

8/1/07 -- 00579

Site Management Plan
Fiscal Years 2008 through 2012
St. Juliens Creek Annex
Chesapeake, Virginia



Prepared for
Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic Division

Contract No. N62470-02-D-3052
CTO-0151

August 2007

Prepared by



8/1/07-00579

Site Management Plan Fiscal Years 2008 through 2012

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

Contract Task Order 0151

August 2007

Prepared for

**Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic**

Under the

**LANTDIV CLEAN III Program
Contract N62470-02-D-3052**

Prepared by



CH2MHILL

Contents

Acronyms and Abbreviations	v
1 Introduction	1-1
2 SJCA Description and Environmental History	2-1
2.1 SJCA Description	2-1
2.2 Environmental History	2-1
2.3 CERCLA Process	2-3
2.3.1 Preliminary Assessment/Site Investigation	2-3
2.3.2 Remedial Investigation/Feasibility Study	2-3
2.3.3 Engineering Evaluation/Cost Analysis and Removal Action.....	2-4
2.3.4 Proposed Plan/Record of Decision	2-4
2.3.5 Remedial Design/Remedial Action	2-5
2.3.6 Response Complete and Remedy-In-Place	2-5
2.3.7 Post-Remedial Action Monitoring and Reporting	2-5
2.3.8 Community Involvement	2-6
3 Site Descriptions.....	3-1
3.1 Remedial Investigation/Feasibility Study Sites	3-1
3.1.1 Site 2 – Waste Disposal Area B.....	3-1
3.1.2 Site 5 – Burning Grounds.....	3-3
3.1.3 Site 21 – Industrial Area.....	3-6
3.2 Response Complete Sites	3-8
3.2.1 Site 4 – Landfill D.....	3-8
3.2.2 Site 19 – Building 190.....	3-10
4 Navy Land Use Planning.....	4-1
5 References	5-1

Tables (Located at the end of each section)

3-1	Site Status Summary Table
3-2	Environmental Studies, Investigations, and Actions Completed To-Date at Active IR Sites
3-3	Land Use Controls

Figures (Located at the end of each section)

2-1	Location of St. Juliens Creek Annex
3-1	Location of Active Sites
3-2	Location of No Further Action Sites, SWMUs, and AOCs
3-3	Schedule of IR Activities for Fiscal Years 2008 through 2012
3-4	Primary Document Submittal Flow Chart, FFA Process
3-5	Secondary Document Submittal Flow Chart, FFA Process
3-6	Dispute Resolution Flow Chart, FFA Process

Acronyms and Abbreviations

ABM	abrasive blast media
AOC	Area of Concern
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
DNAPL	dense non-aqueous phase liquid
DoD	Department of Defense
DPT	direct-push technology
DRMO	Defense Reutilization and Marketing Office
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
ER,N	Environmental Restoration, Navy
ESS	Explosives Safety Submission
FFA	Federal Facilities Agreement
FS	Feasibility Study
ft	feet, foot
ft ³	cubic feet
FY	fiscal year
GIS	Geographical Information System
HHRA	Human Health Risk Assessment
HRS	Hazard Ranking System
IAS	Initial Assessment Study
IR	Installation Restoration
IRACR	Interim Remedial Action Completion Report
JV I	Agviq/CH2M HILL Joint Venture I
LUC	land use control
MARMC	Mid-Atlantic Regional Maintenance Center
MCL	maximum contaminant level
MEC	munitions and explosives of concern
MIP	membrane interface probe
MPPEH	material potentially presenting an explosive hazard
msl	mean sea level

NACIP	Navy Assessment and Control of Installation Pollutants
NAPEC	Naval Ammunition Production Engineering Center
NAVFAC	Naval Facilities Engineering Command
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
RAO	remedial action objective
RACR	Remedial Action Completion Report
RBC	risk-based concentration
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
sf	square feet
SI	Site Investigation
SJCA	St. Juliens Creek Annex
SMP	Site Management Plan
SPAWAR	Space and Naval Warfare Systems Command
SSA	Site Screening Assessment
SVOC	semivolatile organic compounds
SWMU	Solid Waste Management Unit
TNT	trinitrotoluene
UU/UE	unrestricted use and unlimited exposure
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound
VSI	visual site inspection
yd ³	cubic yards

Introduction

This document presents the fiscal years (FYs) 2008 through 2012 Site Management Plan (SMP) for St. Juliens Creek Annex (SJCA), Chesapeake, Virginia. The SMP meets the requirements of the Federal Facilities Agreement (FFA) between the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Region III of the United States Environmental Protection Agency (EPA), and 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 purpose of the SMP is to provide a management tool for the SJCA Installation Restoration (IR) Partnering Team, which includes representatives from NAVFAC, EPA, and VDEQ. The SMP is intended to be used in the planning, scheduling, and environmental remedial response activities to be conducted at SJCA. The SMP provides brief site descriptions, summaries of previous investigations, conceptual schedules, and CERCLA activities for SJCA IR sites. The prioritization of activities and the conceptual schedules were developed by the SJCA IR Partnering Team and are based on several factors:

- The SJCA IR 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 "high-priority" sites by FY 2010
- Goals set by the SJCA IR Partnering Team to meet requirements of EPA, VDEQ, NAVFAC, and the public

The drafting of this SMP was completed in August 2007 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 (ER,N) 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 2007 through 2011 SMP (CH2M HILL, 2006c).

SJCA Description and Environmental History

2.1 SJCA Description

SJCA is a 490-acre facility 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). The facility is bordered to the north by the Norfolk and Western Railroad, the City of Portsmouth, and residential areas; to the west by residential areas; to the south by St. Juliens Creek; and to the east by the Southern Branch of the Elizabeth River. Most surrounding areas are developed and include residences, schools, recreational areas, and shipping facilities for several large industries. The Norfolk Naval Shipyard is located approximately 1.5 miles north.

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 been involved in nonordnance operations, including degreasing, paint shops, machine shops, vehicle and locomotive maintenance shops, pest control shops, battery shops, print shops, electrical shops, boiler plant operations, wash rack operations, potable water and salt water fire-protection systems, fire-fighter training operations, and oil and chemical storage.

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 warehousing facilities for nearby Norfolk Naval Shipyard and other local naval activities. SJCA also provides administrative offices, light industrial shops, and storage facilities for several tenant commands; including Defense Reutilization and Marketing Office (DRMO) storage, Space and Naval Warfare Systems Command (SPAWAR), Mid-Atlantic Regional Maintenance Center (MARMC), and a cryogenics school.

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.

To meet the objectives of the NACIP Program, an Initial Assessment Study (IAS) was conducted at SJCA in 1981. Results of this study revealed that low-level concentrations of ordnance materials still existed at SJCA. Residues were also suspected from waste burning at the Burning Grounds (Site 5) and near the swamp between Buildings 257 and 130 (Site 2), pesticide and herbicide rinsate disposal at Cross Street and Mine Road (Site 8), and ordnance waste and rinse waters to the sediments of Blows Creek. However, the IAS 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 1976, the Resource Conservation and Recovery Act (RCRA) was passed by Congress to address potentially adverse human health and environmental impacts of hazardous waste management and disposal practices. RCRA was legislated to manage the present and future disposal of hazardous wastes.

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) (AOCs A through L). Fifteen SWMUs (4, 9, 13, 14, 15, 16, 17, 19, 20, 23, 25, 27, 32, 33, and 41) and eight AOCs (B, C, D, E, G, H, I, and J) were recommended for further action. Detailed subsurface investigations, such as RCRA Facility Investigations (RFIs), were recommended at 10 SWMUs (1, 2, 3, 4, 5, 6, 8, 24, 30, and 32) and AOC L.

In 1980, CERCLA, or "Superfund," was passed to investigate and remediate areas resulting from past hazardous waste management practices. This program is administered by EPA or state agencies.

In 1983, a Preliminary Assessment (PA), the first step in the CERCLA process (the CERCLA process is further discussed in Section 2.3 of this SMP) 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 proposed.

The NACIP Program was revised in 1986 to reflect the requirements of CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA). This revised program is referred to as the IR Program. The current IR Program is consistent with CERCLA and applicable state environmental laws.

To assess whether SJCA should be proposed for the National Priorities List (NPL), the EPA 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, EPA 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.

Following the inclusion of SJCA on the NPL, the SJCA IR Partnering Team was chartered to streamline the cleanup of former disposal sites by using consensus-based site management strategies during the CERCLA process (described in Section 2.3). The Team consists of representatives from NAVFAC, EPA, and VDEQ and meetings are held quarterly, or more frequently as necessary.

The FFA, negotiated between the Navy, EPA, and VDEQ was signed in July 2004. In accordance with the FFA, all past and future work at IR 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 CERCLA Process

The objectives of the CERCLA process are to evaluate the nature and extent of contamination at a site and to identify, develop, and implement appropriate remedial actions (RAs) in order to protect human health and the environment. The major elements of the CERCLA process are:

- PA/Site Investigation (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)/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 Investigation

The IR Program begins with the initiation of concerns about a site, area, or potential contaminant source. 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. If the PA results in a recommendation for further investigation, a SI is conducted to make a general determination if activities at the site have impacted environmental media and determine whether a site should be included in the CERCLA RI/FS process. A SI typically includes the collection of environmental samples to determine what hazardous substances are present at a site and to determine if they have been released to the environment.

2.3.2 Remedial Investigation/Feasibility Study

Based on the results of the PA/SI, a RI may be conducted. During the RI, environmental samples are usually collected from soil, groundwater, surface water, and sediment. The results are used to characterize the nature and extent of contamination and assess risk to human health and the environment.

