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Final

Site Management Plan
Fiscal Years 2008-2009

Naval Weapons Station Yorktown
Yorktown, Virginia and
Cheatham Annex
Williamsburg, Virginia

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic Division

Contract No. N62470-02-D-3052
CTO-0148

February 2008

Prepared by

CH2MHILL

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Under the

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Virginia Beach, Virginia

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Acronyms and Abbreviations

AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
BEHP	Bis 2-Ethylhexyl phthalate
BHC	Benzene Hexachloride
BTAG	Biological Technical Assistance Group
CAX	Cheatham Annex
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbon
CVOC	Chlorinated Volatile Organic Compound
DCE	Dichloroethene
DDT	Dichlorodiphenyltrichloroethane
DNT	Nitrotoluene
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EIS	Expanded Site Inspection
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ER	Environmental Restoration
ERA	Ecological Risk Assessment
ERP	Environmental Restoration Program
ESD	Explanation of Significant Difference
FFA	Federal Facilities Agreement
FS	Feasibility Study
FY	Fiscal Year
HEPA	High-Efficiency Particulate Air
HHRA	Human Health Risk Assessment
HI	Hazard Index
HMX	Cyclotetramethylenetetranitramine
HQ	Hazard Quotient
HRS	Hazard Ranking System
HRSD	Hampton Roads Sanitation District
IAS	Initial Assessment Study
ILCR	Incremental Lifetime Cancer Risk
IRACR	Interim Remedial Action Completion Report
IRA	Interim Removal Action

LOAEL	Lowest Observed Adverse Effects Level
LTM	Long-term Monitoring
LUC	Land Use Control
MCL	Maximum Contaminant Level
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
MMRP	Military Munitions Response Program
MWR	Morale, Welfare, and Recreation
NACIP	Navy Assessment and Control of Installation Pollutants
NAVFAC	Naval Facilities Engineering Command
NAVFAC Atlantic	Naval Facilities Engineering Command Atlantic Division
NCP	National Contingency Plan
NEDED	Naval Explosives Development Engineering Department
NFA	No Further Action
NFRAP	No Further Remedial Action Plan
NPDS	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTCRA	Non-time-critical Removal Action
OU	Operable Unit
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PCP	Pentachlorophenol
PID	Photo Ionization Detector
PP	Proposed Plan
ppb	Parts per Billion
ppm	Parts per Million
PRG	Preliminary Remediation Goals
PSI	Preliminary Site Inspection/Site Investigation
RA	Remedial Action
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RBC	Risk-based Concentration
RC	Response Complete
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDX	Cyclotrimethylene Trinitroamine
RG	Remediation Goal
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RIP	Remedy in Place

RL	Remediation Level
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RRRS	Relative Risk Ranking System
SARA	Superfund Amendments and Reauthorization Act
SERA	Screening Ecological Risk Assessment
SI	Site Inspection/ Site Investigation
SMP	Site Management Plan
SSA	Site Screening Assessment
SSP	Site Screening Process
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCA	Trichloroethane
TCE	Trichloroethylene
TCL	Target Compound List
TM	Technical Memorandum
TNB	Trinitrobenzene
TNT	Trinitrotoluene
TPH	Total Petroleum Hydrocarbon
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
UUUE	Unlimited Use Unrestricted Exposure
UXO	Unexploded Ordnance
VC	Vinyl Chloride
VDEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound
WP	Work Plan
WPNSTA	Naval Weapons Station

SECTION 1

Introduction

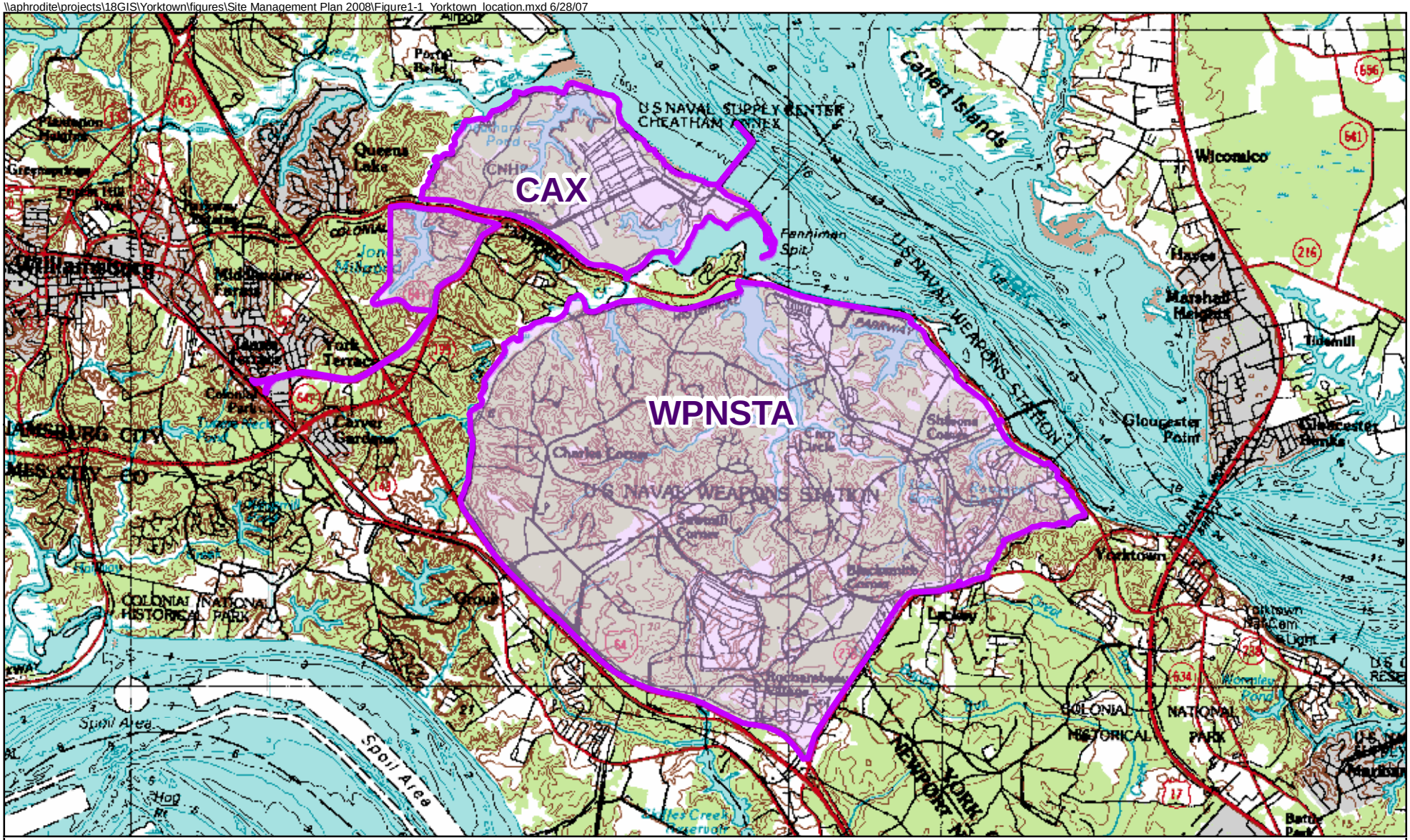
This document presents the fiscal years (FY) 2008 through 2009 Site Management Plan (SMP) for Naval Weapons Station (WPNSTA) Yorktown, Yorktown, Virginia and Cheatham Annex (CAX), Williamsburg, Virginia. The SMP meets the requirements of the Federal Facilities Agreement (FFA) between the Naval Facilities Engineering Command Atlantic Division (NAVFAC Mid-Atlantic), Virginia Department of Environmental Quality (VDEQ), and Region III of the Environmental Protection Agency (EPA) under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) to address environmental contamination at applicable WPNSTA Yorktown (United States Environmental Protection Agency [USEPA], 1994) and CAX (EPA, 2005) sites. The SMP is being submitted for use by the WPNSTA Yorktown Environmental Restoration (ER) Partnering Team and their respective organizations—NAVFAC Mid-Atlantic, WPNSTA Yorktown, CAX, EPA, and the VDEQ. **Figure 1-1** illustrates the location of WPNSTA Yorktown and CAX.

The purpose of the SMP is to provide a management tool for NAVFAC Mid-Atlantic, WPNSTA Yorktown, CAX, VDEQ, EPA, and consultants to be used in planning, scheduling, and setting priorities for environmental remedial response activities to be conducted at WPNSTA Yorktown and CAX. The SMP establishes schedules and conceptual approaches for continued CERCLA activities at WPNSTA Yorktown and CAX ER sites. The prioritization of activities, proposed schedules, and work descriptions were jointly developed by the Navy, EPA, and VDEQ and consist of:

- Site descriptions and proposed activities for the current FY
- Conceptual schedules and general work approaches for activities planned for the two-year period FY 2008 through FY 2009
- Relative ranking of potential risks to human health and the environment
- NAVFAC's funding goal for "high–priority" sites
- Goals set by EPA, VDEQ, NAVFAC, and the public as CERCLA is implemented

The SMP is a working document that is updated annually and supersedes the 2006-2007 SMP finalized in April 2007, following receipt of FY 07 funding. This 2008 SMP update differs from previous SMPs with significant revisions to each site write-up that include: (1) more detailed descriptions of potential contamination, (2) associated risk, (3) remedial actions, (4) rationale for CERCLA status determination, and (5) the path forward for CERCLA implementation. This 2008 SMP update has been prepared to serve as a "baseline" informational tool with the intention that future SMP updates be streamlined to focus on sites that have not yet documented a no further action decision as a final response, or have not yet reached remedial action operation or response complete.

\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure1-1_Yorktown_location.mxd 6/28/07



Legend

Activity Boundaries

N
W E
S

0 0.65 1.3
Miles

Figure 1-1
Location of WPNSTA Yorktown and CAX
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown, Yorktown, Virginia
CAX, Williamsburg, Virginia

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SECTION 2

Background and Regulatory Framework

2.1 Activity Description

2.1.1 WPNSTA

WPNSTA Yorktown is a 10,624-acre installation located on the Virginia Peninsula in York and James City Counties Virginia (**Figure 1-1**). WPNSTA Yorktown is bounded on the northwest by Cheatham Annex and the King's Creek Commerce Center; on the northeast by the York River and the Colonial National Historic Parkway; on the southwest by Route 143 and Interstate 64; and on the southeast by Route 238 and the town of Lackey.

Originally named the U.S. Mine Depot, WPNSTA Yorktown was established in 1918 to support the laying of mines in the North Sea during World War I. For 20 years after World War I, the depot continued to receive, reclaim, store, and issue mines, depth charges, and related materials. During World War II, the facility was expanded to include three trinitrotoluene (TNT) loading plants and new torpedo overhaul facilities. A research and development laboratory for experimentation with high explosives was established in 1944. In 1947, a quality evaluation laboratory was developed to monitor special tasks assigned to the facility which included the design and development of depth charges and advanced underwater weapons. On August 7, 1959, the depot was renamed the U.S. Naval Weapons Station. Today, the primary mission of WPNSTA Yorktown is to provide ordnance, technical support, and related services to sustain the war-fighting capability of the armed forces in support of national military strategy.

2.1.2 CAX

CAX is located on the site of the former Penniman Shell Loading Plant, which was a large powder- and shell-loading facility operated during World War I (**Figure 1-1**). The Penniman facility closed in 1918, and between 1918 and 1943, the property was used for farming or left idle until CAX was commissioned in 1943 as a satellite unit of the Naval Supply Depot to provide bulk storage facilities and serve as an assembly and overseas shipping point throughout World War II. At inception, CAX occupied approximately 3,349 acres. Several portions of the original base have since been declared surplus and transferred to other government jurisdictions, including the National Park Service, the Commonwealth of Virginia, and York County. CAX is currently comprised of 2,300 acres and is divided into two separate parcels, with the larger parcel situated along the banks of the York River. Almost all of the activities at CAX (administration, training, maintenance, support, and housing) take place in this portion of the Installation. The smaller parcel is located south of the Colonial National Historic Parkway. This area contains Jones Pond and is used mainly as a watershed protection area. In July 1987, CAX was designated the Hampton Roads Navy Recreational Complex. Today, the mission of CAX includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel.

2.2 Environmental History

2.2.1 Regulatory History

WPNSTA

Comprehensive environmental restoration activities at WPNSTA Yorktown began in 1984 under the Navy Assessment and Control of Installation Pollutants (NACIP) and ER Programs. The purpose of the NACIP and ER programs was to identify, assess, characterize, and clean up or control contamination from past waste management activities. The NACIP program was modified into the as the ER program in 1986 to reflect the requirements of CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA). The Navy is committed to clean up sites that pose a threat to human health or the environment and implementing environmental stewardship practices that ensures Navy waste management operations are in compliance with all federal and state regulations and Navy policy.

On October 15, 1992, WPNSTA Yorktown was added to the National Priorities List (NPL) based on a Hazard Ranking System (HRS) score of 50. The FFA between the Navy and the EPA was signed August 1994, and incorporated Resource Conservation and Recovery Act (RCRA) Solid Waste Management Units (SWMUs) at WPNSTA Yorktown identified in a 1992 RCRA SWMU Investigation Report (A.T. Kearney, 1992). The FFA Findings of Fact identified 16 Sites (Sites 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 16, 17, 18, 19, and 21) for Remedial Investigation (RI). Appendix A of the FFA identified 19 Site Screening Areas (SSAs) [SSAs 1-19)] for the Site Screening Process (SSP). Subsequent to the FFA, six additional SSAs (SSA 20 - SSA 25) were identified for consideration in CERCLA. Based on the results of the SSP, SSA 1 (Site 23), SSA 6 (Site 24), SSA 7 (Site 25), SSA 10 (Site 28), SSA 16 (Site 16), SSA 18 (Site 26), SSA 20 (Site 29), and SSA 24 (Site 30) were determined to warrant Remedial Investigation/Feasibility Study (RI/FS) efforts under CERCLA. Appendix B of the FFA identified 21 Areas of Concern (AOCs) for desktop audits under CERCLA to determine if the AOCs warranted further consideration in the SSP. With the exception of AOCs 5, 6, and 7 which are associated with SSA 15, the Navy in partnership with EPA and VDEQ agree no further action (NFA) was warranted for all other AOCs (Baker, 1997a). **Table 2-1** identifies the sites addressed under CERCLA at WPNSTA Yorktown. **Figure 2-1** shows the location of each site at WPNSTA.

CAX

In October 1998, CAX was transferred from Fleet and Industrial Supply Center to WPNSTA. CAX was included on the NPL January 2001 with an HRS score of 48.7. The FFA for CAX was signed March 2005 and identified 12 Sites and 7 AOCs. A 1984 Initial Assessment Study (IAS) identified 12 potentially contaminated areas and recommended Sites 1, 9, 10, and 11 for additional investigation. In 1998, the Navy, EPA, and VDEQ performed a site visit and identified five additional potential source areas and designated them as AOCs 1 through 5. In 1999, EPA identified potential sources associated with the past Penniman Facility and included (AOC 6) as an SSA. A 2003 No Further Response Action Planned (NFRAP) Decision for Sites 2, 3, 5, 6, 8, and 10 documents agreement between the Navy, EPA, and VDEQ for response complete at these sites. Additionally, response complete for Site 12 is documented in a 2004 NFRAP Decision Document for Site 12. In 2004 the Navy identified

AOC 7 (Drum and Can Disposal Area) as a Preliminary Screening Area for desktop audit in Appendix B. Sites 1, 4, 7, and 11 are identified in the FFA Findings of Fact for CERCLA implementation with ultimate closure under a Record of Decision (ROD). These sites and AOCs are listed in **Table 2-2** and shown on **Figure 2-2**.

Partnering

The Navy works in partnership with EPA and VDEQ and has established a formal Yorktown-CAX Partnering Team to implement CERCLA. Partnering Team decisions are documented through consensus statements; a summary of Team consensus statements is presented in **Table 2-3**.

2.2.2 Hydrogeologic Setting

WPNSTA Yorktown and Cheatham Annex are situated within the Virginia Coastal Plain Physiographic Province, which is characterized by unconsolidated sediments several thousand feet in thickness (Meng and Harsh, 1988). Deposition and erosion associated with fluctuating sea levels resulted in terraces that decrease in topographic elevation in a stair-step pattern with scarps, oriented north to south, that delineate the eroded shoreline along the toe of each terrace. Two terraces (Lackey Plain and Croaker Flat) are divided by one scarp (the Camp Peary Scarp) within the boundaries of WPNSTA Yorktown.

A total of ten geologic formations have been identified (Brockman et al., 1997) beneath WPNSTA and CAX. The upper most geologic formations consists of alluvial, colluvial, and marsh deposits composed of silt, sand, and pebbles with some clay. The geologic units are grouped into hydrostratigraphic units based upon hydraulic characteristics. The aquifers separated by confining/semi-confining units relevant to CERCLA investigations at WPNSTA and CAX are, from youngest to oldest; the Columbia aquifer, the Cornwallis Cave aquifer, and the Yorktown-Eastover aquifer. Groundwater flow is locally controlled by topography with discharge to nearby surface water bodies and a primary flow and discharge direction toward the York River.

In the vicinity of Sites 1, 3, 6, 7, 11, 17, 24, and 25, the Camp Peary Scarp truncates the Columbia aquifer, the Cornwallis Cave confining unit, the Cornwallis Cave aquifer, and some to all of the Yorktown confining unit; hence, the upper units are missing and either the Yorktown aquifer or a thin portion of the Yorktown confining unit, occurs at the surface. In some areas, the Cornwallis Cave aquifer and confining unit are absent and the Columbia aquifer overlies the Yorktown confining unit. Where present, the Columbia aquifer ranges in thickness from 5 to 10 ft thick, with horizontal hydraulic conductivity between about 0.4 to 8 ft/day and vertical hydraulic conductivity between 1.7×10^{-4} to 1.7×10^{-1} ft/day (Brockman et. al., 1997). The dark greenish gray clay and silt of the Yorktown confining unit is absent north of Turkey Road between the west and south branches of Felgates Creek, along the streambeds of Felgates Creek, Indian Field Creek and their unnamed tributaries, where it is absent (Brockman et al., 1997), and ranges in thickness from 0 to 36 ft. Vertical hydraulic conductivity of the confining unit ranges from 1.3×10^{-5} ft/day to 7.4×10^{-3} ft/day.

The Yorktown-Eastover aquifer extends across all of WPNSTA Yorktown and ranges from 60 to 100 ft thick. Horizontal hydraulic conductivity ranges from 0.004 to 3 ft/day and vertical hydraulic conductivity ranges from 1.7×10^{-5} to 4.8×10^{-1} ft/day. Transmissivity of the aquifer ranges from 0.5 to 40 ft^2/day, with groundwater flow from west-to-east.

2.3 CERCLA Process

The following sections provide an overview of the CERCLA process. The objectives of the CERCLA process are to evaluate the nature and extent of contamination at a site, and to identify, develop, and implement appropriate remedial actions in order to protect human health and the environment. The major elements of the CERCLA process are identified below and described in greater detail in **Table 2-4**:

- Community Participation
- Preliminary Assessment (PA)
- Site Investigation (SI)
- RI/FS
- Engineering Evaluation/Cost Analysis (EE/CA) and Removal Action (may be implemented at any time in the CERCLA process)
- Proposed Plan (PP) and ROD
- Remedial Design (RD) and Remedial Action (RA)
- Post-RA Monitoring and Reporting
- Response Complete (RC)/Remedy In Place (RIP)

2.3.1 Military Munitions Response Program

The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program (ERP) to address munitions and explosives of concern and munitions constituents at other than operational ranges. The DoD and the Navy are establishing policy and guidance for munitions and response actions under the MMRP; however, the key program drivers developed to date conclude that munitions response action will be conducted under the process outlined in the National Contingency Plan (NCP) as authorized by CERCLA.

2.3.2 Community Participation

The documents prepared for the program are maintained in information repositories for review by the public. The index of WPNSTA Yorktown Administrative Records is available at http://public.lantops-ir.org/sites/public/yorktown/default.aspx.

Documents are available to the public in the information repository for the Administrative Record maintained at:

Public Affairs Officer
Naval Facilities Engineering Command
6506 Hampton Boulevard
Norfolk, Virginia 23508-1278
Phone: (757) 322-8005
NFECL_PMO@navy.mil

WPNSTA Yorktown and CAX have developed a Community Relations Plan and established a Restoration Advisory Board (RAB) comprised of members of the community, local environment group members, and state and federal officials, who meet semi-annually to keep the community informed on environmental issues at WPNSTA and CAX.

Table 2-1
Site Summary
Naval Weapons Station Yorktown
Site Management Plan FY 08 Update

Site ID	Other ID		Site Name	Site Description	Current CERCLA Status	Comments/Notes
	IAS (1984) RCRA (1992)	FFA				
Site 1	IAS Site 1	Site 1	Dudley Road Landfill	Landfill with soil cover in place; In 5-year review cycle; ROD 1999 - soil cover/LUCs, some soil and waste removal in 1999	RI/FS	ROD for Soil; LUCs/waste gw/sw/sd investigation on going 5Yr review 2007
Site 2	IAS Site 2	Site 2	Turkey Road Landfill	5-acre landfill; 1994 partial waste removal	RI/FS MRP	landfill waste delineation and soil characterization in progress; Site may transfer to MRP
Site 3	IAS Site 3	Site 3	Group 16 Magazine Landfill	2-acre landfill	RI/FS	ROD (1999) - soil/waste LUCs; Waste removal, 2' soil cover (2000) gw/sw/sd investigation on-going 5Yr review 2007
Site 4	IAS Site 4	Site 4	Burning Pad Residue Landfill	10-acre landfill; 1940 to 1975 received 17 tons waste/yr. 1994 removal action ; 2003 removal action (2,460 tons ash, 3,025 tons batteries, 1,295 tons soil, 510 tons debris); 2005 removal action (57,600 tons soil);	RI/FS	NFA ROD for soil 05' gw/sw/sd investigation on going
Site 5	IAS Site 5	Site 5	Surplus Transformer Storage Area	1000 square foot area; stored surplus transformers; 1982 removal action of contaminated soil and PCB-contaminated transformers	RI/FSPP/ROD	NFA ROD for Site 5 all media
Site 6	IAS Site 6	Site 6	Explosives-Contaminated Wastewater Impoundment	2-areas: impoundment and excavated area, RA completed Shaw 06, wetlands created in impoundment area; Shaw CCR 07 pending Nov 06 removal grading completed	RI/FS	ROD 98 removal of impoundment and soil cover of excavated area; LUCs RA soil/sediment in progress; gw under investigation 5Yr review 2007
Site 7	IAS Site 7	Site 7	Plant 3 Explosieves-Contaminated Wastewater Discharge Area	300-foot long drainage area located adjacent to the wetlands, and the surrounding area; explosive COCs 1994 removal action	RI/FS	ROD (98) - addressed soil/sd/sw (LUCs w/ gw LTM) gw under investigation 5Yr review 2007
Site 8	IAS Site 8	Site 8	NEDED Explosives-Contaminated Wastewater Discharge Area	300-foot drainage way and its surrounding area; 05 soil/sd recharacterization; EE/CA; removal action soil/sd work plan	RI/FS	RA soil/sediment in progress; gw under investigation 5Yr review 2007
Site 9	IAS Site 9	Site 9	Plant 1 Explosives-Contaminated Wastewater Discharge Area	Natural drainage way	RI/FS	ROD (98) - NFA Soil, SW, SD GW not yet investigated 5Yr review 2007
Site 11	IAS Site 11	Site 11	Abandoned Exposives Burning Pits	a 0.5-acre-area waste disposal/burning 1930 to 1950	RI/FS	ROD removal ash/soil 2000 (OHM, 2001) sw/sd not part of site; gw under investigation 5Yr review 2007
Site 12	IAS Site 12	Site 12	Barracks Road Landfill	3 parcels; Area A - 4 acres; Area B - 1.6 acres; Area C - 3.3 acres	RI/FS/PP/ROD	ROD (97) - soil cover / LUCs for cover, residential use, gw restriction/LTM gw/sd Ballard Ck 5Yr review 2007
Site 16	IAS Site 16	Site 16	West Road Landfill	Site addressed with SSA16 5-acre landfill; 1994 removal action (420 tons batteries, 60 tons debris, 125 tons silica gel)	RI/FS/PP/ROD	ROD (95) - NFA soil/waste with gw LUCs Tech Memo for risk management of soil/gw HH risk followed by ESD to remove LUCs and NFA Site
Site 17	IAS Site 17	Site 17	Holm Road Landfill	2-acre landfill; IAS reported that drums and batteries were disposed of in the landfill. 2000 removal action (938 tons soil) ESD (06) for no action being considered by regulatory agencies RI data indicates NFA warranted for gw sw/sd not associated with site	RI/FS/PP/ROD	ROD (00) - removal PAH hot spot LUCs; Tech Memo following test pit to demonstrate no waste in place; also consideration of Tech Memo for risk management of gw. sw/sd not part of site, ESD for NFA Site
Site 18	IAS Site 18	Site 18	Building 476 Discharge Area	Unlined drainage ditch that received battery acid discharges from 1940s-1960s	RI/FS/PP/ROD	05 NFA ROD all media
Site 19	IAS Site 19	Site 19	Conveyor Belt Soils at Building 10	Contaminated soil removed in 1998; backfilled with aluminum-contaminated soil from Bldg. 527 excavation sw/sd not associated with site	RI/FS	ROD (98) - removal and LUCs gw not yet addressed 5Yr review 2007

Table 2-1
Site Summary
Naval Weapons Station Yorktown
Site Management Plan FY 08 Update

Site ID	Other ID		Site Name	Site Description	Current CERCLA Status	Comments/Notes
	IAS (1984) RCRA (1992)	FFA				
Site 21	SWMU 21	Site 21	Battery and Drum Disposal Area	1994 removal action of waste and soil (6,070 tons batteries, 650 tons debris/drums, 90 tons soil); 2002 removal action (145 cubic yards soil)	RI/FS	ROD (03) - No action soil/waste gw/sw/sd investigation on-going
Site 22	Not Identified	Not Identified	Burn Pad	9 acres; 2002 removal action (3,450 cubic yards soil)	RI/FS	ROD (02) - No action soil/waste gw/sw/sd investigation on-going
Site 23	SWMU 99 EPIC 37	SSA 1	Building 428 Teague Road Disposal Area	10.5 acres, 1994 removal action (2 drums, 443 tons treated timbers, 763 tons debris, 1,119 non-friable asbestos, 1,680 pounds pipe wrapped with friable asbestos, 31 tons metal, 2 truck batteries, and 5,815 tons ash/soil). 2003 removal action (1,025 tons soil/debris). 2004 removal action (Zn in soil)	RI/FS	RI in progress
Site 24	IAS Site 14 SWMU 28 EPIC 25	SSA 6	Aviation Field	Wooded area with evidence of concrete foundation, drums and concrete rubble, content of drums unknown	RI/FS	RI in progress
Site 25	SWMU 25 AOC A, EPIC 22 & 23	SSA 7	Building 373 Rocket Plant	.14 acres, area around a former 500-gallon UST and assoc. piping. RA (1996) to remove tank and piping and soil from beneath and around tank	RI/FS	RI in progress
Site 26	SWMU 87	SSA 18	Building 1816 Mark 48 Waste Otto Fuel Tank	6.7 acres. Tanks removed in 1995 and 1997. Retained as an IRP site b/c of VOCs in GW. sw/sd not associated with site	RI/FS	RI in progress
Site 27	SWMU 80 & 81	SSA 9	Building 1751 Chemistry Laboratory Neutralization Unit and Drainage Area	4 underground septic tanks, reportedly only filled with water, soap, neutralized acid, but files indicate industrial waste may have also gone into tanks Below grade steel unit containing limestone for acid neutralization	RI/FS	Final RI 2005; NFA ROD all media (2006)
Site 28	SWMU 107	SSA 10	Building 28 X-Ray Facility Tank Drain Field	5.8 acres. Rec'd wastewater from x-ray facility. 1998 HRSD; septic tank/drain field - no removal record RI (2005) - potential HH risks and silver an aquatic eco driver 05 BERA in progress	RI/FS	SRI with BERA 2008
Site 29	Not Identified	Not Identified	Lee Pond (SSA 20)	4.1 acre pond. Receives storm water runoff from Sites 9 (closest), 19, 18, and SSAs 8 and 22. SSP indicated soil and gw HH risks and sediment and aquatic eco risks.	RI/FS	Final RI 2005; NFA TM to demonstrate NFA for surface water and sediment; RI included soi/gw; possible risk management of soil/gw or exclusion of these media as part of Site for NFA ROD all media for Lee Pond,
Site 30	Not Identified	Not Identified	Bracken Road Incinerator and Environs (former SSA 24)	.1 acre. Mid-1970s burned unknown waste. Venezuelan crude used. SSP ('97) led to RI (2005).	RI/FS	Final RI 2005; EE/CA final in 2007. RA for soil scheduled for 2008.
SSA 2	SWMU 54	SSA 2	Former EOD Burning/Disposal Area	Two 3-cubic yard dumpsters resting on soil that stored non hazardous ash	SSP NFA	NFA 1992 RCRA SWMU Investigation
SSA 3	SWMU 56, 57, 58, 59	SSA 3	Fire Training Pits and Vicinity	3 concrete covered burning pits where debris was incinerated using jet fuel Part of a tanker trailer formerly used for confined space entry training, inside has burn residue and it rests direction on soil	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350
SSA 4	SWMU 102	SSA 4	Weapons Casing/Drum Disposal Area	Former disposal area (ravine) in which debris (old mines, bombs, drums) was deposited, drainage observed seeping into creek	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350
SSA 5	SWMU 101	SSA 5	Bypass Road Landfill	Former disposal area in which a variety of wastes were deposited in and on the ground, drainage observed flowing towards Roosevelt Pond	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350

Table 2-1
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Naval Weapons Station Yorktown
Site Management Plan FY 08 Update

Site ID	Other ID		Site Name	Site Description	Current CERCLA Status	Comments/Notes
	IAS (1984) RCRA (1992)	FFA				
SSA 8	SWMU 122, 123	SSA 8	Building 350 Rail Roadhouse Maintenance Area Trench Outfall	Underground oil/water separator Collection units that gather fluids released from rail engines during maintenance	SSP NFA	NFA Site Screening Process Report 1997 AR# 01.10-07/29/97 0908
SSA 11	SWMU 113	SSA 11	Building 3 Neutralization Unit	Open rectangular tank (approximately 3'x5'x3') with associated trench and sump used in unknown neutralization process	SSP NFA	NFA Site Screening Process Report 1997 AR# 01.10-07/29/97 0908
SSA 12	SWMU 133, 134; EPIC 41, 42	SSA 12	Public Works Storage Yard/Building 683 Vicinity	Waste accumulation area (field approximately 150'x300') where drums of motor oil, batteries, and unknown debris was stored Waste accumulation area (concrete floor) where drums of TCE contaminated with asbestos, hydraulic fluid and oil was stored	SSP NFA	NFA Site Screening Process Report 1997 AR# 01.10-07/29/97 0908
SSA 13	AOC R	SSA 13	Building 529 Battery Drainage Area	Area of pavement where neutralized battery acid washwater was released and allowed to migrate to storm drain 100 feet away	SSP NFA	NFA Site Screening Process Report 1997 AR# 01.10-07/29/97 0908
SSA 14	SWMU 72	SSA 14	Building 537 Discharge to Felgates Creek	.4 acres. Pipe from Bldg 537 through which nitramines where discharged into marshland around Felgates Creek. 2005 EE/CA soil & sd	SSA/SSP	RA soil/sediment in progress; gw under investigation
SSA 15	SWMU 127	SSA 15	Sewage Treatment Plant #1 Sludge Drying Beds and Discharge Area	.3 acres. Imhoff tank, trickling filter, sludge drying bed and chlorination unit. This infrastructure removed in 2001. Removed in 2001 w/ demo of STP. SSP 96; gw not addressed; mercury in sd	SSA/SSP	some data collected assoc/w Site 12 LTM of Ballard Creek watershed. Desktop audit to confirm CERCLA documentation for NFA.
SSA 16	SWMU 69, EPIC 5	SSA 16	Building 402 Metal Disposal Area and Environs	.4 acre dirt field for scrap disposal/storage. ROD 95 soil/waste NFA w/ LUCs	RI/FS/PP/ROD	Studied w/ Site 16 ROD (95) - NFA soil/waste with gw LUCs Tech Memo for risk management of soil/gw HH risk followed by ESD to remove LUCs and NFA Site
SSA 17	SWMU 74	SSA 17	Building 1456 Mark 46 Waste Otto Fuel Tank	Inactive UST of unknown size and construction that previously stored waste otto fuel.	SSP NFA	NFA Site Screening Process Report 1996 AR# 03.13-03/18/96 00666
SSA 19	SWMU 31, 32, AOC B	SSA 19	Beaver Road/Ponds 11 and 12 Drainage Area and Environs	164 acres. Includes drainage to Ponds 11, 11a, and 12 and surrounds EOD range.	SSP NFA	SSP NFA soil/sw/sd/gw gw under EOD RCRA
SSA 21	Not Identified	Not Identified	Roosevelt Pond	22.2 acre pond that receives storm water from industrial area.	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350
SSA 22	Not Identified	Not Identified	Sand Blasting Grit Pile	.5 acres. Operated from 1945 to mid-1980s. Determined to be same as AOC 4. Ordnance items sand-blasted. 1998 Removal Action. Confirmation samples for lead.	SSP NFA soil	NFA for soil Site Screening Process Report 2001 AR# 01350 recommendede further evaluation of groundwater
SSA 23	Not Identified	Not Identified	Coal Storage Area	1 acre coal storage area (formerly known as AOC 21). A 9-inch thick, re-inforced concrete wall surrounded pile of coal	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350
SSA 25	Not Identified	Not Identified	Wetlands Downgradient of Beaver Pond	5.6 acres, 2 impounded portions of Ballard Creek no soil associated with SSA	SSA/SSP	BERA in progress no soil assoc /w SSA
AOC 1	AOC O	AOC 1	Building 350 Rail Roadhouse Transformer Pad	Fenced concrete pad outside Bldg 350	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 2	SWMU 128	AOC 2	Building 372 - PW Vehicle Maintenance O/W Separator	Below grade two chambered concrete oil/water separator	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 3	AOC J	AOC 3	Blasting Grit Spill Area	Area near Building 1347 where black powdery/glassy material was observed (may result from previous sandblasting activities)	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 4	AOC S	AOC 4	Paint Shop Grit Disposal Area	Area of soil and pavement outside building 530 where a container of metal grit was previously stored. Pavement was badly worn and contains staining	NFA	Desk Top Audit determined site as SSA 22, NFA in SSP
AOC 5	SWMU 162	AOC 5	STP # 2 Sludge Drying Beds	Inactive sewage treatment plant consisting of a clarifier, settling tanks, and sludge drying beds. Unit reportedly only managed sanitary waste, but may also have managed dispensary wastewater.	Desk Top Audit	CERCLA status determination pending findings for SSA 15. Addressed in July 1997 Partnering Meeting

Table 2-1
Site Summary
Naval Weapons Station Yorktown
Site Management Plan FY 08 Update

Site ID	Other ID		Site Name	Site Description	Current CERCLA Status	Comments/Notes
	IAS (1984) RCRA (1992)	FFA				
AOC 6	SWMU 175	AOC 6	STP # 3 Sludge Drying Beds	Inactive sewage treatment plant consisting of a clarifier, settling tanks, and sludge drying beds. Unit reportedly only managed sanitary waste, but may also have managed explosive contaminated wastewater.	Desk Top Audit	CERCLA status determination pending findings for SSA 15. Addressed in July 1997 Partnering Meeting
AOC 7	SWMU 177	AOC 7	STP # 4 Sludge Drying Beds	Inactive sewage treatment plant consisting of a clarifier, settling tanks, and sludge drying beds. Unit reportedly only managed sanitary waste, but may also have managed explosive contaminated wastewater.	Desk Top Audit	CERCLA status determination pending findings for SSA 15; Addressed in July 1997 Partnering Meeting
AOC 8	SWMU 37	AOC 8	Building 118 Waste Oil O/W Separator	One or two underground oil/water separators of unknown size and consctruction.	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 9	SWMU 147 & 148	AOC 9	Building 683 O/W Separator	50' x 50' concrete pad used for washing heavy equipment. Wastewater drains to below grade two chambered oil/water separator	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 10	EPIC 45	AOC 10	Stoney Point Road Disposal Area (STP # 2)	Area of soil where construction debris from barracks demolition was disposed.	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 11	SWMU 174	AOC 11	Building 710 Waste Oil O/W Separator	Below grade two chambered concrete oil/water separator	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 12	SWMU 71	AOC 12	Building 457 O/W Separator	Below grade two chambered oil/water separator that received discharge from boiler operations. May be near/assoc/w SSA 14	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 13	SWMU 98	AOC 13	Building 370 O/W Separator	Underground oil/water separator. Liquid contents unknown, but suspected to be oil contaminated wastewater from boiler activities	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 14	SWMU 160	AOC 14	Building 1811 - Supply Storage Yard	Concrete storage pad where usable materials and waste was stored on and around pad.	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 15		AOC 15	Building 1744 Exposive Burning Silo		NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 16	SWMU 107	AOC 16	X-Ray Facility Tank	Below grade two chambered oil/water separator that received discharge from X-ray facility	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 17	SWMU 29 EPIC 34	AOC 17	Dredge Material Disposal Area	Vegetated area where dredge spoils from the York River were deposited.	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 18	AOC M	AOC 18	Code 17 Contaminated Soil Runoff Drainageways	Area of pavement where oil contaminated soil was placed on plastic. Discolored area of pavement caused by drainage from this area and SWMU 104 was observed.	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 19	SWMU 104	AOC 19	Code 17 Storage Compound	Two fenced-in areas of pavement where contaminated liquid and soil are stored in drums. Discolored area of pavement caused by drainage from this area and AOC M was observed.	NFA	Samples collected 1997, results below RBCs, Consensus for NFA September 1997 Partnering Meeting
AOC 20	SWMU 72	AOC 20	NEDED Discharge areas to Felgates Creek	Two pipes discharged explosive contaminated wastewater to Felgates Creek.	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 21	SWMU 181, 97, 168	AOC 21	West Road Coal Storage Area/Buildings 370 & 708 Coal Storage Piles	Currently known as SSA 23	NFA	Portion of AOC became SSA 23; Remainder of site NFA as documented in EPA letter July 11, 1995
AOC 22	Not Identified	Not Identified	Bracken Road Incinerator and Environs	Currently known as Site 30	RI/FS	RA scheduled for 2008
AOC 23	Not Identified	Not Identified	Barracks Road Landfill Industrial Area	Area upgradient of Site 12, surrounding Buildings 3, 4, 5, and 6	SSP	Sample collection in 2007. Evaluation pending.

Note: Sites 10, 13, 14, and 15 went NFA prior to the FFA. They are listed in the IAS (C.C. Johnson & Associates, Inc. and CH2M HILL , 1984).
Site 20 is documented in the Dames and Moore Confirmation studies (1986 and 1988), It became SSA 18 during an SSP investigation (Baker, 1996 - AR No. 00666) and is later designated as Site 26.

Table 2-2
Site Summary
Cheatham Annex
Site Management Plan FY 08

Site ID	Site Name	Site Description	EPA HRS (Source #)	FFA Status (1994) [1]	Current CERCLA Status	Comments/Notes
Site 1	Landfill Near Incinerator	Landfill 1.3 acres, 1942-1972, burn residue and general disposal; landfill waste exposed along York River, 1999 river bank debris removal and stabilization; 2003 removal 1100 cy surface debris 2003 soil removal 18,700 cy; 2005 removal 1700 tons soil & debris; breakwater constructed rip rap 2004 RI ; 2005 BERA (Step 3A); 2006 TM sediment investigation	Source scored (1)	Findings of Fact CERCLA RI/FS/PP/ROD	RI/FS/PP/ROD	Several removal actions 1999 through 2007 removed all waste and mitigated potential unacceptable risk from soil/sd/sw; groundwater risk was only evaluated for non-potable use
Site 2	Contaminated Food Disposal Area	NFRAP signed August 2003	Not identified in HRS	Appendix C - NFA	Response Complete	Response Complete
Site 3	Submarine Dye Disposal Area	NE corner CAD 15, 1970's stored fluorescein dye 55 gal drums; drums removed; NFRAP signed August 2003	Source not scored	Appendix C - NFA	Response Complete	Response Complete
Site 4	Outdated Medical Supply Disposal Area	1968-69 disposal in ravine and covered with soil 1998 removal 200 lbs debris 13 lbs sharps, no intrusive work conducted; 2001 trenching study 2005 SERA soil/sd/sw (w/Site 9) gw not yet addressed	Source not scored	Findings of Fact CERCLA RI/FS/PP/ROD	SSP SSA	SI to be implemented 2007-2008
Site 5	Photographic Chemicals Disposal Area	20-40 gallons photographic chemicals disposed in pit 1967-1968; exact location not identified; NFRAP signed August 2003	Source not scored	Appendix C - NFA	Response Complete	Response Complete
Site 6	Spoiled Food Disposal Area	12-15 ft deep pit disposal of 750 cubic yds spoiled food 1970; NFRAP signed August 2003	Source not scored	Appendix C - NFA	Response Complete	Response Complete
Site 7	Old DuPont Disposal Area	buried debris (pipe metal wood) outcropping in ravine slope, IAS-ammunition waste 1999 test pits, 2004 trenching study (ash & debris), TCRA after 2003 hurricane for debris on York River shoreline; Geotube installed at toe of landfill	Source not scored	Findings of Fact CERCLA RI/FS/PP/ROD	SSP SSA	Navy considering landfill removal followed by site chararacterization,
Site 8	Landfill Near Building CAD 14	located 300ft N of CAD 14; grass area < 1/4 acre; 1940 -1980 disposal trenched spoiled food and clothing' NFRAP signed August 2003	Source not scored	Appendix C - NFA	Response Complete	Response Complete
Site 9	Transformer Storage Area	7000sf next to Bldg CAD16, 1973-1980 PCB transformer storage, 1980 area graded gravel covered confirmation Study soil/sw/sd SERA 2005, gw not investigated	Source scored (2)	Appendix A - CERCLA SI/SSP	SSP SSA	SI to be implemented 2007-2008,
Site 10	Decontaminated Agent Disposal Area Near First Street	75-100 gals decon agent buried in area 1982; NFRAP signed August 2003	Source not scored	Appendix C - NFA	Response Complete	Response Complete

Table 2-2
Site Summary
Cheatham Annex
Site Management Plan FY 08

Site ID	Site Name	Site Description	EPA HRS (Source #)	FFA Status (1994) [1]	Current CERCLA Status	Comments/Notes
Site 11	Bone Yard	2.7 acre, 1940-1978 waste oil & scrap material storage 1994 SI 1997 SSP 60 tons material (including drums) removed 2000 removal metal debris, fence posts, cars, containers, tanks with asphalt/oil, tar cylinders, drums-Removal Close Out Report	Source scored (3)	Findings of Fact CERCLA RI/FS/PP/ROD	RI/FS/PP/ROD	RI 2007 recommended supplemental RI
Site 12	Disposal Site Near Water Tower	April 22, 2004 NFRAP signed	Not identified in HRS	Appendix C - NFA	Response Complete	Response Complete
AOC 1	Scrap Metal Dump	Debris disposal area ravines to Jones Pond (wood metal) 1999 Field Investigation 2001 Site Inspection (wood & metal outcrop in ravine)	Source not scored	Appendix A - CERCLA SI/SSP	SSP SSA	SI planned for 2007 - 2008
AOC 2	Dextrose Dump	1997 identified concrete foundation piers, buried empty drums, glass bottles labeled dextrose ; 98 removal 470 bottles 1998 FI (geophysical anomaly) ; 99 FI (test pits (drums, respirator filter canisters)	Source not scored	Appendix A - CERCLA SI/SSP	SSP SSA	SI planned for 2007 - 2008
AOC 3	CAD 11/12 Pond Bank	Pile of metal banding, empty drums 99 FI;	Not identified in HRS	Appendix A - CERCLA SI/SSP	SSP SSA	SI planned for 2007 - 2008
AOC 4	Outdated Medical Supply Disposal Area	Same area as Site 4	Not identified in HRS	Not Identified	Response Complete Incorporated into Site 4	Response Complete
AOC 5	Debris Area	Same area as Site 5	Not identified in HRS	Not Identified	Response Complete Incorporated into Site 1	Response Complete
AOC 6	Penniman AOC (Site 13) Penniman Shell Loading Plant operated by DuPont Co. TNT manufacturing plant 1916, plant demo 1925;	Ammonia settling pits TNT graining house sump TNT catch box ruins; waste slag material 1918 drum storage	Source scored (4) Source scored (5) Source scored (6) Source scored (7) Source scored (8)	Appendix A - CERCLA SSA/SSP	SSP SSA	SI planned for 2007 - 2008

Table 2-2
Site Summary
Cheatham Annex
Site Management Plan FY 08

Site ID	Site Name	Site Description	EPA HRS (Source #)	FFA Status (1994) [1]	Current CERCLA Status	Comments/Notes
AOC 7	Drum and Can Disposal Area	Identified surface debris disposal area 2004 30' x 20' pit w/ 50-10gal cans (PCE)	Not identified in HRS	Appendix B - Preliminary screening area	SSP SSA	SI planned for 2007 - 2008
AOC 8	Area South of Site 7	Debris disposal area. Formerly referred to as Site 7.	Not Scored	Not Identified	SSP SSA	SI planned for 2007 - 2008

Notes:

1 -FFA Findings of Fact (pg 16) identified Sites 1, 4, 7, & 11 as RI/FS/PP/ROD for closure, but also identifed these Sites in Appendix A as SSP

Table 2-3
WPNSTA Yorktown/CAX Partnering Team Consensus Statement Summary

NUMBER	CONSENSUS STATEMENT NUMBER	DATE	FACILITY	SITE	AOC	TOPIC	CONSENSUS STATEMENT
	NA	10/23/2001	WPNSTA	18		Site 18	The Team agreed to separate the Mercury issue from the Site 18 ROD.
	NA	10/23/2001	WPNSTA			Dec. 2002 Partnering Meeting	The team agreed to start at 12:00 noon Monday, December 3, 01 (lunch on own prior to starting) and meet through Wednesday evening with site visits Thursday December 6, 2001.
	NA	10/24/2001	CAX	2		Site 2 – Contaminated Food Disposal Area	The team thinks NFA for site review site at end of site visit.
	NA	10/24/2001	CAX	3		Site 3 – Submarine Dye Disposal Area	The team decided to review the site at the end of the site visit.
	NA	10/24/2001	CAX	4		Site 4 – Outdated Medical Supply Disposal Area	The team wants to use the site visit to determine the extent of the debris. S. Milhalko stated that DEQ would require that site would either have to have removal with backfill or cover such that it would not be uncovered again.
	NA	10/24/2001	CAX	6		Site 6 – Spoiled Food Disposal Area	The team agreed to drive by site to determine location at end of site visit.
	NA	10/24/2001	CAX	12		Site 12 – Disposal Site Near Water Tower	The team proposed that approach be a SSA and during site visit evaluate need for this. For site visit, evaluate a proposed sampling plan to be evaluated during site visit, prepare site map for site visit.
	NA	10/24/2001	CAX		4	AOC 4 – IR Site 4 – Outdated Medical Supply Disposal Area	During the site visit, the approach will be evaluated and a decision is to be made.
	NA	10/24/2001	CAX		5	AOC 5 – Debris Area	Group decided to combine AOC 5 and Site 1, eliminate AOC 5.
	NA	10/24/2001	CAX			Site Update	Dave Martin, as topic leader, and other members wanted to focus on reviewing sites proposed for NFA, then review sites during site visit & what the team wants to do during the site visit (drive by versus walk the site).
	NA	10/24/2001	CAX			Site Update	For site visit, the team decided that a technical guide to the sites would be prepared that incorporates previous information on the site, the Partnering Team discussion, approach to the site, data gaps. This package is to include: site descriptions, maps, previous sampling locations, aerial photographs with site locations/approximate boundaries and for some sites a proposed sampling plan.
	NA	12/3/2001	WPNSTA	6, 7		LUCIP Review Sites 6 & 7	state the site size and then the size of the restricted area, annotate Global Position Coordinates (GPS) of restricted area on figures.
	NA	12/3/2001				Define Metrics in Partnering Deliverable	Keep as stated in deliverable.
	NA	12/4/2001	CAX	2		Site 2 – Contaminated Food Disposal Area	The team agreed that no further action is warranted at this site given that only spoiled food was disposed of at the site.
	NA	12/4/2001	CAX	4		Site 4 – Outdated Medical Supply Disposal Area	AOC-3 is part of AOC-4, AOC-4 is now Site 4- Outdated Medical Supply Disposal Area.
	NA	12/4/2001	CAX	5		Site 5 – Photographic Chemicals Disposal Area	Due to the small volume of photochemicals disposed in an area that can not be located using historical records and the disposal of these wastes in a "marl" pit consisting of clayey native soils that would prohibit transport of the photochemicals, no further action is warranted at this site.
	NA	12/4/2001	CAX	6		Site 6 – Spoiled Food Disposal Area	The team agreed that no further action is warranted at this site given that only spoiled food was disposed of at the site.
	NA	12/4/2001	CAX	8		Site 8 - Landfill Near Building CAD 14 Site Visit	On page 4-16 of handout, last paragraph, delete first sentence "The VDEQ….site."
	NA	12/4/2001	CAX	8		Site 8 - Landfill Near Building CAD 14 Site Visit	The team agreed that no further action is warranted at this site given that only non-hazardous materials such as spoiled meat, spoiled candy, and clothing were disposed at the site and all anecdotal records indicate that the clothing was not impregnated with any chemicals.
	NA	12/4/2001	CAX	11		Site 11 – Bone Yard	The team agreed to investigate Penniman Lake and Site 11 separately. Penniman Lake is already in the budget cycle as a separate site.
	NA	12/4/2001	CAX	12		Site 12 – Disposal Site Near Water Tower	The team agreed that further sampling is required at the site prior to making a NFA decision. The approach agreed to consist of a grid of five soil samples (1 center, 4 corner points). One sample will be analyzed for TAL/TCL and the remaining 4 will be analyzed for TAL metals only. An additional three soil samples will be collected between the railroad tracks adjacent to the site. These analytical results will be compared to the grid analytical results to determine whether or not the railroad maybe a source area.
	NA	12/4/2001	WPNSTA	6		Site 6 – Explosives-Contaminated Wastewater Impoundment	This site is former cache where TNT was placed in a hole and stored. The hole was later backfilled. Soil with concentrations of cadmium and zinc were left in the hole and then backfilled with 4 feet of soil. After discussing the conditions of the site, the team agreed to evaluate whether further action was required at this site.
	NA	2/5/2002	CAX	9		Site 9 - Transformer Storage Area	Based upon review of PCB confirmation data, proceed with NFA for Site 9.
	NA	2/5/2002	CAX	11		Site 11 – Bone Yard	The team agreed with the proposed sampling plan pending resolution of their comments.
		2/5/2002	CAX	12		Site 12 – Disposal Site Near Water Tower	The team agreed to analyze all soil samples for TCL organics in addition to the planned TAL Metals.
	NA	2/5/2002	CAX		1	AOC 1 - Scrap Metal Dump	AOC 1 will continue as an AOC, a Work Plan will be developed for the debris removal. If no significant contamination is found, based on confirmatory soil sampling, (i.e.: meet Eco/HH requirements), the AOC will be closed. The Work Plan will be flexible to allow for in-field adjustments.
	NA	2/5/2002	CAX			GIS Needs Assessment	The Draft Final CAX GIS Needs Assessment submitted in September 2001 will be considered final. Baker will proceed with the awarded CAX GIS Implementation.
	NA	2/5/2002	WPNSTA	18		Site 18	Because Site 18 is NFA, the team proposed to schedule preparation of documents for this site on the same schedule as Sites 23-26.
	NA	2/5/2002	WPNSTA	2, 8, 14		Sites 2, 8, and SSA 14	Sites 2, 8, and SSA 14 (2 will be a ROD, 8 & SSA 14 will be a ROD) will track on a later schedule than Sites 23-26.
	NA	2/5/2002	WPNSTA	8, 18, SSA 14		RI Sites 8, 18 & SSA 14	Baker will update the report and resubmit for review and comment.
		2/5/2002		12		5-Year Review	The team agreed to form a subgroup to research and report out at the March meeting on this issue. The subgroup consists of Bob Stroud and Jennifer Davis.
	NA	2/5/2002				2002 Goals Update	The team agreed to include the Goals as part of each meeting's minutes.
	NA	2/5/2002				Consensus Statement Documentation	The team agreed to document Consensus Statements by site as an addendum to the Site Management Plan. Mary is to evaluate possible methods (by site, chronologically, etc.) and report back to the team during the March Meeting.
	NA	2/5/2002				Draft FFA	Scott Park/Jennifer Davis to prepare Draft FFA Addendum for counsel review and submittal to EPA and DEQ.

Table 2-3
WPNSTA Yorktown/CAX Partnering Team Consensus Statement Summary

NUMBER	CONSENSUS STATEMENT NUMBER	DATE	FACILITY	SITE	AOC	TOPIC	CONSENSUS STATEMENT
1	3/13/2002-1	3/13/2002				Documentation of Consensus Statements	The team agreed to document Consensus Statements by site as an addendum to the Site Management Plan. A tracking number will be used to track the documents consisting of date and numerical sequence (i.e.: Month/Day/Year-Number – 3/13/02-1).
2	3/13/2002-2	3/13/2002	WPNSTA	4		Clean-up level	If Site 4 removal action cannot achieve residential levels then Sites 4 and 22 ROD will split into two separate RODS.
3	4/23/2002-3	4/23/2002				Identification of new sites	The Team agrees that the FFA (Sections 9.3a and 9.3b) gives the team the authority to add newly identified sites to the SMP.
4	4/24/2002-4	4/24/2002				Site Management Plan	The team agreed to go final with the FY 2002/2003 Draft SMP and revise text for the FY 2003/2004 submittal. Baker will provide Final covers for the FY 2002/2003 SMP.
5	4/24/2002-5	4/24/2002	CAX	11		Approval of Proposed Field Investigation Sampling Locations presented in the Project Plans for CTO 236	The team agreed with the sampling location revisions made during the site visit and agreed that the field investigation can be performed. The field activities will be scheduled for May 2002.
5	4/24/2002-6	4/24/2002	CAX		Penniman	Penniman AOC Sub-areas Investigation approach	The Team agrees to follow a general approach to the Penniman AOC sub-areas as follows: 1918 Drum Storage Area: Verify whether or not the kegs were used to store Ammonium Nitrate. Consider collecting surface soil samples between Buildings 225 and 113. Waste Slag Area: Based upon the understanding that the waste slag is most likely associated with maintenance activities along the rail line, a sampling approach will be developed.
7	4/24/2002-7	4/24/2002				Community Relations Plan	The Team agrees to go final with the Community Relations Plan. If appropriate, final covers and spines will be submitted.
8	6/03/2002-8	6/3/2002	WPNSTA	GWOU 1		Groundwater Operable Unit 1 – Work Plan	The Team agrees to investigate and install groundwater monitoring wells if a removal action(s) at site 24 within Groundwater Operable Unit I shows contamination or materials that pose a potential risk to receptors with the potential of exposure to groundwater (waste left in place or confirmatory samples detections exceed PRG).
9	8/6/2002-9	8/6/2002	CAX	2, 3, 5, 8, 9, 10, 12		NFRAP Decision Document Format	The Team agreed to use the Quantico format for the NFRAP document. The team will review the NFRAP documents before finalizing them.
10	8/6/2002-10	8/6/2002	WPNSTA			Five Year Review Report, WPNSTA Yorktown Sites 1, 6, 7, 12, 16, and 19	The team agrees with the 5-year review Report findings and agrees to go final with the document. Jeff Harlow to pursue signature of the document by Admiral.
11	8/6/2002-11 **ON HOLD**	8/6/2002	CAX	3		Fluorescein Dye	The Team agrees that since Fluorescence Dye is still in use, is very water soluble hence dilutes infinitely.
12	9/18/2002-12	9/18/2002				New technical team member	The Team agreed to add Marlene Ivester as a technical member to the team.
13	9/18/2002-13	9/18/2002				Facilitator	The team agreed a facilitator is needed for a few meetings.
14	10/22/2002-14	10/22/2002	WPNSTA			LUCIPs	The Team agreed to revise the LUCIP to incorporate two sections: Site Environmental History and References. Also, the LUCIP will include a brief executive summary of the ROD (about 1 paragraph, similar to the Camp Allen Landfill LUCIP). The numbers of signs for each site is as follows: - Site 12: At least four signs, placed at egress points to the site (of the ten proposed, four will be mandatory) - Site 19: At least three signs, placed at egress points to the site - Site 1: At least three signs, placed at egress points to the site - Sites 6 & 7: At least three signs for Site 6 at egress points and one sign at Site 7 egress point
15	10/23/2002-15	10/23/2002				N/A	The Team agreed to add a goal to the FY03 Team Goals to be self-facilitating by end of third Quarter 2003 (5 additional meetings).
16	10/23/2002-16	10/23/2002	WPNSTA			GWOU I	The Team agreed that Baker can proceed with submitting the response to comments and with submitting a revised Draft Final Work Plan for GWOU I to the normal distribution list.
17	10/23/2002-17	*12/4/2002 Revised*				WPNSTA-SSAs 3-24; 23-26; 2, 8, 18 & SSA 14; GWOU I, 27-30 CAX-1, 4 & 9, 11, Background Study, NFRAP 2, 3, 5, 6, 9, 10 & 12	The WPNSTA Yorktown/CAX Partnering Team empowers the ecological technical support team to address and resolve ecological issues for various sites at WPNSTA Yorktown/CAX (see table below) to meet the dates and priority specified by the WPNSTA Yorktown/CAX Team, with Ed Corl to take the lead on meeting the schedule determined by the Team. WPNSTA: SSAs 3-24 SSP; 23-26 DF RI; 2, 8, 18 & SSA 14 DF RI; GWOU I Draft WP; 27-30 Draft RI CAX: 1 DF RI; 4 & 9 Draft RI (SERA); 11 Draft RI, Draft Background Study; 2, 3, 5, 6, 9, 10 & 12 Draft NFRAF
18	12/5/2002-18	12/5/2002		21, 22		WPNSTA Sites 21 & 22	Based upon EPA Region III comments, Sites 21 and 22 RODs will be rewritten as No Further Action (NFA) RODs with no institutional controls (ICs) because they were remediated to residential levels.
19	12/5/2002-19	12/5/2002				Site Action Status Report	The Team agrees to use the SASR as a tracking tool and add it to the standard meeting format.
20	12/5/2002-20	12/5/2002				Action Item List	The Team agreed that the Action Item List will be addressed during the Agenda Building Call with respect to whether or not the Action Item has been completed. If completed, a "C" will be put in the Outcome column of the Action Item list and the item will not be addressed during the subsequent Partnering Team Meeting.
21	1/29/2003-21	1/29/2003				CAX Site 1 Baseline Risk Assessment	The eco subgroup discussed the issues for the CAX Site 1 RI and determined that a baseline risk assessment was warranted for the wetland area based upon a conference call prior to the December Partnering Meeting. The Navy RPM determined that based upon the existing ROD schedule and funding execution for the site, ~~it was determined that (revised per team concurrence by MM 3/12/03)~~ the ROD and funding schedule could not be met. Therefore, the Navy recommended that an EECA for soils/debris removal at CAX Site 1 would be the best approach. The Team agrees upon this approach.
22	3/13/2003-22	3/13/2003	WPNSTA	23		Confirmation sampling during removal action	At Yorktown Site 23, the Team agrees that the removal action should meet the following goals: Areas A and C are large areas and confirmation sampling will include multiple bottom samples as proposed in the confirmation sampling plan. All other sample locations that exceed cleanup goals at this time will be removed as hot spots.
23	3/13/2003-23	3/13/2003	CAX	1		Site clean-up goals	The Team agrees that the Draft Final EE/CA for CAX Site 1 can be distributed for public comment without specific site clean-up goals. Specific clean-up goals will be presented to the Team for review and approval, and final clean-up goals will be incorporated in the Final EE/CA.

