Naval Facilities Engineering Systems Command Mid-Atlantic
Norfolk, Virginia

Site Management Plan
Fiscal Years 2023 through 2027

St. Juliens Creek Annex
Chesapeake, Virginia

September 2022

Naval Facilities Engineering Systems Command Mid-Atlantic
Norfolk, Virginia

Site Management Plan
Fiscal Years 2023 through 2027

St. Juliens Creek Annex
Chesapeake, Virginia

September 2022

Prepared for NAVFAC Mid-Atlantic
by CH2M HILL, Inc.
Virginia Beach, Virginia
Contract N62470-16-D-9000
CTO WE32

Contents

Tables

Figures

Acronyms and Abbreviations

AOC	Area of Concern
CCR	Construction Completion Report
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	constituent of concern
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ERA	ecological risk assessment
ERD	enhanced reductive dechlorination
ERP	Environmental Restoration Program
ERS	ecological risk screening
EVO	emulsified vegetable oil
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	In Situ Chemical Reduction
LUC	land use control
MIP	membrane interface probe
MNA	monitored natural attenuation
MRP	Munitions Response Program
NACIP	Navy Assessment and Control of Installation Pollutants
NAVFAC	Naval Facilities Engineering Systems Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substance Pollution Control Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NFA	no further action
NPL	National Priorities List
NTCRA	Non-time-critical Removal Action
NUS	NUS Corporation, Superfund Division
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PP	Proposed Plan
PRB	permeable reactive barrier
RA	Remedial Action

RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RA-C	Remedial Action-Construction
RA-O	Remedial Action-Operation
RAO	remedial action objective
RC	Response Complete
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDX	cyclotrimethylenetrinitramine
RFA	Resource Conservation and Recovery Act Facility Assessment
RFI	Resource Conservation and Recovery Act 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
VDEQ	Virginia Department of Environmental Quality
VI	vapor intrusion
VOC	volatile organic compound
VSI	Visual Site Inspection

SECTION 1

Introduction

This document presents the Environmental Restoration Program (ERP) Site Management Plan (SMP) for St. Juliens Creek Annex (SJCA), Chesapeake, Virginia, for fiscal years (FYs) 2023 through 2027. The SMP meets the requirements of the Federal Facility Agreement (FFA) between the Naval Facilities Engineering Systems Command (NAVFAC) Mid-Atlantic, Region 3 of the United States Environmental Protection Agency (EPA), 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 (DoD, 2004).

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 ERP sites. The prioritization of activities and the conceptual schedules were developed by the SJCA ERP Partnering Team, which includes representatives from NAVFAC, EPA, 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 goals applicable to SJCA ERP
  - Achieve RCs at 95 percent of all IRP and MRP sites at active installations by the end of FY 2021
- Goals set by the SJCA ERP Partnering Team to meet requirements of EPA, VDEQ, NAVFAC, and the public.

The drafting of this SMP was completed in August 2022 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 FY, 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 2022 through 2026 SMP (CH2M, 2021a).

SECTION 2

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**). A Virginia Power easement runs through the facility. 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, which was received in lined boxes from the manufacturer) 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 Naval Weapons Station Yorktown. 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 saltwater fire-protection systems; fire-fighter training; and storage of oil and chemicals.

While activity at SJCA has decreased overall in the past decade with the demolishment of many older structures, most recently it has increased. 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 Logistics Agency, Naval Information Warfare Systems Command, Fleet Logistics Norfolk, Naval Undersea Warfare Center Detachment, 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 (NEESA, 1981). Results of the IAS 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 sediment 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 EPA 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 report for the PA 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), 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.

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, EPA, 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 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 Department of the Navy (Navy), EPA, 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 content of the SMP.

The Preliminary Closeout Report for SJCA was signed in July 2016, signifying that the facility had achieved construction completion (EPA, 2016).

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 summarized in the following subsections.

Community involvement is implemented throughout the CERCLA process. 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, 2000). The plan, now called the Community Involvement Plan, 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 completed in 2020 (CH2M, 2020b). Community participation at SJCA includes a Restoration Advisory Board (RAB), public meetings, an information repository, fact sheets, public notices, and a public Web site (https://go.usa.gov/xGmmW). The RAB was formed in 1999 and is co-chaired by the Navy and a community member from the Geneva Shores neighborhood in the city of Chesapeake. The RAB consists of community members and representatives of the Navy, VDEQ, and EPA. 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, employees at SJCA, and local community members frequently participate in the RAB.

The documents that form the basis for the selection of the response for each site are maintained in an administrative record. An information repository consisting of a reference collection of general and SJCA ERP site information, including documents for public review, the Community Involvement Plan, Superfund information, and fact sheets, is maintained at the Major Hillard Library in the city of Chesapeake, for review by the public. The administrative record, information repository, and ERP public Web site are updated as needed.

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 a Site Inspection (SI) if there is insufficient information to reach an NFA decision, an Engineering Evaluation/Cost Analysis (EE/CA) and Removal Action if significant threat to human health or the environment exists, or a Remedial Investigation (RI)/Feasibility Study (FS) if remediation is deemed necessary.

If the PA recommends an SI, the 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 recommends further investigation and/or remediation, an RI/FS or an EE/CA and Removal Action is initiated. 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 remedial action objectives (RAOs) and remedial strategies that will comprise the FS.

The FS is the mechanism for the development, screening, and detailed evaluation of Remedial Action (RA) 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 influence the development of RA 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 Remedial Design (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 study). For technologies that are well-developed and tested, if treatability studies are needed, 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 Record of Decision (ROD). If the nine National Oil and Hazardous Substance Pollution Control Contingency Plan (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 Proposed Plan (PP) presents the RA alternatives developed in the FS and recommends a preferred RA alternative. The preferred RA alternative selection process factors in the ability of each alternative to satisfy the threshold criteria, trade-offs among RA alternatives considering the primary balancing criteria, and the results of the risk assessment. The public is given 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 held to provide supporting

information. At the end of the public comment period, an appropriate RA 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, EPA, VDEQ, and the public) must have an opportunity to comment on the selected RA alternative. Any public comments received on the PP are addressed as part of the responsiveness summary in the ROD. The Navy, EPA, and VDEQ must agree on the selected RA alternative. A public notice is issued after the ROD is signed and is made 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 for those sites where the selected remedy includes further action.

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, including terms and conditions for establishing and maintaining land use controls (LUCs), 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.

LUCs restrict use of, and may also limit access to, real property at which contamination remains in place. LUCs, which consist of engineered controls and institutional controls, are placed on ERP sites to protect human health and the environment until such time, if ever, as they are no longer needed. Engineered controls include fences, signs, and other physical means of regulating access to and use of real property. Institutional controls are legal and administrative restrictions on land use, such as notations on installation land use plans, notices recorded in public land records, and periodic site inspections. LUCs may be modified as site conditions change. Field inspections are required at least annually to assess the conditions of all sites subject to LUCs. These inspections shall determine whether the current land use remains protective and consistent with all RA/corrective measures objectives outlined in the ROD.

The RA phase is the actual construction or implementation of the cleanup process and implementation of LUCs, if applicable. 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—Remedial Action-Construction (RA-C) and Remedial Action-Operation (RA-O).

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.

Once the RA-C phase is completed and the remedy has been shown to be functioning as designed (for example, initial testing has been accomplished and shows that the remedy will function properly), the RIP milestone is achieved. For long-term remedies where it is anticipated that RAOs will be achieved over a long period, an Interim Remedial Action Completion Report (IRACR) is prepared following RIP to document that the remedy is constructed and operating successfully, and the RA-O phase is initiated.

2.3.6 Response Complete, Long-Term Management, and Site Closeout

Response Complete (RC) is a milestone signifying that the DoD component has met the RAOs for a site, documented the determination, and sought regulatory agreement. RC signifies that the DoD has determined at the end of the RA that no additional response action is required; RIP has been achieved and the required RA-O phase has achieved the RAOs; or where there is no RA-O phase, the RA-C phase has achieved the RAOs. Once RC has been achieved for a site, a Remedial Action Completion Report (RACR) is prepared to demonstrate that the remedy is complete and the RAOs have been met.

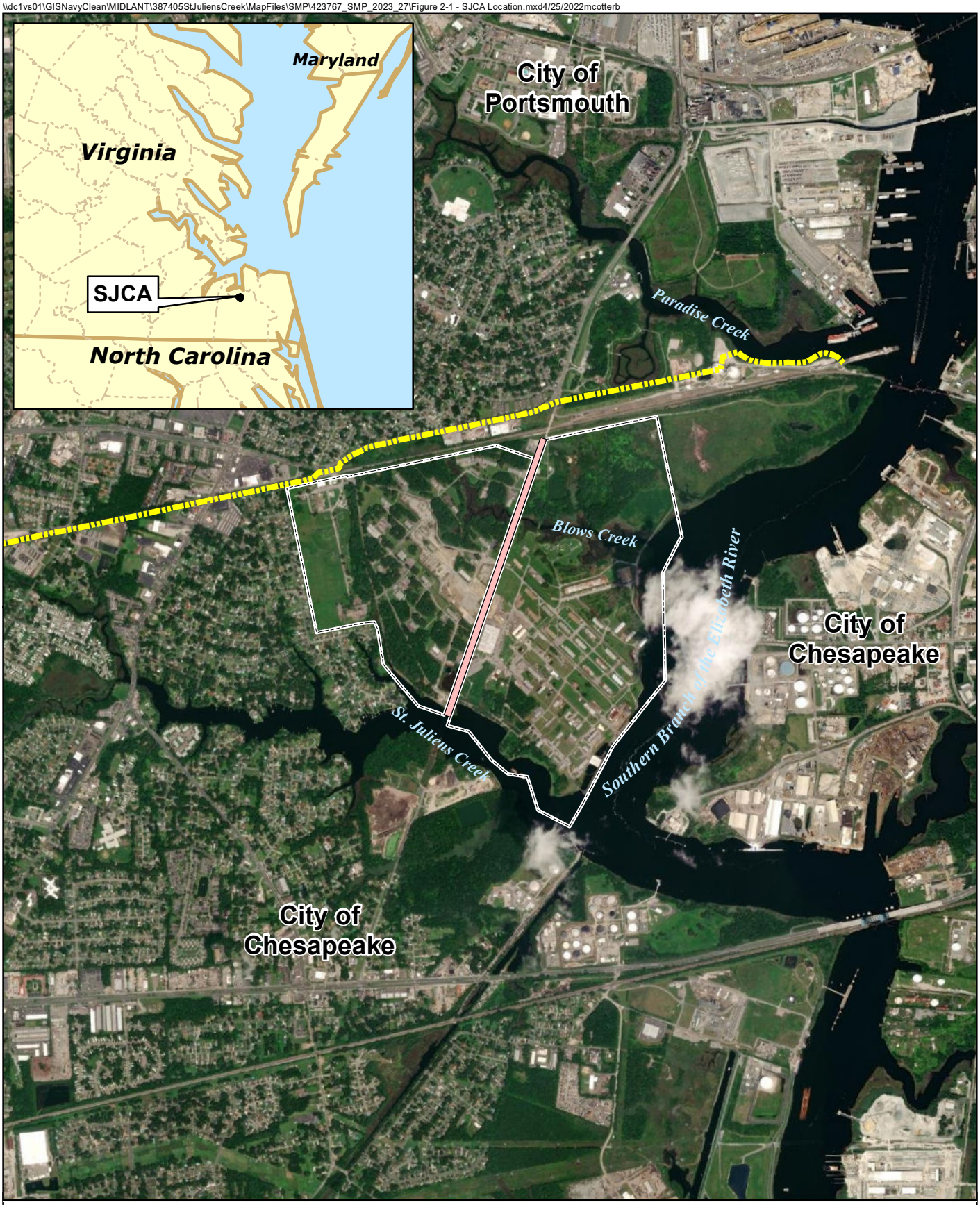
RC is followed by long-term management or individual site closeout. Long-term management may be required to monitor long-term protectiveness of the remedy, and may include implementation and management of LUCs, groundwater monitoring, and preparation of Five-Year Review reports. Long-term management is required at sites where hazardous substances, pollutants, or contaminants remain onsite after RC, and are at levels that prevent unlimited use and unrestricted exposure.

Five-Year Reviews are required by CERCLA when hazardous substances remain onsite above levels permitting unrestricted use and unlimited exposure. 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 EPA retains responsibility for determining the protectiveness of the remedy.

If the PA/SI or RI and ROD conclude that RA is not required, site closeout occurs. If the PA/SI or RI and ROD conclude that RA is required, site closeout occurs once the remedy is protective of human health and the environment and active site management and monitoring are no longer needed.

Construction complete for a facility is achieved when physical construction of all cleanup actions is complete, all immediate threats have been addressed, and all long-term threats are under control for all portions of the site. A Preliminary Closeout Report is completed and signed by EPA to signify achievement of construction completion. Once individual site closeouts, RCs, or RIPs have been documented for every site at the facility and the terms of the FFA (DoD, 2004) have been met, site completion for the facility is documented in a Final Closeout Report by EPA, and NPL deletion is requested for the facility.

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\Figure 2-1 - SJCA Location.mxd4/25/2022mcotterb



Legend

- St. Juliens Creek Annex Boundary
- City Boundary
- Virginia Power Easement

N
W E
S

0 1,000 2,000 Feet

Figure 2-1
Location of St. Juliens Creek Annex
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

ch2m:

SECTION 3

Environmental Restoration Program Site Descriptions

Fifty-nine potentially-contaminated sites, SWMUs, and AOCs have been identified for evaluation at SJCA under the ERP based on previous assessments and investigations. Three sites are currently active in the SJCA ERP: IRP Sites 2, 4, and 21 (**Figure 3-1**). Fifty-six sites have been categorized as NFA sites by the SJCA ERP Partnering Team following desktop audits, SIs, and/or Removal Actions (**Figure 3-2**). **Table 3-1** lists the status of each site.

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

- IAS (NEESA, 1981)
- PA (NUS, 1983)
- Phase II RFA (A. T. Kearney, Inc. and K. W. Brown and Associates, Inc., 1989)
- Aerial Photographic Site Analysis (EPA, 1995)
- Relative Risk Ranking (RRR) System Data Collection (CH2M, 1996)
- HRS (Tetra Tech, 2000)
- Basewide background investigations (CH2M, 2001b, 2004e)
- Site Screening Assessment (SSA) (CH2M, 2002)
- Five-Year Reviews (CH2M, 2010d, 2015b, 2020c)

In 2016, NAVFAC Headquarters released a directive to conduct a comprehensive compilation of existing information about known or potential releases and potential migration pathways for per- and polyfluoroalkyl substances (PFAS), an emerging class of contaminants, at naval facilities (Navy, 2016). As part of the NAVFAC Headquarters directive, a Navy-wide review of records was conducted to establish an inventory of locations where PFAS may have been used, stored, released, or disposed of at Navy installations. In response to this direction, a PA for PFAS at SJCA is being conducted. The PA Work Plan was finalized in October 2018 (CH2M, 2018b). The PA report was finalized in February 2021; a total of seven areas at SJCA were recommended for further investigation as part of an SI (CH2M, 2021b). The SJCA PFAS SI SAP was finalized in September 2021 and includes all seven areas identified to move forward into the SI phase, and the fieldwork is currently ongoing.

The following subsections present a brief site history, site description, summary of the site-specific investigations conducted, and CERCLA activities planned for FY 2022 and beyond at each active ERP site and are divided based on the site's current CERCLA phase.

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 ERP activities that will take place at SJCA FY 2023 through FY 2027 is presented on **Figure 3-3**. The review and comment periods for deliverables shown in the schedule are based on FFA guidelines; flow charts depicting the process are included as **Figures 3-4** through **3-6**.

3.1 Remedial Design/Remedial Action Sites

3.1.1 IRP Site 2—Waste Disposal Area B

Site 2 is a former waste disposal area covering approximately 6.3 acres at the intersection of St. Juliens Road and Cradock Street in the southern portion of SJCA (**Figure 3-7**). 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 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.

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. During the VSI conducted as part of the RFA, 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 also observed during the VSI 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.

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 storm water detention basin, and on the south by St. Juliens Creek. The water body, often referred to as the Site 2 inlet, that was located in the center of the site was filled in as part of the primary RA. Groundwater flow, which historically followed the topography and flowed towards the inlet and creek, has changed as a result of filling in the inlet and constructing the storm water detention basin west of the site, and is flowing predominately southwest.

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

The RI field activities at Site 2 began in 1997 and continued through 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 human health risk assessment (HHRA) and ecological risk assessment (ERA) conducted as part of the RI concluded that there were potential risks 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 were no significant risks to human health or the environment identified. No human health risk drivers were identified in shallow aquifer or deep aquifer groundwater.