The FS is the mechanism for the development, screening, and detailed evaluation of alternative RAs to meet environmental standards and protect human health and the environment. 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 beneficial data.

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. The need for a treatability study generally is identified during the FS.

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.

2.3.3 Engineering Evaluation/Cost Analysis and Removal Action

Removal actions are implemented to clean up or remove hazardous substances from the environment at a specific site 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 or non-time-critical actions. 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 time-critical removal actions. Removal actions that may be delayed for six months or more without significant additional harm to human health or the environment are classified as non-time-critical removal actions (NTCRAs).

For a 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 on all contaminated substances at the site. It is possible for a removal action to become the final RA if the risk assessment results indicate that no further RA is required in order to protect human health and the environment.

2.3.4 Proposed Plan/Record of Decision

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. Site information is compiled in an Administrative Record and placed in the Information Repository established at a local library for public review.

At the end of the public comment period, an appropriate remedial alternative is chosen to protect human health and the environment. All parties directly involved in the IR Program (Navy, EPA, VDEQ, and public) must agree on the selected alternative. The ROD document

is then issued to explain the Selected Remedy. Any public comments received are addressed as part of the responsiveness summary in the ROD.

2.3.5 Remedial Design/Remedial Action

Subsequent to the ROD, RD/RA activities are initiated. The technical specifications for clean-up remedies and technologies are designed in the RD phase. The RA phase is the actual construction or implementation of the clean-up process.

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 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 and 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 risk to human health and the environment (cleanup goals/RA objectives [RAOs] have been met). Once RC is completed for a site, a 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 (i.e., 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 all RCs and RIPs have been documented for every site at the facility and the terms of the FFA have been met, site closeout and NPL deletion is requested.

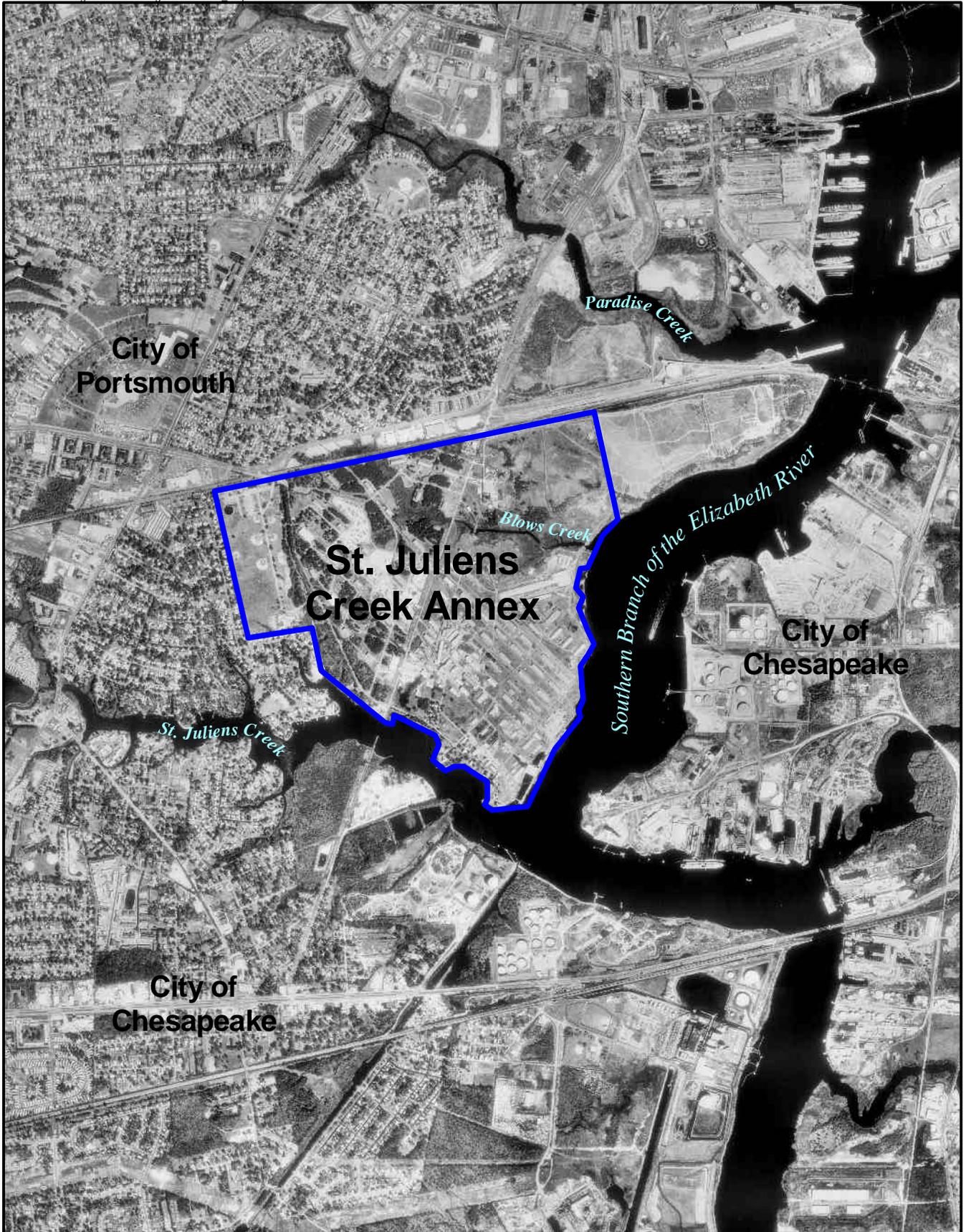
2.3.7 Post-Remedial Action Monitoring and Reporting

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 five years after the initiation of a CERCLA response action, and are conducted every five 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 EPA 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 are conducted and a Community Involvement Plan is developed based on the responses to outline community participation. Community participation at SJCA includes a Restoration Advisory Board (RAB), public meetings, information repository, fact sheets, public notices, and a web site (<http://public.lantops-ir.org/sites/public/sjca/>). The RAB was formed in 1999 and consists of community members and representatives of the Navy, VDEQ, and EPA. RAB meetings are held semiannually (normally every May and October) and are open to the public to provide opportunity for comment and input on the IR Program. The documents prepared as part of the IR Program are maintained in the Administrative Record and listed at an information repository (Major Hillard Library, Chesapeake, Virginia) for review by the public. The Administrative Record and IR web sites are updated on a regular basis.

For EE/CAs and PPs, the public is provided an opportunity to comment 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. Comments received on the PP are documented in a 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.



LEGEND

 St. Juliens Creek Annex



0 1000 2000 3000 Feet

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

Site Descriptions

Fifty-eight potentially contaminated IR sites, SWMUs, and AOCs were identified for evaluation at SJCA based on the previous assessments and investigations. Table 3-1 lists the status of each site. The sites currently active in the IR Program at SJCA include Site 2, Site 4, Site 5, and Site 21 (Figure 3-1). Fifty-four sites at SJCA have been considered no further action (NFA) by the SJCA IR Partnering Team following desktop audits, site investigations, and/or removal actions (Figure 3-2). 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 IR site. The site histories were primarily based on the previous facility-wide investigations completed through the IR Program to-date, including:

- IAS: Navy Engineering and Environmental Support Activity, August 1981
- PA: NUS Corporation, 1983
- Phase II RFA: A. T. Kearney, March 1989
- Aerial Photographic Site Analysis: EPA Region III, February 1995
- Relative Risk Ranking (RRR) System Data Collection Report: CH2M HILL, April 1996
- HRS Documentation Record: Tetra Tech, January 2000
- Basewide Background Investigation: CH2M HILL, October 2001 and August 2004
- Site Screening Assessment (SSA): CH2M HILL, April 2002

Table 3-2 provides a summary of the site-specific investigations conducted at each active site. The conceptual project schedule for IR activities at SJCA is presented in Figure 3-3. 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 3-4 through 3-6.

3.1 Remedial Investigation/Feasibility Study Sites

3.1.1 Site 2—Waste Disposal Area B

Site 2 is a former waste disposal area covering approximately 4.4 acres at the intersection of St. Juliens Drive and Cradock Street, in the southwestern portion of SJCA. In earlier documents, Site 2 was referred to as Dump B, Landfill B, and/or SWMUs 2, 3, and 4. The waste disposal area began operating in 1921. Initially, refuse was burned on site and used to fill an adjacent swampy area. Mixed municipal wastes, organics, inorganics, solvents, waste ordnance, and abrasive blast media (ABM) from ship overhaul and repair operations were reportedly disposed of at Site 2. The total volume of waste prior to burning is reported to have been approximately 35,000 cubic yards (yd³), and it is estimated that half of this waste was disposed of prior to 1942, when an incinerator was installed to replace the open-burning practices. The waste disposal area was closed sometime after 1947.

During the 1981 IAS, a drum of Pen-Strip-G (penetone) was identified in the washrack at Building 249, just north of Site 2. The IAS states that penetone was used for vehicle and equipment cleaning in the washrack and the wastewater drained to the sanitary sewer, but

prior to 1976 the effluent drained to the swampy area (Site 2 inlet), which drained into St. Juliens Creek. In 1989, the site was used for storing heavy equipment and machinery, including tools, tires, and machinery in sheds and trailers.