Table 2-3
WPNSTA Yorktown/CAX Partnering Team Consensus Statement Summary

NUMBER	CONSENSUS STATEMENT NUMBER	DATE	FACILITY	SITE	AOC	TOPIC	CONSENSUS STATEMENT
24	3/13/2003-24	3/13/2003	WPNSTA	4		Site clean-up goals	The team agrees that the ROD for Site 4 should be drafted upon completion of the on-going non-time critical removal action (NTCRA) to ensure that the ROD will be most appropriate in light of final conditions following the NTCRA. The team understands that $600,000 will be committed in March 2003 to fund the NTCRA and that the Navy RPM projects that the NTCRA may require additional funding at the start of FY04 to complete the clean up.
25	4/29/2003-25	4/29/2003	CAX	1		Clean-up goals at CAX Site 1	The Team agrees to the clean-up goals for the planned removal action under the EE/CA for CAX Site 1 established during a conference call on April 14, 2003 (see the attached table).
26	6/17/2003-26	6/17/2003	WPNSTA	24		Groundwater investigation at WPNSTA Site 24 – Aviation Field	Based upon past sample results and the reported solid waste disposed of at WPNSTA Site 24 – Aviation Field, the Partnering Team agrees that a groundwater investigation is not warranted at this time unless the planned removal action at WPNSTA Site 24 can not meet human health or ecological clean-up goals that have yet to be determined for sediment and soil.
27	6/11/2003-27	6/11/2003	CAX	1		Concurrence on CAX Site Removal	EPA Region III, Virginia Department of Environmental Quality and Atlantic Division, Naval Facilities Engineering Division agree to the proposed removal action at Cheatham Annex Site 1 – Landfill Near the Incinerator as documented in the Draft Final April 2003 EE/CA and the Action Memorandum.
28	6/17/2003-28	6/17/2003	CAX	1		CAX Site 1 RI Schedule	For CAX Site 1, the Team agrees: 1. Issue RI as a Final Round I RI with replacement pages and cover letter explaining the decision rationale. 2. Defer the PRAP & ROD for the site until after completion of wetlands BERA and Round II RI for sediments. 3. Issue a letter to file that the FS will be deferred until completion of the Round II RI.
29	6/17/2003-29	6/17/2003	CAX	2, 3, 5, 6, 8, 10		CAX Sites 2, 3, 5, 6, 8 & 10, No further action decision	The Team agrees with the NFA remedy for CAX Sites 2, 3, 5, 6, 8 and 10 based upon the information presented for the Draft NFRAP Decision Document.
30	6/19/2003-30	6/18/2003	WPNSTA	12		Long term monitoring program at WPNSTA Site 12	Based upon the information presented on June 19, 2003 at the Partnering Meeting on the long term monitoring program at WPNSTA Site 12 (years one through five), the Partnering Team agreed to the following: 1. Eliminate LTM monitoring at wells 12GW13 and 12GW4 (located upgradient of site) and collect one round of samples during the next 5 year LTM period at wells 12GW8, 12GW19, 12GW18 and 12GW 18A and analyze for 8 RCRA metals (total metals only). 2. The team agreed to install a new monitoring well, 12GW20, down gradient of well 12GW07 at the site to identify the migration pathway for VOCs. 3. Eliminate sampling at wells 12GW01A, 12GW06 for VOCs because: a. 12GW01A is screened in the deeper aquifer and has no history of detections; b. 12GW06 – concentrations have decreased over time and it is recommended that monitoring at 12GW01 will adequately monitor groundwater pathway. 4. Collect samples from at 10 wells (12GW01, 12GW05, 12GW07, 12GW09, 12GW13, 12GW14, 12GW17, 12GW15, 12GW16, and 12GW20 (new well) every two years and analyze for all VOCs. 5. The team agreed to collect 4 or 5 sediment samples at locations 12SDCWL, 12SD32, 12SD34, 12SD37, and RI s
31	10-30-03-31	10/30/2003	CAX	7		CAX Site 7 TCRA	Based upon the landfill's proximity to the York River and the erosional damage associated with Hurricane Isabel, the team agrees that additional funding is necessary for a TCRA at CAX Site 7 in order to stabilize the shoreline. If additional FY 2004 funds can be obtained, the team agrees to delineate and characterize the landfill and determine the feasibility of landfill removal in the near term.
32	12-2-03-32	Dec. 2, 2003	WPNSTA	WPNSTA OB/OD Range		OB/OD Groundwater Monitoring Program	The Partnering Team agrees that the RCRA groundwater monitoring program conducted at the OB/OD Range Site should be discontinued as the CERCLA program will be conducting a media-wide investigation of the site.
33	1-07-04-33	1/7/2004	WPNSTA	23		Site 23 TCRA	With respect to zinc-contaminated soil at Site 23, the Team agrees to stop excavating at Grids 1 through 6, and to place a minimum of 2 feet of clean backfill. We agree that with a minimum of 2 foot of clean fill, there are no current unacceptable ecological risks presented by the soils. With respect to grids 4, 5, and 6, confirmation sampling indicates that zinc concentrations at the bottom of the excavated grids exceed the cleanup goal of 200 mg/kg. The Team agrees that based on the current mission of the WPNSTA, and the location of Site 23 within the blast arc of the pier, it is unlikely that the site would be redeveloped. However, should the soil at grids 4, 5, and 6 be excavated in the future, there is a chance of future ecological risks from zinc in the soil, should this soil be brought back to the surface. However, this potential risk ecological risk is small, given that the overall size of grids 4 5, and 6 is relatively small, and given that if excavation occurred, soil would be mixed with clean fill, and this mixing with the clean fill would lower the overall zinc concentrations. Therefore, the actual chance of potential future ecological risks
34	3-9-04-34	3/9/2004	WPNSTA	4		Site 4 Draft ROD	The team will move forward with the preparation of the Draft ROD for WPNSTA Site 4 as cited in the FY 2004 team goals. The document will be for internal team review only pending completion of removal activities at WPNSTA Site 4.
35	3-9-04-35	3/11/2004	CAX	12		Site 12 NFRAP	The team agrees with the NFA remedy for CAX Site 12 – Disposal Site Water Tower based upon the no further action remedy recommended in the Technical Memorandum submitted for review on January 12, 2004. A No Further Response Action Planned (NFRAP) Decision Document with a Final Technical Memorandum as an appendix will be prepared for submittal by March 31, 2004 in accordance with the annual team 2004 goals.
36	3-22-04-36	3/22/2004	CAX	7		CAX Site 7	Based upon the field investigation conducted at CAX Site 7N, as summarized in the Draft Trenching Letter Report dated 19 March 2004, the team has agreed to move forward with a TCRA Action Memorandum as an interim action that will recommend appropriate erosion control and shoreline stabilization for the site. The team also agrees that removal of the CAX Site 7N landfill will be accomplished under an Engineering Evaluation/Cost Analysis (EE/CA) when funding is available. While the team agreed that an esthetic clean up of the beach in the vicinity of the landfill does little to mitigate risk, the team agreed to move forward with a beach cleanup at the request of the Navy.

Table 2-3
WPNSTA Yorktown/CAX Partnering Team Consensus Statement Summary

NUMBER	CONSENSUS STATEMENT NUMBER	DATE	FACILITY	SITE	AOC	TOPIC	CONSENSUS STATEMENT
37	5-18-04-37	5/18/2004	WPNSTA	SSA 15 Beaver Pond		Planned action for SSA 15 Beaver Pond	The team agrees, based upon the 2003 limited field investigation, to develop a work plan for the continued investigation of mercury associated with the former STP 2 area, when funding becomes available. The team agrees that the proposed continued investigation is a high priority. The work plan will include a sampling program of sediment and tissue samples of small fish and amphibians or frogs to further assess nature and extent (vertical and lateral) of mercury in Ballard Creek from the Beaver Dam to the next downstream impoundment structure.
38	5-19-04-38	5/19/2004				BTAG	The Yorktown/CAX Partnering Team agrees that the role of USEPA BTAG members will be changed from Adjunct Member to Technical Member.
39	6-24-04-39	6/24/2004	WPNSTA	18		Site 18 NFA	Team agrees with No Further Action for WPNSTA Yorktown Site 18.
40	6-24-04-40	6/24/2004	WPNSTA	2, 8, SSA 14		Planned action for Sites 2, 8, SSA 14	Team agrees to perform pre-characterization sampling for WPNSTA Yorktown Sites 2 and 8 and SSA 14. If the sampling shows that the extent of contamination at the sites can be well defined, then the Navy will complete an EE/CA with a removal action and go for a NFA ROD. However, if the sampling indicates that extent of contamination at the sites cannot be well defined, then the Team agrees to go forward with a BERA and follow on FS/PRAP with a ROD with remedy.
41	5-18-05-41	5/18/2005	WPNSTA	OB/OD		Path forward for sampling for planned RI	As presented on May 18, 2005, the Team agrees with Sampling Option 2 for the upcoming field investigation. Sampling Option 2: collect 15 surface soil and 15 subsurface soil samples from within the tree line area, and collect 30 surface soil samples outside the tree line. This option wil capture the greatest extent of exposure points for ecological receptors
42	8-17-05-42	9/26/2005	WPNSTA	SSA 25		Team approval of Draft Work Plan for SSA 25 Mercury Investigation	The Team agrees that the Work Plan for the SSA 25 investigation can be finalized and that field work can be scheduled.
43	4-4-06-43	4/4/2006	WPNSTA	1, 3, 11		Team approval of post-ROD documentation that addresses minor changes in the remedies at Sites 1, 3 and 11 at WPNSTA Yorktown.	The Team understands that the selected remedy documented in the Sites 1 and 3 ROD (Bake 1999) and the Site 11 ROD (Baker, 2000) estimate an amount of soil that would be removed during the execution of the selected remedies, as noted above. The remedial action closeout reports (OHM, 2001a and 2001b) document that the actions resulted in the removal of 413 tons (260 cy) of soil from Site 1, 284 tons (800 cy) of soil from Site 3, and 655 tons (400 cy) of soil from Site 11. While these increases in quantity constitute changes in the remedy, they are considered minor changes in terms of USEPA guidance on post-ROD changes (USEPA, 1999). A minor change is considered a change that does not have a significant impact on scope, performance, or cost of th remedy, such as a small volume change or a change in the long term monitoring frequency. The Team, therefore, agrees that a Memo to File is appropriate to document these minor changes for Sites 1, 3 and 11. The Memo to File will become part of the WPNSTA Yorktow
44	7-24-06-44	7/24/2006	WPNSTA	GWOUs		Elimination of GWOU designations	Groundwater at WPNSTA Yorktown will be addressed on a site-specific basis.
45	9-1-06-45	9/1/2006	WPNSTA	12		LTM at Site 12	Elimination of VOC sampling from LTM sampling program at Site 12.

Table 2-4
Major Elements of the CERCLA Process

Preliminary Assessment (PA)	Initiation of concern about a site, area, or potential contaminant source. The PA is a limited-scope assessment designed to distinguish between sites that clearly pose little or no threat to human health or the environment and sites that may pose a threat and require further investigation. Environmental samples are rarely collected during a PA. The PA also identifies sites requiring assessment for possible response actions. If the PA results in a recommendation for further investigation, an SI is conducted.
Site Investigation (SI)	Some sites warrant preliminary or interim investigations, studies, or removal/remedial actions. If it is unclear as to whether a site should be included in the CERCLA RI/FS process, an SI is sometimes conducted to make a general determination if activities at the site have impacted environmental media. SIs typically include the collection of environmental and waste samples to determine which hazardous substances are present at a site and to determine if these substances have been released to the environment.
Remedial Investigation (RI)	During an RI, data is collected to characterize site conditions, determine the nature of the waste, assess risk to human health and the environment, and, if necessary, conduct treatability testing to evaluate the potential performance and cost of the treatment technologies being considered.
Treatability Study (TS)	Treatability studies may be conducted at any time during the CERCLA process. The need for a treatability study generally is identified during the FS. Treatability studies may be classified as either bench-scale (laboratory study) or pilot-scale (field studies). For technologies that are well-developed and tested, bench-scale studies are often sufficient to evaluate performance. For innovative technologies, pilot tests may be required to obtain the desired information. Pilot 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. Treatability studies are performed to assist in the evaluation of a potentially promising remedial technology. The primary objectives of treatability testing are to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the FS and support the remedial design of a selected alternative.
Engineering Evaluation/Cost Analysis (EE/CA) and Interim Removal Action (IRA)	Removal actions are implemented to clean up or remove hazardous substances from the environment at a specific site in order to mitigate the spread of contamination. Removal actions may be implemented at any time during the CERCLA process. Removal actions are classified as either time-critical or non-time-critical actions. Actions taken immediately to mitigate an imminent threat to human health or the environment, such as the removal of corroded or leaking drums, are classified as time-critical removal actions. Removal actions that may be delayed for 6 months or more without significant additional harm to human health or the environment are classified as non-time-critical removal actions (NTCRA).
Feasibility Study (FS)	The FS is the mechanism for the development, screening, and detailed evaluation of alternative remedial actions. The RI and FS can be conducted concurrently; data collected in the RI influences the development of remedial alternatives in the FS, which in turn affect the data needs and scope of treatability studies and
Proposed Plan (PP)	A PP presents the remedial alternatives developed in the FS and recommends a preferred remedial alternative. The public has an opportunity to comment on the PP during an announced formal public comment period. Site information is compiled in an administrative record and placed in the general IR program information repositories established at local libraries for public review. The public comments are reviewed and the responses are recorded in a document called a Responsiveness Summary. At the end of the public comment period, an appropriate remedial alternative is chosen to protect
Record of Decision (ROD)	The ROD document is issued to explain the selected remedial action. Public comments received during the PP are addressed as part of the responsiveness summary in the ROD. A notice to the public is issued when the ROD is signed by Navy and EPA following State concurrence.
Remedial Design/Remedial Action (RD/RA)	The final stage in the process is the RD/RA. The technical specifications for cleanup remedies and technologies are designed in the RD phase. If land use controls are a component of the remedy, the Land Use Control Remedial Design is generated during this phase. The RA is the actual construction or implementation phase of the cleanup process.
Remedy In Place	For long-term remedies where it is anticipated that remedial action objectives will be achieved over a long period, the RIP milestone signifies the completion of the remedial action construction phase, and that the remedy has been implemented and has been demonstrated to be functioning as designed (i.e., all testing has been accomplished and the remedy will function properly). Once all RCs and RIPs have been documented for every site at the facility and the terms of the FFA have been met, site closeout and NPL deletion is completed.
Response Complete	Within the CERCLA process there are multiple points at which a decision can be made that no further response action is required; properly documented (necessary regulatory notification or application for concurrence has occurred) these decisions constitute response complete and/or site closeout. RC is the point at which the remedy has achieved the required reduction in risk to human health and the
Five Year Review	Five-year reviews generally are required by CERCLA or program policy when hazardous substances remain on site above levels that permit 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

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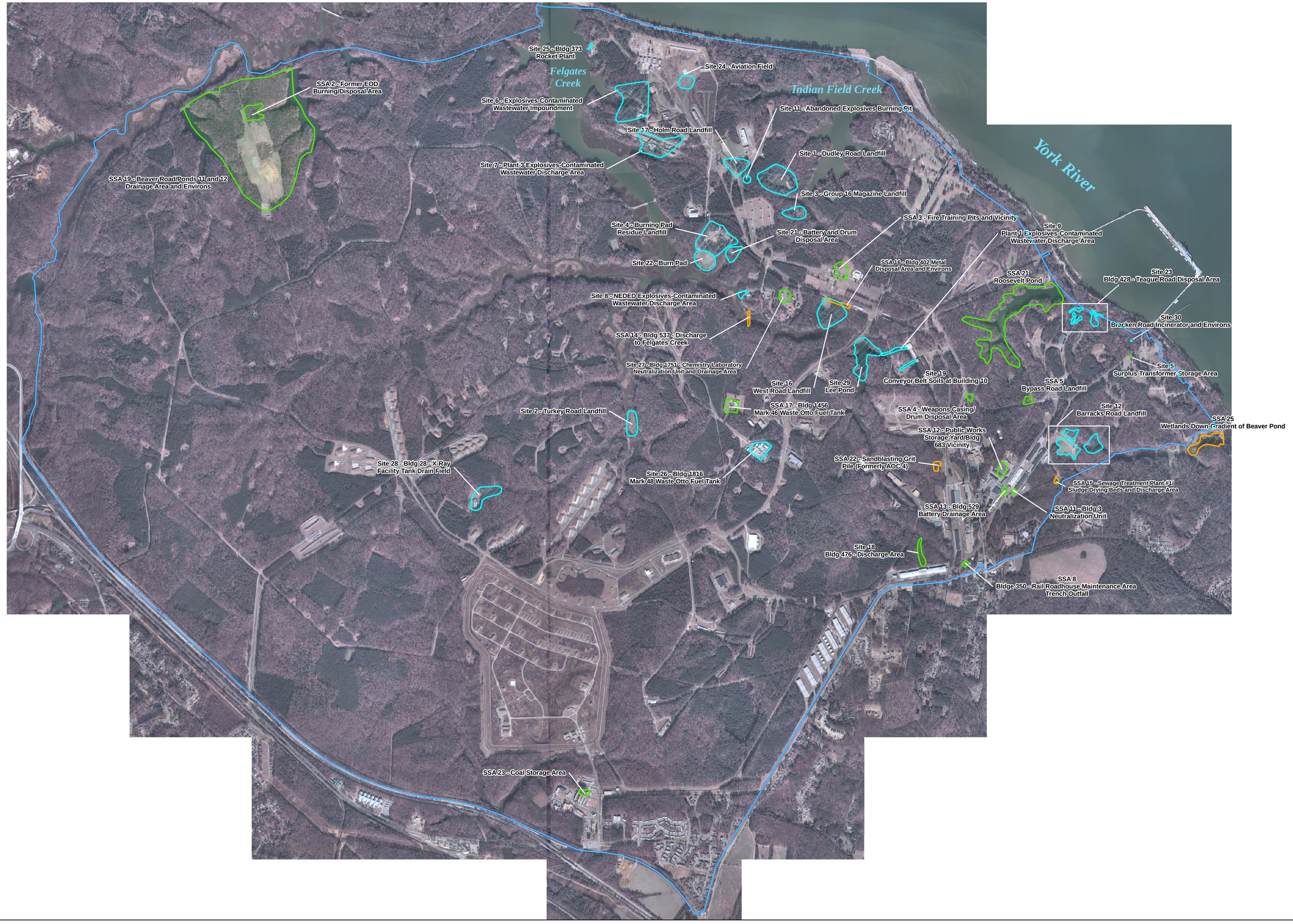

Legend

- Active RI/FS Sites (one or more media)
- Action SSP SSAs (one or more media)
- No Further Action RI/FS Sites and SSP SSAs

N

0 1,800 3,600

Feet

Figure 2-1
Sites/SSA Locations and CERCLA Status
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

CH2MHILL

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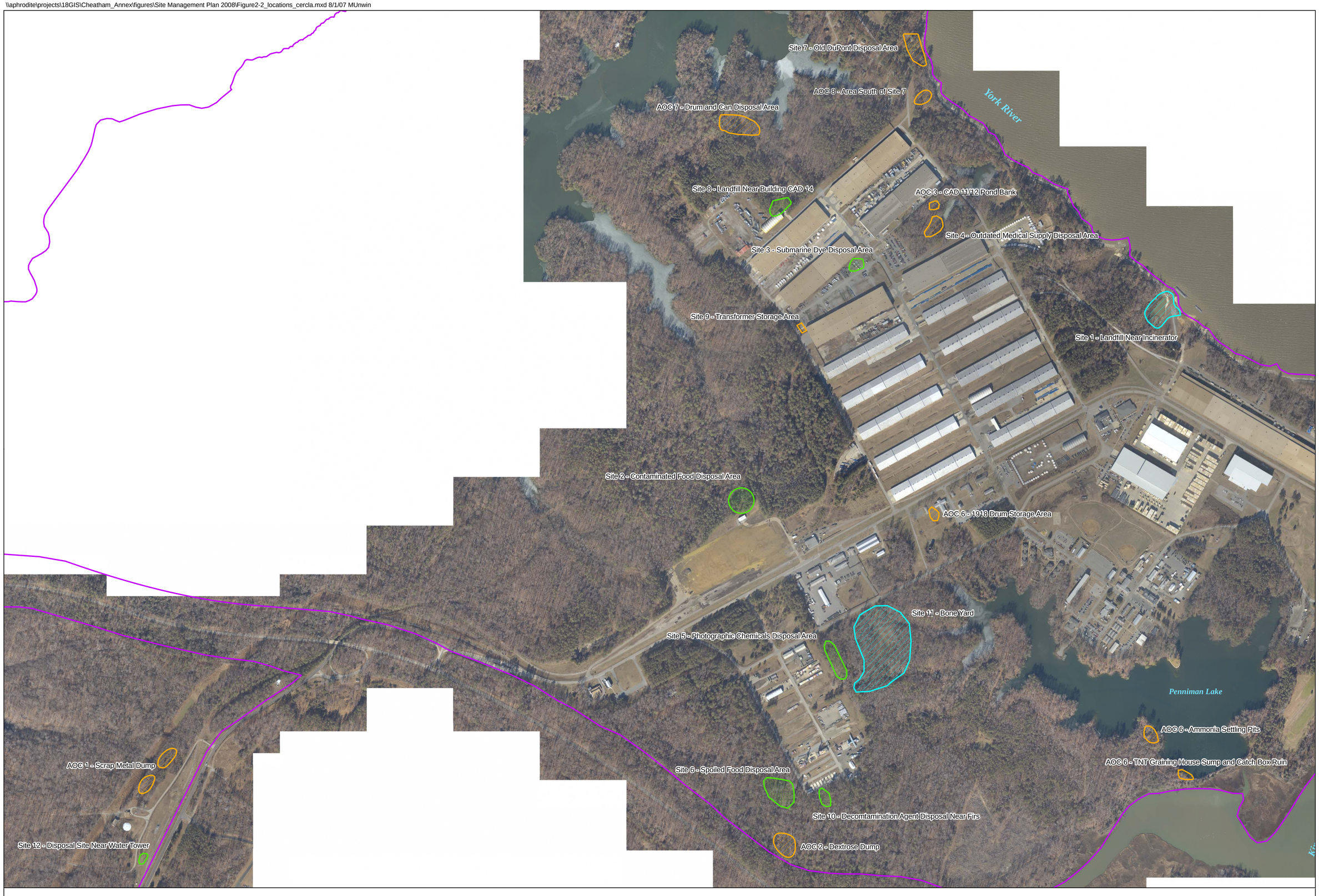

LEGEND

- Active RI/FS Sites (one or more media)
- Action SSP SSAs (one or more media)
- No Further Action RI/FS Sites and SSP SSAs

N

0 600 1,200

Feet

Figure 2-2
Sites/SSA Locations and CERCLA Status
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

CH2MHILL

SECTION 3

WPNSTA Yorktown Site and SSA Descriptions

This section provides a summary of base-wide investigations as well as a brief history of CERCLA activities (chronology of significant CERCLA documents and milestones), summary of the nature and extent of potential contamination, potential unacceptable risks, remedial actions, and CERCLA path forward for each of the Sites and SSAs at WPNSTA. Schedules for this FY 2008-2009 SMP illustrate planned CERCLA implementation activities through 2009.

3.1 Base-wide Studies

WPNSTA Yorktown initiated its environmental investigation and restoration efforts in 1984 under the Navy Assessment and Control of Installation Pollutants program by conducting an IAS. The purpose of the IAS was to identify and assess sites posing a potential threat to human health and/or the environment due to contamination from past operations. A total of 19 sites were identified based on information from historical records, aerial photographs, field inspections, and personnel interviews. The IAS concluded that 15 of the 19 sites posed a sufficient threat to human health or the environment to warrant Confirmation Studies (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984).

Confirmation Studies included the collection and analysis of groundwater, sediment, and soil in 1986 and 1988. In 1986, samples were collected from the 15 sites identified in the IAS. The 1988 sampling effort consisted of additional analysis of groundwater, sediment and soil (Dames & Moore, 1986a and 1988a). In 1992, an RI Interim Report summarized confirmation study results and recommended further RI activities at 14 of the 15 sites (Versar, 1991).

A Focused Biological Sampling and Preliminary Risk Evaluation was completed in 1993 summarizing results of a limited biological tissue, surface water, and sediment sampling effort to evaluate the potential human health risk associated with consumption of fish and shellfish taken from select waters within WPNSTA Yorktown, including Lee Pond, Roosevelt Pond, Felgates Creek, and Indian Field Creek (Baker and Weston, 1993a). A Habitat Evaluation was completed at WPNSTA Yorktown in 1995 that characterized the aquatic and terrestrial habitats at Sites 1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 16, 17, 18, 19, and 21. The evaluation described the major habitat types on or surrounding each site, provided an inventory of vegetative species, and a record of any animal species encountered or suspected to be present (Baker, 1995a).

3.2 Site Descriptions

3.2.1 Site 1—Dudley Road Landfill

Site Description

Site 1 is a 10-acre landfill located in the northern portion of WPNSTA Yorktown west of Indian Field Creek and north of an unnamed tributary to the creek (**Figure 3-1**). Site 1 is generally level and grassy with topography that gently slopes to the east with more pronounced slopes east and south toward Indian Field Creek and the unnamed tributary to Indian Field Creek. The area surrounding the soil-covered landfill is wooded and acts as a riparian buffer for the adjacent Indian Field Creek. Depth to groundwater is approximately 3-10 ft bgs. Groundwater flow in both the Columbia and Yorktown-Eastover aquifers is primarily toward Indian Field Creek and its tributary. Indian Field Creek discharges to the York River (~ 1 mile) downstream of Site 1.

Site 1 was historically used for sand mining activities, resulting in the construction of two borrow pits, which were subsequently filled with waste materials. Between 1965 and 1979, Site 1 was operated as a landfill under a VDEQ Conditional Permit (No. 287) for disposal of solid waste materials in the borrow pits. Waste disposed of included asbestos from insulation on steam piping; empty oil, grease, paint, and solvent containers; nitramine-contaminated carbon; household appliances; scrap metal banding; construction debris; tree limbs; lumber, packaging wastes; electrical wires; waste oil; and plastic lens grinding waste. These wastes were estimated at quantities of 17 tons/year for approximately 15 years. In 1979, the landfill was closed except for the disposal of plastic lens grinding residues, which continued for two years after the closure of the main landfill. In 1985, the landfill was closed to the receipt of all waste materials. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	Administrative Record (AR) Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Round Two Remedial Investigation Report, Sites 1 and 3	Baker, 1998	00998
Hot Spot Delineation	Baker, 1997	N/A
Feasibility Study for Sites 1 and 3	Baker, 1997	01158
Proposed Remedial Action Plan for Sites 1 and 3	Baker, 1998	01840
Record of Decision, Operable Unit Nos. Viii and IX, Site 1 and Site 3	Baker, 1999	01000
Remedial Action Report for Sites 1 and 3 and SSA 22	OHM, 2001	01091
Long-Term Monitoring	2000–2004	N/A

Document Title /Milestone	Author/Date	Administrative Record (AR) Document Number
Remedial Design for Naval Weapons Station Yorktown Site 1	Baker, 2006	(Draft – no AR No.)
Long-Term Monitoring Report for Sites 1, 3, and 7	Baker, 2006	02075
Phase I RI Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	HILL, 2007	(To be added to AR)

Nature and Extent of Potential Contamination

The waste at Site 1 is the source of contamination to soil, groundwater, sediment, and surface water. Previous investigations included full suite analysis of soil, surface water, sediment, and groundwater (target compound list (TCL) VOCs, TCL semivolatile organic compounds (SVOCs), Polychlorinated Biphenyl (PCBs), pesticides, explosives, target analyte list (TAL) inorganics). A maximum arsenic concentration of 141 milligrams per kilogram (mg/kg) was identified in surface soil during a "Hot Spot" Delineation conducted in 1997. Additional surface soil samples were collected as part of the *Final Feasbility Study for Sites 1 and 3* (Baker, 1997) to better define the extent of arsenic in surface soils. No explosives or pesticides/PCBs were detected in surface water or sediment. VOCs were detected in groundwater with concentrations of trichloroethene (TCE) at 850 micrograms per liter (µg/L), detected in 1GW12B, which is screened in the Yorktown confining unit. Additionally, in the Columbia aquifer pair for this well (1GW12), TCE was detected at a concentration of 17 µg/L (Baker, 2006 LTM).

Potential Risks

The Human Health Risk Assessment (HHRA) identified unacceptable child resident cancer risks (1.5 x 10-3) and non cancer hazard (4.2) from exposure to arsenic, beryllium, and iron in surface and subsurface soil at Site 1. No risk was identified to human receptors from surface water or sediment from Indian Field Creek and its tributary adjacent to Sites 1. Cancer risks and non-cancer hazards for the future adults and child resident were identified based on exposure to chlorinated volatile organic compounds (CVOC) contamination in Columbia and Yorktown-Eastover aquifer groundwater at Site 1. Based on a screening ecological risk assessment (SERA), concentrations of aluminum, copper, and iron exceeded ecological risk screening values in surface water; however, only copper exceeded the background upper confidence limit (UCL) concentration. Concentrations of cadmium, iron, and manganese in sediment exceeded ecological risk screening values; however, aluminum and manganese are below background UCL concentrations (Baker, 1998a). Further investigations are being conducted at Site 1, to better understand nature, extent, and risk associated with potential contamination of groundwater and surface water and sediment of Indian Field Creek and its tributary adjacent to Site 1.

Remedial Action(s)

A ROD for Site 1 soil was signed June 1999 to address soil and surface debris. Groundwater, surface water, and sediment are not addressed in this ROD and are currently under further investigation and have not yet been addressed by any remedial actions.

Remedial actions for soil and waste included the removal of metal surface debris and excavation and off-site disposal of 413 tons of waste and soil. Following confirmation soil samples that verified arsenic concentrations remaining in place were below the removal action clean-up goal of 63 mg/kg, the excavated area was backfilled with on-base borrow material and re-graded. Land use controls (LUCs) prohibiting residential development of Site 1 and disturbance of the soil cover have been maintained by the Navy through routine inspections.

Review of documents, applicable or relevant and appropriate requirements (ARARs), risk assumptions, and site inspections demonstrate that the soil cover placed at Site 1 is functioning as intended by the ROD.

The Navy plans to finalize a draft a LUC RD following resolution of RD language with EPA legal.

CERCLA Path Forward

- Site Inspection (soil cover maintenance, as needed)
- RI for groundwater, surface water, and sediment
- Five-Year Review (2012)
- FS/PP/ROD for groundwater, surface water, and sediment, as appropriate
- Remedial Action Completion Report (RACR)

Schedule 3-1 presents the FY08-09 schedule for Site 1.

3.2.2 Site 2—Turkey Road Landfill

Site Description

Site 2 is a five-acre landfill located east of Turkey Road adjacent to a wetland area of the Southern Branch of Felgates Creek and two unnamed tributaries that border Site 2 (**Figure 3-2**). Operations at the landfill reportedly began in the 1940s and ceased in 1981. Wastes disposed in this landfill reportedly included mercury and carbon-zinc batteries, tree stumps and limbs, construction rubble, missile hardware (e.g., wings, fins and power packs), electrical devices, and unidentified drums and/or tanks. An estimated 240 tons of waste were disposed during the period of use. Waste material (e.g. mine casings) was primarily located along the tributaries to the Southern Branch of Felgates Creek. A summary of relevant documents and milestones is presented in the table below.

Documents and Milestones

Document Title/ Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Action Memorandum and EE/CA	Baker, 1994	00615
Closeout Report, Sites 2 and 9 and Site Screening Area 4, Mine Casing and Debris Removal Action	IT Corporation, 1995	00646
Round Two Remedial Investigation Report for Sites 2, 8, 18, and Site Screening Area 14, Naval Weapons Station Yorktown, Yorktown, Virginia	Baker, 2004	01548
Work Plan for the Pre-Removal Characterization of Soil, Site 2, Site 8, and SSA 14,	Baker, 2005	01687

Nature and Extent of Potential Contamination

The source of potential contamination is the waste disposed of in the landfill. Surface and near-surface debris, including large concrete masses, asphalt, scrap metal, empty drums, miscellaneous construction/demolition debris, scrap ordnance, and batteries, were removed from the site in 1994. Landfill waste remains in place. Following a removal action in 1994, investigations at Site 2 included sampling of soil, groundwater, surface water and sediment for analysis of VOCs, SVOCs, pesticides/PCBs, metals and explosives. The 2004 RI identified metals, PAHs, PCBs, and nitramine compounds in surface soil. Additional soil sampling in 2005 unearthed an ordnance item that resulting in suspension of sampling activities pending ordnance characterization by explosives safety personnel. Following resolution of explosive ordnance characterization and limitations on field activities to ensure explosive safety measures are maintained, additional characterization of site media is anticipated.

Potential Risks

The HHRA identified potentially unacceptable reasonable maximum exposure (RME) risks for future residents associated with exposure to cadmium in surface soil; however, there is no unacceptable risk based on central tendency exposure to cadmium. The SERA identified silver as a potential risk to aquatic ecological receptors. Additional evaluation of silver was recommended in Step 3b of an aquatic baseline ecological risk assessment. Though current levels of exposure do not indicate the potential for unacceptable risk to aquatic receptors from PAHs, the PCB Aroclor-1254, cadmium, and mercury, the potential for continued source release and future exposures elevated above those measured in the current dataset warrants additional investigation.

Remedial Action(s)

In 1994, 676 tons of non-ordnance waste and soil were removed from Site 2. Approximately 4,327 ordnance items also were removed from Sites 2, 9, & SSA 4 (closeout report did not distinguish between sites but reported the majority of ordnance came from Site 2). Wastes removed at Site 2 included large concrete masses, asphalt, scrap metal, empty drums,

miscellaneous construction/demolition debris, batteries, and ordnance. All ordnance items were certified inert either by the unexploded ordnance (UXO) superintendent, were transferred to the Naval Explosives Development Engineering Department (NEDED) laboratory on site and verified as inert, or were transferred off site by the Station Explosive Ordnance Disposal (EOD) staff for final disposition. Post-removal soil samples from the floor of excavations and outside the designated limits of excavation were collected and analyzed for VOCs, SVOCs, pesticides/PCBs, metals, and explosives. Excavated areas were backfilled, including a six-inch layer of topsoil, seeded, and mulched.

CERCLA Path Forward

Site 2 is being transferred from the ERP to the MMRP, no actions FY08-FY-09.

3.2.3 Site 3—Group 16 Magazine Landfill

Site Description

Site 3, the Group 16 Magazines Landfill is a two-acre wooded area behind the Group 16 Magazines located in the northern portion of WPNSTA Yorktown west of Indian Field Creek (**Figure 3-3**). Site 3 is named for its proximity to the Group 16 Magazines; however, the history of this landfill is unrelated to operations at the magazines. Surface water and groundwater flow to the north/northeast toward Indian Field Creek. The area adjacent to Indian Field Creek is covered by woods that act as a riparian buffer for surface water runoff. North and south of Site 3 are two unnamed tributaries leading to Indian Field Creek.

The site was originally used for sand mining and consisted of one borrow pit to a depth of 10 ft bgs. Between 1940 and 1970, Site 3 was operated as a landfill. Approximately 90 tons of wastes were disposed of in the borrow pit and reportedly included solvents, sludge from boiler cleaning operations, grease trap wastes, Imhoff tank skimmings containing oil and grease, and animal carcasses. The Site 3 waste boundary was approximated as part of previous investigations including a geophysical survey. Test pit investigations performed in 1997 confirmed the presence of scrap metal, 55-gallon metal drums, grease, wax, lumber, banding, concrete blocks, plastic sheeting and surface debris. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Round Two Remedial Investigation Report, Sites 1 and 3	Baker, 1998	00998
Feasibility Study for Sites 1 and 3	Baker, 1997	01158
v2 Proposed Remedial Action Plan for Sites 1 and 3	Baker, 1998	01840
Record of Decision, Operable Unit Nos. Viii and IX, Site 1 and Site 3	Baker, 1999	01000
Remedial Action Report for Sites 1 and 3 and SSA 22	OHM, 2001	01091

Document Title /Milestone	Author/Date	AR Document Number
Long-Term Monitoring	2000–2004	N/A
Long-Term Monitoring Report for Sites 1, 3, and 7	Baker, 2006	02075
Phase I RI Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	HILL, 2007	(To be added to AR)

Nature and Extent of Potential Contamination

The waste at Site 3 was the source of potential contamination to soil, groundwater, sediment, and surface water. Previous investigations included full suite analysis (TCL VOCs, TCL SVOCs, PCBs, pesticides, explosives, TAL inorganics) of soil, surface water, sediment, and groundwater. A PAH "hot spot" area (total PAHs > 100 mg/kg) was identified in the northeastern portion of the site (Baker, 1998a). Organics were not detected in surface water or sediment samples from Indian Field Creek, adjacent to Site 3. Additionally, no explosives or pesticides/PCBs were detected in surface water. VOCs were detected in groundwater with the highest concentration of TCE (140µg/L) detected at monitoring well 3GW19. The concentration of TCE in deep well pair 3GW19A was 2 Jµg/L during the same sampling event (Baker, 2006 LTM). The concentration of TCE in groundwater from 3GW19 has declined over time while daughter products have remained stable or increased, indicating that at least partial reductive dechlorination of TCE may be occurring in this area. Further investigations of groundwater, surface water, and sediment are on-going.

Potential Risks

Human health risks were evaluated separately for the Site 3 "proper" area (excluding the PAH "hot spot") and from the Site 3 PAH "hot spot" area and concluded:

- There were no unacceptable cancer risks or noncancer hazards to potential current receptors (adult and adolescent trespassers) in Site 3 proper from exposure to surface soil
- The Site 3 "Hot Spot" area posed unacceptable risk to potential current receptors from exposure to PAHs [mainly benzo(a)pyrene] in surface soil
- Surface water and sediment from Indian Field Creek (adjacent to Site 1 and 3) posed no unacceptable human health cancer risk or non-cancer hazards to the future child resident
- Unacceptable cancer risks and non-cancer hazards for the future adult and child residents were identified from the potable use of groundwater from CVOCs in the Yorktown-Eastover aquifer (Baker, 1998a).

The SERA determined that potential risks for the terrestrial ecosystem (with the exception of the PAH hot spot area) were not significant enough to warrant further consideration for remedial action. Potential ecological risks were identified from exposure to PAHs in the "hot spot" area that warranted remedial action. Based on the SERA, concentrations of aluminum, copper, and iron exceeded ecological risk screening values in surface water;

however only copper exceeded the background UCL concentration. Concentrations of aluminum, cadmium, iron, and manganese in sediment exceeded ecological risk screening values; however, aluminum and manganese are below background UCL concentrations (Baker, 1998a).

Remedial Action(s)

A ROD for Site 3 soil was signed June 1999 to address soil and surface debris. Groundwater, surface water, and sediment are not addressed in this ROD and are currently under further investigation and have not yet been addressed by any remedial actions.

Post-ROD Remedial actions included the removal of metal surface debris and excavation and off-site disposal of 284 tons of PAH contaminated soil and landfill waste (2,700 tons of galley waste, 50 drums of solidified resin (22 tons), and 127 tons of abandoned dry cell batteries) (OHM, 2001a). Following confirmation soil samples that verified PAH concentrations remaining in place were below the removal action clean-up goal (10 mg/kg industrial and 4 mg/kg for the child resident), the excavated area was backfilled with on-base borrow material and re-graded. LUCs prohibiting residential development of Site 3 and disturbance of the soil cover have been maintained by the Navy through routine inspections.

LTM of surface water, sediment, and groundwater was initiated in 2000 to further assess VOCs detected in these media. Additional investigations will be conducted at Site 3, to better understand nature, extent, and risk associated with potential contamination of groundwater and surface water and sediment of Indian Field Creek and its tributaries.

Because all waste was removed during implementation of the remedy, and post-removal confirmation soil samples (<1 mg/kg) are below levels that allow for unlimited use unrestricted exposure (UUUE) (4 mg/kg), there are no unacceptable risks from exposure to soil or waste that remain at the site. The Navy has prepared a technical memorandum (TM) currently under regulatory review, demonstrating that no unacceptable human health or ecological risks from exposure to soil and waste remain at Site 3. Pending regulatory agreement of the TM, a draft Explanation of Significant Differences (ESD) for the ROD will be prepared to document that no-further action is required to address site soils and waste.

CERCLA Path Forward

- Site Inspection
- Finalize TM (documenting removal of waste and soil)
- ESD (document NFA for waste and soil pending approval/consensus of tech memo)
- RI for groundwater, surface water, and sediment
- Five-Year Review (2012, pending approval of ESD)
- FS/PP/ROD for groundwater, surface water, and sediment, as appropriate
- RACR

Schedule 3-2 presents the FY08-09 schedule for Site 3.

3.2.4 Site 4—Burning Pad Residue Landfill

Site Description

Site 4, the Burning Pad Residue Landfill, consists of a ten acre open field surrounded by woods in the north-central portion of WPNSTA Yorktown (**Figure 3-4**). The site is bordered by Site 22 to the south and Site 21 and an unnamed tributary leading to the Eastern Branch of Felgates Creek to the southeast, and an intermittent drainage channel on the east side. The topography of Site 4 is relatively flat, sloping gently to the south and southwest toward Site 22 and the Eastern Branch of Felgates Creek. Topography to the southeast slopes sharply toward the tributary to the Eastern Branch of Felgates Creek.

Site 4 received an estimated 17 tons of waste per year from 1940 to approximately 1975. Materials reportedly disposed at Site 4 included: carbon-zinc batteries from underwater weapons; burning pad residues (possibly containing aluminum, cyclotrimethylene trinitroamine [RDX], TNT, 2,4- nitrotoluene [2,4-DNT], and cyclotetramethylenetetranitramine [HMX]); tree stumps; fly ash from coal-fired boilers; mine casings; electrical equipment; and transformers. Limits of waste disposal were estimated based on 28 test pits and a geophysical survey (Baker and Weston, 1993b). Depth of fill material was estimated to be 5 to 10 ft (Baker and Weston, 1993b). An ash pile (estimated to be 6 ft thick and covered an area of approximately 3,000 sq ft) from the burning of explosives and VOCs at Site 22 was located in the northeast corner of the site.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Engineering Evaluation/Cost Analysis (EE/CA) For Sites 4, 16, and 21 Removal Actions	Baker and Weston, 1993	00331
Closeout Report, Sites 4, 16, and 21, Battery and Drum Disposal Area	IT, 1995	00616
Post-Removal Confirmation Sampling Report and Baseline Ecological Risk Assessment	Baker, 1995	00661 00662
Round Two Remedial Investigation Report, Sites 4, 21, and 22	Baker, 2001	01296 01297
Feasibility Study, Sites 4, 21, and 22	Baker, 2001	01160
Proposed Remedial Action Plan, Sites 4 and 22	Baker, 2001	01290
Removal Action	Shaw, 2001	N/A
Project Closeout Report For Site 4 – Burn Pad Residue Landfill	Shaw, 2005	01680
Record of Decision, Site 4 – Burning Pad Residue Landfill	Baker, 2005	02026

Nature and Extent of Potential Contamination

The waste at Site 4 was the source of potential contamination to soil, groundwater, sediment, and surface water. Previous investigations included analysis of soil, groundwater, sediment, and surface water for VOCs, SVOCs, PCBs, explosives, and metals. Additionally, surface soil samples were collected for dioxin and dibenzofuran. An area of elevated PAHs (> 10 mg/kg) and arsenic (63 mg/kg) was identified in surface soil. Explosives [HMX; RDX; 1,3,5-trinitrobenzene; and 2,4,6-trinitotoluene (2,4,6-TNT)] were detected in surface soil near the ash pile. Dioxin and dibenzofuran were not detected in surface soil.

Explosives were also detected in surface water collected from the tributary to Eastern Branch of Felgates Creek southeast of the site. In groundwater, TCE (maximum concentration 9 µg/L), pesticides and several explosives were detected downgradient of Site 4 and in surface water upstream and downstream of where Sites 4 and 22 border the Eastern Branch of Felgates Creek. SVOCs and PCBs were not detected in any groundwater samples. Metals, including arsenic, barium, lead, nickel, selenium, and zinc, were detected in groundwater, surface water, and sediment. Dissolved arsenic was detected at a concentration of 13.9 µg/L in one well, greater than the MCL of 10 µg/L. There are no monitoring wells near the former ash pile or just downgradient of the former landfill, so it is unknown what the concentrations are within the likely source areas at the site. Investigation of groundwater, surface water, and sediment are ongoing.

Potential Risks

Following a 1994 removal action, samples were collected and a human health and screening ecological risk assessments were performed. Unacceptable cancer risks (1.5 x 10-3) and non-cancer hazards [hazard index (HI) = 25] were identified for exposure to arsenic and carcinogenic PAHs (cPAHs) in soil. Although no acceptable risks were identified from exposure to the Yorktown Aquifer groundwater (based on data from one well under a non-potable use scenario), potential groundwater risks were not calculated for potable residential use exposure to either Columbia or Yorktown aquifers. No potential human health risks were identified for exposure to surface water or sediment under a residential scenario.

A screening ecological risk assessment (ERA) which compares concentrations to accepted literature screening values was conducted for Site 4. Potential ecological risks were identified for terrestrial and aquatic habitats related to concentrations of PAHs, explosives, and metals.

The Round Two RI evaluated data from previous investigations (Round One RI in 1993 and Post Removal Action Sampling in 1994) as well as the Round Two RI data. The evaluation segregated data into two areas, a “Hot Spot “area and Site 4 Proper. Since a soil removal was planned for the Hot Spot, the current scenarios utilized Hot Spot data in the risk evaluation, while the future scenarios were run with data from the Hot Spot removed from the calculations. Unacceptable cancer risks (6.5 x 10-4) and non-cancer hazard (HI=9.6) were identified from exposure to of Yorktown Aquifer (from one well under a non-potable use scenario). Unacceptable non-cancer hazard (HI=5.8) were identified for exposure to arsenic and cPAHs in soil. The data did not change the results of the human health risk assessment conducted during the Round One RI. No potential human health risks were identified for exposure to surface water or sediment under a residential scenario.

The screening ERA identified potential adverse effects to terrestrial receptors from SVOCs, 4,4'-Dichlorodiphenyltrichloroethane (4,4'-DDT), endosulfan II, and metals from soils within the Hot Spot area. The terrestrial environment for Site 4 - Proper potentially may be adversely impacted by soil concentrations of PAHs, pesticides/PCBs, explosives, and metals. Potential adverse impacts to the future aquatic habitat from groundwater were identified for 2,4-DNT/2,6-DNT, TNT, amino-dinitrotoluenes, RDX and metals.

Remedial Action(s)

In 1994, surface debris, the ash pile, and buried batteries were removed as part of a non-time-critical removal action (NTCRA). Wastes removed included concrete, drums, batteries, inert ordnance, cables, construction debris, and roofing shingles.

A second NTCRA was begun in 2001 (Shaw, 2005) whereby approximately 57,600 tons of waste (construction debris, transformers, drums, and ordnance items) and contaminated soil were excavated. Due to an increase in the extent of the excavation, funding limitations prohibited the removal of all material. Final removal of all remaining soil and waste which was stockpiled on site was completed in 2005.

Since soil samples were determined to have met remediation goals, an NFA ROD for soil at Site 4 was signed September 2005 (Baker, 2005a). This ROD did not address groundwater, surface water, or sediment at the site. Groundwater, surface water, and sediment are currently under further investigation and have not yet been addressed by any remedial actions.

CERCLA Path Forward

- RI for groundwater, surface water, and sediment
- FS/PP/ROD for groundwater, surface water, and sediment, as appropriate
- RACR

Schedule 3-3 presents the FY08-09 schedule for Site 4.

3.2.5 Site 5—Surplus Transformer Storage Area

Site Description

Site 5 is a former Surplus Transformer Storage Area, approximately 1,000 square feet in size with two concrete pads and a gravel area (**Figure 3-5**). It was located in a fenced area adjacent to the north end of Building 76, off Barracks Road in the northeastern portion of WPNSTA Yorktown. The site was used from 1940 to 1981 as a storage area for surplus polychlorinated biphenyl (PCB)-containing transformers. Following 1981, only non-PCB containing transformers were stored at this location. An estimated 300 pounds of PCB-containing fluids were reported to have leaked from stored transformers (Baker, 1994a). A cleanup effort in 1982 included the removal of contaminated soils at Site 5. The amount of soil removed from the site is not known and confirmation sampling was not conducted. Building 76 has since been demolished, and all storage materials were removed when the building was razed. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Removal of Contaminated Soil	NA/1982	(N/A – referenced in 00313)
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Weston, 1993	00313
Risk Evaluation, Site 5, Surplus Transformer Storage Area,	Baker, 1994	00602
Proposed Remedial Action Plan, Operable Unit 1, Site 5,	Baker, 1994	01173
Record of Decision, Operable Unit 1, Site 5,	Baker, 1994	01174

Nature and Extent of Potential Contamination

The potential source of contamination was from PCB transformer storage. Previous investigations included analysis of soil, groundwater, sediment, and surface water for VOCs, SVOCs, PCBs, explosives, and metals.

Potential Risks

No unacceptable risks were identified from exposure to PCBs at Site 5 and a No Further Action ROD for all media was signed in September 1994.

Remedial Action(s)

Soil was removed from the site in 1982. No CERCLA remedial actions have taken place at Site 5.

CERCLA Path Forward

CERCLA documentation complete with RI/FS and No Action ROD.

3.2.6 Site 6—Explosives Contaminated Wastewater Impoundment, Flume Area and Excavation Area, Buildings 109, 110 and 501

Site Description

Site 6 is located in the northern portion of WPNSTA Yorktown and consists of three areas: an impoundment area, a flume area, and an excavated pit (**Figure 3-6**).

Flume Area. Wastewater possibly containing explosives [TNT, RDX, and 2,4-dinitrotoluene (DNT)] and solvents (TCE, trichloroethane (TCA), and cyclohexanone] generated in Building 109 for explosives reclamation, and Building 110 for explosives loading, mixing, and casting, was discharged through a network of flumes into the Site 6 impoundment area from 1942 to 1975 (Baker, 1998b). In 1975, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge into the drainage way. A National Pollutant Discharge Elimination System (NPDES) permit was granted to allow the discharge of effluent from the carbon adsorption tower containing acceptable concentrations of

nitramines/nitroaromatics. In 1986, the effluent from the tower was diverted to the sanitary sewer and ultimately to the Hampton Roads Sanitation District (HRSD) (Baker, 1998b).

Impoundment Area The Site 6 impoundment is a 3-acre, unlined, surface impoundment adjacent to wetlands along a small tributary to the main branch of Felgates Creek. The impoundment was created by building a coffer dam across the headwaters of the small tributary. Wastewater (containing explosives and solvents) was discharged to this area from the flume network from 1942 to 1975. After 1986, the impoundment collected only surface runoff from the area around Buildings 109 and 110. Wastewater discharges ceased in 2003 when operations in Buildings 109 and 110 terminated (Baker, 1998b).

Excavated Area Although not well documented, the Site 6 excavated area may have been the soil borrow pit for construction of the coffer dam for the impoundment; it may have also been used to contain packed explosives. This area is northwest of former Building 501 and is currently wooded.

Site 6 is generally wooded with some open areas near buildings. Site 6 topography generally slopes from east to west toward the impoundment area with ground surface elevations from ~ 40 ft msl near Main Road to less than 10 ft msl at the impoundment area. Surface water runoff from the site is conveyed to Felgates Creek either directly by overland flow, or via tributaries adjacent to Site 6.

The surface geology at Site 6 is consistent with Yorktown-Eastover aquifer lithology. The depth to groundwater mimics topography ranging from 1 to 35 ft bgs. Groundwater generally flows westward toward the impoundment and Felgates Creek. The Yorktown-Eastover aquifer is approximately 80 ft thick in the vicinity of Site 6 and is underlain by the Eastover-Calvert confining unit (Brockman et al., 1997).

A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Feasibility Study, v2, Sites 6 and 7	Baker, 1998	01077
Record of Decision, Operable Unit Nos. XII, XIII, XIV, and XV, Sites 6 and 7	BAKER, 1998	01001
Round Two RI Report, Sites 7 and 6	Baker, 1998	01294
Proposed Remedial Action Plan, v2, Sites 6 and 7	Baker, 1998	01838
Contractor Closeout Report for Site 6 Remediation	OHM, 1999	01221
Five-Year Review Report for Sites 1, 6, 7, 12, 16, and 19	Baker, 2002	01310
Remedial Design for Naval Weapons Station Yorktown Sites 6 and 7	Baker, 2006	(Draft – no AR No.)
Phase I RI Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	HILL, 2007	(To be added to AR)

Nature and Extent of Potential Contamination and Potential Risks

The sources of potential contamination at Site 6 are related to the wastewater discharge from the flumes at the site and the possible storage of explosives within the excavated area. Previous investigations included analysis of soil, surface water, sediment, and groundwater for TCL VOCs, TCL SVOCs, explosives, and TAL inorganics; additionally soil and groundwater were analyzed for TCL pesticides and PCBs. A summary of the results of the investigations is provided below.

Site 6 Flume and Impoundment Area Soil. Surface and subsurface soil samples were collected in the area surrounding Buildings 109 and 110 and on the banks of the slopes leading to the impoundment during previous investigations. These samples were analyzed for VOCs, SVOCs, pesticides/PCBs, explosives, and inorganics.

With the exception of low levels of common laboratory contaminants (bis(2-ethylhexyl)phthalate and acetone), there were no organics detected in surface soils in the impoundment and flume areas. VOCs were detected in subsurface soil near Building 109. In general, concentrations of VOCs in this area increased with depth below ground surface. Maximum concentrations of TCE (3,400 µg/kg), VC (4,700 µg/kg), and cis-1,2-DCE (3,100 µg/kg) were detected in a sample collected near the discharge point from the flumes to the impoundment. 1,1-DCE; trans-1,2-DCE; 1,1,2-TCA, and tetrachloroethene (PCE) were also detected at lower concentrations in this area. VOCs were also detected just south of the impoundment area, in the vicinity of Building 110, and just south of the excavated area.

HMX and RDX were detected in one surface soil sample collected in the vicinity of Building 109 at concentrations of 5,600 µg/kg and 2,900 µg/kg, respectively during the Round One RI. There were no explosives detected during subsequent rounds of sampling or at any other surface soil sample locations. Explosives were detected in subsurface soils during the Round One and Round Two RIs. During the Round One RI, a number of explosives were detected in the vicinity of the flume area at maximum concentrations of 61,000 µg/kg (HMX), 160,000 µg/kg (RDX), 21,000 µg/kg (1,3,5-TNB), 1,000 µg/kg (nitrobenzene), 640,000 µg/kg (2,4,6-TNT), 5,600 µg/kg (2,4-DNT), and 46 J µg/kg (2,6-DNT). Explosives were also detected in one subsurface soil sample collected at the discharge point from the flume to the impoundment during the Round Two RI. 4-amino-DNT and 2-amino-DNT were both detected in a sample from this area at a concentration of 2,500 µg/kg (both chemicals).

Several inorganics were detected in surface and subsurface soils around the impoundment and flume areas. Maximum concentrations of antimony (13.8 mg/kg), chromium (27.5 mg/kg), and mercury (0.09 mg/kg) in surface soil exceeded corresponding background and ecological and/or human health screening values. There were no inorganics detected in Site 6 subsurface soils at concentrations greater than background concentrations.

SVOCs (with the exception of low levels of common phthalate laboratory contaminants), pesticides, and PCBs were not detected in impoundment area soils (Baker, 1998b).

Unacceptable non-cancer hazards indices of 1.1 and 1.9 were identified for future child resident dermal contact with and accidental ingestion of surface soils due primarily to concentrations of antimony. However, there were no individual hazard quotient (HQ) values greater than 1.0. There were also no unacceptable cancer risks associated with future

child resident exposure to impoundment/flume area soils. An unacceptable non-cancer hazard was identified for the future construction worker (HI=4.4) primarily due to potential exposure to 2,4,6-TNT in subsurface soils (dermal HQ = 2.2 and ingestion HQ = 2.2). There were no unacceptable cancer risks to the hypothetical construction worker. Future residential exposure to subsurface soils was not evaluated. Based on the SERA, concentrations of RDX, antimony, and mercury exceeded ecological screening values in the impoundment area/drainage area.

Site 6 Flume and Impoundment Area Groundwater. Groundwater samples were collected within and around the impoundment and flume areas during previous investigations. Several chlorinated VOCs were detected in Site 6 groundwater (Yorktown-Eastover). The highest concentrations of these constituents were detected from the impoundment area. TCE; cis-1,2,-DCE; and VC were detected at maximum concentrations of 37,000 µg/L; 26,000 µg/L; and 21,000 µg/L; respectively. Chlorinated VOCs were also detected at lower concentrations across the site. Explosives (4-amino-2,6-DNT; tetryl; HMX; and RDX) were detected in groundwater at concentrations of 1.2 µg/L, 4.9 µg/L, 3.2 µg/L, and 63 µg/L, respectively.

Several inorganics were detected at concentrations above background in groundwater including aluminum, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, and zinc. Arsenic was detected at a maximum concentration of 37.1 µg/L, above the corresponding maximum contaminant level (MCL) for this constituent. Pesticides, PCBs, and SVOCs (with the exception of low levels of common laboratory contaminants) were not detected in site groundwater (Baker, 1998b).

There were no unacceptable risks for human receptors exposed to groundwater under a non-potable, beneficial use scenario (lawn watering and car washing). Risks to future residents from potable groundwater use have not been calculated. Because surface water was evaluated directly, ecological risks associated with groundwater discharge to surface water were also not calculated. A summary of previous investigations including sampling and analysis of groundwater is provided in the Phase I Groundwater RI Report (CH2M HILL, 2006). Further investigations of groundwater are on-going.

Site 6 Flume and Impoundment Area Sediment. Sediment samples were collected from the drainage area leading to the impoundment (flume area and areas near Buildings 109 and 110), the impoundment, the tributary, and Felgates Creek during previous Site 6 investigations. VOCs, SVOCs, explosives, and inorganics were detected in sediment from the impoundment area and SVOCs and inorganics were detected from the drainage leading to the impoundment. TCE; 1,1-DCA; total 1,2-DCE; VC; and fluoromethane were detected at maximum concentrations of 5 µg/kg, 52 µg/kg, 27 µg/kg, 63 µg/kg, and 15 µg/kg, respectively within the impoundment area. PAHs with a maximum concentration of 3,900 µg/kg (fluoranthene) were also detected within the impoundment area and drainage. Explosives (1,3,5-trinitrobenzene; 1,3-dinitrobenzene; TNT; 4-amino-DNT; 2-amino-DNT; tetryl; HMX; RDX) were detected at maximum concentrations 450 µg/kg; 210 µg/kg; 93,000,000 µg/kg; 520,000 µg/kg; 160,000 µg/kg; 5,200 µg/kg; 730,000 µg/kg; and 3,900,000 µg/kg, respectively within the impoundment area. Inorganics detected in sediment from the impoundment, the drainage, the tributary, and Felgates Creek were generally comparable to background concentrations (Baker, 1998b).

Unacceptable cumulative non-cancer hazards to the current adult (HI=4.4) and adolescent (HI=5.7) trespasser were identified for sediments within the Site 6 impoundment area. These hazards were primarily due to potential dermal contact with 4-amino-2,6-DNT (adolescent HQ=3.8, adult HQ = 3.0). The human health risk assessment also identified a potential unacceptable cumulative non-cancer hazard to the hypothetical future child resident (HI = 3.2), primarily due to exposure to 4-amino-2,6-DNT in sediments (dermal HI = 1.5 and ingestion HI =0.74) within the impoundment area. There were no unacceptable cancer risks identified for impoundment area sediments. There were also no unacceptable human health hazards or risks identified for the drainage area (surrounding Buildings 109 and 110), the tributary, or Felgates Creek.

According to the SERA, TNT, RDX, chlorinated VOCs, PAHs, beryllium, cadmium, iron, mercury, nickel, selenium, vanadium and zinc produced mortality in chronic sediment toxicity tests on the Amphipoda *Hyalella azteca* in the flume area. Additionally, concentrations of TCE, PAHs, bis(2-ethylhexyl)phthalate, beryllium, copper, lead, and zinc from sediment in the impoundment area produced unacceptable HQ values and exceeded background values. In sediments taken from the tributary to Felgates Creek, phenol was detected in one sediment sample at 0.895 mg/kg. This value produced a maximum sediment HQ value of 2.12. Beryllium also produced an unacceptable HQ value and exceeded its background value in Felgates Creek sediment (Baker, 1998b). Further investigations of sediment are on-going.

Site 6 Flume and Impoundment Area Surface Water. Surface water samples were collected from the drainage area, the impoundment area, the tributary at the site, and from Felgates Creek. Three VOCs (1,1-DCA; 1,1,-DCE; 1,1-TCA) were detected in surface water at concentrations at 4 µg/L, 5 µg/L, and 98 µg/L, respectively, in the drainage area downstream of Building 110. 1,1-TCA was also detected in surface water from the impoundment area at a concentration of 6 µg/L. One SVOC (phenol) was detected at a concentration of 5 µg/L in surface water at the mouth of the tributary leading to Felgates Creek. Inorganics detected in surface water were generally comparable to background concentrations. No other SVOCs, pesticides, or PCBs were detected in surface water. Although explosives were detected during the Round One RI, they were not detected in surface water during the Round Two RI sampling. VOCs (with the exception of low level concentrations of common laboratory contaminants), SVOCs (with the exception of phenol), and explosives were not detected in the mouth of the tributary leading to Felgates Creek or in Felgates Creek sediment or surface water samples (Baker, 1998b).

No unacceptable human health risks were identified from surface water at Site 6. However, potential risks to aquatic receptors associated with explosives and metals were identified from within the impoundment/drainage area during the SERA. Additionally, metals in surface water were determined to pose potential risk to aquatic receptors in the tributary leading to Felgates Creek (Baker, 1998b). Further investigations of surface water are on-going.

Site 6 Excavated Area Soil and Groundwater. Surface soil samples were collected in the excavated area during the Round Two RI. There were no VOCs, SVOCs, pesticides/PCBs, or explosives detected in these surface soil samples. Maximum concentrations of aluminum (27,000 mg/kg), antimony (11.9 L mg/kg), cadmium (18.4 L mg/kg), chromium (52.2

mg/kg), iron (35,300 mg/kg), and zinc (2,340 mg/kg) exceeded background values and ecological and/or residential risk based concentration (RBC) values.

Subsurface soils were collected in the excavated area during the Round Two RI. With the exception of common laboratory contaminants, 1,1,1-TCA was the only VOC detected in subsurface soil. This constituent was detected at a concentration of 18 µg/kg which does not exceed any human health or ecological screening values. The maximum concentration of chromium (43.8 mg/kg) in excavated area subsurface soil exceeded the maximum background concentration and the corresponding the ecological screening value.

The human health risk assessment identified potential dermal and accidential ingestions non-cancer hazards to the hypothetical future child resident of 1.2 and 2.5, respectively, primarily due to potential exposure to iron in surface soil (dermal HQ=0.68 and ingestion HQ = 1.4). There were no unacceptable cancer risks to the hypothetical future child resident associated with surface soils in the excavated area. Potential ecological risks for the terrestrial receptor associated with aluminum, cadmium, chromium, and zinc in soil were identified. (Baker, 1998b). There are no monitoring wells within the excavated area, so risks associated with groundwater were not evaluated.

Potential Risks

Soil. The human health risk assessments identified a potential unacceptable non-cancer hazard to the child resident from exposure to iron (HQ = 1.4) in surface soil from the excavated area at Site 6. Cadmium (HQ = 1.3×10^{-2}) and zinc (HQ= 7.4×10^{-2}) contributed to the overall HI of 2.5. Additionally, an unacceptable non-cancer hazard (HI=2.2) was identified for the future construction worker from exposure to 2,4,6-TNT in subsurface soils. No other human health risks were identified; however, future residential receptor contact with subsurface soil was not evaluated.

Based on the SERA, concentrations of RDX, antimony, and mercury exceeded ecological screening values in the impoundment area/drainage area. Additionally, aluminum, antimony, cadmium, chromium, and zinc exceeded ecological screening values from soil within the excavated area (Baker, 1998b).

Sediment. The human health risk assessments identified potential unacceptable non-cancer hazards to the future child resident (HQ = 1.5) and current older child trespasser (HQ = 3.8) from exposure to 4-amino-2,6-DNT in sediments from the impoundment area.

According to the SERA, TNT, RDX, chlorinated VOCs, PAHs, beryllium, cadmium, iron, mercury, nickel, selenium, vanadium and zinc produced mortality in chronic sediment toxicity tests on the Amphipoda *Hyalella azteca* in the flume area. Additionally, concentrations of TCE, PAHs, bis(2-ethylhexyl)phthalate, beryllium, copper, lead, and zinc from sediment in the impoundment area produced unacceptable HQ values and exceeded Station-wide background values. In sediments taken from the tributary to Felgates Creek, phenol was detected in one sediment sample at 0.895 mg/kg. This value produced a maximum sediment HQ value of 2.12. Beryllium also produced an unacceptable HQ value and exceeded its background value in Felgates Creek sediment (Baker, 1998b).

Surface Water. No unacceptable human health risks were identified from surface water at Site 6. However, potential risks to aquatic receptors associated with explosives and metals

were identified from within the impoundment/drainage area during the SERA. Additionally, metals in surface water were determined to pose potential risk to aquatic receptors in the tributary leading to Felgates Creek (Baker, 1998b).

Groundwater. There were no unacceptable risks for human receptors exposed to groundwater under a non-potable, beneficial use scenario (lawn watering and car washing). Risks to future residents from potable groundwater use have not been calculated. Because surface water was evaluated directly, ecological risks associated with groundwater discharge to surface water were also not calculated. A summary of previous investigations including sampling and analysis of surface water, sediment, soil, and groundwater are provided in the Phase I RI Report (CH2M HILL, 2006). Further investigations of surface water, sediment, and groundwater are on-going.

Remedial Action(s)

The ROD for Site 6 soil and sediment, and flume area residue was signed in October 1998. Although the ROD required LTM of surface water, sediment, and groundwater it was specified that this would not be the final remedy for these media. Groundwater, surface water, and sediment are currently under investigation. The selected remedy consisted of:

Site 6 Flume Area. Excavation of explosives-, chlorinated VOCs-, and inorganic-contaminated soil and sediment from the Site 6 flume area.