The RI report 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 aquifer 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, 2001a)

SI activities were conducted in 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 human health risk screening (HHRS) and ecological risk screening (ERS) conducted as part of the SI concluded that there were 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 through 2010 (CH2M, 2010a)

Based on the results of the Site 2 RI and data gaps identified, an expanded RI was conducted. The expanded RI activities were conducted in phases from 2003 through 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 aquifer groundwater VOC plume and source area; aquifer testing of the deep aquifer to determine if VOCs had impacted the deep groundwater; storm water 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 were potential risks to human and ecological receptors from exposure to chemicals in soil (primarily PAHs and inorganics), shallow aquifer 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 the deep aquifer groundwater.

The expanded RI report recommended an FS to evaluate potential RA alternatives to mitigate unacceptable human health and/or ecological risks in soil and waste, shallow aquifer groundwater, sediment, and surface water at Site 2.

Feasibility Study—2008 through 2010 (CH2M, 2010b)

Based on the findings of the expanded RI (CH2M, 2010a), an FS was conducted to identify and analyze RA alternatives to mitigate potential risks associated with soil and waste, shallow aquifer groundwater, sediment, and surface water (CH2M, 2010b). The following eight RA 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 VOCs, naphthalene, and heptachlor epoxide target areas)
- **Alternative 3—**cover (waste and soil), excavation (St. Juliens Creek sediment), sheet pile (high-concentration VOCs target area), and MNA (low-concentration VOCs, naphthalene, and heptachlor epoxide target areas)
- **Alternative 4—**cover (waste and soil), excavation (St. Juliens Creek sediment), enhanced reductive dechlorination (ERD) (high-concentration VOCs target area), and MNA (low-concentration VOCs, naphthalene, and heptachlor epoxide target areas)
- **Alternative 5—**cover (waste and soil), excavation (St. Juliens Creek sediment), ERD (high- and low-concentration VOCs 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 VOCs target area), and MNA (low-concentration VOCs, naphthalene, and heptachlor epoxide target areas)
- **Alternative 7—**cover (waste and soil), excavation (St. Juliens Creek sediment and high-concentration VOCs target area), and MNA (low-concentration VOCs, naphthalene, and heptachlor epoxide target areas)
- **Alternative 8—**cover (waste and soil), excavation (St. Juliens Creek sediment and high-concentration VOCs target area), ERD (low-concentration VOCs target area), and MNA (naphthalene and heptachlor epoxide target areas)

In addition to the RA alternatives for each component, a permeable reactive barrier (PRB) contingency was developed independently for addition to any of the RA alternatives.

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

Proposed Plan and Record of Decision—2010 through 2011 (CH2M, 2010e; NAVFAC, 2011a)

The PP identified the preferred RA alternative for addressing human health and ecological risks at Site 2 as Alternative 4 in the FS (CH2M, 2010e). 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 –cover, excavation, ERD, MNA, LUCs, and a contingency PRB – was signed in February 2011 (NAVFAC, 2011a).

Remedial Design—2010 through 2013 (CH2M, 2011c, 2013; NAVFAC, 2011b)

The RD for the soil cover, ERD, and MNA components of the selected remedy was completed in 2011 (CH2M, 2011c). The initial RD for LUCs was completed in 2011 (NAVFAC, 2011b). The RD addendum for the St. Juliens Creek sediment excavation component of the selected remedy was completed in January 2013 (CH2M, 2013).

Remedial Action-Construction and Interim Remedial Action Completion Report—2012 through 2015 (Shaw, 2012b, 2013; CH2M, 2014; CB&I, 2014a; EPA, 2015)

The RA work plan for the soil cover, ERD, and MNA components of the selected remedy was completed in 2012 (Shaw, 2012b). The RA work plan addendum for the St. Juliens Creek sediment excavation component of the selected remedy was completed in March 2013 (Shaw, 2013).

The RA was initiated in April 2012 and construction of the primary components of the RA (construction of a compensatory mitigation wetland, installation of a cover system over the Site 2 waste disposal area, excavation of the impacted sediment in St. Juliens Creek at the outfall from Site 2, implementation of an ERD shallow aquifer groundwater treatment system to evaluate remedy effectiveness, and implementation of LUCs) was completed in July 2014. The Construction Completion Report (CCR) documenting construction of the primary RA components was finalized in December 2014 (CB&I, 2014a). The IRACR documenting that RIP has been achieved for the site was signed in September 2015 (EPA, 2015).

Record of Decision Memorandum to Site File and Land Use Control Remedial Design Revision—2014 (CH2M, 2014; NAVFAC, 2014a)

During construction of the primary RA components, waste was discovered outside of the limits of waste defined in the ROD. Therefore, a memorandum to site file and a LUC RD revision were finalized in October 2014 to document the post-ROD change in the limits of waste, LUC, and site boundaries, the selected remedy components, and the LUC objectives (CH2M, 2014; NAVFAC, 2014a).

Record of Decision Memorandum to Site File–2016 (CH2M, 2016a)

The cleanup level of naphthalene in groundwater was revised to 19 µg/L replacing the previous value of 170 µg/L identified in the ROD (NAVFAC, 2011a). The cleanup level differs from the calculated value in the FS because the calculations were performed using updated risk assessment exposure factors.

Remedial Action-Operation—2014 through To-Be-Determined (Ongoing) (NAVFAC, 2014a, 2016b, 2018a, 2018b; CH2M, 2015b, 2016a, 2016b, 2018c, 2019b, 2020c, 2020d, 2021c; CB&I, 2016, 2017; APTIM, 2018a, 2018b, 2018c, 2019a, 2021a, 2021b; Meadows, 2017a, 2018a, 2018b, 2019a, 2019b, 2020a, 2021a, 2021c, 2022a)

RA-O was initiated in July 2014 and is ongoing. The RA-O phase includes groundwater monitoring to evaluate remedy effectiveness, additional emulsified vegetable oil (EVO) injections (as needed), LUCs maintenance, and Five-Year Reviews. The groundwater monitoring is currently conducted semiannually but the frequency may be adjusted as the treatment progresses.

Groundwater Monitoring and EVO Injections

Thirteen RA-O groundwater monitoring events have been conducted to-date. The most recent groundwater monitoring event was conducted in November 2021 (Meadows, 2022a).

Evaluation of groundwater data collected during Event 3 (January 2015) identified high concentrations of chlorinated VOCs extending further downgradient and into a deeper portion of the Columbia aquifer than previously known. Therefore, the need for additional downgradient EVO injections (Round 2) was identified (CB&I, 2016). An investigation was completed in December 2015 to further characterize the treatment area to aid in preparing a RD for the Round 2 injections. The investigation consisted of conducting hydraulic profiling tool/electrical conductivity logging to evaluate the site lithology and potential preferential pathways, and collecting groundwater samples to evaluate select VOC concentrations adjacent to St. Juliens Creek. The RD and RA Work Plan for implementation of the Round 2 injections was finalized in December 2016 (CH2M, 2016b), and the Round 2 EVO and bioaugmentation injections were completed in March 2017. An addendum to the CCR documenting the additional downgradient injections was finalized in December 2017 (CB&I, 2017).

The results of the Event 6 and 7 groundwater monitoring indicated that in general the EVO injections were effective in enhancing the dechlorination process at the site, although COC concentrations at some locations remained relatively unchanged from the baseline levels and remained above the PALs, and enhanced rates of degradation and favorable conditions for enhanced degradation are decreasing in some locations. Therefore, it was recommended that additional biostimulation and bioaugmentation injections should be completed in the high concentration target area (Meadows, 2019a). A Work Plan for implementation of the Round 3 injections was finalized in December 2018 (APTIM, 2018c) and the Round 3 injections field work was completed in September 2019. The Round 3 injections CCR was finalized in January 2021(APTIM, 2021a). In addition, well maintenance consisting of injection well rehabilitation and/or replacement was conducted in July 2020 at 10 of the injection wells that were unable to be injected at during the Round 3 injections. Three new monitoring wells were also installed in July 2020 to supplement the existing monitoring well network. The Completion Report Addendum for Well Maintenance was finalized in August 2021 (APTIM, 2021b).

Land Use Controls

LUCs to prevent unacceptable exposure and control changes in site use are being maintained in accordance with the LUC RD (NAVFAC, 2014a). LUC maintenance will continue as long as waste is left in place. The LUC objectives are provided in **Table 3-3**. Maintenance includes annual update of the LUC boundaries based on the most recent site data, LUC site inspections and reporting, and corrective actions, as needed.

During the 2017 LUC Inspection, ponding water was noted in the central portion of the landfill soil cover, suspected to be a result of settling. A Work Plan to repair the impacted area was finalized in July 2018 (APTIM, 2018b). The soil cover repair work was completed between July 2018 and May 2019 and is documented in the CCR (APTIM, 2019a).

Updates to the LUC boundaries are documented in the SMP (refer to Section 4 for updated boundaries). The results of the annual inspections documented to-date indicate that the facility is compliant with the LUC RD (NAVFAC, 2014b, 2018a, 2018b; CH2M, 2018c, 2019a, 2020d, 2021c, 2022a).

Five-Year Reviews

The Second Five-Year Review Report for SJCA was the first Five-Year Review conducted for Site 2[1]. It was conducted in 2014, and the final report was signed in May 2015 (CH2M, 2015b). The Third Five-Year Review for SJCA was conducted in 2019, and the final report was signed in May 2020 (CH2M, 2020c). The results of the Third Five-Year Review indicated that the remedy is in place, functioning as designed, and is protective of human health and the environment. Exposure pathways that could result in unacceptable risk have been addressed by previous remedial action activities and continue to be controlled through a combination of a soil cover and land use controls (LUCs), and Remedial Action-Operation (RA-O) maintenance and monitoring is ongoing. Issues identified and the recommendation provided in the Five-Year Reviews, along with the current status and/or resolution of the issue, is presented in **Table 3-4**.

[1] The Site 2, Site 4, and Site 21 CERCLA Five-Year Site Remedy Reviews will be performed together and comply with the Site 4 trigger date. The First Five-Year Review included Site 4 only. The Second and Third Five-Year Reviews included Sites 2, 4, and 21.

Future activities at Site 2 consist of:

- RA-O optimization; groundwater monitoring; and, as needed, additional injections
- Treatability Study to evaluate alternative remedial options
- LUC maintenance
- Five-Year Reviews
- RACR

3.1.2 IRP Site 21—Industrial Area

Site 21 is approximately 20.8 acres and is located in the central, industrial portion of SJCA (**Figure 3-8**). The site was initially identified as Building 187, a locomotive maintenance shed where trichloroethene (TCE) was used. Based on investigations, the Site 21 area 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. A warehouse was constructed in 1992 for use by the Mid-Atlantic Regional Maintenance Center. The building is now used for the Fleet Logistics Center Norfolk. A storm sewer system runs through the site and drains to a downstream storm water detention basin constructed as part of the Site 2 RA.

Site Screening Assessment—2002 (CH2M, 2002)

As part of the SSA, the unvalidated analytical results from soil and groundwater samples collected during the RRR were used to conduct an HHRS and ERS. Based on elevated VOC concentrations detected in groundwater and potentially unacceptable human health risks identified, the SSA report 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 through 2006 (CH2M, 2004d)

Based on the results of the SSA, an SI was conducted. 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 cyclotrimethylene-trinitramine (RDX) in shallow aquifer groundwater and chloroform, arsenic, and vanadium in deep aquifer groundwater. Although the SI report 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 discharged 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 report recommended further evaluation of VOCs in shallow aquifer 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 through 2008 (CH2M, 2006b, 2008a)

The RI activities were conducted from 2003 through 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 (CH2M, 2006b), and the site data were incorporated into an RI report (CH2M, 2008a). The field activities consisted of storm water sampling and a storm sewer system video inspection to evaluate the potential for transport and release of chlorinated VOCs from shallow aquifer 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 RA alternative evaluation.

The HHRA conducted as part of the RI concluded that there were potentially unacceptable risks to current and future human receptors from potable use of shallow aquifer groundwater and inhalation of indoor air impacted by shallow aquifer groundwater vapors. The unacceptable risks were associated with chlorinated VOCs in shallow groundwater. The HHRA also identified potential human health risks from exposure to arsenic and vanadium in deep aquifer 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 aquifer groundwater has not been impacted by Site 21 activities and requires NFA. An ERA was not conducted as part of 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 report recommended an FS to evaluate potential RA alternatives to mitigate unacceptable human health risks from the site-related contaminants, chlorinated VOCs, in shallow aquifer groundwater. Because of uncertainties with the potential risk identified from inhalation of VOCs from vapor intrusion (VI) into buildings located within the site, the RI report also recommended further evaluation of the potential VI pathway.

Feasibility Study—2009 (CH2M, 2009a)

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

Interim Proposed Plan and Record of Decision—2009 through 2010 (CH2M, 2009c; NAVFAC, 2010)

The draft interim PP identified the preferred interim RA alternative for addressing the chlorinated VOC plume in shallow aquifer groundwater as ISCR and ERD (CH2M, 2009c). 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 aquifer groundwater was signed in May 2010 (NAVFAC, 2010). The PP and ROD were “interim” because they did not address the potential unacceptable risk to current and future building occupants from VI through inhalation of indoor air, which was still being evaluated.

Remedial Design—2009 through 2011 (CH2M, 2010c; NAVFAC, 2011d)

The RD to address shallow aquifer groundwater at Site 21 was completed in 2010 (CH2M, 2010c). The RD for LUCs to prevent unacceptable exposure and control changes in site use until the RAOs are met was completed in 2011 (NAVFAC, 2011d).

Remedial Investigation and Feasibility Study Addendum—2009 through 2010 (CH2M, 2010f)

A VI investigation was conducted in two phases in 2009 to evaluate the potential for the migration of the chlorinated VOCs in shallow aquifer groundwater into the indoor air of overlying occupied buildings and to assess current and future potential risk to building occupants from potential VI, as recommended in the RI report. The investigation included the collection and analysis of subslab vapor, indoor air, and outdoor air samples. Due to the potential for concentrations of VI constituents of interest to increase during implementation of the RA to address unacceptable risks associated with future potable use of shallow groundwater, additional VI monitoring was recommended during the RA. The RI and FS addendum report recommended that the approach for the VI monitoring be developed in a sampling and analysis plan.

Remedial Action-Construction and Interim Remedial Action Completion Report—2010 through 2013 (CH2M, 2010h; Shaw, 2012a; NAVFAC, 2012)

The RA work plan to address shallow aquifer groundwater at Site 21 was completed in 2010 (CH2M, 2010h). The RA-C was initiated in November 2010. RA-C was completed in 2012 and the CCR documenting the activities completed during the RA-C was finalized in September 2012 (Shaw, 2012a). The IRACR documenting that RIP has been achieved for the site was signed in July 2013 (NAVFAC, 2012).

Proposed Plan and Record of Decision—2011 (CH2M, 2011a; NAVFAC, 2011c)

The draft PP identified the final preferred RA 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 selected remedy – ISCR and ERD – was signed in October of 2011.

Remedial Action-Operation—2012 through To-Be-Determined (Ongoing) (Shaw, 2012a; CH2M, 2012b, 2015b, 2018c, 2018d, 2018e, 2018f, 2019c, 2020e, 2020f, 2020g, 2020i, 2020j, 2021f, 2021g, 2021h; NAVFAC, 2011C, 2011d, 2012, 2013b, 2014d, 2018c, 2018d; CB&I, 2014b; APTIM, 2019b, 2020a, 2021c; Meadows, 2017b, 2018c, 2018d, 2018e, 2019c, 2019d, 2021b, 2021d, 2022b)

RA-O was initiated in May 2012 and is ongoing. The RA-O includes groundwater monitoring to evaluate remedy effectiveness, storm water monitoring to evaluate whether groundwater with contaminants at concentrations of concern are migrating offsite through the storm drain system, VI monitoring to evaluate whether the RA or building deterioration have resulted in potential unacceptable inhalation risks or explosive hazards, additional EVO injections (as needed), LUC maintenance, and Five-Year Reviews. The groundwater, storm water, and VI monitoring is currently conducted semiannually but the frequency may be adjusted as the treatment progresses.

Groundwater, Storm Water, and VI Monitoring and EVO Injections

Nineteen RA-O groundwater and storm water, and nineteen VI monitoring events have been conducted. The most recent groundwater monitoring event was conducted in November 2021 (Meadows, 2022b). The most recent VI monitoring event was conducted in January 2022, and at the time this SMP was drafted, the report was currently being reviewed by the Partnering Team.

Additional EVO injections were conducted in May 2014 as a polishing treatment to target areas of the site in which the COC degradation appeared to be slowing or stalled. A CCR addendum documenting the additional injections was finalized in December 2014 (CB&I, 2014b).