Site 2 is bounded on the north by a parking lot; on the east by a grass-covered field where Building 130 once stood; on the west by a storm water 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 inlet is tidally influenced and drains surface water from adjoining land into the creek. The Site 2 topography ranges from 0 to 8 feet (ft) above mean sea level (msl), sloping towards the tidal inlet and St. Juliens Creek. Grass-lined drainage ditches (approximately 2 to 3 ft deep) originate north of Site 2 along Cradock Street and discharge stormwater runoff to the inlet. Groundwater flow follows the topography and flows towards the inlet and creek. Concrete, brick, asphalt, and ABM are visible on the ground surface. An underground storm drainage system originates approximately 1,000 ft northeast of the Site 2 area (Site 21) and outlets through a culvert to the inlet. Surface runoff from an adjacent parking lot to the northwest of the inlet also drains directly into the inlet.

Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment—1997 through 2004

The RI field activities at Site 2 began in 1997 and continued through 2004. 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 human health risk assessment (HHRA) and ecological risk assessment (ERA) conducted as part of the RI concluded that there is potential risk to human and ecological receptors from exposure to chemicals in soil and sediment (primarily inorganics, pesticides, and polycyclic aromatic hydrocarbons [PAHs]). Elevated concentrations of VOCs were present in the surface water but because surface water is transient, there was no significant risk 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 most of the shallow monitoring wells were found to be located upgradient of historical Site 2 activities.

Expanded Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment—2004 to Present

Based on the results of the Site 2 RI and data gaps identified, an Expanded RI was conducted. The Expanded RI investigation activities were initially conducted in two phases from December 2003 through March 2005. Field activities included membrane interface probe (MIP) investigation, monitoring well installation, and groundwater sampling to further define the nature and extent of shallow groundwater; storm water and surface water

sampling to assess the source of VOCs in inlet surface water; sediment sampling to further characterize ecological risks and to evaluate potential impacts to St. Juliens Creek; and direct-push technology (DPT) waste delineation under the parking lot area. The results of the Expanded RI indicated the presence of a localized VOC plume in the groundwater, VOC migration via the upgradient storm water system from Site 21, and groundwater discharge from Site 2 is impacting inlet surface water and sediment, potential for adverse effects to benthic-dwelling organisms from inlet sediment, and that site-related effects are only reflected in St. Juliens Creek sediment directly at the outfall location. The results of the initial Expanded RI activities were reported in a Draft Expanded RI Report for Site 2 in October 2005. However, it was determined that data gaps remained, and finalization of the report was postponed in order to further investigate the site.

To address remaining data gaps, additional investigation activities were conducted from April through July 2007 using the Triad approach, which utilizes systematic project planning, dynamic work approaches, and real-time measurement technologies. A conceptual site model (CSM) was developed to identify data gaps and develop preliminary RAOs and remedial alternatives to ensure the investigation gathered the necessary information. Field activities included MIP investigation, monitoring well installation, and groundwater sampling to further define the nature and extent of the shallow groundwater chlorinated volatile organic compound (CVOC) plume and source area; sediment pore water sampling to screen for potential ecological risks; soil sampling to determine the presence/absence of natural attenuation parameters; and a surface debris delineation within the wetland area (CH2M HILL, 2007b). The results of the investigation activities, along with changes resulting from comments on the original draft report, will be incorporated into a revised Draft Expanded RI Report, for review.

Future activities at Site 2 consist of:

- Expanded RI Report
- FS
- PP and ROD
- RD and RA
- RACR/IRACR

3.1.2 Site 5—Burning Grounds

Site 5 is the former Burning Grounds consisting of approximately 21 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 indicate that prior to use as a disposal area, the site and much of the adjacent area had been used for placement of dredge spoil material that reportedly originated from Blows Creek and the Southern Branch of the Elizabeth River.

Operations began at the Burning Grounds in the 1930s when waste ordnance materials, including black powder (mixture of charcoal, nitrate, and sulfur), smokeless powder (nitrocellulose), Explosive D (ammonium picrate), and Composition A-3 (contains cyclotri-methylenetrinitramine [RDX] and wax), were disposed of by open burning on three main pads. Tetryl, trinitrotoluene (TNT), 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 ft below ground surface (bgs) (although investigation activities have only identified shallow waste) and that other material disposed of included tables and metal from buildings. In 1974, 427 tons of ordnance items were reportedly disposed of.

In mid-1977, the Burning Grounds was used for facility-wide ordnance and equipment decontamination. The decontamination process included filling equipment from buildings with oil and straw and igniting them. Afterwards, the ground surface was reportedly covered with oil and straw and burned. The top 6 inches of soil was then diced, and the ground surface was covered with oil and straw and burned again. After the decontamination was completed, the Naval Ammunition Production Engineering Center (NAPEC) 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. One- to three-ft deep vegetated drainage ditches are reducing runoff onto the site from adjacent areas. Site 6, located within the east-central portion of Site 5, is a former IR site that was closed under a no action ROD in September 2003 after a removal action.

Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment—1997 through 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 HHRA and ERA conducted as part of the RI concluded that there is potential risk 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 is no significant risk 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 risk 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

A separate Baseline Ecological Risk Assessment (BERA) for Blows Creek was conducted to identify potential risk associated with possible historical contributions to Blows Creek from upland Navy IR Program 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 and 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 no further action under CERCLA. This no further action decision will be incorporated into the ROD for Site 5.

Expanded Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment—2003 through 2006

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 risk, 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/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 risk to future residents. Due to 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 IR Partnering Team agreed to risk manage shallow groundwater with no further action. The shallow groundwater HHRA will be revised and the results and risk management rationale will be 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 RA objective of UU/UE consist of the waste and burnt soil, and sporadic metals and pesticides in surface soil and drainage ditch sediment.

Engineering Evaluation/Cost Analysis and Action Memorandum—2006

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 risk in the waste/burnt soil area and impacted surface soil and drainage sediment areas. Four alternatives were identified, evaluated, and ranked. 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 is estimated to be 24,930 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

risk. The waste/burnt soil will be excavated to visible limits and confirmatory samples will be collected to verify that clean-up goals are met. The impacted surface soil and sediment will be excavated to a depth of 1 ft based on subsurface soil data from the RI. With the exception of three areas which will be delineated by pre-confirmation samples, the horizontal extent of the impacted surface soil and sediment areas has been defined by existing sample locations. Confirmation sampling will be conducted for the impacted surface soil and sediment areas that are being removed based on human health risk; those driven by ecological risk will not require confirmation sampling. Site restoration includes 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. Therefore, the Navy signed an Action Memorandum on March 20, 2007 to implement the NTCRA as specified in the EE/CA.

Future activities at Site 5 consist of:

- Expanded RI Addendum
- NTCRA
- PP and ROD

3.1.3 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 shed used for maintenance. Based on investigations, the Site 21 area has been expanded to encompass the underlying VOC groundwater plume. Buildings at Site 21 were historically used for machine, vehicle, and locomotive maintenance, and electrical shops; and munitions loading facilities. Railroad tracks were present throughout the industrial area and a fuel service station was located in the vicinity. Several of the buildings and/or surrounding areas were former IR sites (Sites 9, 10, 11, 12, 13, 14, 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 used by MARMC was constructed in 1992. A storm sewer system runs through the site and drains to a downstream inlet (Site 2) to St. Juliens Creek.

Site Screening Assessment—2002

As part of the SSA, the unvalidated analytical results from soil and groundwater samples collected during the RRR were used to conduct human health and ecological risk screenings. Based on the elevated VOC concentrations detected in groundwater and potential 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 or for evaluating potential ecological effects.

Site Investigation—2003

Based on the results of the SSA, an SI was conducted at Site 21 in August 2003. The SI field activities included a MIP investigation to delineate the vicinity of elevated VOCs, monitoring well installation, and collection of groundwater samples. Potential human health risks were identified from VOCs and RDX in shallow groundwater, and chloroform, arsenic, and vanadium in deep groundwater. 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.

Supplemental Site Investigation—2004 through 2005

Based on the SI recommendations, additional monitoring wells were installed and groundwater samples were collected in November 2004 and October through November 2005 as part of a Supplemental SI. Results further delineated the VOC plume covering approximately 5.2 acres. The human health risk screening results indicated that exposure to shallow groundwater at Site 21 may result in unacceptable noncarcinogenic and carcinogenic risks to human health based on concentrations of several COPCs, including several VOCs and arsenic. Potential vapor intrusion of VOCs into the adjacent Building 1556 was calculated and no risks were identified. The Draft Supplemental SI Report was completed in April 2006 and recommended additional delineation and data collection to support development of a remedial approach for the site.

Additional investigation activities were conducted in 2006 and 2007 and initially identified as Supplemental SI activities. However, the SJCA IR Partnering Team concluded that the data collected was sufficient to satisfy the objectives of a RI. To expedite the site closeout approach, the Draft Supplemental SI Report will not be finalized, and the site data will instead be incorporated into a RI/FS Report.

Remedial Investigation—2004 to present

The RI activities were conducted from October 2006 through February 2007. The field activities consisted of a storm sewer system video inspection to evaluate the potential for transport and release of CVOCs 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 (DNAPL); and 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 results of the investigation will be incorporated into a Draft RI Report.

Future activities at Site 21 consist of:

- RI Report
- FS Report
- PP and ROD
- RD and RA
- RACR/IRACR

3.2 Response Complete Sites

Fifty-four sites at SJCA have been considered NFA by the SJCA IR Partnering Team following desktop audits, site investigations, and/or removal actions (Table 3-1 and Figure 3-2). Site 19 was added to the list of NFA sites during FY 2007. There is one site at SJCA (Site 4) requiring post-ROD land use controls (LUCs) (Figure 3-1). The LUCs are detailed on Table 3-3.

