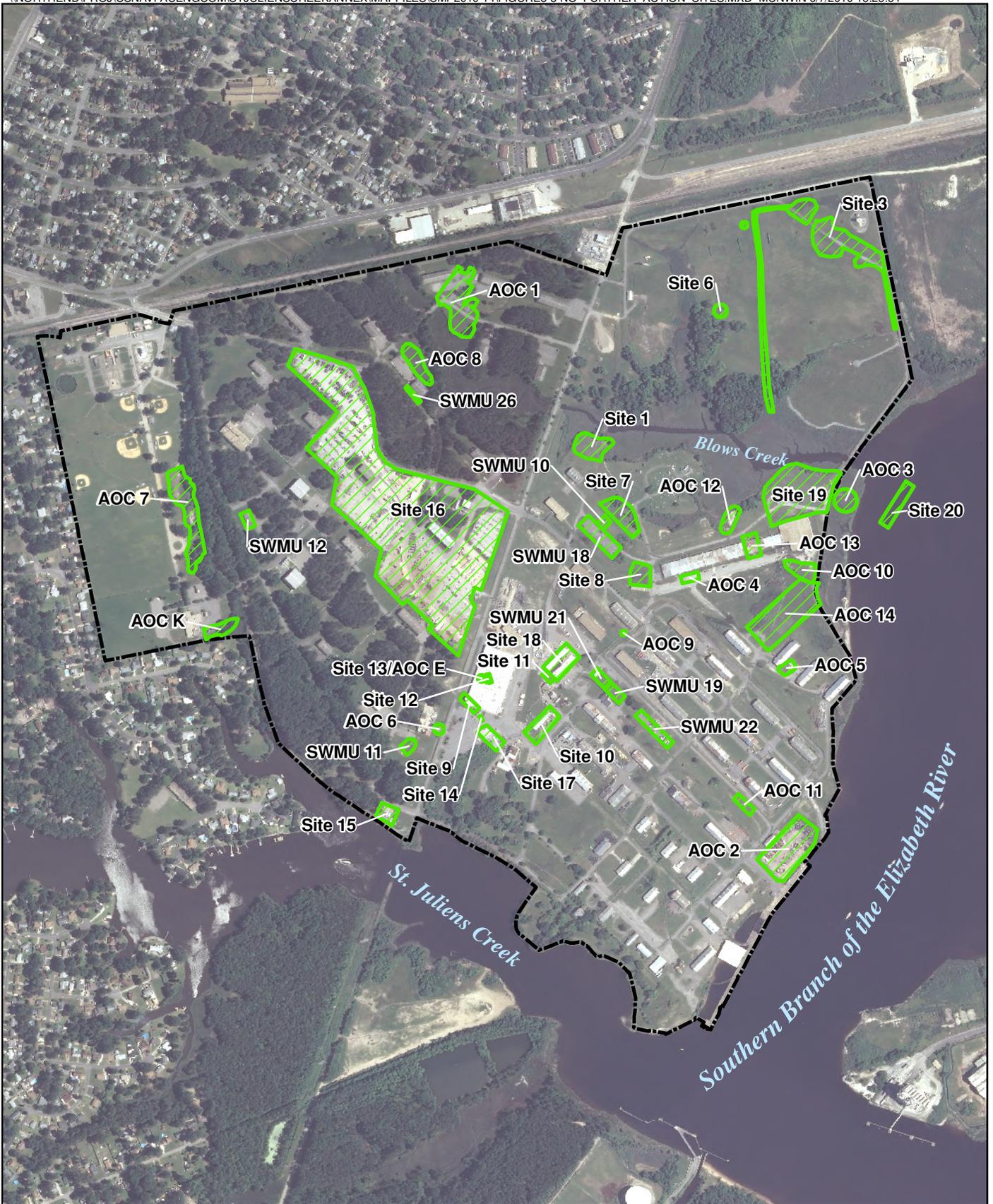


Figure 3-2
Location of Active MRP Sites
St. Juliens Creek Annex
Chesapeake, Virginia



Legend

- SJCA Boundary
- Response Complete - NFA Sites

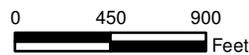


Figure 3-3
Location of NFA Sites, SWMUs, and AOCs
St. Juliens Creek Annex
Chesapeake, Virginia