Evaluation of groundwater data collected during Event 13 and Event 14 (May 2018 and November 2018 respectively) indicate that in general the injections were effective in enhancing the dechlorination process at the site, although degradation appeared to have stalled at some locations and favorable conditions for enhanced degradation decreased in some locations (Meadows, 2018e, 2019c). Therefore, additional injections were recommended for those locations. A Work Plan to conduct the additional biostimulation and bioaugmentation injections was completed in October 2019 (APTIM, 2019b). The additional injections were initiated and conducted

from October to December 2019, at which time the injections were temporarily stopped due to administrative issues. The injections were re-started in July 2020 and completed in September 2020. A CCR documenting the additional injections was finalized in May 2021 (APTIM, 2021c).

Building 54, which is located within the current building LUC boundary, was not investigated during the VI investigation conducted in 2009 for the occupied buildings at Site 21 because it was unoccupied. However, a change in building use for Building 54 was identified during the annual LUC inspection conducted for Site 21 in November 2015. The building was being accessed for inventory purposes. Therefore, in accordance with the LUCs, an investigation to evaluate the VI pathway at the building was completed in May 2017. The report evaluating and documenting the VI investigation was finalized in January 2018 (CH2M, 2018f). The report concluded that the VI pathway at the building was not complete and significant, but recommended monitoring be conducted at the building in accordance with the ongoing RA-O VI monitoring.

Building 81, which is located within the current building LUC boundary, was not investigated during the VI investigation conducted in 2009 for the occupied buildings at Site 21 because it was unoccupied. However, a potential change in building use for Building 81 was identified. The Navy is currently considering renovating the building, at which point the building would become occupied. Therefore, in accordance with the LUCs, an investigation to evaluate the VI pathway at Building 81 was conducted. The report evaluating and documenting the VI investigation concluded that VOCs in groundwater are not entering, and do not have the potential to enter Building 81 via the VI pathway at concentrations that exceed risk based targets, therefore no additional monitoring was warranted for Building 81. The report recommended that Building 81 be removed from the current RA-O VI monitoring approach (CH2M, 2020f). The report was finalized in November 2020 and Building 81 is no longer part of the RA-O VI Phase monitoring program (CH2M, 2020f).

Land Use Controls

LUCs to prevent unacceptable exposure and control changes in site use are being maintained in accordance with the LUC RD (NAVFAC, 2011d). LUC maintenance will continue until the RAOs have been met. The LUC objectives are provided in **Table 3-3**. Maintenance includes annual update of the LUC boundaries based on the most recent site data, and LUC site inspections and reporting, and corrective actions (as needed). Updates to the LUC boundaries are documented in the SMP (refer to Section 4 for updated boundaries). The results of the annual inspections documented to-date indicate that the facility is compliant with the LUC RD (CH2M, 2012b; NAVFAC, 2013b; NAVFAC, 2014b, 2018c, 2018d, CH2M, 2018e, 2019c, 2020g, 2021d, 2022b).

Five-Year Reviews

The Second Five-Year Review for SCA was the first Five-Year Review conducted for Site 21[2]. It was conducted in 2014, and the final report was signed in May 2015 (CH2M, 2015b). The Third Five-Year Review for SJCA was conducted in 2019, and the final report was signed in May 2020 (CH2M, 2020c). The results of the Third Five-Year review indicated that the remedy at Site 21 is in place, functioning as designed, and is protective of human health and the environment. Exposure pathways that could result in unacceptable risk have been addressed by previous remedial action activities and continue to be controlled by LUCs, and RA-O maintenance and monitoring is ongoing. Issues identified and the recommendation provided in the Five-Year Reviews, along with the current status and/or resolution of the issue is presented in **Table 3-4**.

Future activities planned for Site 21 consist of:

- RA-O optimization; groundwater, storm water, and VI monitoring; and, if needed, additional injections
- LUC Maintenance
- Five-Year Reviews
- RACR

[2] The Site 2, Site 4, and Site 21 CERCLA Five-Year Site Remedy Reviews will be performed together and comply with the Site 4 trigger date. The First Five-Year Review included Site 4 only. The Second and Third Five-Year Reviews included Sites 2, 4, and 21.

3.2 Response Complete Sites

3.2.1 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 (**Figure 3-9**). 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 cubic yards. 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, 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 aquifer groundwater. Although human health risk drivers (primarily inorganics) were identified for the deep aquifer groundwater, 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 report recommended an FS be prepared to evaluate RA 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, 2004b)

As part of the FS for Site 4, RA alternatives were developed and 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 RA alternatives evaluated were no action, soil cover, RCRA Subtitle D Cap, and excavation and offsite disposal. Based on the comparative analysis, the preferred RA 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, 2004c; NAVFAC, 2004)

The PP for Site 4 identified the preferred RA alternative for addressing potential contamination at Site 4 (CH2M, 2004c). 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 (NAVFAC, 2004).

Remedial Design—2004 (AGVIQ-CH2M, 2004; NAVFAC, 2006a)

The RD for the soil cover and drainage ditch components of the selected remedy was completed in 2004 (AGVIQ-CH2M, 2004). The RD for LUCs to ensure the effectiveness of the cover is maintained was completed in 2006 (NAVFAC, 2006a).

Remedial Action and Remedial Action Completion Report—2005 through 2006 (AGVIQ-CH2M, 2005; NAVFAC, 2006b)

The soil cover and drainage ditch components of the RA were completed in 2005, as documented in the CCR (AGVIQ-CH2M, 2005). The LUCs were implemented in 2006 in accordance with the RD for LUCs (NAVFAC, 2006a). 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 (NAVFAC, 2006b).

Record of Decision Modification—2006 (CH2M, 2006a)

Minor modifications to the Selected Remedy in the ROD were documented in a Technical Memorandum in 2006 (CH2M, 2006a). The minor modifications consisted of extension of the soil cover to the west and compensatory mitigation for permanent wetland impacts.

Voluntary Groundwater Performance Monitoring—2006 through 2008 (CH2M, 2009b)

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 were below the background upper-tolerance limit. There were 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, annual inspections to confirm the soil cover is adequately maintained and continued enforcement of LUCs was recommended.

Long-term Management – 2006 through To-Be-Determined (Ongoing) (APTIM, 2019c, 2019d; CH2M, 2006c, 2007, 2008c, 2009d, 2010d, 2010g, 2011b, 2012a, 2015b, 2018h, 2019e, 2020b, 2020h, 2021e, 2022c; NAVFAC, 2006a, 2013a, 2014c, 2018e, 2018f)

Long-term management is being conducted because waste remains in place at the site. The long-term management includes LUC maintenance and Five-Year Reviews.

LUCs to prevent unacceptable exposure and control changes in site use are being maintained in accordance with the RD for LUCs (NAVFAC, 2006a). The LUCs are detailed in **Table 3-3**. Maintenance includes annual site

inspections and reporting, and corrective actions as needed. The results of the annual inspections documented to-date indicate that the facility is compliant with the LUC RD (CH2M, 2007, 2008c, 2009d, 2010g, 2011b, 2012a; NAVFAC, 2013a, 2014c, 2018e, 2018f; CH2M, 2018h, 2019e, 2020h, 2021e, 2022c).

The First Five-Year Review for Site 4 was conducted in 2009 and signed in May 2010. The Second Five-Year Review for Site 4 was conducted in 2014 and signed in May 2015. The Third Five-Year Review for Site 4 was conducted in 2019 and signed in May 2020 (CH2M, 2020c). The results of the Third Five-Year Review indicated that the remedy at Site 4 is in place, functioning as designed, and is protective of human health and the environment. Exposure pathways that could result in unacceptable risk have been addressed by previous remedial action activities and continue to be controlled through a combination of a soil cover and LUCs. Issues identified and the recommendation provided in the Five-Year Reviews, along with the current status and/or resolution of the issue is presented in **Table 3-4**.

Future activities at Site 4 consist of long-term management, including LUC maintenance and Five-Year Reviews.

Table 3-1. Environmental Restoration Program Site Status Summary

Site Management Plan Fiscal Years 2023 through 2027

St. Juliens Creek Annex

Chesapeake, Virginia

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure or Response Complete
Installation Restoration Program Sites					
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; NIRIS: Site 00002 - Trash/Ash Fill Dump	RA - LUCs	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. Final RD completed in November 2011 and RD Addendum for St. Juliens Creek sediment completed in January 2013. RA-Construction initiated April 2012 and completed July 2014. Final IRACR documenting RIP signed September 2015. RA-Operation initiated July 2014, currently ongoing (consists of groundwater monitoring, additional injections as needed, LUCs maintenance, compensatory mitigation wetland monitoring and maintenance). Final ROD Memo to File completed in October 2014. Second Five-Year Review signed in May 2015 (the first Five-Year Review that included Site 2). Final ROD Memo to File Addendum completed in July 2016. The Five-Year Review Emerging Contaminants Investigation Technical Memorandum for 1,4-dioxane and perchlorate was completed in February 2018. Third Five-Year Review signed in May 2020.	
Site 4	Landfill D	Dump D; Old Tanks at Dump D; RFA: SWMU 6, AOC L; EPA: OU-4; NIRIS: Site 00004 - Sanitary Landfill Dump D	RC - LUCs	Final RI completed March 2003; Final FS completed March 2004; PP finalized June 2004; ROD signed September 2004, RD submitted November 2004; RA completed in October 2005; Minor ROD modification completed in February 2006; RA Completion Report signed October 2006. First Five-Year Review signed May 2010. Second Five-Year Review signed in May 2015. Third Five-Year Review signed in May 2020. LUCs maintenance ongoing.	RA Completion Report (signed October 2006).
Site 21	Industrial Area	FFA: Site Staining at Building 187; EPA: OU-12, Site 21 - Bldg 187; NIRIS: Site 00021 - Heavy Soil Staining	RA - LUCs	Final SI completed June 2004; Draft Supplemental SI Report completed April 2006; RI finalized July 2008. Final FS completed February 2009. Interim PP completed July 2009 and Interim ROD signed May 2010. RD for groundwater completed May 2010. RI and FS Addendum for vapor intrusion completed October 2010. Interim RA-construction initiated November 2010 and completed May 2012. PP completed May 2011 and ROD signed October 2011. RA-operation initiated May 2012, currently ongoing (consists of groundwater, stormwater, and vapor intrusion monitoring, and LUCs maintenance). Final CCR completed September 2012. Final IRACR documenting RIP signed July 2013. RD Addendum for additional injections completed March 2014, additional injections completed May 2014, and CCR Addendum completed December 2014. Second Five-Year Review signed in May 2015 (the first Five-Year Review that included Site 21). The Five-Year Review Emerging Contaminants Investigation Technical Memorandum for 1,4-dioxane and perchlorate was completed in February 2018. The Site 21 Vapor Intrusion Investigation Report for Building 54 was completed in January 2018. Third Five-Year Review signed in May 2020.	
Site 1	Waste Disposal Area A	Dump A; RFA: SWMU 1	RC - 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	RC - 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	RC - NFA	RFA indicated that the dumpsters were no longer present.	Final ROD (signed September 2004).
Site 5	Burning Grounds	RFA: SWMU 8; EPA: OU-5; NIRIS: Site 00005 - Waste Ord Burn Ground	RC - NFA	Final RI completed March 2003; Final Expanded RI Report completed June 2006. Final EE/CA for non-time-critical removal action of Waste/Burnt Soil Area completed February 2007. Final Expanded RI Addendum completed December 2007. Removal action initiated December 2007 and completed July 2012. Final Confirmation Sampling Report and CCR completed in December 2012. Supplemental RI for shallow groundwater completed in March 2015. PP finalized December 2015; NFA ROD signed May 2016.	NFA Final ROD (signed May 2016).
Site 6	Small Arms Unit	Caged Pit; RFA: SWMU 24; FFA: Caged Pit at the Burning Grounds; EPA: OU-8, Caged Pit Disposal	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
Site 10	Swale beneath Bldg. 13	RFA: SWMU 31	RC - 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	RC - 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	RC - NFA	Removed/remediated during construction of the SIMA building (currently referred to as the FISC, Norfolk Integrated Logistics Support building).	FFA (signed July 2004)

Table 3-1. Environmental Restoration Program Site Status Summary

Site Management Plan Fiscal Years 2023 through 2027

St. Juliens Creek Annex

Chesapeake, Virginia

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure or Response Complete
Site 13	Waste Generation Area	RFA: SWMU 20	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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).
SWMU 29	Dumpsters (throughout the facility)	None	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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).

Table 3-1. Environmental Restoration Program Site Status Summary
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

Site ID	Name/Description	Other ID	Status	Comments	Documentation of Closure or Response Complete
AOC E	Temporary Pump Storage	None	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - 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	RC - NFA	NFA consensus by Navy, VDEQ, and EPA during a site visit in July 2001.	SSA (signed February 2002).
EPIC AOC 12	Sandy Flat	AOC 12	RC - 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	RC - 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	RC - 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).
Munitions Response Program Sites					
Area UXO 1	Wharf Area Sediments	Residual Ordnance at wharf area; RFA: AOC I; Site 20	RC - NFA	PA completed June 2009 and SI completed September 2010. Expanded SI, documenting NFA, signed in June 2013.	Final Expanded SI Report (signed June 2013).

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
No Further Action
Response Complete Site with Land Use Controls
Remedial Action Site with Land Use Controls

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
RIP - Remedy-in-Place
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 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

ERP Site	Preliminary Studies			Preliminary Investigations	RI	FS	EE/CA and Removal Actions	PP/ROD	RD/RA	Response Complete and Longterm Management
	IAS (1981)	PA (1983)	RFA (1989)							
RD/RA - LUC Sites										
IRP Site 2	X	X	X	RRR - 1996	RI - 2003 Expanded RI - 2008 Revised Expanded RI - 2010	FS - 2009 Revised FS - 2010	N/A	PP - 2010 ROD - 2011 ROD Memo to File - 2014 ROD Memo to File Addendum - 2016	LUC RD - 2011 RD - 2011 RD Addendum - 2013 Revised LUC RD - 2014 RA-Construction - 2014 RA-Operation - Ongoing (initiated 2014) IRACR & RIP - 2015	Five-Year Reviews - Ongoing (Second Five-Year Review signed in 2015, Third Five-Year Review signed in 2020)
IRP Site 21	X		X	RRR - 1996 SSA - 2002 SI - 2004 Supplemental SI - 2006	RI - 2008 RI/FS Addendum - 2010	FS - 2009 RI/FS Addendum - 2010	N/A	Interim PP - 2009 Interim ROD - 2010 PP - 2011 ROD - 2011	RD - 2010 RA-Construction - 2011 LUC RD - 2011 RA-Operation - Ongoing (initiated 2011) IRACR & RIP - 2013	Five-Year Reviews - Ongoing (Second Five-Year Review signed in 2015; Third Five-Year Review signed in 2020)
RC - LUC Sites										
IRP Site 4	X	X	X	RRR - 1996	2003	2004	N/A	2004	RD - 2004 RA Construction - 2005 LUC RD - 2006	Response Complete and RACR - 2006 LUCs Maintenance - Ongoing (initiated 2006) Five-Year Reviews - Ongoing (First Five-Year Review signed in 2010; Second Five-Year Review signed in 2015; Third Five-Year Review signed in 2020)

Notes:
Years represent end dates for work element, unless otherwise noted
EE/CA - Engineering Evaluation/Cost Analysis
ERP - Environmental Restoration Program
FS - Feasibility Study
IAS - Initial Assessment Study
IRACR - Interim Remedial Action Completion Report
IRP - Installation Restoration Program
LUC - Land Use Controls
N/A - not applicable
PA - Preliminary Assessment
PP - Proposed Plan
RA - Remedial Action
RACR - Remedial Action Completion Report
RC - Response Complete
RD - Remedial Design
RFA - RCRA Facility Assessment
RI - Remedial Investigation
RIP - Remedy in Place
ROD - Record of Decision
RRR - Relative Risk Ranking
SI - Site Inspection
SSA - Site Screening Assessment