- *Ex situ* bioremediation of excavated soil and sediment. Explosives are readily degraded by the process, but chlorinated VOCs may be recalcitrant to degradation. If VOCs do not degrade during a reasonable cycle of ex situ treatment, a contingency remedy (low temperature thermal desorption) will be employed to remove remaining chlorinated VOCs from the soil.
- Habitat restoration of the flume area
- Pressure washing of the trenches (SWMU 179), and residue removal and pressure washing of the trenches under Building 109 (AOC C).
- Removal of explosives-contaminated residue from SWMU 179 and treatment by burning at the Station's thermal treatment unit.
- This site will be cleaned up to levels appropriate for commercial/industrial use, which is
- The current land use and the most likely future land use for this site. Residual levels of contamination, however, will make the site inappropriate for residential uses. Consequently, residential use is prohibited as part of the remedy.

Site 6 Excavated Area. Grading and placement of backfill as a soil cover (minimum 8 inches) to prevent contact with cadmium and zinc-contaminated surface soil by terrestrial ecological receptors. No LTM will be necessary.

- Activities that interfere with or compromise the integrity of the cover at this site will be prohibited.

Site 6 Impoundment Area Surface Water, Sediment, and Groundwater. LTM of surface water and sediment will be conducted for explosives and chlorinated VOCs and inorganics

(including nickel and zinc) in the Site 6 impoundment Area. LTM of the groundwater throughout Sites 6 for explosives, chlorinated VOCs and inorganics will also be conducted, but this is not the final remedy for groundwater. Groundwater at Sites 6 will be addressed in a separate operable unit (OU) after USEPA Region III completes a watershed study for Felgates Creek scheduled for September 1998.

- Specifics of the LTM program will be developed by the Navy, USEPA Region III, and VDEQ and presented in a LTM Work Plan, a primary document under the WPNSTA Yorktown FFA.

Implementation of the selected remedy was initiated in 1999. The initial phase of remediation consisted of the construction of a bio-cell, excavation of PAH and explosives contaminated soil to approximately 4 ft bgs, disposal of PAH contaminated soil/sediment, transportation of explosives contaminated soil to the biocell, flume and drain decontamination, and site restoration (OHM, 1999). A soil cover was placed over the excavated area during the 1999 remedial actions. Soil and sediment that exceeded the RLs was excavated and transported to the biocell where it was treated by *ex situ* biological treatment. To allow for adequate treatment time in the bio-cell, implementation of the remedy (removal of soil and sediment and treatment in the bio-cell) has continued into 2006. A Construction Close-out report documenting remedy implementation through 2006 is expected to be completed in 2008.

Land Use Controls prohibiting residential development of the Site 6 area and disturbance of the excavated area's soil cover have been maintained through routine inspections. Site 6 is inaccessible to the general public. Access to the Site 6 impoundment area is restricted by a fence and locked gates at both roads leading into the Building 109 compound area. Signs are posted at both entrances. The LUCs shall be maintained until such time as they are no longer required to protect human health or the environment. The RD includes periodic inspections and LTM of surface water, sediment, and groundwater (Baker, 2005b). The Navy plans to finalize a draft LUC RD following resolution of RD language with EPA legal.

CERCLA Path Forward

- Remedy Implementation (site inspections; maintenance of soil cover as needed; groundwater, surface water, and sediment LTM; and LUCs)
- Construction Completion Report (Impoundment Area)
- RI for groundwater
- FS/PP/ROD for groundwater, as appropriate
- Five-Year Review (2012)
- RACR

Schedule 3-4 presents the FY08-09 schedule for Site 6.

3.2.7 Site 7—Plant 3 Explosives-Contaminated Wastewater Discharge Area

Site Description

Site 7 is located in the northern portion of WPNSTA Yorktown in the vicinity of Poe Road and adjacent to an unnamed tributary leading to Felgates Creek (**Figure 3-7**), approximately 1 mile upstream from the confluence of Felgates Creek and the York River. The site consists of the Plant 3 Explosives-Contaminated Discharge Area, including an approximately 300-foot long drainage area located adjacent to wetlands surrounding an unnamed tributary to Felgates Creek. Depth to groundwater (Yorktown-Eastover aquifer) at the site is variable with topography and ranges from approximately 15 to 25 feet bgs and generally flows westward toward the tributary and Felgates Creek.

Plant 3 was used as a weapons loading facility beginning in 1945. Between 1945 and 1975, wastewater from the Plant was discharged directly into the drainage area. The wastewater possibly contained RDX, TNT, cyclohexane, and TCE (C. C. Johnson & Associated from CH2M HILL, 1984). From 1975 to 1986, the wastewater was treated in an activated carbon unit, which removed dissolved explosives from the water prior to discharge to the site. After 1986, the carbon treated wastewater was directed to the sanitary sewer system and ultimately to HRSD. The site has reverted to a natural drainage area and received no discharge from the Plant 3 complex after 1986. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Report for Field Scale Treatability Study for Site 7 and 22	OHM, 1997	00887
Pilot Study Report for the Explosives-Contaminated Soil at Naval Weapons Station Yorktown	Baker, 1997	01088
Round Two RI Report, Sites 6 and 7	Baker, 1998	01294 (Volume I) 01295 (Volume II) 01346 (Volume III) 01347 (Volume IV)
Feasibility Study, v2, Sites 6 and 7	Baker, 1998	01077
Proposed Remedial Action Plan, v2, Sites 6 and 7	Baker, 1998	01838
Record of Decision, Operable Unit Nos. XII, XIII, XIV, and XV, Sites 6 and 7	BAKER, 1998	01001
Long-Term Monitoring	2000-2005	N/A
Five-Year Review Report for Sites 1, 6, 7, 12, 16, and 19	Baker, 2002	01310
Long-Term Monitoring Report Sites 1, 3, and 7	Baker, 2006	02075
Remedial Design for Naval Weapons Station Yorktown Sites 6 and 7	Baker, 2006	(Draft – no AR No.)
Phase I RI Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	HILL, 2007	(To be added to AR)

Nature and Extent of Potential Contamination

The nitromine-contaminated wastewater discharged from Plant 3 was the source of potential contamination. Previous investigations included analysis of soil, surface water, sediment, and groundwater for TCL VOCs, TCL SVOCs, explosives, and TAL inorganics. Additionally soil and groundwater were analyzed for TCL pesticides and PCBs.

Soils. No pesticides or PCBs were detected in Site 7 soils. VOCs and SVOCs (with the exception of low levels of common laboratory contaminants) were not detected in surface or subsurface soils. The metals detected in soil include aluminum, antimony, arsenic, cadmium, iron, lead, manganese, and zinc. Arsenic exceeded the residential RBC. Explosives HMX; RDX; 1,3,5-TNB; nitrobenzene; 2,4,6-TNT; and 2,4-DNT were detected at maximum concentrations of 61,000 µg/kg, 160,000 µg/kg, 21,000 µg/kg, 1,000 µg/kg, 640,000 µg/kg, and 2,300 µg/kg, respectively in soil (Baker, 1993b).

Unnamed Tributary to Felgates Creek Surface water and Sediment. No VOCs, SVOCs, or explosives were detected in surface water from the unnamed tributary. VOCs (1,1,1-DCA; carbon disulfide; 1,1,1-TCA) and explosives (HMX; and RDX) were detected in surface water. VOCs and SVOCs detected in sediment included acetone, di-n-butylphthalate, and 2-butanone at maximum concentrations 300 J µg/kg, 2,700 µg/kg, and 23 µg/kg, respectively. Additionally, phenol was detected in one sample at the mouth of the tributary to Felgates Creek at a concentration of 660 J µg/L. No explosives were detected in sediment.

Felgates Creek Surface Water and Sediment. Felgates Creek surface water and sediment samples were collected adjacent to, upstream, and downstream of Sites 6 and 7. No VOCs, SVOCs, or explosives were detected in surface water. Aluminum, cobalt, iron, manganese, and nickel were detected in surface water at concentrations above screening values. Concentrations of metals were consistent with background. In Felgates Creek sediment, 1,1,1-TCE; chlorobenzene; and xylenes were detected at concentrations of 28 µg/kg, 26 µg/kg, and 15 µg/kg upstream of Site 7. Additionally, one or more sediment samples had concentrations of di-n-butylphthalate, beryllium, iron, manganese, and/or selenium at levels above based screening values for aquatic receptors.

Groundwater. VOCs comprising 1,1,1-TCA; 1,1-DCA; and 1,1-DCE were detected at maximum concentrations 200 µg/L, 58 µg/L, and 33 µg/L, respectively in Site 7 groundwater. Additionally, explosives HMX; RDX; 4-amino-2,6-DNT; and TNT were detected at concentrations of 34 µg/L, 180 µg/L, 37 µg/L, and 56 µg/L, respectively. No SVOCs, pesticides, or PCBs were detected in groundwater. There are currently no groundwater wells within or close to the drainage area which received the contaminated wastewater. Groundwater monitoring at Site 7 is ongoing.

Potential Risks

Human health risks were evaluated for Site 7 and concluded:

- Exposure to iron in surface soils posed potential unacceptable non-cancer hazards to the future child resident.
- There were no unacceptable cancer risks or non-cancer hazards to potential current receptors (construction workers) at Site 7 from exposure to subsurface soil; however,

potential risks were not calculated for the future resident from exposure to subsurface soils.

- No unacceptable human health risks were identified from exposure to surface water or sediment from the unnamed tributary or Felgates Creek.
- There were no unacceptable risks for exposure to groundwater under a non-potable, beneficial use scenario (lawn watering and car washing). Risks from potable groundwater use by future residents have not been calculated.

The SERA determined that:

- Surface soil concentrations of aluminum, antimony, cadmium, chromium, copper, iron, lead, mercury, vanadium, and zinc presented potential unacceptable risks to ecological receptors. .
- Aluminum, iron, manganese, and nickel were detected at concentrations posing potential unacceptable risk to aquatic ecological receptors in surface water from the unnamed tributary leading to Felgates Creek. However, these constituents were below their respective background values.
- Sediment collected from the Site 7 unnamed tributary posed potential unacceptable risk to benthic macroinvertebrates or aquatic receptors from di-n-butylphthlate, aluminum, beryllium, iron, and manganese. Sediment concentrations of aluminum, beryllium, iron, and manganese were detected within background sediment concentrations.
- In Felgates Creek sediment, di-n-butylphthalate, beryllium, iron, manganese, and/or selenium potentially pose unacceptable risk to aquatic receptors, however, selenium was the only chemical that exceeded background concentrations (Baker, 1998b).

Field-Scale Pilot Study. Following the Round Two RI, a field-scale pilot study to treat explosives-contaminated soil and sediment at Site 7 was conducted in 1996. Approximately 770 cy of soil and sediment were excavated from the drainage area leading to the tributary at Site 7. TNT contaminated soil was excavated and sent to the newly-constructed biocell at Site 22. The TNT concentrations in the soil entering the biocell averaged over 1,000 parts per million (ppm). After treatment, the TNT concentrations ranged from less than 1 ppm to 4 ppm (Baker, 1997b).

Remedial Action(s). A ROD was signed in October 1998 for sediment in the drainage area and soil. The remedy included LUCs and LTM of groundwater and surface water from the drainage way and unnamed tributary. Although the ROD required LTM of surface water and groundwater, it specified LTM was not the final remedy for these media. Groundwater, surface water, and sediment are currently under investigation. The ROD specified no additional action for soil and sediment because the removal of contaminated soil and sediment for use in the bioremediation full-scale pilot study conducted in 1996 mitigated potential human health risks and ecological concerns under industrial/commercial land use (Baker, 1998c). LTM of surface water, sediment, and groundwater was conducted from 2000-2005 and included VOCs, explosive, and inorganic analysis (Baker, 2006). The 2007 Five-Year Review addresses LTM data and remedy protectiveness. Although groundwater monitoring is included in the LTM program further investigations of groundwater are being

conducted. LUCs prohibiting residential use within and around the Site 7 drainage area have been maintained through routine inspections.

The Navy plans to finalize a draft Remedial Design for Land-Use Controls following Navy-EPA resolution of RD language.

CERCLA Path Forward

- Remedy Implementation (including site inspections, groundwater, surface water, and sediment LTM in the drainage way, and LUCs)
- Five-Year Review (2012)
- FS/PP/ROD for groundwater, as appropriate
- RACR

Schedule 3-5 presents the FY08-09 schedule for Site 7.

3.2.8 Site 8—NEDED Explosives-Contaminated Wastewater Discharge Area

Site Description

Site 8 is a 300-foot drainage way located along the Eastern Branch of Felgates Creek, approximately 1.5 miles from the confluence of the creek and the York River (**Figure 3-8**). The drainage area lies east of the NEDED complex (Building 456). The topography is flat around Building 456, but slopes steeply into the drainage way. The ground surface is paved with the exception of the western and northern portions of the site which are wooded. Shallow (Yorktown-Eastover aquifer) groundwater at the site is encountered at approximately 6 ft bgs with flow towards Felgates Creek.

The Site 8 drainage way received wastewater from the NEDED complex from 1940 to 1975. The wastewater reportedly contained unspecified solvents, spent/neutralized acids, and nitramine compounds. In 1974, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge. In 1986, the effluent from the tower was diverted to the sanitary sewer serviced by HRSD. Since 1986, the site has reverted to a natural drainage area. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21,	Baker and Weston, 1993	00313
Round Two Remedial Investigation Report for Sites 2, 8, 18, and SSA 14	Baker, 2004	01548
EE/CA and AM for Contaminated Soil and Sediment at Site 8 and SSA 14	Baker, 2005	02076
Work Plan Interim Removal Action at Site 8 and SSA 14	Shaw, 2006	01890

Nature and Extent of Potential Contamination

Historical wastewater discharge was the source of potential contamination to soil, sediment, surface water, and groundwater.

Surface Soil. Several metals, VOCs, SVOCs, explosives, pesticides, and one PCB were detected in soils with maximum concentrations generally associated with the banks of the drainage way. Maximum concentrations of aluminum (26,300 mg/kg), arsenic (13.8 mg/kg), chromium (61.5 mg/kg), copper (68.4 mg/kg), cyanide (3.1 mg/kg), iron (31,700 mg/kg), lead (129 mg/kg), mercury (0.91 mg/kg), nickel (12.7 mg/kg), and zinc (249 mg/kg) were above background and residential soil RBCs and/or ecological screening values. Several PAHs (fluoranthene 1400 µg/kg) were detected at concentrations above residential RBCs and/or ecological screening values. 2,4,6-TNT, amino-DNTs, and RDX were the only explosives detected at concentrations exceeding human health risk screening values in surface soil, at maximum concentrations of 2,000 µg/kg, 4,900 µg/kg, and 30,000 µg/kg, respectively. HMX was detected in surface soil at a maximum concentration of 14,000 µg/kg, below the residential RBC. Arochlor-1260 was detected at maximum concentration of 10,000 µg/kg, which is above the residential and industrial RBCs and the ecological risk screening value. There were no VOCs or pesticides detected in surface soils at concentrations exceeding ecological or human health screening values.

Subsurface Soil. Several metals, SVOCs, pesticides, and explosives were detected in subsurface soils. There were no VOCs or PCBs detected in subsurface soil. The maximum concentrations of chromium (57.7 mg/kg), iron (58,500 mg/kg), thallium (1.6 mg/kg), and vanadium (79.9 mg/kg) were above background and ecological screening values. Concentrations of iron and thallium also exceeded residential RBCs. Three PAHs were detected at maximum concentrations above ecological screening values: fluoranthene (140 µg/kg), phenanthrene (130 µg/kg), and pyrene (110 µg/kg). There were no pesticides or explosives detected at concentrations greater than corresponding human health and ecological screening values.

Groundwater. Several metals, VOCs, SVOCs, pesticides, and explosives were detected in groundwater. There were no inorganic exceedances of background and RBCs and/or MCLs. Maximum VOC concentrations of 1,1-dichloroethene (12 µg/L), chloroform (10 µg/L), and TCE (8 µg/L) slightly exceeded MCLs and/or RBCs. Maximum explosives concentrations of 2,4,6-TNT (170 µg/L), amino-DNTs (200 µg/L), and RDX (300 µg/L) exceeded tap water RBCs. There were no other organics detected at concentrations greater than corresponding MCLs and/or RBCs.

Sediment. Several metals, VOCs, SVOCs, and explosives were detected in surface and/or subsurface sediment. The maximum concentrations of cadmium (1.6 mg/kg), cobalt (9.5 mg/kg), copper (60.5 mg/kg), iron (40,800 mg/kg), lead (51.4 mg/kg), nickel (20.6 mg/kg), and vanadium (51.6 mg/kg) exceeded background and adjusted residential RBCs and/or conservatively adjusted ecological screening values. Bis 2-Ethylhexyl phthalate (BEHP) was detected at a maximum concentration (34,000 µg/kg) greater than the screening value of 1,300 µg/kg. 2,4,6-TNT, 2-Amino-4,6-DNT, and 4-amino-2,6-DNT were detected at maximum concentrations of 12.11 µg/kg, 3.366 µg/kg, and 2.738 J µg/kg. There were no explosives detected at concentrations exceeding adjusted RBCs. There were also no VOCs detected at concentrations exceeding human health or ecological screening values.

Surface Water. Several metals, VOCs, SVOCs, and explosives were detected in surface water. Maximum concentrations of antimony and nickel were greater than background and corresponding adjusted residential RBCs and/or conservatively adjusted ecological screening values. 2,4,6-trinitrotoluene, 4-nitrotoluene, HMX, RDX, and tetryl were detected in surface water at maximum concentrations of 118.6 µg/L, 13.12 µg/L, 69.47 J µg/L, 102.6 µg/L, and 4.65 µg/L, respectively. The maximum concentrations of 2,4,6-TNT and RDX were greater than the adjusted residential RBC values. There are no ecological screening values associated with explosives.

Potential Risks

Human health and ecological risks were assessed for all media at Site 8.

No unacceptable human health risks were identified for the adult and adolescent recreational users, the current maintenance worker, the construction worker, or the future adult resident for exposure to any site media. A cumulative hazard index of 4.38 was calculated for the future child resident due primarily to the ingestion of amino-DNTs (HQ = 0.57), iron (HQ = 1.02), and arsenic (HQ = 0.39) and dermal contact with amino-DNTs (HQ = 0.94) in surface soils. Accidental ingestion of amino-DNTs (HQ = 1.07) in groundwater under a beneficial use scenario (lawn watering and car washing) also contributed to the total risk. Under the future residential scenario, risks associated with potable use of groundwater and exposure to subsurface soil were not evaluated.

Ecological Risks

A screening ERA and Step 3a refinement identified potential unacceptable risks for terrestrial receptors due to concentrations of amino-DNTs, HMX, RDX, Arochlor-1260, BEHP, chromium, iron, mercury, vanadium, and zinc in soils. Potentially unacceptable risks were identified for aquatic receptors due to concentrations of 2,4,6-TNT and 4-amino-2,6-DNT in surface water. Because concentrations of 2,4,6-TNT in soil could be impacting surface water, this constituent was also identified as posing a potential risk for terrestrial receptors. Potentially unacceptable risks were identified for aquatic receptors due to concentrations of BEHP in sediment.

Remedial Action(s)

Pre-removal confirmation sampling was conducted in the drainage area from the discharge point to the Felgates Creek channel to determine the extent of chemicals posing potential risk (Baker, 2005c). The EE/CA recommended excavation and off-site disposal of contaminated soil and sediment (Baker, 2005d) based on established remediation goals (RGs) (a sediment RG for Aroclor-1260 was established in the event that the contamination extended beyond the soil/sediment interface).

The removal action was initiated in March 2007 and is on-going. Thus far, 585 tons of soil/sediment and 44 tons of PCB-contaminated soil have been removed. Post-removal confirmation samples collected indicated that all explosives were either non-detect or below the established RG. Additionally, chromium, iron, mercury, vanadium, and zinc detected in confirmation samples were either below their established RGs or consistent with background values. Total PCBs (0.61 mg/kg) in soil exceeded the RG (0.1 mg/kg) at the transition of soil to sediment along the western excavation towards Felgates Creek. The

Navy, in partnership with the EPA and VDEQ reached consensus (April 2007 Partnering meeting) that no further action for explosives and metals in soil or sediment was required. It was determined that further removal of PCBs in sediment at the western boundary toward Felgates Creek with a maximum excavation out to the creek channel would continue. Removal actions are expected to be completed in August 2007.

CERCLA Path Forward

- Construction Completion Report (2007 removal action)
- RI for groundwater, surface water, and sediment
- FS/PP/ROD (for all media)

Schedule 3-6 presents the FY08-09 schedule for Site 8.

3.2.9 Site 9—Plant 1 Explosives-Contaminated Wastewater Discharge Area

Site Description

Site 9 is a discharge area that consists of a 600-foot drainage way and the immediate surrounding area located east of Lee Pond and topographically downgradient of Site 19 (**Figure 3-9**). The drainage way runs from the northwest portion of Building 10 westward, underneath Bollman Road, and discharges to Lee Pond. Wooded areas immediately surround the drainage way and rip-rap is present along the top of the relatively steep slope that leads down into the site. Groundwater is encountered at a depth of 10 ft – 29 ft bgs within the shallow Cornwallis Cave aquifer and flows to the southwest toward Lee Pond. Within the deeper Yorktown-Eastover aquifer, groundwater was encountered at approximately 39 ft – 51 ft bgs and flows west/southwest southeast.

The discharge area was used as a drainage way for Plant 1 (Building 10) explosives-contaminated wastewater and possibly organic solvents. The drainage way was reportedly in use from the late 1930s to 1975. A carbon adsorption tower was installed in 1974 to treat the wastewater prior to discharge in accordance with an NPDES permit. In 1986, the effluent from the tower was diverted to the sanitary sewer and ultimately to HRSD. Wastes including weapons casings and railroad ties were discarded along the drainage way bank prior to flowing under Bollman Road. Additionally, on the other side of Bollman Road, several drums were discarded along the drainage way. No information is available regarding the date(s) this material was disposed (Baker, 1994b). These wastes were removed along with contaminated soil and sediment in 1994. Currently, the site has reverted to a natural drainage way for surface runoff from surrounding areas and receives no discharge from the Plant 1 complex. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Action Memorandum and EE/CA	Baker, 1994	00615
Closeout Report, Sites 2 and 9 and Site Screening Area 4, Mine Casing and Debris Removal Action	IT Corporation, 1995	00646
Site 19 and Composites of Site 9, Site 19, SSA 6 & SSA7 Independent Sampling and Risk Screening Report	Black & Veatch, 1996	00781
Round Two RI Report, Sites 9 and 19	Baker, 1997	00889
Feasibility Study Sites 9 and 19	Baker, 1997	00966
Proposed Remedial Action Plan Sites 9 and 19	Baker, 1997	00967
Record of Decision,v3, Operable Unit Nos. VI and VII, Sites 9 and 19	Baker, 1998	02077

Nature and Extent of Potential Contamination

The Plant 1 wastewater discharge was the source of potential contamination to soil, sediment, surface water, and groundwater. Previous investigations included full suite analysis (TCL VOCs, TCL SVOCs, pesticides, explosives, TAL inorganics) for soil, groundwater, surface water, and sediment.

Soil. VOCs were not detected in surface or subsurface soil with the exception of acetone (a common laboratory contaminant) at 120 µg/kg. SVOCs detected in surface soil exceeding residential RBCs comprised benzo(a)anthracene at 1100 µg/kg, benzo(b)fluoranthene at 2200 µg/kg, benzo(k)fluoranthene at 520 µg/kg, benzo(a)pyrene at 1200 µg/kg, indeno(1,2,3-cd)pyrene at 550 µg/kg, and dibenzo(a,h)anthracene at 160J µg/kg. The same SVOCs were detected in subsurface soil, but at higher concentrations. Maximum concentrations detected were 1700 µg/kg, 2500 µg/kg, 980 µg/kg, 1700 µg/kg, 1000 µg/kg, 270 J µg/kg, respectively. Pesticide and explosives were detected in both surface and subsurface soil, however, not above residential RBCs. Inorganics detected in surface soil exceeding maximum background values comprised cadmium, at 1.8 K mg/kg, lead at 68.4 mg/kg, vanadium at 68.6 J mg/kg, and zinc at 133 mg/kg; all below residential RBCs. Arsenic was detected at a maximum concentration of 23.3 K mg/kg in excess of the residential RBC; however it did not exceed maximum background in soil. Additionally, metals detected in subsurface soil exceeding maximum background values comprised arsenic at 54.7 K, barium at 119 mg/kg, beryllium at 4.1 mg/kg, cadmium at 4.5 mg/kg, chromium at 46.5 mg/kg, cobalt at 41.4 mg/kg, copper at 81.9 mg/kg, iron at 170,000 mg/kg, lead at 124 L mg/kg, manganese at 755 J mg/kg, selenium at 1.5 K mg/kg, vanadium at 219 J mg/kg, and zinc at 400 mg/kg. Of these, arsenic, iron, and vanadium exceeded residential RBCs and lead exceeded the established USEPA soil action level (Baker, 1997c).

Groundwater. No VOCs (with the exception of chloroform, a common laboratory contaminant, at a maximum concentration of 11 µg/L) or pesticides were detected in groundwater at Site 9. Phenol (44 µg/L), 2,4-DNT (2 J µg/L) and bis(2-ethylhexyl)phthalate (10 µg/L) were the only SVOCs detected in groundwater. Explosives detected in groundwater comprised amino-DNTS (4400 µg/L), 2,4,6-TNT (880 µg/L), and 1,3,5-trinitrobenzene (0.79 µg/L). The following metals were detected at maximum concentrations above background levels: arsenic (25.9 µg/L), barium (78.8 µg/L), copper (7.2 µg/L), vanadium (12 µg/L), and total cyanide (10.5 µg/L). There were no MCL exceedences in groundwater.

Sediment. Other than low concentrations of common laboratory contaminants, toluene at 2J µg/kg was the only other VOC detected in sediment. No pesticides were detected in the sediment. A number of SVOCs exceeded maximum background concentrations, however, only benzo(a)anthracene (2400J µg/kg), benzo(b)fluoranthene (2600 µg/kg), benzo(a)pyrene (2100 µg/kg), and dibenzo(a,h)anthracene (300J µg/kg) exceeded residential RBCs. Explosives detected comprised amino-DNTS (2300 µg/kg) and 2,4,6-TNT (620 µg/kg). The following metals were detected above maximum background levels: arsenic at 55.5J mg/kg, cadmium at 1.9 K mg/kg, chromium at 47.3 mg/kg, copper at 22 mg/kg, iron at 54400 mg/kg, silver at 0.55 mg/kg, vanadium at 43.4 mg/kg, and zinc at 147 mg/kg. Of these, arsenic exceeded the residential RBC.

Surface Water. Of the surface water samples collected at Site 9, the only VOC detected was chloroform at 3 J µg/L (considered a common laboratory contaminant). BEHP at 2 J µg/L was the only SVOCs detected above background levels in surface water, however, it was below its established Biological Technical Assistance Group (BTAG) screening value. The only pesticide detected in surface water was heptachlor epoxide at a concentration of 0.08 K µg/L. The detection was above background levels and its surface water BTAG screening value. Explosive detections in surface water comprised RDX (6.1 µg/L), 1,3,5-trinitrobenzene (0.44NJ µg/L), 1,3-dinitrobenzene (0.46 NJ µg/L), 2,6-dinitrotoluene (2J µg/L), 2,4-dinitrotoluene (6J µg/L), amino-DNTS (1000 µg/L), HMX (14 µg/L), and 2,4,6-TNT (880 µg/L). 2,4-dinitrotoluene fell below the BTAG screening value. Maximum concentrations of metals above background in surface water comprised the following: arsenic (4.6 µg/L), barium at 45.3 µg/L, chromium at 5.6 µg/L, cobalt at 2.6 µg/L, iron (2960 µg/L), lead at 1.4K µg/L, manganese at 231 µg/L, vanadium at 4.5 µg/L, zinc at 10.7 µg/L, and total cyanide at 27.7 µg/L. Of these, manganese and cyanide exceeded surface water BTAG screening value. Additionally, while total aluminum did not exceed the maximum background concentration, it was detected at a maximum concentration of 200 µg/L, in excess of the BTAG screening value (25 µg/L). Dissolved aluminum was not detected in any surface water samples.

Potential Risks

The human health risks were evaluated for the future adult/child resident and current civilian worker from exposure to surface soil, surface water, and sediment. Additionally, risks were calculated for the future onsite resident for exposure to potable groundwater and shallow subsurface soil. Potential risks to the future construction worker were also evaluated from exposure to shallow subsurface soil. The following potential unacceptable risks were identified:

- RME non-cancer hazard (HI = 1.2) from ingestion (HI = 0.91) and dermal contact (HI = 0.31) with arsenic in surface soil for the future child resident was identified.
- RME non-cancer hazard (HI = 1.5) from ingestion (HI = 0.96) and dermal contact (HI = 0.51) with 2,4,6-TNT in surface water for the future child resident was identified.
- RME non-cancer hazards (HI=120), primarily from 2,4,6-TNT (HQ=110) and dissolved arsenic (HQ=5.5) and cancer risks (total incremental lifetime cancer risk (ILCR)=3.6x10-4), primarily from 2,4,6-TNT (ILCR=1.4x10-4) and dissolved arsenic (ILCR=2.1x10-4) were identified for the future child resident from ingestion of shallow groundwater.
- RME non-cancer hazards (HI=51), primarily from 2,4,6-TNT (HQ=48) and dissolved arsenic (HQ=2.4) and cancer risks (total ILCR=6.3x10-4), primarily from 2,4,6-TNT (ILCR=2.5x10-4) and dissolved arsenic (ILCR=3.6x10-4) were identified for the future adult resident from ingestion of shallow groundwater.
- RME non-cancer hazard (HI=1.4), due to 1,3,5-TNB (HQ=1.0), was identified for the future child resident from ingestion of deep groundwater.
- Ecological risks were evaluated for the terrestrial and aquatic ecosystems. Potential ecological risks to terrestrial receptors were identified with exposure to heptachlor epoxide, nitramines, aluminum, chromium, iron, lead, and vanadium in soil. However, it was determined that no further actions were necessary to address concentrations of aluminum, chromium, lead, iron, and vanadium based on a comparison of detections to background values. Additionally, it was determined the heptachlor epoxide is not a site-related compound. It is noted that heptachlor epoxide and 2,4,6-TNT were not retained as soil ECOCs; however, due to the surface water contamination, these constituents were included in the models.
- Surface water concentrations of amino-DNTs, aluminum, cyanide, and iron may adversely impact the aquatic environment in the drainage way at Site 9. The sediment contained elevated levels of SVOCs, nitramines, and inorganics (Baker, 1997c). Sediment concentrations of iron produced an HQ of 45.7 to the great blue heron (in the least conservative model); however, iron was detected in deeper ditch sediments (4 to 8 inches bgs) to which the heron in unlikely to be exposed. Although arsenic concentrations in Site 9 ditch sediments exceeded background freshwater stream sediment concentrations, they did not produce unacceptable HQ values when using the Effects Range-Median (ER-M) value for arsenic. It is noted that the nitramines detected in the sediment during the Round Two investigation were not detected in any previous investigations in the drainage way, indicating that the surface water concentrations of nitramines are possibly beginning to influence the quality of the sediment. Additionally, it was determined that remediation of ditch sediments would cause greater harm to the local ecology then leaving contaminants such as arsenic, iron, vanadium, and lead in place (Baker, 1998d).

Remedial Action(s)

A removal action was completed in December 1994 to address contaminated soils and sediments, as well as, surface and subsurface debris. The remedial action included the concurrent removal of ordnance and railroad ties to a depth of four ft bgs at the lower end

of the drainage way before it crosses Bollman Road (Baker, 1997d). Following the excavation of contaminated media and debris, confirmation soil samples were collected and analyzed for VOCs, SVOCs, inorganics, pesticides/PCBs, and explosives (IT Corporation, 1995a). The excavated area was backfilled with on-base borrow topsoil and re-graded.

A ROD for soil, surface water, and sediment was signed in March 1998 and documented the decision for no further remedial action. No further action was selected for soil, surface water, and sediment as risks posed to human health only slightly exceeded a hazard index threshold of 1, and there were no cancer risks from exposure to soil, sediment, and surface water; therefore potential human health risks were considered acceptable or manageable. The Navy, EPA, and VDEQ agreed that remediation would result in greater ecological harm than leaving the drainage undisturbed for the concentrations remaining in soil and sediment.

CERCLA Path Forward:

- RI for groundwater
- FS, as appropriate
- PP/ROD for groundwater
- Five-Year Review (2012)
- RACR

Schedule 3-7 presents the FY08-09 schedule for Site 9.

3.2.10 Site 11—Abandoned Explosives Burning Pits

Site Description

Site 11, Abandoned Explosives Burning Pits, is a 0.5-acre area located east of Main Road, north of a steep ravine which leads to Indian Field Creek, and just south of Site 17 and west of Site 1 (**Figure 3-10**). Site 11 is primarily a grass-covered cleared area surrounded by woods with level topography at approximately 30 ft above mean sea level (msl). Railroad tracks run along the western and northern portions of the site. Surface run-off is southeast to a drainage ditch that is no more than 2 ft deep and is only wet following storm events (groundwater does not recharge the drainage ditch). This intermittent drainage ditch continues eastward and becomes a tributary to Indian Fields Creek.

Site 11 was operated as explosives burn pits from 1930 to 1950. Waste solid explosives (e.g., TNT, RDX, and HMX), explosive contaminated sludges, and packaging contaminated with explosives were placed in pits and ignited. Burning of waste residue may have resulted in potential releases to soil, groundwater, and the intermittent drainage ditch through surface water run-off during storm events. It is assumed that approximately 200 pounds of explosive residues may have been deposited at the site after 20 years of burning disposal activities (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984). A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Round Two Remedial Investigation Report Sites 11 and 17	Baker, 1998	01553
Feasibility Study Report Sites 11 and 17	Baker, 1999	01573
Proposed Remedial Action Plan Sites 11 and 17	Baker, 1999	01600
Record of Decision, Operable Unit Nos. X and XI, Site 11 and Site 17	Baker, 2000	01094
Remedial Action Report Sites 11 and 17	OHM, 2001	01090
Phase I RI Report for GROUNDWATER at Sites 1, 3, 6, 7, 11, 17, 24, and 25	HILL, 2007	(To be added to AR)

Nature and Extent of Potential Contamination

Previous investigations included full suite analysis of soil, surface water, sediment, and groundwater (TCL VOC, TCL SVOCs, PCBs, pesticides, explosives, and TAL inorganics).

Surface water samples from the intermittent drainage ditch contained arsenic, copper, lead, mercury, nickel, and zinc at concentrations exceeding various aquatic chronic criteria, however, most were comparable to background concentrations. The drainage was dry in subsequent field investigations (Baker and Weston, 1993b). No VOCs, SVOCs, pesticides, PCBs, or explosives were detected above applicable criteria in sediment. Mercury in sediment was the only metal detected above applicable screening criteria (Baker and Weston, 1993b). No VOCs, SVOCs, pesticides, or explosives were detected in soil at concentrations above applicable screening criteria. Arsenic (in surface and subsurface soil) and beryllium (in surface soil) were the only metals detected above applicable screening criteria. No chemicals exceeded applicable criteria were detected in groundwater (Baker, 1998e).

Potential Risks

The human health risk assessment indicated no unacceptable cancer risks or non-cancer hazards from soil and non-potable exposure (watering lawns, car washing, etc.) to groundwater for adult/child residents. Groundwater investigations at Site 11 are on-going to determine potential potable groundwater risks.

The SERA identified concentrations of aluminum, chromium, copper, iron, lead, mercury, and vanadium in soil exceeding ecological risk screening values. However, copper (max concentration of 220 mg/kg) and mercury (max concentration of 1.6 mg/kg) were the only constituents that exceeded background concentrations (Baker, 1998e). Possible adverse effects [lowest observed adverse effects level (LOAEL)] to aquatic receptors may exist from exposure to aluminum, cobalt, and vanadium in sediment. However, for less conservative model inputs and mean sediment exposure concentrations there are no HQs greater than 1

for LOAEL. Furthermore, the drainage ditch is intermittent and there is no viable aquatic habitat at Site 11.

Remedial Action(s)

A ROD for Site 11 soil was signed in October 2000 to address risks to ecological receptors from elevated levels of copper and mercury in site soil. The selected remedy was excavation and off-site disposal of an estimated 45 cy of soil, confirmatory sampling, followed by backfilling, addition of topsoil and site restoration. The removal action consisted of 400 cy (655 tons) of copper and mercury contaminated soil and ash material. Following excavation, clean fill from an on-Base source and a minimum of 4-inches of topsoil was placed over the removal area and a vegetative cover was established (OHM, 2001b). Confirmation sample results demonstrated soil concentrations of copper were below 1.2 mg/kg and non-detect for mercury, below the established RGs (OHM, 2001b). No unacceptable human health risks were identified in soil for Site 11 and the remedial action mitigated the potential unacceptable ecological risks related to site soils.

Response complete has been achieved for soil, waste ash, and surface water and sediment following implementation of the ROD. Groundwater assessment is on-going at Site 11 to determine potential potable groundwater risks.

CERCLA Path Forward

- TM (assess potable groundwater risk)
- PP / ROD for groundwater
- RACR

Schedule 3-8 presents the FY08-09 schedule for Site 11.

3.2.11 Site 12—Barracks Road Landfill

Site Description

Site 12, the Barracks Road Landfill, currently consists of three former disposal areas: Area A, Area B/C, and the Wood/Debris Disposal Area (**Figure 3-11**). Area A was the former location of an industrial and non-industrial waste incinerator facility. Ash from the incinerator facility was disposed throughout Area A. Area B/C is located adjacent to the access road leading to the former incinerator facility. Area B/C is an area of uneven terrain where ash may have been disposed. The Wood/Debris Disposal Area was created when lumber, wood pallets, and miscellaneous construction debris were disposed of and pushed into a ravine that leads to Ballard Creek. The following is a brief description of each disposal area:

- Area A is 4.4 acres, partially wooded, and formerly included an incinerator building and smoke stack that were razed 1997. The former incinerator building contained two incinerators (SWMUs 142 and 143) to burn wastes. Incinerator ash was disposed of in a topographic low area immediately southwest of the incinerator building that drains to Ballard Creek.

- Area B/C east of Barracks Road and adjacent to the access road to the incinerator in Area A is a 1.6 acre open field with wooded steep slopes and ravines.

- The Wood/Debris Disposal Area (formerly identified as Site 22 and SWMU 164) east of Areas A and B/C, is a 3.3 acre open field with protruding construction debris visible adjacent to Ballard Creek. A ditch with an intermittent stream channel is located adjacent to the Wood/Debris Disposal Area (Baker, 1997e).

The topography of Site 12 disposal areas slope to the south-southeast from Barracks Road toward Ballard Creek. With the exception of some relatively flat, grassy field areas, Site 12 is predominantly wooded. An industrial area is located west and north of the Site 12 Disposal Areas. The former disposal areas at Site 12 operated from 1925 to the mid-1960s and received an estimated 1,400 tons of waste, including general refuse, scrap wood, piping, steel containers, and nitramine-contaminated packaging. Wastes were transported to Area A by truck and railcar and open-burned in two incinerators prior to disposal. Incinerator ash was disposed of on the hillside behind the incinerator and spread across the top of Area A. Scrap metal, charred wood, cloth, and glass have been observed in the ash. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Study Area Analysis	USEPA, 1992	00289
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Operable Unit Evaluation Report	Baker, 1993	01060
Round Two RI Report Site 12	Baker, 1996	00640
AOC 22, Site 12, and SSA 2, SSA 19 and King Creek Independent Sampling and Risk Screening Report	Black & Veatch, 1996	00669
Feasibility Study Report Site 12	Baker, 1996	00647
Proposed Remedial Action Plan Site 12	Baker, 1996	00654
Record of Decision, Operable Unit Nos. III, IV, and V, Site 12	Baker, 1997	00871
Construction Closeout Report for Site 12 – Area A	OHM, 1998	01154
Long-Term Monitoring	1998–2003	N/A
Long-Term Monitoring Report, Site 12	Baker, 2000	01219
Site 12 Long-Term Monitoring Report - 1998-2000	Baker, 2005	02078
Partnering Team Consensus Statement 9-1-06-45	-----	N/A
Long-Term Monitoring Work Plan	CH2M HILL, 2007	(Draft – No AR No.)

Nature and Extent of Potential Contamination

The waste materials burned/disposed of in the Site 12 Disposal Areas is the source of potential contamination to site media. Previous investigations of Site 12 included sampling and full suite analysis (VOCs, SVOCs, pesticides, PCBs, nitramine compounds, inorganics) of surface and subsurface soil, groundwater, and surface water and sediment of Ballard's

Creek and tributaries. Several metals were detected in Area A surface soils at concentrations exceeded background levels, with lead, mercury, and zinc being the most common metals. PAHs and low levels of pesticides were also detected in Area A soils, as well as VOCs at low concentrations (3 µg/kg)) and explosives (2,4,6-trinitrotoluene 15,000 µg/kg) at low frequency of detection (3 out of 17 samples). In general these constituents were also detected in subsurface soil but at lower concentrations and less frequently. Only low levels of PAHs and pesticides were detected in soils from Area B/C and the Wood/Debris Disposal Area. Metal concentrations in these areas were consistent with background levels.

In groundwater, low concentrations of VOCs (maximum concentration 55 µg/L [trichloroethene (TCE)]) and nitramine (maximum concentration 4.4 µg/L [hexahydro-1,3,5-trinotro-1,3,5-triazine (RDX)] compounds were detected. However, their presence in groundwater is attributed to past operations at AOC 23 – Barracks Road Landfill Industrial Area, which is upgradient of Site 12. Concentrations of metals were similar to background, and no SVOCs, pesticides or PCBs were detected in groundwater samples. The deeper Yorktown-Eastover Aquifer does not appear to have been affected by past operations at Site 12 disposal areas.

In a seep sample, TCE was detected at a maximum concentration of 3,300 µg/L (near the drainage to Ballard Creek between the upgradient industrial area suggesting surface runoff from the Site 12 disposal area is not the likely source of VOCs in surface water. Pesticides were detected upstream of Site 12. PAHs, PCBs, and nitramine compounds were not detected in surface water samples. Elevated concentrations of the total metals cadmium, copper, mercury, lead, and nickel exceeded surface water criteria, however, only the concentrations of the dissolved metals copper, mercury, and nickel exceeded surface water criteria.

In sediment, PAHs, PCBs, and metals were the primary constituents detected.

Only low levels common laboratory contaminant VOCs (acetone 49 µg/kg and 2-butanone 140 µg/kg) were detected in sediment samples. Elevated concentrations of SVOCs, pesticides, and PCBs were detected above screening values (effect range-medium values). Several metals (beryllium, barium, cadmium, lead, manganese, mercury, silver, and zinc) were detected above background concentrations in sediment, with cadmium, lead, mercury, silver, and/or zinc exceeding screening values in at least one sample.

Unacceptable human health risks were identified for exposure to lead in Area A surface soil for a trespasser (HI = 1.5) and child resident (HI = 5.9). The potable use of groundwater also poses unacceptable human health risks from TCE exposure. There are no unacceptable human health risks from residential use exposure to surface water or sediment.

Potential terrestrial ecological risks were identified due to the presence of metals (lead and cadmium) in Area A surface soil. Pesticides, PCBs, PAHs, and metals pose potential risks to aquatic ecological receptors in Ballard Creek surface water and sediment. The presence of metals in the surface water of Ballard Creek indicates the potential for moderate ecological risk. Because elevated levels of organic compounds were detected in Ballard Creek surface water and sediment , an expanded Site 12 Study Area was established, as documented in the 1996 Feasibility Study (FS) (Baker, 1996a), to encompass the 92 acre watershed of Ballard's Creek (see Figure 3-11).

Remedial Action(s)

As noted in the FS and PP, it was determined that only soil in Area A required active remediation, and that active remediation of groundwater was not considered because TCE in groundwater did not exceed a non-potable use (car washing and lawn watering) risk-based RL (16,000 µg/L) since it was determined that groundwater would not likely be used as a potable supply. Sediment in Ballard Creek was not considered for active remediation because it was determined that dredging would result in greater adverse ecological impact than those potential posed under existing conditions. Based on the absence of unacceptable risk in Area B/C and the Wood/Debris Disposal Area, no remedial action was determined necessary for these disposal areas.

The ROD for Site 12 was signed in April 1997 to address lead in soil in Area A, TCE in shallow groundwater, and metals and PAHs in sediment in Ballard Creek watershed. The remedy for soil was excavating soil, removing surface debris, spreading excavated soil over flat portions of Area A, and backfilling the excavated area with clean soil, followed by a clay cap over the landfill area. For groundwater, the selected remedy is land use controls consisting of restrictions throughout Area A, Area B/C, and the Wood/Debris Disposal Area to prohibit the use of groundwater as a drinkable source and groundwater monitoring of shallow and deep wells across the Site 12 Study Area. The remedy for surface water and sediment is long-term monitoring of Ballard Creek and its tributaries.

Remedial action construction for Area A began in July 1997 and consisted of well abandonment; demolition of the incinerator facility, incinerator stack, and a one-story maintenance shed; and implementation of erosion and sediment controls. Metal debris scattered throughout the site was removed and sent to a recycling facility (OHM, 1998). In addition, the limits of the landfill were defined and contaminated material located outside the limits of the landfill were placed within the landfill. The landfill was subsequently capped with a geosynthetic clay liner and covered with soil. Finally, a surface drainage channel (i.e., Tri-Lock Block) and settling pond was installed and the site was revegetated and restored.

Implementation and findings of the LTM program are summarized in Final Long-Term Monitoring Report Site 12, Naval Weapons Station, Yorktown, Virginia (Baker, 2005e). Because AOC 23 is the source of VOCs in groundwater, the Navy has initiated investigation of groundwater, surface water, and sediment upgradient of Site 12. Therefore, there have been several agreements with the EPA and VDEQ to modify the LTM program between 2003 and 2006. Consequently, the objective of LTM for Site 12 is focused on monitoring for the detection of potential releases from waste remaining in place in the Site 12 Disposal Areas. A revised Long-term Monitoring Work Plan for Site 12 (CH2M HILL, 2007a) is currently in regulatory review. This revised LTM Work Plan focuses on monitoring groundwater and sediment immediately adjacent to and downgradient of the disposal areas for metals.

The Navy plans to finalize a draft Remedial Design of Land-Use Controls following resolution of RD language with EPA legal.

CERCLA Path Forward

- Site Inspection (soil cover maintenance, as needed)
- LTM (Biannually for groundwater)
- Five-Year Review (2012)
- RACR

Schedule 3-9 presents the FY08-09 schedule for Site 12.

3.2.12 Site 16—West Road Landfill and Site Screening Area 16 – Building 402 Metal Disposal Area and Environs

Site Description

Site 16, the West Road Landfill, is located adjacent to West Road near Lee Road on WPNSTA Yorktown. SSA 16, Building 402 Metal Disposal Area and Environs (former SWMU 69), overlies the northern portion of Site 16 landfill; consequently these sites have been studied together (**Figure 3-12**). Site 16 disposal area is approximately 8 acres and received waste from 1950 to the early-1960s at an estimated 9 tons per year, including dry carbon batteries, banding materials, pressure transmitting fluid, other chemicals, and 55-gallon drums with unknown contents (C.C. Johnson & Associates and CH2M HILL, 1984). SSA 16 is approximately 0.4 acres used for scrap metal storage. SSA 16 was also used for waste container storage prior to the remodeling and conversion of Building 402 into a hazardous waste storage facility (Baker, 1995b).

The northern portion of Site 16 (including SSA 16), south of railroad tracks, is level and predominantly covered with grass. The remaining portion of Site 16 is wooded. Site 16 is located upgradient of a wetland adjacent to Felgates Creek that drains into the York River approximately 1.5 miles from Site 16 (Baker, 1995b). A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Engineering Estimate/Cost Analysis for Sites 4, 16, and 21 Removal Actions	Baker, 1993	00311
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Site 16: West Road Landfill Clearance Sampling and Polychlorinated Biphenyl (PCB) Screening Report	Black & Veatch, 1994	00676
Closeout Report Sites 4, 16, and 21	IT Corporation, 1995	00616
Round Two RI and Baseline Risk Assessment Site 16 and Site Screening Area 16	Baker, 1995	00635 (Volume I) 01177 (Volume II)
Proposed Remedial Action Plan Site 16 and Site Screening Area 16	Baker, 1995	00672
Record of Decision, Operable Unit Nos. II, Site 16 and Site Screening Area 16	Baker, 1995	00671

Document Title /Milestone	Author/Date	AR Document Number
Five-Year Review Report for Sites 1, 6, 7, 12, 16, and 19	Baker, 2002	01310
Draft Remedial Design for Land Use Controls for Site 16 and SSA 16	Baker, 2006	(Draft – No AR No.)
Considerations for Risk Management at Site 16/Site Screening Area 16	CH2M HILL, 2007	(Draft – No AR No.)

Nature and Extent of Potential Contamination

The source of potential contamination is landfill materials from Site 16. Previous investigations included a full suite analysis (VOCs, SVOCs, PCBs, pesticides, and inorganics) of soil, surface water, sediment, and groundwater.

Surface Soil. Metals detected with maximum concentrations above background are antimony, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc. Of these, chromium (1060 mg/kg), iron (217,000 mg/kg), and lead (2610 mg/kg) exceeded residential RBCs, and silver (12.4 mg/kg) exceeded BTAG screening criteria. Although the maximum concentration of arsenic (20 mg/kg) exceeded the residential RBC, it is below background.

Pesticides and PCBs detected above background consist of beta-benzene hexachloride (beta-BHC), heptachlor, dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, methoxychlor, endrin ketone, alpha-chlordane, Aroclor-1254, and Aroclor-1260. Aroclor-1254 (2100 J µg/kg) and Aroclor-1260 (1400 J µg/kg) also exceeded residential RBCs and BTAG screening criteria.

No VOCs were detected in surface soil, with the exception of low levels of methylene chloride and acetone, which are both common laboratory contaminants.

Maximum concentrations of the SVOCs: fluoranthene (1,500 µg/kg), pyrene (1,300 µg/kg), chrysene (1,100 µg/kg), and benzo(b)fluoranthene (1,700 µg/kg) were detected above background and BTAG screening criteria. Of these, only benzo(b)fluoranthene exceeded the residential RBC.

Subsurface Soil. Aluminum, antimony, arsenic, beryllium, chromium, cobalt, iron, nickel, and zinc were detected at concentrations above background; however, only arsenic (38.2 mg/kg) and iron (57,000 mg/kg) exceeded residential RBCs.

There were no pesticides or PCBs detected in subsurface soils. With the exception of low levels of acetone, which is a common laboratory contaminant, there were no VOCs detected in subsurface soil, and there were no SVOCs detected in subsurface soils at concentrations exceeding background or residential RBCs.

There were no constituents detected in subsurface soil that exceeded the BTAG screening criteria.

Groundwater. Total metals detected at concentrations exceeding background consist of aluminum, arsenic copper, iron, lead, and selenium. There were no total metals detected at concentrations exceeding the MCL.

Dissolved metals detected at concentrations exceeding background consist of arsenic, beryllium, chromium, copper, lead, manganese, nickel, and zinc. None of these constituents exceeded residential tap water RBCs or MCLs. Antimony (19.3 J µg/L) exceeded the MCL and the adjusted residential RBC value for tap water; however, it was below background (21.1 µg/L).

Pesticides consisting of aldrin (0.043 J µg/L), endrin (0.02 J µg/L), and 4,4'-DDT (0.058 J µg/L); VOCs consisting of acetone (0.6 J µg/L), 1,1-DCE (2 µg/L), 1,1-DCA (1 µg/L), 1,1,1-TCA (7 µg/l), TCE (0.7 J µg/L), and PCE (0.6 J µg/L); and SVOCs consisting of 1,4-dichlorobenzene (2 J µg/L) and di-n-butylphthalate (1 J µg/L) were detected at low concentrations. However, no pesticides, VOCs, or SVOCs were detected at concentrations exceeding the MCL.

Surface Water. The total metals detected above background were lead and selenium. Total metals aluminum (99 J µg/L), iron (2,000 J µg/L), lead (5.9 µg/L), and manganese (374 µg/L) exceeded BTAG screening values.

Dissolved metals consisting of aluminum, manganese, and zinc exceeded background. Dissolved aluminum (129 J µg/L), iron (419 J µg/L), and manganese (382 J µg/L) exceeded BTAG screening criteria. Only manganese excceded an adjusted (times 10) tap water RBC.

Pesticides, PCBs, and SVOCs were not detected in surface water. Additionally, with the exception of low levels of toluene, , which is a common laboratory contaminant, VOCs were not detected in surface water.

Sediment. Metals detected at concentrations exceeding background consist of cadmium, copper, and silver. However, none exceeded their respective residential RBC or BTAG screening values.

Pesticides and PCBs consisting of heptachlor expoxide, endrin aldehyde, were detected at concentrations above background. Aroclor-1260 (45 J µg/kg) was detected above BTAG screening criteria . No pesticides or PCBs were detected at concentrations exceeding RBCs .

VOC detected were chloromethane, 2-butanone, and toluene. However, none exceeded residential RBCs or BTAG screening values. There were no SVOCs detected in sediment.

Potential Risks

In the Round Two RI (Baker, 1995b), potential risks were evaluated for the civilian worker for surface soil, surface water, sediment; the future adult construction worker for subsurface soil; and the future adult resident and future child resident for surface soil, surface water, and sediment. The following unacceptable human health risks were identified:

- Although a non-cancer hazard (HI = 2.0) from ingestion (HI = 1.6) and dermal contact (HI = 0.39) with surface soil exceeded the acceptable hazard index threshold of 1 for the future child resident, no individual constituents had HQ values greater than 1.0 and there are no cumulative target organ effects, and risk management is warranted.
- Although a non-cancer hazard (HI = 3.0) from ingestion (HI = 3.0) and dermal contact (HI = 0.04) with potable use of groundwater, primarily from exposure to antimony (HQ = 1.7) was identified for the future child resident, no other individual constituents had

an HQ of greater than 1.0, there are no cumulative target organ effects, and risk management is warranted.

- Although a non-cancer hazard (HI = 1.3) from ingestion (HI = 1.3) and dermal contact (HI = 0.019) with groundwater was identified, no individual constituents had HQ values greater than 1.0 and risk management is warranted.

With the exception of antimony, no constituents contributed an individual HQ greater than 1.0; and, antimony concentrations in groundwater are less than background. All other constituents contributing to potential unacceptable non-cancer hazards are non-additive since they affect different target organs. Therefore, potential hazards to the future adult resident and future child resident warrant risk management for (Baker, 1995b; CH2M HILL, 2007b).

Cancer risks and non-cancer hazards to potential future residents via exposure to subsurface soil was evaluated in Considerations for Risk Management at Site 16/ SSA 16 (CH2M HILL, 2007b), since this scenario was not completed during the Round Two RI.

- No potential unacceptable cancer risks were identified for the future adult resident or future child resident from exposure to subsurface soil.
- A potential unacceptable non-cancer hazard (HI = 1.7) from ingestion (HI = 0.21) and dermal contact (HI = 1.5) with subsurface soil was identified for the future adult resident. However, there are no target organs with an HI value of greater than 1.0.
- A potential unacceptable non-cancer hazard (HI = 4.7) from ingestion (HI = 2.0) and dermal contact (HI = 2.7) with subsurface soil was identified for the future child resident. With the exception of vanadium (HQ = 1.8 for dermal exposure and 0.45 for ingestion), no individual constituents had HQ values greater than 1.0. Since the maximum concentration of vanadium detected in subsurface soil (58.3 mg/kg) is below the background (70.3 mg/kg), there are no unacceptable non-cancer hazards associated with subsurface soil.

An ecological risk assessment was completed for soil, groundwater, surface water, and sediment in the Round Two RI. A few metals in soil and sediment, a few organic compounds in sediment, and manganese in surface water were further evaluated in the ERA. Based on the results of the ERA, and taking into consideration background concentrations and the conservative nature of the ecological risk assessment models, the Navy in partnership with EPA and VDEQ agreed there are no unacceptable risks to ecological receptors at Site 16/SSA 16 (Baker, 1995c).

Remedial Action(s)

In September 1992, scrap metal was partially removed from the surface along the northeastern section of Site 16. The area was backfilled with soil and revegetated (Black & Veatch, 1994).

In 1994, the landfill wastes and debris including 420 tons of batteries, 60 tons of debris, 125 tons of silica gel, ordnance, and other miscellaneous debris and buried waste were removed from the site (IT Corporation, 1995b). Post-removal soil samples were collected for analysis of for VOCs, SVOCs, pesticides/PCBs, and metals. Risk based screening values were

exceeded for arsenic, beryllium, manganese, benzo(a)pyrene, dieldrin, Aroclor-1254, and Aroclor-1260. Post removal confirmation sample results were included in the risk assessment evaluation.

Based on the conclusions from the Considerations for Risk Management at Site 16/ SSA 16 (CH2M HILL, 2007b), the Navy is proposing an ESD to the ROD that will allow for unrestricted land use at Site 16/SSA 16.

CERCLA Path Forward

- Finalize TM (risk management of groundwater)
- ESD, if consensus for no unacceptable risk
- RACR

Schedule 3-10 presents the FY08-09 schedule for Site 16/SSA16.

3.2.13 Site 17—Holm Road Landfill

Site Description

Site 17, Holm Road Landfill, is a 2-acre [former] disposal area located south of Holm Road and east of Main Road (**Figure 3-13**). Most of the area is cleared, with woodlands to the south and east and cleared areas with industrial buildings to the north and west. The site lies on a topographically high area with a small (~ 0.5 acre) low lying isolated wetland area created following a soil removal action in 2000 in the north-central part of the site. Surface runoff is overland to off-site drainage ditches that feed tributaries of Indian Field Creek east of the site and to the isolated wetland. Former railroad tracks (now gravel) bisect the western third of the site. Additionally, railroad tracks lie along the eastern boundary of the site.

Disposal activities at Site 17 occurred for approximately 10 years from the 1950s to the 1960s. Wastes reportedly disposed included acid batteries from underwater weapons, hydraulic fluids (Dolconik) from the de-milling of torpedoes, other types of hydraulic fluids, drums, and scrap metal. An estimated 60 tons of waste were deposited in the disposal area over 10 years (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984).

There is no documentation of activities conducted at Site 17 since the cessation of landfill operations until the Site was identified during the 1984 IAS. Investigations included sampling and analysis of surface and subsurface soil and groundwater, geophysical survey and test pits. No waste was identified in monitoring well borings or test pits excavated during remedial investigation activities between 1993 and 1998 (Baker, 1998e). Interviews with Navy personnel report the landfill waste had been removed; however, there is no documentation of construction of a soil cover on the landfill or removal of landfill waste. Test pits activities were conducted in 2007 in an area of previously identified geophysical anomaly to verify the presence or absence of waste at Site 17; no waste observed in the 2007 test pits. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Round Two RI Report Sites 11 and 17	Baker, 1998	01553
Feasibility Study Report Sites 11 and 17	Baker, 1999	01573
Proposed Remedial Action Plan Sites 11 and 17	Baker, 1999	01600
Record of Decision, Operable Unit Nos. X and XI, Site 11 and Site 17	Baker, 2000	01094
Remedial Action Report Sites 11 and 17	OHM, 2001	01090
Statistical Evaluation of Post-Excavation Soil Sampling Data, Site 17 – Holm Road Landfill	Baker, 2005	(Not in AR – will be added)
Phase I RI Report for GROUNDWATER at Sites 1, 3, 6, 7, 11, 17, 24, and 25	CH2M HILL, 2006	(Draft – No AR No.)
Technical Memorandum – Test Pits	HILL, 2007	(To be added to AR)

Nature and Extent of Potential Contamination

Previous investigations included full surface and subsurface soil samples for full suite parameter analysis (TCL SVOCs, pesticides/PCBs, explosives, TAL inorganics), cyanide, pH, TOC, and CEC. Elevated PAHs (total PAHs = 10 to 42 mg/kg) were detected in soil in the north central portion of Site 17. The area of elevated PAHs covered approximately 17,650 ft2 and was detected down to a depth of 2 ft. Zinc and mercury were the only metals detected above background concentrations in the area of potential PAH contamination (Baker, 1998e).

Groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides/PCBs, explosives, filtered and unfiltered TAL inorganics, cyanide, nitrate, nitrite, dissolved gases, bromide, chloride, sulfate, orthophosphate, TDS, and TSS. No organic or inorganic compounds were identified in groundwater above MCLs.

Potential Risks

PAHs in soil in the north central portion of Site 17 posed unacceptable risk to the child and adolescent resident. No unacceptable risk was identified from non-potable exposure (watering lawns, car washing, etc.) to groundwater for the most conservative (child resident) exposure scenario (Baker, 1998e). Based on the SERA, concentrations in soil of aluminum, chromium, iron, mercury, vanadium, and zinc exceeded ecological risk screening values.

Remedial Action(s)

A ROD for soil was signed in October 2000 to address human health risks associated with exposure to PAHs. Groundwater was not addressed in this ROD and is under further investigation and has not been addressed by any remedial actions. Remedial activities completed in August 2000 included the excavation of approximately 940 tons of PAH-

contaminated soil to a depth of 2 feet (OHM, 2001b). The material was classified as non-hazardous for off-site disposal. Clean fill from an on-Base source was placed within the excavated area and imported topsoil was placed over the impacted area.

Total cPAH concentrations in post-removal confirmation samples ranged from less than 1 mg/kg to 6 mg/kg, which are below the industrial PRG of 10 mg/kg. The remedial action mitigated unacceptable human health risks for current land use. Potential ecological risks from zinc and mercury in soil were assumed to be mitigated from the removal of the PAH contaminated area.

LUCs prohibiting residential development at the site have been maintained by the Navy through routine inspections. During development of the remedial design for LUCs and following review of post-removal confirmation sample results, it was determined that the need for LUCs warranted reconsideration. A Final Site 17 Statistical Evaluation of Post-Excavation Soil Sampling Data (Baker, 2005f) compared the 16 post-excavation confirmation samples to residential soil cleanup goal for cPAHs of 4.0 mg/kg. With the exception of one sample (total cPAHs at 5.8 mg/kg), all post-removal soil concentrations were below the RG of 4.0 mg/kg for the child resident. The USEPA statistical software package, ProUCL, calculated the 95 percent UCL for total cPAHs in soil at 0.8 mg/kg. Therefore, risk management consideration that no unacceptable risk for UUUE remains at the site from exposure to soil is warranted, because only one sample exceeded the child resident RG and the 95 percent UCL for total cPAHs across Site 17 is 0.8 mg/kg, well-below the child resident RG.

CERCLA Path Forward:

- Finalize TM (verify absence of waste)
- ESD (Document no waste and no soil risk for LUC removal)
- Finalize RI for groundwater (NFA for groundwater)
- NFA PP /ROD for groundwater
- RACR

Schedule 3-11 presents the FY08-09 schedule for Site 17.