3.2.1 Site 4—Landfill D

Site 4 is an 8.32-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 and included SWMU 7 and AOC L and was reported to consist of only 5 acres.

The first indication of activity at Site 4 is a trench identified on a historical aerial photograph from 1961. The trench was approximately 1,000 ft long and was located parallel to and about 500 ft north of Blows Creek. The original trench and others were filled with trash, wet garbage, and soil from subsequent trenches. It is not known how many trenches were eventually dug, but based on a review of historical aerial photographs, there appears to have been only two trenches. The IAS 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 off-site 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 polychlorinated biphenyls (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 1.5 million cubic ft (ft³). 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

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 was potential risk 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 was no significant risk to human health and the environment identified from direct exposure to surface water. No human health risk drivers were identified for the shallow Columbia Aquifer groundwater. Although human health risk drivers (primarily inorganics) were identified for the deeper Yorktown Aquifer, the SJCA IR Partnering Team determined the risks to be acceptable based on the concentrations of compounds, the risks identified with these compounds, and the nature of the groundwater flow conditions.

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

Feasibility Study—2004

As part of the FS for Site 4, remedial alternatives were evaluated to minimize contact of human and ecological receptors with 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 off-site disposal. Based on the comparative analysis; soil cover with removal of wetland debris, removal of the eastern drainage ditch, and LUCs was recommended as the preferred alternative for Site 4.

Proposed Plan and Record of Decision—2004

The PP for Site 4 identified the preferred alternative for addressing potential contamination at Site 4. A public notice of the meeting and availability of the PP was issued on April 29, 2004. The Navy provided a public comment period from May 12 through June 12, 2004. A public meeting to present the PP 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

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 [AGVIQ-CH2M HILL Joint Venture I (JV I), 2005]. The RD for LUCs was completed in June 2006.

Remedial Action Completion Report—2006

The RACR was prepared 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 will be conducted to ensure the effectiveness of the cover is maintained. Additionally, because waste will remain on-site above levels that allow for UU/UE, LUCs will be maintained at the site and CERCLA five-year site remedy reviews will be conducted.

Future activities at Site 4 consist of:

- Voluntary Groundwater Performance Monitoring
- Annual Visual Soil Cover and LUC Inspections
- CERCLA Five-Year Site Remedy Review

3.2.2 Site 19—Building 190

Site 19 consists of former Building 190 and the surrounding area. Building 190 was located just south of the mouth of Blows Creek at the confluence of the Southern Branch of the Elizabeth River. Building 190 handled loose ordnance materials and was heavily used for loading explosives into ammunition. From the 1940s to the 1970s, Explosive D and Composition A-3 were reportedly used at Building 190.

In mid-1977, ordnance-handling buildings were decontaminated by flushing with chemical solutions and water. Prior to decontamination, NAPEC visually inspected the facilities and collected samples for chemical analysis to develop appropriate decontamination procedures for each building. At the conclusion of the decontamination process, NAPEC visually reinspected each building, collected samples for chemical analysis, and certified that the facilities were decontaminated. However, the level of decontamination was not specified and residues of ordnance may remain.

The 1989 RFA reported that various ordnance items had been disposed of in the area between Building M-5 and Building 190 during past ordnance management activities. The area was noted to contain a variety of construction rubble and facility personnel reported no knowledge of residual contamination from ordnance management operations.

Building 190 was demolished sometime after 2000 and the site is now a grass-covered field. Two concrete drainage culverts remain on site, leading underground from former Building 190 to the Southern Branch of the Elizabeth River.

Site Screening Assessment—2002

As part of the SSA, the unvalidated analytical results from soil and groundwater samples collected during the RRR were used to conduct human health and ecological risk screenings. The SSA concluded that potential human health risks identified in soil and groundwater should be further evaluated. Additionally, concerns were identified regarding the two concrete drainage culverts leading from the former Building 190 towards the Southern Branch of the Elizabeth River.

Site Investigation—2003

Based on the results of the SSA, an SI was conducted at Site 19 in August 2003. Surface soil, subsurface soil, and sediment samples were collected. Potential human health risks from PAHs and inorganics in soil were identified. The compounds detected in Site 19 sediment were similar to those frequently detected in urban water bodies such as the Elizabeth River and although these compounds may be in part related to historic site activities, the presence of these chemicals more likely reflects chemical input from a variety of anthropogenic sources; therefore, no further evaluation of sediment was recommended.

The SI recommended further delineation of PAHs and inorganics in soil for potential removal. Additionally, groundwater sampling was recommended to assess the potential impact of the elevated PAHs found in subsurface soil.

Supplemental Site Investigation—2004 to 2005

Based on the SI recommendations, additional soil and groundwater samples were collected in November 2004 and April 2005 as part of a Supplemental SI. The Supplemental SI Report identified the Elevated Subsurface PAHs Area and Metallic Slag Area as AOCs and delineated the horizontal and vertical extent of each area. A soil removal action of the two isolated hot spots indicating potential human health risks from inorganics and PAHs was recommended.

Engineering Evaluation/Cost Analysis and Action Memorandum—2005 to 2006

Based on the findings of the Supplemental SI, an EE/CA was conducted to identify and analyze removal actions to mitigate potential risk at Site 19. Three alternatives were identified, evaluated, and ranked. Based on a comparative analysis of the alternatives, the selected NTCRA involved excavation, disposal characterization, and disposal of soil from Site 19. The volume of the soil to be removed was estimated to be 360 yd³. The Metallic Slag Area was to be excavated to a depth of 1.5 ft over a 2,866 square ft (sf) area defined by the Supplemental SI sample locations. The Elevated Subsurface PAHs Area was to be excavated to a depth of 4 ft and was delineated by the Supplemental SI sample locations and the asphalt road located east of the area.

A public notice of availability of the Draft EE/CA was issued on October 16, 2005 and the EE/CA was made available to the public for comment from October 17 to November 16, 2005. No comments were received. Therefore, the Navy signed an Action Memorandum on January 25, 2006 to implement the NTCRA as specified in the EE/CA.

Removal Action—2006

The NTCRA activities at Site 19 were completed in May 2006. Approximately 500 tons of soil were removed, transported, and disposed from the excavation areas. The limits of excavation were delineated based on pre-removal confirmatory sampling during the SSI. The excavation areas were backfilled with topsoil and general fill with concentrations below VDEQ standards for total petroleum hydrocarbons and below residential risk-based concentrations (RBCs) for VOCs, semivolatile organic compounds (SVOCs), pesticides/PCBs, and metals. The Construction Closeout Report (JV I, 2006) summarizes the NTCRA activities.

Site Closeout Report—2006

Based on the results of previous investigations and the NTCRA conducted, Site 19 poses no unacceptable risk to human health or the environment. The Site Closeout Report documented the determination that NFA is necessary to ensure protection of human health and the environment at Site 19. As there are no hazardous substances, pollutants, or contaminants remaining on site above levels that prevent UU/UE, no restrictions on land use are necessary and a five-year review is not required.

**Table 3-1
Site Status Summary Table
Site Management Plan (FY 2008 - 2012)
St. Juliens Creek Annex
Chesapeake, Virginia**