Table 3-3. Environmental Restoration Program Land Use Controls
Site Management Plan Fiscal Years 2023 through 2027
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 2	Waste Disposal Area B	2/22/2011; ROD Memo to File 10/14/2014; ROD Memo to File Addendum 7/1/2016	Southern portion of SJCA at the intersection of St. Juliens Road and Cradock Street	6.3 acres	1) Prohibit digging into the cover, disposal area contents, and/or contaminated soil and sediment with the following exceptions: • As required for Remedial Action-Operation and maintenance with the application of controls to prevent unacceptable exposure to waste and contaminants in soil and inlet sediment in the Historical Inlet Disposal Area.* • As required for Remedial Action-Operation and maintenance and/or facility operation and maintenance with the application of controls to prevent unacceptable exposure to waste and contaminants in soil and inlet sediment in the Historical Parking Lot Disposal Area.* 2) Prohibit activities that would result in contact with shallow groundwater except for environmental monitoring 3) Prohibit the withdrawal of shallow groundwater except for environmental monitoring 4) Prohibit construction of new buildings at the site without evaluation of potential vapor intrusion and/or ensuring vapor intrusion mitigation measures are included in building design 5) Prohibit intrusive activities that would compromise the integrity of the Yorktown confining unit 6) Maintain the integrity of any current or future remedial or monitoring system	●5-year site remedy reviews ●Annual inspections of LUCs ●Monitor groundwater per the ROD for Site 2 and any subsequent decision documents ●Post and maintain warning signs for Site 2 ●Indicate where LUCs have been imposed and annotate LUC objectives in the Navy GIS database and real estate summary map(s) for the installation, and follow LUC-related procedures pertaining to the ground-disturbing activity and changes in land use ●Notify USEPA and VDEQ at least 45 days in advance of: proposals for changes in land use that would be inconsistent with use restrictions and exposure assumptions described in the ROD; any anticipated action that may disrupt LUC effectiveness; or any action that may alter or negate the need for LUCs ●Notify USEPA and VDEQ 6 months in advance of any anticipated transfer, out of Navy custody and control, of real property subject to LUCs ●Notify USEPA and VDEQ as soon as practicable of the discovery of activity at Site 2 inconsistent with LUC objectives ●Obtain USEPA and VDEQ concurrence prior to modifying or terminating LUC objectives or required LUC implementation actions ●Maintain a comprehensive list of LUCs with associated boundaries and expected durations ●Notify and invite comment from USEPA and VDEQ at least 14 days prior to making changes to internal LUC-related policies or procedures if such changes are reasonably likely to negatively impact the effectiveness of LUCs
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.	8.3 acres	1) Prohibit digging into or disturbing the soil cover or landfill contents 2) Prohibit residential use and development of the site	●5-year site remedy reviews ●Annual visual inspections of the soil cover ●Survey plat prepared by a professional land surveyor registered in the Commonwealth of Virginia ●Maintain posted signs ●Maintain a Regional Shore Infrastructure Plan or similar document that incorporates LUC objectives ●Notification to USEPA 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 USEPA 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 USEPA 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

Table 3-3. Environmental Restoration Program Land Use Controls
Site Management Plan Fiscal Years 2023 through 2027
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 21	Industrial Area	10/20/2011	Central industrial portion of SJCA	20.8 acres	1) Prohibit withdrawal of groundwater except for environmental monitoring 2) Prohibit a change from current industrial building use to residential, child care or elementary or secondary school use without further evaluation and/or implementation of mitigation measures 3) Prevent occupation of unoccupied buildings, construction of new buildings and activities that would compromise the integrity of the building envelopes without further evaluation and/or implementation of mitigation measures	●5-year site remedy reviews ●Annual inspections of LUCs ●Monitor groundwater per the ROD for Site 21 and any subsequent decision documents ● Post and maintain warning signs for Site 21 ●Indicate where LUCs have been imposed and annotate LUC objectives in the Navy GIS database and real estate summary map(s) for the installation, and follow LUC-related procedures pertaining to the ground-disturbing activity and changes in land use ●Notify USEPA and VDEQ at least 45 days in advance of: proposals for changes in land use that would be inconsistent with use restrictions and exposure assumptions described in the ROD; any anticipated action that may disrupt LUC effectiveness; or any action that may alter or negate the need for LUCs ●Notify USEPA and VDEQ 6 months in advance of any anticipated transfer, out of Navy custody and control, of real property subject to LUCs ●Notify USEPA and VDEQ as soon as practicable of the discovery of activity at Site 21 inconsistent with LUC objectives ●Obtain USEPA and VDEQ concurrence prior to modifying or terminating LUC objectives or required LUC implementation actions ●Maintain a comprehensive list of LUCs with associated boundaries and expected durations ●Notify and invite comment from USEPA and VDEQ at least 14 days prior to making changes to internal LUC-related policies or procedures if such changes are reasonably likely to negatively impact the effectiveness of LUCs

Notes:
*Refer to the Site 2 ROD Memo to File (CH2M HILL, 2014) for the Historical Inlet and Historical Parking Lot Disposal Area boundaries.
USEPA - United States Environmental Protection Agency
VDEQ- Virginia Department of Environmental Quality
IRP - Installation Restoration Program
LUC - land use control
ROD - Record of Decision
SJCA - St. Juliens Creek Annex

Table 3-4. Five-Year Review Summary Table

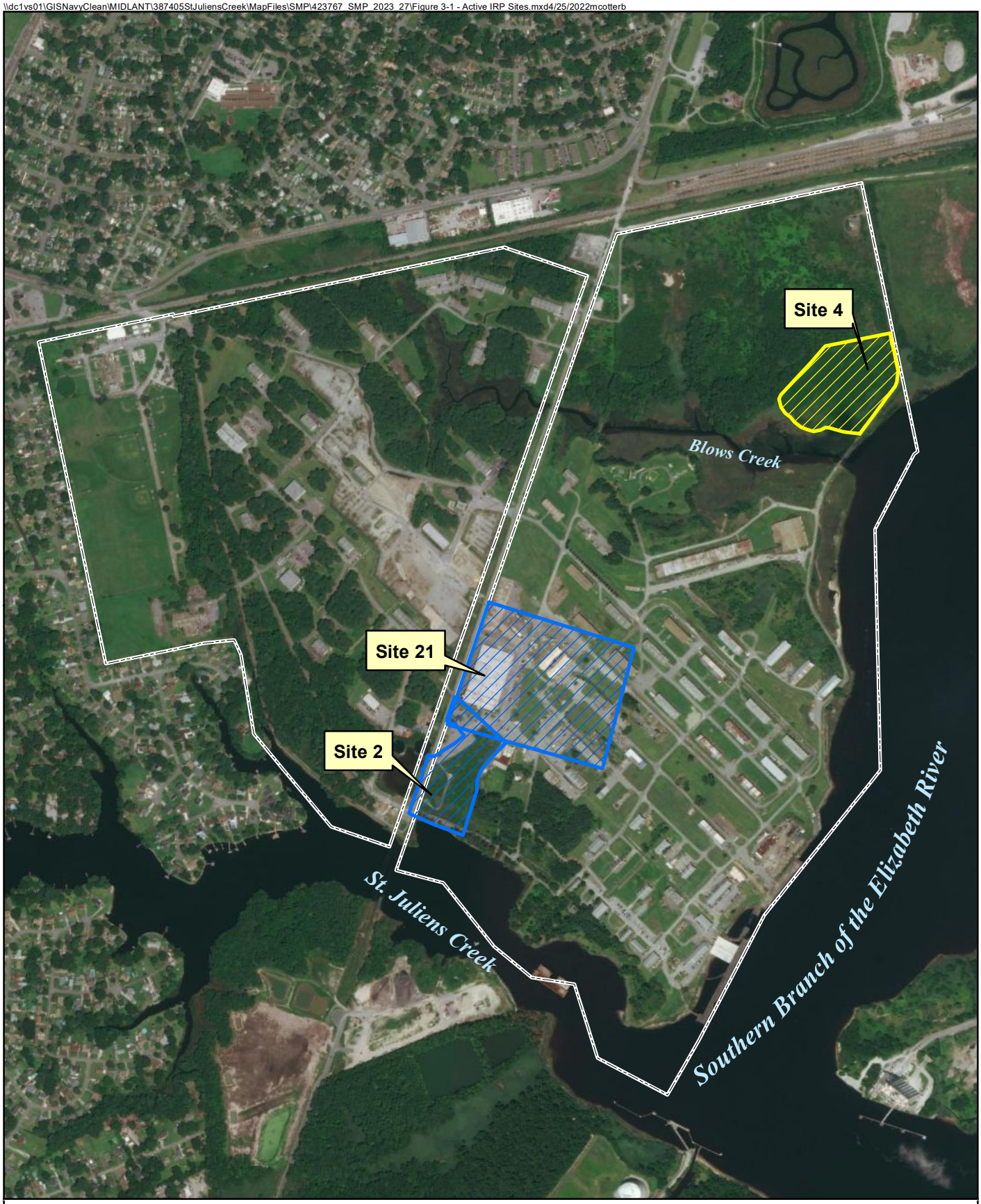
Site Management Plan Fiscal Years 2023 through 2027

St. Juliens Creek Annex

Chesapeake, Virginia

Site ID	Name/Description	Issue Identified	Recommendation	Status/Resolution
Site 2	Waste Disposal Area B	**Second Five-Year Review (2015)**		
		Based on site history, there is the potential for emerging contaminants perchlorate and 1,4-Dioxane to be present in site groundwater. However, the presence of perchlorate and 1,4-dioxane and any resulting unacceptable risk is unknown.	Determine whether perchlorate and 1,4-dioxane are present and pose unacceptable risk in the shallow aquifer groundwater. If a data evaluation indicates these chemicals should be considered constituents of concern (COCs) for Site 2, revise the existing remedy, land use control (LUC) boundary, and/or treatment system if warranted.	The 1,4-dioxane and perchlorate emerging contaminants investigation was conducted in April 2017. A report documenting the results of the investigation was finalized in February 2018 (CH2M, 2018b). The investigation concluded that neither 1,4-dioxane nor perchlorate were COCs for Site 2 and no further investigation or action was warranted for these constituents.
		Cleanup level for naphthalene in groundwater is not protective of potential future use.	Calculate a cleanup value for naphthalene in groundwater that is protective of potential future use. Document the revised cleanup goal in a Record of Decision Memorandum to File.	The naphthalene groundwater cleanup goal was revised to account for future potential residential use, and an addendum to the ROD Memorandum to File was finalized in July 2016 to document the revised cleanup goal (CH2M, 2016b).
		Remedial Action-operation phase groundwater data is not available to determine whether the groundwater component of the remedy is functioning as intended by the Record of Decision.	Collect groundwater data in accordance with the Remedial Action-operation monitoring plan and evaluate the data to determine whether the remedy is functioning as intended by the Record of Decision	RA-O phase groundwater data is collected on a semi-annual basis and has indicated the groundwater component of the remedy is functioning as intended.
		Successful restoration of the compensatory mitigation wetland has not been demonstrated.	Develop a Wetland Maintenance and Monitoring Plan, conduct the monitoring, report the monitoring, and conduct any necessary maintenance.	A Wetland Monitoring and Maintenance Plan was finalized in March 2018 (APTIM, 2018). The Fiscal Year 2018 monitoring event was conducted in April 2018, and a report documenting the findings was finalized in September 2019.
		Third Five-Year Reivew (2020)		
		None	Not applicable	Not applicable
Site 4	Landfill D	**First Five-Year Review (2010)**		
		None	Not applicable	Not applicable
		Second Five-Year Review (2015)		
		None	Not applicable	Not applicable
		Third Five-Year Reivew (2020)		
		None	Not applicable	Not applicable
Site 21	Industrial Area	**Second Five-Year Review (2015)**		
		Based on site history, there is the potential for emerging contaminants perchlorate and 1,4-Dioxane to be present in site groundwater. However, the presence of perchlorate and 1,4-dioxane and any resulting unacceptable risk is unknown.	Determine whether perchlorate and 1,4-dioxane are present and pose unacceptable risk in the shallow aquifer groundwater. If a data evaluation indicates these chemicals should be considered COCs for Site 21, revise the existing remedy, land use control LUC boundary, and/or treatment system if warranted.	The 1,4-dioxane and perchlorate emerging contaminants investigation was conducted in April 2017. A report documenting the results of the investigation was finalized in February 2018 (CH2M, 2018b). The investigation concluded that neither 1,4-dioxane nor perchlorate were COCs for Site 21 and no further investigation or action was warranted for these constituents.
		Third Five-Year Reivew (2020)		
		None	Not applicable	Not applicable

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\Figure 3-1 - Active IRP Sites.mxd4/25/2022mcotterb



Legend

- St. Juliens Creek Annex Boundary
- Response Complete Site with Land Use Controls
- Remedial Action Site with Land Use Controls

N
W E
S

0 450 900
Feet

Figure 3-1
Location of Active Environmental Restoration Program Sites
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

ch2m

Legend

- St. Juliens Creek Annex Boundary
- Response Complete - No Further Action Site

N
W E
S

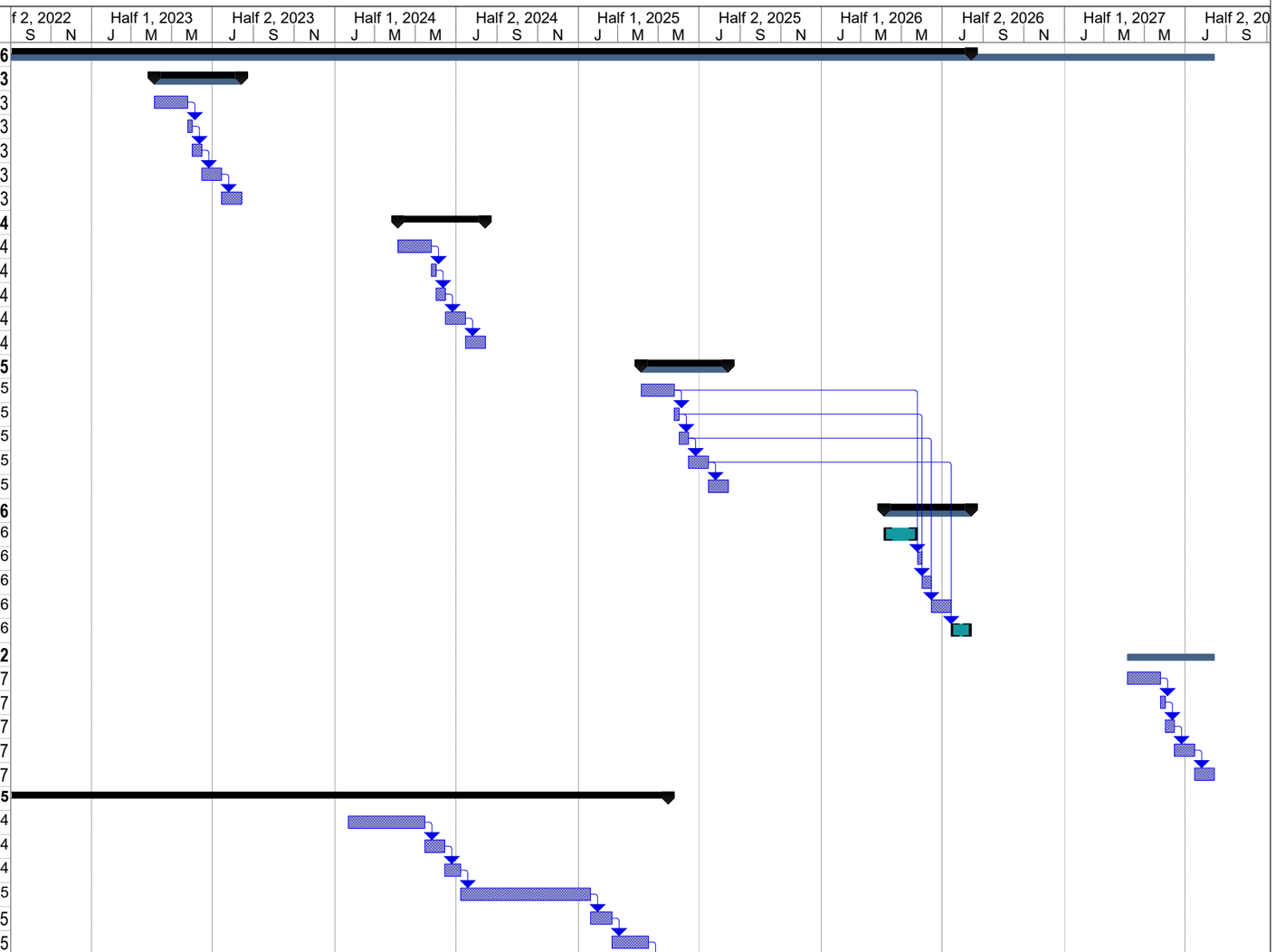
0 450 900
Feet

Figure 3-2
Location of Environmental Restoration Program No Further Action Sites, Solid Waste Management Units, and Areas of Concern
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

ch2m:

Figure 3-3
Schedule of Environmental Restoration Program Activities
Site Management Plan for Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