3.2.14 Site 18—Building 476 Discharge Area

Site Description

Site 18 is located within a wooded area north of Building 476 and includes a small, unlined, one-quarter mile long drainage ditch that flows perpendicular from the building (**Figure 3-14**). Wastewater discharge from Building 476 into the ditch reportedly contained battery acid waste, consisting of hydrochloric acid or calcium hydroxide and dissolved metals such as lead, cadmium, nickel, and antimony. An estimated 100 to 200 pounds of metals may have been discharged over the 20 year use of the area (1940s to the 1960s). Battery acid waste no longer discharges from Building 476 into the ditch. Currently, Site 18 is overgrown and the drainage ditch receives surface water runoff from the surrounding area and Building 476. The drainage way flows toward a larger, unnamed intermittent tributary that leads to Lee Pond. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation for Sites 1-9, 11, 12, 16-19, and 21	Baker, 1993	00313
Round Two Remedial Investigation Report for Sites 2, 8, 18, and Site Screening Area 14	Baker, 2004	01548 (Volume I) 01549 (Volume II)
Proposed Plan	Baker, 2005	01657
Record of Decision, Site 18	Baker, 2005	01749

Nature and Extent of Potential Contamination

Previous investigations have included analysis of soil, groundwater, surface water, and sediment for analysis of VOCs, SVOCs, pesticides, PCBs, and metals.

Potential Risks

No unacceptable human health or ecological risks were identified from exposure to soil, groundwater, surface water or sediment at Site 18. Therefore, a No Further Action ROD for all media was signed in September 2005.

Remedial Actions

No CERCLA remedial actions have taken place at Site 18.

CERCLA Path Forward

CERCLA documentation complete with RI/FS and No Action ROD.

3.2.15 Site 19—Conveyor Belt Soils at Building 10

Site Description

Site 19 includes soil beneath and surrounding a 500-foot long conveyor belt formerly used to transport packaged TNT from Building 10 to Building 98. Site 19 is located west of Building 10 and 300 ft south of Site 9 (**Figure 3-15**). The topography of Site 19 decreases to the north towards Site 9. A topographic low formed by a trench beneath the former conveyor belt bisects the site and receives surface water runoff that infiltrates the subsurface or flows through drainage channels connecting Site 19 to Site 9, ultimately discharging to nearby Lee Pond. Depth to groundwater for the Cornwallis-Cave aquifer is typically found between 14-20 ft bgs with flow generally southwest toward Lee Pond. Groundwater for the Yorktown-Eastover aquifer is typically found between 39-51 ft bgs with flow generally west to southwest also toward Lee Pond.

The conveyor belt was used for transport of packaged TNT from the 1940s to the 1970s. As documented in the Round Two RI, holes were observed along the floors and walls of the conveyor belt and in the conveyor belt enclosure. The walls and floor of the conveyor belt were periodically sprayed with water to control dust. Although the area has not been active for any other land use since operations ceased in the 1970's, the site remains relatively

cleared and has not been excessively overgrown with vegetation. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	00313
Site 19 and Composites of Site 9, Site 19, SSA 6 & SSA7 Independent Sampling and Risk Screening Report	Black & Veatch, 1996	00781
Feasibility Study Sites 9 and 19	Baker, 1997	00966
Round Two RI Report, Sites 9 and 19	Baker, 1997	00889
Proposed Remedial Action Plan Sites 9 and 19	Baker, 1997	00967
Record of Decision,v3, Operable Unit Nos. VI and VII, Sites 9 and 19	Baker, 1998	02077
Closeout Report Site 19 Bioremediation	OHM, 2000	01556
Five-Year Review Report for Sites 1, 6, 7, 12, 16, and 19	Baker, 2002	01310

Nature and Extent of Potential Contamination

Fine particulates released through the holes and the rinse water sprayed on the conveyor belt were a source of potential contamination to soil and groundwater proximal to the conveyor belt, and sediment located in the concrete drainage way west of the conveyor belt. Previous investigations included full suite analysis (TCL VOCs, TCL SVOCs, PCBs, pesticides, explosives, TAL inorganics) for soil. VOCs were not detected above residential RBCs. Benzo(a)pyrene (140 µg/kg) and benzo(b)fluoranthene (230 µg/kg) were the only SVOCs detected exceeding their respective soil residential RBCs. RDX, HMX, and TNT and its breakdown products were detected in soil at maximum concentrations of TNT at 35,000 mg/kg, RDX at 230 mg/kg, and HMX at 34 mg/kg (Baker, 1997c). Metals detected above background levels in surface and/or subsurface soil comprised aluminum (90,600 mg/kg), cadmium (2.2 mg/kg), chromium (52.4 J mg/kg), copper (41.6 mg/kg), iron (114,000 mg/kg), lead (392 J mg/kg), vanadium (74 J mg/kg), and zinc (365 J mg/kg) (Baker, 1997c).

Groundwater was analyzed for TCL VOCs, TCL SVOCs, TAL inorganics, PCBs, pesticides, and explosives. No VOCs or SVOCs (with the exception of low concentrations of common laboratory contaminants), pesticides, or PCBs were detected in groundwater. The following metals were detected above background levels: chromium (2.5 µg/L), copper (17 µg/L), iron (1370 µg/L), manganese (2820 µg/L), and nickel (6.4 µg/L). There were no MCL exccedence of metals in groundwater. Explosives detected comprised RDX; 1,3,5-TNB; amino-DNTs; and 2,4,6-TNT at maximum concentrations 1.1 µg/L, 5.8 µg/L, 130 µg/L, and 38 µg/L, respectively. Further investigations of groundwater are on-going (Baker, 1997c).

Potential Risks

Human health risks were evaluated for the future adult/child resident and current commercial worker from exposure to surface soil and potable groundwater. The following conclusions were reached:

- Potential unacceptable non-cancer hazards were identified for the future child resident and adult resident from exposure to shallow groundwater from potable use. 1,3,5-trinitrobenzene (1,3.5-TNB)(HQ=1.7) contributed to the overall HI of 2.8 for a non-cancer hazard to the future adult resident and 1,3,5-TNB (HQ=4.1) and 2,4,6-TNT (HQ=1.9) contributed to the overall HI of 6.4 non-cancer hazards to the future child resident .
- The ILCR value (4.8x10-4) and the HI value (92.0) indicated the potential for unacceptable cancer risks and hazards from exposure to 2,4,6-TNT in soil. RDX, and HMX were above their respective soil residential RBCs and may potentially pose unacceptable risks to human health; however, the constituents were evaluated quantitatively because of the significant potential risks posed by 2,4,6-TNT.
- No aquatic habitats are associated with Site 19. Ecological risks were evaluated for the terrestrial ecosystem. Concentrations of metals posing potential ecological risks (aluminum, iron, lead, and vanadium) were evaluated against background concentrations. Although concentrations exceed background, HQs for iron, lead, and vanadium are similar to HQs calculated for background concentrations. Average Site 19 aluminum concentrations produced ecological HQ values similar to background values. However, it was determined in partnering meetings that concentrations of aluminum in soil exceeding 14,830 mg/kg should be addressed to mitigate potential impact to ecological receptors (Baker, 1997c).

Remedial Action(s)

Removal of an undocumented quantity of soil from beneath the conveyor belt and the surrounding area was conducted between 1973 and 1974. A ROD for soil was signed in March 1998 to mitigate the potential for direct contact of 2,4,6-TNT and RDX in soils by human receptors, to prevent ecological effects to terrestrial receptors from exposure to aluminum in soil, and to eliminate the potential migration of these contaminants to other environmental media (Baker, 1997f).

The remedy was initiated April 1998 and included the removal of transite panels and asbestos insulated piping, dismantling and disposal of the conveyor system, excavation of explosives contaminated soils, and confirmation sampling. The RLs established for 2,4,6-TNT and RDX were 15 mg/kg and 5 mg/kg, respectively. Approximately 1,000 cubic yards of explosives-contaminated soil were excavated to a depth of 4 ft in the conveyor belt trench, and excavated soils placed in a biocell at Site 22 (OHM, 2000). Following treatment, these soils were placed at Site 22 in the area surrounding the biocell.

Soil concentrations of aluminum in excess of 14,850 mg/kg were excavated from around Building 527 (Baker, 1997f). Approximately 60 cubic yards of soil with elevated aluminum concentrations were excavated from the area surrounding Building 527 and placed in the conveyor belt trench excavation and covered with clean fill followed by site restoration with topsoil and vegetated, preventing ecological exposure to elevated aluminum in soil. A total

of 2 wall samples (south wall 350' at 610 mg/kg (later re-sampled and analyzed below the RL) and west wall at 111 mg/kg) and one floor sample (993.82 mg/kg) were reported above the cleanup level for 2,4,6-TNT. All other samples were reported below cleanup levels, ranging from non-detect for all analytes to 13 mg/kg for 1,3,5-TNB, 6.57 mg/kg for 2-amino-4,6-dinitrotoluene, 8.9 mg/kg for 4-amino-2,6-DNT, and 0.6 mg/kg for RDX (OHM, 2000).

LUCs prohibiting residential development of Site 19 and disturbance of the soil cover have been maintained by the Navy through routine inspections. Site 19 is inaccessible to the general public with controlled access by the Navy. A Remedial Design for Land-Use Controls is currently being negotiated with the EPA. A Five-Year Review is currently in progress to determine the protectiveness of the remedy selected in the ROD. The Navy intends to further assess the nature, extent, and potential risk associated with groundwater.

CERCLA Path Forward

- Site Inspection (soil cover maintenance, as needed)
- RACR for soil/waste)
- Five-Year Review (2012)
- RI/FS/PP/ROD for groundwater

Schedule 3-12 presents the FY08-09 schedule for Site 19.

3.2.16 Site 21—Battery and Drum Disposal Area

Site Description

Site 21, the Battery and Drum Disposal Area, covers approximately one acre in the north-central portion of WPNSTA Yorktown (**Figure 3-16**). Site 21 is an open field surrounded by trees and brush. The site is located immediately adjacent to an unnamed tributary leading southeast to the Eastern Branch of Felgates Creek. West Road marks the northeast boundary of the site, and Sites 4 and 22 are located northwest and southwest of the site, respectively. A gravel access road extends from West Road to the central portion of the site. The topography of Site 21 is relatively flat in the central portion of the site with steep slopes toward the un-named tributary along the northern, western, and southern boundaries; and a gentle slope toward the gravel access road along the northeastern boundary. Site elevations range from 5 to 45 ft msl. Depth to groundwater (Columbia aquifer) is approximately 10 ft bgs with flow is west toward the unnamed tributary to Felgates Creek.

Site 21 was identified as a battery and drum disposal area in November 1990. Site 21 was reportedly used as a land disposal area in the 1950s during which it received an estimated 7,000 tons of waste. Filling operations reportedly occurred three to four times a week. A site reconnaissance conducted in October 1991 identified exposed waste throughout the site with several areas of concentrated waste disposal (batteries and drums). Empty solvent containers and scrap metal were observed. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Draft Final Site Inspection Report, Site 21	Baker, 1992	00213
Round One RI Report, Sites 1-9, 11, 12, 16-19, and 21	Baker, 1993	00313
Engineering Estimate/Cost Analysis for Sites 4, 16, and 21 Removal Actions	Baker, 1993	00311
Closeout Report Sites 4, 16, and 21	IT Corporation, 1995	00616
Post-Removal Confirmation Sampling Report and Baseline Risk Assessments Sites 4 and 21	Baker, 1995	00660
Round Two RI Report, Sites 4, 21, and 23	Baker, 2001	01296 (Volume I) 01297 (Volume II)
Feasibility Study Sites 4, 21, and 22	Baker, 2001	01160
Closeout Report Sites 21 and 22	Shaw, 2003	01779
Record of Decision, Operable Unit Nos. XVIII, Site 21	Baker, 2003	01374

Nature and Extent of Potential Contamination

Waste disposed of at Site 21 is the source of potential contamination to site media. Investigations have consisted of analysis of groundwater, surface and subsurface soils, surface water and sediment for VOCs, SVOCs, pesticides/PCBs, metals, and explosives (nitramines), and total petroleum hydrocarbons (TPH). Surface water and sediment samples were collected near Site 21 as part of an overall evaluation of surface water related to Sites 4, 21, and 22 as they are adjacent to each other and contribute runoff and groundwater discharge to the Eastern Branch of Felgates Creek.

Surface Soil. Four VOCs were detected in surface soil with none exceeding their residential RBCs; methylene chloride (0.06 mg/kg), acetone (0.007J mg/kg), toluene (0.001J to 0.003J mg/kg), and styrene (0.001J mg/kg). Thirteen SVOCs were detected with only two; benzo(a)fluoranthene (0.91 mg/kg) and benzo(a)pyrne (0.14J) exceeding the residential RBCs. Thirteen pesticides were detected with only dieldrin (0.000085J to 0.046 mg/kg) exceeding the residential RBC. Twenty-three metals were detected with nine; aluminum (938 to 43,300 mg/kg), arsenic (0.34J to 11.6 mg/kg), cadmium (1.5J to 38.4J mg/kg), chromium (2.5 to 32.3 mg/kg), iron (1,400 to 31,100 mg/kg), manganese (3.7J to 1,310 mg/kg), mercury (0.06J to 4.4J mg/kg), thallium (1.8 mg/kg), and zinc (7.8 to 6,780 mg/kg) exceeding residential RBCs. TPH was detected in surface soil ranging from non-detected to 17,200 mg/kg. No nitramines were detected in any of the surface soil samples.

Subsurface Soil. In subsurface soil, three VOCs; acetone (0.11J mg/kg), methylene chloride (0.018J to 00.38 mg/kg), and toluene (0.002J to 0.004J mg/kg) were detected. Nine SVOCs; phenol (0.026J mg/kg), di-n-butylphthalate (0.044J to 0.17J), fluoranthene (0.048J mg/kg), pyrene (0.05J mg/kg), chrysene (0.042J to 0.051J mg/kg), bis(2-ethylhexyl)phthalate (0.043J to 0.071J mg/kg), benzo(b)fluoranthene (0.052J to 0.085J mg/kg), benzo(a)pyrene (0.049J to 0.085J mg/kg), and benzo(g,h,i)pyrene (0.037J mg/kg) were detected. Five pesticides; 4,4'-

DDE (0.002J to 0.0067J mg/kg), 4,4'-DDD (0.0028J to 0.025J mg/kg), 4,4'-DDT (0.0081 to 0.038J mg/kg), alpha-chlordane (0.0024J mg/kg), and gamma-chlordane (0.002J mg/kg) were detected. Only one pesticide; aroclor-1260 (0.032J mg/kg) was detected. All organic compounds were detected at concentrations below residential RBCs. Fourteen metals were detected, four at concentrations above residential RBCs and background. No nitramines were detected in the subsurface soil samples.

Groundwater. Two VOCs, 1, 2-dichloroethene (4J µg/L) and trichloroethene (TCE) (2J µg/L), were detected in groundwater; TCE exceeded the tap water RBC. The pesticide heptachlor (0.023J µg/L) was the only pesticide detected and exceeded the tap water RBC. No organic compounds exceeded the MCL. Sixteen inorganic were detected, of these, eight, aluminum (8,250 iron µg/L), arsenic (8.6L µg/L), cadmium (79.5 µg/L), chromium (37 µg/L), iron (40J to 11,800J µg/L), manganese (10.4 to 3,010 µg/L), vanadium (50.2 µg/L), and zinc (14.3L to 14,300L µg/L) exceeded their tap water RBCs and only cadmium exceeded the MCL. No SVOCs, PCBs, or nitramines were detected in groundwater.

Surface Water. One SVOCs, bis(2-ethylhexyl)phthalate (1J to 66L µg/L), was detected surface water at concentrations above ten times the tap water RBC. Eight nitramines were detected; 1,3-dinitrobenzene (2 µg/L), 2,4/2,6-dinitrotoluene (2.4 µg/L), HMX (11 µg/L), nitrobenzene (2NJ µg/L), amino-dinitrotoluenes (0.28 to 5.2 µg/L), RDX (0.32J to 58 µg/L), and 1,3,5-trinitrobenzne (0.59 µg/L). Three, 2,4/2,6-dinitrotoluene, amino-dinitrotoluene, and RDX exceeded ten times the tap water RBC. Sixteen metals were detected in surface water with two; antimony (24.9 µg/L) and arsenic (1.6 to 3 µg/L) exceeding ten times the tap water RBC. Both nitramines and metals were detected in the surface water above the Clean Water Act salt water chronic criteria.

Sediment. Four VOCs, carbon disulfide (0.011J to 0.058J mg/kg), 2-butanone (0.031 mg/kg), benzene (0.017J mg/kg), and tetrachloroethene (0.006J to 0.019J mg/kg) were detected, all below the residential RBC. Ten SVOCs, di-n-butylphthalate (0.2J mg/kg), fluoranthene (0.059J to 0.16J mg/kg), pyrene (0.064J to 0.18J mg/kg), chrysene (0.09J mg/kg), bis(2-ethylhexyl)phthalate (0.15J mg/kg), benzo(b)fluoranthene (0.14J to 0.17J mg/kg), benzo(k)fluoranthene (0.14J to 0.17J mg/kg), benzo(a)pyrene (0.087J mg/kg), indeno(1,2,4-cd)pyrene (0.07J mg/kg), and benzo(g,h,i)pyrene (0.055J mg/kg) were detected. Four pesticides/PCBs, 4,4'-DDE (0.003J mg/kg), 4,4'-DDD (0.0028J to 0.0062J mg/kg), alpha-chlordane (0.0038J mg/kg), and gamma-chlordane (0.0032J mg/kg) were detected. All organic compounds were below residential RBCs. Nine metals were detected above the residential RBCs: aluminum (2,580 to 26,600 mg/kg), antimony (3.9K to 26.7L mg/kg), arsenic (0.67 to 18.6 mg/kg), cadmium (0.76L to 4.4 mg/kg), chromium (5 to 51.1 mg/kg), iron (1,990 to 45,300 mg/kg), manganese (11.9 to 447 mg/kg), thallium (0.78L mg/kg), and vanadium (2.8 to 79.9 mg/kg). Antimony, arsenic, cadmium, iron, thallium, and vanadium were also detected above background.

Potential Risks

No unacceptable cancer risks were identified for any media. Potential unacceptable total non-cancer hazards were identified for adult (HI=1.5) and adolescent (HI=2.0) trespassers, future older child resident (HI=1.5), and young child resident (HI=2.8) from exposure to benzo(b)fluoranthene, benzo(a)pyrene, dieldrin, and metals in soil. There is also potential non-cancer hazard due to non-potable exposure to groundwater from both the Columbia

and Yorktown aquifers for adult (HI=1.4 and 1.5, respectively), adolescent child (HI=2.2 and 2.3, respectively), and young child (HI=4.1 and 4.2, respectively). While potential unacceptable non-cancer hazards to current adolescent trespasser were identified from exposure to metals in sediment (HI=1.2), no individual metals contributed an hazard quotient greater than 1

A SERA identified potential adverse impacts to terrestrial receptors from exposure to SVOCs, 4,4'-DDD, and metals in soil. Based on combined data from Sites 4, 21, and 22, freshwater flora and fauna are at risk due to 1,3-dinitrobenzene, 2,4-DNT/2,6-DNT, 2,4,6-trinitrotoluene, HMX, amino-DNTs, RDX, 1,3,5-trinitrobenzene, aluminum and iron in surface water and from mercury in sediment. Tidal freshwater flora and fauna may be at potential risk from RDX, and aluminum, cadmium, iron, lead, and manganese in surface water and carbon disulfide and benzene, 4,4'-DDE, alpha- and gamma-chlordane, 2,4,6-trinitrotoluene, and metals in sediment. Upper trophic level receptors are at potential risk due from exposure to di-n-butylphthalate, aluminum, antimony, arsenic, barium, lead, manganese, selenium, thallium and vanadium in surface water and/or sediment.

Remedial Action(s)

A removal action in 1994 consisted of excavation and disposal of 6,070 tons of batteries and screened soils, 650 tons of debris, drums, and 90 tons of soil. With the exception of the contents of the drums that contained elevated lead, the waste and soil were disposed off-site as non-hazardous wastes. Following the removal action, the area was re-graded and re-vegetated (IT Corporation, 1995b).

A removal action was completed in 2002 consisting of the excavation and off-site disposal of approximately 145 cubic yards of soil. Confirmation samples indicated that all potential human health and ecological risks in surface soil at Site 21 were mitigated (Shaw, 2003). An NFA ROD for soils was signed in September 2003.

CERCLA Path Forward

- RI for groundwater surface water and sediment
- RACR for soil/waste
- FS/PP/ROD for groundwater surface water and sediment, as appropriate
- RD/RA, as appropriate

Schedule 3-13 presents the FY08-09 schedule for Site 21.

3.2.17 Site 22—Burn Pad

Site Description

Site 22, The Burn Pad, consists of a nine acre area located south of Site 4 (**Figure 3-17**). The site is on a flat, elevated plateau with topography sloping steeply to the east, south, and southwest toward the Eastern Branch of Felgates Creek. An access road runs north-south along the west side of Site 4 and provides vehicle access to Site 22 from the north. The site consists of a grassy field surrounded by woods.

Site 22 contained a 150-foot diameter circular array of 11 steel burning pans which were used for burning waste plastic explosives and spent solvents. Open burning operations at

the Burn pad ceased in 1994. Site 22 was also used for the treatment of nitramine-contaminated soil and TNT-contaminated soil from Site 7. A 153-foot by 86-foot biocell was constructed and 770 cy of contaminated soil from Site 7 was treated. Biocell operations ceased in 1998 and treated (clean) soil was pumped into an impoundment area in a topographical low area directly southeast of the existing biocell to dewater treated soil. Erosion control measures were implemented in 1999 to prevent discharge to the wetlands west of the biocell. An earthen dam built to hold clean soil and water in the impoundment area was also opened to prevent rainwater from overflowing into Felgates Creek. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Pilot Study Report for the Explosives-Contaminated Soil At The Naval Weapons Station Yorktown	Baker, 1997	01088
Round Two Remedial Investigation Report, Sites 4, 21, and 22	Baker, 2001	01296 01297
Feasibility Study, Sites 4, 21, and 22	Baker, 2001	01160
Proposed Remedial Action Plan, Sites 4 and 22	Baker, 2001	01290
Closeout Report Sites 21 and 22	Shaw, 2003	01779
Record of Decision, Site 22 – Burn Pad	Baker, 2003	01375

Nature and Extent of Potential Contamination

Historical burning operations are the source for potential contamination of site media. Investigations have consisted of analysis of groundwater, soil, surface water and sediment for VOCs, SVOCs, pesticides/PCBs, metals, and explosives (nitramines). In surface soils, PAHs (total PAHs < 3,000 µg/kg), the explosives HMX (140,000 µg/kg), RDX (3,500 µg/kg), 2,4,6-TNT (220 µg/kg), and amino-DNT (270 µg/kg), were detected with the highest concentrations generally found in samples from the northeast central portion of the site. The concentrations of metals detected in soil were below background. VOCs, explosives and metals were also detected in groundwater. The highest concentrations of VOCs (TCE at 1,200 µg/L, 111-TCA at 1,700 µg/L, and 1,1-DCE at 1,700 µg/L) and explosives (HMX at 49 µg/L and RDX at 110 µg/L) were detected in samples from the southern (downgradient) portion of the site. In sediment, relatively low concentrations estimated below reporting limits of VOCs, SVOCs, and pesticides were detected. The only explosive detected in sediment was 2,4,6-TNT in one sample at 930N µg/kg. The concentrations of metals in sediment were within background levels.

Potential Risks

No unacceptable cancer risks were identified for the child resident from exposure to site media. Unacceptable non-cancer hazards (HI=9.1) were identified for a child resident exposure to arsenic and iron in soil. Although no acceptable risks were identified from exposure to the Yorktown Aquifer for non-potable use, risks were not calculated for residential potable groundwater use from either Columbia or Yorktown aquifers. No

potential human health risks were identified for exposure to surface water or sediment under a residential scenario.

The screening ERA identified potential adverse effects to terrestrial receptors from SVOCs, 2,4,6-trinitrotoluene, HMX, amino-DNTs, RDX, 1,3,5-trinitrobenzene, and

metals from soils. Potential adverse impacts to the future aquatic habitat from potential groundwater discharge (without dilution) were identified for 1,1-dichloroethene, trichloroethene, di-n-butylphthalate, aldrin, HMX, RDX, tetryl and metals. Aquatic receptors (both freshwater and tidal freshwater habitats) may be adversely impacted by VOCs, SVOCs, explosives, and metals in surface water and sediment.

Remedial Action(s)

In 2002, 3,540 cubic yards of soil were removed based on the following remediation goals: HMX (5.7 mg/kg), cadmium (4 mg/kg), copper (100 mg/kg), lead (48.7 mg/kg), and cPAHs (1 mg/kg). Confirmation samples were collected that demonstrated concentrations in soil remaining in place are below remediation goals. Based on the removal actions conducted and confirmation sampling results, the Navy in partnership with the EPA and VDEQ agreed all potential human health and ecological risks in soil at Site 22 were mitigated and an NFA ROD for soil was signed in September 2003. The ROD did not address groundwater, surface water or sediment.

CERCLA Path Forward

- RI for groundwater surface water and sediment
- RACR for soil/waste
- FS/PP/ROD for groundwater surface water and sediment, as appropriate
- RD/RA, as appropriate

Schedule 3-14 presents the FY08-09 schedule for Site 22.

3.2.18 Site 23—Building 428 Teague Road Disposal Area

Site Description

Site 23 (formerly SSA 1), the Building 428 Teague Road Disposal Area, is located northeast of Building 428 along the eastern portion of the Installation property boundary (**Figure 3-18**). The site encompasses 10.5 acres bisected by a former railroad track. The railroad track was constructed in 1919 and operated until 1989. The track has since been removed and only the ballast and a gravel road that parallels the former track remain. The site generally consists of open, maintained grass-covered areas where disposed materials were removed surrounded by mixed hardwood/pine forest. South of the former railroad tracks, surface runoff flows toward an intermittent unnamed tributary that was dry during the 1997-1998 remedial investigation. This drainage lies about 300 feet east-southeast of the site disposal areas and trends to the York River about 1,000 feet east of Site 23. Depth to groundwater (Cornwallis Cave aquifer) is between 8 and 15 ft bgs with flow toward the York River.

Disposal activities reportedly began at the site in 1940 and ceased in 1960 and included debris from a pier fire in the mid 1950s. Aerial photography suggests the area was also used for waste storage in 1945. From 1960 to the present, there is no evidence of additional waste

storage/disposal or release, with the exception of a land survey in 1993 where discrete piles of surface debris and partially buried were identified (concrete rubble; scrap metal; wooden pilings and railroad ties; empty fuel cans; empty, open, and corroded drums; asbestos pipe insulation; and shingles). A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Waste Characterization Sampling, SSAs 1, 2, and 5	Baker, 1993	00313
Engineering Evaluation Cost Analysis and Action Memorandum SSA 1, 2, and 5	Baker, 1994	00625
Soil and Debris Removal Action Site Screening Areas 1, 2, and 5	OHM, 1996	00648
Site Screening Process Report Site Screening Areas 1, 6, 7, and 15	Baker, 1996	00663
Construction Closeout Report for Site 23	J.A. Jones, 2003	(Draft – No AR No.)
Excavation and Off-site Landfill Disposal, Site 23	UNITEC, 2006	(Draft – No AR No.)
Draft Final Round One Remedial Investigation Report for Sites 23, 24, 25, and 26	Baker, 2007	(Draft - No AR No.)

Nature and Extent of Potential Contamination

Waste materials disposed of at Site 23 were the source of potential contamination to soil, groundwater, sediment, and surface water. Initial investigations (mid 1990's) included full suite analysis (TCL VOCs, SVOCs, PCBs, pesticides and TAL inorganics) of soil and groundwater, and surface water and sediment in the unnamed intermittent tributary. To address debris and elevated PAHs in soil, removal actions were completed in 1994, 2003, and 2004. A draft 2002 RI is currently being updated in 2007 to assess risk based on site conditions following the removal actions and to incorporate additional 2006 soil data for updated risk evaluations.

Soil. VOCs (including TCE, PCE, toluene, and xylenes), PAHs, pesticides (4,4'-DDE, 4,4'-DDT, and dieldrin), explosives (TNT and TNB), and metals were detected in surface soil. PAHs were significantly elevated (> 100,000 µg/kg) near the former railroad tracks. TNT had the highest explosive concentration of 260 mg/kg in subsurface soil along the former railroad track, but in general the explosives were detected sporadically at low concentrations. Low concentrations of pesticides were detected in soil, however only dieldrin (87µg/kg) exceeds the residential RBC; the average dieldrin concentration (32 µg/kg) is below the RBC (40 µg/kg). Arsenic and lead are the only metals to exceed the residential RBC and action level, respectively.

Groundwater. Explosives were detected in groundwater samples from one well (23GW05-001), co-located with maximum concentration of explosives in soil which is downgradient of the former explosive-contaminated ash pile which was removed in 1994. Groundwater concentrations of TNT, 4-amino-2,6-DNT, and 2-amino-4,6-DNT were 4.1 µg/L, 6.4 µg/L,

and 6.1 µg/L, respectively. With the exception of the laboratory artifact detection of chloroform (0.6J µg/l), no other organic compounds were detected in groundwater. Arsenic was detected at a maximum concentration of 15 µg/L and represented the only MCL exceedence in groundwater.

Sediment. Organic compounds detected in sediment include carbon disulfide (3J to 37 µg/kg), pyrene (66J to 93J mg/kg), chrysene (61J to 95J µg/kg), benzo(b)fluoranthene (78J to 120J µg/kg), 4,4'-DDE (0.34J to 25 µg/kg), and methoxychlor (8.4J µg/kg). The most frequently detected metals included aluminum, barium, lead, manganese, and vanadium, with the highest concentrations for iron (54,100 mg/kg) and aluminum (21,200 mg/kg).

Potential Risks

Unacceptable human health risks were identified for the future adult and child resident from exposure to soil and groundwater. Child cancer risks (7 x 10 -4) were unacceptable from exposure to arsenic and benzo(a)pyrene in soil and arsenic in groundwater. While the total non-cancer hazard (HI= 1.79) for the child resident from exposure to metals in soil exceeded the threshold of 1, no individual metal contributed a hazard greater than 1 and non-cancer hazards based on central tendency exposures are acceptable. Although potable use of groundwater resulted in an unacceptable non-cancer hazard (2.77) from exposure to arsenic, chromium, iron, and vanadium in groundwater, concentrations are consistent with background and no central tendency risks were identified for these metals.

Based on a screening ERA, concentrations of arsenic, cyanide, mercury, and zinc in soil and sediment of the unnamed tributary to the York River exceed ecological screening values and could pose risk to terrestrial and lower trophic level aquatic receptors. No unacceptable food web risks were identified. Following all removal actions and mercury soil sampling and analysis in 2006, several locations remain with mercury concentrations in soil above 0.24 mg/kg.

Remedial Action(s)

The first removal action at Site 23 was completed in 1994 and consisted of the removal of drums, 443 tons of creosote timbers, 763 tons of non-hazardous debris, 1,119 tons of non-friable asbestos debris, 680 pounds of pipe wrapped with friable asbestos, 31 tons of recyclable metal, and 5,815 tons of TNT-and trinitrobenzene-contaminated ash/soil from an area north of the railroad tracks. Prior to completion of the RI, two removal actions were completed, one in 2003 and the other in 2004. In 2003, debris and soil (1,025 tons) were removed based on cleanup goals developed in partnership with the EPA for ecological receptors for total PAHs (10 mg/kg), arsenic (14.8 mg/kg), mercury (0.24 mg/kg), and zinc (200 mg/kg). Human health clean up goals for the removal action were established for cPAHs (1 mg/kg), N-nitrosodi-n-propylamine (0.0613 mg/kg), 2,4,6-trinitrotoluene (14.3 mg/gk). A third removal action in 2004 removed 2,800 tons of zinc-contaminated soil south of the railroad tracks. Although zinc exceeded the clean up goal of 200 mg/kg in samples from three of six grids laid out for excavation and confirmation samples, because soil was excavated to depths of four to six feet bgs and backfilled with clean material, it was determined that no current unacceptable ecological risks remained in this area (Consensus Statement 1-07-04-3). Additional confirmation sampling in 2006 identified elevated mercury (above 0.24 mg/kg) remaining in soil at several locations.

CERCLA Path Forward

- Finalize RI
- EE/CA
- Interim Removal Action (IRA)
- PP/ROD for all media

Schedule 3-15 presents the FY08-09 schedule for Site 23.

3.2.19 Site 24—Aviation Field

Site Description

Site 24, Aviation Field (formerly Site 14, SSA 6, and SWMU 27), is an open grassy area around the helicopter landing pad at WPNSTA Yorktown, just south of the York River (**Figure 3-19**). The site is bounded by Bellfield Road to the north, former railroad tracks to the east, Main Road to the south, and storage areas to the west. Although no groundwater level measurements have been made groundwater is expected to flow north toward the river. Surface water runoff flows toward the York River and a surface depression in the central portion of the site.

Historically, the site was utilized as an aviation field until 1927, after which it was used for storage of munitions on the surface and in underground caches. The site was also used for storage of miscellaneous debris including batteries and cables. Aerial photographs indicate that peak surface storage occurred in 1968. Areas of surface debris are no longer evident at the site. The area where the helicopter landing pad is currently located may also have been used briefly as an explosives burning area. Sludge from WPNSTA Sewage Treatment Plant #1 was reportedly dried in the eastern portion of the site. A Daramend™ greenhouse/biocell was constructed in 1999 to treat explosive-contaminated soil and sediment from Site 6, and was removed in August 2006 once treatment was complete. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 1, 6, 7 and 15	Baker, 1996	00663
Draft Final Round One Remedial Investigation for Sites 23, 24, 25, and 26	Baker, 2007	(Draft – No AR No.)
Phase I RI Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	HILL, 2007	(To be added to AR)

Nature and Extent of Potential Contamination

Several areas of buried debris are present at Site 24 based on the results of a geophysical survey and test pitting conducted as part of the SSP (Baker, 1996b). Based on the geophysical survey results, the debris is located in five discontinuous areas. The existing test pit data set is limited and does not provide enough spatial coverage to confirm the lateral

extent of the waste, determine the thickness of soil cover, or evaluate the total depth of the waste.

Previous investigations identified PAHs, pesticides, PCBs, and metals at concentrations above the residential and/or industrial RBC values or ecological screening values in surface and subsurface soils. Elevated concentrations were generally detected in samples east of Diggs Road and surrounding the helicopter landing pad. Arochlor-1254 (4,200 µg/kg) was detected in surface soil east of Diggs Road, and in subsurface soil (79,000 µg/kg) south of the helicopter landing pad. Although organics and inorganics were detected in Hydropunch™ groundwater samples collected at the site, there were no organic exceedances of tap water RBCs or MCLs and dissolved inorganic concentrations were comparable to background. However, there were no groundwater wells placed downgradient or adjacent to the areas of soil contamination, so concentrations in these areas are unknown.

Potential Risks

The human health risk assessment identified a cumulative risk to the future adult construction worker from ingestion of and dermal contact with cadmium and PCBs in subsurface soil. No other unacceptable human health risks were identified. However, future residential receptor contact with subsurface soil was not evaluated. Additionally, SSP surface soil samples collected in the area of elevated PCBs, PAHs, pesticides and metals east of Diggs Road were not included in the risk assessment. Potential risks associated with groundwater have not been evaluated.

Based on a screening ecological risk assessment, terrestrial receptors may be adversely impacted by soil concentrations of aluminum, chromium, copper, iron, mercury, silver, and vanadium.

Remedial Action(s)

No CERCLA remedial actions have taken place at Site 24.

CERCLA Path Forward

- Finalize RI
- Supplemental RI (RI is expected to recommend additional RI)
- FS
- PP/ROD for all media

Schedule 3-16 presents the FY08-09 schedule for Site 24.

3.2.20 Site 25—Building 373 Rocket Plant

Site Description

Site 25, the Rocket Plant (formerly SWMU 25 and AOC 7), is located at the end of Main Road, just east of Felgates Creek (**Figure 3-20**). Site 25 is relatively flat with a surface depression west of Building 373. The majority of the site consists of paved or grassy areas; however, a wooded area lies just west of the surface depression and separates the site from Felgates Creek. Groundwater flows westward toward Felgates Creek. Surface water generally flows toward Felgates Creek and the surface depression west of Building 373.

Building 373 is an explosives loading plant. Prior to the 1960's, wash/rinse water from cleanup of formulation/pouring equipment drained into a settling basin within the building for removal of suspended solids. The solids were incinerated and dumped at Site 4 (Burning Pad Residue Landfill). The wash/rinse water was then discharged through discharge pipe towards Felgates Creek. The discharge line to the creek was plugged in the early 1980s and a 220-gallon underground storage tank (UST) was installed to contain the wash/rinse water. The UST was a precast concrete pipe installed vertically into the ground with a bottom section cast in the concrete pipe. Once the tank was filled, the water was filtered through a carbon unit and discharged to the sanitary sewer system. The use of the UST was curtailed in the early 1980s and an aboveground storage tank (AST) was installed at the north end of the building. Materials contained within the tanks included binders, stabilizers, and explosives.

AOC 7 included what is now the Site 25 Rocket Plant in addition to the Group 18 Magazine and the Main Road Disposal Area. However, these areas were not recommended for further investigation in the SSP Report. A summary of relevant documents and action milestones for Site 25 is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 1, 6, 7 and 15	Baker, 1996	00663
Final Report for Removal Action at Site Screening Areas 3 and 7	OHM, 1997	00893 00892 (Appendix D)
Draft Final Round One Remedial Investigation for Sites 23, 24, 25, and 26	Baker, 2007	(Draft – No AR No.)
Phase I RI Report for GROUNDWATER at Sites 1, 3, 6, 7, 11, 17, 24, and 25	HILL, 2007	(To be added to AR)

Nature and Extent of Potential Contamination

Soils. One pesticide (endrin ketone) and one VOC (methylene chloride) were detected at low concentrations (less than 5 µg/kg) in surface soils. These were the only organic constituents detected in surface soils. Arsenic was the only metal detected in surface soils at a concentration greater than the residential RBC. However, the highest concentration of arsenic (13.8 mg/kg) was below the maximum background concentration. The only constituent in surface soil which exceeded both background and an ecological screening value was copper, detected at a concentration of 21.9 mg/kg in one sample adjacent to Building 373. In general, surface soil data indicate that this medium was not adversely impacted by site activities.

Methylene chloride, acetone, 1,1,1-TCA, TCE, toluene, xylenes, di-n-butylphthalate, bis(2-ethylhexyl)phthalate, methoxychlor, RDX, and HMX were detected in Site 25 subsurface soil. Concentrations were lower than corresponding residential soil RBCs and ecological screening values for these constituents. Only two metals exceeded both an ecological screening value or residential RBC and a background concentration: mercury and arsenic.

Mercury was detected at a concentration of 0.1 mg/kg in exceedance of the BTAG screening value for soil of 0.058 mg/kg. Arsenic was detected at a concentration of 59.5 mg/kg in exceedance of the residential RBC value of 0.43 mg/kg. However, this concentration is only slightly above maximum background (42.7 mg/kg). In general, subsurface soil data indicate minimal impacts to this medium.

Groundwater. The only organic compounds detected in groundwater at concentrations greater than their respective tap water RBC values were chloroform (37 µg/L), bromodichloromethane (4 µg/L), and RDX (22 µg/L). Tap water RBC values for these constituents are 0.15 µg/L, 0.17 µg/L, and 0.61 µg/L, respectively. Concentrations of chloroform and bromodichloromethane do not exceed the MCLs for these chemicals (100 µg.L for both compounds). RDX was detected in one sample in the vicinity of Building 373. There were no MCL exceedences of dissolved metals in groundwater

Surface Water. BEHP (a common laboratory contaminant) and 3-nitrotoluene were detected in Felgates Creek surface water adjacent to Site 25 at maximum concentrations of 8 µg/L and 0.27 µg/L, respectively. However, because BEHP and 3-nitrotoluene were not detected in site soils or groundwater, it is unlikely that they are related to the site. These were the only organic constituents detected in surface water. Several metals were also detected in surface water, however concentrations were also below background and/or ecological and human health screening values. In general, surface water data indicate minimal impacts from Site 25 to this medium.

Sediment. Several VOCs, SVOCs, pesticides, and one PCB (Arochlor-1260) were detected in sediment samples from Felgates Creek adjacent to Site 25. With the exception of carbon disulfide, a naturally occurring chemical, there were no organic constituents detected in surface sediment which exceeded human health or ecological risk screening values. Carbon disulfide was detected at a concentration of 14 µg/kg in Felgates Creek surface sediment. Benzo(b)fluoranthene and 2,4-dinitrotoluene were detected in subsurface sediment at concentrations of 110 µg/kg and 130 µg/kg respectively, greater than ecological screening values. However, these constituents were detected in a duplicate sample and were not detected in the parent sample collected at the same location. There were no metals detected in sediment at concentrations greater than background and risk screening values.

Potential Risks

There were no unacceptable human health or ecological risks associated with exposure to site media based on the human health and ecological risk assessments included in the 2002 Draft Round One RI Report. However, groundwater risks associated with potable use and risks to future residential receptors from subsurface soil were not evaluated. The human health risk and ecological risk assessments are currently being updated using current guidance and considering the most conservative residential human exposure scenarios.

Remedial Action(s)

The UST, associated piping, and surrounding soils at Site 25 were removed in 1996 (OHM, 1997).

CERCLA Path Forward

- Finalize RI
- Supplemental RI (RI is expected to recommend additional RI)
- FS
- PP/ROD for all media

Schedule 3-17 presents the FY08-09 schedule for Site 25.

3.2.21 Site 26—Building 1816 Mark 48 Waste Otto Fuel Tank

Site Description

Site 26 (formerly SSA 18) is located in the central portion of the WPNSTA, outside Building 1816 (**Figure 3-21**). Site 26 includes a 2,500-gallon concrete UST and network of ancillary drain pipes that were formerly used to store waste Otto fuel. This fuel consisted of a mixture of Otto fuel and water, which may have also contained oil, denatured ethyl alcohol, detergent, and trace amounts of cyanide, halogenated hydrocarbons, and heavy metals. In late 1987, waste Otto fuel was discovered leaking from the tank. The fuel was removed, the tank was cleaned, and a RCRA closure permit was filed. In March 1995, the 2,500-gallon waste Otto fuel UST and a nearby 8,000-gallon UST were removed. Site 26 has been retained as an ERP site because of chlorinated VOCs detected in shallow groundwater. Depth to groundwater in this area is generally 30 feet to the shallow Cornwallis Cave aquifer. The Yorktown confining unit is approximately 25 feet thick at Site 26 and separates the Yorktown-Eastover aquifer from the Cornwallis Cave. The topography at the site is generally flat at about 70 feet msl. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Action Memorandum, Site Screening Area 18	Environmental and Safety Designs, Inc, 1994	00612
Soil Assessment Report for Site Screening Area 18	Baker, 1994	00619
Site Screening Progress Report for Site Screening Areas 2, 17, 18 and 19	Baker, 1996	00666 (Volume I) 00667 (Volume II)
Draft Final Round One Remedial Investigation Report for Sites 23, 24, 25, and 26	Baker, 2007	(Draft – No AR No.)

Nature and Extent of Potential Contamination

The source of contamination to site media was the product contained in the USTs that were removed in 1995. Previous investigations included full suite analysis (TCL VOCs, SVOCs, PCBs, pesticides and TAL inorganics) of soil and groundwater. Surface water and sediment are not associated with Site 26.

Soil. The only VOCs detected in soil were carbon disulfide and methylene chloride, which are considered laboratory artifacts. Fluoranthene was detected in one surface soil sample at a concentration of 36J µg/kg. Three pesticides [methoxychlor (3.4 µg/kg), alpha-chloradane

(0.56 µg/kg), and gamma-chloradane (0.57 µg/kg)] were detected in one surface soil sample. No metals were detected above residential RBCs, with the exception of arsenic (53 mg/kg) and iron (129,000) with maximum concentrations in deep (37 feet bgs) subsurface samples.

Groundwater. *Shallow Groundwater (Cornwallis Cave Aquifer).* The chlorinated VOCs 1,1 DCE, 1,1 DCA, and 1,1,1 TCA were detected in the Cornwallis Cave aquifer at maximum concentrations of 100 µg/L, 10 µg/L, and 130 µg/L, respectively. No other organic compounds were detected in shallow groundwater. Total metals were elevated in shallow groundwater, including MCL (maximum concentrations) exceedence of: arsenic (206 µg/L), beryllium (11 µg/L), chromium (1,890 µg/L), and lead (90 µg/L). Concentrations of dissolved metals were significantly less than the total fraction, with maximum arsenic at 6.8 µg/L and chromium at 28.9 µg/L, both of which are below the MCL. Lead and beryllium were not detected in the dissolved analysis.

Deep Groundwater (Yorktown-Eastover Aquifer). One VOC (chloroform) was detected in one groundwater sample at a concentration of 0.9J µg/L; no chlorinated VOCs were detected. Pesticides were detected at trace levels estimated below laboratory limits. No other organic compounds were detected in deep groundwater. Metals were not elevated in the deeper aquifer, and there were no total or dissolved metal MCL exceedances.

Potential Risks

No unacceptable human health risks were identified for any receptors, including future child resident, from exposure to soil and shallow and deep groundwater for potable use.

Based on a comparison of surface soil and groundwater concentrations to established screening values and toxicological data, statistical comparisons to background concentrations, and on confirmation that there is no "dilution" of maximum concentrations requiring further investigation, risks to terrestrial receptors associated with the site and to potential down-gradient aquatic receptors are acceptable. The conclusion of the assessment is that the levels of chemicals in site media pose an acceptable potential for risk to ecological receptor populations.

Based on the absence of risk identified for both human health and ecological receptors from exposure to all media (soil and groundwater), no further action at Site 26 is warranted.

Remedial Action(s)

No CERCLA remedial actions have taken place at Site 26.

CERCLA Path Forward

- Finalize RI
- TM (for NFA documentation)
- PP and ROD for all media

Schedule 3-18 presents the FY08-09 schedule for Site 26.

3.2.22 Site 27—Building 1751 Chemistry Laboratory Neutralization Unit and Drainage Area

Site Description

Site 27 (formerly SSA 9) is approximately 1.9 acres adjacent to Building 1751 in the north central portion of WPNSTA Yorktown, near Site 8 (the NEDED Explosives-Contaminated Wastewater Discharge Area) and the headwaters of an unnamed tributary that drains into the Eastern Branch of Felgates Creek (**Figure 3-22**). The ground surface is grass covered and bisected by an asphalt road. The topography ranges from approximately 50-feet msl to less than 10-feet msl and slopes to the southeast. Surface water run-off is southeast to the unnamed tributary. Depth to groundwater (Cornwallis aquifer) is between 23 and 33 ft bgs with flow southeast toward the unnamed tributary.

Site 27 consists of a below-grade cylindrical unit into which acids from the Chemistry Lab were discharged for neutralization and four underground septic tanks in the area that may have stored industrial waste (Baker, 2005). The Chemistry Lab unit was used from 1969 to early 1995 when discharge was diverted to HRSD; the integrity of the below-grade unit is unknown. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Relative Risk Ranking Evaluation	Baker, 1995	00675
Site Screening Process for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)
Round One Remedial Investigation for Sites 27, 28, 29 and 30	Baker, 2005	02079
Record of Decision, Site 27	Baker, 2006	(To Be Added to AR)

Nature and Extent of Potential Contamination

The potential source of contamination was from the chemistry lab neutralization unit. Previous investigations included the collection of soil, groundwater, surface water, and sediment for VOCs, SVOCs, pesticides, PCBs, explosives, and metals analyses.

Potential Risks

Although the future resident total lifetime cancer risk (1.1 x 10-4) slightly exceeded USEPA's acceptable risk range due to arsenic from potable use of groundwater, individually, cancer risks are acceptable for the adult (4.9 x 10-5) and child resident (2.7 x 10-5) and total lifetime cancer risk is acceptable based on CT exposure.

During the Screening ERA, no chemicals are identified as risk drivers for Site 27. Though there were several detected (VOCs, pesticides, and inorganics) exceedances of available probable and effects-based concentrations, the conclusion of the assessment is that levels of chemicals in site media pose an acceptable risk to ecological receptor populations.

The Navy in partnership with the EPA and VDEQ agreed that Site 27 poses no unacceptable risks to human or ecological receptors from exposure to soil, groundwater, surface water, and sediment as documented in the No Further Action ROD signed in September 2006.

Remedial Action(s)

No CERCLA remedial actions have taken place at Site 27.

CERCLA Path Forward

CERCLA documentation complete with RI/FS and No Action ROD for all media.

3.2.23 Site 28—Building 28 X-Ray Facility Tank Drain Field

Site Description

Site 28 (formerly SSA 10) is a 5.8 acre drain field adjacent to Building 28 and an unnamed tributary that drains into the southern branch of Felgates Creek in the south central portion of the WPNSTA Yorktown (**Figure 3-23**). The ground surface is landscaped lawn and asphalt parking lot. The topography ranges from approximately 65 to 40-feet msl and slopes northeast toward the shallow creek bed tributary with steep eroded sides. The site receives surface water run-off from the access road and surrounding wooded area, which drains into the tributary. Depth to groundwater (Cornwallis aquifer) is between 5 and 14 ft bgs with flow northeast towards an unnamed tributary.

Site 28 consists of a septic tank drain field that received sanitary wastewater from the X-Ray Facility at Building 28 beginning in the late 1960s until 1998, when wastewater was diverted to the sanitary sewer and ultimately to HRSD. Before silver recovery units were installed, the tanks may have stored hazardous wastes (Baker, 2005g). A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Relative Risk Ranking System, Data Collection Investigation	Baker, 1995	00675
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)
Round One Remedial Investigation for Sites 27, 28, 29 and 30	Baker, 2005	02079

Nature and Extent of Potential Contamination

Silver is considered a site related release and was detected in surface soil (21.1 mg/kg), surface water (4.5J mg/kg), and sediment (47.7 mg/kg). In surface soil, silver was consistently detected in the drainage leading from the site, increasing from 11.9 mg/kg proximal to the drain field to 21.1mg/kg 1,500 feet downgradient. The gradient concentrations of silver in sediment increase from 9.3 mg/kg immediately downgradient of the drain field to 47.7 mg/kg 800- feet downgradient. The concentrations then decrease to

6.5 mg/kg at the furthest downgradient sample (28SD08-01). Silver was detected consistently in surface water samples at concentrations from 0.69J to 4.5J µg/L. Silver was not detected in subsurface soil or groundwater.

In addition to silver, pesticides (methoxyclor and gamma chlordane), metals (above background - arsenic, cadmium, chromium, cobalt, copper, iron, manganese, vanadium, and zinc), and acetone were detected in sediment. VOCs, SVOCs, and pesticides detected in surface soil were at concentrations below residential RBCs. Arsenic was detected in surface water above the tap water RBC. No SVOCs were detected in surface water. No VOCs or SVOCs were detected in groundwater. All dissolved metals detected in groundwater were at concentrations below the tap water RBC and only low, estimated levels of chromium (0.57J µg/L) and iron (21.3J µg/L) were detected above the tap water RBC. There were no groundwater MCL exceedences.

Potential Risks

A total HI for the child resident was calculated to be 4.05 from exposure to chromium and iron in groundwater; iron, arsenic, and vanadium in subsurface soil; and iron, vanadium and arsenic in surface soil. Although risks were identified for the ingestion of soil and groundwater by future child resident, all metals posing potential risk in surface soil, subsurface soil, and groundwater were below background. Therefore, it was determined that no additional evaluation or action was warranted for human health.

Silver was identified as a chemical posing potential ecological risk based on a screening ERA for both terrestrial and aquatic lower trophic level receptors. Additional evaluation of potential ecological risks from silver exposure was recommended, and a Step 3b ERA is in progress.

Remedial Action(s)

No CERCLA remedial actions have taken place at Site 28.

CERCLA Path Forward

- Supplemental RI (BERA)
- FS/PP/ROD for all media
- RD/RA as appropriate

Schedule 3-19 presents the FY08-09 schedule for Site 28.

3.2.24 Site 29—Lee Pond

Site Description

Site 29 (formerly SSA 20) is an approximately 4.1 acre pond located in the east central portion of WPNSTA (**Figure 3-24**). The pond receives storm water runoff from Building 10 by way of Site 9 located adjacent to the pond and approximately 900 ft from the industrial area containing Sites 18, 19, SSA 8 and SSA 22 which are addressed individually under CERCLA. Lee Pond empties into a channel, which in turn flows around Site 16/SSA 16 into Felgates Creek. Depth to groundwater (Cornwallis aquifer) varies with topography and is between 3 and 33 ft bgs with flow northwest towards an unnamed tributary that drains into

the Eastern Branch of Felgates Creek. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Lee Pond Independent Fish Sampling	Black & Veatch, 1995	00668
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)
Round One Remedial Investigation for Sites 27, 28, 29 and 30	Baker, 2005	02079
Draft TM; Supplemental Ecological Risk Assessment, Site 29	CH2M HILL, 2007	(Draft – No AR No.)

Nature and Extent of Potential Contamination

Site 29 is Lee Pond surface water and sediment. Soil and groundwater data from monitoring wells install adjacent to the pond both as part of the SSP for Lee Pond and as part of nearby CERCLA investigations at Sites 9 and 19 were included in the RI. CERCLA sites within the drainage areas to Lee Pond (Sites 18, 19, SSA 8 and SSA 22) are addressed individually.

Soil. Three surface soil samples were collected downgradient of Lee Pond on the northwest side of Lee Road. In surface soil, VOCs, SVOCs, pesticides and inorganics were detected. The only VOC detected was carbon disulfide (0.9J mg/kg), below its respective residential RBC. One SVOC, benzo(a)pyrene was detected in one sample at 170J mg/kg, above the residential RBC, but did not exceed background. The pesticides 4,4'-DDT (0.31J to 0.67 µg/kg), beta-BHC (13J µg/kg), dieldrin (2.4J to 3.3J µg/kg), heptachlor (0.077J to 0.15J µg/kg), and heptachlor epoxide (1.1J to 2.9J µg/kg) were detected at concentrations below their respective residential RBCs. The metals arsenic (2.1J to 11.8 mg/kg), iron (3,730 to 21,100 mg/kg), manganese (38.1J to 269 mg/kg), thallium (4.4 to 6.4 mg/kg), and vanadium (6.2J to 31 mg/kg) were detected; however, only arsenic exceeded the residential RBC.

Subsurface soil samples were collected from three of four SSP monitoring wells (A20GW01, A20GW03, and A20GW04) installed adjacent to the pond. A few VOCs, SVOCs, pesticides were detected at low, estimated concentrations below laboratory reporting limits. The inorganic compounds aluminum (5,980J to 9,130 mg/kg), arsenic (3J to 3.7J mg/kg), iron (11,300J to 11,500J mg/kg), and vanadium (16.9J to 23.6J mg/kg) were detected above their residential RBCs, but none exceeded background.

Groundwater. In groundwater, chloroform (1J to 4J µg/L), a common laboratory artifact, was the only VOC detected in groundwater above the tap water RBC. The metals aluminum (84.5K to 28,000 µg/L), arsenic (3.1L to 41.8L µg/L), barium (57.7 to 529 µg/L), cadmium (4.4 µk/L), chromium (31.9 to 132J µg/L), iron (20,600 to 160,000 µg/L), lead (4.1J to 60.5 µg/L), manganese (116 to 1,290 µg/L), and vanadium (23.6J to 258 µg/L) were detected above the tap water RBC. Of these, arsenic, chromium, and lead also exceeded the MCL and background. Explosives were detected in 19GW04, a monitoring well upgradient of Lee Pond and related to Site 19. The explosives detected included 1,3,5-trinitrobenzene (3.8NJ

µg/L), 2,4,8-trinitrotolune (1.7 µg/L), 2,4/2,6-dinitrotolune (0.68NJ µg/L), amino dinitrotoluenes (7.3NJ µg/L), and RDX (1.1 µg/L). With the exception of chloroform, 3-nitrotoluene, and RDX, all maximum concentrations which exceeded screening values (tap water RBC and/or MCL) and background occurred in monitoring wells associated with Sites 9 and 19. Arsenic, at 40 µg/L in monitoring well A20GW02 and thallium at 7.6B µg/L in monitoring wellA20GW01 were the only compounds which exceeded the MCL for the Site 29 monitoring wells.

Low levels of VOCs, pesticides, inorganics, and explosives were detected in surface water. The VOCs, acetone (6J µg/L), bromoform (0.2J µg/L), chloroform (0.3J to 2 µg/L), chloromethane (2J to 3J µg/L), and toluene (1J µg/L) were detected in surface water. Of these, chloroform exceeded ten times the tap water RBC in one sample. Three pesticides (4,4'-DDT, alpha-BHC, and methoxyclor) were detected at low concentrations, below RBCs for tap water. Inorganics detected in surface water greater than ten times the tap water RBC and above background included: arsenic (5.9J to 7.8J µg/L), iron (425 to 7,000 µg/L), manganese (3.9J to 725 µg/L), and vanadium (1J to 8.5J µg/L). The explosives 2-amino-4,6-dinitrotoluene (40 µg/L), 4-amino-2,6-dinitrotoluene (0.33 to 55 µg/L), and 3-nitrotoluene (0.22 to 1.6 µg/L) were detected.

Sediment. In sediment, the VOCs 2-butanone, acetone, carbon disulfide, chloromethane, methylene chloride, and toluene were detected, but none exceeded available screening values. SVOCs, predominantly PAHs, were detected above the residential RBCs. No pesticides were detected above residential RBCs. Three explosives, 2,4,6-trinitrotoluene (0.12 to 0.42 mg/kg), amino dinitrotoluenes (0.12 to 0.42 mg/kg), and HMX (1 mg/kg) were detected. The metals aluminum (16,900 to 29,700 mg/kg), antimony (4.7L to 8.4L mg/kg), arsenic (1.9J to 38.8J mg/kg), chromium (5.5 to 60.5 mg/kg), iron (3,410 to 39,800 mg/kg), manganese (18 to 533 mg/kg), and vanadium (8.9J to 103) exceeded their residential RBC, with manganese and vanadium exceeding background.

Potential Risks

Unacceptable total site cancer risks were identified for the adult (4.8 x 10-4) and child (2.9 x 10-4) resident due to ingestion of arsenic from potable groundwater use. The total site cancer risk is acceptable for the adult (8.4 x 10-5) based on CT exposures, but remains unacceptable for the child (1.9 x 10-4) residents. A total HI for the child resident was calculated to be 27, due primarily to the ingestion of iron and arsenic in groundwater with lesser contributions from ingestion of thallium; iron, arsenic and vanadium in surface soil. However, the concentrations of arsenic, iron, and vanadium in the surface soil are all below background.

No potential risks were identified based on a screening ecological assessment for terrestrial upper trophic level receptors and further evaluation is not warranted for this pathway/receptor. For exposures to Lee Pond sediments, potential ecological risks based on screening ERA are considered acceptable and no further investigation of sediment in Lee Pond is warranted.

Based on data presented in the RI, total aluminum, iron, and zinc exceeding ecological screening values and National Ambient Water Quality Criteria may pose potential risk for aquatic lower trophic level receptors. However, because there was large uncertainty

associated with these total metals data, additional sampling and supplemental screening ecological risk assessment was conducted in 2006/2007; results are presented in a draft TM. This supplemental assessment concluded that based upon the results of the dissolved surface water samples, no unacceptable risks are likely for aquatic receptors in Lee Pond. In addition, the 2006 data do not indicate that the metals evaluated are migrating to downgradient habitats at significant concentrations that would result in unacceptable impacts.

No further action for ecological receptors at Site 29 is recommended in the draft TM based upon the results of the 2005 ERA (terrestrial receptors, upper trophic level aquatic receptors, bottom water, and sediment) and the results of the 2007 supplemental investigation (surface water) (CH2M HILL, 2007c). Pending Navy, EPA, and VDEQ consensus that no further action is necessary for surface water and sediment of Lee Pond, the Navy in partnership with the EPA and VDEQ will identify a management approach to address potential soil and groundwater human health risks identified in the Site 29 RI.

Remedial Action(s)

No CERCLA remedial actions have taken place at Site 29.

CERCLA Path Forward

- Finalize TM (Surface water NFA Documentation)
- PP/ROD for all media

Schedule 3-20 presents the FY08-09 schedule for Site 29.

3.2.25 Site 30—Bracken Road Incinerator and Environs

Site Description

Site 30 (formerly SSA 24 and AOC 22) is a former incinerator area approximately 0.1 acres in size and located north of Site 5 (Surplus Transformer Storage Area), and south of a former railroad tracks (**Figure 3-25**). The site is situated within a forested area, and the topography ranges from 40-feet msl to 20-feet msl north toward the former railroad tracks. The site receives surface water run-off from surrounding wooded areas and drains into a culvert that runs beneath the former railroad tracks and drains into the York River. Depth to groundwater (Cornwallis Cave aquifer) is between 9 and 22 ft bgs, with flow northwest towards to the York River. The incinerator was used to burn unknown waste for an unknown period of time. Historical information was found which documents the burning of Venezuelan crude oil in the mid-1970s. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
AOC 22, Site 12, and SSA 2, SSA 19 and King Creek Independent Sampling and Risk Screening Report	Black & Veatch, 1996	00669

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)
Round One Remedial Investigation for Sites 27, 28, 29 and 30	Baker, 2005	02079
Draft Engineering Evaluation Cost Analysis Site 30	Baker, 2007	(Draft – No AR No.)

Nature and Extent of Potential Contamination

Ash residue from incinerator operations is the source of potential contamination of site media. The primary concern at Site 30 is vanadium in soil and its potential migration to groundwater and sediment.

Surface Soil. Three common laboratory contaminant VOCs were detected in surface soil samples with none exceeding residential RBCs: acetone (3J mg/kg), methylene chloride (5J mg/kg), and toluene (2J mg/kg). Six SVOCs were detected, all below residential RBCs: benzo(a) anthracene (48J mg/kg), benzo(b)fluoranthene (52J to 97J mg/kg), bis(2-ethyhexyl)phthalate (82J to 590 mg/kg), chrysene (53J mg/kg), fluoranthene (44J to 47J mg/kg), and pyrene (51J to 55J mg/kg). Five pesticides were detected, all below residential RBCs: 4,4'-DDE (0.33J to 27J mg/kg), alpha chlordane (1.5J mg/kg), endosulfan II (1J mg/kg), endrin ketone (0.19J to 0.45J mg/kg), heptachlor epoxide (0.086J mg/kg). Eighteen metals were widely detected across the site in surface soil; nine exceeded the residential RBCs and include: aluminum (1,640 to 9,720 mg/kg), antimony (0.47L to 57.7L mg/kg), arsenic (1.6J to 59.4 mg/kg), chromium (3.3 to 38.2 mg/kg), iron (2,980 to 81,200 mg/kg), manganese (134 to 532 mg/kg), nickel (3.5J to 7,490 mg/kg), thallium (13.1J to 40,900 mg/kg), and vanadium (13.1J to 40,900 mg/kg). Of these nine, antimony, arsenic, chromium, iron, manganese, nickel, and vanadium also exceeded background. The highest concentrations of these inorganics were generally located southeast of the incinerator. No nitramines were detected in any of the surface soil samples.

Subsurface Soil. In subsurface soil, only one VOC, carbon disulfide (1J mg/kg), and one SVOC, bis(2-ethylhexyl)phthalate (140J to 210J mg/kg) were detected and were below residential RBCs. Seven metals were detected above residential RBCs: aluminum (2,040J to 10,300 mg/kg), arsenic (1.5J to 15.2 mg/kg), chromium (5.1 to 24.9 mg/kg), iron (5,180 to 51,900 mg/kg), manganese (33.9 to 391 mg/kg), thallium (0.83J to 7.2 mg/kg), and vanadium (8.6J to 736 mg/kg). Of these, only iron, thallium and vanadium also exceeded background. No pesticides, PCBs, or explosives were detected in the subsurface soil samples.