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure
Site 2	Waste Disposal Area B	Dump B; Dump B Incinerator; Dump B Blast Grit; RFA - SWMU 2, SWMU 3, SWMU 4	RI/FS	Final Site 2 RI completed February 2004 recommending Expanded RI to further investigate groundwater, sediment, and surface water; Phase II Draft Expanded RI Report submitted in October 2005 recommending further groundwater, soil, and sediment pore water investigation. Draft Final Expanded RI will be submitted in August 2007 and will be finalized in FY 2008.	
Site 5	Burning Grounds	RFA - SWMU 8	RI/FS	Final RI completed March 2003 recommending Expanded RI to further investigate surface soil and groundwater; Final Expanded RI Report submitted June 2006 recommending additional groundwater sampling; Final EE/CA for NTCRA of Waste/Burnt Soil Area submitted in February 2007. Expanded RI addendum to be submitted in FY 2007. NTCRA beginning in FY 2007.	
Site 21	Industrial Area	None	RI/FS	Final SI submitted in June 2004 recommending Supplemental SI to further investigate groundwater; Draft Supplemental SI Report submitted April 2006 recommending additional delineation. Draft RI/FS Report to be submitted in FY 2007.	
Site 4	Landfill D	Dump D; Old Tanks at Dump D; RFA - SWMU 6, AOC L	Response Complete - LUCs	Final RI completed March 2003; Final FS completed March 2004; PRAP finalized June 2004; ROD signed September 2004, RD submitted November 2004; RA completed in October 2005; RACR signed October 2006. LUCs implemented, site inspections continuing annually.	Final ROD signed September 2004
Site 1	Waste Disposal Area A	Dump A; RFA - SWMU 1	Response Complete - NFA	Consensus for NFA by Navy, VDEQ, and EPA in November 2002 based on RRR data and September 2002 test pit information.	Consensus for NFA as documented in an Addendum to the SSA in January 2003.
Site 3	Waste Disposal Area C	Dump C; Dump C Waste Disposal Pits; RFA - SWMU 5, SWMU 30	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; PRAP finalized January 2005; NFA ROD signed February 2006.	Final NFA ROD signed February 2006.
Site 4	Dumpster Storage at Landfill D	Dumpster storage at Dump D; RFA - SWMU 7	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	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; PRAP finalized July 2003; NFA ROD signed September 2003.	NFA Final ROD signed September 2003.
Site 7	Old Storage Yard	Old Storage Yard #1; RFA - SWMU 17	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.	July 2001 Tier I Partnering Meeting Minutes and documented in FFA.
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	Signature Page in Final SI (June 2004).
Site 9	Pest. Control Bldg. 249	PA - SWMU 13	Response Complete - NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 9	Oil Water Separator at Bldg. 249	RFA - SWMU 23	Response Complete - NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 9	Washrack Bldg. 249	RFA - SWMU 25	Response Complete - NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 10	Waste Disposal at Railroad Tracks	Hazardous Waste Disposal Area at Bldg. 13 (Railroad Tracks); RFA - SWMU 14	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
Site 10	Swale beneath Bldg. 13	RFA - SWMU 31	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
Site 11	Waste Disposal at Building 53 (formerly referenced to Bldg. 266)	RFA - SWMU 15	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.	Consensus for NFA as documented in the November 2002 SSA.
Site 12	Sand Blast Area Bldg. 323	RFA - SWMU 16	Response Complete - NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 13	Waste Generation Area	RFA - SWMU 20	Response Complete - NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 14	Washrack Bldg. 266	None	Response Complete - NFA	Removed/remediated during construction of SIMA facility.	Closed out during the construction of the SIMA building and documented in FFA.
Site 15	Fire Training Area	Fire Training Area at Bldg. 271; RFA - SWMU 27	Response Complete - NFA	Will be investigated under the Navy's Underground Storage Tank (UST) program and therefore, NFA under CERCLA consensus by Navy, VDEQ, and EPA in July 2002.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
Site 16	DRMO Storage/Salvage Yard	RFA - SWMU 28	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 stormwater management.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
Site 17	Storage Pad at Building 279	Satellite storage at Bldg. 279; RFA - AOC A	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. Based upon the proximity to Site 2, consensus in February 2003 by Navy, VDEQ, and EPA that further action related to Site 17 will be addressed as part of Site 2.	February 2003 Tier I Partnering Meeting Minutes and documented in FFA.
Site 18	Blasting Grit at Building 47	RFA - AOC C	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.	Consensus for NFA as documented in the November 2002 SSA.
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 stormwater management.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
Site 19	Building 190	Residual Ordnance at Bldg. M 5 & 190 RFA - AOC H	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.	Final Site Closeout Report signed December 2006.
Site 20	Wharf Area Sediments	Residual Ordnance at wharf area; RFA - AOC I	Response Complete - NFA	Navy Range Program will manage the site. Due to the potential for buried ordnance, signs were posted in 2003 to prohibit intrusive activities, the Navy will place a warning notice in LANTDIV Real Estate Documents, and notify the U.S. Army Corps of Engineers of the potential for UXO. During the July 2001 site visit, the Navy, VDEQ and EPA reached consensus for NFA under CERCLA.	Consensus for NFA as documented in the November 2002 SSA.
SWMU 10	Hazardous Waste Container Storage Bldg. 254Y	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.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
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 is managed under the Virginia Hazardous Waste Management Regulations (VHWMR).	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
SWMU 12	PCB Storage Bldg. 198	None	Response Complete - NFA	Recommended for NFA in the RFA. SWMU 12 is a current storage facility managed under Toxic Substances Control Act (TSCA) therefore, consensus by Navy, VDEQ, and EPA for NFA under CERCLA in July 2002.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
SWMU 18	Old Storage Yard # 2	None	Response Complete - NFA	Recommended for NFA in the RFA. Currently in operation and Regional inspections are conducted for stormwater management. Consensus by Navy, VDEQ, and EPA for NFA under CERCLA.	FFA
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

**Table 3-1
Site Status Summary Table
Site Management Plan (FY 2008 - 2012)
St. Juliens Creek Annex
Chesapeake, Virginia**

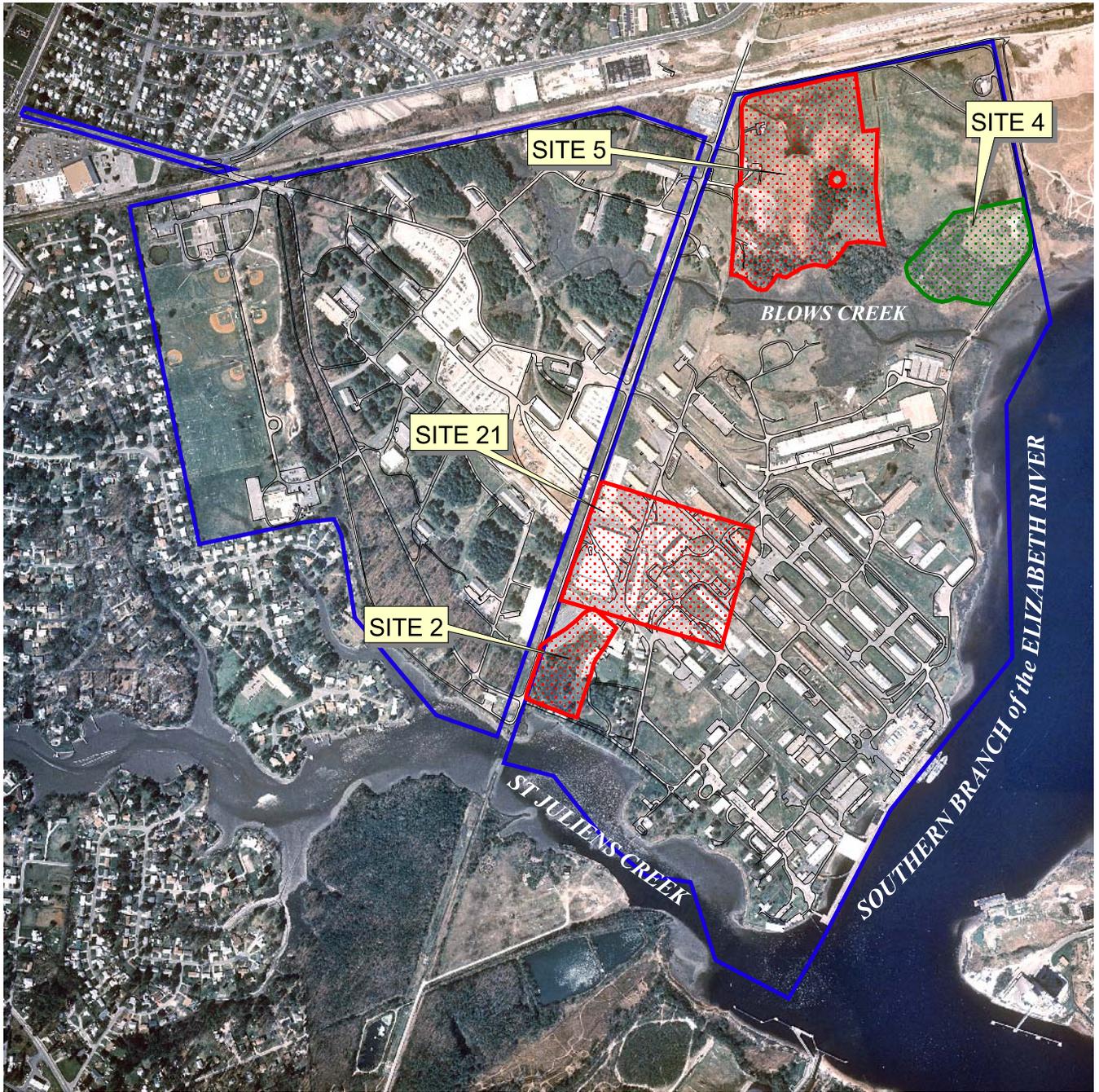
Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure
SWMU 21	Hazardous Waste Accumulation Area (SIMA # 2)	None	Response Complete - NFA	The RFA recommended NFA for this SWMU. A site visit was performed in November 2002 by Navy, VDEQ, and EPA to confirm status and consensus for NFA under CERCLA was reached. The Navy submitted a closure notification letter to VDEQ for SWMU 21.	Closure letter submitted to VDEQ and documented in FFA.
SWMU 22	Repair Shop Satellite Storage Area NE of Bldg. 40	None	Response Complete - NFA	The RFA recommended NFA for this SWMU. A site visit was performed in November 2002 by Navy, VDEQ, and EPA to confirm status and consensus for NFA under CERCLA was reached. The Navy submitted a closure notification letter to VDEQ for SWMU 22.	Closure letter submitted to VDEQ and documented in FFA.
SWMU 26	Scrap Metal Storage in Railroad Cars near Bldg. 176	None	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
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 under RCRA.	FFA
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
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
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
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
AOC E	Temporary Pump Storage	None	Response Complete - NFA	AOC E was remediated during a removal action conducted as part of the SIMA facility construction. Therefore, the SJCA Partnering Team reached consensus for NFA for AOC E based on the removal action.	Closed out during the construction of the SIMA building and documented in FFA.
AOC F	Underground Storage Tanks	None	Response Complete - NFA	Navy, VDEQ, and EPA reached consensus for NFA under CERCLA in July 2002, as AOC F is managed under the Navy's UST Program.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
AOC G	Former Process Buildings	None	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.	July 2002 Tier I Partnering Meeting Minutes and documented in FFA.
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
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.	Signature Page in Final SSA Addendum (June 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.	Signature Page in Final SI (June 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.	Consensus for NFA as documented in the November 2002 SSA.
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.	Consensus for NFA as documented in the November 2002 SSA.
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.	Consensus for NFA as documented in the November 2002 SSA.
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.	Consensus for NFA as documented in the November 2002 SSA.
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.	Consensus for NFA as documented in the November 2002 SSA.
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.	Consensus for NFA as documented in the November 2002 SSA.
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.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 9	Ground Scarring Southwest of Building 74	AOC 9	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 10	Ground Scarring in Wharf Area	AOC 10	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 11	Open Storage Area Northeast of Building 55	AOC 11	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
EPIC AOC 12	Sandy Flat	AOC 12	Response Complete - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	Consensus for NFA as documented in the November 2002 SSA.
AOC 13	PCP Dip Tank	AOC 13; FFA - SSA AOC 13	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.	Signature Page in Final SSA Addendum (June 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.	Signature Page in Final SSA Addendum (June 2004).