**Figure 3-4
Schedule of ERP Activities for FYs 2012 through 2016
Site Management Plan
St. Juliens Creek Annex**

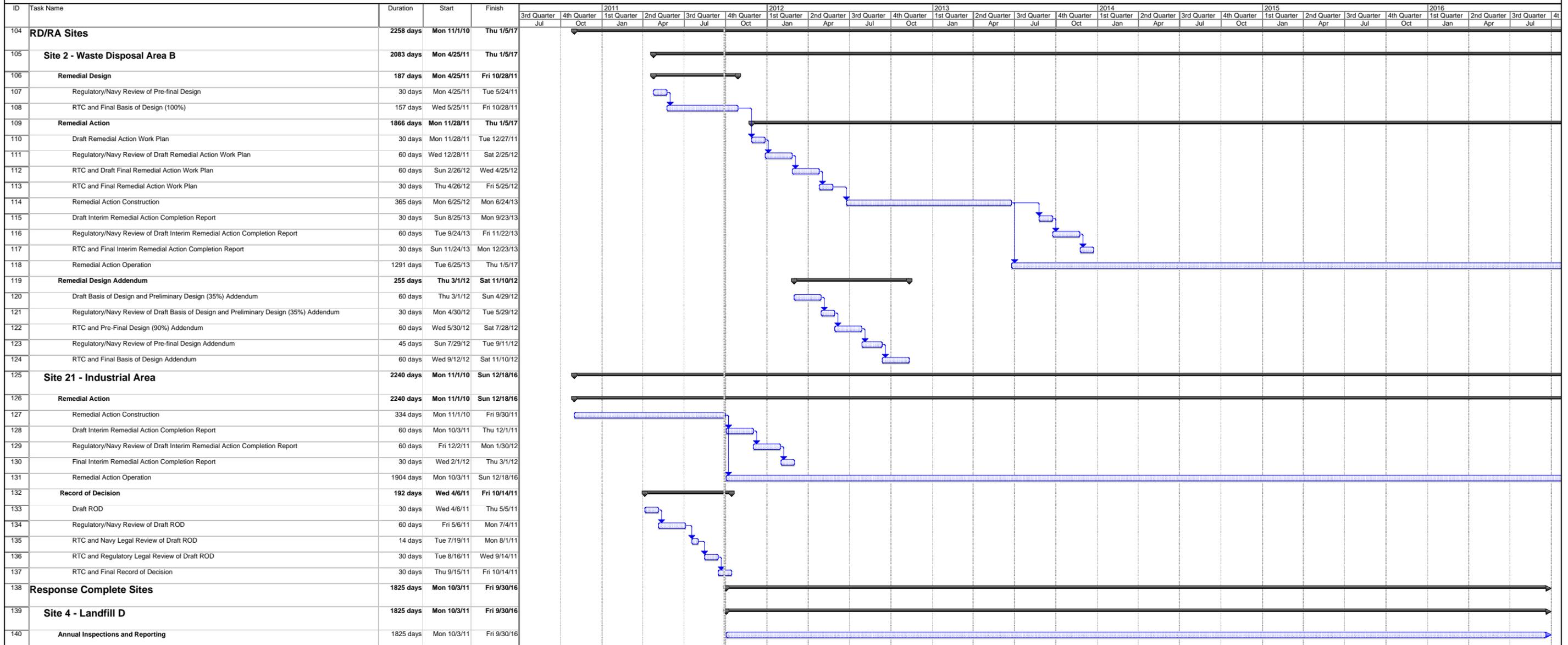


Date: Tue 9/27/11

Task Progress Summary External Tasks External Milestone Deadline
 Split Milestone Project Summary External Milestone External Milestone

Note: The review and submittal dates are based on the FFA Process Flow Charts or dates previously agreed upon and assume informal dispute resolution of Draft Final documents within a reasonable number of days.

**Figure 3-4
Schedule of ERP Activities for FYs 2012 through 2016
Site Management Plan
St. Juliens Creek Annex**

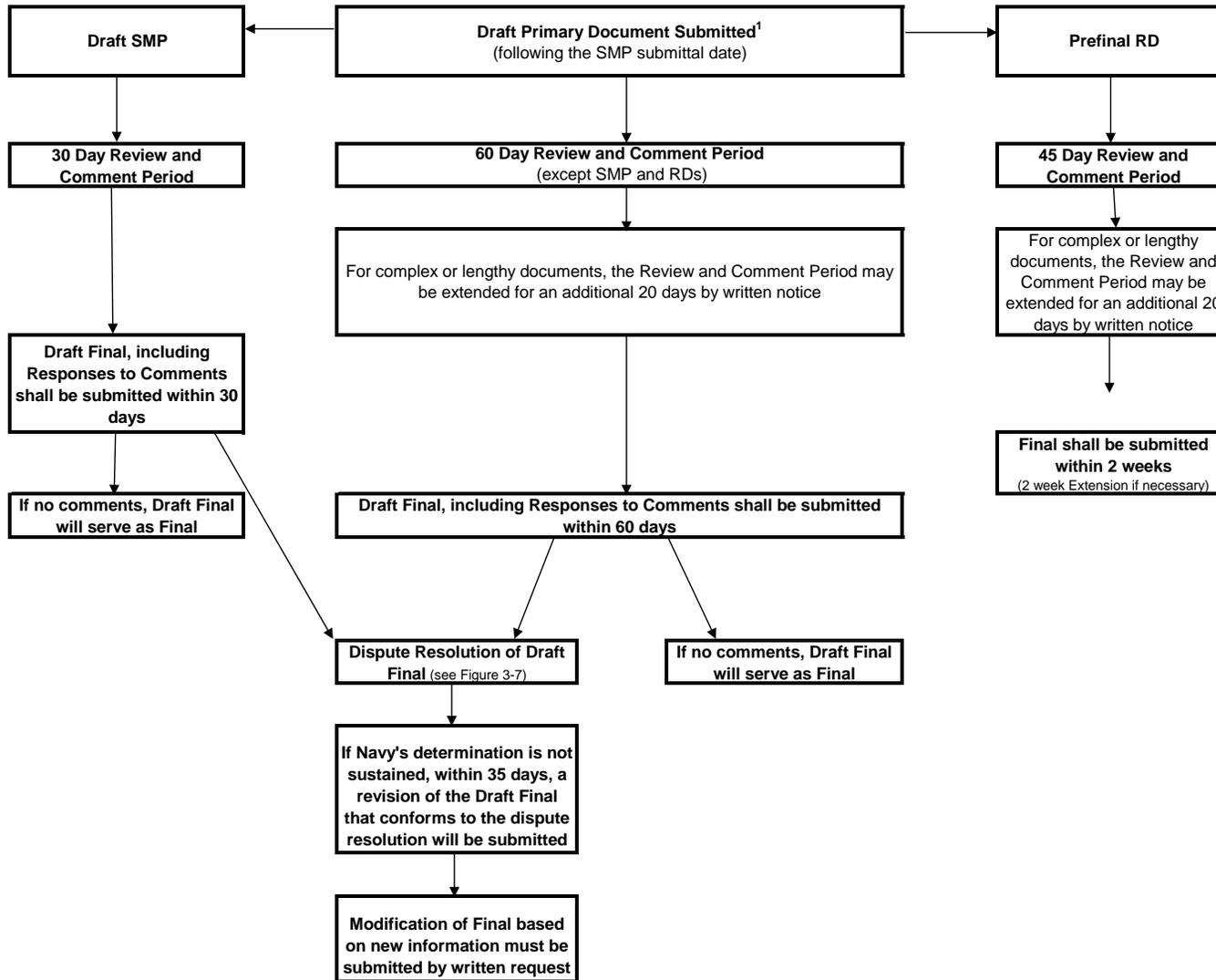


Date: Tue 9/27/11

Task		Progress		Summary		External Tasks		External Milestone		Deadline	
Split		Milestone		Project Summary		External Milestone		External Milestone			

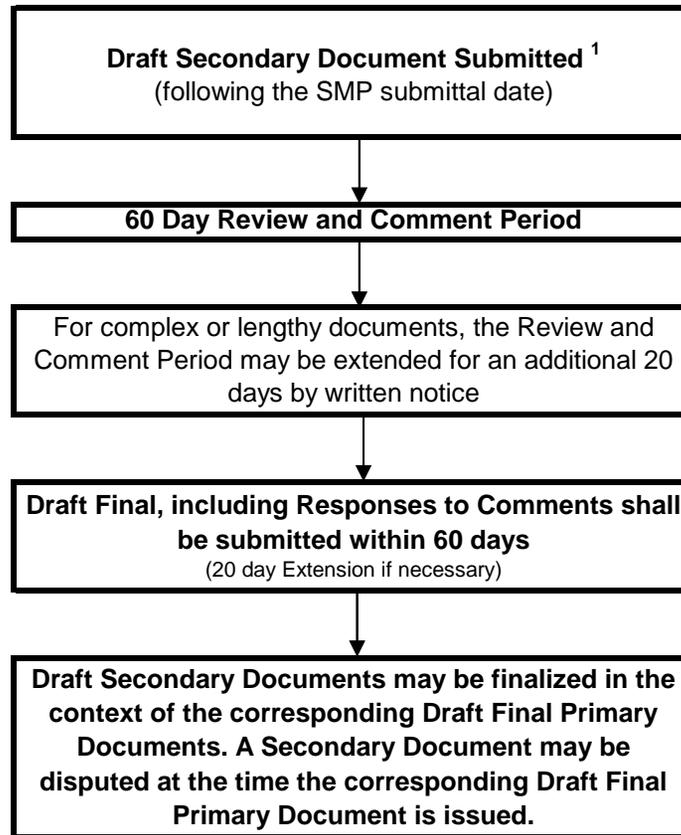
Note: The review and submittal dates are based on the FFA Process Flow Charts or dates previously agreed upon and assume informal dispute resolution of Draft Final documents within a reasonable number of days.