Groundwater. The VOCs carbon disulfide (4J µg/L), 1,1-dichloroethane (4J µg/L), 1,2-dichloroethane (1J µg/L), chloroform (2J to 6J µg/L), bromodichloromethane (1J µg/L), toluene (2J µg/L), and chlorobenzene (14 µg/L) were detected in two groundwater samples; however, none of these VOCs exceeded MCLs. Trichloroethene (6J µg/L) slightly exceeded the MCL of 5 µg/L. Nine metals were detected; of these, only iron (980 to 1,740 µg/L) and

vanadium (4.2J µg/L) exceeded their tap water RBCs, but neither exceeded background. No SVOCs, pesticides, or PCBs were detected in groundwater.

Sediment. Two VOCs, 2-butanone (6J to 9J µg/kg) and acetone (9J to 32J µg/kg), were detected in sediment, neither exceeding residential RBCs. SVOCs detected were at concentrations below residential RBCs: 4-chloro-3-methylphenol (72J µg/kg), acenaphthalene (63J µg/kg), benzo(a)anthracene (45J to 57J µg/kg), benzo(a)pyrene (44J µg/kg), benzo(b)fluoranthene (71J to 77J µg/kg), benzo(k)fluoranthene (66J µg/kg), bis(2-ethylhexyl)phthalate (51J to 470J µg/kg), chrysene (56J to 72J µg/kg), fluoranthene (82J to 130J µg/kg), and pyrene (60J to 100J µg/kg). Of the twenty-four metals detected, five exceed residential RBCs: aluminum (2,190 to 8,330 mg/kg), arsenic (2.6 to 32.5 mg/kg), chromium (6.9 to 29.9 mg/kg), iron (4,680 to 39,000 mg/kg), and manganese (12.2 to 254 mg/kg). No pesticides or PCBs were detected in the sediment samples.

Potential Risks

There are no unacceptable cancer risks for all media at Site 30. A total non-cancer hazard was determined for adult residents (HI = 19) and child residents (HI = 112) due primarily to exposure to vanadium in surface soil (which contributed HIs of 18 and 106, respectively, to the total HI). The vanadium hazard quotient exceeded 1.0 in all the current and future receptors evaluated (industrial/construction worker, trespasser, and resident), and vanadium concentrations in surface and subsurface soil exceed background. The only potential unacceptable risk from potable use of groundwater by a child resident was identified as a slight non-cancer hazard (due primarily to TCE). However, this potential risk warrants risk management consideration.

Based on a screening ERA, potential risks are identified in soil for lower trophic level terrestrial receptors from chromium, iron, lead, mercury, nickel, thallium, vanadium, and zinc. Additional evaluation was recommended in Step 3b of a BERA. No risk drivers were identified for terrestrial upper trophic level consumers. In addition, risks are acceptable and no further action is warranted for the downgradient wetland habitat.

Removal Action(s)

A Revised Draft EE/CA has been developed (Baker, 2007) which identifies remedial alternatives for the removal of surface soils at Site 30. The preferred remedial alternative consists of the excavation and off-site disposal of 4,200 cubic yards of soil. Risk-based remediation goals (PRGs) were developed based on comparisons with background concentrations, soil screening values, and PRGs developed for other WPNSTA Yorktown sites.

CERCLA Path Forward

- Finalize EE/CA
- IRA
- Construction Completion Report
- PP/ROD for all media

Schedule 3-21 presents the FY08-09 schedule for Site 30.

3.2.26 Site Screening Area 2—Former EOD Burning/Disposal Area

Site Description

SSA 2 consists of an irregular, U-shaped area, approximately 400 feet by 450 feet, and is located at the north end of the existing EOD range (**Figure 3-26**). The SSA 2 area consists of a wooded ravine which drains into Pond No. 11. It is bounded to the north, east, and south by wooded areas, and to the west by a gravel road. SSA 2 is surrounded on all sides by SSA 19, which is the location of the existing EOD range. Debris including non-explosive arming devices, MK 46 shipping containers, and various types of scrap metal were identified at SSA 2 (Baker, 1994c). Numerous earthen berms and depressions indicate the historical use of bulldozers and other earth-moving equipment throughout the SSA. Demolition records indicate that the area was the original EOD range for WPNSTA Yorktown, and was actively used throughout the 1950s and 1960s for the routine destruction of ordnance material. The area was closed in 1970 and operations were moved south to the current site of the existing EOD range (SSA 19). Anecdotal information indicates that the move was prompted by growing concerns that range operations might cause forest fires in the wooded areas bordering the SSA (Baker, 1996c). A summary of relevant documents and milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Action Memorandum and EE/CA, Site Screening Areas 1, 2, and 5	Baker, 1994	00625
Report for Soil and Debris Removal Action Site Screening Areas 1, 2, and 5	OHM, 1996	00648
Site Screening Process Report for Site Screening Areas 2, 17, 18, and 19	Baker, 1996	00666 (Volume I) 00667 (Volume II)
AOC 22, Site 12, and SSA 2, SSA 19 and King Creek Independent Sampling and Risk Screening Report	Black & Veatch, 1996	00669

Nature and Extent of Contamination

An SSP investigation included the collection of surface soil, subsurface soil, and groundwater samples for analysis of VOCs, SVOCs, pesticides, PCBs, nitramine compounds, and metals. Data were compared to risk-based screening values. In soil, aluminum, antimony, arsenic, beryllium, chromium, manganese, nickel, and vanadium exceeded criteria. In groundwater, acetone, RDX, and manganese exceeded criteria.

Potential Risks

Cancer and non-cancer effects were evaluated and no unacceptable risks were identified based on a risk threshold of 10-4 for cancer and an HI of 1 for non-cancer. Cancer risk was 1.3 x 10-5, while the HI values ranged between 0.53 and 0.96. As a result, no further action is recommended for SSA 2.

Remedial Action(s)

In 1994, scrap metal (torpedo casings, bomb casings, powder cans, used detonation devices, tractor parts, marsh matting, and other miscellaneous debris), 14 containers of lead, and 11 live ordnance pieces were removed.

A No Further Action Decision Summary was signed in March 1996 (Baker, 1996c).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.27 Site Screening Area 3—Fire Training Pits and Vicinity

Site Description

SSA 3 consists of a grass field situated on approximately 2.7 acres bounded to the north, northeast, and northwest by mixed pine-hardwood woodland, to the south by Main Road, and to the west and east by industrial buildings and the Hazardous Waste Storage/Transfer Facility, respectively (**Figure 3-27**). An unnamed tributary of Indian Field Creek is located in the wooded area to the east, between SSA 3 and the Fire Station. Fire training activities were conducted in the grass field and include three former concrete/masonry block oil pits, a confined space training area consisting of a quonset hut, and a 35-foot by 35-foot area of burnt surface soil. Berms were built around each of the pit areas in 1986 and a roof was added to each area in 1991. Debris was reportedly placed in each of the pits, doused with jet fuel, and set on fire. The quonset hut, used for confined space entry training, was located in the center of SSA 3, with blackened and burned earthen floor. The 35-foot by 35-foot area of burnt surface soil was identified at the northern portion of the SSA, north of the confined space training area. A summary of relevant documents and milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
EE/CA and Action Memorandum, Site Screening Areas 3 and 7	Baker, 1996	00657
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)
Additional Evaluation of Site Screening Areas 3, 4, 5, and 21 Addendum to the Site Screening Process Report	Baker, 2002	01568
Additional Evaluation of Site Screening Areas 3, 4, 5, and 21, Addendum to the Site Screening Report	Baker, 2004	01427

Nature and Extent of Contamination

The potential source of contamination at SSA 3 consisted of petroleum based substances and solvents that were ignited during fire training exercises. Previous investigations included

the sampling of soil, groundwater, and surface water for VOCs, SVOCs, pesticides, PCBs, TPH, metals, and explosives analysis.

Potential Risks

Human health risk screening identified a cancer risk of 7.1 X 10-5, within the acceptable risk threshold, and an HI of 6.3. Although the total HI exceeds the acceptable threshold of 1, the Navy in partnership with EPA and VDEQ agreed that these risks are considered acceptable based on a comparison to background, most individual compounds contributed an HI < 1, and groundwater concentrations were due to turbid samples.

Based on the conclusions and recommendations presented in the Additional Evaluation of Site Screening Areas 3, 4, 5, and 21, Addendum to the Site Screening Report Naval Weapons Station Yorktown (Baker, 2004a), no unacceptable ecological risks were identified, and no further evaluation was recommended.

Remedial Action(s)

A removal action was conducted in 1996, and consisted of excavating and removing the fire training pits, confined space training area (quonset hut), and the area of burnt surface soil. Post excavation soil samples were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, TPH, oil and grease, and metals. The results of these analyses indicate that TPH along the walls and floor of each fire training pit exceeded the VDEQ action level of 100 parts per million (ppm) (Baker, 2001a). Additional soil removal was performed beyond the measured TPH, to a depth of about 1 foot below the existing excavated area, and no additional confirmation samples were collected. TPH was not detected in confirmatory soil samples collected from the former quonset hut area or former burn area at the northern end of the site.

A No Further Action Decision Summary was signed in May 2004 (Baker, 2004a).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.28 Site Screening Area 4—Weapons Casing/Drum Disposal Area

Site Description

SSA 4 consists of a wooded ravine that was used to dispose of debris, including weapons casings and drums. It is about 0.5 acres in size, and is located between Main Road and By-Pass Road at the headwaters of a tributary leading to Roosevelt Pond (**Figure 3-28**). Surface water in the tributary is ephemeral near the headwaters and persistent downgradient as the stream meets and discharges to Roosevelt Pond. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
EE/CA and Action Memorandum Sites 2 and 9, and Site Screening Area (SSA) 4	Baker, 1994	00615

Document Title /Milestone	Author/Date	AR Document Number
Closeout Report Sites 2 and 9, Site Screening Area 4 Mine Casing and Debris Removal Action	IT Corporation, 1995	00646
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)
Additional Evaluation of Site Screening Areas 3, 4, 5, and 21, Addendum to the Site Screening Process Report	Baker, 2002	01568
Additional Evaluation of Site Screening Areas 3, 4, 5, and 21 Addendum to the Site Screening Process Report	Baker, 2004	01427

Nature and Extent of Potential Contamination

The potential source of contamination at SSA 4 was related to waste disposal. Previous investigations included the sampling of soil, groundwater, surface water and sediment for VOCs, SVOCs, pesticides, PCBs, metals, and explosives analysis.

Potential Risks

Although human health risk screening identified a cumulative cancer risk of 1.7 x 10-4 from exposure to arsenic, benzo(a)pyrene, and beryllium in soil and a hazard index of 8.9 from exposure to arsenic and iron in soil and iron and manganese in groundwater, these risks were determined to be acceptable based on comparison of site concentrations to background and because individually, the cancer risks and hazard indices for chemicals and media are within an acceptable risk threshold.

Based on the conclusions and recommendations presented in the Additional Evaluation of Site Screening Areas 3, 4, 5, and 21, Addendum to the Site Screening Report Naval Weapons Station Yorktown (Baker, 2004a), no unacceptable ecological risks were identified, and no further evaluation was recommended.

Removal Action(s)

A removal action to remove surface debris from the ravine was conducted at SSA 4 in 1994. Debris removed included various types of ordnance, empty drums, miscellaneous construction/demolition debris, fire extinguishers, and nominal amounts of paint wastes and paraffin wax.

A No Further Action Decision Summary was signed in May 2004 (Baker, 2004a).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.29 Site Screening Area 5 – By-Pass Road Landfill

Site Description

SSA 5 consists of a wooded ravine located just north of By-Pass Road and covers approximately 0.9 acres. It is bounded to the south by By-Pass Road, and to the north, west, and east by a wooded area (**Figure 3-29**). A tributary passes through the site, entering from a culvert that begins south of By-Pass Road and flows into Roosevelt Pond. Metal debris, with lesser amounts of concrete and miscellaneous materials, was present at SSA 5. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Field Sampling Plan Waste Characterization Sampling, Site Screening Areas 1, 2, and 5	Baker, 1993	00312
Action Memorandum Site Screening Areas 1, 2, and 5	Baker, 1994	00625
Report for Soil and Debris Removal Action Site Screening Areas 1, 2, and 5	OHM Remediation Services Corp., 1996	00648
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)
Additional Evaluation of Site Screening Areas 3, 4, 5, and 21, Addendum to the Site Screening Process Report	Baker, 2002.	01568
Additional Evaluation of Site Screening Areas 3, 4, 5, and 21 Addendum to the Site Screening Process Report	Baker, 2004	01427

Nature and Extent of Potential Contamination

The potential source of contamination at SSA 5 was related to the waste disposal. Previous investigations included the sampling of soil, groundwater, surface water and sediment for VOCs, SVOCs, pesticides, PCBs, metals, and explosives analysis.

Potential Risks

Although human health risk screening identified a cumulative cancer risk of 5.5 x 10-4 from exposure to arsenic in groundwater and a hazard index of 18 from exposure to arsenic, manganese, and iron in groundwater and arsenic and iron in soil, these risks were determined to be acceptable based on comparison of site concentrations to background.

Based on the conclusions and recommendations presented in the Additional Evaluation of Site Screening Areas 3, 4, 5, and 21, Addendum to the Site Screening Report Naval Weapons Station Yorktown (Baker, 2004a), no unacceptable ecological risks were identified, and no further evaluation was recommended.

Removal Action(s)

A removal action was conducted at SSA 5 in 1994 to remove the small amount of debris including empty drums, pipes, scrap metal, and rubble. No wood materials were identified among the surface debris piles.

A No Further Action Decision Summary was signed in May 2004 (Baker, 2004a).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.30 Site Screening Area 8—Building 350 Rail Roundhouse Maintenance Area Trench Outfall

Site Description

SSA 8 is located at the southeast corner of WPNSTA Yorktown and occupies an area of about 0.4 acres outside of former Building 350 (**Figure 3-30**). A concrete trench within Building 350 was used to access train engines for repair and maintenance. The floor of the concrete maintenance trench was stained. The drainage pipe from the trench to the outside sewer system was plugged in 1985 (wooden plug and grout). The plugged drain pipe in the floor of the trench led to a catch basin approximately 100 yards south Building 350. This catch basin also collected storm water from the area around the Main Gate (Gate 1) and Building 350. The outfall associated with the catch basin extends under the former railroad tracks, northwest, toward Bollman Road. Natural surface drainage (overland flow) extends under Bollman Road toward the wooded area east of Site 18. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 8, 11, 12, and 13	Baker, 1997	00908

Nature and Extent of Potential Contamination

The potential source of contamination was related to the Building 350 trench outfall. Surface soil, subsurface soil, and groundwater samples were collected during the 1997 SSP investigation and analyzed for VOCs, SVOCs, pesticides, PCBs, nitramine compounds, and metals. Surface water and sediment are not associated with SSA 8 and an ecological risk assessment has not been performed.

Potential Risks

Although human health risk screening identified a cumulative cancer risk of 2.4 x 10-4 from exposure to dissolved arsenic and beryllium in groundwater and a hazard index of 4.5 from exposure to arsenic and iron in soil, these risks were determined to be acceptable based on comparison of site concentrations to background.

Based on the results of the 1997 Final Site Screening Process Report for Site Screening Areas 8, 11, 12, and 13, no further action was recommended for SSA 8 (Baker, 1997g).

Removal Action(s)

- No CERCLA remedial actions have taken place at SSA 8.
- A No Further Action Decision Summary was signed in July 1997 (Baker, 1997g).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.31 Site Screening Area 11 – Building 3 Neutralization Unit

Site Description

SSA 11 is an open, metal tank (approximately 3 feet by 5 feet by 3 feet deep) with piping that leads to a trench and sump located inside the southeast corner of Building 3. Building 3 is located in the eastern section of WPNSTA Yorktown (southwest of Site 12 and near SSAs 12 and 13) and occupies an area of approximately 0.2 acres (**Figure 3-31**). It is assumed that this tank was used for acid neutralization of wastes generated from an unknown process. The tank has reportedly been inactive since the early 1980s. Chipping and pitting were observed in the trench and sump during a 1997 SSP site visit; however, no cracks or holes were identified in the floor. Based on a review of as-built drawings, the trench and drain discharge into the storm sewer system. The storm sewer system from this area flows overland, and eventually discharges into Ballard Creek. In addition, the as-built drawings noted that the concrete floor at SSA 11 is 6-inches thick, indicating that a contaminant release through the floor is unlikely. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 8, 11, 12, and 13	Baker, 1997	00908

Nature and Extent of Potential Contamination

Because SSA 11 is located inside Building 3 and the outfall from the building is routed to the storm water sewer system, soil and groundwater were not collected. One surface water sample was collected from the headwaters of Ballard Creek and two sediment samples were collected from the storm sewer system, directly below the drainage pipe from the acid neutralization room and analyzed for VOCs, SVOCs, pesticides, PCBs, nitramines, and metals. Cadmium (2.9 µg/L) and TCE (5 µg/L) were detected in the surface water sample. Other metals detected in the surface water were within background concentrations. The two sediment samples had detections of SVOCs, pesticides, and PCBs.

Potential Risks

A total ecological index (EI) value for the surface water collected at SSA 11 in Ballard Creek was calculated to be 0.40 for acute effects and 2.40 for chronic effects. The elevated chronic EI is a result of concentrations of aluminum and cadmium detected in the surface water above screening levels.

Based on the results of the 1997 Final Site Screening Process Report for Site Screening Areas 8, 11, 12, and 13, no further action was recommended for SSA 11 (Baker, 1997g).

Removal Action(s)

- No CERCLA remedial actions have taken place at SSA 11.
- A No Further Action Decision Summary was signed in July 1997 (Baker, 1997g).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.32 Site Screening Area 12 – Public Works Storage Yard/Building 683 Vicinity

Site Description

SSA 12 is about 1.5 acres located in the Public Works storage yard, at the eastern portion of WPNSTA Yorktown near Site 12 and SSAs 11 and 13 (**Figure 3-32**). SSA 12 is comprised of two areas: a field about 150 feet by 300 feet and a fenced yard controlled by Building 645. The field was used to store waste generated by the Public Works Department (used motor oil, used batteries and old tires). The fenced yard was used to store new electrical transformers and other electrical equipment (used or damaged transformers have not been stored at SSA 12). Also, within the fenced yard is a formerly wooded area where demolition debris was reportedly deposited. Concrete debris was visible at the edge of this area during the 1997 SSP (Baker, 1997g). A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 8, 11, 12, and 13	Baker, 1997	00908

Nature and Extent of Potential Contamination

Soil, sediment, and groundwater samples were collected at SSA 12 and analyzed for VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TPH, and metals. Arsenic and PAHs exceeded industrial screening values in surface soil. There were no VOCs, pesticides, PCBs, or nitramine compounds detected in subsurface soil. Lead was the only metal in subsurface soil to exceeded background. There were no VOCs, SVOCs, pesticides, PCBs, or nitramine compounds in groundwater. Dissolved metals in groundwater were consistent with background.

Potential Risks

Although human health risk screening identified unacceptable risks associated with metals in subsurface soil and unfiltered groundwater samples, these risks were determined to be acceptable based on comparison of site concentrations to background and because individually, the cancer risks and hazard indices for chemicals and media are within an acceptable risk threshold. A total effects range-low (ER-L) EI value of 125.72 was calculated for sediment and is due to pesticides (DDE and DDT), PAHs, and arsenic.

Based on the results of the 1997 Final Site Screening Process Report for Site Screening Areas 8, 11, 12, and 13, no further action was recommended for SSA 12 (Baker, 1997g).

Removal Action(s)

- No CERCLA remedial actions have taken place at SSA 12.
- A No Further Action Decision Summary was signed in July 1997 (Baker, 1997g).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.33 Site Screening Area 13 – Building 529 Battery Drainage Area

Site Description

SSA 13 is about 0.5 acres located outside of Building 529 at the eastern portion of the facility near Site 12 and SSAs 11 and 12 (**Figure 3-33**). The area consists of pavement where neutralized battery washwater was released and migrated to a storm drain about 100 feet away. Battery washwater was mixed with baking soda as it drained to the storm water sewer system. Historical records indicate that chlorinated solvents were not used in the battery washing process. The storm drain is located in the southeastern corner of the concrete platform in Building 529. The pavement on the western side of Ballard Road and the eastern side of Building 529 slopes on each side towards the storm drain. The entire area is asphalt covered. During a 1995 site visit, it was confirmed that the drain was connected to a storm sewer line. The storm water sewer system eventually drains (through surface overland flow) into Ballard Creek. Operations at Building 529 began in the 1940's, and battery washing occurred at SSA 13 until 1987. The battery wash area is underlain by 6-inches of concrete. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 8, 11, 12, and 13	Baker, 1997	00908

Nature and Extent of Potential Contamination

Subsurface soil, groundwater, surface water, and sediment samples were collected and were analyzed for VOCs, SVOCs, pesticides, PCBs, nitramine compounds, and metals.

Chlorinated VOCs (1,1, DCE, 1,1,1-TCA, and TCE) were detected at low concentrations estimated below reporting limits in subsurface soil, and 1,1, DCE (47 µg/L) and TCE (53 µg/L) were detected in groundwater above the MCL. Metals in soil and dissolved metals in groundwater were consistent with background.

One surface water sample was collected from Ballard Creek in which TCE was detected at a concentration below VDEQ standards. Four sediment samples were collected from two locations: two at the intersection of a storm culvert drainageway and Ballard Creek, and two within the drainage ditch at the culvert outfall from SSA 13. SVOCs, pesticides, and one PCB were detected in the sediment samples collected from the grass covered ditch near Building 529. The 1997 SSP attributed these detections to railroad activity since the sample locations were in close proximity to railroad tracks.

Potential Risks

Human health risk screening identified a cumulative cancer risk of 1.1 x 10-3 due to VOCs in groundwater and an HI of 1.9 due to iron in soil. Iron concentrations in soil are consistent with background. A total EI value for the surface water collected at SSA 13 in Ballard Creek was calculated to be 0.40 for acute effects and 2.40 for chronic effects. The elevated chronic EI is a result of concentrations of aluminum and cadmium detected in the surface water above screening levels.

Based on the results of the 1997 Final Site Screening Process Report for Site Screening Areas 8, 11, 12, and 13, no further action was recommended for SSA 13 (Baker, 1997g).

Removal Action(s)

- No CERCLA remedial actions have taken place at SSA 13.
- A No Further Action Decision Summary was signed in July 1997 (Baker, 1997g).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.34 Site Screening Area 14 – Building 537 Discharge to Felgates Creek

Site Description

SSA 14, The Building 537 Discharge to Felgates Creek, is approximately 0.4 acres in the north-central portion of WPNSTA Yorktown (**Figure 3-34**). A one-lane asphalt road circles around Buildings 458, 459, 460, 537, and 651, which are concrete bunkers set into a hillside. South of the road, the sparsely wooded terrain slopes steeply to a flat marsh wetland area north of the main channel of the Eastern Branch of Felgates Creek. SSA 14 consists of a pipe which originates at Building 537 and extends south to Felgates Creek. Nitramine contaminated wastewater was reportedly discharged through the pipe.

The surface geology at SSA 14 consists of approximately 10 ft of silt and clay consistent with the Yorktown confining unit. This clay unit overlies the Yorktown-Eastover aquifer which consists predominantly of sand, but includes an approximately 10 ft thick clay lense at 30-40 ft bgs at SSA 14. Depth to groundwater at the site is between 10 and 12 ft bgs. Groundwater and surface water flow south toward the Eastern Branch of Felgates Creek. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Relative Risk Ranking System, Data Collection Investigation	Baker, 1995	00675
Round Two Remedial Investigation Report for Sites 2, 8, 18, and Site Screening Area 14	Baker, 2004	01548 (Volume I) 01549 (Volume II)
Engineering Evaluation/Cost Analysis for Contaminated Soil and Sediment Site 8 and SSA 14	Baker, 2005	02076
Work Plan Interim Removal Action At Site 8 and SSA 14	Shaw, 2005	01890

Nature and Extent of Potential Contamination

The primary source of contamination was wastewater discharged from the Building 537 pipeline. Previous investigations included full suite analysis (TCL VOCs, TCL SVOCs, explosives, TCL pesticides/PCBs, and TAL metals) of soil, surface water, sediment, and groundwater.

Soil Explosives (HMX and 2,6-DNT) were detected in the discharge drainage ditch surface soil with a maximum concentration of HMX of 1,700,000 µg/kg. 2,6-DNT was detected at concentrations below 1 µg/kg. Various PAHs were also detected in surface soils at concentrations up to 570 µg/kg (chrysene). BEHP was detected at a maximum concentration of 2400 J µg/kg in surface soil. No organics were detected in subsurface soils at SSA 14. Barium, chromium, iron, mercury, thallium, vanadium and zinc were detected in surface soil at concentrations exceeding maximum background values. Thallium was the only inorganic detected at a concentration above maximum background in subsurface soil (Baker, 2004b).

Surface Water and Sediment Felgates Creek flows due west in the vicinity of SSA 14; approximately 250 feet downstream the creek abruptly turns northward and receives runoff from Site 8. Due to proximity of Site 8 and SSA 14 to each other and Felgates Creek, surface water, sediment, and aquatic ecological investigations have been combined. Explosives (2,4,6-TNT and 4-amino-2,6-DNT) were detected in Felgates Creek surface water in the vicinity of Site 8. Aluminum (1990 µg/L), arsenic (2.7 µg/L), iron (2990 µg/L), manganese (405J µg/L), and vanadium (7.2 µg/L) were detected in surface water above background concentrations. One explosive (RDX) was detected in sediment in the SSA 14 drainage way at a concentration of 627 µg/kg. No other explosives were detected in sediments. Several PAHs and vinyl chloride were detected in sediment. BEHP was detected at a maximum concentration of 6,200 µg/kg. Inorganics detected above maximum background concentrations in sediment comprised the following: aluminum at 29300 mg/kg, arsenic at 13 mg/kg, beryllium at 1.6 mg/kg, chromium at 57.6 mg/kg, cobalt at 9.9 mg/kg, copper at 45.7 mg/kg, iron at 42500 mg/kg, manganese at 450 mg/kg, mercury at 0.14 mg/kg, silver at 3.7 mg/kg, and vanadium at 56.1 mg/kg. Of the constituents detected above background concentrations, chromium, copper, and silver exceeded their respective low BTAG values (Baker, 2004b).

Groundwater Chlorinated VOCs were detected in groundwater at concentrations of 4,200 µg/L (TCE). The highest concentrations were localized to the area just downgradient of Building 537. Explosives (HMX, RDX, nitrobenzenes, and amino-DNTs) were also detected in site groundwater at concentrations below 10 µg/L. Inorganics were detected in groundwater, however, only thallium (6.9K µg/L) was detected above the backgroundand also exceeds the MCL Groundwater is currently under further investigations (Baker, 2004). Preliminary MIP data indicates that the presence of VOCs in the vicinity of Building of 537 may not be related to the discharge pipe.

Potential Risks

Human health risks were evaluated for the current maintenance worker and the adolescent and adult recreational user and trespasser from exposure to surface soil, surface water, and sediment. Additionally risks were evaluated for the construction worker from exposure to subsurface soil. Potential risks for future on-site residents were evaluated from exposure to surface soil and shallow groundwater (beneficial use scenario- car washing and lawn watering). Potable groundwater use was not evaluated in the risk assessment. The only unacceptable risks identified in the HHRA are:

- Potential unacceptable risks to the future adolescent recreational user or trespasser were identified from exposure to surface soil (HI = 1.06). This risk was primarily driven by HMX (HQ = 1.02).
- Potential unacceptable non-cancer hazards were identified for the future child resident (HI = 16.1) due to potential ingestion (7.1) and dermal exposure (9.0) to surface soil. The ingestion pathway risk drivers were HMX (HQ = 4.35) and iron (HQ = 1.1). HMX (HQ = 8.72) was the primary risk driver in the dermal absorption pathway.
- Potential unacceptable non-cancer hazards were identified for the future adult resident (HI = 5.9) from dermal exposure to HMX (HQ = 4.9) in surface soil.

A SERA was completed to evaluate potential risks to terrestrial and aquatic receptors from soil, sediment, and surface water at SSA 14. HMX, chromium, iron, mercury, vanadium, and zinc were identified as risk drivers for terrestrial lower trophic level receptors due to concentrations in soil. BEHP and selenium were also identified as risk drivers for aquatic organisms due to concentrations in sediment. Concentrations of these constituents were greater than background.

Removal Action(s)

A removal action was completed in 2007 (Shaw) to address concentrations of HMX, chromium, iron, mercury, vanadium and zinc in SSA 14 soils and selenium and BEHP in site sediment. The total volume of soil and sediment removed was 1,139 cubic yards. The Navy in partnership with the EPA and VDEQ agree confirmation sample data demonstrate that clean up goals and/or background concentrations were achieved. Construction completion documentation of the removal action is in progress.

CERCLA Path Forward

- Construction Completion Report (documenting 2007 removal action)
- RI for groundwater surface water and sediment

- FS/PP/ROD (for all media)

Schedule 3-22 presents the FY08-09 schedule for SSA 14.

3.2.35 Site Screening Area 15—Sewage Treatment Plant #1/Sludge Drying Beds and Discharge Area

Site Description

SSA 15 is situated on about 0.3 acres and comprises the sewage treatment plant (STP) #1/Sludge Drying Beds and Discharge Area. It is located in the southeast corner of the WPNSTA, east of Buildings 3 and 4 and south of Site 12 (Barracks Road Landfill) (**Figure 3-35**). An Imhoff tank, a trickling filter, a sludge drying bed, and a chlorination unit were located at SSA 15. Wastewater reportedly entered the Imhoff tank, which operated as a primary settling basin for the waste. The water then was passed through the trickling filter for biological treatment and pumped back to the Imhoff tank for secondary settling. The water was chlorinated in the chlorination unit and discharged to a tributary of Ballard Creek. Sludge from the Imhoff tank was periodically removed and placed in the sludge drying bed. STP #1 received and managed only sanitary waste from physical plants and the Officer's Club located nearby, but may have treated nitramine-containing and other industrial wastewater. WPNSTA personnel have reported that during the operation of STP #1, a mercury-containing bearing on the trickling filter cracked, allowing mercury to be released. Also, WPNSTA personnel indicated that sludge from SSA 15 was transported to SSA 6 and land farmed.

SSA 15 represents AOCs 5, 6, and 7, which are the drying beds for former STPs 2, 3, and 4, respectively. The Navy, in partnership with EPA and VDEQ, agreed that the SSP determination for SSA 15 would be applicable to AOCs 5, 6, and 7. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 1, 6, 7, and 15	Baker, 1996	00663 (Volume I) 00664 (Volume II) 00665 (Volume III)

Nature and Extent of Potential Contamination

Surface soil, subsurface, soil, groundwater, surface water, and sediment samples were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, nitramine compounds, and metals. Mercury was not detected in soil, groundwater, or surface water, but was detected in sediment (0.44 mg/kg). SVOCs and pesticides were detected in soil below screening levels. Metals detected in soil were consistent with background. No SVOCs or PCBs were detected in groundwater, and generally only low VOC and pesticide concentrations were estimated below reporting limits. Dissolved metals were generally detected at concentrations consistent with background. Vinyl chloride (2 µg/L) and TCE (500 µg/L) were detected in surface water. Metals were detected in surface water generally consistent with background. Only low VOC and SVOC concentrations were estimated below reporting

limits in sediment. Pesticides detected in sediment included DDT (86 µg/kg), DDD (40 µg/kg), and DDE (31 µg/kg).

Potential Risks

There were no unacceptable risks identified for the potable use of groundwater. Although there was an unacceptable HI of 2 from exposure to arsenic and manganese in soil, concentrations were similar to background. An EI value of 99 was determined for sediments, attributable to pesticides. The source of TCE elevated in surface water is attributable to potential sources in the industrial area upgradient of SSA 15.

Because SSA 15 does not appear to be the source of contamination to surface water and sediment, no further investigation was recommended in the SSP (Baker, 1996b). (CERCLA status determinations for AOCs 5, 6, and 7, as identified in the *Area of Concern Decision Signature Page with Attachments* (Baker, 1997a), are pending the CERCLA status decision for SSA 15.)

Removal Action(s)

In 2001, the Imhoff tank, trickling filter, sludge drying bed, and chlorination unit were removed.

CERCLA Path Forward

Desktop audit to confirm CERCLA documentation for NFA is complete with the SSP, as the SSP does not recommend additional RI/FS activities, but does acknowledge additional sampling in association with Site 12.

3.2.36 Site Screening Area 17—Mark 46 Torpedo Support Facility

Site Description

SSA 17 is located about 400 feet north of Sharpe Road and about 2,000 feet northwest of the intersection of Sharpe and Lee Roads in the central portion of WPNSTA Yorktown and occupies an area of about 330 feet by 310 feet (**Figure 3-36**). This area previously contained a 10,000-gallon UST and ancillary drain pipes that was used to store waste Otto fuel generated during the cleaning of MK 46 torpedoes. (Waste Otto fuel is a mixture of Otto fuel and water which potentially contained oil, denatured ethyl alcohol, detergent, and trace amounts of cyanide.) In June 1988, a tank integrity test was performed; the tank system failed the hydrostatic integrity test and was subsequently taken out of service. The floor drains leading to the tank were sealed and a RCRA closure and post-closure plan was submitted to VDEQ in November 1988. The UST system was removed in March 1995. The MK 46 torpedo shop subsequently stored waste Otto fuel in 55-gallon drums for later off-site disposal. Waste Otto fuel is no longer generated or stored at SSA 17. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
EE/CA and Action Memorandum Site Screening Area 17 – Mark 46 Torpedo Shop Waste Otto Fuel Underground Storage Tank	Environmental and Safety Designs, Inc., 1994	00614 (AM) 00621 (EE/CA)
Screening Process Report for Site Screening Areas 2, 17, 18, and 19	Baker, 1996	00666 (Volume I) 00667 (Volume II)

Nature and Extent of Potential Contamination

The source of contamination was waste Otto fuel stored in an UST. Soil and groundwater were sampled for VOCs, SVOCs, pesticides, PCBs, propylene glycol di-nitrate (PGDN), and metals. Methylene chloride was consistenty detected in soil at concentrations as high as 3,500 mg/kg with a high frequency of detection. Metals were not elevated in soil in concentrations of concern. Although low VOC concentrations [methylene chloride (5.4 µg/L) and 1,1-DCE (15 µg/L) were detected in groundwater, there were no MCL exceedances. SVOCs, pesticides, PCBs, and PGDN were not detected in soil or groundwater, with the exception of trace detections of phthlates in soil.

Potential Risks

No unacceptable cancer risks were identified from exposure to soil and groundwater. Although an HI of 4.7 was identified from exposure to total aluminum and manganese in groundwater and manganese in soil, manganese concentrations is soil are consistent with background and the HI for dissolved metals in groundwater is 0.33.

Based on the results of the 1996 *Final Site Screening Process Report for Site Screening Areas 2, 17, 18, and 19,* no further action was recommended for SSA 17 (Baker, 1996c).

Removal Action(s)

- A removal action was conducted in 1995 to remove the UST system. Closure documentation is included in Appendix P of the SSP report.
- A No Further Action Decision Summary was signed in March 1996 (Baker, 1996c).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.37 Site Screening Area 19—Beaver Road/Ponds 11 and 12 Drainage Areas

Site Description

SSA 19 occupies an area of about 164 acres, and is located in the northwestern section of WPNSTA Yorktown (**Figure 3-37**). It encompasses the area surrounding the Open Burn/Open Detonation (OB/OD) Range, including SSA 2(Former EOD Burning Disposal Area) that drains into Ponds 11 and 12. The FFA identities SSA 19 as former SWMUs 31(EOD Holes), SWMU 32 (EOD Burn Containers), and AOC B (EOD Range Pond). The EOD range began operations in 1970 when the former disposal range (SSA 2) was taken out

of service. The OB/OD range was used for explosive waste destruction conducted in accordance with permitted RCRA requirements, including groundwater monitoring. EOD operations involved detonation of ordnance in 20 ft borings constructed in 40 ft high soil berms. Nine metal containers of varying sizes were used when higher temperatures were needed to adequately burn explosive waste. During the winter, this area is covered and grass is grown to prevent erosion. Unlined settling ponds collect runoff through pipes from this area. Effluent from these ponds may discharge to nearby Ponds 11 and 12. SSA 19 does not include the operational area of the OB/OD Range but addresses the soil and groundwater at the perimeter of the range and surface water and sediment in Ponds 11 and 12 that receives runoff from the area. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 2, 17, 18, and 19	Baker, 1996	00666 (Volume I) 00667 (Volume II)
AOC 22; Site 12, and SSA2, SSA19, and King Creek Independent Sampling and Risk Screening Report	Black and Veatch, for EPA, 1996	00669

Nature and Extent of Potential Contamination

Surface soil, subsurface soil, groundwater, surface water, and sediment samples were collected for analysis of VOCs, SVOCs, pesticides, PCBs, nitramines, and metals. Low concentrations of ideno(1,2,3-cd)pyrene (120 J µg/kg) and and 1,1,1 TCA (16 µg/kg) were detected soil. Metals were detected in soil at concentrations generally similar to background. Low concentrations of phthalates estimated below reporting limits were detected in groundwater, as were low levels of DNT (0.27 µg/L), and RDX (2.2 µg/L). Dissolved metals in groundwater did not exceed MCLs. There were no detections of VOCs, SVOCs, pesticides, PCBs, or nitramine compounds in surface water from Ponds 11 and 12. VOCs and PAHs were detected at low estimated concentrations below reporting limits in sediment and metals concentrations in sediment were generally similar to background.

Potential Risks

No unacceptable human health cancer risk was identified from exposure to soil and dissolved groundwater. A cumulative hazard index of 2.3 for soil and 1.9 for groundwater was identified from exposure to due arsenic and antimony. These metals were present at concentrations similar to background. A total EI value for the surface water was calculated to be 27 due to iron and silver. A total EI value for the sediment was calculated to be 17 due to pesticides and metals. Because metals in site media were consistent with background, no further action was recommended (Baker, 1996c).

Remedial Action(s)

- No CERCLA remedial actions have taken place at SSA 19.
- A No Further Action Decision Summary was signed in March 1996 (Baker, 1996c).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.38 Site Screening Area 21—Roosevelt Pond

Site Description

SSA 21 is Roosevelt Pond, approximately 22.2 acres in the eastern portion of WPNSTA Yorktown. SSA 21 is bounded to the north by Roosevelt Road, to the west by Main Road, to the south by By-Pass Road, and to the east by Mine Assembly Plant 1 and the York River (**Figure 3-38**). The surrounding area is generally wooded. Roosevelt Pond is fresh water and receives runoff from the industrial area to the south including SSA 12, SSA 4, and SSA 5. Roosevelt Pond discharges into the York River within 500 feet of WPNSTA Yorktown facility boundary. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)
Additional Evaluation of Site Screening Areas 3, 4, 5, and 21, Addendum to the Site Screening Process Report	Baker, 2002	01568
Additional Evaluation of Site Screening Areas 3, 4, 5, and 21, Addendum to the Site Screening Process Report	Baker, 2004	01427

Nature and Extent of Potential Contamination

Potential contamination of Roosevelt Pond surface water and sediment is from surface water runoff received from upgradient Sites and SSAs. Previous investigations included sampling of fish and shellfish tissue, surface water, sediment, and soil. Analyses included VOCs, SVOCs, pesticides, PCBs, nitramines, metals, and TOC, as appropriate. Low concentrations estimated below reporting limits of VOCs and SVOCs were detected in soil, below risk screening criteria. Explosives and PCBs were not detected in soil, and pesticides and metals detected in soil were at concentrations consistent with background.

VOCs and SVOCs detected infrequently in surface water and sediment were at concentrations below risk screening criteria. Pesticides and metals detected in surface water and sediment were at concentrations generally consistent with background. The explosive 3-nitrotoluene was detected in one surface water sample at 0.41 µg/L. Low concentrations of pesticides and PCBs were detected in fish and shellfish.

Potential Risks

No unacceptable human health cancer risk (8.5×10^{-5}) was identified from exposure to SSA 21 media. Although the cumulative non-cancer HI (5.3) exceeded 1, from exposure to iron

and arsenic in soil, concentrations are consistent with background, and individual hazard quotients were below 1.

A total EI value of 4 and 90 were calculated for acute and chronic screening levels, respectively. Aluminum and iron is surface water pose potential risk to aquatic receptors; however iron concentrations are consistent with background. Total EI values of 72 for the ER-L and 17 for the ER-M indicate that the benthic community may be impacted by sediment concentrations of carbon disulfide, 4,4'-DDD, and 4,4-DDE, in sediment; however, pesticides were at concentrations consistent with background.

Based on the conclusions and recommendations presented in the Additional Evaluation of Site Screening Areas 3, 4, 5, and 21, Addendum to the Site Screening Report Naval Weapons Station Yorktown (Baker, 2004a), no chemicals were identified as ecological risk drivers for SSA 4, and no further evaluation was recommended.

Remedial Action(s)

- No CERCLA remedial actions have taken place at SSA 21.
- A No Further Action Decision Summary was signed in May 2004 (Baker, 2004a).

CERCLA Path Forward

CERCLA documentation is complete with the SSP and Decision Signature.

3.2.39 Site Screening Area 22 – Sand Blasting Grit Area

Site Description

SSA 22 (formerly AOC 4) consists of approximately 0.5 acres in the eastern portion of WPNSTA Yorktown. SSA 22 is bounded to the east and north by Bollman Road, to the south by the former location of buildings 530, 644, and 1720, and to the west by unused land (**Figure 3-39**). A sand blast grit area was adjacent to Building 530, which operated from 1945 until the early to mid 1980s. Bomb fins and wings, inert bomb casings, and various other inert ordnance items were grit blasted in a blasting booth inside Building 530, and outside at the northern end of the building. Grit blasting material may have been composed of coal slag or steel grit. The blasting booth within the building used a dust collector; accumulated dust may have been deposited in the vicinity of the northern side of Building 530.

The general topography at SSA 22 is flat. The area is mostly a cleared grassy area, bounded by woods to the west, south, and north and Bollman Road to the east. There are no surface water bodies associated with this SSA. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Navy Final Recommendation for Areas of Concern (SSA 22 is identified as AOC#4)	P.A. Rakowski, P.E., 1995	00355
Remedial Action Report for Sites 1 and 3 and SSA 22	OHM, 2001	01091
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)

Nature and Extent of Potential Contamination

Potential contamination at SSA 22 is related to sand blasting activities within and near former Building 530 and the grit pile that was possibly located in the north corner of Building 530. The contaminants of concern at SSA 22 are VOCs in groundwater (note: only one monitoring well has been installed at SSA 22). Surface water and sediment are not associated with SSA 22. No SVOCs, pesticides, or PCBs were detected in the groundwater. Dissolved metals were significantly lower than total metals and were detected at concentrations below tap water RBC values. The VOCs 1,1-DCE (2 J µg/L), total 1,2-DCE (6 J µg/L), TCE (220 µg/L), and total xylenes (2 J µg/L) were detected in groundwater. Of the VOCs, only TCE exceeded its respective MCL and tap water RBC (Baker, 2001). These detections are located downgradient of a UST; however historical records indicate that only #2 fuel oil (which does not contain any VOCs) was stored in the UST. Therefore, it is most likely that the potential VOC contamination be associated with the use of solvents and degreasers as part of Building 530 activities.

Potential Risks

A cumulative non-cancer hazard (HI=19) for the future resident from ingestion of unfiltered groundwater was due to exposure to aluminum, arsenic, chromium, iron, manganese, and vanadium. HQs of these inorganics were below 1 except for aluminum (HQ = 1.2), arsenic (HQ = 7.7), and iron (HQ = 8.0). Additionally an unacceptable cumulative cancer risk of $2.1x10^{-3}$ was calculated from exposure to TCE (ILCR = $1.4x10^{-4}$) and total arsenic (ILCR = $1.9x10^{-3}$). However, arsenic and TCE effect different organs (arsenic effects skin and TCE effects liver) and therefore their effects would not be additive.

A cumulative non-cancer hazard (HI=1.5) for the future resident from ingestion of filtered groundwater was due to exposure to dissolved aluminum, arsenic, iron, and manganese. There were no individual HQs greater than 1 and these inorganics affect different target organs; therefore their effects are not cumulative. An unacceptable cancer risk of $3.4x10^{-4}$ was calculated from exposure to TCE (ILCR = $1.4x10^{-4}$) and dissolved arsenic (ILCR = $1.2x10^{-4}$). Since arsenic and TCE effect different organs their effects would not be cumulative.

Potential terrestrial ecological risks were not evaluated.

Remedial Action(s)

In 1998, a remedial action consisted of the removal of lead contaminated soil and sandblasting grit from 6 inches to 2 feet below grade. Following the removal action, post excavation soil samples demonstrate lead concentrations in soil remaining at the site are below 200 mg/kg (OHM, 2001a).

A No Further Action Decision Summary for soil was signed May 2004 (Baker, 2004a).

CERCLA Path Forward

CERCLA documentation for soil is complete with the SSP and Decision Signature Page. The SSP concluded further evaluation of groundwater was warranted. Further evaluation of groundwater has not been scheduled at this time. Site Screening Area 23—Coal Storage Area

Site Description

SSA 23 (formerly AOC#21) occupies a one acre area adjacent to Building 708, used for coal storage from 1953 to the late 1970s. SSA 23 is north of Building 706 and west of Longfellow Road (Figure 3-40). A nine-inch thick reinforced concrete wall surrounded the former coal pile. Drainage pipes (2 to 6-inches in diameter) were present in the wall every 20 feet. The drainage pipes released water from the coal storage area to the ground surface, on the north side of Building 1827. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Navy Final Recommendation for Areas of Concern (SSA 23 is identified as AOC#21)	P.A. Rakowski, P.E., 1995	00355
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	01350 (Volume I) 01351 (Volume II) 01352 (Volume III)

Nature and Extent of Potential Contamination

Former coal storage is the source for potential contamination of site media. Previous investigations include sampling and analysis of soil and groundwater for VOCs, SVOCs, metals, and pesticides/PCBs. Composite coal samples were collected and analyzed for metals. In soil, arsenic and beryllium exceeded the residential RBC. Concentrations of VOCs, SVOCs, metals, and pesticides were either non-detect or below applicable standards in surface and subsurface soil samples. Concentrations of metals and pesticides in surface and subsurface soil samples were consistent with background.

Two groundwater samples were collected from one monitoring well at SSA 23, and did not have detections of No SVOCs, pesticides, or PCBs were detected in groundwater. Chloroform (common laboratory contaminant) was the only VOC detected.

Potential Risks

An unacceptable cancer risk of 1.3×10^{-4} was identified from exposure to arsenic and beryllium in soil, and chloroform in groundwater. A non-cancer hazard index (3.9) was identified from exposure to iron and arsenic in soil. Individual HQ values for iron and arsenic in soil were less than one, and, based on central tendency exposure, mean arsenic and beryllium concentrations do not pose unacceptable health risks.

An ecological risk assessment was not conducted.

Remedial Action(s)

A remedial action in 1998 included the excavation of arsenic contaminated soil adjacent to the north wall of the coal storage structure (Building 1827). Post-excavation samples exceeded the applicable standards for arsenic, and additional soil excavations were conducted in 1999 (Baker, 2004a). Post-excavation samples in 1999 demonstrate arsenic concentrations in soil were below the RL of 63 mg/kg. Therefore, no further action was recommended for this SSA (Baker, 2004a).

No Further Action Decision Summary for soil was signed in May 2004 (Baker, 2004a).

CERCLA Path Forward

CERCLA documentation for soil is complete with the SSP and Decision signature.

3.2.40 SSA 25—Wetlands Downgradient of Beaver Pond

Site Description

SSA 25 is located in the extreme eastern portion of the facility property (**Figure 3-41**). The area is approximately 5.6 acres, and is located between two impounded portions of Ballard Creek: a natural beaver dam (Impoundment No. 1) which forms the eastern edge of Beaver Pond and a second impoundment approximately 750 feet downgradient (Impoundment No. 2), whose history of construction is unclear. Ballard Creek is hydraulically connected for its entire length. Water flows from the erosive, upgradient areas down to Beaver Pond, then over a low area along the northern edge of the beaver dam into the downgradient wetlands, and then through a break in the southern edge of the second impoundment towards the York River. The second impoundment restricts tidal influences from the York River, though the break allows some interaction, the magnitude of which has varied over time. The centerline of Ballard Creek, which meanders throughout the area, marks the property boundary between NWSY and the National Park Service's (NPS) Colonial National Historic Park. Based on its location on Ballard Creek between two impoundments, the wetlands represent a low energy, bottomland depositional habitat. The topography is characterized by a broad, flat area between steep upland slopes with elevations on the order of 30 to 50 feet above mean sea level.

During its operational period, the STP No. 2 trickling filter discharged via a regulated outfall directly to the wetland area. The unit was installed in 1952 and reportedly managed sanitary waste. The trickling filter used elemental mercury (approximately 4 to 6 ounces) as a water seal in the pivot point. Though this seal was maintained, it is likely that mercury leaked into the trickling filter tank and was subsequently discharged to SSA 25 via the STP outfall. It is assumed that treatment operations ceased in the early 1970s, as mercury-sealed

trickling filters were banned from use in the state of Virginia in 1971. STP No. 2, prior to being dismantled and removed in 2000, was an inactive treatment plant consisting of a clarifier, settling tanks, and sludge drying beds. The STP No. 2 clarifier and settling tanks were filled with rainwater and substantial vegetation was growing in drying beds during early assessment activities associated with the NWSY Environmental Restoration (ER) Program (early 1990s). Beaded elemental mercury was discovered around the base of the trickling filter during the demolition process. Twelve drums of mercury-contaminated soils were disposed of and confirmation samples indicated no residual mercury contamination following the removal of the STP buildings and infrastructure. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Draft Steps 6 & 7 of the Aquatic Baseline Ecological Risk Assessment, Site Screening Area 25 – Wetlands Downgradient of Beaver Pond	Baker, 2007	(Draft – No AR No.)

Nature and Extent of Potential Contamination

Sediment analytical data collected from Ballard Creek and historical records indicate that the primary source of mercury contamination to the wetlands is Sewage Treatment Plant (STP) No. 2, formerly located northwest and immediately up-slope of the wetlands area. Sediment samples located near the former STP discharge pipe detected mercury at 5.9 mg/kg, which led to additional surface and subsurface sediment sampling throughout SSA 25 where mercury concentrations were found to range from 0.031J to 15.3 mg/kg to 0.037J to 19.5 mg/kg, respectively. Based on this information and potential for unacceptable impacts to aquatic ecological receptors from mercury exposures in SSA 25, the Navy in partnership with EPA and VDEQ agreed to identify mercury as the sole COC and move directly to a baseline ERA (May 2004 Partnering meeting). A BERA was implemented that included surface water, sediment and tissue samples were collected and analyzed for mercury, methylmercury, pH, total organic carbon, sulfate, sulfide, ammonia, dissolved organic carbon, and grainsize, as appropriate.

Potential Risks

The risk evaluation concluded that mercury concentrations in sediment at SSA 25 may impair growth of aquatic invertebrates, and that additional evaluation (ERA Step 8) in the form of remedy development and evaluation is recommended. To aid in the evaluation of potential remedies, a preliminary remediation goal (PRG) of 4.2 mg/kg (total mercury) was developed for surface and subsurface sediment. This value is the site-specific NOAEL established from the 42-day *Hyalella azteca* survival, growth, and reproduction tests but should also be protective of other ecological receptors based upon the results of the BERA.

Human health risk has not been assessed.

Remedial Action(s)

No CERCLA remedial actions have taken place at SSA 25.

CERCLA Path Forward

- Complete BERA
- EE/CA and AM
- IRA

Schedule 3-23 presents the FY08-09 schedule for SSA 25.

3.3 MMRP Sites

Because funding for both ERP and MMRP is managed by NAVFAC, sites classified as MMRP are also included in this SMP. The only MMRP site identified at Yorktown is the Morale, Welfare, and Recreation (MWR) Skeet Range. However, because a number of ordnance items were found during investigations at ERP Site 2 (Turkey Road Landfill), the Navy will transfer the site to MMRP. For this SMP, information on Site 2 is presented with the Yorktown ERP sites.

3.3.1 MWR Skeet Range

The MWR Skeet Range is approximately 30 acres used exclusively for recreational purposes from 1980 to 1982 (weekends only); after 1982, the range was used sporadically until it was dismantled in 1994 (**Figure 3-42**). Activities were limited to skeet shooting with shotguns from a launching pad, with a 900-foot arc safety danger zone. The site currently is not maintained and not in use. A revised draft final PA (Malcolm Pirnie, 2005) was conducted for the MWR Skeet Range. There are no munitions and explosives of concern on the site, as only small-caliber ammunition was used. Munitions constituents on the site include lead, antimony, copper, zinc, arsenic, and polycyclic aromatic hydrocarbons (PAHs) from bullets, fragments, bullet jackets, and related sporting material such as clay targets. The potential for lead contamination exists over the majority of the site and primarily along the tree line. The PA also identified three areas as potential MMRP sites: the Demolition Range, the Detonator Blasting Pit Area, and the Detonator Pit.

In 2007, an Expanded Site Inspection (ESI) was conducted at the MWR Skeet Range. The evaluation and reporting of ESI results are in progress.

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Legend

- Columbia Monitoring Wells
- Yorktown-Eastover Monitoring Wells
- Study Area Boundary
- Area of Excavation of Arsenic Contaminated Soil
- Interpreted (Geophysical Survey) Northern Extent of Main Disposal Area (Roy F. Weston, Inc., 1993)

N
W E
S

0 150 300
Feet

Figure 3-1
Site 1 - Dudley Road Landfill
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-2_Site2.mxd 6/28/07 munwin

LEGEND

Site Boundary

N
W E
S

0 175 350

Feet

Figure 3-2
Site 2 - Turkey Road Landfill
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-3_Site3_layout.mxd 6/28/07 munwin

Legend

- Yorktown-Eastover Monitoring Wells
- Study Area Boundary
- Area of Excavation of PAH Contaminated Soil
- Landfill Access Road
- Interpreted (Geophysical Survey) Southern Extent of Waste Boundary (Roy F. Weston, Inc., 1993)

N
W E
S

0 100 200
Feet

Figure 3-3
Site 3 - Group 16 Magazine Landfill
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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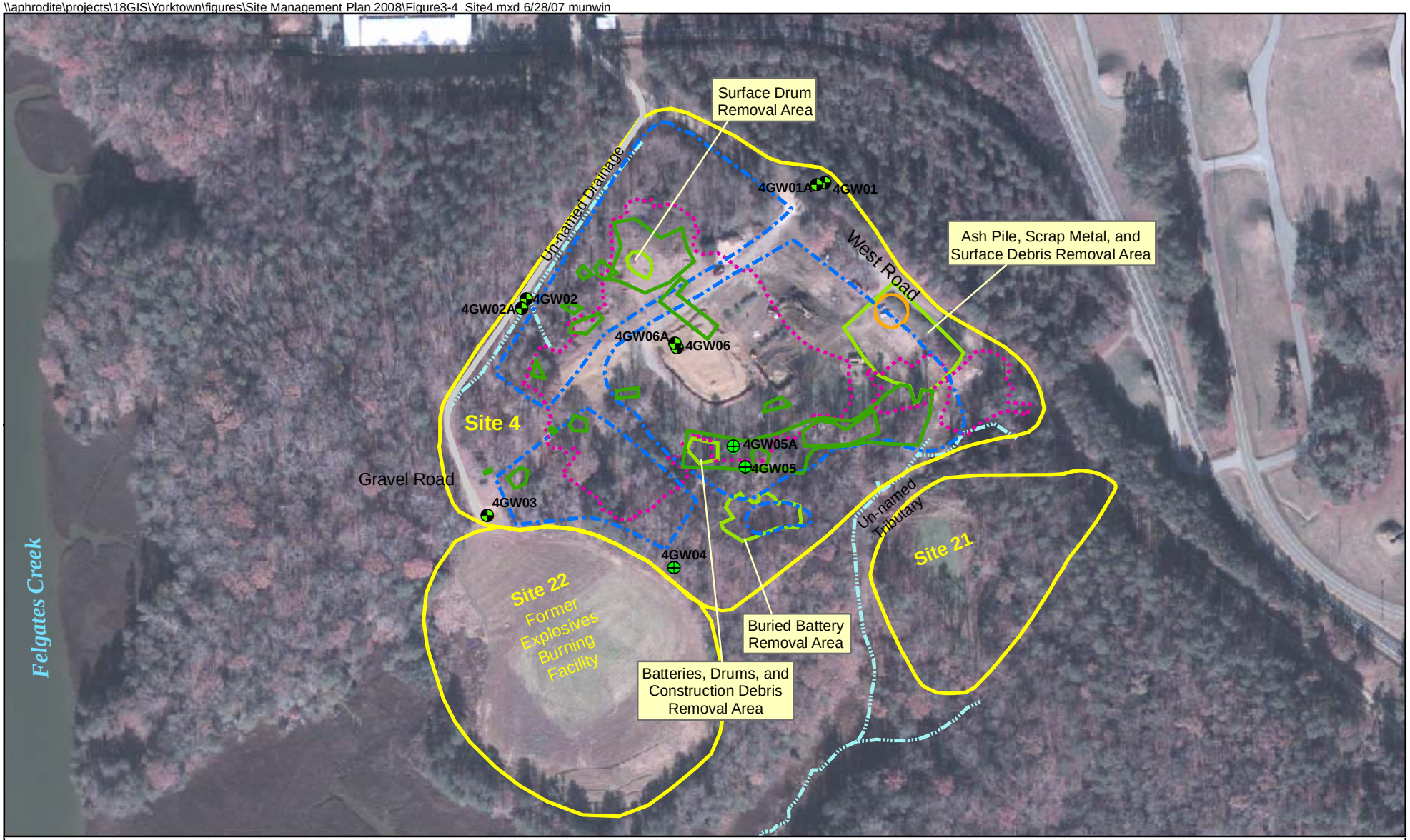

Legend

- Study Area
- Location of Former Ash Pile
- Drainage
- Gravel Access Road
- Existing Monitoring Well (location approximated)
- Existing Monitoring Well (location surveyed)
- Approximate Waste Boundary (1992)
- 1994 NTCRA surface Battery/Soil and Surface Debris Removal Area
- 1994 NTCRA Removal Areas
- 2005 NTCRA Removal Areas

N
W E
S

0 125 250
Feet

Figure 3-4
Site 4 - Burning Pad Residue Landfill
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-5_Site5.mxd 7/30/07 MUnwin

LEGEND

- Site Boundary
- Approximate Location of Former Building 76

N
W E
S

0 50 100
Feet

Figure 3-5
Site 5
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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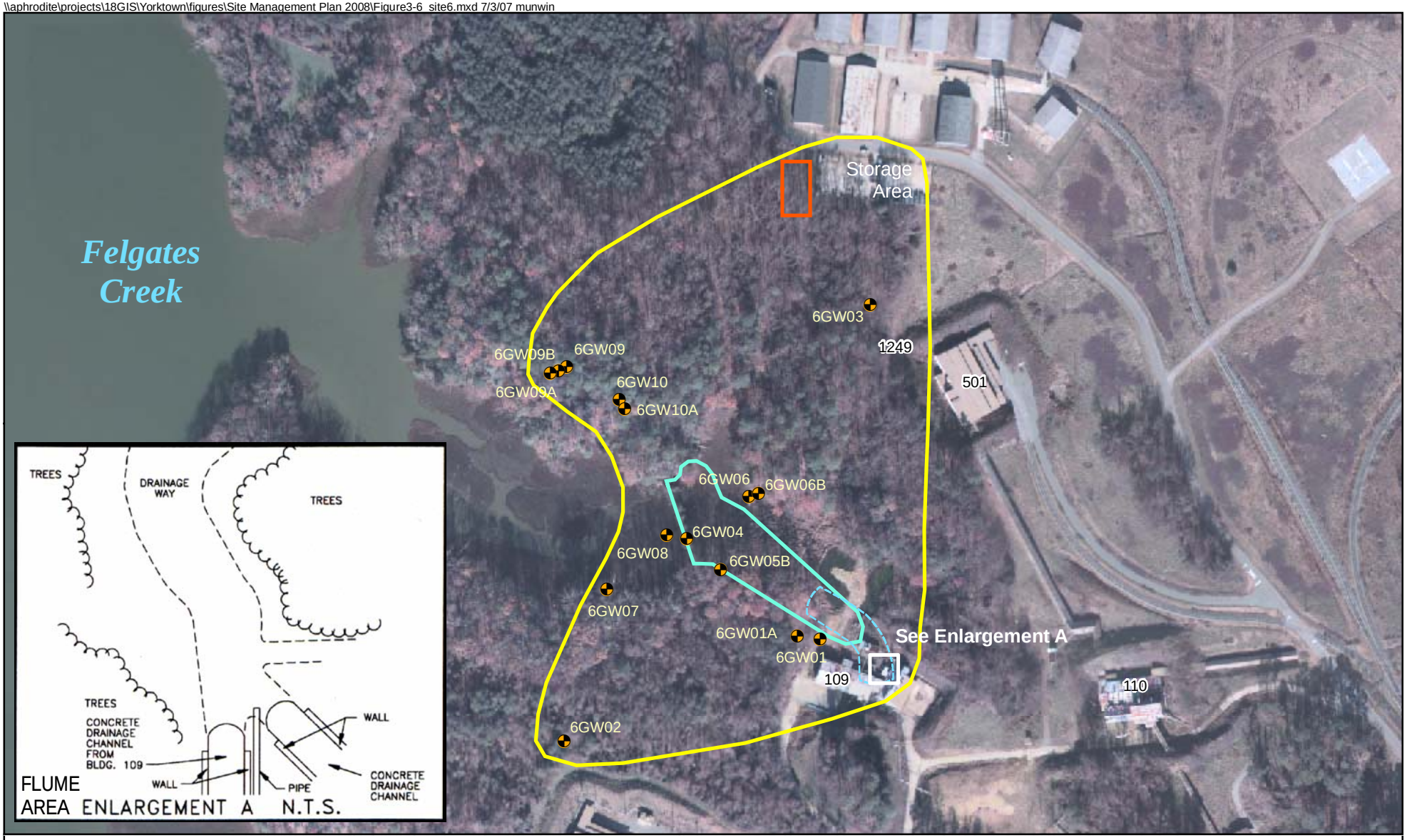

Legend

- Yorktown-Eastover Monitoring Wells
- Study Area Boundary
- Surface Impoundment Area
- Drainage
- Excavated Area