**Table 3-2
Environmental Studies, Investigations, and
Actions Completed To-Date at Active IR Sites
Site Management Plan (FY 2008 - 2012)
St. Juliens Creek Annex
Chesapeake, Virginia**

IR Site	Preliminary Studies			Preliminary Investigations	RI	FS	EE/CA	Removal Actions	PP/ROD	RD/RA
	IAS (1981)	PA (1983)	RFA (1989)							
RI/FS Sites										
Site 2	X	X	X	RRR - 1996	2003 Expanded RI - 2007					
Site 5	X		X	RRR - 1996	2003 Expanded RI - 2007		2007			
Site 21	X		X	RRR - 1996 SSA - 2002 SI - 2004 Supplemental SI - 2006	2007					
Response Complete LUCs Sites										
Site 4	X	X	X	RRR - 1996	2003	2004			2005	2005

**Table 3-3
Land Use Controls
Site Management Plan (FY 2008 - 2012)
St. Juliens Creek Annex
Chesapeake, Virginia**

IR Site	Site Name	Date of Final ROD	Location on SJCA	Estimated Area	Land Use Control Objectives	Land Use Control Implementation and Maintenance Actions
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 IR office



LEGEND

-  SJCA Boundary
-  RI/FS Sites
-  Response Complete - Sites with LUCs

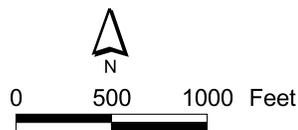
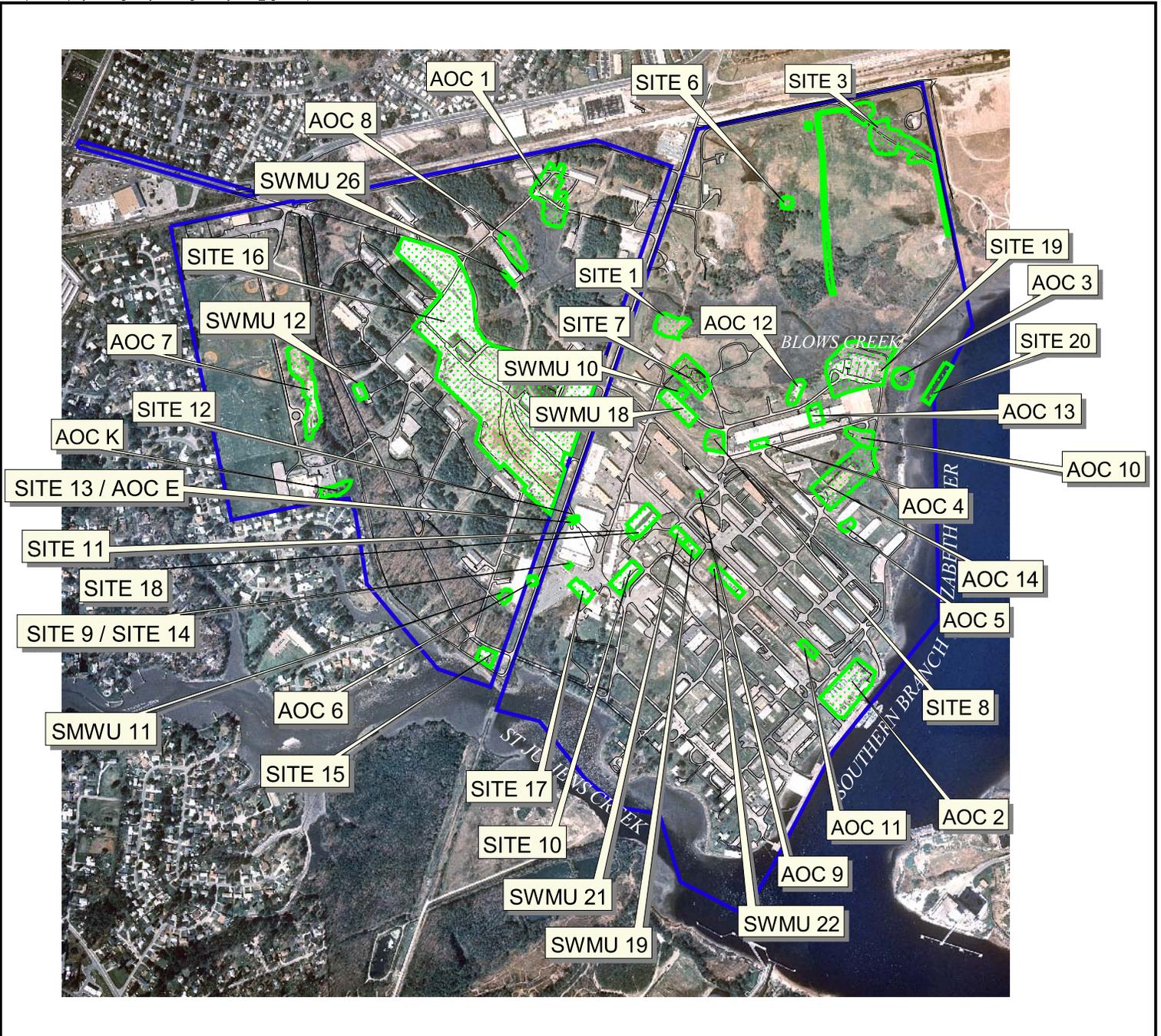


Figure 3-1
Location of Active Sites
St. Juliens Creek Annex
Chesapeake, Virginia



LEGEND

-  SJCA Boundary
-  Response Complete- No Further Action Sites

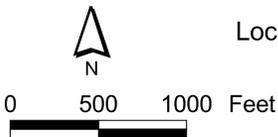
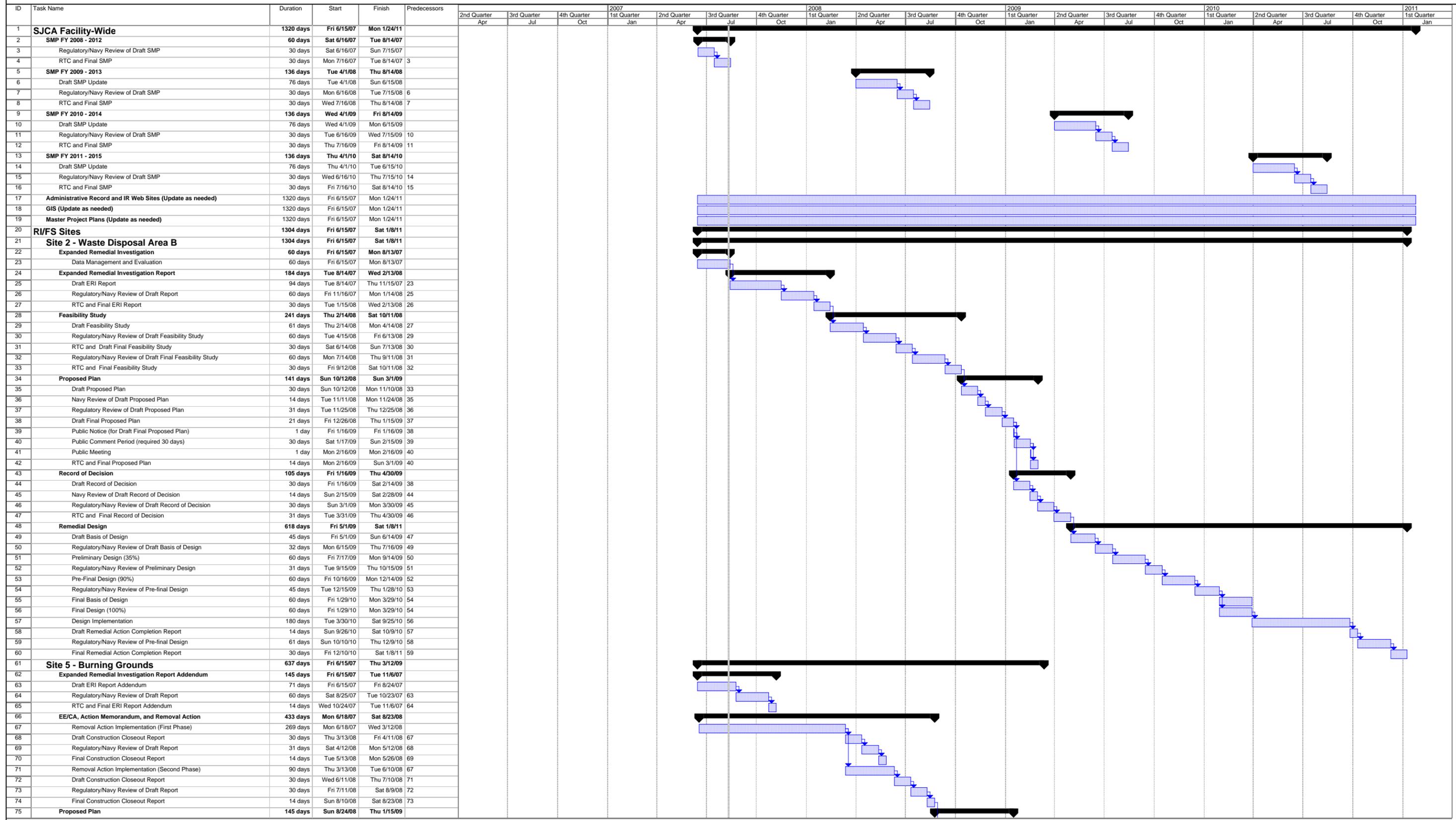