**Figure 3-5
Primary Document Submittal Flow Chart
FFA Process
St. Juliens Creek Annex
Chesapeake, Virginia**



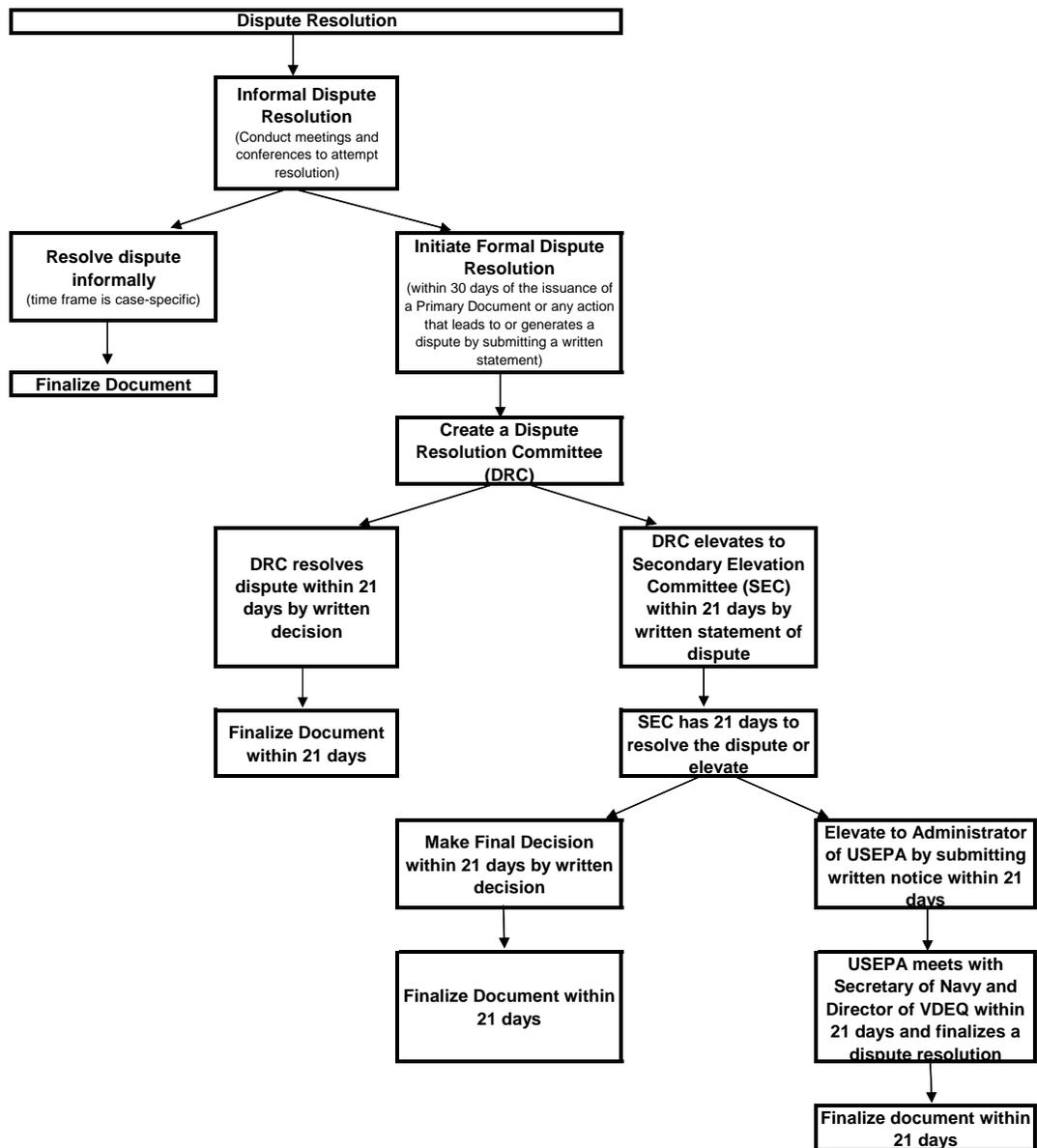
¹SJCA Primary Documents Include: Remedial Investigation (RI)/Feasibility Study (FS)/Focused Feasibility Study (FFS) Work Plans, RI Reports, FS and FFS Reports, Proposed Plans (PPs), Records of Decision (RODs), Final Remedial Designs (RDs), Remedial Action Work Plans, Remedial Action Completion Reports (RACRs), and Site Management Plans (SMPs)

**Figure 3-6
Secondary Document Submittal Flow Chart
FFA Process
St. Juliens Creek Annex
Chesapeake, Virginia**



¹SJCA Secondary Documents Include: Health and Safety Plans (HSPs), Non-Time-Critical Removal Action (NTCRA) Plans, Pilot/Treatability Study Work Plans and Reports, Engineering Evaluation/Cost Analysis (EE/CA) Reports, Well Closure Methods and Procedures, Preliminary/Conceptual Designs or equivalents, Prefinal Remedial Designs (RDs), Periodic Reviews/5-Year Review Assessment Reports, Removal Action Memorandums, Preliminary Closeout Reports (PCORs)/Final Closeout Reports (FCORs)