N
W E
S

0 150 300
Feet

Figure 3-6
Site 6 - Explosives Contaminated Wastewater Impoundment
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
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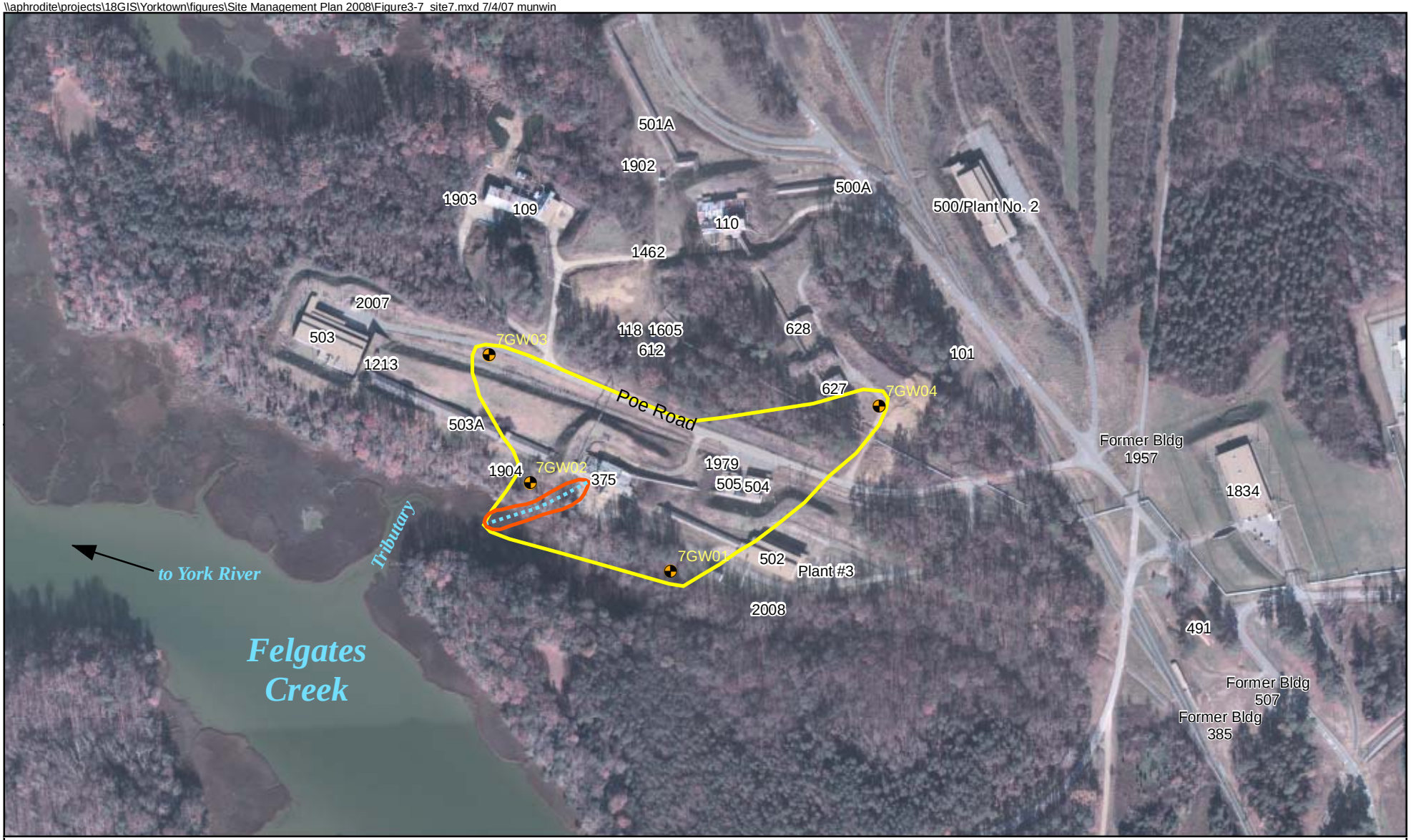

Legend

- Yorktown-Eastover Monitoring Wells
- Study Area Boundary
- Drainage
- Area of Excavation of Nitroamine / Nitroaromatic Compounds of Contaminated Soil

N
W E
S

0 200 400
Feet

Figure 3-7
Site 7 - Plant 3 Explosives Contaminated Wastewater Discharge Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
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\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-8_Site8.mxd 6/28/07 munwin

LEGEND

- Study Area
- Drainage Channel
- Existing Monitoring Well (location surveyed)
- Unable to locate well since Spring 2003, possibly graded over

N
W E
S

0 50 100
Feet

Figure 3-8
Site 8 - NEDED Explosives Contaminated Watewater Discharge Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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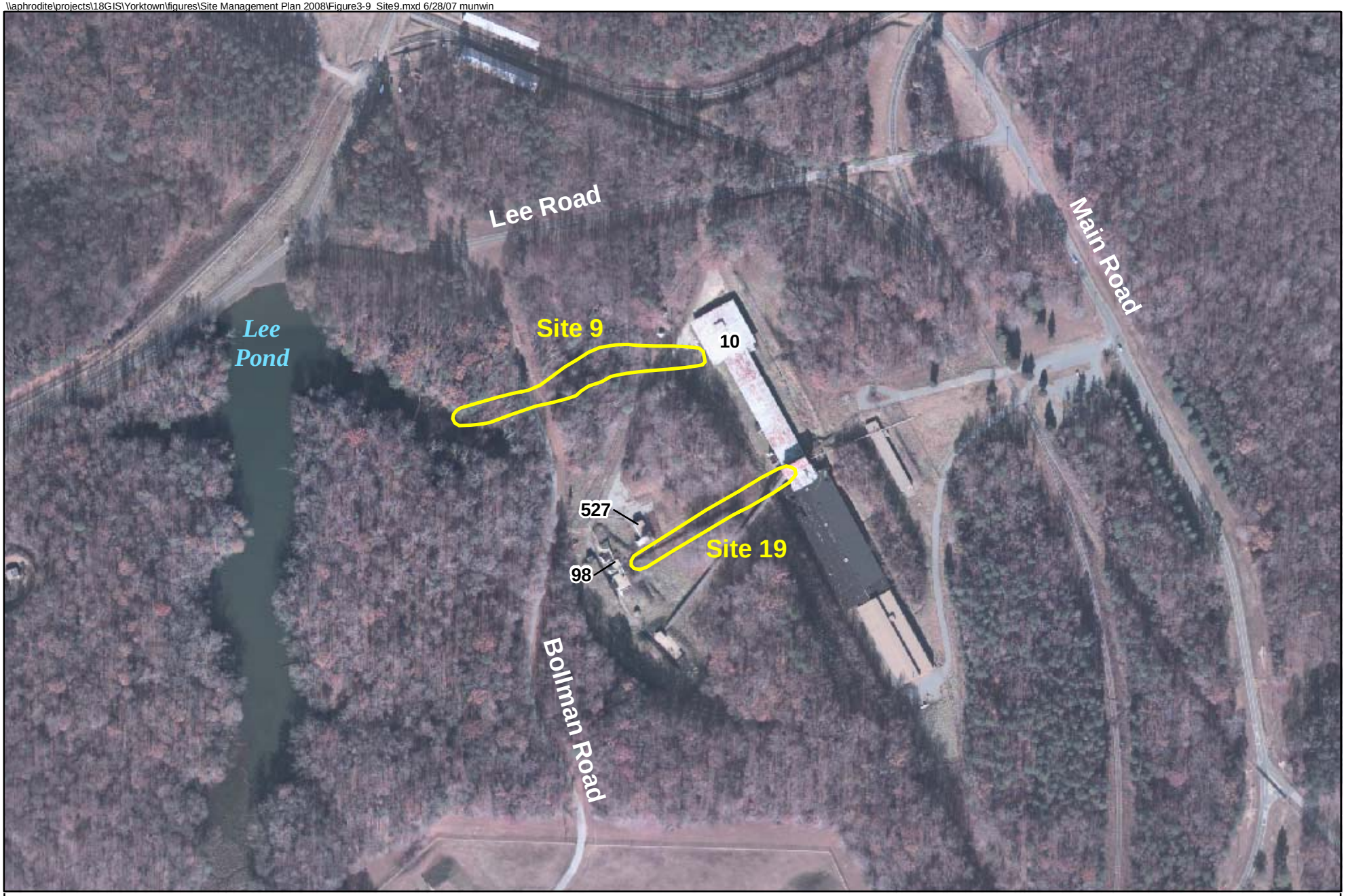
\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-9_Site9.mxd 6/28/07 munwin



LEGEND

Site Boundary

N
W E
S

0 175 350

Feet

Figure 3-9
Site 9 - Plant 1 Explosives Contaminated Wastewater Discharge Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
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\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-10_site11.mxd 7/4/07 munwin

Legend

- Columbia Monitoring Wells
- Yorktown-Eastover Monitoring Wells
- Study Area Boundary
- Area of Excavation to Remove Copper and Mercury Contaminated Soil
- Burn Pit Area

N
W E
S

0 50 100
Feet

Figure 3-10
Site 11 - Abandoned Explosives Burning Pits
Site Management Plan for FY 2008 to 2009
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Yorktown, Virginia

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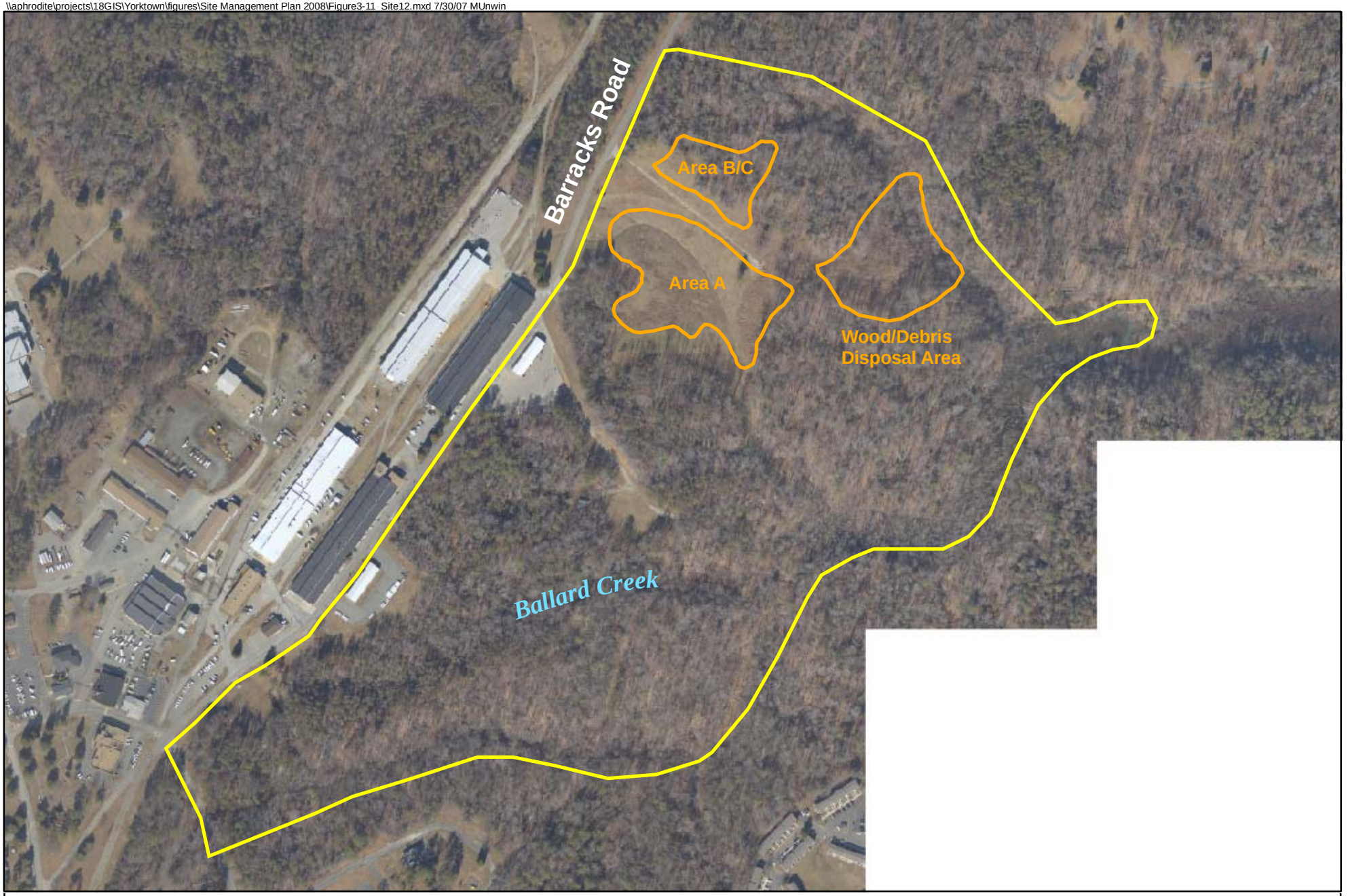

LEGEND

- Site Boundary
- Study Area Boundaries

N
W E
S

0 225 450
Feet

Figure 3-11
Site 12 - Industrial Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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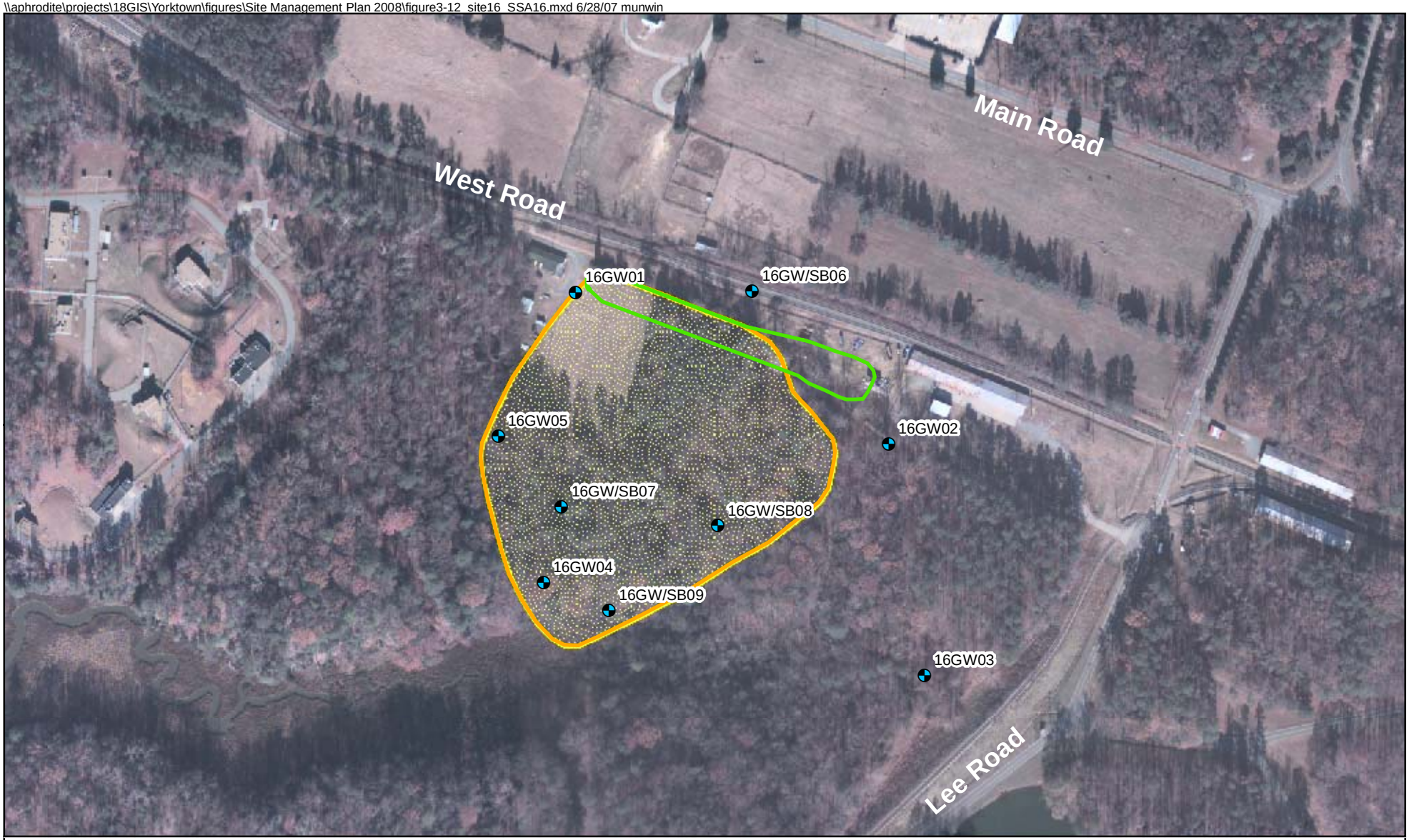

Legend

- Monitoring Well
- 1994 Removal Action Excavation
- Approximate SSA 16 Site Boundary
- Approximate Site 16 Boundary

N
W E
S

0 150 300
Feet

Figure 3-12
Site 16/SSA 16 - West Road Landfill
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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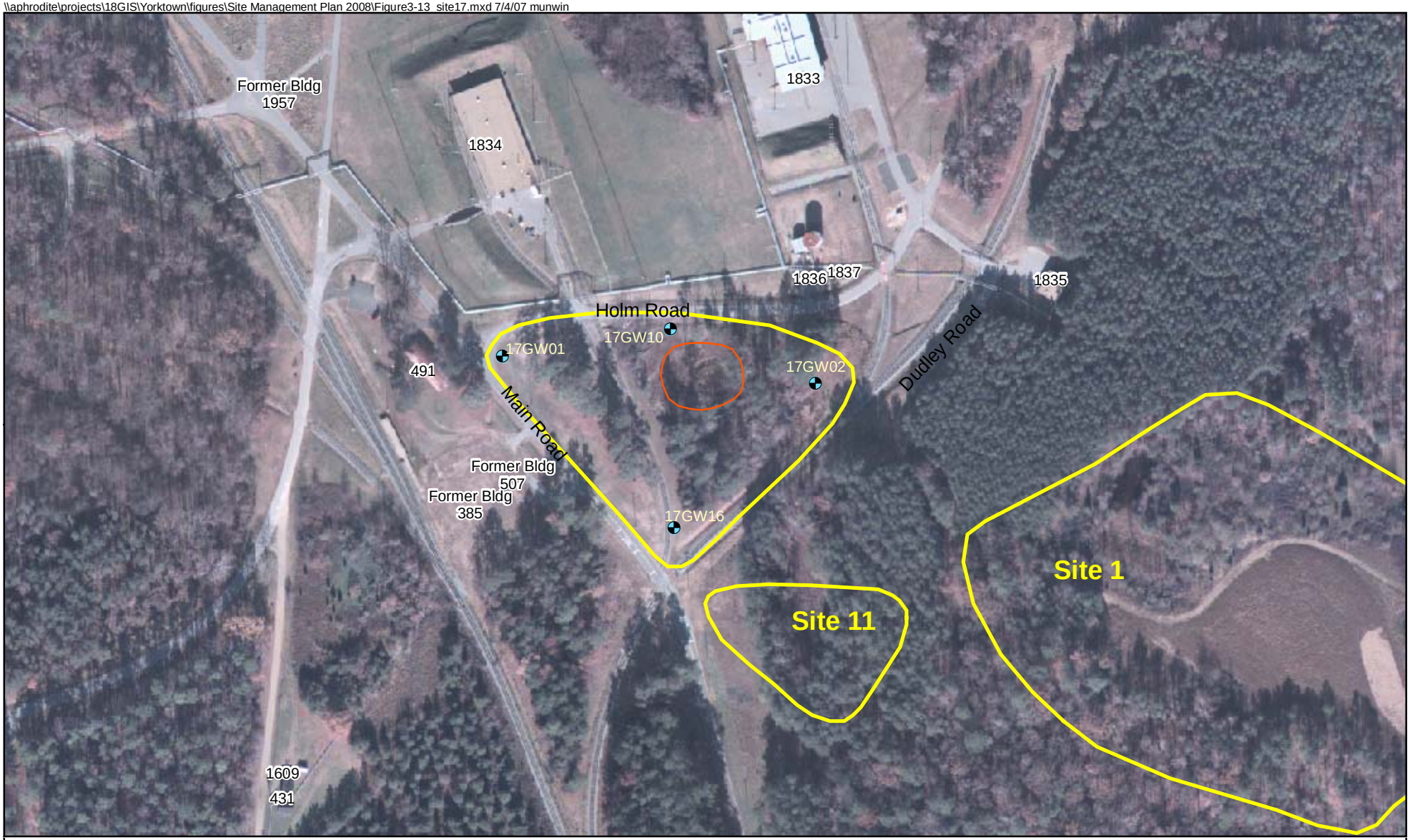

Legend

- Columbia Monitoring Wells
- Study Area Boundary
- Area of Excavation to Remove PAH and Metals Contaminated Soil

N
W E
S

0 100 200
Feet

Figure 3-13
Site 17 - Holm Road Landfill
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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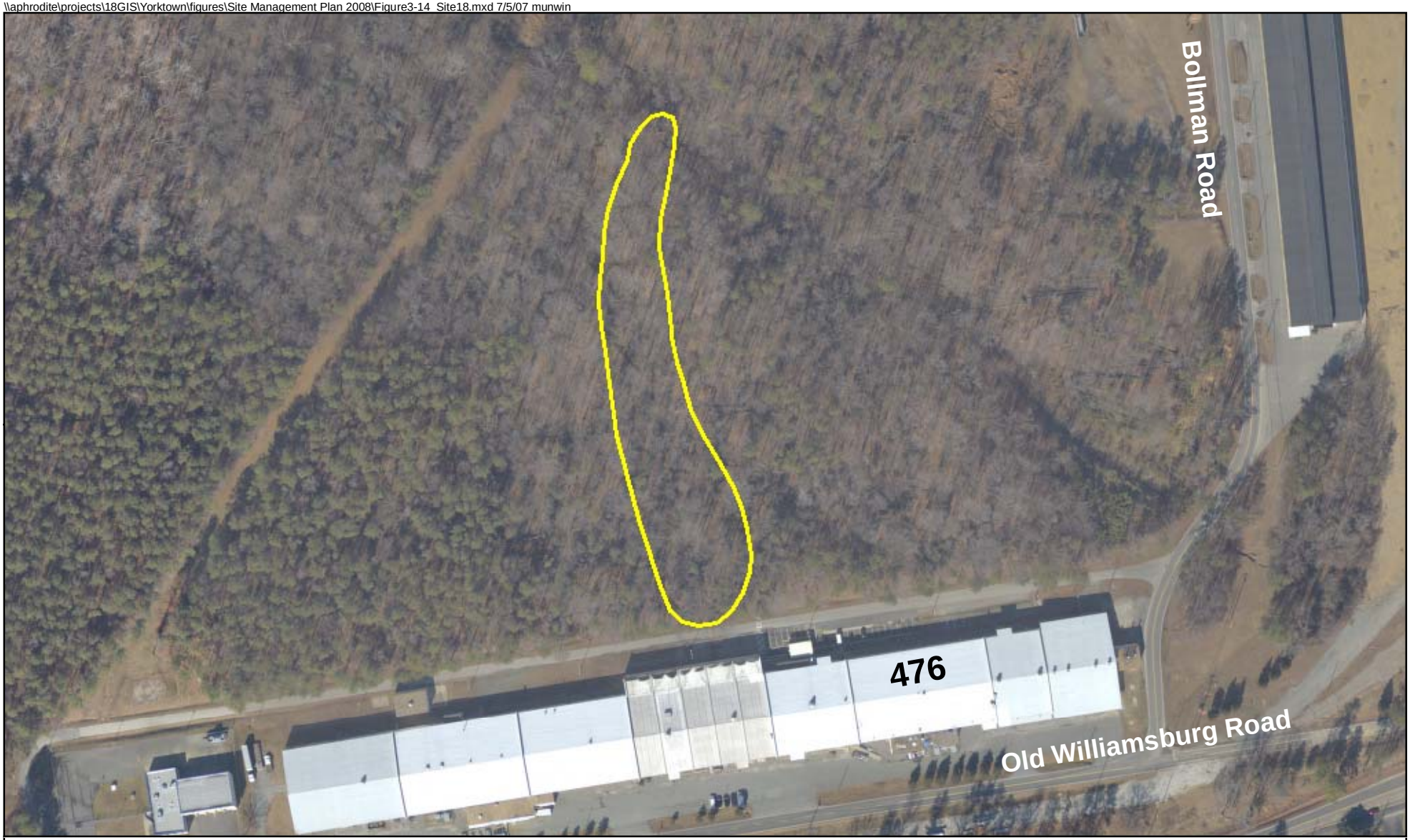

LEGEND

Site Boundary

N
W E
S

0 100 200

Feet

Figure 3-14
Site 18
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Boundary

N
W E
S

0 175 350

Feet

Figure 3-15
Site 19 - Conveyor Belt Soils at Building 10
Site Management Plan for FY 2008 to 2009
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Yorktown, Virginia

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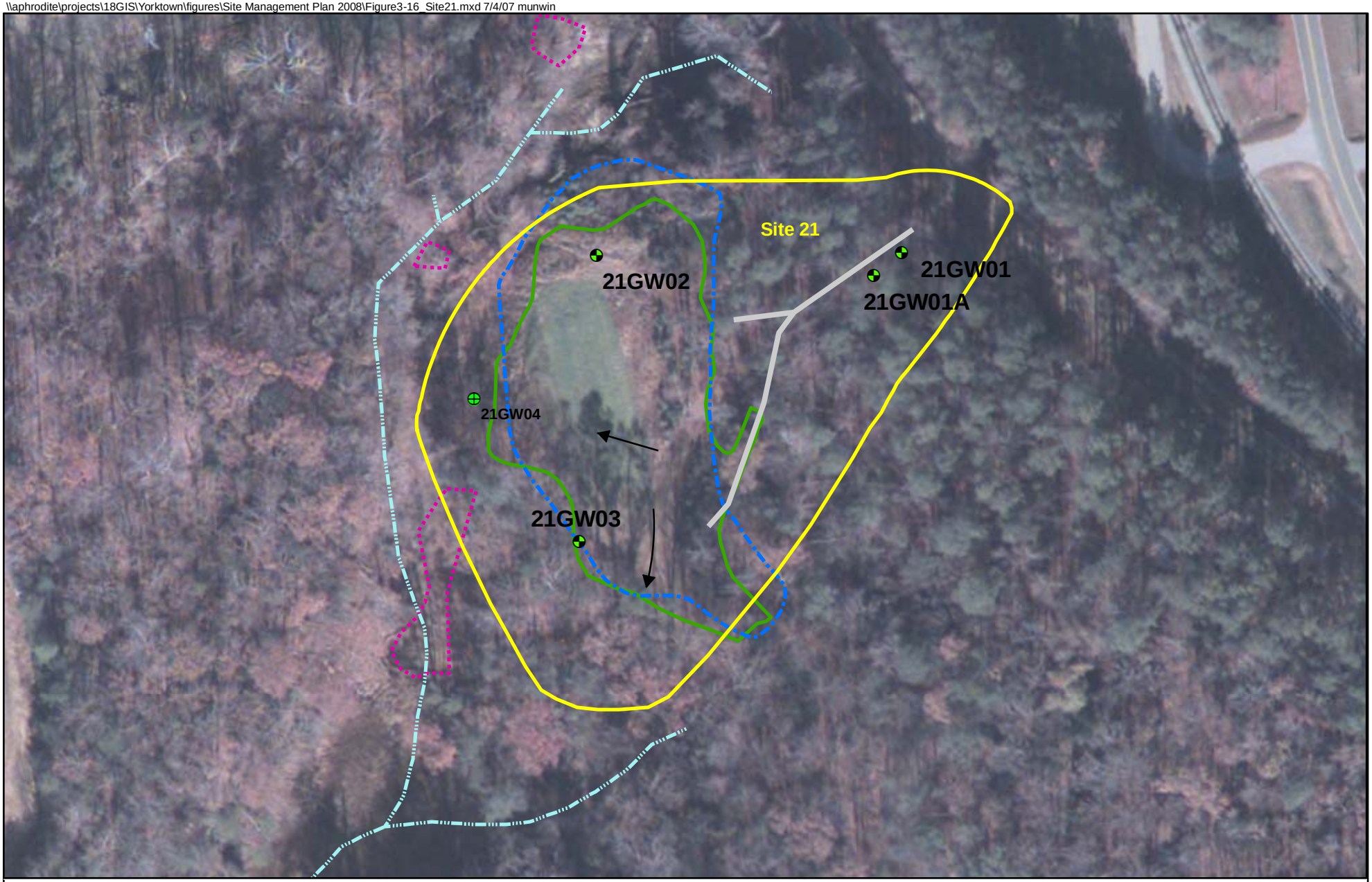

LEGEND

- Study Area
- Approximate Waste Boundary (1992)
- 1994 NTCRA Battery/Soil and Surface Debris Removal Area
- 2002 NTCRA Removal Area
- Drainage
- Gravel Access Road
- Existing Monitoring Well (location surveyed)
- Existing Monitoring Well (location approximated)
- Estimated Groundwater Flow Direction

N
W E
S

0 50 100
Feet

Figure 3-16
Site 21 - Battery and Drum Disposal Area
Site Management Plan for FY 2008 to 2009
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Yorktown, Virginia

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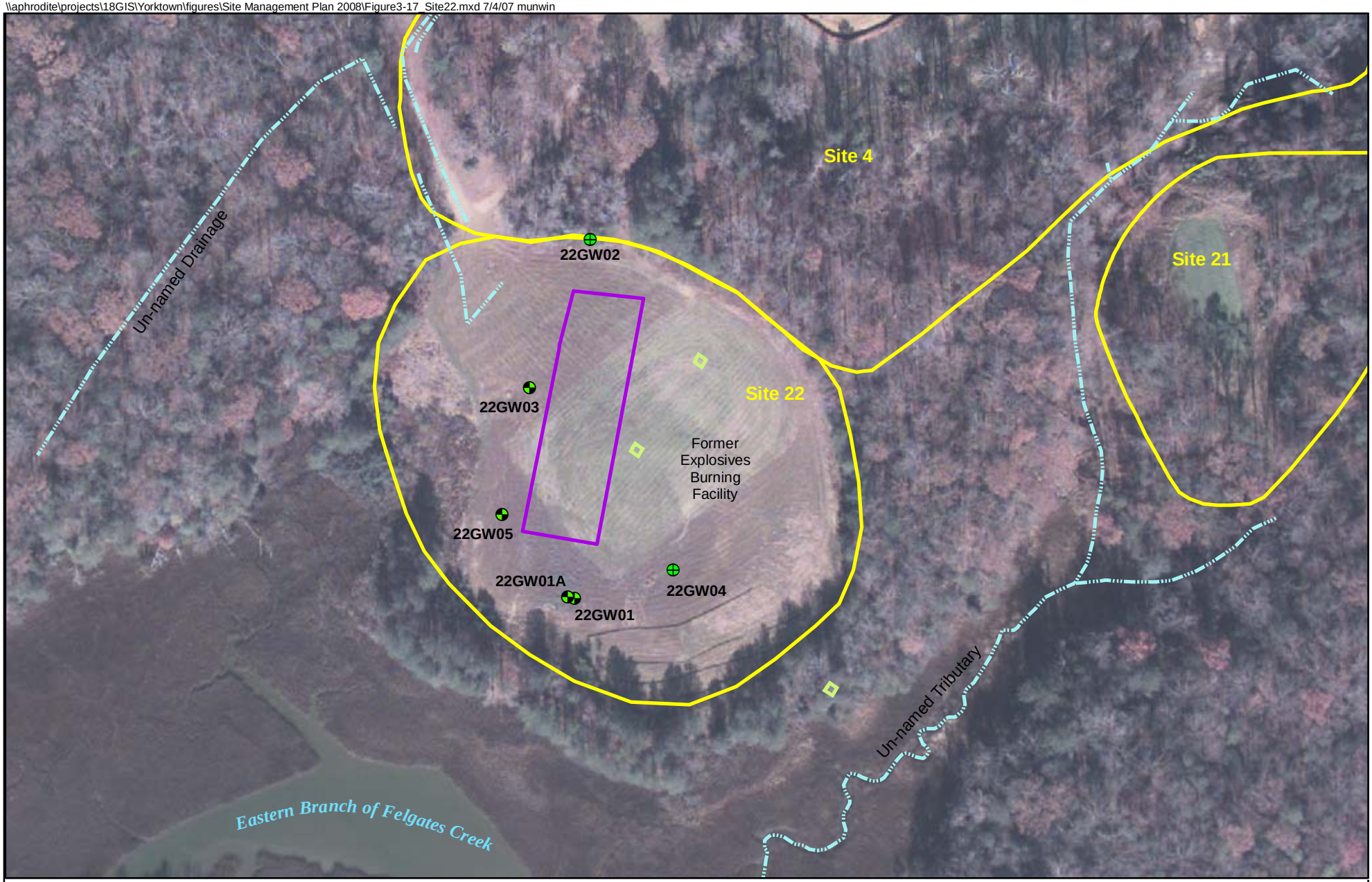

LEGEND

- Study Area
- Excavation Areas
- Former Biocell Location
- Drainage
- Existing Monitoring Well (location surveyed)
- Existing Monitoring Well (location approximated)

N
W E
S

0 75 150
Feet

Figure 3-17
Site 22 - Burn Pad
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-18_Site23.mxd 7/31/07 MUnwin

LEGEND

Removal Area Boundary

N
W E
S

0 100 200
Feet

Figure 3-18
Site 23 - Building 428 Teague Road Disposal Area
Site Management Plan for FY 2008 to 2009
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Yorktown, Virginia

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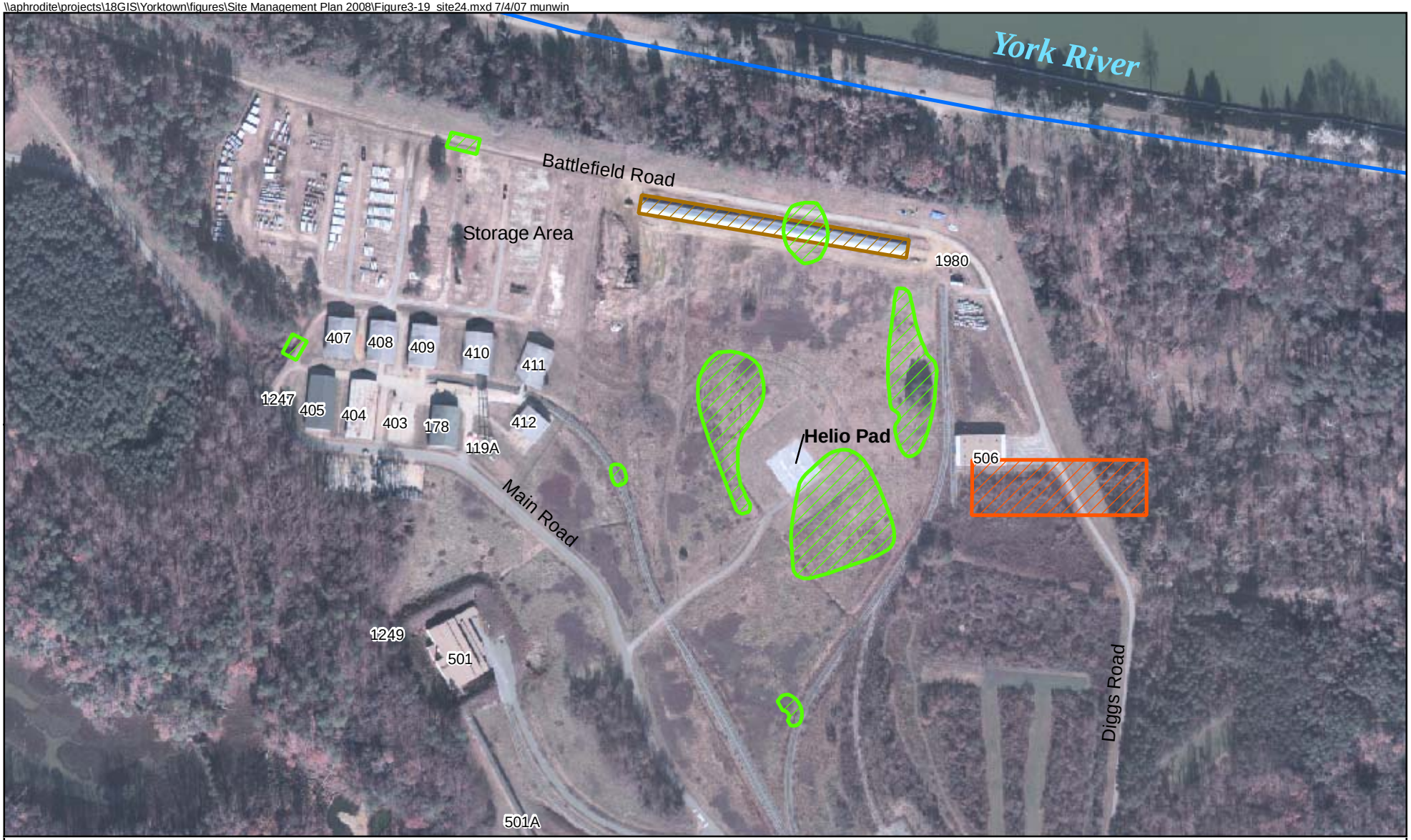

Legend

- Yorktown Base Boundary
- Buried Debris
- Sludge Disposal Area
- Site 6 Bioremediation Treatment Cell

N
W E
S

0 200 400
Feet

Figure 3-19
Site 24 - Former Location of the
Site 6 Bioremediation Treatment Cell
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-20_site25_layout.mxd 7/4/07 munwin

Legend

- Yorktown-Eastover Monitoring Wells
- Study Area Boundary
- Limits of Excavation
- Former Discharge Line

N
W E
S

0 40 80
Feet

Figure 3-20
Site 25 - Building 373 Rocket Plant
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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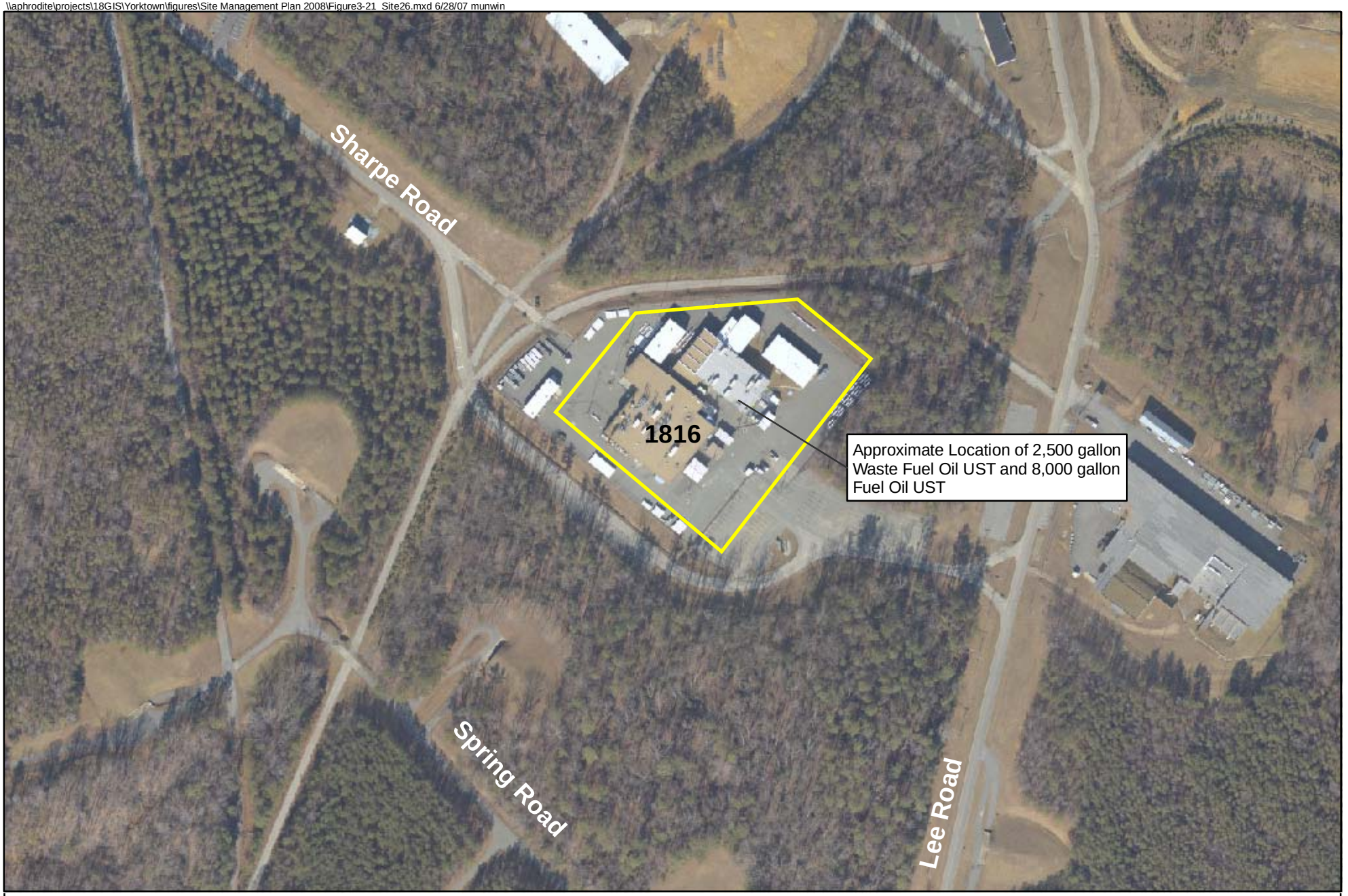

LEGEND

Site Boundary

N
W E
S

0 125 250

Feet

Figure 3-21
Site 26 - Building 1816 Mark 48 Waste Otto Fuel Tank
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

CH2MHILL

\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-22_Site27.mxd 7/5/07 munwin

LEGEND

Site Boundary

N
W E
S

0 100 200
Feet

Figure 3-22
Site 27 - Building 1751 Chemistry Lab Neutralization Unit and Drainage Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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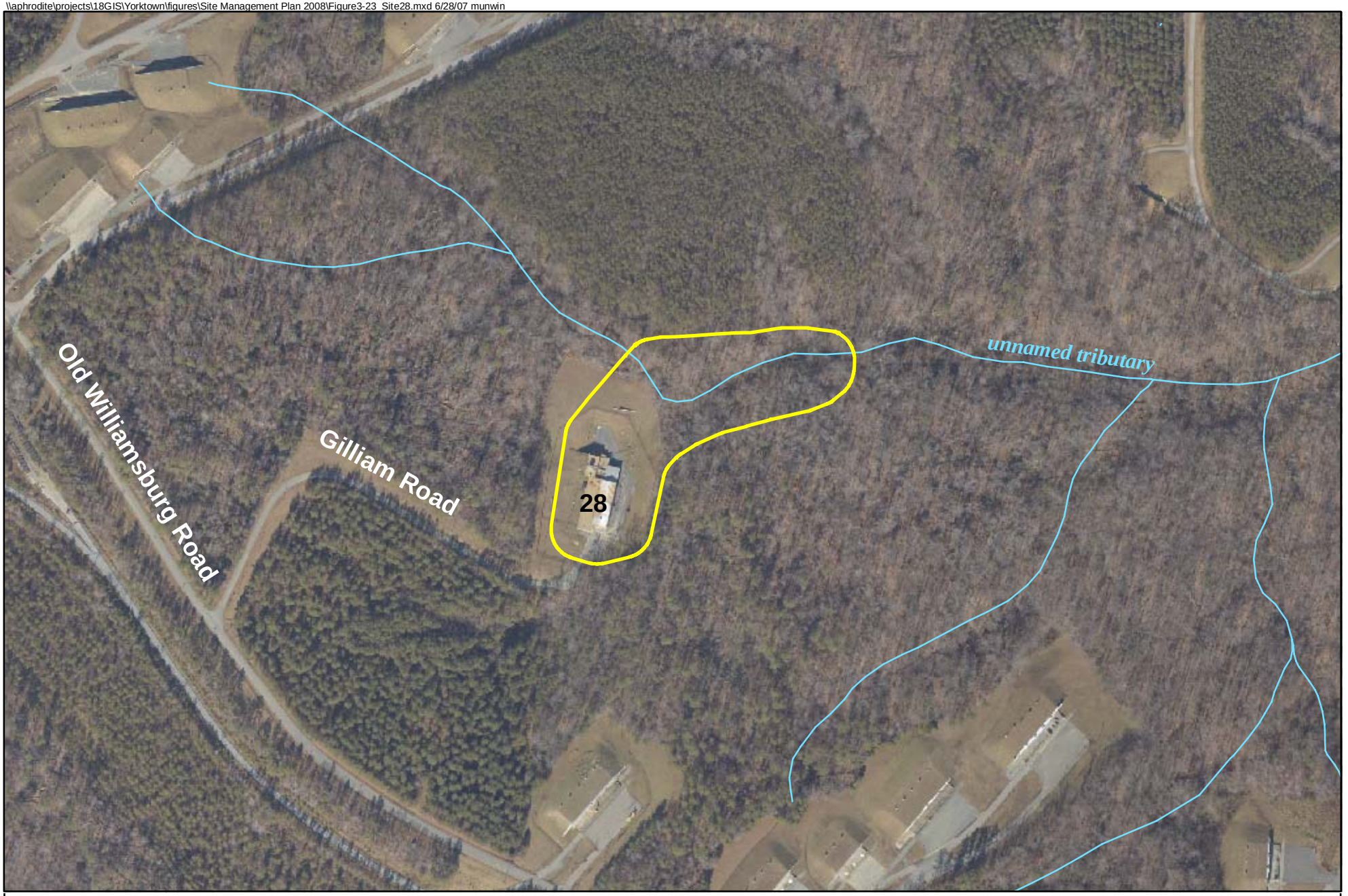
\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-23_Site28.mxd 6/28/07 munwin



LEGEND

Site Boundary

N
W E
S

0 175 350

Feet

Figure 3-23
Site 28 - Building 28 X-Ray Facility Tank Drain Field
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-24_Site29.mxd 6/28/07 munwin

LEGEND

- Monitoring Wells
- Site Boundary

N
W E
S

0 175 350
Feet

Figure 3-24
Site 29 - Lee Pond
Site Management Plan for FY 2008 to 2009
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Yorktown, Virginia

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\\aphrodite\projects\18GIS\Yorktown\figures\Site Management Plan 2008\Figure3-25_Site30.mxd 6/28/07 munwin

LEGEND

Site Boundary

N
W E
S

0 100 200
Feet

Figure 3-25
Site 30 - Bracken Road Incinerator and Environs
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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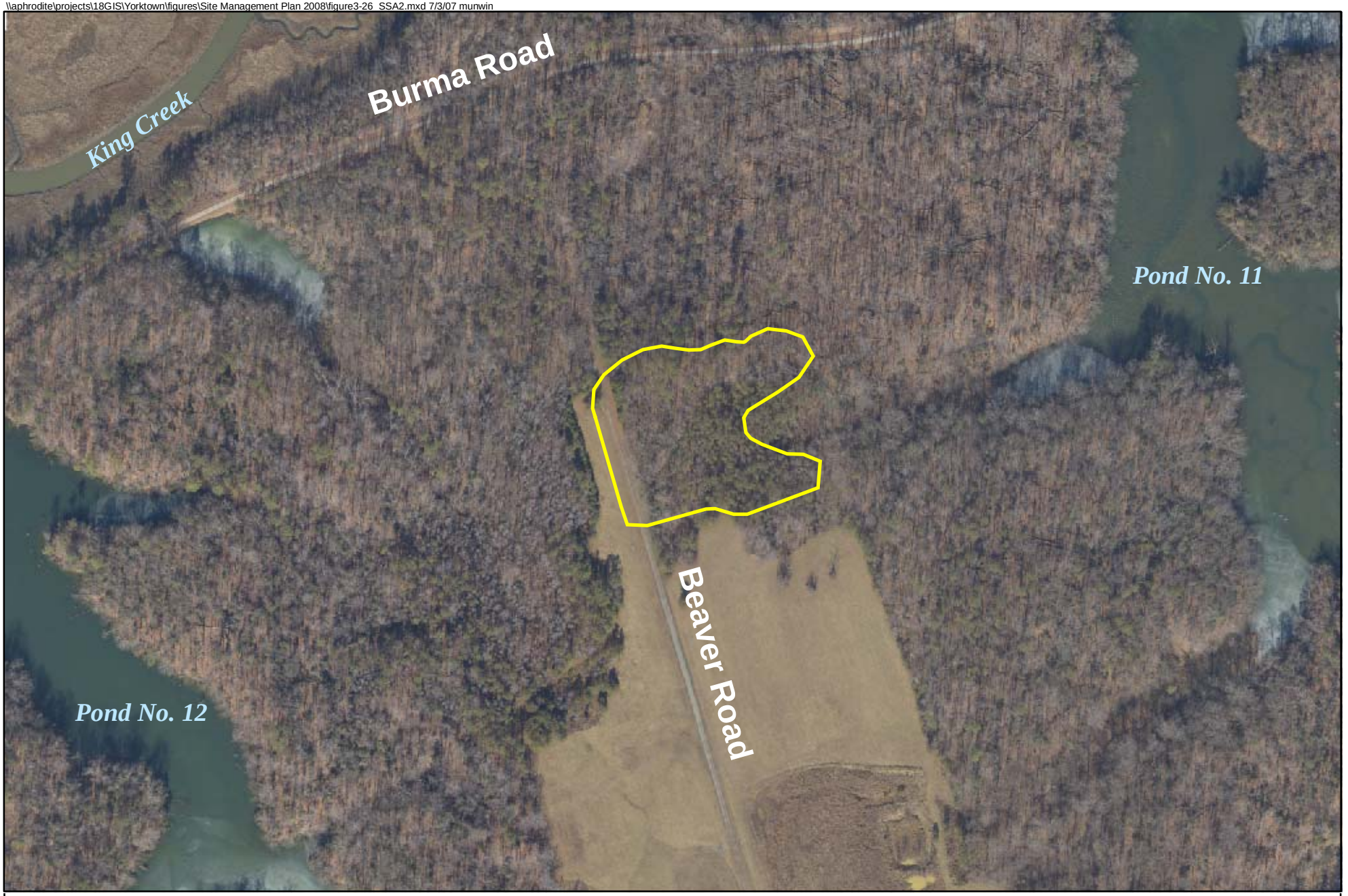

LEGEND

Site Screening Area Boundary

N
W E
S

0 150 300
Feet

Figure 3-26
SSA 2 - Former Explosive Ordnance Disposal Burning/Disposal Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Screening Area Boundary

N
W E
S

0 100 200
Feet

Figure 3-27
SSA 3 - Fire Training Pits and Vicinity
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Screening Area Boundary

N
W E
S

0 75 150
Feet

Figure 3-28
SSA 4 - Weapons Casing/Drum Disposal Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Screening Area Boundary

N
W E
S

0 75 150

Feet

Figure 3-29
SSA 5 - By-Pass Road Landfill
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

- Site Screening Area Boundary
- Approximate Location of Former Building 350

N
W E
S

0 50 100
Feet

Figure 3-30
SSA 8 - Building 350 Rail Roundhouse
Maintenance Area Trench Outfall
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Screening Area Boundary

N
W E
S

0 50 100
Feet

Figure 3-31
SSA 11 - Building 3 Neutralization Unit
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Screening Area Boundary

N
W E
S

0 100 200
Feet

Figure 3-32
SSA 12 - Public Works Storage Yard/
Building 683 Vicinity
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Screening Area Boundary

N
W E
S

0 75 150
Feet

Figure 3-33
SSA 13 - Building 529 Battery Drainage Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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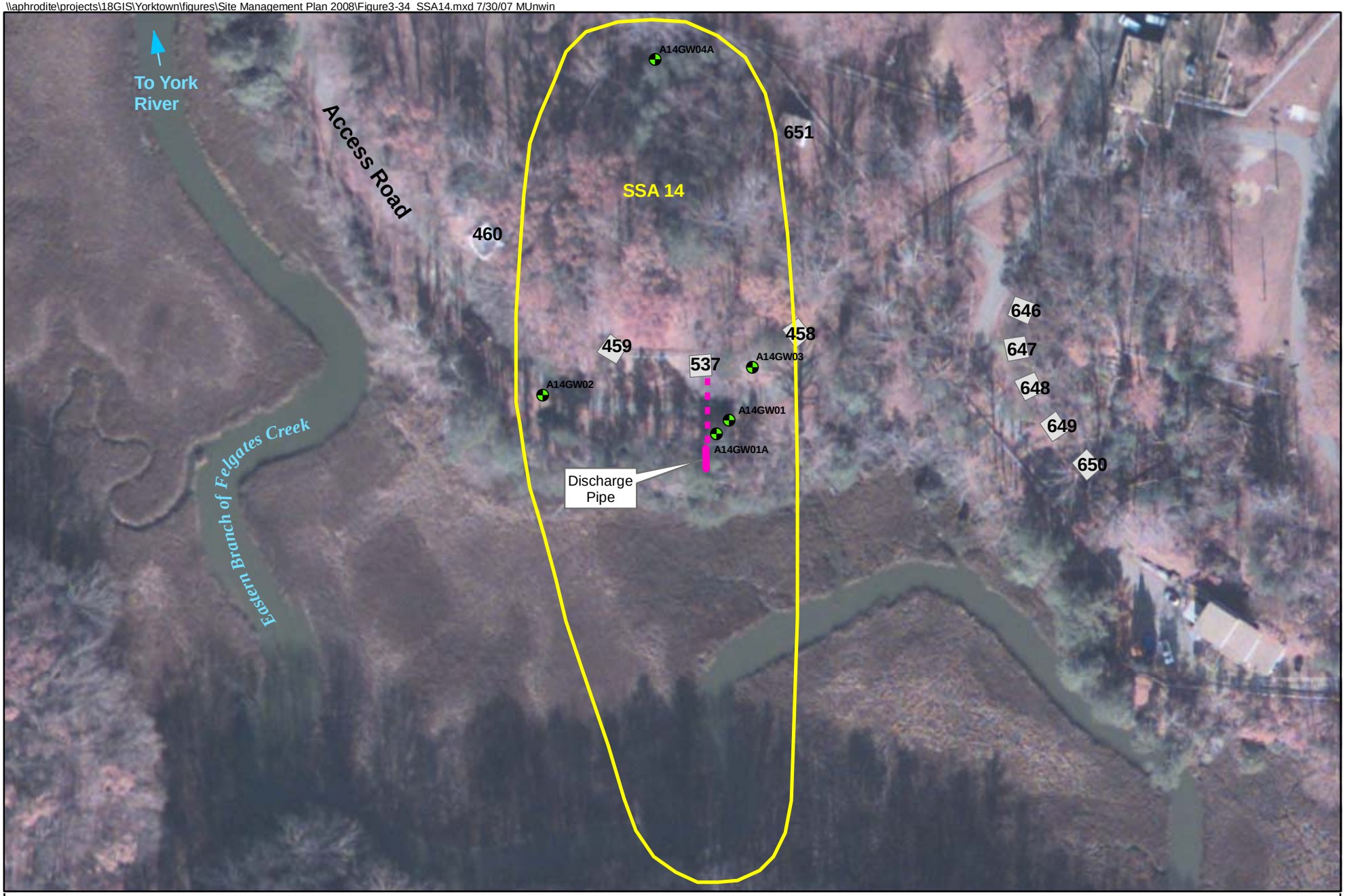

LEGEND

- Study Area
- Approximate location of Discharge Pipe
- Existing Monitoring Well (location surveyed)

N
W E
S

0 50 100
Feet

Figure 3-34
SSA 14 - Building 537 Discharge to Felgates Creek
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Screening Area Boundary

N
W E
S

0 75 150
Feet

Figure 3-35
SSA 15 - Sewage Treatment Plant #1/
Sludge Drying Beds and Discharge Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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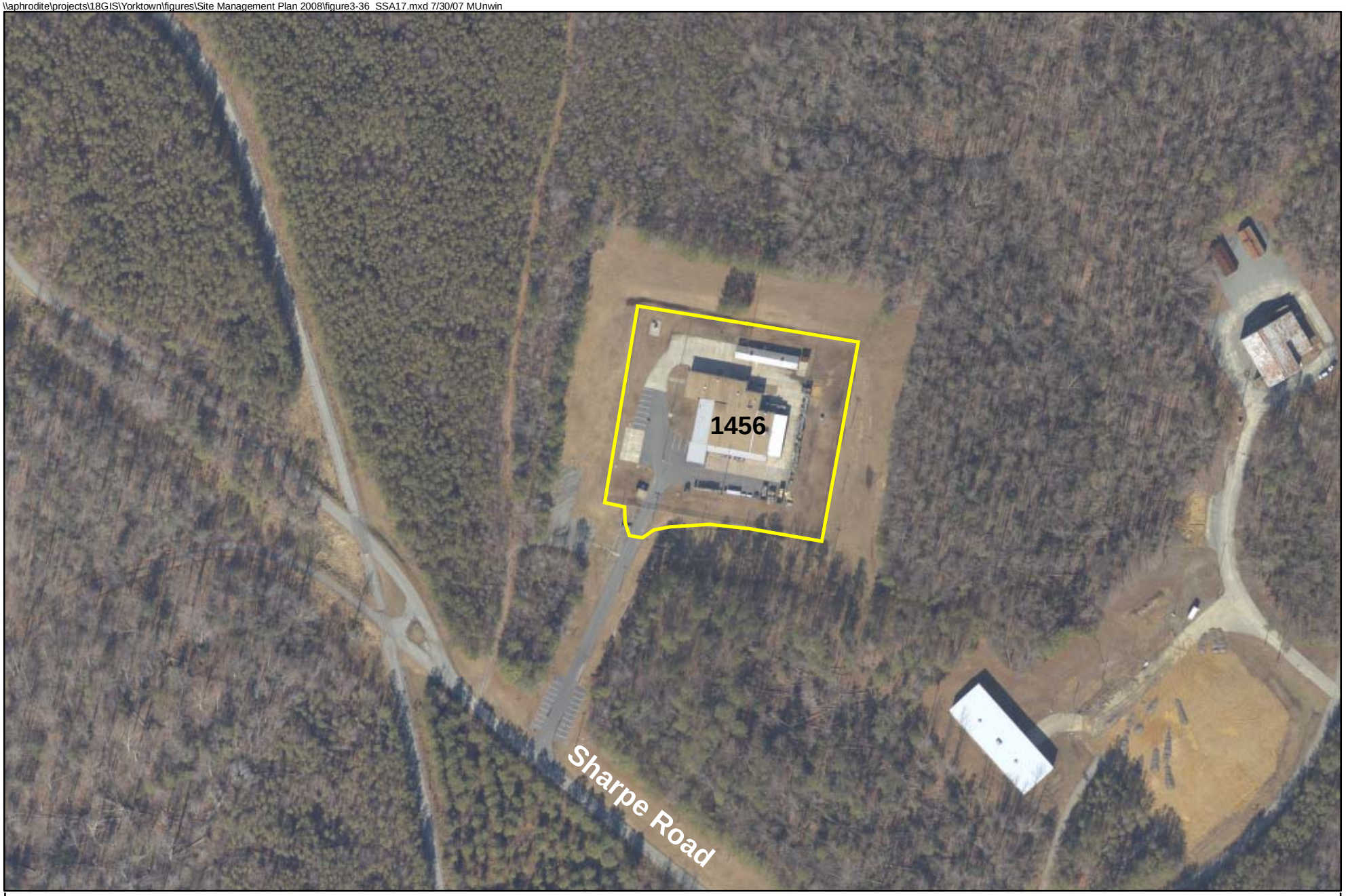

LEGEND

Site Screening Area Boundary

N
W E
S

0 100 200
Feet

Figure 3-36
SSA 17 - Mark 46 Torpedo Support Facility
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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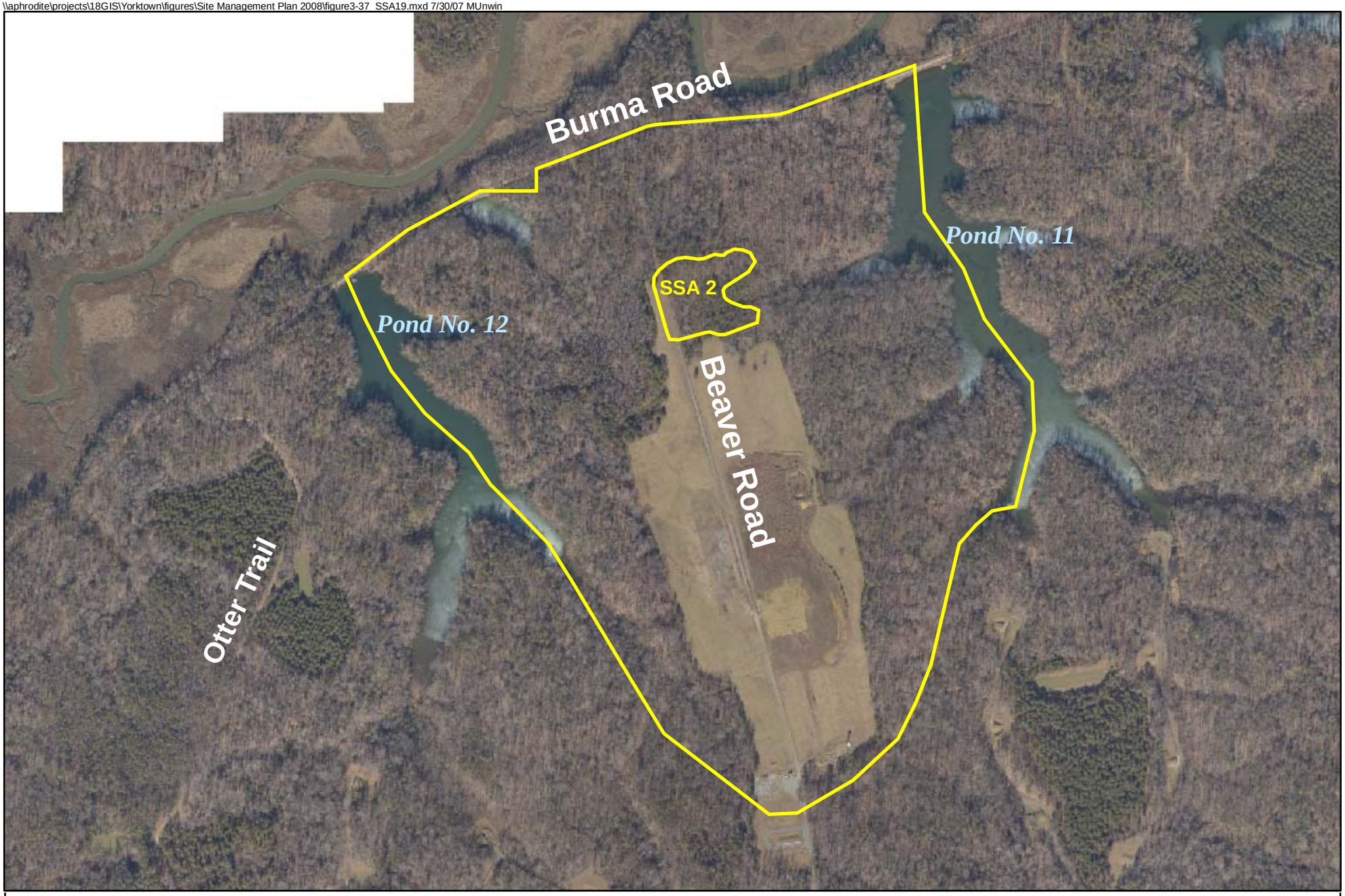

LEGEND

Site Screening Area Boundary

N
W E
S

0 325 650
Feet

Figure 3-37
SSA 19 - Explosive Ordnance Disposal Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Screening Area Boundary

N
W E
S

0 325 650
Feet

Figure 3-38
SSA 21 - Roosevelt Pond
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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LEGEND