ID	Task Name	Duration	Start	Finish
1	**SJCA Facility-Wide**	**1839 days**	**Sun 8/1/21**	**Thu 8/13/26**
2	**SMP FY 2024-2028**	**131 days**	**Wed 4/5/23**	**Sun 8/13/23**
3	Preliminary Draft Generation	50 days	Wed 4/5/23	Wed 5/24/23
4	Navy Review of Preliminary Draft	7 days	Thu 5/25/23	Wed 5/31/23
5	Navy RTCs and Draft Generation	14 days	Thu 6/1/23	Wed 6/14/23
6	Regulator Review of Draft	30 days	Thu 6/15/23	Fri 7/14/23
7	Regulator RTC and Draft Final Generation	30 days	Sat 7/15/23	Sun 8/13/23
8	**SMP FY 2025 - 2029**	**131 days**	**Fri 4/5/24**	**Tue 8/13/24**
9	Preliminary Draft Generation	50 days	Fri 4/5/24	Fri 5/24/24
10	Navy Review of Preliminary Draft	7 days	Sat 5/25/24	Fri 5/31/24
11	Navy RTCs and Draft Generation	14 days	Sat 6/1/24	Fri 6/14/24
12	Regulator Review of Draft	30 days	Sat 6/15/24	Sun 7/14/24
13	Regulator RTC and Draft Final Generation	30 days	Mon 7/15/24	Tue 8/13/24
14	**SMP FY 2026 - 2030**	**131 days**	**Sat 4/5/25**	**Wed 8/13/25**
15	Preliminary Draft Generation	50 days	Sat 4/5/25	Sat 5/24/25
16	Navy Review of Preliminary Draft	7 days	Sun 5/25/25	Sat 5/31/25
17	Navy RTCs and Draft Generation	14 days	Sun 6/1/25	Sat 6/14/25
18	Regulator Review of Draft	30 days	Sun 6/15/25	Mon 7/14/25
19	Regulator RTC and Draft Final Generation	30 days	Tue 7/15/25	Wed 8/13/25
20	**SMP FY 2027 - 2031**	**131 days**	**Sun 4/5/26**	**Thu 8/13/26**
21	Preliminary Draft Generation	50 days	Sun 4/5/26	Sun 5/24/26
22	Navy Review of Preliminary Draft	7 days	Mon 5/25/26	Sun 5/31/26
23	Navy RTCs and Draft Generation	14 days	Mon 6/1/26	Sun 6/14/26
24	Regulator Review of Draft	30 days	Mon 6/15/26	Tue 7/14/26
25	Regulator RTC and Draft Final Generation	30 days	Wed 7/15/26	Thu 8/13/26
26	**SMP FY 2028 - 2032**	**131 days**	**Tue 4/5/22**	**Sat 8/13/22**
27	Preliminary Draft Generation	50 days	Mon 4/5/27	Mon 5/24/27
28	Navy Review of Preliminary Draft	7 days	Tue 5/25/27	Mon 5/31/27
29	Navy RTCs and Draft Generation	14 days	Tue 6/1/27	Mon 6/14/27
30	Regulator Review of Draft	30 days	Tue 6/15/27	Wed 7/14/27
31	Regulator RTC and Draft Final Generation	30 days	Thu 7/15/27	Fri 8/13/27
32	**Fourth Five-Year Review**	**1930 days**	**Sun 2/2/20**	**Thu 5/15/25**
33	Preliminary Draft Generation	115 days	Sun 1/21/24	Tue 5/14/24
34	Navy Review of Preliminary Draft	30 days	Wed 5/15/24	Thu 6/13/24
35	Navy RTCs and Draft Generation	24 days	Fri 6/14/24	Sun 7/7/24
36	Regulator Review of Draft	195 days	Mon 7/8/24	Sat 1/18/25
37	Regulatory RTCs and Comment Resolution	32 days	Sun 1/19/25	Wed 2/19/25
38	Draft Final Review and Final Generation	55 days	Thu 2/20/25	Tue 4/15/25

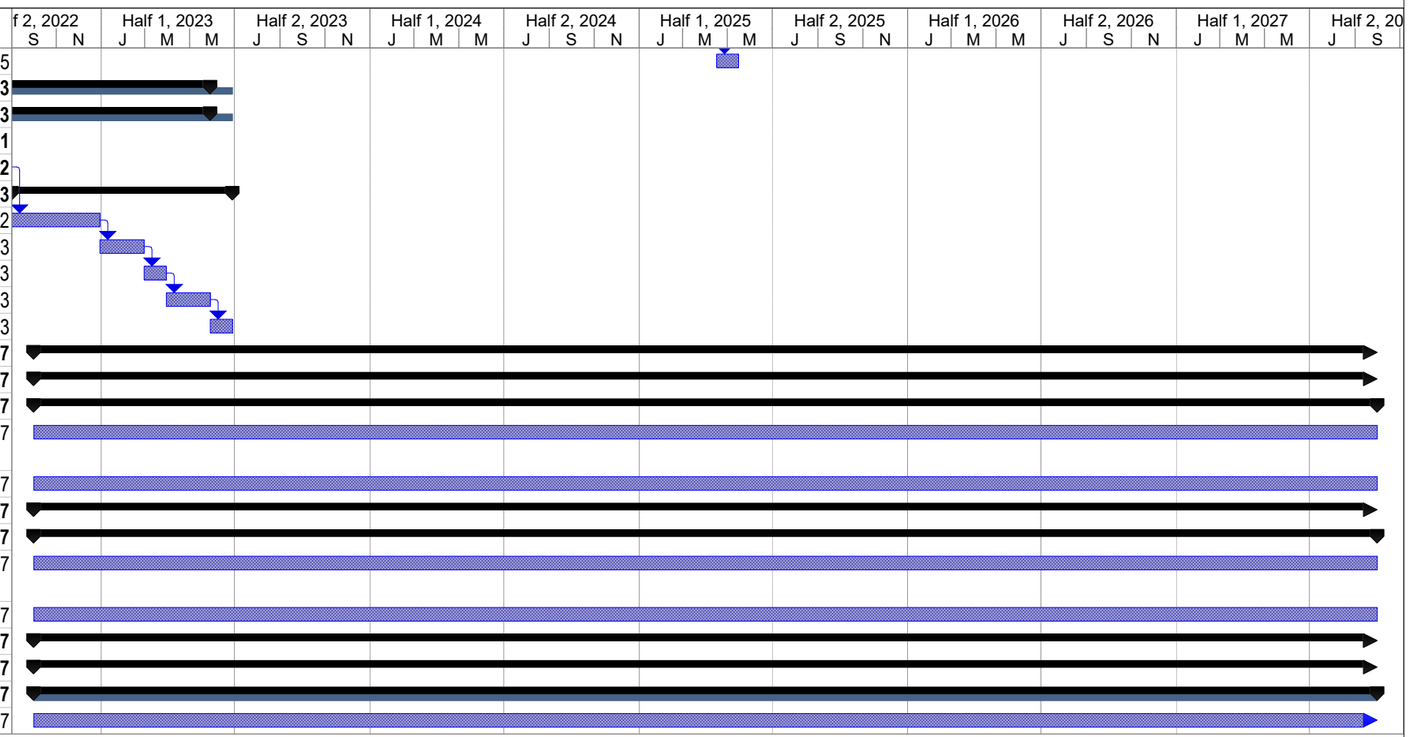


Date: Wed 5/25/22

Task	External Tasks	Inactive Summary	Start-only	Deadline
Split	External Milestone	Manual Task	Finish-only	
Milestone	External Milestone	Duration-only	External Tasks	
Summary	External Milestone	Manual Summary Rollup	External Milestone	
Project Summary	Inactive Milestone	Manual Summary	Progress	

Figure 3-3
Schedule of Environmental Restoration Program Activities
Site Management Plan for Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

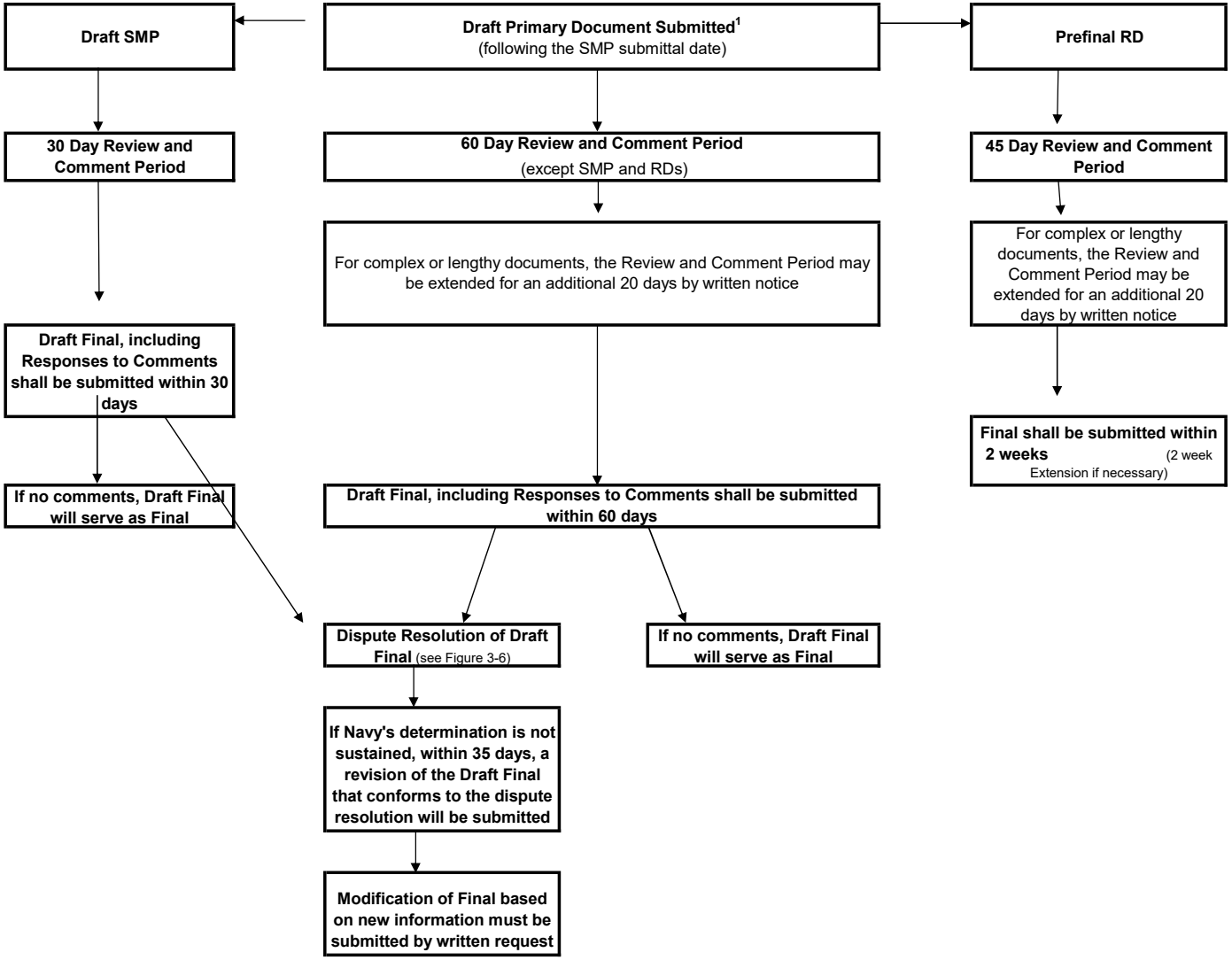
ID	Task Name	Duration	Start	Finish
39	Final Submittal and Signature	30 days	Wed 4/16/25	Thu 5/15/25
40	**PFAS Preliminary Assessment/Site Inspection**	**1212 days**	**Sun 2/2/20**	**Sun 5/28/23**
41	**Site Inspection**	**1212 days**	**Sun 2/2/20**	**Sun 5/28/23**
42	**Sampling and Analysis Plan**	**240 days**	**Tue 3/2/21**	**Wed 10/27/21**
48	**Field Work**	**60 days**	**Sun 7/3/22**	**Wed 8/31/22**
49	**Report**	**300 days**	**Thu 9/1/22**	**Tue 6/27/23**
50	Preliminary Draft Generation	120 days	Thu 9/1/22	Thu 12/29/22
51	Navy Review of Preliminary Draft	60 days	Fri 12/30/22	Mon 2/27/23
52	Navy RTCs and Draft Generation	30 days	Tue 2/28/23	Wed 3/29/23
53	Regulator Review of Draft	60 days	Thu 3/30/23	Sun 5/28/23
54	Regulator RTC and Final Generation	30 days	Mon 5/29/23	Tue 6/27/23
55	**RD/RA Sites with LUCs**	**1826 days**	**Sat 10/1/22**	**Thu 9/30/27**
56	**Site 2 - Waste Disposal Area B**	**1826 days**	**Sat 10/1/22**	**Thu 9/30/27**
57	**Remedial Action-Operation**	**1826 days**	**Sat 10/1/22**	**Thu 9/30/27**
58	Groundwater Monitoring and Additional Injections (as needed)	1826 days	Sat 10/1/22	Thu 9/30/27
59	LUC Maintenance	1826 days	Sat 10/1/22	Thu 9/30/27
60	**Site 21 - Industrial Area**	**1826 days**	**Sat 10/1/22**	**Thu 9/30/27**
61	**Remedial Action-Operation**	**1826 days**	**Sat 10/1/22**	**Thu 9/30/27**
62	Groundwater, Stormwater, and Vapor Intrusion Monitoring, and Additional Injections (as needed)	1826 days	Sat 10/1/22	Thu 9/30/27
63	LUC Maintenance	1826 days	Sat 10/1/22	Thu 9/30/27
64	**Response Complete Sites with LUCs**	**1826 days**	**Sat 10/1/22**	**Thu 9/30/27**
65	**Site 4 - Landfill D**	**1826 days**	**Sat 10/1/22**	**Thu 9/30/27**
66	**Long-term Management**	**1826 days**	**Sat 10/1/22**	**Thu 9/30/27**
67	LUC Maintenance	1826 days	Sat 10/1/22	Thu 9/30/27



Date: Wed 5/25/22

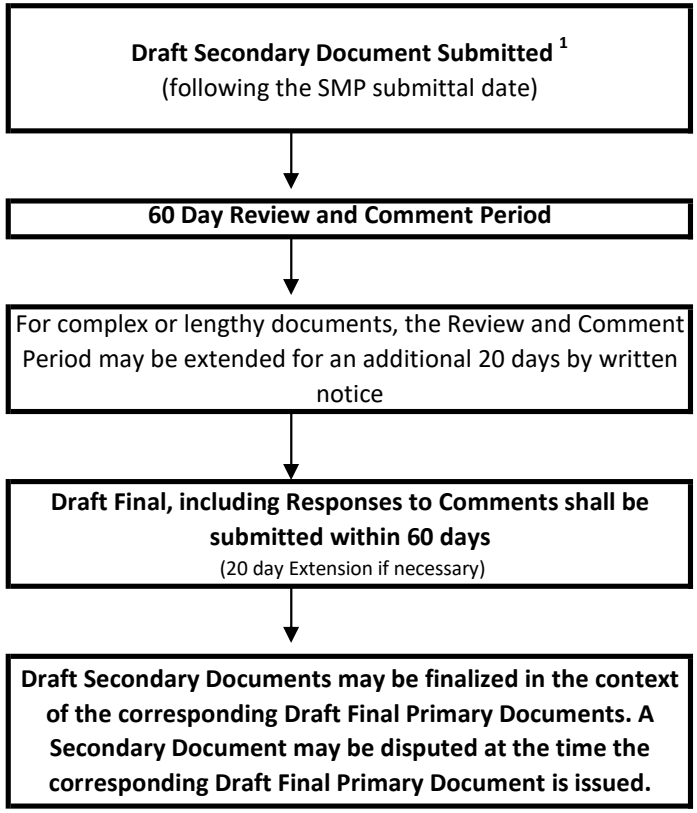
Task	External Tasks	Inactive Summary	Start-only	Deadline
Split	External Milestone	Manual Task	Finish-only	
Milestone	External Milestone	Duration-only	External Tasks	
Summary	External Milestone	Manual Summary Rollup	External Milestone	
Project Summary	Inactive Milestone	Manual Summary	Progress	

Figure 3-4
Primary Document Submittal Flow Chart - Federal Facility Agreement Process
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia



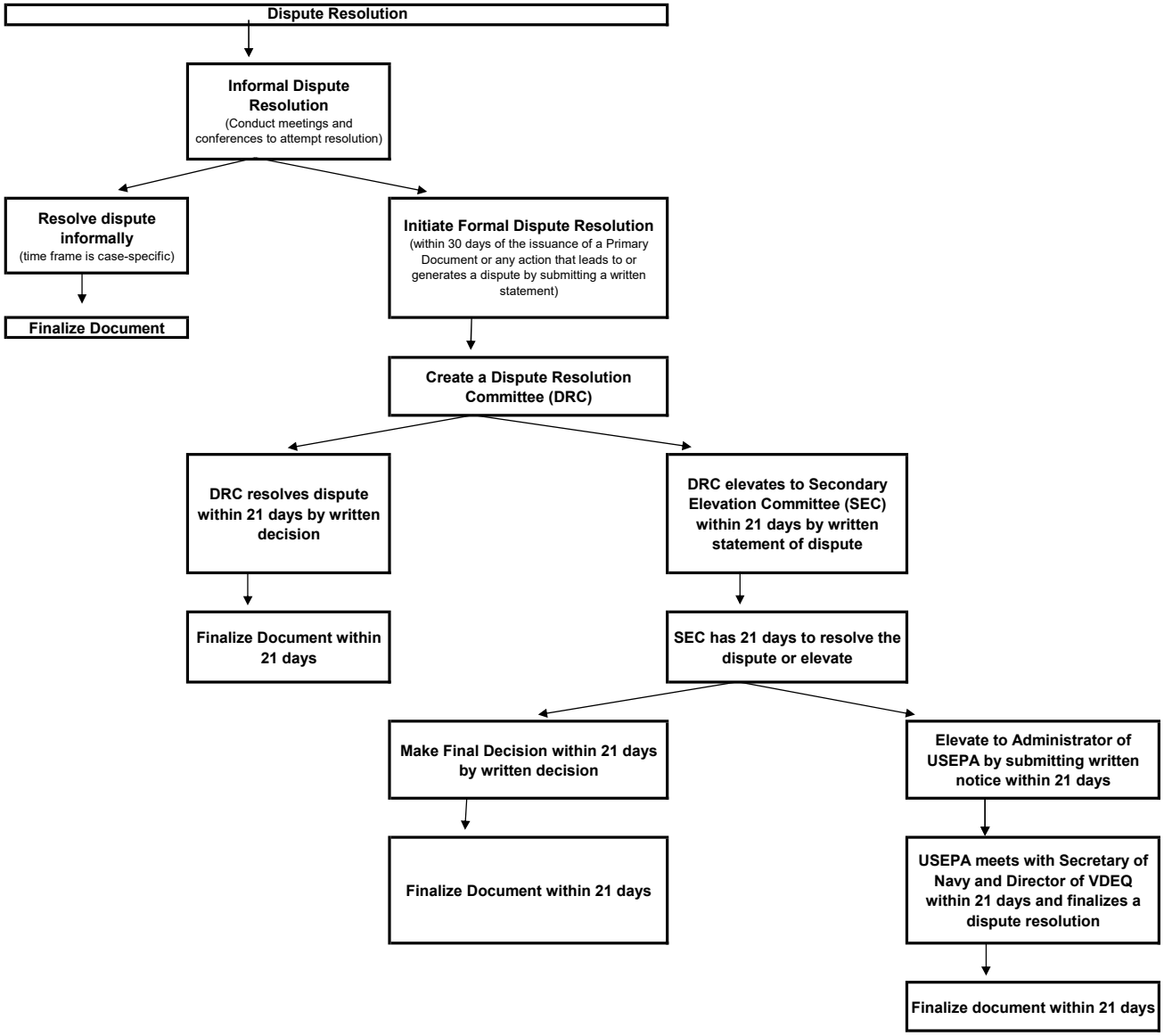
[1]SJCA Primary Documents Include: Remedial Investigation (RI)/Feasibility Study (FS)/Focused Feasibility Study (FFS) Work Plans, RI Reports, FS and FFS Reports, Proposed Plans (PPs), Records of Decision (RODs), Final Remedial Designs (RDs), Remedial Action Work Plans, Remedial Action Completion Reports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

Figure 3-5
Secondary Document Submittal Flow Chart - Federal Facility Agreement Process
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

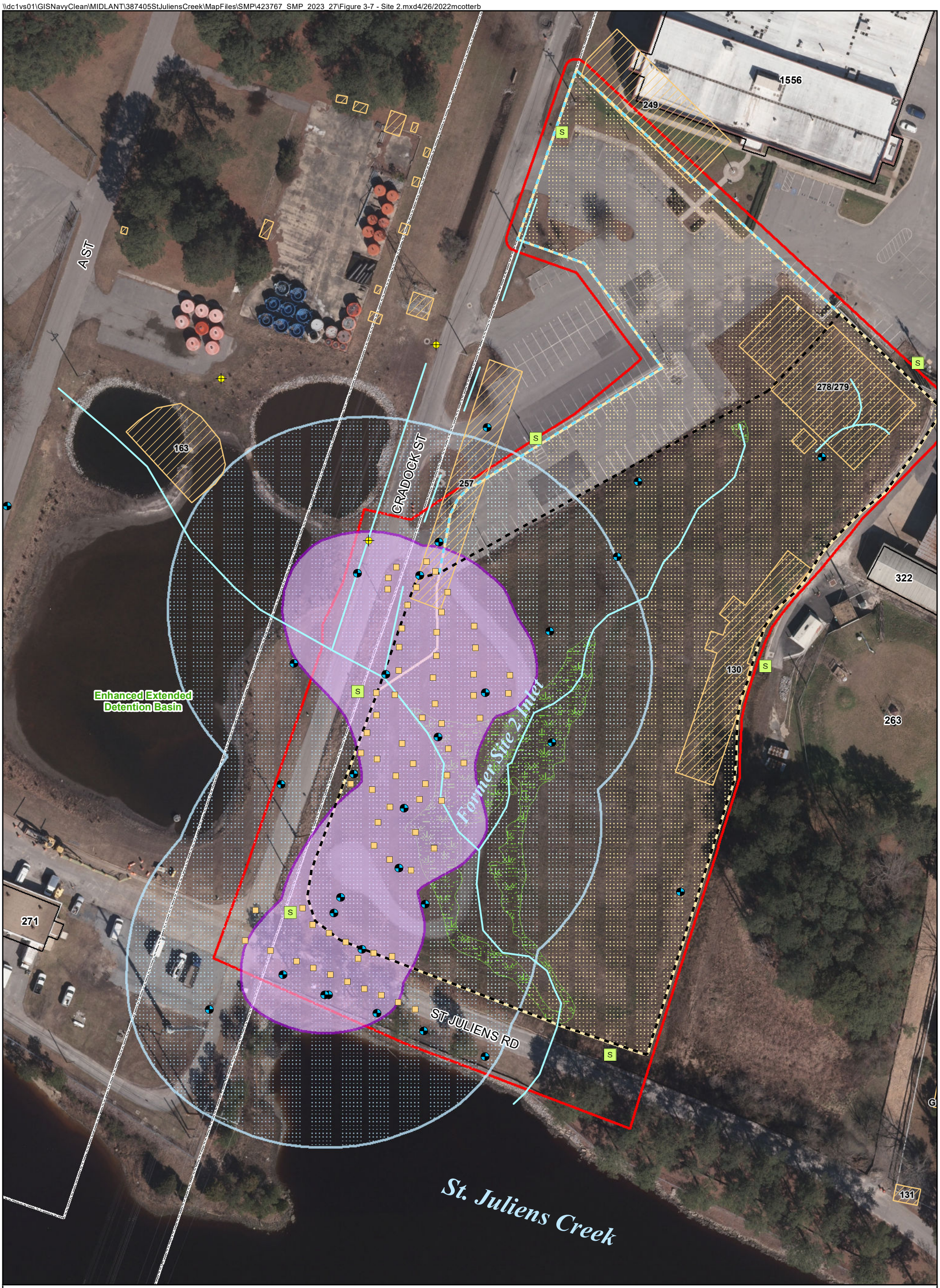


[1]SJCA Secondary Documents Include: Health and Safety Plans (HSPs), Non-Time-Critical Removal Action (NTCRA) Plans, Pilot/Treatability Study Work Plans and Reports, Engineering Evaluation/Cost Analysis (EE/CA) Reports, Well Closure Methods and Procedures, Preliminary/Conceptual Designs or equivalents, 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 - Federal Facilitiy Agreement Process
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia



\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\Figure 3-7 - Site 2.mxd4/26/2022mcotterb



Legend

- Monitoring Well
- Piezometers
- ERD Injection Well
- Land Use Control Sign
- Former Drainage
- Former Wetlands
- Land Use Control Boundary - Groundwater (Potable use)
- Land Use Control Boundary - Groundwater (Inhalation)
- Land Use Control Boundary - Waste and Soil
- Historical Inlet Disposal Area Land Use Control Boundary
- Historical Parking Lot Disposal Area Land Use Control Boundary
- Demolished Building
- Existing Building
- Site Boundary
- St. Juliens Creek Annex Boundary

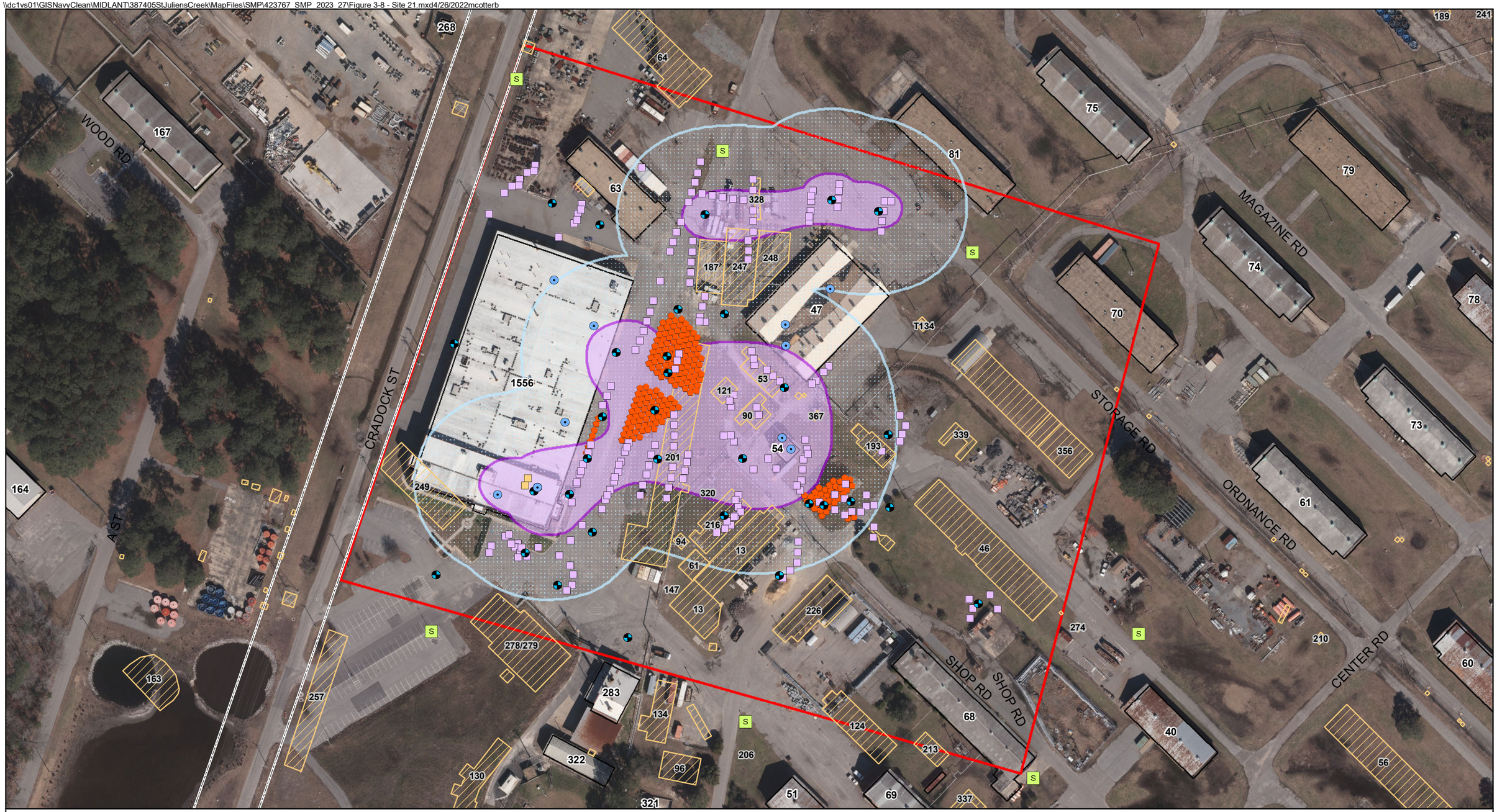
N W E S

0 40 80 Feet

Figure 3-7
Site 2 - Waste Disposal Area B
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

ch2m

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\Figure 3-8 - Site 21.mxd4/26/2022mcotterb



Legend

- Subslab Vapor Probe
- Monitoring Well
- ERD Injection Well
- ERD Temporary Injection Well
- Temporary ZVI Injection Location
- Land Use Control Sign
- Land Use Control Boundary - Groundwater (Potable use)
- Land Use Control Boundary - Groundwater (Inhalation)
- Demolished Building
- Existing Building
- Site Boundary
- St. Juliens Creek Annex Boundary

N
W E
S

0 145 290
Feet

Figure 3-8
Site 21 - Industrial Area
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

ch2m

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\Figure 3-9 - Site 4.mxd4/26/2022mcotterb

Legend

- Monitoring Well
- S Land Use Control Sign
- Fence
- Access Road
- Drainage Ditch
- Site Boundary/Land Use Control Boundary – Waste and Soil
- St. Juliens Creek Annex Boundary

N
W E
S

0 75 150
Feet

Figure 3-9
Site 4 - Landfill D
Site Management Plan Fiscal Years 2023 through 2027
St. Juliens Creek Annex
Chesapeake, Virginia

ch2m

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 the following maps and GIS layers in ArcView:

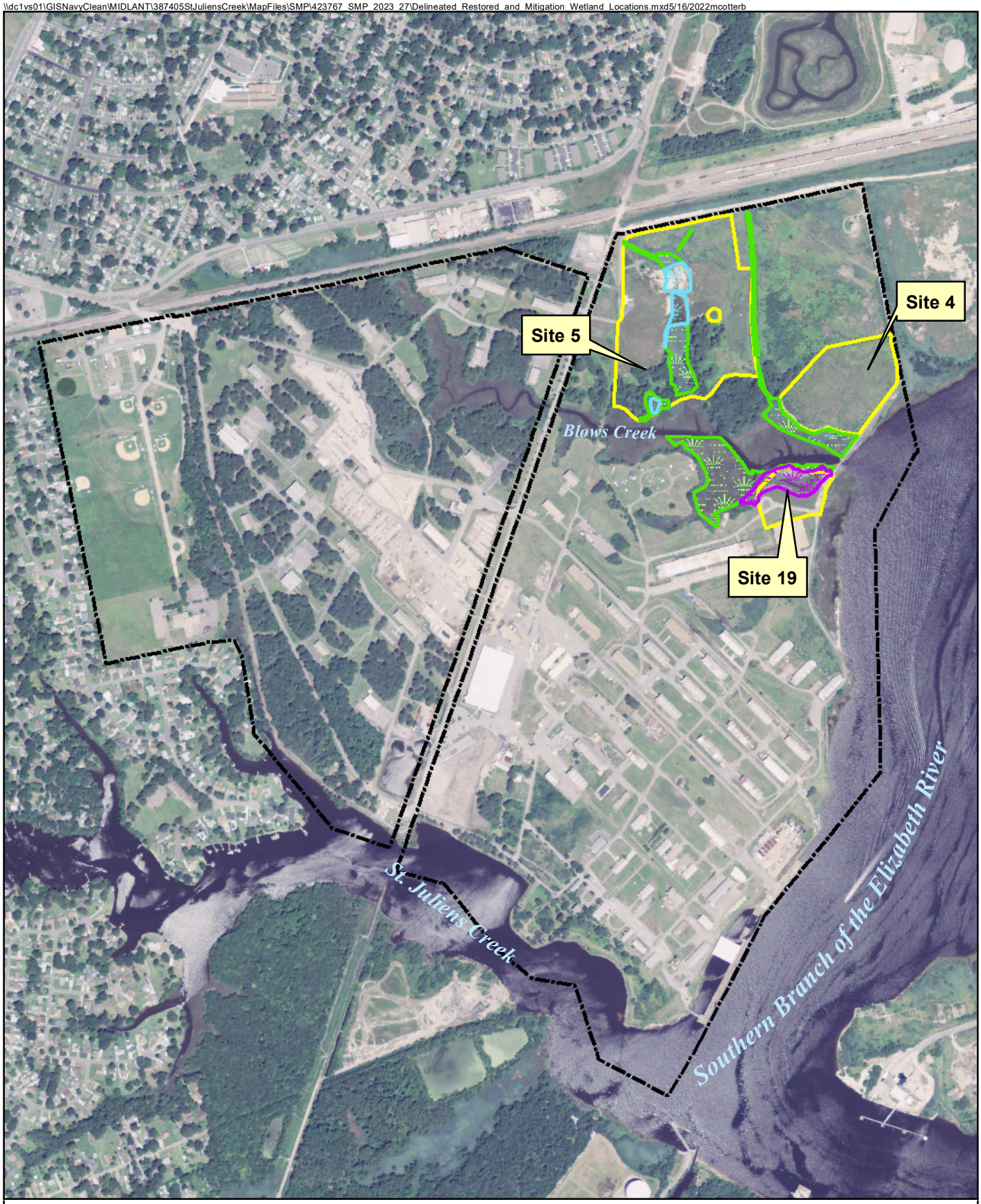
- NFA ERP sites
- Active ERP sites
- Petroleum, oil, and lubricant sites
- ERP LUC boundaries and restricted use locations
- Active or NFA ERP sites where munitions and explosives of concern, material potentially presenting an explosive hazard, or munitions debris were identified during previous intrusive activities
- Explosives Safety Submission requirement extents
- Delineated, restored, or mitigation wetland areas