**Figure 3-7
Dispute Resolution Flow Chart
FFA Process
St. Juliens Creek Annex
Chesapeake, Virginia**



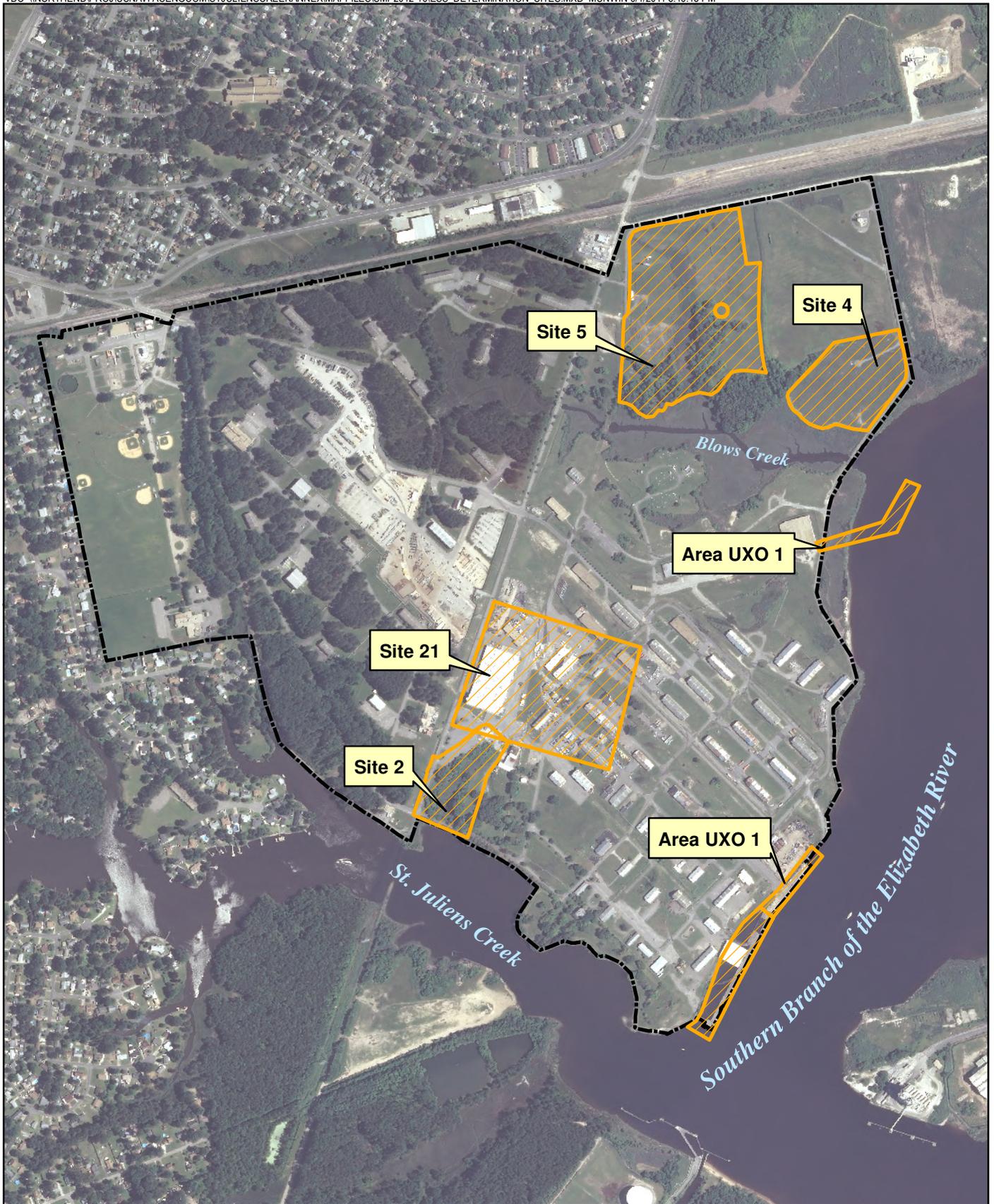
SECTION 4

Navy Land Use Planning

The SJCA ERP has developed a geographical information system (GIS) that identifies areas of past or present environmental concern and environmentally sensitive areas. The attached compact disc (CD) provides maps and GIS layers in Arcview® for the active IRP and MRP sites; NFA ERP sites; ERP sites with LUCs; groundwater plume configurations for ERP sites; petroleum, oil, and lubricant (POL) sites; active or NFA ERP sites where MEC, material potentially presenting an explosive hazard (MPPEH), or munitions debris (MD) have been identified during previous intrusive activities or the potential exists to encounter those items; ERP sites with an ESS or ESS Waiver for intrusive activities; and delineated wetland areas. As information changes based on ongoing activities, updates to Navy Installation Restoration Information Solution are provided. This information is available 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.

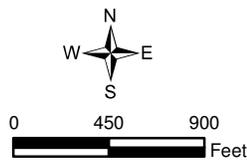
In the event DoD activities will influence the areas outlined or highlighted on the CD, the NAVFAC Remedial Project Manager should be consulted:

Mr. Walter J. Bell
Naval Facilities Engineering Command, Mid Atlantic
Environmental Code OPHE3, Bldg N-26, Rm 3300
9742 Maryland Avenue
Norfolk, Virginia 23511-3095
(757) 341-0484