Site Screening Area Boundary

Approximate Location of Former Bldg. 530

N
W E
S

0 75 150
Feet

Figure 3-39
SSA 22 - Sand Blasting Grit Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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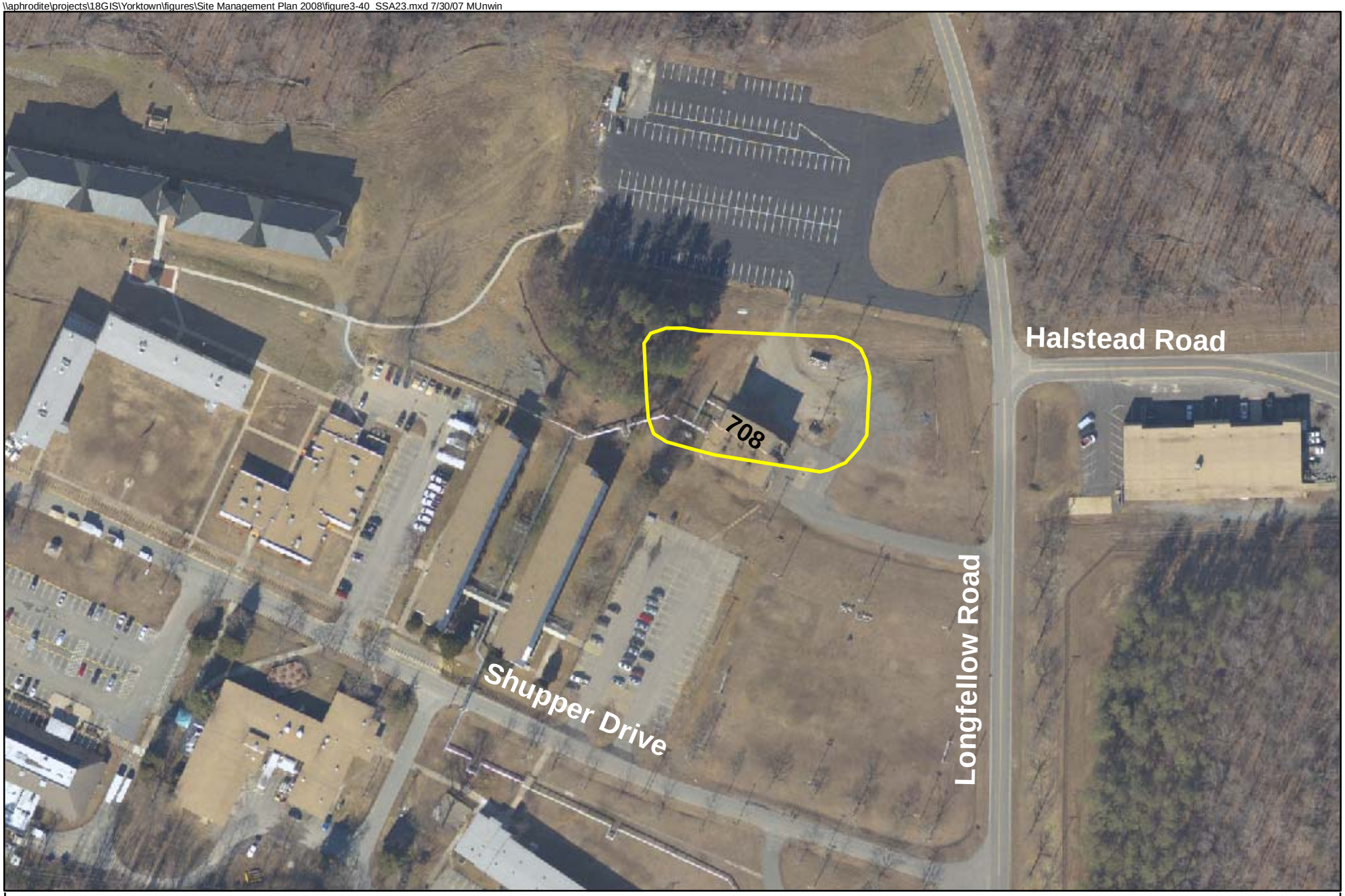

LEGEND

Site Screening Area Boundary

N
W E
S

0 75 150
Feet

Figure 3-40
SSA 23 - Coal Storage Area
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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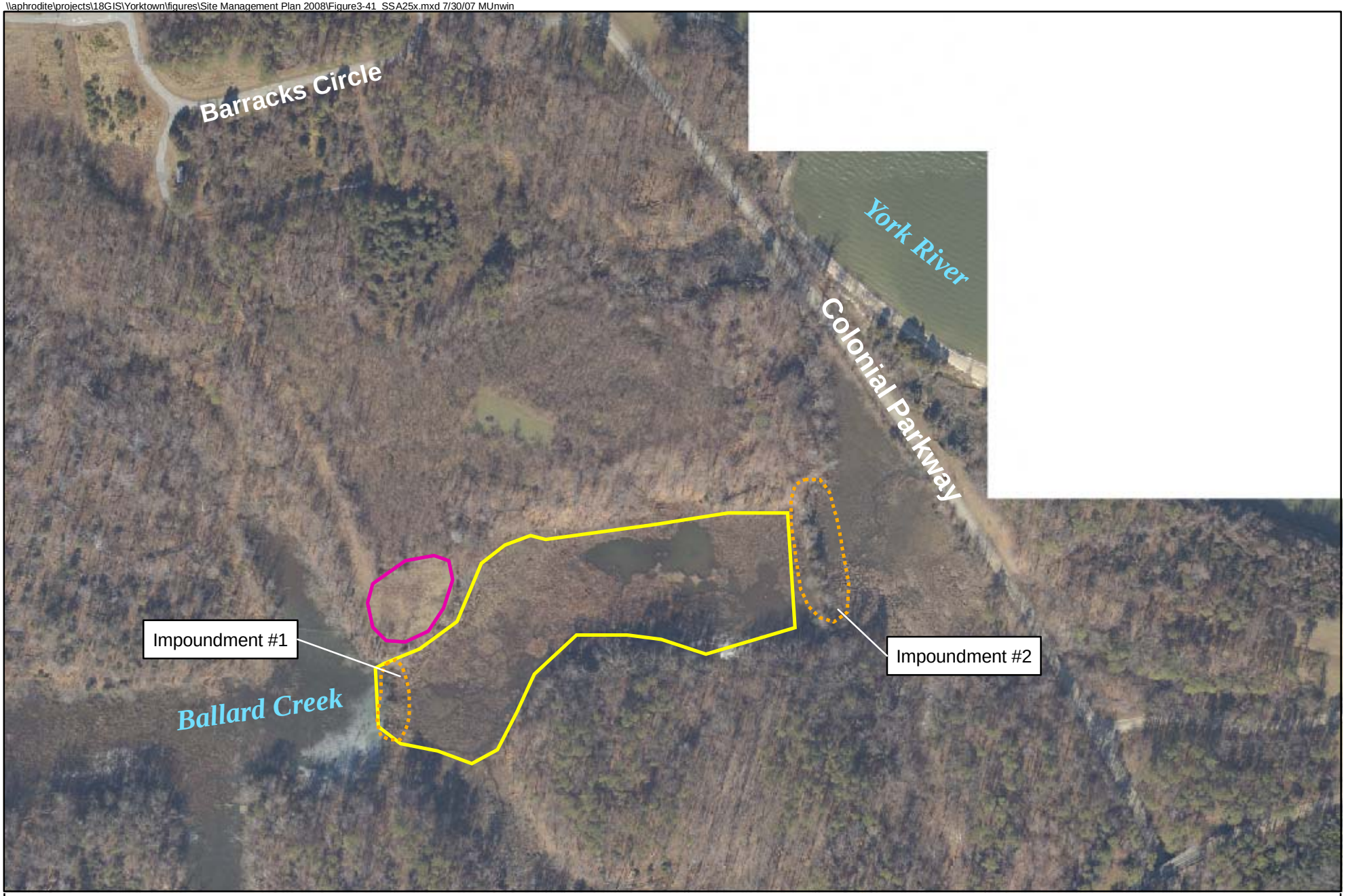

LEGEND

- Site Boundary
- Location of Former STP2

N
W E
S

0 150 300
Feet

Figure 3-41
SSA 25 - Wetlands Down-Gradient of Beaver Pond
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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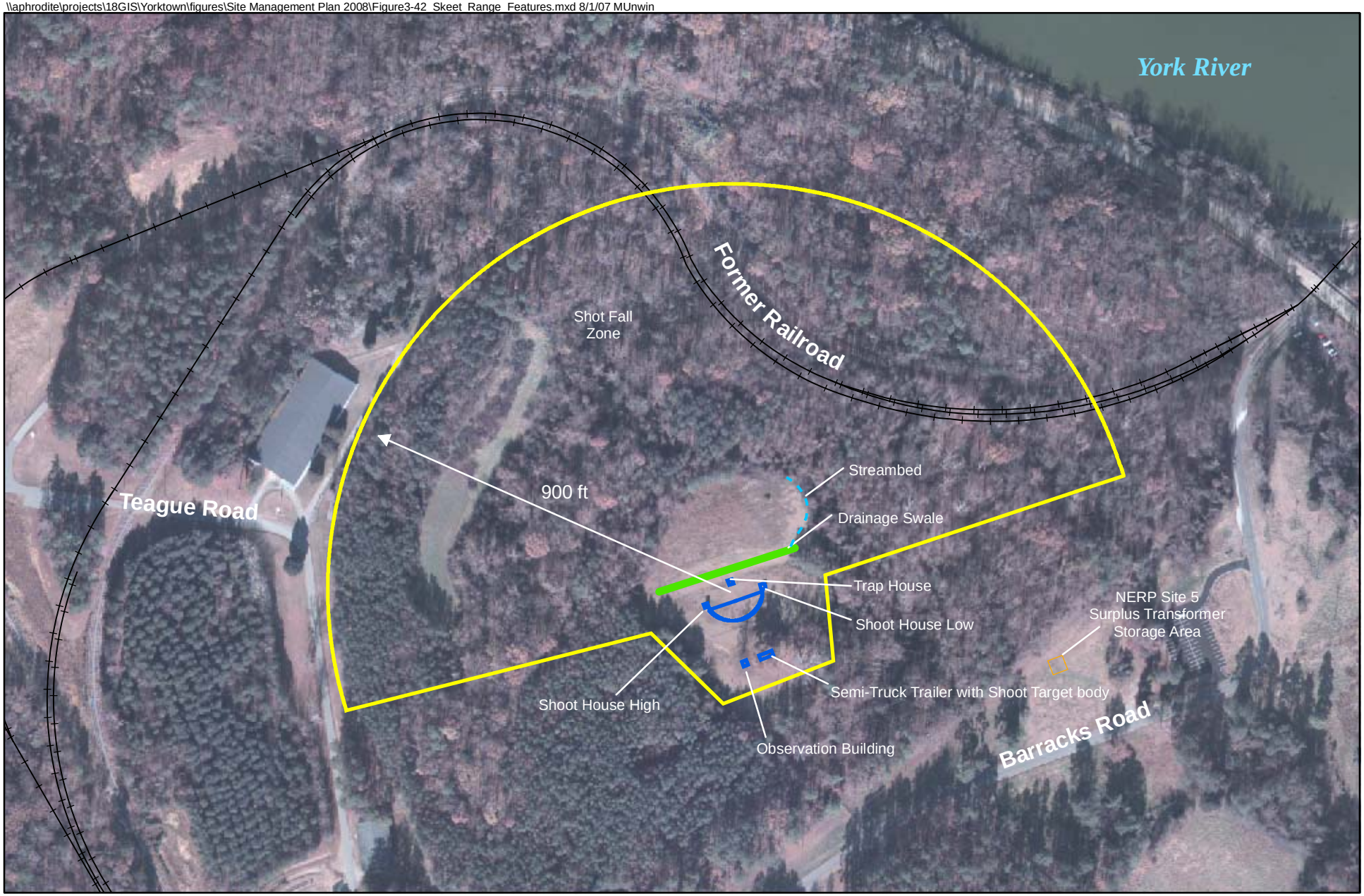

LEGEND

- Yorktown Naval Weapons Station Base Boundary
- Drainage Swale
- MWR Skeet Range
- Skeet Range Site Features
- Former Railroad

Note:
All structures associated with the Skeet Range have been demolished.

N
W E
S

0 150 300
Feet

Figure 3-42
MWR Skeet Range
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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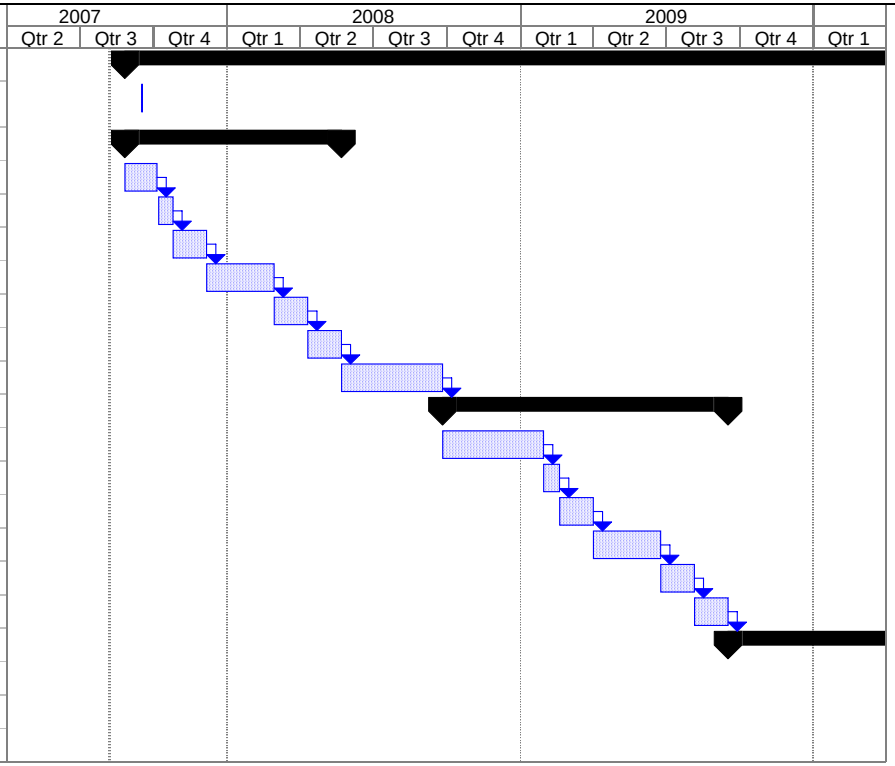
Schedule 3-1
Site 1 SMP FY08-09

ID	Task Name	Duration	Start	Finish
2	**Site 1**	**1373 days**	**Mon 8/27/07**	**Wed 11/28/12**
3	Annual Site Inspection (soil cover)	1 day	Mon 9/17/07	Mon 9/17/07
4	**GW/SW/SD Work Plan**	**194 days**	**Mon 8/27/07**	**Thu 5/22/08**
5	Preliminary WP	30 days	Mon 8/27/07	Fri 10/5/07
6	Gov't comments	14 days	Mon 10/8/07	Thu 10/25/07
7	Issue Draft WP	30 days	Fri 10/26/07	Thu 12/6/07
8	Regulatory Review	60 days	Fri 12/7/07	Thu 2/28/08
9	Issue Draft Final WP	30 days	Fri 2/29/08	Thu 4/10/08
10	Issue Final WP	30 days	Fri 4/11/08	Thu 5/22/08
11	Fieldwork (and laboratory)	90 days	Fri 5/23/08	Thu 9/25/08
12	**RI Report for GW/SW/SD**	**254 days**	**Fri 9/26/08**	**Wed 9/16/09**
13	Preliminary RI	90 days	Fri 9/26/08	Thu 1/29/09
14	Gov't comments	14 days	Fri 1/30/09	Wed 2/18/09
15	Issue Draft RI	30 days	Thu 2/19/09	Wed 4/1/09
16	Regulatory Review	60 days	Thu 4/2/09	Wed 6/24/09
17	Issue Draft Final RI	30 days	Thu 6/25/09	Wed 8/5/09
18	Issue Final RI	30 days	Thu 8/6/09	Wed 9/16/09
19	**FS Report**	**224 days**	**Thu 9/17/09**	**Tue 7/27/10**
26	**PP**	**179 days**	**Wed 7/28/10**	**Mon 4/4/11**
33	**ROD**	**134 days**	**Tue 4/5/11**	**Fri 10/7/11**
39	**Five-year Review**	**152 days**	**Tue 5/1/12**	**Wed 11/28/12**



Task
Split
Progress
Milestone
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Project Summary
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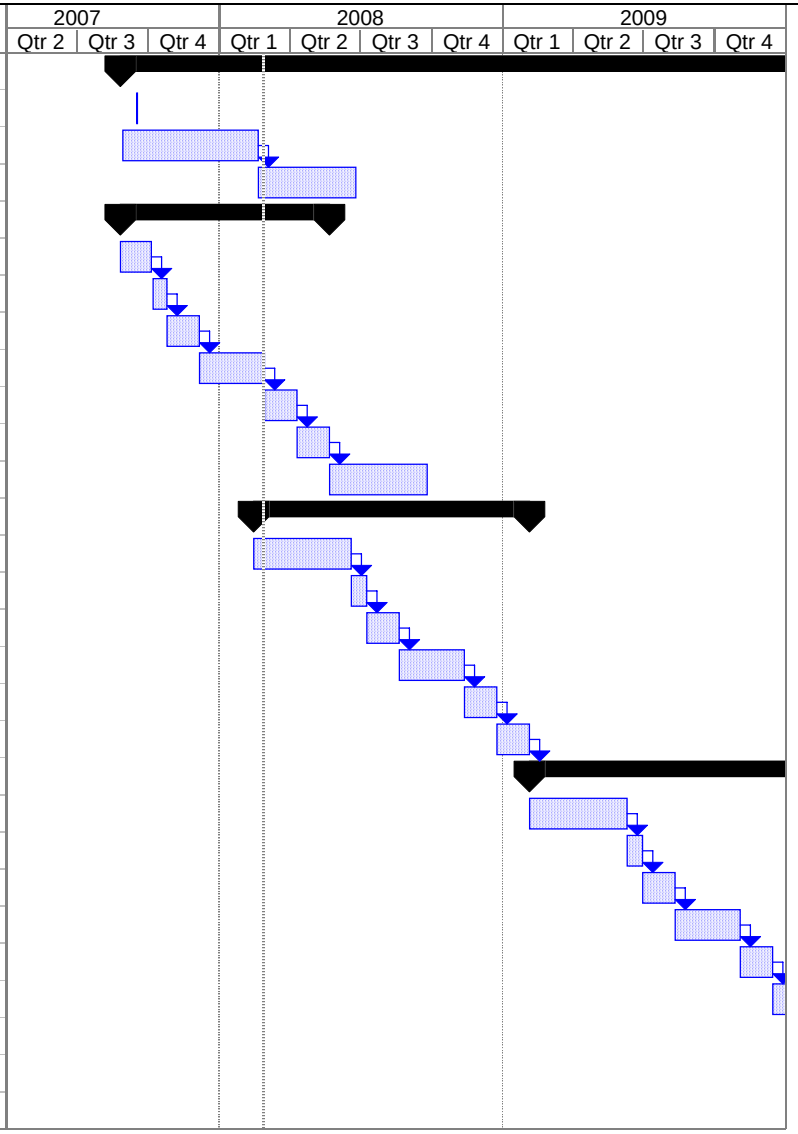
Schedule 3-2
Site 3 SMP FY08-09

ID	Task Name	Duration	Start	Finish
74	**Site 3**	**1373 days**	**Mon 8/27/07**	**Wed 11/28/12**
75	Site Inspection (soil cover)	1 day	Mon 9/17/07	Mon 9/17/07
76	Technical Memorandum	125 days	Thu 8/30/07	Wed 2/20/08
77	ESD	90 days	Thu 2/21/08	Wed 6/25/08
78	**GW/SW/SD Work Plan**	**194 days**	**Mon 8/27/07**	**Thu 5/22/08**
79	Preliminary WP	30 days	Mon 8/27/07	Fri 10/5/07
80	Gov't comments	14 days	Mon 10/8/07	Thu 10/25/07
81	Issue Draft WP	30 days	Fri 10/26/07	Thu 12/6/07
82	Regulatory Review	60 days	Fri 12/7/07	Thu 2/28/08
83	Issue Draft Final WP	30 days	Fri 2/29/08	Thu 4/10/08
84	Issue Final WP	30 days	Fri 4/11/08	Thu 5/22/08
85	Fieldwork (and laboratory)	90 days	Fri 5/23/08	Thu 9/25/08
86	**RI Report for GW/SW/SD**	**254 days**	**Fri 2/15/08**	**Wed 2/4/09**
87	Preliminary RI	90 days	Fri 2/15/08	Thu 6/19/08
88	Gov't comments	14 days	Fri 6/20/08	Wed 7/9/08
89	Issue draft RI report	30 days	Thu 7/10/08	Wed 8/20/08
90	Regulatory Review	60 days	Thu 8/21/08	Wed 11/12/08
91	Issue draft final RI report	30 days	Thu 11/13/08	Wed 12/24/08
92	Issue final RI report	30 days	Thu 12/25/08	Wed 2/4/09
93	**FS Report**	**254 days**	**Thu 2/5/09**	**Tue 1/26/10**
94	Preliminary FS	90 days	Thu 2/5/09	Wed 6/10/09
95	Gov't comments	14 days	Thu 6/11/09	Tue 6/30/09
96	Issue draft FS	30 days	Wed 7/1/09	Tue 8/11/09
97	Regulatory Review	60 days	Wed 8/12/09	Tue 11/3/09
98	Issue draft Final FS	30 days	Wed 11/4/09	Tue 12/15/09
99	Issue Final FS	30 days	Wed 12/16/09	Tue 1/26/10
100	**PP**	**239 days**	**Wed 1/27/10**	**Mon 12/27/10**
107	**ROD**	**224 days**	**Tue 12/28/10**	**Fri 11/4/11**
113	**Five-year Review**	**152 days**	**Tue 5/1/12**	**Wed 11/28/12**



Task
Split
Progress
Milestone
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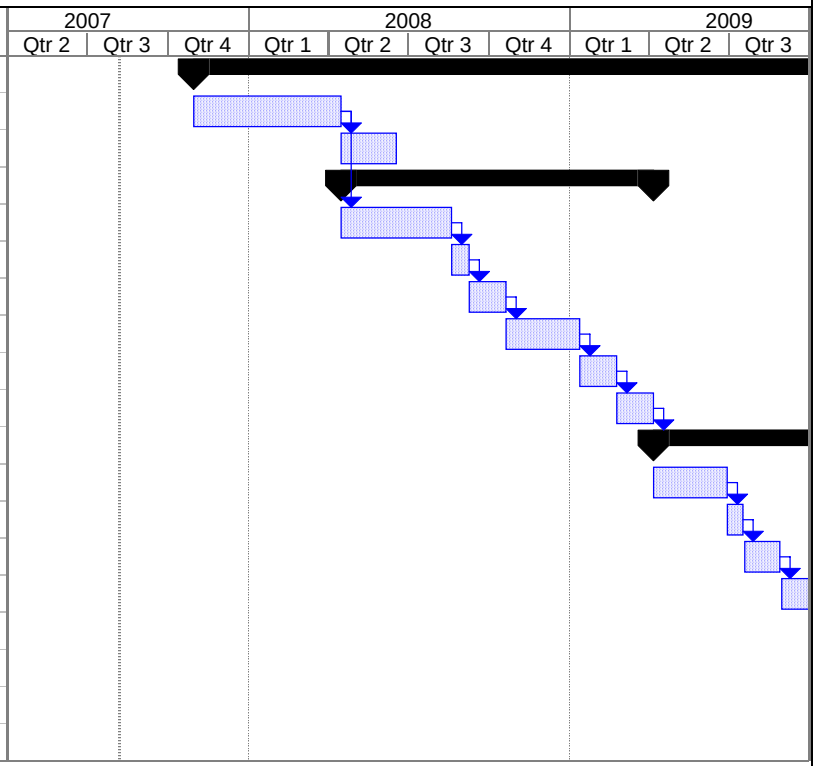
Project Summary
External Tasks
External Milestone
Deadline

Schedule 3-3
Site 4 SMP FY08-09

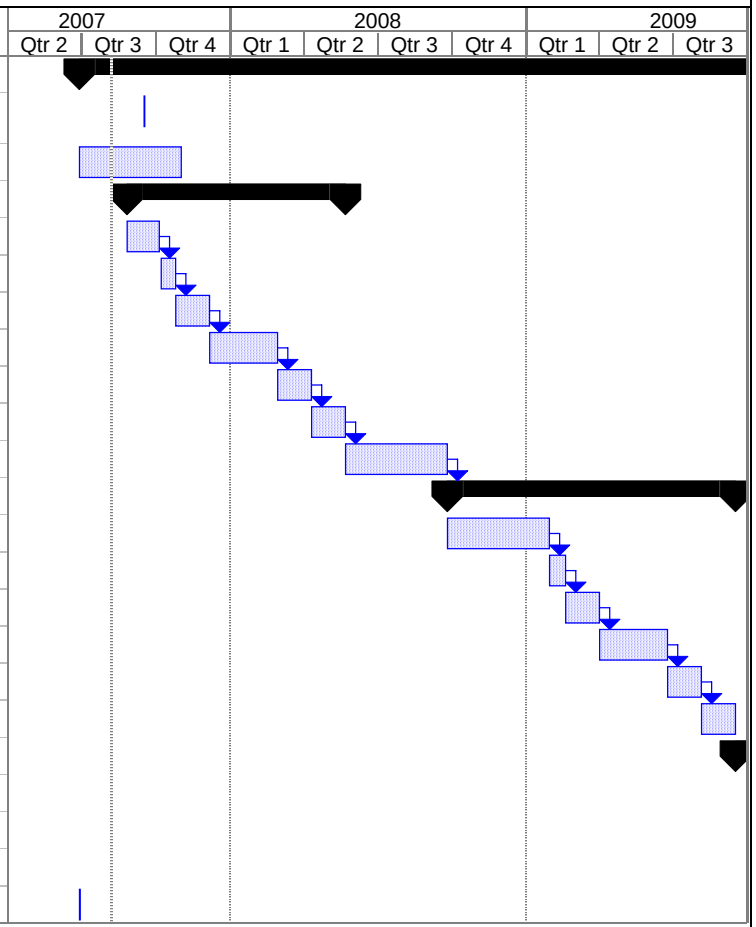
ID	Task Name	Duration	Start	Finish
122	**Site 4**	**1061 days**	**Wed 10/31/07**	**Wed 11/23/11**
123	Fieldwork	120 days	Wed 10/31/07	Tue 4/15/08
124	Laboratory Analysis	45 days	Wed 4/16/08	Tue 6/17/08
125	**RI Report for GW/SW/SD**	**254 days**	**Wed 4/16/08**	**Mon 4/6/09**
126	Preliminary RI	90 days	Wed 4/16/08	Tue 8/19/08
127	Gov't comments	14 days	Wed 8/20/08	Mon 9/8/08
128	Issue draft RI report	30 days	Tue 9/9/08	Mon 10/20/08
129	Regulatory Review	60 days	Tue 10/21/08	Mon 1/12/09
130	Issue draft final RI report	30 days	Tue 1/13/09	Mon 2/23/09
131	Issue final RI report	30 days	Tue 2/24/09	Mon 4/6/09
132	**FS Report GW/SW/SD**	**224 days**	**Tue 4/7/09**	**Fri 2/12/10**
133	Preliminary FS	60 days	Tue 4/7/09	Mon 6/29/09
134	Gov't comments	14 days	Tue 6/30/09	Fri 7/17/09
135	Issue draft FS	30 days	Mon 7/20/09	Fri 8/28/09
136	Regulatory Review	60 days	Mon 8/31/09	Fri 11/20/09
137	Issue draft Final FS	30 days	Mon 11/23/09	Fri 1/1/10
138	Issue Final FS	30 days	Mon 1/4/10	Fri 2/12/10
139	**PP GW/SW/SD**	**239 days**	**Mon 2/15/10**	**Thu 1/13/11**
146	**ROD GW/SW/SD**	**224 days**	**Fri 1/14/11**	**Wed 11/23/11**



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

Schedule 3-4
Site 6 SMP FY08-09

ID	Task Name	Duration	Start	Finish
154	**Site 6**	**1414 days**	**Fri 6/29/07**	**Wed 11/28/12**
155	Site Inspection (Excavated Area soil cover)	1 day	Mon 9/17/07	Mon 9/17/07
156	Construction Complete Report	90 days	Fri 6/29/07	Thu 11/1/07
157	**GW Investigation Work Plan**	**194 days**	**Mon 8/27/07**	**Thu 5/22/08**
158	Preliminary WP	30 days	Mon 8/27/07	Fri 10/5/07
159	Gov't comments	14 days	Mon 10/8/07	Thu 10/25/07
160	Issue Draft WP	30 days	Fri 10/26/07	Thu 12/6/07
161	Regulatory Review	60 days	Fri 12/7/07	Thu 2/28/08
162	Issue Draft Final WP	30 days	Fri 2/29/08	Thu 4/10/08
163	Issue Final WP	30 days	Fri 4/11/08	Thu 5/22/08
164	GW Investigation Fieldwork	90 days	Fri 5/23/08	Thu 9/25/08
165	**RI Report for GW**	**254 days**	**Fri 9/26/08**	**Wed 9/16/09**
166	Preliminary RI	90 days	Fri 9/26/08	Thu 1/29/09
167	Gov't comments	14 days	Fri 1/30/09	Wed 2/18/09
168	Issue draft RI report	30 days	Thu 2/19/09	Wed 4/1/09
169	Regulatory Review	60 days	Thu 4/2/09	Wed 6/24/09
170	Issue draft final RI report	30 days	Thu 6/25/09	Wed 8/5/09
171	Issue final RI report	30 days	Thu 8/6/09	Wed 9/16/09
172	**FS Report**	**192 days**	**Thu 9/17/09**	**Fri 6/11/10**
179	**PP**	**179 days**	**Mon 6/14/10**	**Thu 2/17/11**
186	**ROD**	**134 days**	**Fri 2/18/11**	**Wed 8/24/11**
192	**Five-year Review**	**152 days**	**Tue 5/1/12**	**Wed 11/28/12**
199	LTM	1 day	Fri 6/29/07	Fri 6/29/07



Task
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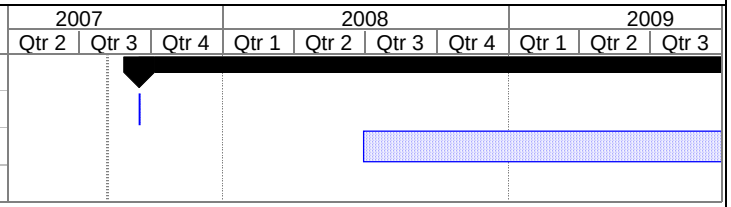
Schedule 3-5
Site 7 SMP FY08-09

ID	Task Name	Duration	Start	Finish
203	**Site 7**	**1358 days**	**Mon 9/17/07**	**Wed 11/28/12**
204	Annual Site Inspection (soil cover)	1 day	Mon 9/17/07	Mon 9/17/07
205	LTM for GW	600 days	Mon 6/30/08	Fri 10/15/10
206	**Five-year Review**	**152 days**	**Tue 5/1/12**	**Wed 11/28/12**



Task
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Progress
Milestone
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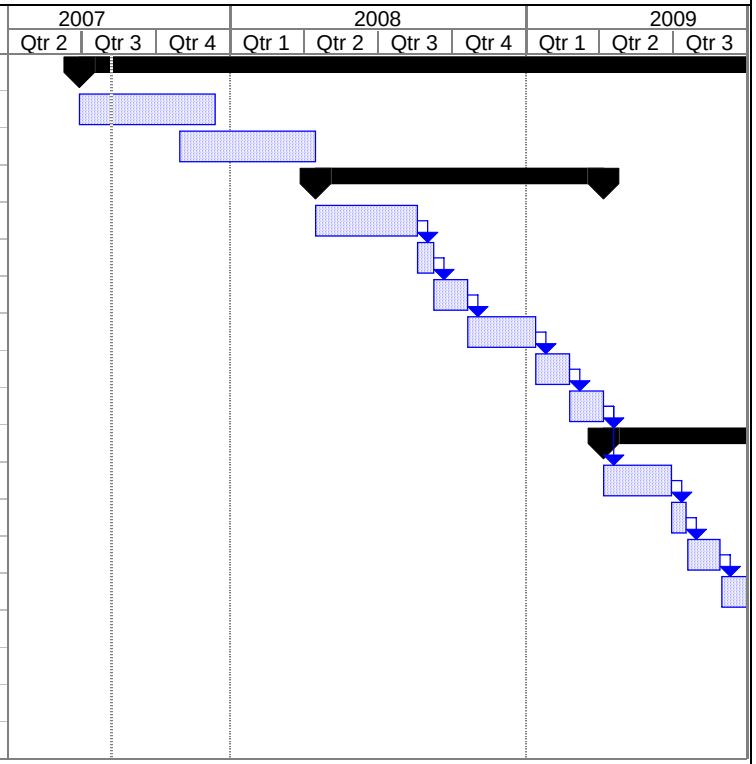
Deadline

Schedule 3-6
Site 8 SMP FY08-09

ID	Task Name	Duration	Start	Finish
213	**Site 8**	**1059 days**	**Fri 6/29/07**	**Wed 7/20/11**
214	Construction Completion Report	120 days	Fri 6/29/07	Thu 12/13/07
215	GW/SW/SD RI Fieldwork	120 days	Wed 10/31/07	Tue 4/15/08
216	**RI Report for GW/SW/SD**	**254 days**	**Wed 4/16/08**	**Mon 4/6/09**
217	Preliminary RI	90 days	Wed 4/16/08	Tue 8/19/08
218	Gov't comments	14 days	Wed 8/20/08	Mon 9/8/08
219	Issue Draft RI	30 days	Tue 9/9/08	Mon 10/20/08
220	Regulatory Review	60 days	Tue 10/21/08	Mon 1/12/09
221	Issue Draft Final RI	30 days	Tue 1/13/09	Mon 2/23/09
222	Issue Final RI	30 days	Tue 2/24/09	Mon 4/6/09
223	**FS Report**	**224 days**	**Tue 4/7/09**	**Fri 2/12/10**
224	Preliminary FS	60 days	Tue 4/7/09	Mon 6/29/09
225	Gov't comments	14 days	Tue 6/30/09	Fri 7/17/09
226	Issue Draft FS	30 days	Mon 7/20/09	Fri 8/28/09
227	Regulatory Review	60 days	Mon 8/31/09	Fri 11/20/09
228	Issue Draft Final FS	30 days	Mon 11/23/09	Fri 1/1/10
229	Issue Final FS	30 days	Mon 1/4/10	Fri 2/12/10
230	**PP**	**239 days**	**Mon 2/15/10**	**Thu 1/13/11**
237	**ROD**	**134 days**	**Fri 1/14/11**	**Wed 7/20/11**



Task
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Progress
Milestone
Summary
Project Summary
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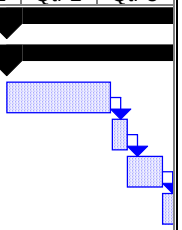
Deadline

Schedule 3-7
Site 9 SMP FY08-09

ID	Task Name	Duration	Start	Finish
246	**Site 9**	**1195 days**	**Mon 3/16/09**	**Fri 10/11/13**
247	**GW Investigation Work Plan**	**254 days**	**Mon 3/16/09**	**Thu 3/4/10**
248	Preliminary WP	90 days	Mon 3/16/09	Fri 7/17/09
249	Gov't comments	14 days	Mon 7/20/09	Thu 8/6/09
250	Issue Draft WP	30 days	Fri 8/7/09	Thu 9/17/09
251	Regulatory Review	60 days	Fri 9/18/09	Thu 12/10/09
252	Issue Draft Final WP	30 days	Fri 12/11/09	Thu 1/21/10
253	Issue Final WP	30 days	Fri 1/22/10	Thu 3/4/10
254	Fieldwork & Laboratory	90 days	Fri 3/5/10	Thu 7/8/10
255	**RI Report for GW**	**254 days**	**Fri 7/9/10**	**Wed 6/29/11**
256	Preliminary RI	90 days	Fri 7/9/10	Thu 11/11/10
257	Gov't comments	14 days	Fri 11/12/10	Wed 12/1/10
258	Issue Draft RI report	30 days	Thu 12/2/10	Wed 1/12/11
259	Regulatory Review	60 days	Thu 1/13/11	Wed 4/6/11
260	Issue Draft Final RI report	30 days	Thu 4/7/11	Wed 5/18/11
261	Issue Final RI report	30 days	Thu 5/19/11	Wed 6/29/11
262	**FS Report**	**224 days**	**Thu 6/30/11**	**Tue 5/8/12**
269	**PP**	**239 days**	**Wed 5/9/12**	**Mon 4/8/13**
276	**ROD**	**134 days**	**Tue 4/9/13**	**Fri 10/11/13**
282	**Five-year Review**	**152 days**	**Tue 5/1/12**	**Wed 11/28/12**



Task
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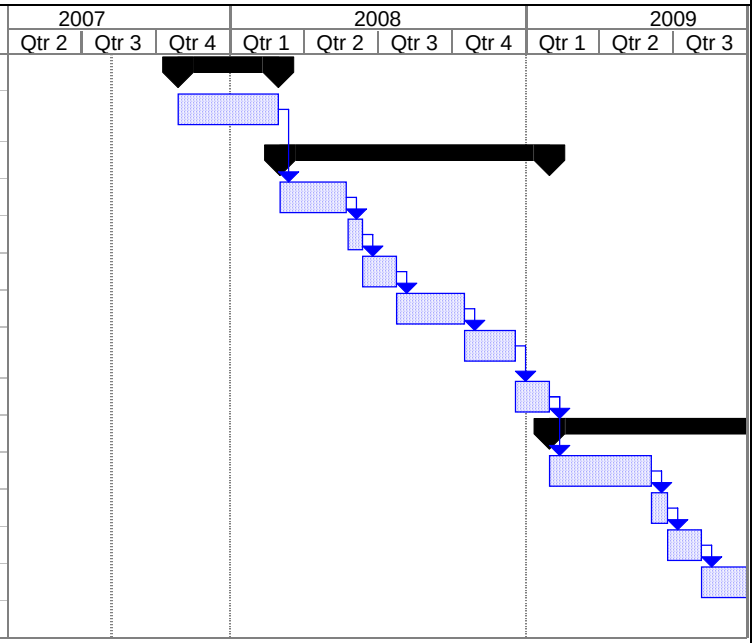
Deadline

Schedule 3-8
Site 11 SMP FY08-09

ID	Task Name	Duration	Start	Finish
291	**Site 11**	**90 days**	**Mon 10/29/07**	**Fri 2/29/08**
292	Technical Memorandum (GW Risk)	90 days	Mon 10/29/07	Fri 2/29/08
293	**PP for GW (NFA)**	**239 days**	**Mon 3/3/08**	**Thu 1/29/09**
294	Preliminary PP	60 days	Mon 3/3/08	Fri 5/23/08
295	Navy Review	14 days	Mon 5/26/08	Thu 6/12/08
296	Issue Draft PP	30 days	Fri 6/13/08	Thu 7/24/08
297	Regulatory / Legal Review	60 days	Fri 7/25/08	Thu 10/16/08
298	Public Comment Period Draft Final PP	45 days	Fri 10/17/08	Thu 12/18/08
299	Issue Final PP	30 days	Fri 12/19/08	Thu 1/29/09
300	**ROD for GW (NFA)**	**224 days**	**Fri 1/30/09**	**Wed 12/9/09**
301	Preliminary ROD	90 days	Fri 1/30/09	Thu 6/4/09
302	Navy Review	14 days	Fri 6/5/09	Wed 6/24/09
303	Issue Draft ROD	30 days	Thu 6/25/09	Wed 8/5/09
304	Regulatory / Legal Review	60 days	Thu 8/6/09	Wed 10/28/09
305	Issue ROD for Signature	30 days	Thu 10/29/09	Wed 12/9/09



Task
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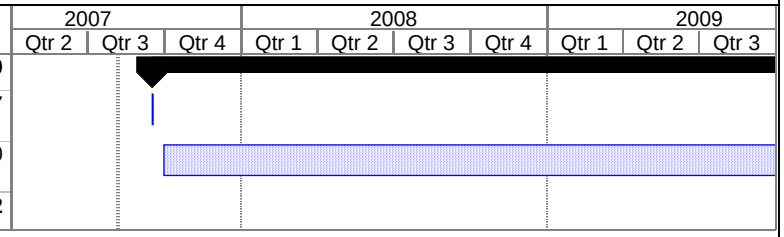
Schedule 3-9
Site 12 SMP FY08-09

ID	Task Name	Duration	Start	Finish
308	**Site 12**	**610 days**	**Mon 9/17/07**	**Fri 1/15/10**
309	Annual Site Inspection (for landfill cap)	1 day	Mon 9/17/07	Mon 9/17/07
310	LTM (for GW) - Every Two Years	600 days	Mon 10/1/07	Fri 1/15/10
311	**Five-year Review**	**152 days**	**Tue 5/1/12**	**Wed 11/28/12**



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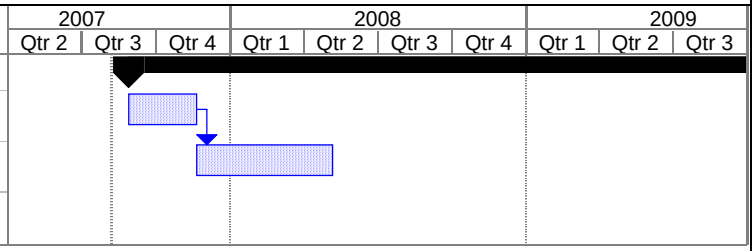
Schedule 3-10
Site 16/SSA 16 SMP FY08-09

ID	Task Name	Duration	Start	Finish
318	**Site 16**	**1371 days**	**Wed 8/29/07**	**Wed 11/28/12**
319	Technical Memorandum (GW risk management)	60 days	Wed 8/29/07	Tue 11/20/07
320	ESD (pending Tech Memo consensus)	120 days	Wed 11/21/07	Tue 5/6/08
321	**Five-year Review (pending ESD)**	**152 days**	**Tue 5/1/12**	**Wed 11/28/12**



Task
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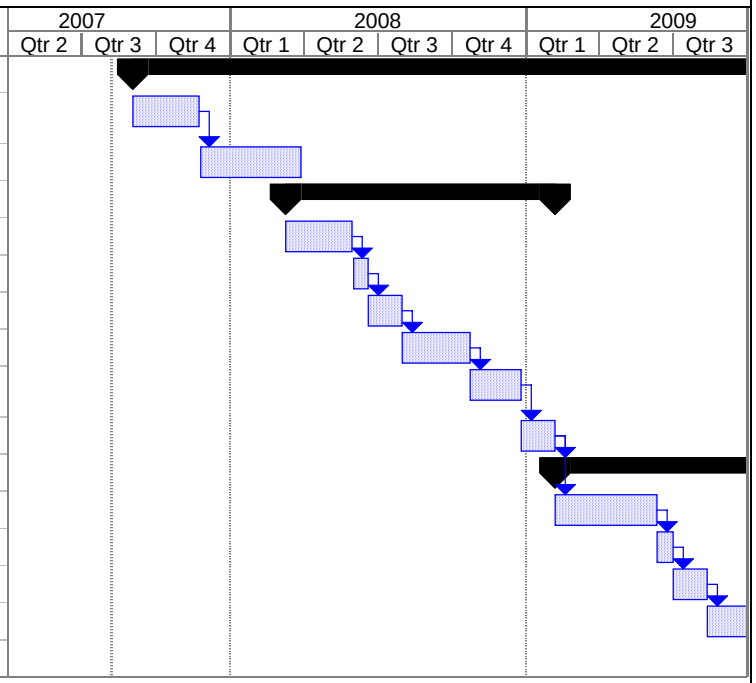
Schedule 3-11
Site 17 SMP FY08-09

ID	Task Name	Duration	Start	Finish
328	**Site 17**	**598 days**	**Mon 9/3/07**	**Wed 12/16/09**
329	Technical Memorandum (all waste removed)	60 days	Mon 9/3/07	Fri 11/23/07
330	ESD for Soil/Waste (NFA)	90 days	Mon 11/26/07	Fri 3/28/08
331	**PP for GW (NFA)**	**239 days**	**Mon 3/10/08**	**Thu 2/5/09**
332	Preliminary PP	60 days	Mon 3/10/08	Fri 5/30/08
333	Gov't Comments	14 days	Mon 6/2/08	Thu 6/19/08
334	Issue Draft PP	30 days	Fri 6/20/08	Thu 7/31/08
335	Regulatory / Legal Review	60 days	Fri 8/1/08	Thu 10/23/08
336	Public Comment Period Draft Final PP	45 days	Fri 10/24/08	Thu 12/25/08
337	Issue Final PP	30 days	Fri 12/26/08	Thu 2/5/09
338	**ROD for GW (NFA)**	**224 days**	**Fri 2/6/09**	**Wed 12/16/09**
339	Preliminary ROD	90 days	Fri 2/6/09	Thu 6/11/09
340	Gov't Comments	14 days	Fri 6/12/09	Wed 7/1/09
341	Issue Draft ROD	30 days	Thu 7/2/09	Wed 8/12/09
342	Regulatory / Legal Review	60 days	Thu 8/13/09	Wed 11/4/09
343	Issue ROD for Signature	30 days	Thu 11/5/09	Wed 12/16/09



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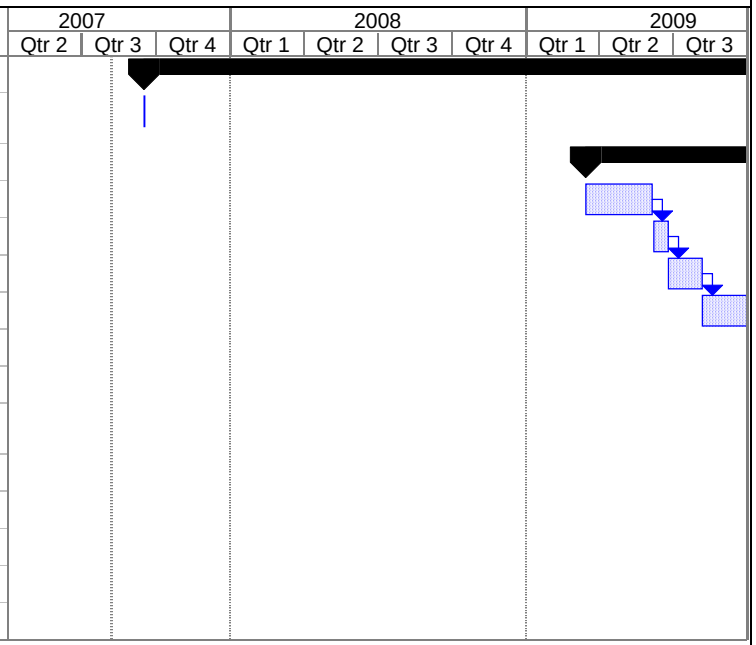
Schedule 3-12
Site 19 SMP FY08-09

ID	Task Name	Duration	Start	Finish
346	**Site 19**	**1555 days**	**Mon 9/17/07**	**Fri 8/30/13**
347	Annual Site Inspection (soil cover in trench)	1 day	Mon 9/17/07	Mon 9/17/07
348	**GW Investigation Work Plan**	**314 days**	**Mon 3/16/09**	**Thu 5/27/10**
349	Preliminary WP	60 days	Mon 3/16/09	Fri 6/5/09
350	Gov't comments	14 days	Mon 6/8/09	Thu 6/25/09
351	Issue Draft WP	30 days	Fri 6/26/09	Thu 8/6/09
352	Regulatory Review	60 days	Fri 8/7/09	Thu 10/29/09
353	Issue Draft Final WP	30 days	Fri 10/30/09	Thu 12/10/09
354	Issue Final WP	30 days	Fri 12/11/09	Thu 1/21/10
355	GW Investigation Fieldwork and Laboratory	90 days	Fri 1/22/10	Thu 5/27/10
356	**RI Report for GW**	**254 days**	**Fri 5/28/10**	**Wed 5/18/11**
363	**FS Report for GW**	**224 days**	**Thu 5/19/11**	**Tue 3/27/12**
370	**PP for GW**	**239 days**	**Wed 3/28/12**	**Mon 2/25/13**
377	**ROD for GW**	**134 days**	**Tue 2/26/13**	**Fri 8/30/13**
383	**Five-year Review**	**152 days**	**Tue 5/1/12**	**Wed 11/28/12**



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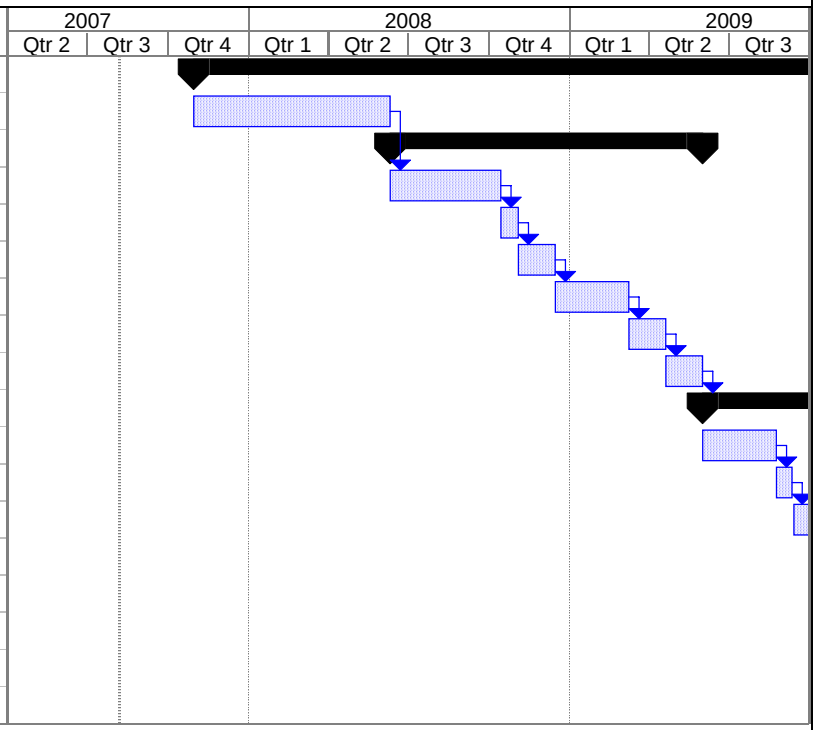
Schedule 3-13
Site 21 SMP FY08-09

ID	Task Name	Duration	Start	Finish
122	**Site 21**	**1069 days**	**Wed 10/31/07**	**Mon 12/5/11**
123	Fieldwork (and laboratory)	160 days	Wed 10/31/07	Tue 6/10/08
124	**RI Report for GW/SW/SD**	**254 days**	**Wed 6/11/08**	**Mon 6/1/09**
125	Preliminary RI	90 days	Wed 6/11/08	Tue 10/14/08
126	Gov't comments	14 days	Wed 10/15/08	Mon 11/3/08
127	Issue Draft RI	30 days	Tue 11/4/08	Mon 12/15/08
128	Regulatory Review	60 days	Tue 12/16/08	Mon 3/9/09
129	Issue Draft Final RI	30 days	Tue 3/10/09	Mon 4/20/09
130	Issue Final RI	30 days	Tue 4/21/09	Mon 6/1/09
131	**FS Report GW/SW/SD**	**192 days**	**Tue 6/2/09**	**Wed 2/24/10**
132	Preliminary FS	60 days	Tue 6/2/09	Mon 8/24/09
133	Gov't comments	14 days	Tue 8/25/09	Fri 9/11/09
134	Issue Draft FS	14 days	Mon 9/14/09	Thu 10/1/09
135	Regulatory Review	60 days	Fri 10/2/09	Thu 12/24/09
136	Issue Draft Final FS	14 days	Fri 12/25/09	Wed 1/13/10
137	Issue Final FS	30 days	Thu 1/14/10	Wed 2/24/10
138	**PP GW/SW/SD**	**239 days**	**Thu 2/25/10**	**Tue 1/25/11**
145	**ROD GW/SW/SD**	**224 days**	**Wed 1/26/11**	**Mon 12/5/11**



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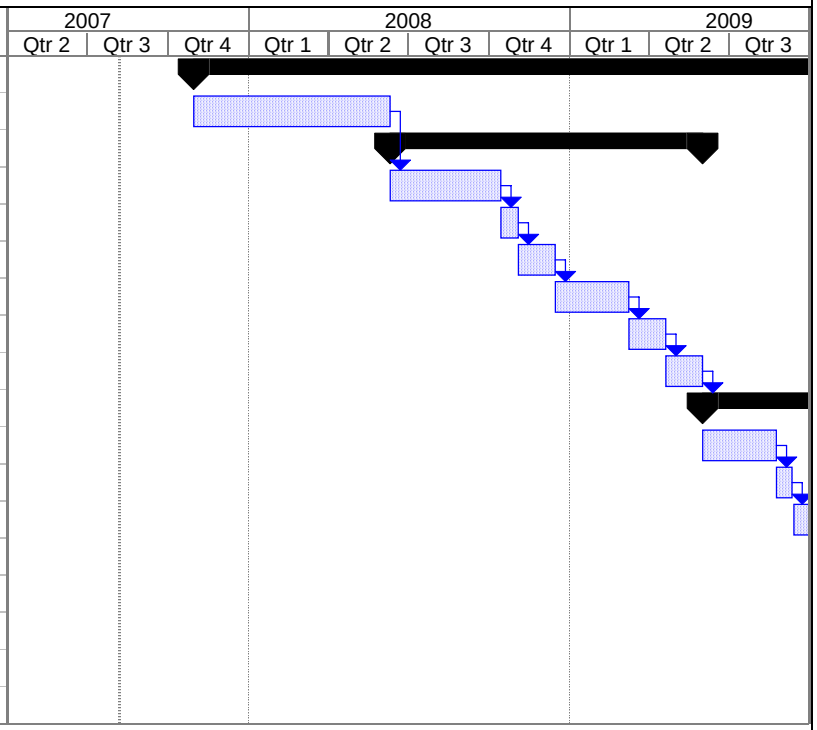
Schedule 3-14
Site 22 SMP FY08-09

ID	Task Name	Duration	Start	Finish
122	**Site 22**	**1101 days**	**Wed 10/31/07**	**Wed 1/18/12**
123	Fieldwork (and laboratory)	160 days	Wed 10/31/07	Tue 6/10/08
124	**RI Report for GW/SW/SD**	**254 days**	**Wed 6/11/08**	**Mon 6/1/09**
125	Preliminary RI	90 days	Wed 6/11/08	Tue 10/14/08
126	Gov't comments	14 days	Wed 10/15/08	Mon 11/3/08
127	Issue Draft RI report	30 days	Tue 11/4/08	Mon 12/15/08
128	Regulatory Review	60 days	Tue 12/16/08	Mon 3/9/09
129	Issue Draft Final RI	30 days	Tue 3/10/09	Mon 4/20/09
130	Issue final RI report	30 days	Tue 4/21/09	Mon 6/1/09
131	**FS Report GW/SW/SD**	**224 days**	**Tue 6/2/09**	**Fri 4/9/10**
132	Preliminary FS	60 days	Tue 6/2/09	Mon 8/24/09
133	Gov't comments	14 days	Tue 8/25/09	Fri 9/11/09
134	Issue Draft FS	30 days	Mon 9/14/09	Fri 10/23/09
135	Regulatory Review	60 days	Mon 10/26/09	Fri 1/15/10
136	Issue Draft Final FS	30 days	Mon 1/18/10	Fri 2/26/10
137	Issue Final FS	30 days	Mon 3/1/10	Fri 4/9/10
138	**PP GW/SW/SD**	**239 days**	**Mon 4/12/10**	**Thu 3/10/11**
145	**ROD GW/SW/SD**	**224 days**	**Fri 3/11/11**	**Wed 1/18/12**



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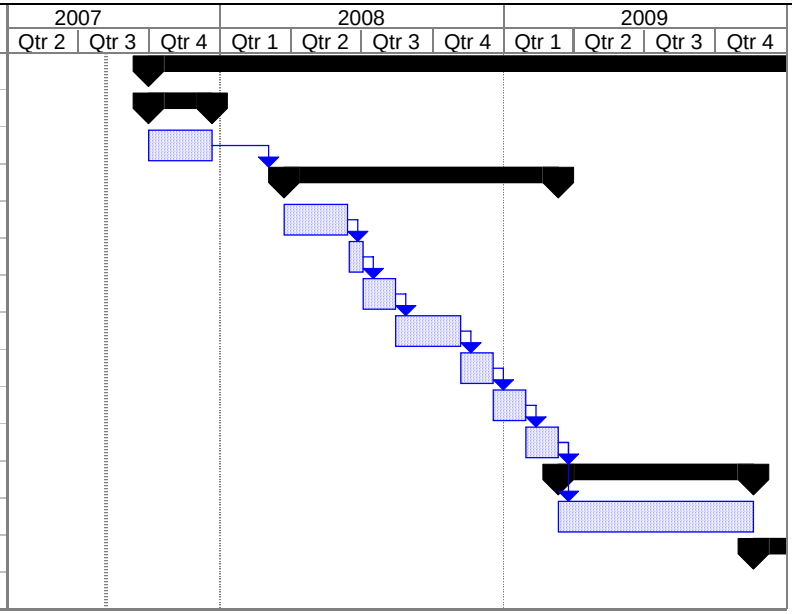
Schedule 3-15
Site 23 SMP FY08-09

ID	Task Name	Duration	Start	Finish
505	**Site 23**	**1022 days**	**Mon 10/1/07**	**Tue 8/30/11**
506	**RI Report**	**60 days**	**Mon 10/1/07**	**Fri 12/21/07**
507	Issue final RI report	60 days	Mon 10/1/07	Fri 12/21/07
508	**EE/CA**	**254 days**	**Mon 3/24/08**	**Thu 3/12/09**
509	Preliminary EE/CA	60 days	Mon 3/24/08	Fri 6/13/08
510	Gov't comments	14 days	Mon 6/16/08	Thu 7/3/08
511	Issue Draft EE/CA	30 days	Fri 7/4/08	Thu 8/14/08
512	Regulatory Review	60 days	Fri 8/15/08	Thu 11/6/08
513	Issue Draft Final EE/CA	30 days	Fri 11/7/08	Thu 12/18/08
514	Public Comment Period	30 days	Fri 12/19/08	Thu 1/29/09
515	Issue Final EE/CA/AM	30 days	Fri 1/30/09	Thu 3/12/09
516	**IRA**	**180 days**	**Fri 3/13/09**	**Thu 11/19/09**
517	Implement IRA	180 days	Fri 3/13/09	Thu 11/19/09
518	**PP**	**239 days**	**Fri 11/20/09**	**Wed 10/20/10**
525	**ROD**	**224 days**	**Thu 10/21/10**	**Tue 8/30/11**



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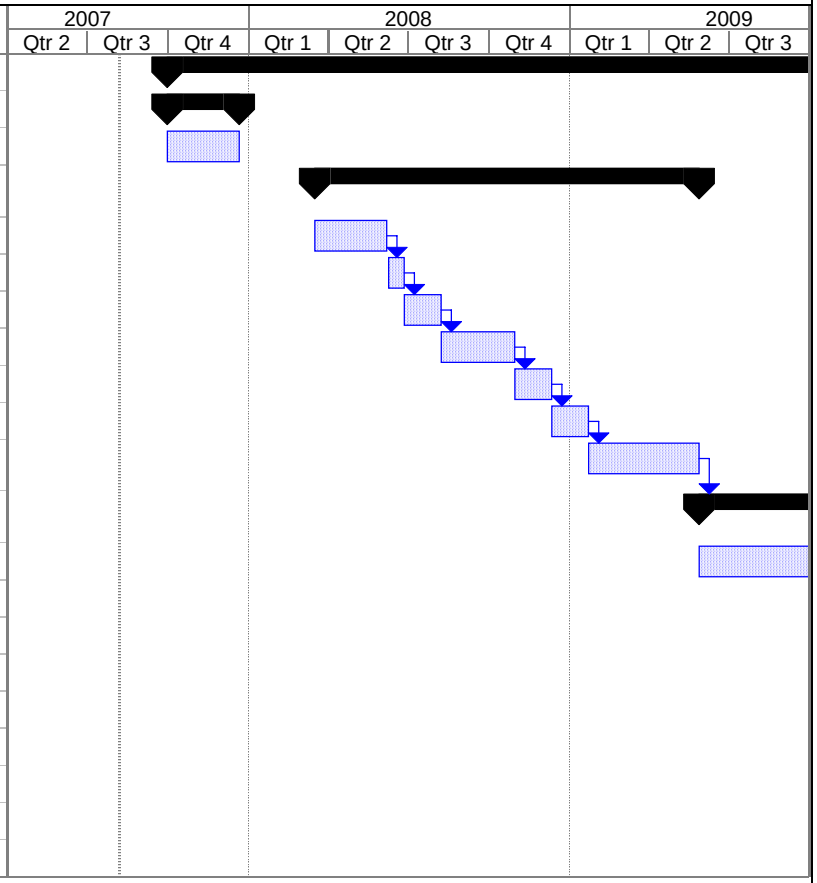
Schedule 3-16
Site 24 SMP FY08-09

ID	Task Name	Duration	Start	Finish
533	**Site 24**	**1375 days**	**Mon 10/1/07**	**Fri 1/4/13**
534	**RI Report**	**60 days**	**Mon 10/1/07**	**Fri 12/21/07**
535	Issue final RI report	60 days	Mon 10/1/07	Fri 12/21/07
536	**Supplemental RI Work Plan (all media)**	**314 days**	**Mon 3/17/08**	**Thu 5/28/09**
537	Preliminary WP	60 days	Mon 3/17/08	Fri 6/6/08
538	Gov't comments	14 days	Mon 6/9/08	Thu 6/26/08
539	Issue Draft WP	30 days	Fri 6/27/08	Thu 8/7/08
540	Regulatory Review	60 days	Fri 8/8/08	Thu 10/30/08
541	Issue Draft Final WP	30 days	Fri 10/31/08	Thu 12/11/08
542	Issue Final WP	30 days	Fri 12/12/08	Thu 1/22/09
543	Fieldwork (and Laboratory)	90 days	Fri 1/23/09	Thu 5/28/09
544	**Supplemental RI Report (all media)**	**254 days**	**Fri 5/29/09**	**Wed 5/19/10**
545	Preliminary RI	90 days	Fri 5/29/09	Thu 10/1/09
546	Gov't comments	14 days	Fri 10/2/09	Wed 10/21/09
547	Issue Draft RI report	30 days	Thu 10/22/09	Wed 12/2/09
548	Regulatory Review	60 days	Thu 12/3/09	Wed 2/24/10
549	Issue Draft Final RI report	30 days	Thu 2/25/10	Wed 4/7/10
550	Issue Final RI report	30 days	Thu 4/8/10	Wed 5/19/10
551	**FS Report**	**224 days**	**Thu 5/20/10**	**Tue 3/29/11**
558	**PP**	**239 days**	**Wed 3/30/11**	**Mon 2/27/12**
565	**ROD**	**224 days**	**Tue 2/28/12**	**Fri 1/4/13**