As information changes based on ongoing ERP 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. Robert Bray
Naval Facilities Engineering Systems Command, Mid Atlantic
Environmental Code OPHE3, Bldg. N-26, Rm 3300
9742 Maryland Avenue
Norfolk, Virginia 23511-3095
(757) 341-0450

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\Delineated_Restored_and_Mitigation_Wetland_Locations.mxd5/16/2022mcotterb



Legend

- St. Juliens Creek Annex Boundary
- Site Boundary
- Delineated Wetlands
- Mitigation Wetlands
- Restored Wetlands

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

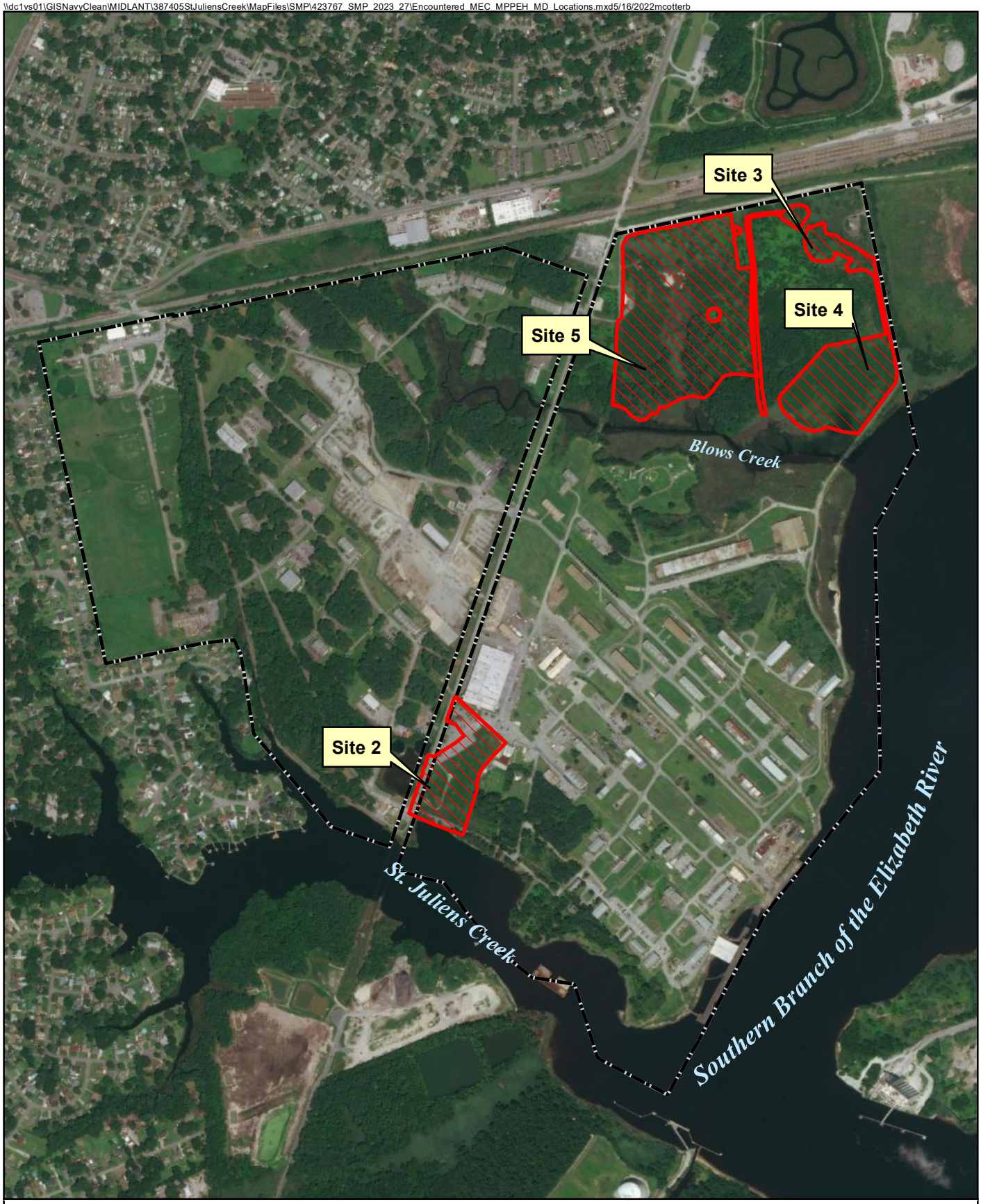
Delineated, Restored, and Mitigation Wetland Locations
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

N
W E
S

0 450 900
Feet

ch2m

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\Encountered_MEC_MPPEH_MD_Locations.mxd5/16/2022mcotterb



Legend

St. Juliens Creek Annex Boundary

Munitions and Explosives of Concern/Material Potentially Presenting an Explosive Hazard/Munitions Debris Locations

N
W E
S

0 450 900
Feet

Encountered Munitions and Explosives of Concern/MaterialPotentially Presenting an Explosive Hazard/Munitions Debris Locations
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

ch2m

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\ESS_sites.mxd5/16/2022mcotterb

Legend

St. Juliens Creek Annex Boundary

Explosives Safety Submission Requirement Extents

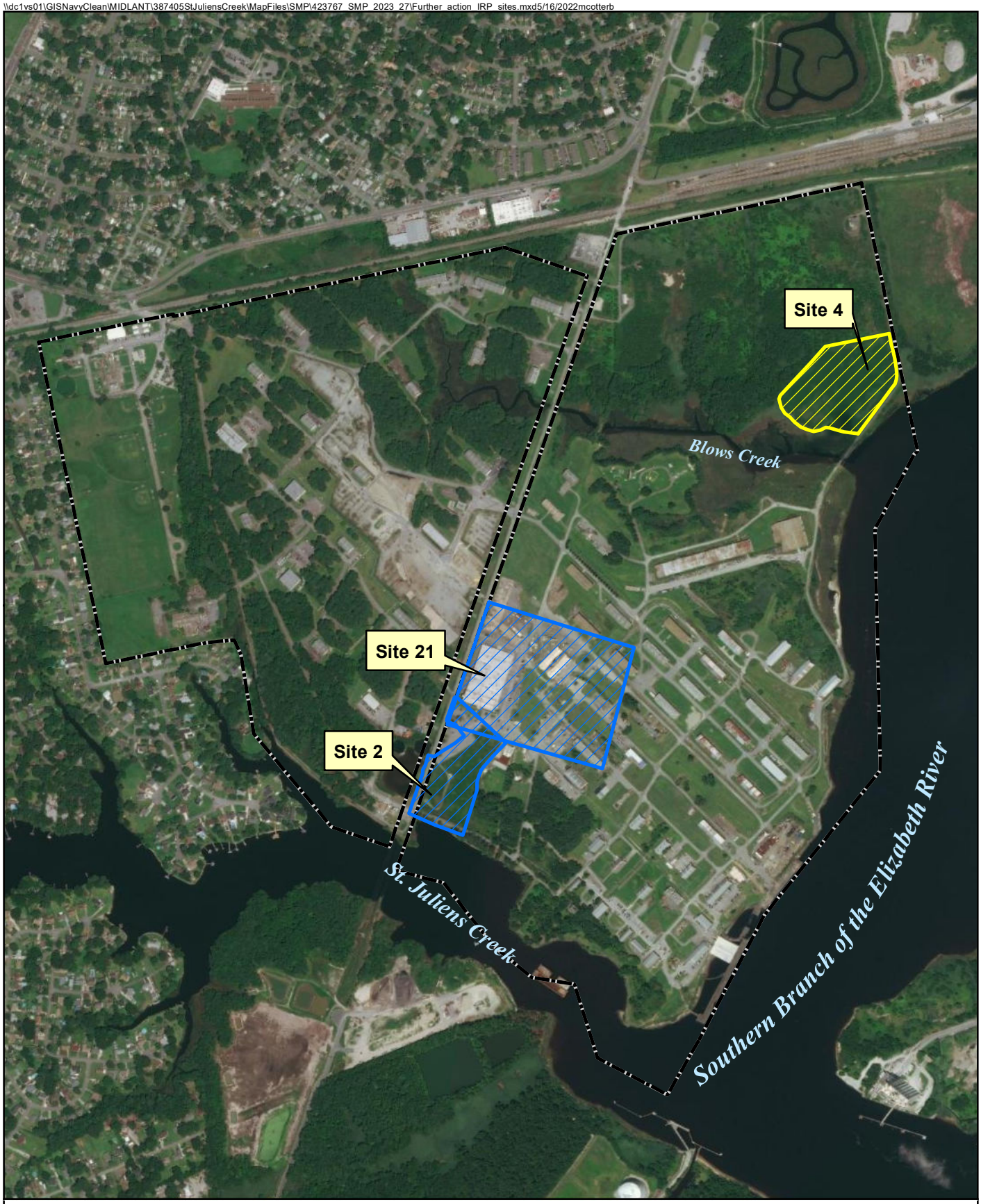
Explosives Safety Submission Requirement Extents
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

N
W E
S

0 450 900
Feet

ch2m

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\Further_action_IRP_sites.mxd5/16/2022mcotterb



Legend

- St. Juliens Creek Annex Boundary
- Response Complete Site with Land Use Controls
- Remedial Action Site with Land Use Controls

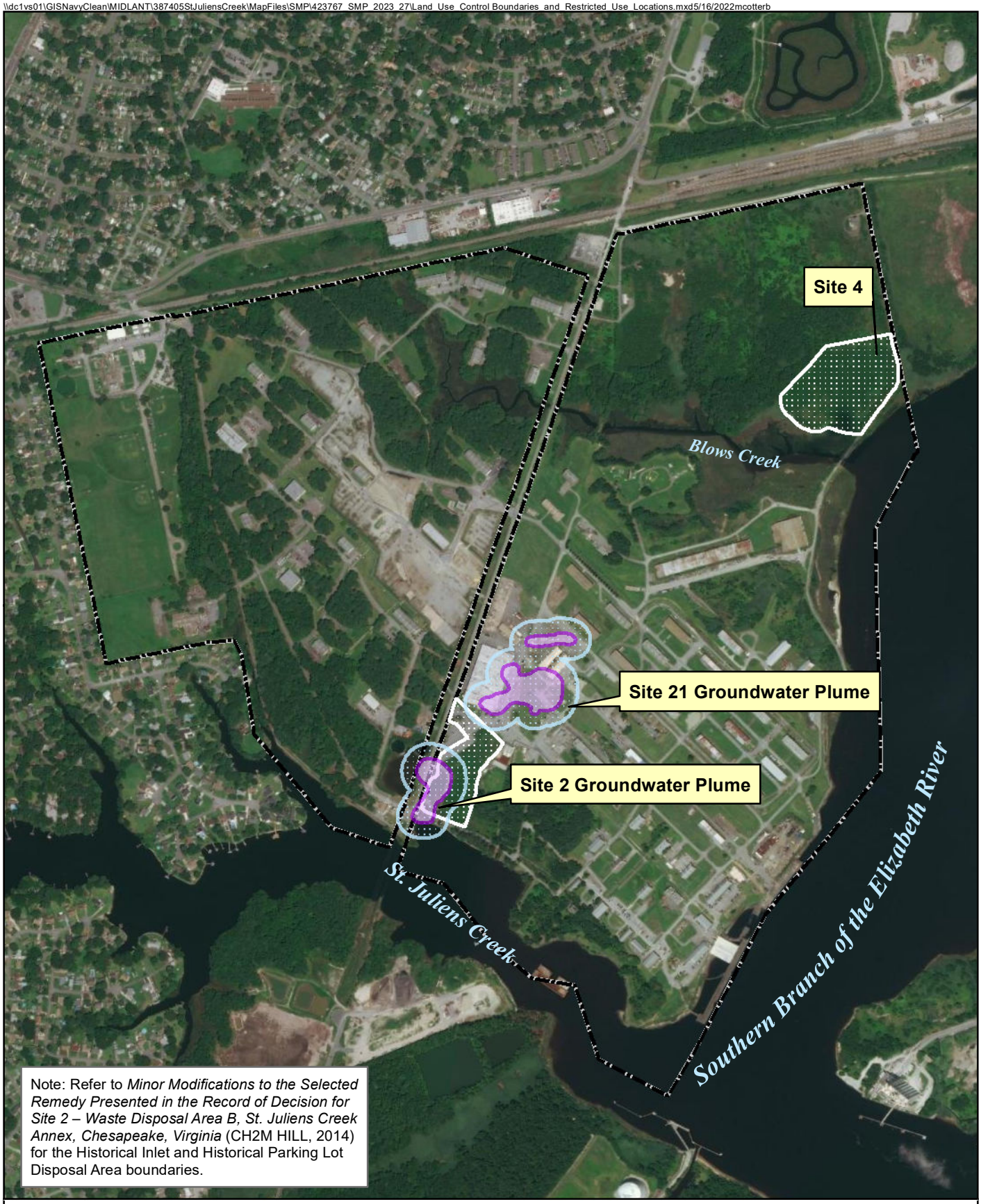
Location of Active Environmental Restoration Program Sites
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

N
W E
S

0 450 900
Feet

ch2m

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\Land_Use_Control Boundaries_and_Restricted_Use_Locations.mxd5/16/2022mcotterb



Note: Refer to *Minor Modifications to the Selected Remedy Presented in the Record of Decision for Site 2 – Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia* (CH2M HILL, 2014) for the Historical Inlet and Historical Parking Lot Disposal Area boundaries.

Legend

- St. Juliens Creek Annex Boundary
- Land Use Control Boundary - Groundwater (Inhalation)
- Land Use Control Boundary - Groundwater (Potable use)
- Land Use Control Boundary - Waste and Soil

N
W E
S

0 450 900
Feet

Environmental Restoration Program
Land Use Control Boundaries and Restricted Use Locations
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

ch2m

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\No_further_action_sites.mxd5/16/2022mcotterb

Legend

St. Juliens Creek Annex Boundary

Response Complete Site, Solid Waste Management Unit, or Area of Concern with No Further Action

Location of Environmental Restoration Program No Further Action Sites, Solid Waste Management Units, and Areas of Concern
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

N
W E
S

0 450 900
Feet

ch2m

\\dc1vs01\GISNavyClean\MIDLANT\387405StJuliensCreek\MapFiles\SMP\423767_SMP_2023_27\POL_sites.mxd5/16/2022mcotterb

Legend
- St. Juliens Creek Annex Boundary
- Petroleum, Oil, and Lubricants Site

N
W E
S

0 450 900
Feet

Petroleum, Oil, and Lubricants Sites
Environmental Restoration Program
St. Juliens Creek Annex
Chesapeake, Virginia

ch2m.

SECTION 5

References

AGVIQ-CH2M. 2004. *Design Package, Site 4 – Landfill D. St. Juliens Creek Annex, Chesapeake, Virginia*. November.

AGVIQ-CH2M. 2005. *Construction Closeout Report, Site 4—Landfill D Soil Cover (Design/Build), St. Juliens Creek Annex, Chesapeake, Virginia.* December.

APTIM. 2018a. *Final Mitigation Monitoring and Maintenance Plan - Compensatory Wetland Mitigation Area, Site 2- Remedial Action, St. Juliens Creek Annex, Chesapeake, Virginia*. March.

APTIM. 2018b. *Final Technical Memorandum Soil Cap Repairs and Inspections [Work Plan] for Site 2 at St. Julien's Creek Annex*. July.

APTIM. 2018c. *Final Technical Memorandum Round 3, Biostimulation and Bioaugmentation Injections [Work Plan] at Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* December.

APTIM. 2019a. *Draft Final Construction Completion Report, Site 2 – Soil Cap Repair, St. Juliens Creek Annex, Chesapeake, Virginia.* September.

APRIM. 2019b. Final Work Plan, Site 21 Remedial Action Operation for Groundwater at St. Juliens Creek Annex, Chesapeake, Virginia. October.

APTIM. 2019c. *Final Sampling and Analysis Plan/Quality Assurance Plan Five Year Review, Site 4, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

APTIM. 2019d. *Draft Project Completion Report, Site 4 – Five Year Review Sampling, St. Juliens Creek Annex, Chesapeake, Virginia.* July.

APTIM. 2020a. *Draft Construction Completion Report, Site 21 Remedial Action Operation for Groundwater, St. Juliens Creek Annex, Chesapeake, Virginia.* October.