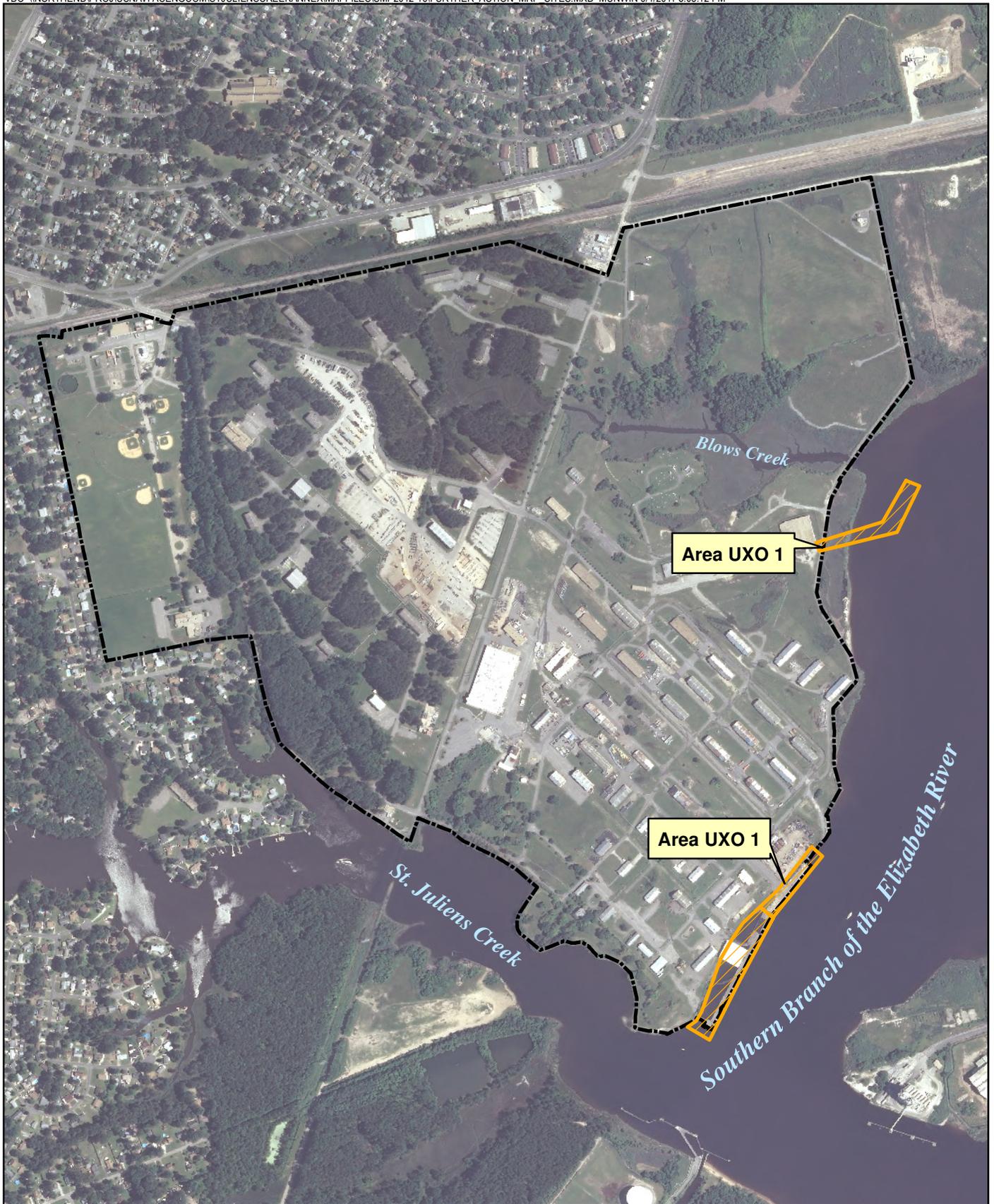
Legend

-  SJCA Boundary
-  ESS/ESS Determination Sites



ESS Determination / ESS Sites
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

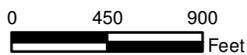
ESS Determination in place for soil sampling activities.



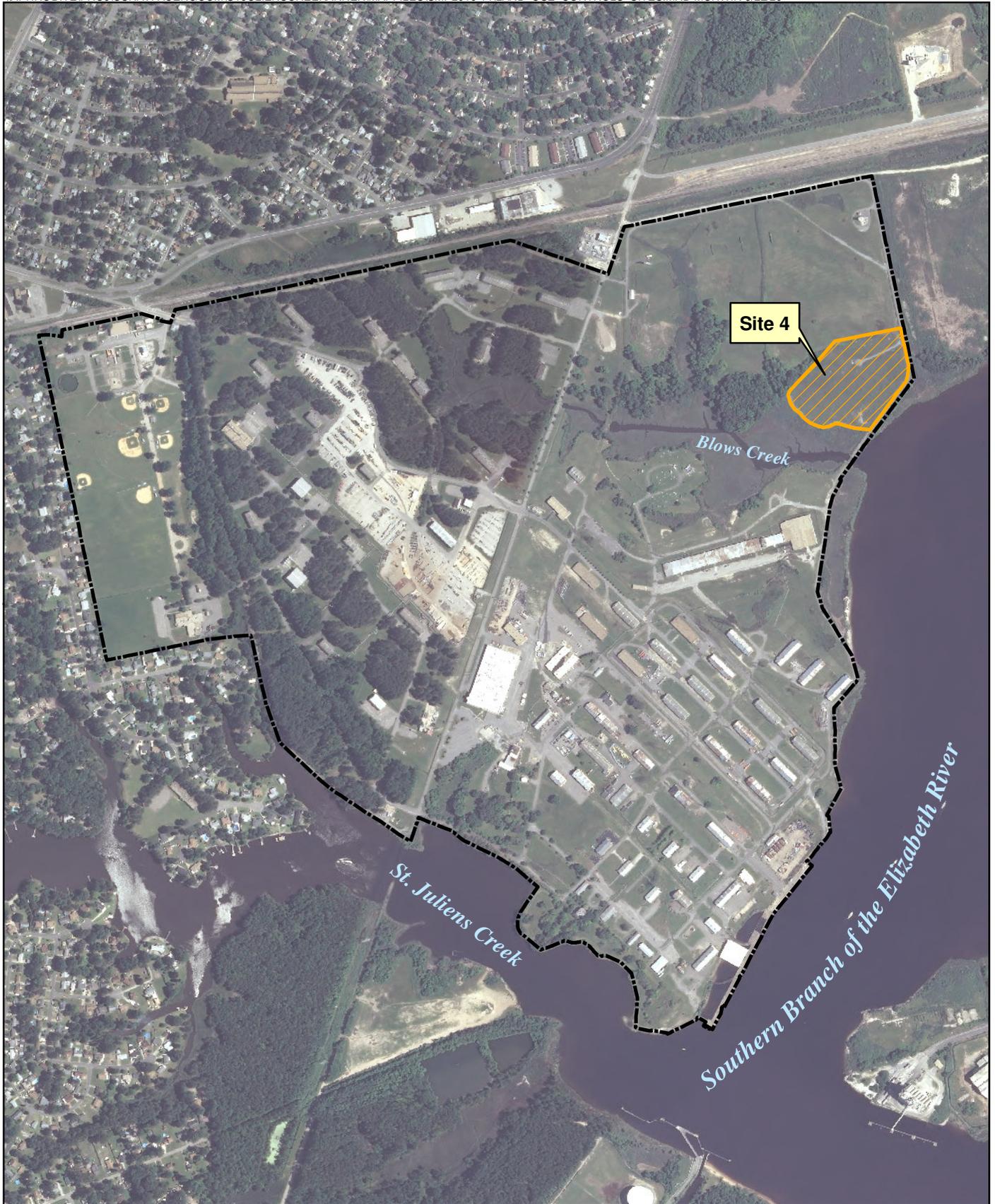
Legend

 SJCA Boundary

 PA/SI Sites

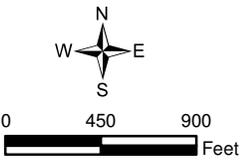


Further Action MRP Sites
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia



Legend

-  SJCA Boundary
-  Land Use Controls Sites

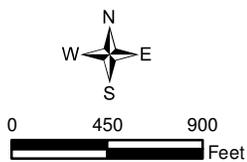


Land Use Controls Sites
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia



Legend

-  SJCA Boundary
-  POL Sites



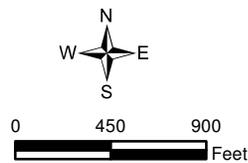
POL Sites
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia



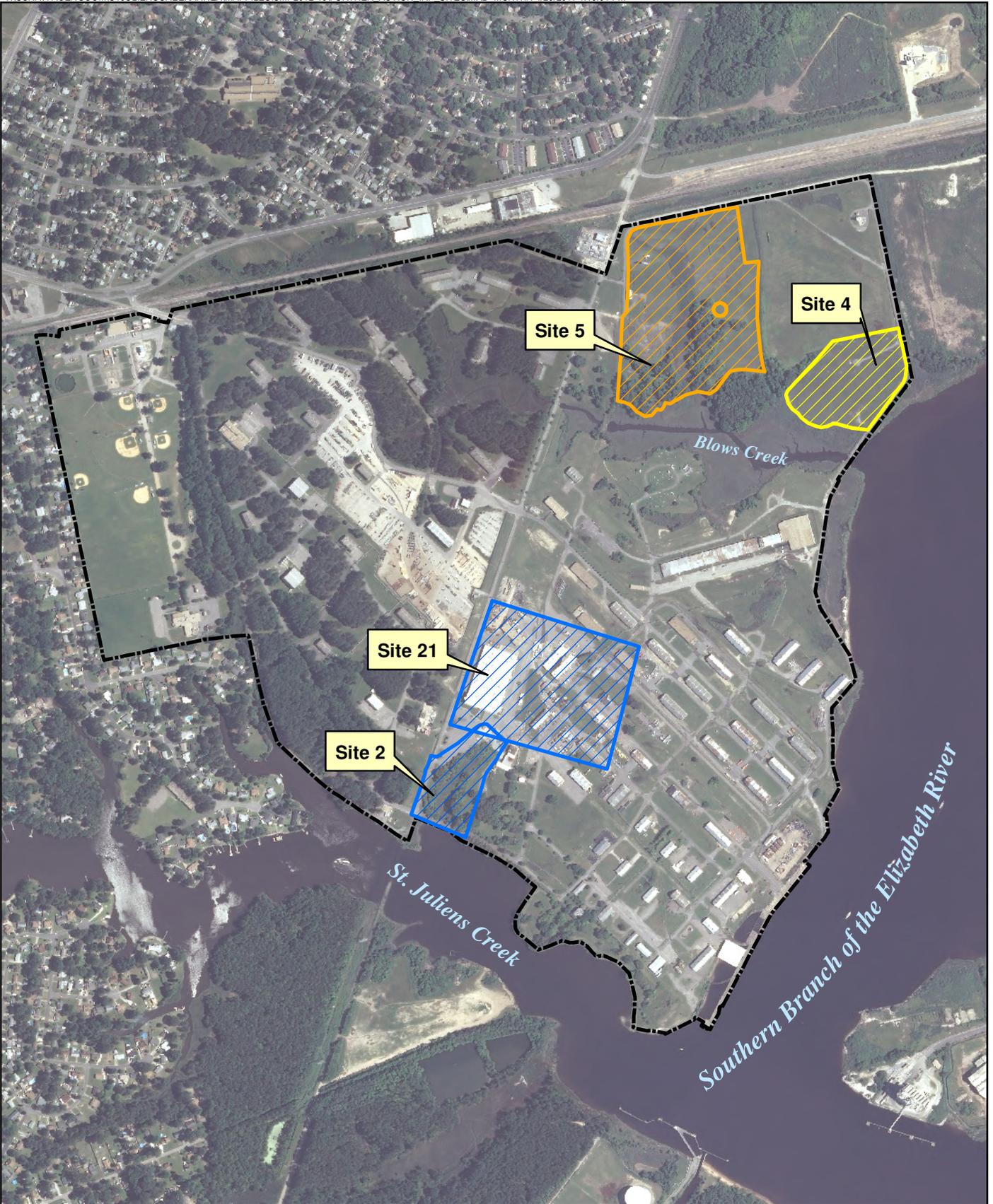
Legend

-  SJCA Boundary
-  Site Boundary
-  Delineated Wetland Boundary

Wetlands associated with Sites 4, 5, and 19 extend beyond the wetland areas that were delineated.

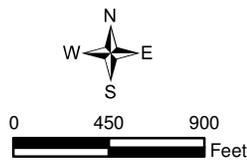


Delineated Wetland Locations
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