Figure 3-2
Location of No Further Action Sites, SWMUs, and AOCs
St. Juliens Creek Annex
Chesapeake, Virginia

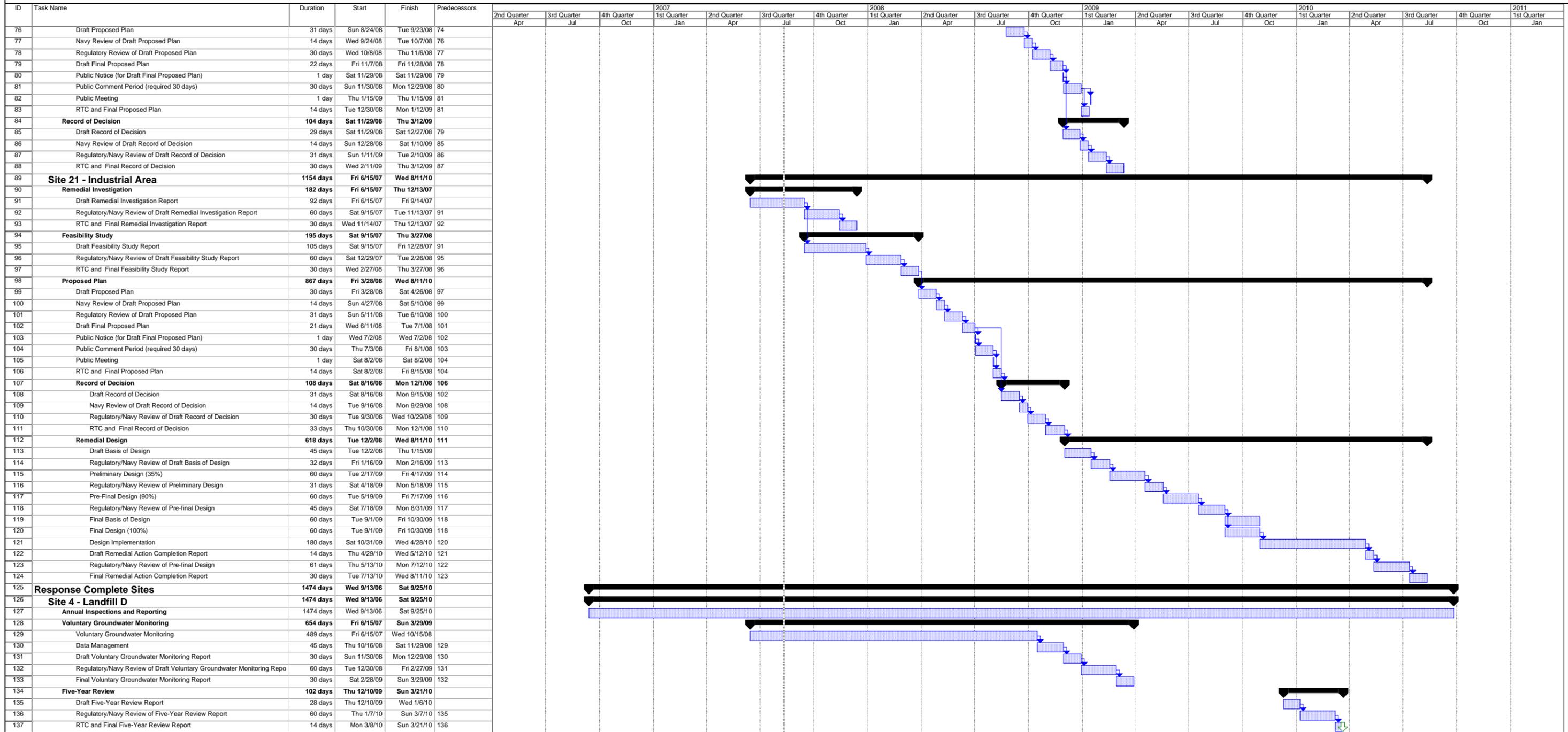
**Figure 3-3
Schedule of IR Activities for Fiscal Years 2008 through 2012
St Juliens Creek Annex
Site Management Plan**



Date: Fri 8/10/07 Task Split Progress Milestone Summary Project Summary External Tasks External Milestone External Milestone External Milestone External Milestone Deadline

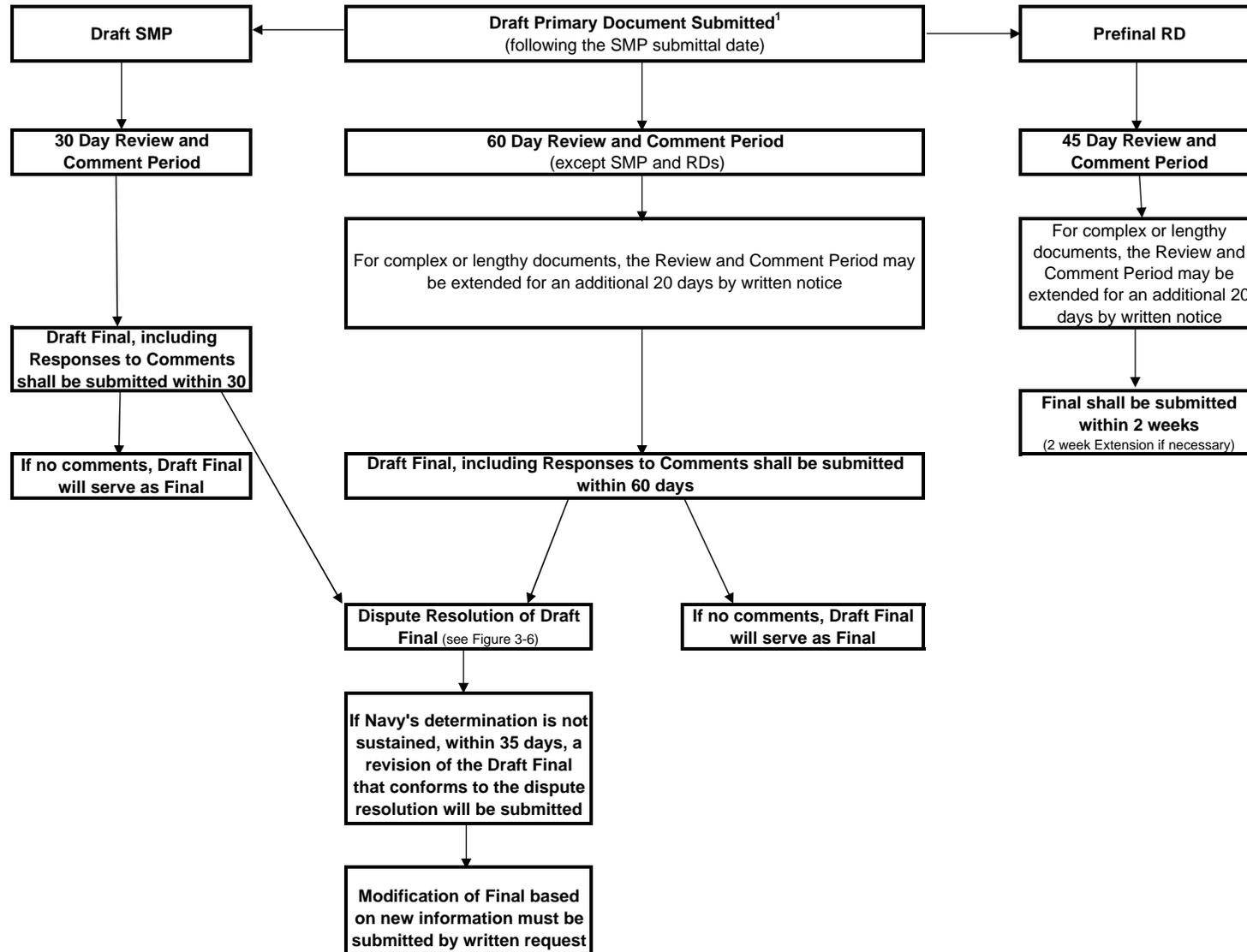
Note: The review and submittal dates are based on the FFA Process Flow Charts or dates previously agreed upon and assume informal dispute resolution of Draft Final documents within a reasonable number of days. Page 1 of 2