APTIM. 2021a. *Final Construction Completion Report, Site 2 – Round 3 Biostimulation and Bioaugmentation Injections, St. Juliens Creek Annex, Chesapeake, Virginia.* October.

APTIM. 2021b. *Final Completion Report Addendum for Well Maintenance, Site 2 – Round 3 Biostimulation and Bioaugmentation Injections, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

APTIM. 2021c. *Final Construction Competition Report, Site 21 Remedial Action Operation for Groundwater, St. Juliens Creek Annex, Chesapeake, Virginia. April.*

A. T. Kearney, Inc. and K. W. Brown and Associates, Inc. 1989. *Phase II RCRA Facility Assessment of the St. Juliens Creek Annex Facility, Chesapeake, Virginia.* March.

CB&I. 2014a. *Remedial Action Construction Completion Report Addendum, Site 2, St Juliens Creek Annex, Chesapeake, Virginia.* December.

CB&I. 2014b. *Interim Remedial Action Construction Completion Report Addendum, Site 21, St Juliens Creek Annex, Chesapeake, Virginia.* December.

CB&I. 2016. *Final 3rd Semi-Annual Sampling Technical Report – Site 2 Remedial Action, St. Juliens Creek Annex, Chesapeake, Virginia*. March

CB&I. 2017. *Final Construction Completion Report, Site 2 Additional Down Gradient Injections, Saint Julien's Creek Annex, Chesapeake, Virginia. December.*

CH2M HILL, Inc. (CH2M). 1996. *Relative Risk Ranking System Data Collection Report, St. Juliens Creek Annex to the Norfolk Naval Base, Chesapeake, Virginia.* April.

CH2M. 2000. *Community Relations Plan, St. Juliens Creek Annex, Chesapeake, Virginia*. November.

CH2M. 2001a. *Technical Memorandum Findings of the Expanded Site Inspection Site 17 (Building 278/279), St. Juliens Creek Annex, Chesapeake, Virginia.* September.

CH2M. 2001b. *Background Investigation Report, St. Juliens Creek Annex, Chesapeake, Virginia.* October.

CH2M. 2002. *Site Screening Assessment Report, St. Juliens Creek Annex, Chesapeake, Virginia.* April.

CH2M. 2003. *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. 2004a. *Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* February.

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

CH2M. 2004c. *Proposed Remedial Action Plan for Site 4, St. Juliens Creek Annex. Chesapeake, Virginia.* May.

CH2M. 2004d. *Site Investigation at Sites 8, 19, 21, and AOC 1. St. Juliens Creek Annex, Chesapeake, Virginia.* June.

CH2M. 2004e. *Background Investigation Report Addendum for Groundwater, St. Juliens Creek Annex, Chesapeake, Virginia.* August.

CH2M. 2006a. *Final Technical Memorandum: Minor Modifications to the Selected Remedy Presented in the Record of Decision for Site 4 – Landfill D, St. Juliens Creek Annex, Chesapeake, Virginia.* February.

CH2M. 2006b. *Draft Supplemental Site Investigation for Site 21*, *St. Juliens Creek Annex, Chesapeake, Virginia.* April.

CH2M. 2006c. *Site 4 Annual Inspection Report – Fiscal Year 2006*, *St. Juliens Creek Annex, Chesapeake, Virginia.* November.

CH2M. 2007. *Site 4 Annual Inspection Report – Fiscal Year 2007*, *St. Juliens Creek Annex, Chesapeake, Virginia.* December.

CH2M. 2008a. *Remedial Investigation Report for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* June.

CH2M. 2008b. *Site 4 Annual Inspection Report – Fiscal Year 2008*, *St. Juliens Creek Annex, Chesapeake, Virginia.* December.

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

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

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

CH2M. 2009d. *Site 4 Annual Inspection Report – Fiscal Year 2009*, *St. Juliens Creek Annex, Chesapeake, Virginia.* October.

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

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

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

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

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

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

CH2M. 2010g. *Site 4 Annual Inspection Report – Fiscal Year 2010*, *St. Juliens Creek Annex, Chesapeake, Virginia.* October.

CH2M. 2010h. *Interim Remedial Action Work Plan, Site 21*, *St. Juliens Creek Annex, Chesapeake, Virginia.* November.

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

CH2M. 2011b. *Site 4 Annual Inspection Report – Fiscal Year 2011*, *St. Juliens Creek Annex, Chesapeake, Virginia.* October.

CH2M. 2011c. *100% Design Submittal, Site 2 Basis of Design Report, St. Juliens Creek Annex, Chesapeake, Virginia*. November.

CH2M. 2012a. *Site 4 Annual Inspection Report – Fiscal Year 2012, St. Juliens Creek Annex, Chesapeake, Virginia.* October.

CH2M. 2012b. *Site 21 Annual Inspection Report – Fiscal Year 2012, St. Juliens Creek Annex, Chesapeake, Virginia.* October.

CH2M. 2013. *Site 2 Basis of Design Report Addendum, St. Juliens Creek Annex, Chesapeake, Virginia.* January.

CH2M. 2014. *Revised Final Minor Modifications to the Selected Remedy Presented in the Record of Decision for Site 2 – Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia.* October.

CH2M. 2015a. *Community Involvement Plan, St. Juliens Creek Annex, Chesapeake, Virginia*. March.

CH2M. 2015b. *Five-Year Review Report, St Juliens Creek Annex, Chesapeake, Virginia*. May.

CH2M. 2016a. *Final Record of Decision Memorandum to File, Addendum to Minor Modifications of the Selected Remedy Presented in the Record of Decision for Site 2 – Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia.* July.

CH2M. 2016b. *Final Remedial Design/Remedial Action Work Plan for the Site 2 Permeable Reactive Barrier, St. Juliens Creek Annex, Chesapeake, Virginia*. December.

CH2M. 2017. *Site Management Plan, Fiscal Years 2018 through 2022, St. Juliens Creek Annex, Chesapeake, Virginia.* July.

CH2M. 2018a. *Site Management Plan, Fiscal Years 2019 through 2023, St. Juliens Creek Annex, Chesapeake, Virginia.* September.

CH2M. 2018b. Final Work Plan for Conducting a Preliminary Assessment for Per- and Polyfluoroalkyl Substances, St. Juliens Creek Annex, Chesapeake, Virginia. October.

CH2M. 2018c. *Final 2017 Land Use Control Inspection Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* June.

CH2M. 2018d. *Final Sites 2 and 21 Five Year Review Emerging Contaminants Investigation, St. Juliens Creek Annex, Chesapeake, Virginia.* February.

CH2M. 2018e. *Final 2017 Land Use Control Inspection Report for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* June.

CH2M. 2018f. *Final Vapor Intrusion Investigation Report, Site 21 Building 54, St. Juliens Creek Annex, Chesapeake, Virginia.* January.

CH2M. 2018g. *Final Site 21 Remedial Action-Operation Phase Vapor Intrusion Monitoring Event 12, St. Juliens Creek Annex, Chesapeake, Virginia*. September.

CH2M. 2018h. *Final 2017 Land Use Control Inspection Report for Site 4, St. Juliens Creek Annex, Chesapeake, Virginia.* June.

CH2M. 2019a. *Site Management Plan, Fiscal Years 2020 through 2024, St. Juliens Creek Annex, Chesapeake, Virginia.* August.

CH2M. 2019b. *Final 2018 Land Use Control Inspection Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

CH2M. 2019b. *Final 2018 Land Use Control Inspection Report for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

CH2M. 2019c. *Final Site 21 Remedial Action-Operation Phase Vapor Intrusion Monitoring Event 13, St. Juliens Creek Annex, Chesapeake, Virginia*. August.

CH2M. 2019d. *Final 2018 Land Use Control Inspection Report for Site 4, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

CH2M. 2020a. *Site Management Plan, Fiscal Years 2021 through 2025, St. Juliens Creek Annex, Chesapeake, Virginia.* August.

CH2M. 2020b*. Community Involvement Plan, St. Juliens Creek Annex, Chesapeake, Virginia*. March.

CH2M. 2020c. *Final Five-Year Review Report, St. Juliens Creek Annex, Chesapeake, Virginia*. February.

CH2M. 2020d. *Final 2019 Land Use Control Inspection Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

CH2M. 2020e. *Final Vapor Intrusion Investigation for Site 21 Buildings Proposed for Occupancy during Remedial Action-Operation Sampling and Analysis Plan Addendum, St. Juliens Creek Annex, Chesapeake, Virginia*. January.

CH2M. 2020f. *Final Vapor Intrusion Investigation Report, Site 21 Building 81, St. Juliens Creek Annex, Chesapeake, Virginia*. November.

CH2M. 2020g. *Final 2019 Land Use Control Inspection Report for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

CH2M. 2020h. *Final 2019 Land Use Control Inspection Report for Site 4, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

CH2M. 2020i. *Remedial Action-Operation Phase Vapor Intrusion Monitoring Event 14 at Site 21, St. Juliens Creek Annex, Chesapeake, Virginia*. March.

CH2M. 2020j. *Remedial Action-Operation Phase Vapor Intrusion Monitoring Event 15 at Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* July.

CH2M. 2021a. *Site Management Plan, Fiscal Years 2022 through 2026, St. Juliens Creek Annex, Chesapeake, Virginia.* August.

CH2M. 2021b. *Final 2021 Preliminary Assessment for Per- and Polyfluoroalkyl Substances, St. Juliens Creek Annex, Chesapeake, Virginia.* February.

CH2M. 2021c. *Final 2020 Land Use Control Inspection Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* January.

CH2M. 2021d. *Final 2020 Land Use Control Inspection Report for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

CH2M. 2021e. *Final 2020 Land Use Control Inspection Report for Site 4, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

CH2M. 2021f. *Remedial Action-Operation Phase Vapor Intrusion Monitoring Event 16 at Site 21, St. Juliens Creek Annex, Chesapeake, Virginia*. March.

CH2M. 2021g. *Remedial Action-Operation Phase Vapor Intrusion Monitoring Event 17 at Site 21, St. Juliens Creek Annex, Chesapeake, Virginia*. June.

CH2M. 2021h. *Remedial Action-Operation Phase Vapor Intrusion Monitoring Event 18 at Site 21, St. Juliens Creek Annex, Chesapeake, Virginia*. November.

CH2M. 2022a. *Final 2021 Land Use Control Inspection Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* January.

CH2M. 2022b. *Final 2021 Land Use Control Inspection Report for Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* January.

CH2M. 2022c. *Final 2021 Land Use Control Inspection Report for Site 4, St. Juliens Creek Annex, Chesapeake, Virginia.* January.

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

EPA. 2015. *Interim Remedial Action Completion Report. Site 2 – Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia.* September.

EPA. 2016. Preliminary Closeout Report, St. Juliens Creek Annex, NPL Site (CERCLIS ID: VA5170000181), Chesapeake, Virginia. July. Naval Facilities Engineering Command (NAVFAC). 2004. *Record of Decision—Site 4: Landfill D*, *St. Juliens Creek Annex, Chesapeake, Virginia.* August.

Meadows. 2017a. *Final Remedial Action Operations Performance Monitoring Report, April 2017 (Fourth Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* December.

Meadows. 2017b. Final Post-Injection Monitoring Sampling Monitoring Report November 2016 (Tenth Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia. August.

Meadows. 2018a. *Final Remedial Action Operations Performance Monitoring Report, November 2017 (Fifth Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* June.

Meadows. 2018b. *Final Remedial Action Operations Performance Monitoring Report, May 2018 (Sixth Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* September.

Meadows. 2018c. *Final Post-Injection Monitoring Sampling Monitoring Report May 2017 (Eleventh Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

Meadows. 2018d. *Final Post-Injection Monitoring Sampling Monitoring Report November 2017 (Twelfth Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* June.

Meadows. 2018e. *Final Post-Injection Monitoring Sampling Monitoring Report May 2018 (Thirteenth Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* September.

Meadows. 2019a. *Final Remedial Action Operations Performance Monitoring Report, November 2018 (Seventh Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* May.

Meadows. 2019b. *Final Remedial Action Operations Performance Monitoring Report, February 2019 (Eighth Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* November.

Meadows. 2019c. *Final Post-Injection Monitoring Sampling Monitoring Report November 2018 (Fourteenth Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* May.

Meadows. 2019d. *Final Post-Injection Monitoring Sampling Monitoring Report May 2019 (Fifteenth Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

Meadows. 2020a. *Final Remedial Action Operations Performance Monitoring Report, November 2019 (Ninth Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* April.

Meadows. 2020b. *Final Remedial Action Operations Performance Monitoring Report, May 2020 (Tenth Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* December.

Meadows. 2020c. *Final Monitoring Report, May 2020 (Sixteenth Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* December.

Meadows. 2021a. *Final Remedial Action Operations Performance Monitoring Report, November 2020 (Eleventh Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

Meadows. 2021b. Final *Monitoring Report, November 2020 (Seventeenth Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* April.

Meadows. 2021c. *Final Remedial Action Operations Performance Monitoring Report, May 2021 (Twelve Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* November.

Meadows. 2021d. Final *Monitoring Report, May 2021 (Eighteenth Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* November.

Meadows. 2022a. *Final Remedial Action Operations Performance Monitoring Report, November 2021 (Thirteenth Sampling Event), Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* June.

Meadows. 2022b. *June Monitoring Report, November 2021 (Eighteenth Sampling Event), Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* Final.

Navy. 2016. *Perfluorinated Compounds/Perfluoroalkyl Substances PFC/PFAS) – Identification of Potential Areas of Concern (AOCs)*. June.

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

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

NAVFAC. 2010. *Interim Record of Decision for Site 21: Industrial Area, St. Juliens Creek Annex, Chesapeake, Virginia.* May.

NAVFAC. 2011a. *Record of Decision for Site 2: Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia.* January.

NAVFAC. 2011b. *Final Land Use Control Remedial Design, Site 2: Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

NAVFAC. 2011c. *Record of Decision for Site 21: Industrial Area, St. Juliens Creek Annex, Chesapeake, Virginia.* October.

NAVFAC. 2011d. *Land Use Control Remedial Design, Site 21: Industrial Area, St. Juliens Creek Annex, Chesapeake, Virginia.* December.

NAVFAC. 2012. *Interim Remedial Action Completion Report, Site 21, St. Juliens Creek Annex, Chesapeake, Virginia.* September. (Signed July 2013)

NAVFAC. 2013a. *Technical Memorandum: Site 4 Annual Inspection Report - 2013.* November.

NAVFAC. 2013b. *Technical Memorandum: Site 21 Annual Inspection Report - 2013.* November.

NAVFAC. 2014a. *Revised Final Land Use Control Remedial Design, Site 2: Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia.* February.

NAVFAC. 2014b. *Technical Memorandum: Site 2 Annual Inspection Report - 2014.* November.

NAVFAC. 2014c. *Technical Memorandum: Site 4 Annual Inspection Report - 2014.* November.

NAVFAC. 2014d. *Technical Memorandum: Site 21 Annual Inspection Report - 2014.* November.

NAVFAC. 2016b. Memorandum to Site File for St. Juliens Creek Annex Installation Remediation Program, Subj: Clarification of Planned Activities at Site 2, St. Juliens Creek Annex. June.

NAVFAC. 2018a. *Final Site 2 Annual Inspection Report – 2015*, *St. Juliens Creek Annex, Chesapeake, Virginia.* December.

NAVFAC. 2018b. *Final Site 2 Annual Inspection Report – 2016*, *St. Juliens Creek Annex, Chesapeake, Virginia.* August.

NAVFAC. 2018c. *Final Site 21 Annual Inspection Report – 2015*, *St. Juliens Creek Annex, Chesapeake, Virginia.* December.

NAVFAC. 2018d. *Final Site 21 Annual Inspection Report – 2016, St. Juliens Creek Annex, Chesapeake, Virginia.* August.

NAVFAC. 2018e. *Final Site 4 Annual Inspection Report – 2015, St. Juliens Creek Annex, Chesapeake, Virginia.* December.

NAVFAC. 2018f. *Final Site 4 Annual Inspection Report – 2016, St. Juliens Creek Annex, Chesapeake, Virginia.* August.

Naval Energy and Environmental Support Activity (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*.

Shaw Environmental and Infrastructure, Inc. (Shaw). 2012a. *Interim Remedial Action Construction Completion Report, Site 21 – St. Juliens Creek Annex, Chesapeake, Virginia*. April.

Shaw. 2012b. *Work Plan, Site 2 Remedial Action, St. Juliens Creek Annex, Chesapeake, Virginia*. April.

Shaw. 2013. *Addendum to Final Work Plan, Site 2 Remedial Action, St. Juliens Creek Annex, Chesapeake, Virginia.* March.

Tetra Tech. 2000. *Hazard Ranking System Documentation Record for St. Juliens Creek Annex, Chesapeake, Virginia.* January.