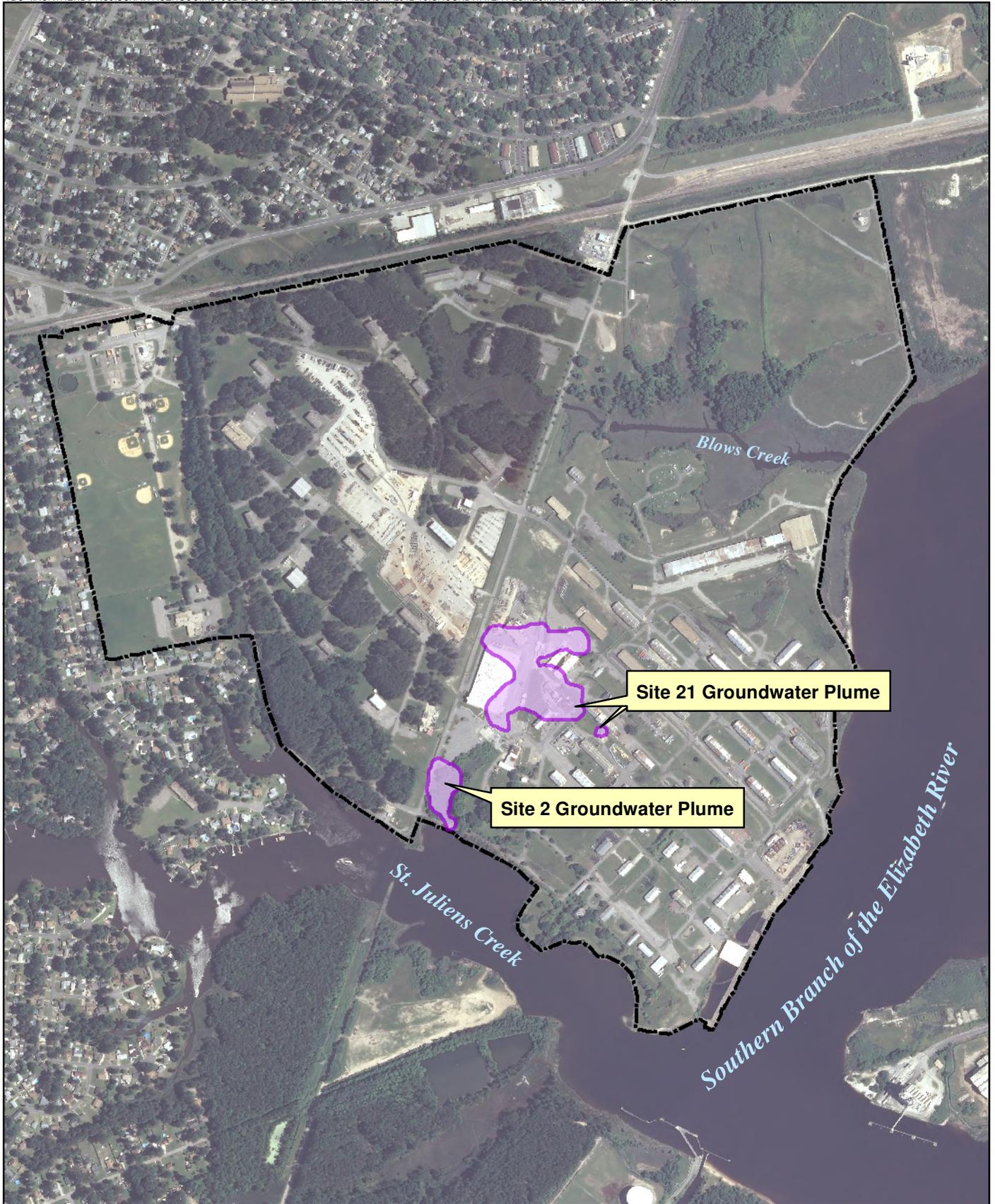


Legend

-  SJCA Boundary
-  Response Complete - Sites with LUCs
-  EE/CA/Removal Action Sites
-  RD/RA Sites



Further Action IRP Sites
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

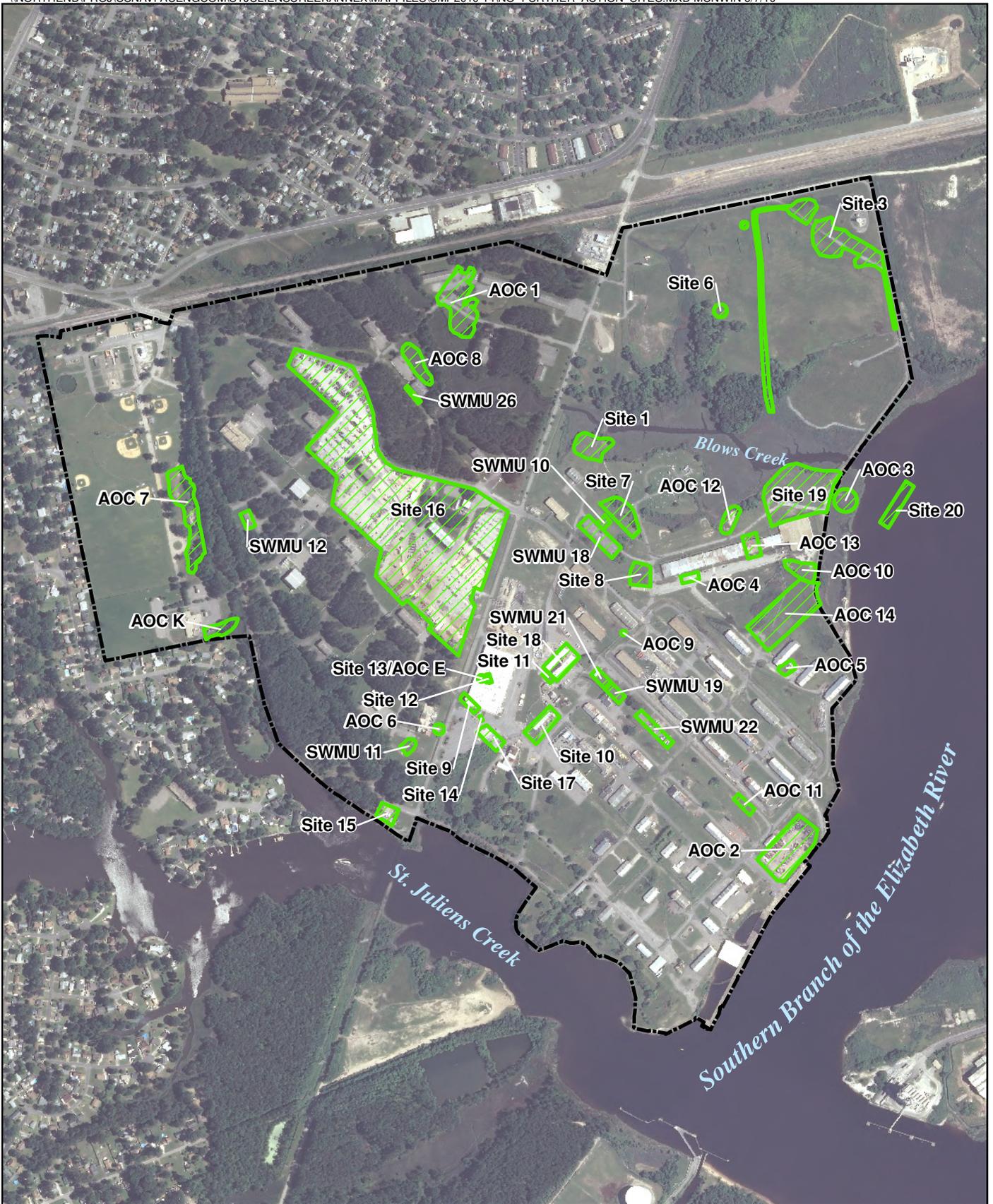


Legend

-  SJCA Boundary
-  Groundwater Plume



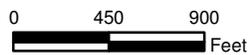
Groundwater Plume Locations
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia



Legend

-  SJCA Boundary
-  Response Complete - No Further Action Sites

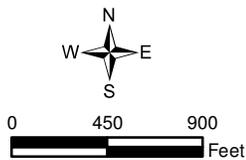
Locations of No Further Action Sites, SWMUs, and AOCs
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia





Legend

-  SJCA Boundary
-  Potential MEC/MPPEH/MD Locations



Potential MEC/MPPEH/MD Locations
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