**Figure 3-3
Schedule of IR Activities for Fiscal Years 2008 through 2012
St Juliens Creek Annex
Site Management Plan**



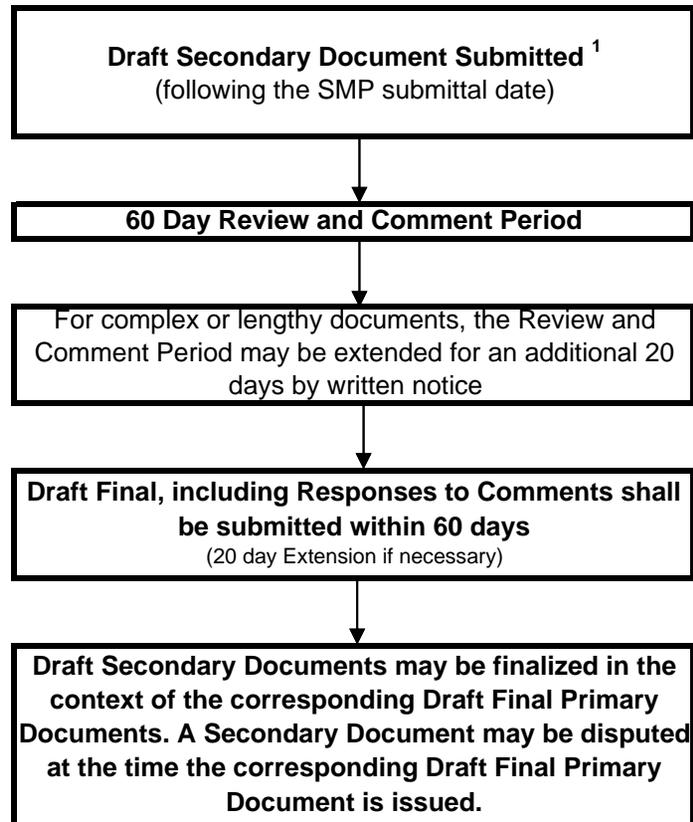
Date: Fri 8/10/07 Task Split Progress Milestone Summary Project Summary External Tasks External Milestone External Milestone External Milestone External Milestone Deadline

**Figure 3-4
Primary Document Submittal Flow Chart
FFA Process
St. Juliens Creek Annex
Chesapeake, Virginia**



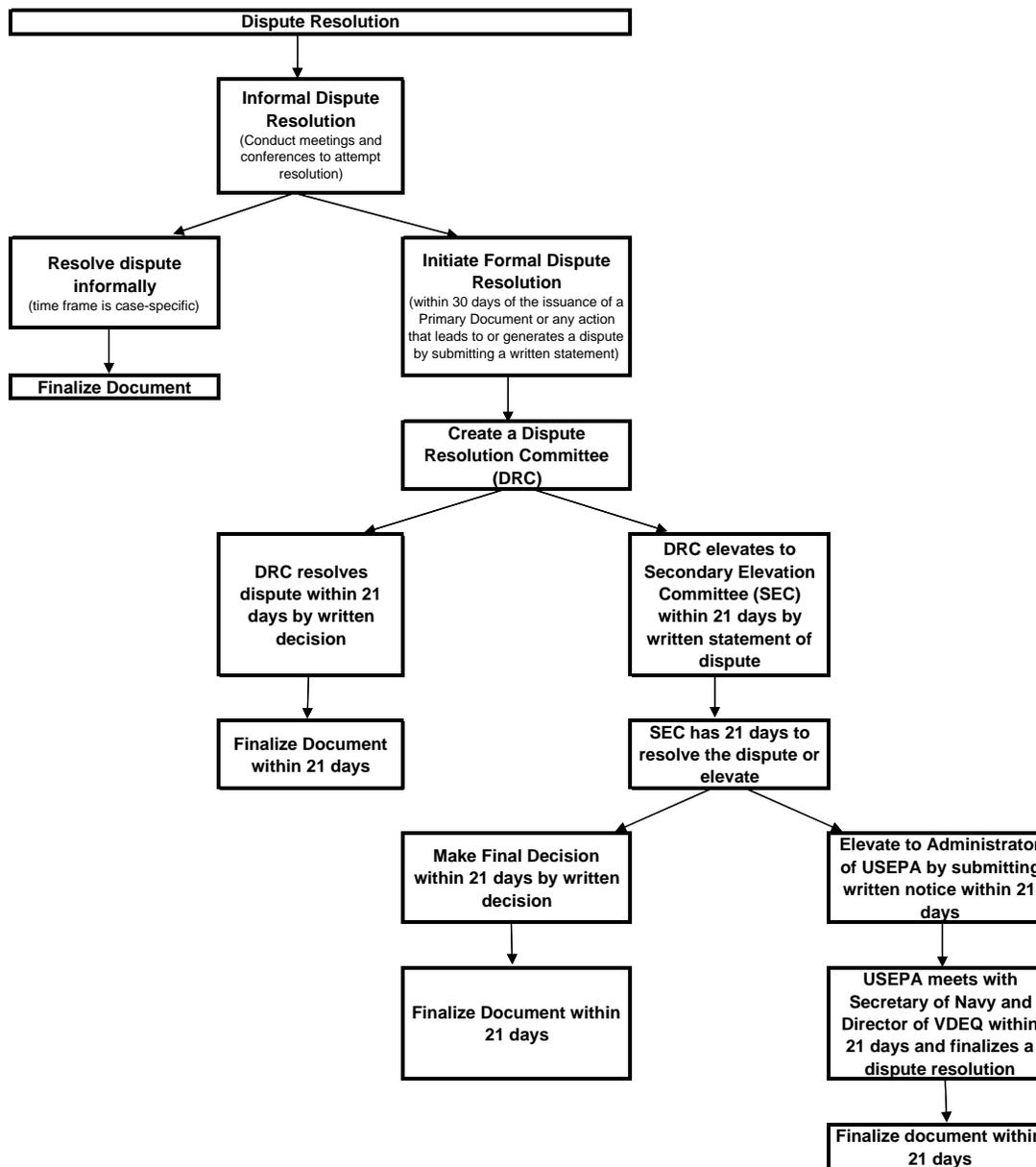
¹SJCA Primary Documents Include: Remedial Investigation (RI)/Feasibility Study (FS)/Focused Feasibility Study (FFS) Work Plans, RI Reports, FS and FFS Reports, Proposed Plans (PPs), Records of Decision (RODs), Final Remedial Designs (RDs), Remedial Action Work Plans, Remedial Action Completion Reports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

**Figure 3-5
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 3-6
Dispute Resolution Flow Chart
FFA Process
St. Juliens Creek Annex
Chesapeake, Virginia



SECTION 4

Navy Land Use Planning

The SJCA IR Program has developed a Geographical Information System (GIS) that identifies areas of past or present environmental concern. The attached compact disc (CD) provides maps and GIS layers in Arcview® for the active IR sites; NFA IR sites; IR sites with LUCs; petroleum, oil, and lubricant (POL) sites; former or existing IR sites where munitions and explosives of concern (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; and IR sites with an Explosives Safety Submission (ESS) or ESS Waiver for intrusive activities. As information changes based on ongoing site investigations, desktop GIS updates 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 IR 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 Regional Project Manager should be consulted:

Mr. Tim Reisch, P.E.
Naval Facilities Engineering Command, Mid Atlantic
Environmental Code EV3, Bldg N-26, Rm 3208
9742 Maryland Avenue
Norfolk, Virginia 23511-3095
(757) 444-6890

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.
- AGVIQ-CH2M HILL Joint Venture I. 2005. *Final Construction Closeout Report, Site 4 – Landfill D Soil Cover (Design/Build), St. Juliens Creek Annex, Chesapeake, Virginia*. December.
- AGVIQ-CH2M HILL Joint Venture I. 2006. *Final Construction Closeout Report, Site 19 – Removal Action, St. Juliens Creek Annex, Chesapeake, Virginia*. July.
- 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. 2001. *Final Background Investigation Report, St. Juliens Creek Annex, Chesapeake, Virginia*. October.
- 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 Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia*. February.
- CH2M HILL. 2004b. *Final Feasibility Study for Site 4, St. Juliens Creek Annex, Chesapeake, Virginia*. March.
- CH2M HILL. 2004c. *Final Background Investigation Report Addendum for Groundwater, St. Juliens Creek Annex, Chesapeake, Virginia*. August.
- CH2M HILL. 2005a. *Final Supplemental Site Investigation Report for Site 19, St. Juliens Creek Annex, Chesapeake, Virginia*. September.
- CH2M HILL. 2005b. *Draft Expanded Remedial Investigation Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia*. October.
- CH2M HILL. 2005c. *Final Engineering Evaluation/Cost Analysis for Site 19, St. Juliens Creek Annex, Chesapeake, Virginia*. November.
- CH2M HILL. 2006a. *Final Action Memorandum for Site 19, St. Juliens Creek Annex, Chesapeake, Virginia*. January.
- CH2M HILL. 2006b. *Draft Supplemental Site Investigation for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia*. April.
- CH2M HILL. 2006c. *Final Site Management Plan, Fiscal Years 2007 through 2011, St. Juliens Creek Annex, Chesapeake, Virginia*. August.

CH2M HILL. 2006d. *Final Baseline Ecological Risk Assessment, Blows Creek Watershed. St. Juliens Creek Annex, Chesapeake, Virginia.* December.

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

CH2M HILL. 2007b. *Final Dynamic Work Plan for Triad Investigation at Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* April.

Department of Defense. 2004. *Final Federal Facilities Agreement, St. Juliens Creek Annex, Chesapeake, Virginia.* March. (Signed July 2004.)

United States Environmental Protection Agency (EPA). 1995. *Aerial Photographic Site Analysis, Norfolk Naval Shipyard: Annex Areas, Norfolk, Virginia.* February.

Naval Facilities Engineering Command. 2004. *Final Record of Decision – Site 4: Landfill D, St. Juliens Creek Annex, Chesapeake, Virginia.* August.

Navy Engineering and Environmental Support Activity. 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 (U.S. Navy), Chesapeake City, Virginia.* January