SECTION 5

References

- A. T. Kearney, Inc. and K. W. Brown and Associates, Inc. (A. T. Kearney). 1989. *Phase II RCRA Facility Assessment of the St. Juliens Creek Annex Facility, Chesapeake, Virginia*. March.
- CH2M HILL. 1996. *Final Relative Risk Ranking System Data Collection Report, St. Juliens Creek Annex to the Norfolk Naval Base, Chesapeake, Virginia*. April.
- CH2M HILL. 2000. *Final Community Relations Plan, St. Juliens Creek Annex, Chesapeake, Virginia*. November
- CH2M HILL. 2001a. *Final Background Investigation Report, St. Juliens Creek Annex, Chesapeake, Virginia*. October.
- CH2M HILL. 2001b. *Final Technical Memorandum Findings of the Expanded Site Inspection Site 17 (Building 278/279), St. Juliens Creek Annex, Chesapeake, Virginia*. September.
- CH2M HILL. 2002. *Final Site Screening Assessment Report, St. Juliens Creek Annex, Chesapeake, Virginia*. April.
- CH2M HILL. 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*. March.
- CH2M HILL. 2004a. *Final Background Investigation Report Addendum for Groundwater, St. Juliens Creek Annex, Chesapeake, Virginia*. August.
- CH2M HILL. 2004b. *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia*. February.
- CH2M HILL. 2004c. *Final Feasibility Study for Site 4, St. Juliens Creek Annex, Chesapeake, Virginia*. March.
- CH2M HILL. 2004d. *Proposed Remedial Action Plan for Site 4, St. Juliens Creek Annex, Chesapeake, Virginia*. May.
- CH2M HILL. 2006a. *Final Baseline Ecological Risk Assessment, Blows Creek Watershed, St. Juliens Creek Annex, Chesapeake, Virginia*. December.
- CH2M HILL. 2006b. *Final Expanded Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment for Site 5, St. Juliens Creek Annex, Chesapeake, Virginia*. June.
- CH2M HILL. 2006c. *Draft Supplemental Site Investigation for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia*. April.
- CH2M HILL. 2007a. *Final Addendum to the Expanded Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment for Site 5, St. Juliens Creek Annex, Chesapeake, Virginia*. December.

CH2M HILL. 2007b. *Final Engineering Evaluation/Cost Analysis for Site 5 Waste/Burnt Soil Area, St. Juliens Creek Annex, Chesapeake, Virginia.* February.

CH2M HILL. 2008a, Revised 2010. *Final Expanded Remedial Investigation Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* November, January revision.

CH2M HILL. 2008b. *Final Remedial Investigation Report for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* July.

CH2M HILL. 2009a. *Final Preliminary Assessment Report for Munitions Response Site Area UXO 1, St. Juliens Creek Annex, Chesapeake, Virginia.* June.

CH2M HILL. 2009b, Revised 2010. *Final Feasibility Study Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* October, January revision.

CH2M HILL. 2009c. *Final Feasibility Study for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

CH2M HILL. 2009d. *Final Interim Proposed Plan for Site 21, Industrial Area, St. Juliens Creek Annex, Chesapeake, Virginia.* July.

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

CH2M HILL. 2010a. *Site Management Plan, Fiscal Years 2011 through 2015, St. Juliens Creek Annex, Chesapeake, Virginia.* August.

CH2M HILL. 2010b. *Final Community Involvement Plan, St. Juliens Creek Annex, Chesapeake, Virginia.* February.

CH2M HILL. 2010c. *Final Five-Year Review Report, St. Juliens Creek Annex, Chesapeake, Virginia.* May.

CH2M HILL. 2010d. *Final Area UXO-001 Site Inspection, Underwater Geophysical Survey Technical Memorandum, St. Juliens Creek Annex, Chesapeake, Virginia.* September.

CH2M HILL. 2010e. *Final Change in Scope of the Response and Ceiling Increase Action Memorandum for Site 5 Waste/Burnt Soil Area and Impacted Surface Soil and Sediment Areas, St. Juliens Creek Annex, Chesapeake, Virginia.* November.

CH2M HILL. 2010f. *Proposed Plan for Site 2, Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia.* July.

CH2M HILL. 2010g. *Final Remedial Investigation and Feasibility Study Addendum Report for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* October.

CH2M HILL. 2010h. *100% Submittal Basis of Design Report for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* May.

CH2M HILL. 2011a. *Pre-Final 90% Design Submittal, Site 2 Basis of Design Report, St. Juliens Creek Annex, Chesapeake, Virginia.* April.

CH2M HILL. 2011b. *Proposed Plan for Site 21, Industrial Area, St. Juliens Creek Annex, Chesapeake, Virginia.* May.

- Department of Defense (DoD). 2004. *Final Federal Facility Agreement, St. Juliens Creek Annex, Chesapeake, Virginia*. March. (Signed July 2004.)
- JV I. 2004. *Final Design Package, Site 4 – Landfill D*. St. Juliens Creek Annex, Chesapeake, Virginia. November.
- JV I. 2005. *Final Construction Closeout Report, Site 4 – Landfill D Soil Cover (Design/Build), St. Juliens Creek Annex, Chesapeake, Virginia*. December.
- Kelly, Jamie. 2009. Personal Communication. March 2.
- NAVFAC. 2004. *Final Record of Decision – Site 4: Landfill D, St. Juliens Creek Annex, Chesapeake, Virginia*. August.
- NAVFAC. 2006a. *Remedial Design for Land Use Controls, Site 4, Landfill D, St. Juliens Creek Annex, Chesapeake, Virginia*. June.
- NAVFAC. 2006b. *Final Remedial Action Completion Report, Site 4 - Landfill D, St. Juliens Creek Annex, Chesapeake, Virginia*. June.
- NAVFAC. 2010. *Final Interim Record of Decision for Site 21: Industrial Area, St. Juliens Creek Annex, Chesapeake, Virginia*. May.
- NAVFAC. 2011a. *Final Record of Decision for Site 2: Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia*. January.
- NAVFAC. 2011b. *Land Use Control Remedial Design, Site 2, Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia*. March.
- NAVFAC. 2011c. *Draft Final Record of Decision for Site 21: Industrial Area, St. Juliens Creek Annex, Chesapeake, Virginia*. July.
- NEESA. 1981. *Navy Assessment and Control of Installation Pollutants: Initial Assessment Study of St. Juliens Creek Annex, Norfolk Naval Shipyard, Portsmouth, Virginia*. NEESA 13-001. August.
- NUS Corporation, Superfund Division (NUS). 1983. *Preliminary Assessment*.
- Tetra Tech. 2000. *Hazard Ranking System Documentation Record for St. Juliens Creek Annex, Chesapeake, Virginia*. January.
- USEPA. 1995. *Aerial Photographic Site Analysis, Norfolk Naval Shipyard: Annex Areas, Norfolk, Virginia*. February.