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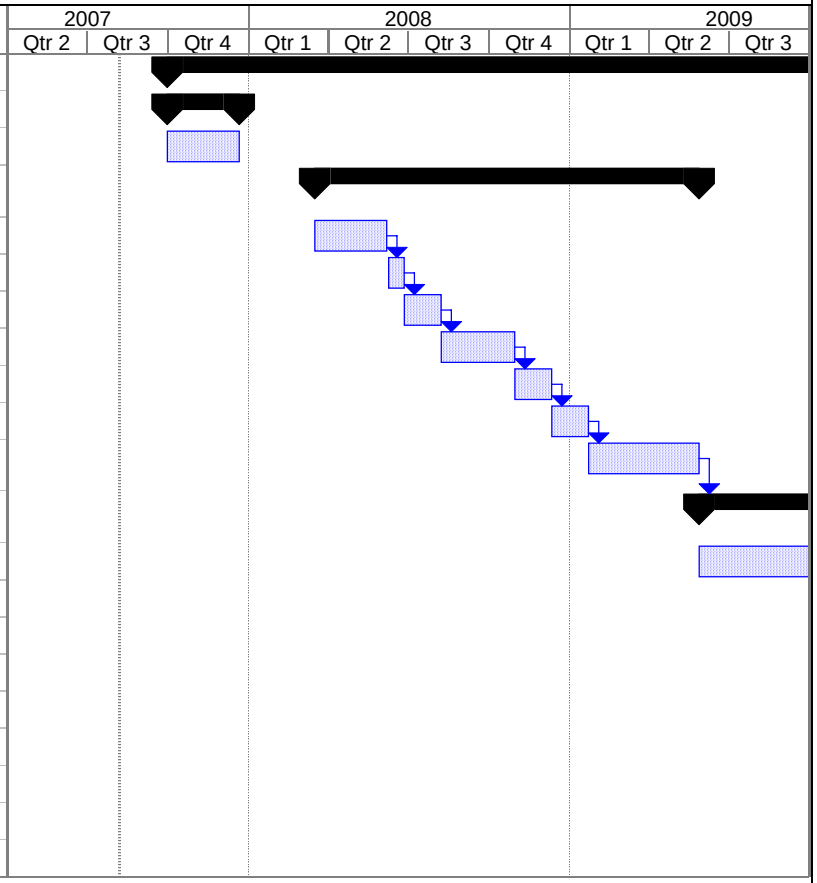
Schedule 3-17
Site 25 SMP FY08-09

ID	Task Name	Duration	Start	Finish
533	**Site 25**	**1375 days**	**Mon 10/1/07**	**Fri 1/4/13**
534	**RI Report**	**60 days**	**Mon 10/1/07**	**Fri 12/21/07**
535	Issue final RI report	60 days	Mon 10/1/07	Fri 12/21/07
536	**Supplemental RI Work Plan (all media)**	**314 days**	**Mon 3/17/08**	**Thu 5/28/09**
537	Preliminary WP	60 days	Mon 3/17/08	Fri 6/6/08
538	Gov't comments	14 days	Mon 6/9/08	Thu 6/26/08
539	Issue Draft WP	30 days	Fri 6/27/08	Thu 8/7/08
540	Regulatory Review	60 days	Fri 8/8/08	Thu 10/30/08
541	Issue Draft Final WP	30 days	Fri 10/31/08	Thu 12/11/08
542	Issue Final WP	30 days	Fri 12/12/08	Thu 1/22/09
543	Fieldwork (and Laboratory)	90 days	Fri 1/23/09	Thu 5/28/09
544	**Supplemental RI Report (all media)**	**254 days**	**Fri 5/29/09**	**Wed 5/19/10**
545	Preliminary RI	90 days	Fri 5/29/09	Thu 10/1/09
546	Gov't comments	14 days	Fri 10/2/09	Wed 10/21/09
547	Issue Draft RI report	30 days	Thu 10/22/09	Wed 12/2/09
548	Regulatory Review	60 days	Thu 12/3/09	Wed 2/24/10
549	Issue Draft Final RI report	30 days	Thu 2/25/10	Wed 4/7/10
550	Issue Final RI report	30 days	Thu 4/8/10	Wed 5/19/10
551	**FS**	**224 days**	**Thu 5/20/10**	**Tue 3/29/11**
558	**PP**	**239 days**	**Wed 3/30/11**	**Mon 2/27/12**
565	**ROD**	**224 days**	**Tue 2/28/12**	**Fri 1/4/13**



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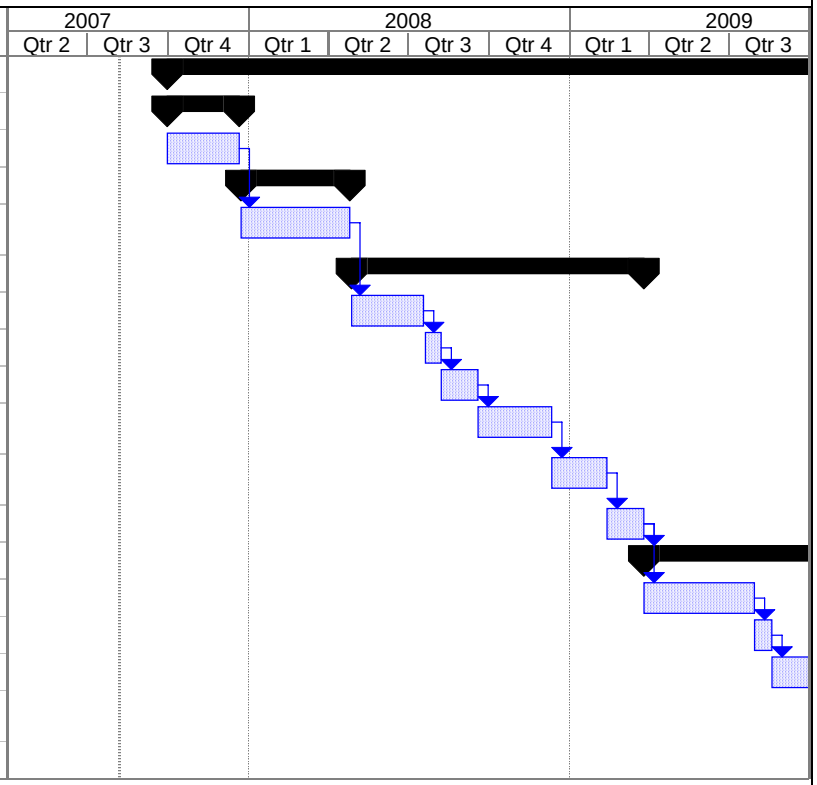
Schedule 3-18
Site 26 SMP FY08-09

ID	Task Name	Duration	Start	Finish
533	**Site 26**	**613 days**	**Mon 10/1/07**	**Wed 2/3/10**
534	**RI Report**	**60 days**	**Mon 10/1/07**	**Fri 12/21/07**
535	Issue final RI report	60 days	Mon 10/1/07	Fri 12/21/07
536	**Technical Memorandum**	**90 days**	**Mon 12/24/07**	**Fri 4/25/08**
537	Technical Memorandum (NFA documentation)	90 days	Mon 12/24/07	Fri 4/25/08
538	**PP for GW (NFA)**	**239 days**	**Mon 4/28/08**	**Thu 3/26/09**
539	Preliminary PP	60 days	Mon 4/28/08	Fri 7/18/08
540	Gov't Comments	14 days	Mon 7/21/08	Thu 8/7/08
541	Issue Draft PP	30 days	Fri 8/8/08	Thu 9/18/08
542	Regulatory / Legal Review	60 days	Fri 9/19/08	Thu 12/11/08
543	Public Comment Period Draft Final PP	45 days	Fri 12/12/08	Thu 2/12/09
544	Issue Final PP	30 days	Fri 2/13/09	Thu 3/26/09
545	**ROD for GW (NFA)**	**224 days**	**Fri 3/27/09**	**Wed 2/3/10**
546	Preliminary ROD	90 days	Fri 3/27/09	Thu 7/30/09
547	Gov't Comments	14 days	Fri 7/31/09	Wed 8/19/09
548	Issue Draft ROD	30 days	Thu 8/20/09	Wed 9/30/09
549	Regulatory / Legal Review	60 days	Thu 10/1/09	Wed 12/23/09
550	Issue ROD for Signature	30 days	Thu 12/24/09	Wed 2/3/10



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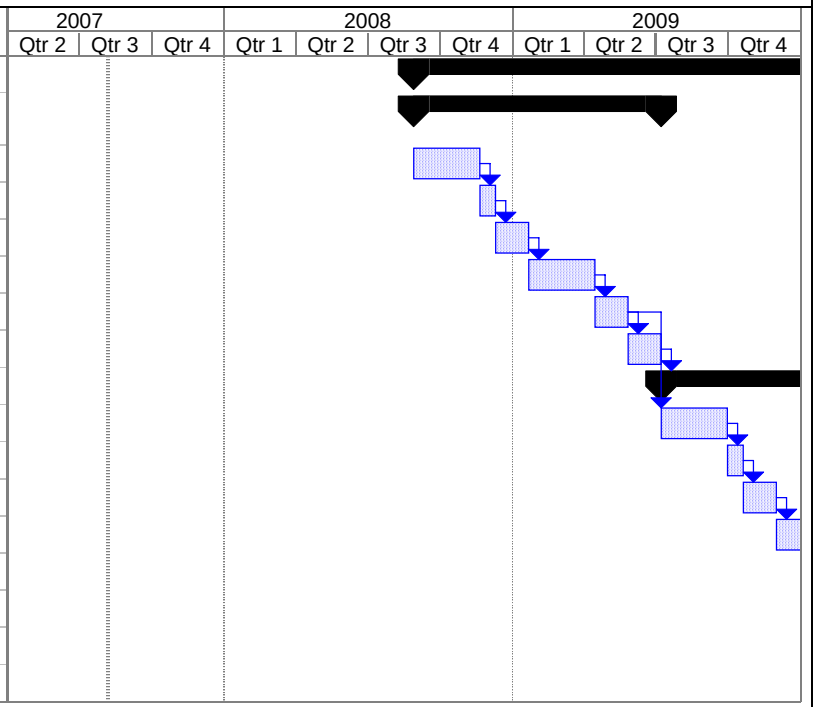
Schedule 3-19
Site 28 SMP FY08-09

ID	Task Name	Duration	Start	Finish
533	**Site 28**	**911 days**	**Fri 8/29/08**	**Fri 2/24/12**
534	**Supplemental RI BERA Report**	**224 days**	**Fri 8/29/08**	**Wed 7/8/09**
535	Preliminary RI BERA	60 days	Fri 8/29/08	Thu 11/20/08
536	Gov't comments	14 days	Fri 11/21/08	Wed 12/10/08
537	Issue Draft BERA	30 days	Thu 12/11/08	Wed 1/21/09
538	Regulatory Review	60 days	Thu 1/22/09	Wed 4/15/09
539	Issue Draft Final BERA	30 days	Thu 4/16/09	Wed 5/27/09
540	Issue Final BERA	30 days	Thu 5/28/09	Wed 7/8/09
541	**FS Report**	**224 days**	**Thu 7/9/09**	**Tue 5/18/10**
542	Preliminary FS	60 days	Thu 7/9/09	Wed 9/30/09
543	Gov't comments	14 days	Thu 10/1/09	Tue 10/20/09
544	Issue Draft FS	30 days	Wed 10/21/09	Tue 12/1/09
545	Regulatory Review	60 days	Wed 12/2/09	Tue 2/23/10
546	Issue Draft Final FS	30 days	Wed 2/24/10	Tue 4/6/10
547	Issue Final FS	30 days	Wed 4/7/10	Tue 5/18/10
548	**PP**	**239 days**	**Wed 5/19/10**	**Mon 4/18/11**
555	**ROD**	**224 days**	**Tue 4/19/11**	**Fri 2/24/12**



Project: WPNSTA Master Schedule
Date: Mon 8/6/07

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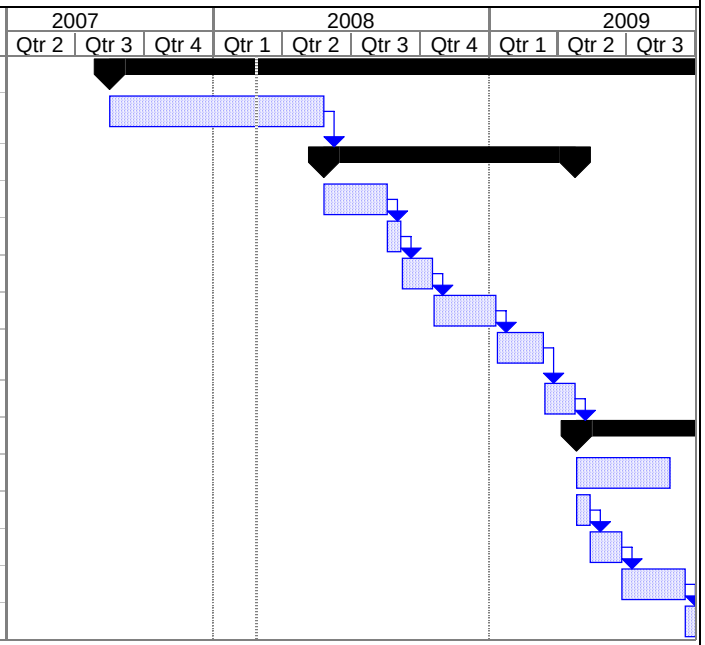
Schedule 3-20
Site 29 SMP FY08-09

ID	Task Name	Duration	Start	Finish
346	**Site 29**	**575 days**	**Fri 8/17/07**	**Thu 10/29/09**
347	Technical Memorandum (All Media NA Documentation)	202 days	Fri 8/17/07	Mon 5/26/08
348	**PP (NA All Media)**	**239 days**	**Tue 5/27/08**	**Fri 4/24/09**
349	Preliminary PP	60 days	Tue 5/27/08	Mon 8/18/08
350	Gov't comments	14 days	Tue 8/19/08	Fri 9/5/08
351	Issue Draft PP	30 days	Mon 9/8/08	Fri 10/17/08
352	Regulatory / Legal Review	60 days	Mon 10/20/08	Fri 1/9/09
353	Public Comment Period Draft Final PP	45 days	Mon 1/12/09	Fri 3/13/09
354	Issue Final PP	30 days	Mon 3/16/09	Fri 4/24/09
355	**ROD (NA All Media)**	**134 days**	**Mon 4/27/09**	**Thu 10/29/09**
356	Preliminary ROD	90 days	Mon 4/27/09	Fri 8/28/09
357	Gov't comments	14 days	Mon 4/27/09	Thu 5/14/09
358	Issue Draft ROD	30 days	Fri 5/15/09	Thu 6/25/09
359	Regulatory / Legal Review	60 days	Fri 6/26/09	Thu 9/17/09
360	Issue ROD for Signature	30 days	Fri 9/18/09	Thu 10/29/09



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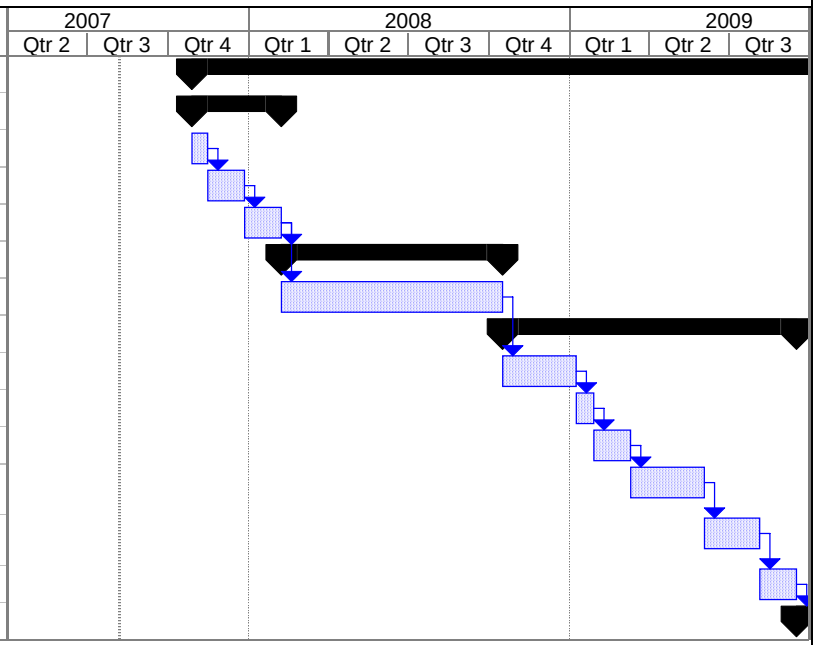
Schedule 3-21
Site 30 SMP FY08-09

ID	Task Name	Duration	Start	Finish
505	**Site 30**	**717 days**	**Mon 10/29/07**	**Tue 7/27/10**
506	**EE/CA**	**74 days**	**Mon 10/29/07**	**Thu 2/7/08**
507	Issue Draft Final EE/CA	14 days	Mon 10/29/07	Thu 11/15/07
508	Public Comment Period	30 days	Fri 11/16/07	Thu 12/27/07
509	Issue Final EE/CA/AM	30 days	Fri 12/28/07	Thu 2/7/08
510	**IRA**	**180 days**	**Fri 2/8/08**	**Thu 10/16/08**
511	Implement IRA	180 days	Fri 2/8/08	Thu 10/16/08
512	**PP**	**239 days**	**Fri 10/17/08**	**Wed 9/16/09**
513	Preliminary PP	60 days	Fri 10/17/08	Thu 1/8/09
514	Gov't Comments	14 days	Fri 1/9/09	Wed 1/28/09
515	Issue Draft PP	30 days	Thu 1/29/09	Wed 3/11/09
516	Regulatory / Legal Review	60 days	Thu 3/12/09	Wed 6/3/09
517	Public Comment Period Draft Final PP	45 days	Thu 6/4/09	Wed 8/5/09
518	Issue Final PP	30 days	Thu 8/6/09	Wed 9/16/09
519	**ROD**	**224 days**	**Thu 9/17/09**	**Tue 7/27/10**



Task
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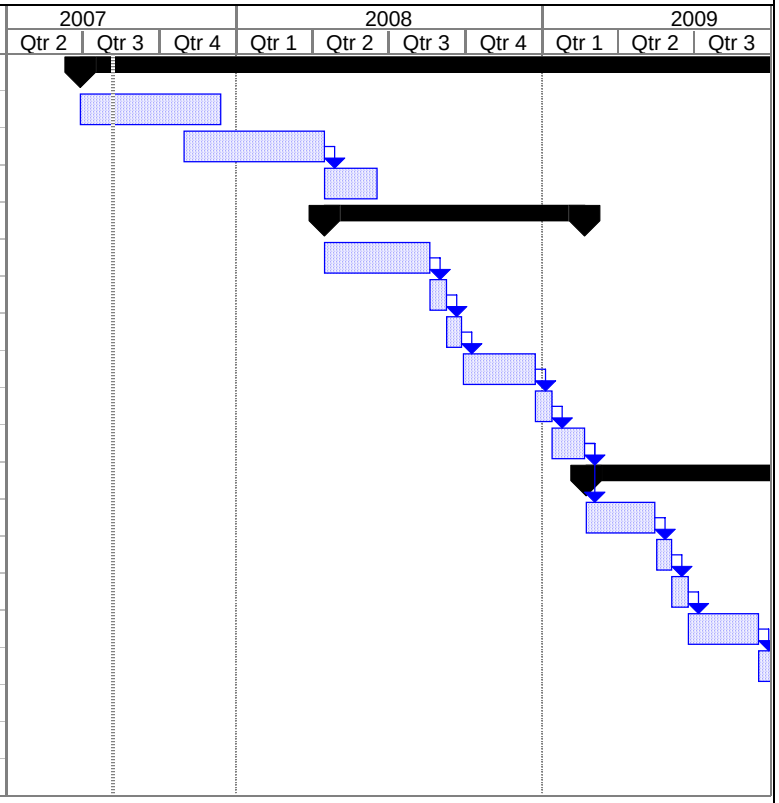
External Milestone
Deadline

Schedule 3-22
SSA 14 SMP FY08-09

ID	Task Name	Duration	Start	Finish
213	**SSA 14**	**996 days**	**Fri 6/29/07**	**Fri 4/22/11**
214	Construction Completion Report	120 days	Fri 6/29/07	Thu 12/13/07
215	GW/SW/SD RI Fieldwork	120 days	Wed 10/31/07	Tue 4/15/08
216	Laboratory Analysis	45 days	Wed 4/16/08	Tue 6/17/08
217	**RI Report for GW/SW/SD**	**223 days**	**Wed 4/16/08**	**Fri 2/20/09**
218	Preliminary RI	90 days	Wed 4/16/08	Tue 8/19/08
219	Gov't comments	14 days	Wed 8/20/08	Mon 9/8/08
220	Issue Draft RI	14 days	Tue 9/9/08	Fri 9/26/08
221	Regulatory Review	62 days	Mon 9/29/08	Tue 12/23/08
222	Issue Draft Final RI	14 days	Wed 12/24/08	Mon 1/12/09
223	Issue Final RI	29 days	Tue 1/13/09	Fri 2/20/09
224	**FS Report**	**192 days**	**Mon 2/23/09**	**Tue 11/17/09**
225	Preliminary FS	60 days	Mon 2/23/09	Fri 5/15/09
226	Gov't comments	14 days	Mon 5/18/09	Thu 6/4/09
227	Issue Draft FS	14 days	Fri 6/5/09	Wed 6/24/09
228	Regulatory Review	60 days	Thu 6/25/09	Wed 9/16/09
229	Issue Draft Final FS	14 days	Thu 9/17/09	Tue 10/6/09
230	Issue Final FS	30 days	Wed 10/7/09	Tue 11/17/09
231	**PP**	**239 days**	**Wed 11/18/09**	**Mon 10/18/10**
238	**ROD**	**134 days**	**Tue 10/19/10**	**Fri 4/22/11**



Task
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Project Summary
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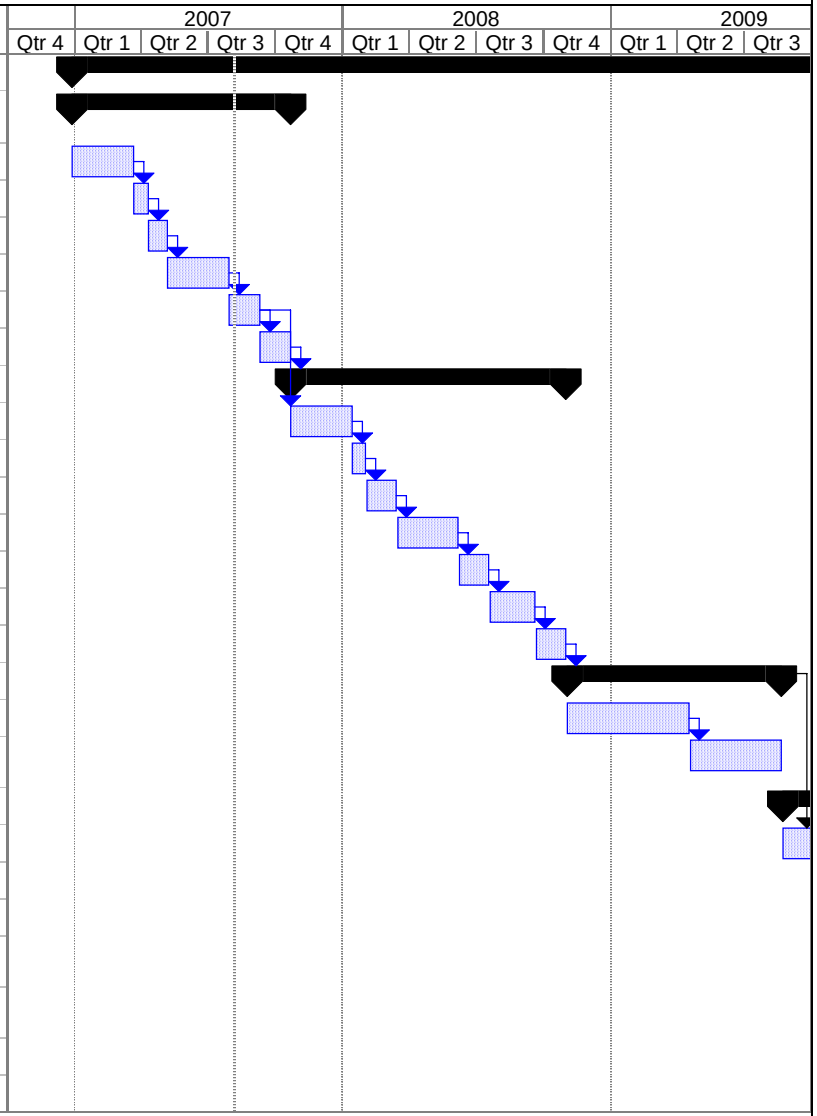
Deadline

Schedule 3-23
SSA 25 SMP FY08-09

ID	Task Name	Duration	Start	Finish
533	**SSA 25**	**1154 days**	**Fri 12/29/06**	**Wed 6/1/11**
534	**RI BERA Report**	**212 days**	**Fri 12/29/06**	**Mon 10/22/07**
535	Preliminary BERA	60 days	Fri 12/29/06	Thu 3/22/07
536	Gov't comments	14 days	Fri 3/23/07	Wed 4/11/07
537	Issue Draft BERA	18 days	Thu 4/12/07	Mon 5/7/07
538	Regulatory Review	60 days	Tue 5/8/07	Mon 7/30/07
539	Issue Draft Final BERA	30 days	Tue 7/31/07	Mon 9/10/07
540	Issue Final RI report	30 days	Tue 9/11/07	Mon 10/22/07
541	**EE/CA & AM**	**269 days**	**Tue 10/23/07**	**Fri 10/31/08**
542	Preliminary EE/CA	60 days	Tue 10/23/07	Mon 1/14/08
543	Gov't comments	14 days	Tue 1/15/08	Fri 2/1/08
544	Issue Draft EE/CA	30 days	Mon 2/4/08	Fri 3/14/08
545	Regulatory Review	60 days	Mon 3/17/08	Fri 6/6/08
546	Issue Draft Final EE/CA	30 days	Mon 6/9/08	Fri 7/18/08
547	Public Comment Period	45 days	Mon 7/21/08	Fri 9/19/08
548	Issue Final EE/CA	30 days	Mon 9/22/08	Fri 10/31/08
549	**IRA**	**210 days**	**Mon 11/3/08**	**Fri 8/21/09**
550	Implement IRA	120 days	Mon 11/3/08	Fri 4/17/09
551	Construction Completion Report	90 days	Mon 4/20/09	Fri 8/21/09
552	**PP**	**239 days**	**Mon 8/24/09**	**Thu 7/22/10**
553	Preliminary PP	60 days	Mon 8/24/09	Fri 11/13/09
554	Gov't comments	14 days	Mon 11/16/09	Thu 12/3/09
555	Issue Draft PP	30 days	Fri 12/4/09	Thu 1/14/10
556	Regulatory / Legal Review	60 days	Fri 1/15/10	Thu 4/8/10
557	Public Comment Period Draft Final PP	45 days	Fri 4/9/10	Thu 6/10/10
558	Issue Final PP	30 days	Fri 6/11/10	Thu 7/22/10
559	**ROD**	**224 days**	**Fri 7/23/10**	**Wed 6/1/11**



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SECTION 4

CAX Site and AOC Descriptions

This section provides a summary of base-wide investigations as well as a brief history of CERCLA activities (chronology of significant CERCLA documents and milestones), summary of the nature and extent of potential contamination, summary of potential unacceptable risks, and CERCLA path forward for each of the Sites and AOCs at CAX. Site figures and schedules follow each site description. Schedules illustrate planned CERCLA implementation activities through 2009.

4.1 Base-Wide Studies

CAX initiated an IAS in 1984 to identify and assess sites posing a potential threat to human health and/or the environment due to contamination from past operations. Twelve (12) potentially contaminated sites were identified based on information from historical records, aerial photographs, field inspections, and personnel interviews. The IAS concluded that 4 of the 12 sites (Sites 1, 9, 10, and 11) were a sufficient threat to human health or the environment to warrant Confirmation Studies (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984b). As with WPNSTA Yorktown, Confirmation Studies included the collection and analysis of groundwater, surface water and sediment, and soil in 1986 and 1988 from four sites (Sites 1, 9, 10, and 11) identified in the IAS. Based on the 1986 sampling results no further investigation at Site 9 (Transformer Storage Area) was recommended. The 1988 sampling effort consisted of additional analysis of groundwater (Sites 1, 10 and 11) and sediment and surface water samples (Site 11) (Dames & Moore, 1986b and 1988b). In 1991, a Remedial Investigation Interim Report summarized confirmation study results for Sites 1, 9, 10, and 11 and recommended further RI activities at Sites 1, 10, and 11 and no further investigation of Site 9 (Dames and Moore, 1991).

4.2 Site Descriptions

4.2.1 Site 1—Landfill Near Incinerator

Site Description

Site 1 Landfill was used for burn residues from 1942 to 1951, and as a general landfill from 1951 to 1972. Site 1 covers approximately 1.3 acres located along the York River behind a former incinerator that was dismantled between 1989 and 1992 (**Figure 4-1**). An unnamed tributary and associated wetland that discharges to the York River, border the northwest edge of the landfill. A variety of wastes, including empty paint cans and paint thinner cans, cartons of ether and other unspecified drugs, railroad ties, tar paper, sawdust, rags, concrete, and lumber, were burned and disposed in the landfill until disposal activities ceased in 1981. During its operation, an estimated 34,500 tons of solid waste were buried at the landfill. The landfill occupied an area of approximately one acre; an additional northern area of impacted soils (referred to as the debris pile) occupied approximately three tenths of

an acre. The debris pile contained cables, metal storage containers, an empty storage tank, automobiles, airplane and boat parts, and other miscellaneous items. This area was previously designated as AOC 5 - Debris Area, and is currently managed as part of Site 1.

The edges of the landfill along both the wetland and the York River were historically steep (approximately 20 feet high, nearly vertical in areas) and unvegetated. Landfill contents (including metal scrap, wood, drums, containers, and other miscellaneous debris) were exposed along this perimeter. Continued erosion of the slopes caused by flooding and wave action may have caused exposure and migration of contaminated soil and debris to the adjacent wetland area over time. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Investigation Report, Sites 1, 10, and 11	Baker, 1994	00140C
Site Screening Process Report, Sites 1, 10, and 11	Baker, 1997	00131C
Action Memorandum, Site 1 – Landfill Near Incinerator	Baker, 1999	00176C
Field Investigation Report, Site 1 and AOC 2	Baker, 1999	01217
Construction Close-Out Report, Site 1 Time Critical Removal Action	Baker, 2000	00214C
Round One Remedial Investigation Report for Site 1 – Landfill Near Incinerator	Baker, 2004	01475
Focused Feasibility Study, Site 1 – Landfill Near Incinerator	Baker, 2000	01124
Trenching Letter Report, Site 1, Site 4, and AOC 2	Baker, 2002	01234
Engineering Evaluation/Cost Analysis For Contaminated Soil, Site 1 – Landfill Near Incinerator	Baker, 2003	01563
Memorandum: Yorktown, Cheatham Annex Site-1 Physical Changes Due To Hurricane Isabel	NAVFAC, 2003	01380
Project Completion Report, Site 1 – Landfill Near Incinerator and Site 7 – Old DuPont Disposal Area	Bhate, 2006	(Draft – No AR No.)
Closeout Report, Site 1 – Landfill Near Incinerator, Southeast Wooded Area	Shaw, 2006	01922
TM, Pre-Removal Characterization of Sediments, Site 1 – Landfill Near Incinerator	Baker, 2006	02014
TM – Risk Management of Groundwater	HILL, 2008	(To be added to AR)
Hot Spot and Depression Pool Removal Action (Removal Action E) – 2007	Shaw, 2008	(Draft – No AR No.)

Nature and Extent of Potential Contamination

The waste at Site 1 was the source of potential contamination to soil, groundwater, sediment, and surface water. VOCs, PAHs, pesticides, PCBs and metals were detected in soil and sediment at concentrations that would suggest a CERCLA release. Sediment shows an increase in PAH and metal (particularly arsenic) concentrations upstream to downstream. Pesticides (>2,000 µg/kg), PAHs (greater than >50,000 µg/kg), RDX (at 7,200 µg/kg) and metals (antimony, arsenic, copper, iron, and lead) were detected in soil at elevated concentrations within the boundaries of the landfill waste. PAHs and explosives were detected at low concentrations and low frequencies of detection outside the boundary of the landfill waste; however, PCB hotspot was identified outside the northwestern waste boundary at 5,400 µg/kg. No VOCs were detected in groundwater. Two explosive compounds were detected in groundwater at trace levels.

Potential Risks

Prior to any remedial action(s) soil and waste posed unacceptable risks to human health and ecological receptors. There were no unacceptable human health risks to surface water and sediment for the child resident (cancer risk = 3.9×10^{-6} and HI = 0.39). Although no unacceptable child resident risk was identified for nonpotable groundwater use (cancer risk = $1.7X10^{-6}$ and HI = 0.09), no quantitative risk was evaluated for potable groundwater use by adult/child resident.

Removal Action(s)

Removal actions conducted in 2003, 2004, and 2005 eliminated all landfill waste and associated soil from the site. Following the 2003 removal action, a "depression pool" was created east of the unnamed tributary that borders the northwest edge of the former landfill. A removal action in 2007 was implemented to excavate sediment contaminated with PAHs, metals, and pesticides from the depression pool and sediment with elevated PCBs in the marsh adjacent to the depression pool. Completion of this removal action is pending confirmation sample results as of July 2007. A construction completion report will be prepared.

All previous removal actions have eliminated all waste at the site and mitigated unacceptable risks from exposure to soil and sediment.

CERCLA Path Forward

- Complete RA
- Construction Closeout Report
- TM to risk managed GW
- NFA PP and ROD for all media

Schedule 4-1 presents the FY08-09 schedule for Site 1.

4.2.2 Site 2—Contaminated Food Disposal Area

Site Description

Site 2 was a contaminated food disposal area located within the woods behind Building 40 (Cold Storage Warehouse – which was razed in 2005) (**Figure 4-2**). Food was contaminated with ammonia following a leak in one of the cold storage rooms. Approximately 100 cubic yards of ammonia-contaminated food was buried with cellophane wrappers and boxes intact in a disposal pit approximately 50 feet in diameter and 12 to 15 feet deep in 1970. Site 2 was exclusively used for disposal of this contaminated food. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
No Further Response Action Planned Decision Document For Sites 2, 3, 5, 6, 8 and 10	Baker, 2003	01373

Nature and Extent of Potential Contamination

The IAS concluded that additional study was not warranted for the site due to the decomposable nature of the wastes buried at the site (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984b). The Navy, EPA, and VDEQ agreed on June 18, 2003 to include Site 2 as part of a multi-site NFRAP.

Potential Risks

The NFRAP Decision Document presents the technical information to support the conclusion that soil and groundwater at Site 2 does not pose an unacceptable risk to human health or the environment. The NFRAP was signed in August 2003 (Baker, 2003).

Removal Action(s)

No CERCLA remedial actions have taken place at Site 2.

CERCLA Path Forward

CERCLA documentation is complete with the NFRAP and Decision Signature.

4.2.3 Site 3—Submarine Dye Disposal Area

Site Description

Site 3 was used for the storage of 55-gallon drums of fluorescein dye. Site 3 is located at the southeastern corner of CAD 15 and is presently used as a storage lot (**Figure 4-3**). The fluorescein dye was stored in 55-gallon drums on two or three pallets located between the warehouses. Drum corrosion allowed dye to leak onto the ground and into the storm sewer system. On rainy days, puddles containing a green fluorescent dye were observed and at times, the dye would leak into the storm sewer leading to the York River. The drums were removed in the early 1970s. The fluorescein dye is non-hazardous, does not adversely

impact environmental media, and naturally degrades. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
No Further Response Action Planned Decision Document For Sites 2, 3, 5, 6, 8 and 10	Baker, 2003	01373

Nature and Extent of Potential Contamination

Because the drums were removed and there is a lack of environmental hazard, no additional investigation was warranted for Site 3. The Navy, EPA and VDEQ agreed on June 18, 2003 to include Site 3 as part of a multi-site NFRAP.

Potential Risks

The NFRAP Decision Document presents the technical information to support the conclusion that soil and groundwater at Site 3 does not pose an unacceptable risk to human health or the environment. The NFRAP was signed in August 2003 (Baker, 2003).

Removal Action(s)

No CERCLA remedial actions have taken place at Site 3.

CERCLA Path Forward

CERCLA documentation is complete with the NFRAP and Decision Signature.

4.2.4 Site 4—Outdated Medical Supply Disposal Area

Site Description

Site 4 is located at the headwaters of a pond upstream of Youth Pond, between buildings CAD 11 and CAD 12 (**Figure 4-4**). In 1968 or 1969, out-of-date medical supplies, possibly including syringes, empty intravenous bottles, and one-inch metal banding, were unloaded down a bank in this area and covered with soil. Much of that material was reportedly removed from the site because syringe needles were getting stuck in deer hooves. After heavy rains, what appeared to be syringes could sometimes be seen floating in the adjacent pond and in the downgradient Youth Pond. Railroad ties and concrete debris also were dumped along the main drainage channel to the "upstream" pond. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Inspection Report, Site 4 and AOC 1	Baker, 2001	01291
Trenching Letter Report, Site 1, Site 4, and AOC 2	Baker, 2002	01234
Screening Level Ecological Risk Assessment Report for Sites 4 and 9	Baker, 2005	01565

Nature and Extent of Potential Contamination

The 2001 Site Inspection Report identified VOCs, SVOCs, pesticides, PCBs, and inorganic compounds in surface soil, subsurface soil, and sediment at concentrations exceeding residential RBCs. The Site Inspection recommended the extent of debris be determined and addressed through an EE/CA. Groundwater was not evaluated during the SI.

Potential Risks

Potential cancer risk from PAHs and non-cancer hazard from iron in soils (though iron was within base background levels) were identified. A SERA recommended additional data for Step 3a ERA.

Removal Action(s)

Approximately 200 pounds of debris and 13 pounds of sharps (metal and plastic) found on the surface were removed by Reactives Management, Inc. in May 1998.

CERCLA Path Forward

- SSP Investigation
- SERA Step 3a
- NFA SSP Decision Document or RI

Schedule 4-2 presents the FY08-09 schedule for Site 4.

4.2.5 Site 5—Photographic Chemicals Disposal Area

Site Description

Site 5 was originally a marl borrow pit located east of Second Street and south of Antrim Road . Site 5 drains to Penniman Lake and is adjacent to Site 11 (Bone Yard) (**Figure 4-5**). Site 5 was used for the disposal of approximately 20 to 40 gallons of outdated photographic developers and fixers in 1967 or 1968. The material was reportedly disposed in a pit of unknown dimensions. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
No Further Response Action Planned Decision Document For Sites 2, 3, 5, 6, 8 and 10	Baker, 2003	01373

Nature and Extent of Potential Contamination

Based on the small quantity and the non-hazardous nature of the chemicals disposed, the IAS concluded that further study was not warranted at Site 5. The Navy, EPA, and VDEQ agreed in December 2001 that Site 5 warranted no further action and was included as part of a multi-site NFRAP.

Potential Risks

The NFRAP Decision Document presents the technical information to support the conclusion that Site 5 does not pose an unacceptable risk to human health or the environment. The NFRAP was signed in August 2003 (Baker, 2003).

Removal Action(s)

No CERCLA remedial actions have taken place at Site 5.

CERCLA Path Forward

CERCLA documentation is complete with the NFRAP and Decision Signature.

4.2.6 Site 6—Spoiled Food Disposal Area

Site Description:

Site 6 is located southwest of First Street in a vegetated area between First Street and the Patrol Road (**Figure 4-6**). Site 6 was used as spoiled food disposal area for approximately 750 cubic yards of food spoiled in cold storage. The food was buried in a 12 to 15 foot deep pit around 1970. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
No Further Response Action Planned Decision Document For Sites 2, 3, 5, 6, 8 and 10	Baker, 2003	01373

Nature and Extent of Potential Contamination

The IAS concluded that additional study was not warranted for the site because of the non-hazardous nature of the spoiled food buried at the site. The Navy, EPA, and VDEQ agreed on June 18, 2003 to include Site 6 as part of a multi-site NFRAP.

Potential Risks

The NFRAP Decision Document presents the technical information to support the conclusion Site 6 does not pose an unacceptable risk to human health or the environment. The NFRAP was signed in August 2003 (Baker, 2003).

Removal Action(s)

No CERCLA remedial actions have taken place at Site 6.

CERCLA Path Forward

CERCLA documentation is complete with the NFRAP and Decision Signature.

4.2.7 Site 7—Old DuPont Disposal Area

Site Description

Site 7 is located along the York River, east of Davis Road and the former location of Cabin 169 (**Figure 4-7**). The site gradient is steep, nearly vertical in some areas, along the shoreline, and flattens out moving west toward Davis and Chase Roads. During the early 1900s, it was reported that non-hazardous and/or inert wastes from the City of Penniman and the DuPont Company Penniman facility were disposed in what was thought to be a topographic depression along the York River. Site 7 was identified as a potential area of concern in the IAS (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984b).

As the shoreline eroded, site waste (dinner ware, incinerated bottles and metal, etc.) would litter the beach. In 2003, Hurricane Isabel eroded approximately 15 to 20 feet of shoreline, causing a large of amount of debris to cover the beach and action was taken to minimize the impact. In February 2004, trenching with limited soil sampling adjacent to Cabin 169 was conducted to delineate the extent of debris. Additional soil sampling was conducted in April 2004 to further delineate the extent of debris near Cabin 170. The trenching report identified potential soil contamination adjacent to and encompassing Cabins 169 and 170 (Baker, 2004). In addition, a volume of ash and debris was identified in the southwestern portion of the site where erosion of the slope has occurred. This area is highly vulnerable to further erosion into the York River by surface water runoff and intense wave action. Therefore, an Action Memorandum for a Time Critical Removal Action (TCRA) was signed to prevent further erosion of the disposal area contents into the York River. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Trenching and Limited Investigation Report, Site 7N	Baker, 2004	01479
Action Memorandum Time-Critical Removal Action, Site 7N – Old DuPont Disposal Area	Baker, 2004	01592
Project Completion Report Site 1 – Landfill Near Incinerator and Site 7 – Old DuPont Disposal Area	Bhate, 2007	(To be added to AR)

Nature and Extent of Potential Contamination

The source of potential contamination is debris disposed of at Site 7. In 2004, test pits were excavated to identify extent of the debris. The extent of debris is still unknown to the north and west. Eight soil samples were collected for analysis of VOCs, SVOCS, pesticides and PCBs and metals; no groundwater samples were collected. No significant concentrations (low levels estimated below reporting limits) of VOCs, SVOCs, pesticides, or PCBs were detected in soil. Elevated metals consisting of arsenic (9.2 mg/kg), chromium (2,220 mg/kg), lead (6,420 mg/kg), and zinc (2,240 mg/kg) were detected in soil. Concentrations in subsurface soil were less than surface soil. In addition, one sample was collected from the ash pile and analyzed for dioxin, with a total tetrachlorodibenzo-p-dioxin of 325 nanograms/kilogram.

Potential Risks

No risk assessments have been done to date.

Remedial Action(s)

During the 2004 beach surface debris clean-up, a munitions item was discovered and properly disposed. The TCRA was put on hold while the Navy obtained an Explosives Safety Submission (ESS) Waiver. In November 2006, the Geotubes™ were installed to stabilize the shoreline and protect it from further erosion.

A removal action for the debris is anticipated to start in FY08.

CERCLA Path Forward

- Removal Action
- SSP Investigation
- SSP Report
- NFA SSP Decision Document or RI

Schedule 4-3 presents the FY08-09 schedule for Site 7.

4.2.8 Site 8—Landfill Near Building CAD 14

Site Description

Site 8 is located approximately 300 feet north of Building CAD 14 and is estimated to be less than 0.25 acre (**Figure 4-8**). The disposal area reportedly consisted of a series of trenches 2,000 feet long and 10 feet deep. The site was used at various times since the early 1940s but was most active before the Site 1 Landfill (near the incinerator) was opened. Waste was reportedly disposed at the site as recently as 1980.

Specific information documenting disposal practices is not available. Reportedly, only non-hazardous materials such as spoiled meat, spoiled candy, and clothing have been disposed at the site. The surface of the site is level and overgrown with tall grasses, and, at the time of the IAS, there was no surface evidence of waste and no stressed vegetation. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
No Further Response Action Planned Decision Document For Sites 2, 3, 5, 6, 8 and 10	Baker, 2003	01373

Nature and Extent of Potential Contamination

Due to the non-hazardous nature of the waste disposed at Site 8, the IAS, concluded that further study was not warranted (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984b). A site visit took place at Site 8 in 2002 by Baker and Navy representatives, and no signs of contamination or distressed areas could be identified. Based on the inert nature of the materials disposed of at Site 8 and observations made during the site visit, the site retained

its status as not warranting further investigation and was included in the NFRAP Decision Document.

Potential Risks

The NFRAP presents the technical information to support the conclusion that Site 8 does not pose an unacceptable risk to human health or the environment. The NFRAP was signed in August 2003 (Baker, 2003).

Removal Action(s)

No CERCLA remedial actions have taken place at Site 8.

CERCLA Path Forward

CERCLA documentation is complete with the NFRAP and Decision Signature.

4.2.9 Site 9—Transformer Storage Area

Site Description

Site 9 is a former transformer storage area approximately 7,000 square feet in size located adjacent to the northwest corner of Building CAD 16 (**Figure 4-9**). Between 1973 and 1980, electrical transformers, some of which contained PCBs, were reportedly stored at the site for repair or disposal. The storage area was not paved; however it was enclosed by an earthen wall. Transformers were not stored at the site after 1980, and the area was graded and covered with gravel. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Screening Level Ecological Risk Assessment Report for Sites 4 and 9	Baker, 2005	01565

Nature and Extent of Potential Contamination

Previous investigations identified PCBs in soil (<1 mg/kg) and potential migration of PCBs through surface water runoff. No groundwater investigations have been conducted. Potential transport of PCBs through runoff to sediment and surface water downgradient of Site 9 ("upstream" pond and Youth Pond) warrant investigation.

Potential Risks

SERA indicated potential ecological risk from exposure to PCBs. The SERA recommended that Site 9 continue to Step 3a of an ERA. On-site risks are minimal given poor habitat quality, however, potential risks posed by PCBs migrating downgradient to aquatic and terrestrial receptors warrants further consideration. The SERA also concluded that insufficient data are available at Site 9 to conduct Step 3a of an ERA (Baker, 2005h).

Remedial Action(s)

No CERCLA remedial actions have taken place at Site 9.

CERCLA Path Forward

- SSP Investigation
- SERA Step 3a
- NFA SSP Decision Document or RI

Schedule 4-4 presents the FY08-09 schedule for Site 9.

4.2.10 Site 10—Decontamination Agent Disposal Area Near First Street

Site Description

Site 10 covers a one acre area located south of First Street (**Figure 4-10**). An estimated 75 to 100 gallons of decontamination agent (DS-2) were reportedly buried at the site before 1982. DS-2 was used for decontaminating equipment contaminated with nerve or blister agents and is a known human toxin with corrosive properties. It is not known if the DS-2 at Site 10 was neutralized prior to disposal. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Investigation For Sites 1, 10, and 11	Baker, 1994	00140C
Site Screening Process Report, Sites 1, 10, and 11	Baker, 1997	00131C
No Further Response Action Planned Decision Document For Sites 2, 3, 5, 6, 8 and 10	Baker, 2003	01373

Nature and Extent of Potential Contamination

A geophysical survey in 1991 indicated approximately 170 cubic yards of metallic debris buried to a depth of three feet. No samples were collected. The 1994 SI concluded no significant degradation of soils and groundwater. Based on results of groundwater sampling in 1997 (SSP) for VOCs and mercury, no additional investigation or remedial activity at the site was warranted (Baker, 1997h).

Potential Risks

An HHRA identified unacceptable non-cancer hazards associated with soil due to iron, however, the maximum detected iron concentration was similar to background. The NFRAP Decision Document presents the technical information to support the conclusion that the amount and composition of DS-2 disposed at the site does not pose an unacceptable risk to human health or the environment.

Remedial Action(s)

No CERCLA remedial actions have taken place at Site 10.

Based on the site history, material disposed, and results of investigations, the Navy, EPA, and VDEQ agreed to NFRAP; the NFRAP was signed in August 2003 (Baker, 2003).

CERCLA Path Forward

CERCLA documentation is complete with the NFRAP and Decision Signature.

4.2.11 Site 11— Bone Yard

Site Description

The IAS identifies Site 11 as 8 acres, located 250 feet south of Antrim Road and the Public Works facility, used between 1940 and 1978 to store containers of waste-oil and tar as well as asphalt and other scrap materials (**Figure 4-11**). The site was described as 2.7 acres in documentation following removal of stored material in 2000 (Baker, 2000). Oil, asphalt, gasoline, as well as scrap metal, old containers (fuel oil, mixing tanks, etc), fence posts, and abandoned cars have been found inside the fenced and gated enclosure. Various discarded clamshell buckets and other surplus metal objects used in heavy construction were also located throughout the area. Approximately ten five-gallon containers labeled "paraplastic" (concrete sealant) were also present at one time. South of the entrance, numerous barrels containing petroleum products were discovered, as well as several 500-gallon square tanks containing asphalt or oil used in making asphalt. The site is wooded and slopes slightly east towards Penniman Lake. Two small drainage ditches border the site and flow east toward Penniman Lake. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Investigation For Sites 1, 10, and 11	Baker, 1994	00140C
Site Screening Process Report, Sites 1, 10, and 11	Baker, 1997	00131C
Draft Removal Closeout Report, Site 11 – Bone Yard	Baker, 2000	01477
Remedial Investigation, Site 11 – Bone Yard	Baker, 2007	(To be added to AR)

Nature and Extent of Potential Contamination

The material stored at Site 11 was the source of potential contamination to soil, groundwater, sediment, and surface water. Previous investigations included full suite analysis (VOCs, SVOCs, PCBs, pesticides, explosives, and metals) of soil, surface water, sediment, and groundwater. Elevated concentrations in soil of pesticides (4,4-DDD at 37,000 µg/kg and 4,4-DDE at 1,800 µg/kg), PCBs (340 µg/kg), and PAHs (total PAHs > 10,000 µg/kg) were detected in localized areas. VOCs detected in soil were limited to low concentrations estimated below reporting limits of ethylbenzene, styrene, and xylenes. Only a few VOCs, SVOCs, and pesticides were detected in groundwater at trace concentrations estimated below laboratory reporting limits. Arsenic (21.4 mg/L) was detected in groundwater above the MCL.

VOCs and SVOCs detected in surface water were low concentrations of common laboratory contaminants (acetone, methylene chloride, toluene, and phthalates). In sediment, TCE (5J µg/kg) and 1,2-DCE (13J µg/kg) were detected in one sample. PCBs (26 – 15,000 µg/kg) were elevated in sediment with the highest concentrations in samples from Penniman Lake.

Potential Risks

Unacceptable cancer risks (1.4×10^{-4}) were identified for child resident exposure to arsenic in groundwater. Unacceptable non-cancer hazards (10.17) were identified for child resident exposure to arsenic, iron, and manganese in groundwater and iron and vanadium in soil. The SERA and Step 3a of the baseline ERA identified potential adverse impacts to ecological receptors in the terrestrial habitat, north stream aquatic habitat, south stream aquatic habitat, and Penniman Lake from exposure to multiple chemicals.

Remedial Action(s)

Drum, tanks, and storage containers were removed in 1987 and again in 1997 (Baker, 2000).

CERCLA Path Forward

- EE/CA and AM
- IRA /Construction Completion Report
- Supplemental RI
- FS/PP/ROD

Schedule 4-5 presents the FY08-09 schedule for Site 11.

4.2.12 Site 12—Disposal Site Near Water Tower

Site Description

Site 12 is located between Patrol Road and railroad tracks (approximately 2,000 feet west of Jones Pond,). It was used for surface disposal of scrap metal, primarily old automobile parts, and iron pipe (**Figure 4-12**). Based on visual inspection of the site, approximately 70 to 110 cubic feet of material was disposed. Non-hazardous materials are believed to have been disposed of at the site and no signs of stressed vegetation were noted at the time of the IAS in 1984 (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984b). A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
No Further Response Action Planned Decision Document For Site 12	Baker, 2004	01428

Nature and Extent of Potential Contamination

A limited field investigation consisting of eight surface and eight subsurface soil samples was conducted at Site 12 in June 2002. The data was incorporated into a Source Release Investigation (SRI), which was part of the NFRAP. The SRI concluded that chemicals detected within Site 12 soil media are either consistent with concentrations found in reference conditions or are below benchmark concentrations protective of terrestrial ecological receptors. An examination of the laboratory and validation analysis indicates the

presence of certain organic compounds is more likely due to laboratory contamination than to Site 12 influences and that no further action is warranted for Site 12 (Baker, 2004c).

Potential Risks

The NFRAP presents the technical information to support the conclusion that Site 12 does not pose an unacceptable risk to human health or the environment. The NFRAP was signed in April 2004 (Baker, 2004c).

Remedial Action(s)

No CERCLA remedial actions have taken place at Site 11.

CERCLA Path Forward

CERCLA documentation is complete with the NFRAP and Decision Signature.

4.2.13 AOC 1—Scrap Metal Dump

Site Description

AOC 1 was identified as an AOC in 1998 following site visits by the Navy, EPA, and VDEQ. AOC 1 is a debris disposal area located just west of Chapman Road within two ravines associated with unnamed tributaries to Jones Pond (**Figure 4-13**). Wood and metal debris outcrop from the banks of the ravines, with debris being more extensive within the southern ravine. Orange staining in the unnamed tributary that receives runoff from the southern ravine has been identified. AOC 1 is divided into a North Area (0.2 acres) and a South Area (0.4 acres). Based on an average thickness of debris of three feet, the total volume of debris has been estimated to be 3,000 cubic yards. Two cylinders were present along the top of bank along the northern ravine. Markings were distinguishable on both of the cylinders, and included raised lettering around the neck "The Liquid Carbonic Co." These were later determined to be empty and were removed from the site. A summary of relevant documents and action milestones is presented below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Inspection Report, Site 4 and AOC 1	Baker, 2001	01291

Nature and Extent of Potential Contamination

A 2001 Site Inspection and field investigation included a geophysical survey and collection of soil, surface water, and sediment samples; no groundwater samples were collected (Baker, 2001b). The geophysical survey concluded debris in the northern area to be about 10 to 12 feet beyond the edge of visible surface debris, and that there is not extensive buried debris in the remaining areas of the site. Total PAHs (~ 5000 µg/kg) and arsenic (23.5 mg/kg) were detected in soil, with the highest concentrations in the northern area. Only low estimated levels of phthaltes were detected in surface water and sediment. Arsenic (7.4 mg/kg) and low estimated levels below reporting limits of ethylebenzene and xylene were also detected in sediment.

Potential Risks

A human health risk screening evaluation indicated total potential cancer risk from PAHs and non-cancer hazards from iron to be unacceptable. However, individually, chemicals contributing to cancer risk are within EPA's acceptable range, and iron was within background levels contributing to the non-cancer hazard. No groundwater risk exposures or ecological risk evaluations have been performed on terrestrial or aquatic receptors in the drainages or Jones Pond.

Remedial Action(s)

No CERCLA remedial actions have taken place at AOC 1.

CERCLA Path Forward

- SSP Investigation
- SSP Report
- NFA SSP Decision Document or RI

Schedule 4-6 presents the FY08-09 schedule for Site AOC 1.

4.2.14 AOC 2—Dextrose Dump

Site Description

AOC 2 was identified during site visits in 1998 by the Navy, EPA, and VDEQ. The area is situated in woods, north of Garrison Road, along the southern perimeter of CAX and contains several rows of concrete foundation piers, which at one time supported a Shipping House at the former Penniman Shell Loading Plant (**Figure 4-14**). Most of the Penniman facility was demolished between 1918 and 1925. Grass-covered lanes, which lead to the area, are likely locations of former rail lines that have been removed. Several glass bottles, many of which are labeled dextrose, were present. In addition, several partially buried empty drums were also noted. Mounds of soil that are present may also indicate buried materials. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Field Investigation Report, Site 1 and AOC 2	Baker, 1999	01217
Field Investigation Report, Site 7 and AOC 2	Baker, 2001	01348

Nature and Extent of Potential Contamination

A 1999 investigation consisted of a geophysical survey and soil and groundwater sampling (Baker, 1999). VOCs, pesticides and metals were detected in soil at low levels. SVOCs and metals were detected in groundwater at low levels. The investigation concluded low concentrations of detected constituents are not related to site activities.

A 2001 investigation included test pits and hand auger borings to define the extent of buried debris (Baker, 2001c). Samples of native soil and soil within the debris zones were collected and analyzed. A large volume of buried drums and respirator filter canisters were

encountered. A few of the drums contained a thin layer of tar coating or residue. The remaining drums were empty. Soil samples collected within and outside the waste area contained concentrations of VOCs, SVOCs, pesticides, PCBs, and metals above residential RBCs. The investigation recommended further study and possible waste removal.

Potential Risks

A full evaluation of all media has not been completed, including risk assessments.

Removal Action(s)

In 1998, Reactives Management, Inc. removed 470 bottles from the site as part of a routine housekeeping operation and selected 24 bottles for random analysis. Each bottle contained greater than 2,000 ppm glucose indicating that the bottles did contain dextrose, as suspected.

CERCLA Path Forward

- SSP Investigation
- SSP Report
- NFA SSP Decision Document or RI

Schedule 4-7 presents the FY08-09 schedule for Site AOC 2.

4.2.15 AOC 3—CAD 11/12 Pond Bank

Site Description

AOC 3 consists of an approximately 20 foot by 20 foot by 10 foot high pile of metal banding along the north bank of the "upstream" pond, situated between Buildings CAD 11 and CAD 12 and west of D Street (**Figure 4-15**). This area, which also contains a few empty drums and pieces of charred wood, is adjacent to Site 4 - Medical Supplies Disposal Area. This location was designated as an AOC in 1998 following site visits by Navy, EPA, and VDEQ. A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Inspection Report, Site 4 and AOC 1	Baker, 2001	01291

Nature and Extent of Potential Contamination

During the 1999 field investigation of adjacent Site 4, one soil sample and one sediment sample were collected next to the metal banding pile (Baker, 2001b). Results indicate that the soil and sediment samples have elevated concentrations of PAHs and metals above their respective residential RBC.

Potential Risks

A full evaluation of all media has not been completed, including risk assessments.

Removal Action(s)

No CERCLA remedial actions have taken place at AOC 3.

CERCLA Path Forward

- SSP Investigation
- SSP Report
- NFA SSP Decision Document or RI

Schedule 4-8 presents the FY08-09 schedule for Site AOC 3.

4.2.16 AOC 4—Outdated Medical Supply Disposal Area

Site Description

During 1998, AOC 4 was identified as a new AOC, however, based on review of site history and available information, it was determined to be the same area as Site 4. Therefore, AOC 4 is closed and addressed as Site 4.

CERCLA Path Forward

No further action.

4.2.17 AOC 5—Debris Area

Site Description

A large pile of debris that existed at the toe of the Site 1 landfill was identified as AOC 5 in 1998. It contained cables, conex boxes, an empty storage tank, automobiles, airplane/boat parts, and other miscellaneous items. Based on the results of the 1998 field investigation (Baker, 1999), that included a geophysical survey and soil and sediment sampling in the vicinity of the pile, the Navy, EPA and VDEQ agreed Site 1 and AOC 5 should be managed as one unit and AOC 5 was incorporated into Site 1. Consequently, AOC 5 is closed and is addressed as Site 1.

CERCLA Path Forward

No further action.

4.2.18 AOC 6—Penniman AOC

Site Description

AOC 6 consists of five sub-areas related to the former Penniman Shell Loading Plant. The Penniman Shell Loading Plant was an explosives manufacturing facility operated by the DuPont de Nemours Company on what is now CAX and adjacent properties. This facility operated as a TNT manufacturing plant beginning in approximately 1916, and subsequently began loading artillery shells for the war effort in 1918. Between 1918 and 1925 this facility was demolished and reverted to farmland. The Navy established CAX on a portion of this property in 1942 (Weston, 1999).

The five AOC 6 sub-areas were identified through aerial photographic analysis and are (**Figure 4-16**):

- **Ammonia Settling Pits -** This area consists of earthen ammonia settling pits that were part of a former shell loading area located on Cheatham Annex. Wastewater from an ammonia finishing building was discharged through these settling pits.
- **TNT Graining House Sump -** This area consists of a concrete-lined, open top pit believed to be the sump pit for the TNT graining house in the former shell loading area.
- **TNT Catch Box Ruins -** This area consists of an earthen, brick-lined depression located immediately adjacent to the TNT graining house in the former shell loading area. This area was used to separate TNT particles from wastewater.
- **Waste Slag Material -** This area consists of waste metallic slag material that is located throughout the shell loading area predominantly along the railroad tracks. [Note: There are no definitive boundaries to this area, because it consists of widely scattered, uncontained waste slag throughout CAX. The origin of this slag material is unknown; however, it has been speculated that this material may be slag broken out of steam locomotive boilers and dumped along the tracks during the Penniman Shell Loading Plant era. (Weston, 1999)]
- **1918 Drum Storage -** This area was used for the storage of wooden kegs when the shell loading area was active.

A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Inspection Narrative Report, Penniman Shell Loading Plant	Weston, 1999	00161C
Data Acquisition/Summary Report, Penniman Shell Loading Plant	Weston, 1999	00162C

Nature and Extent of Potential Contamination

AOC 6 has not been investigated.

Potential Risks

No risk assessments have occurred.

Removal Action(s)

No CERCLA remedial actions have taken place at AOC 6.

CERCLA Path Forward

- SSP Investigation
- SSP Report
- NFA SSP Decision Document or RI

Schedule 4-9 presents the FY08-09 schedule for Site AOC 6.

4.2.19 AOC 7—Drum and Can Disposal Area

Site Description

In April 2004, the Navy identified a potential area of concern north of Building 14 and Site 8 (**Figure 4-17**). The potential area of concern consists of several small surface debris disposal areas containing a 55-gallon drum and numerous cans. One of the areas of note is a pit approximately 30 feet by 20 feet and 8 feet deep that contained 40 to 50 10-gallon rusted cans with labeling containing the word "tetrachloroethane." A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Completion Letter Report for Housekeeping Actions at CAX Site 1 and AOC 7	Shaw, 2006	(To be added to AR)

Nature and Extent of Potential Contamination

This AOC has not yet been investigated.

Potential Risks

No risk assessments have occurred.

Removal Action(s)

In June 2006, Shaw Environmental conducted a housekeeping effort and removed all of the surface debris (drums and cans) (Shaw, 2006).

CERCLA Path Forward

- SSP Investigation
- SSP Report
- NFA SSP Decision Document or RI

Schedule 4-10 presents the FY08-09 schedule for Site AOC 7.

4.2.20 AOC 8—Area South of Site 7

Site Description

AOC 8 (formerly referred to as Site 7) is located along the York River on a flat, sparsely vegetated depression, with a berm along the northern perimeter (**Figure 4-18**). Gravel and ballast rock can be seen on the ground surface. To the east of the flat area, the land drops off slightly, and in a very small area along the perimeter, buried debris (pipe, metal, and wood) can be seen outcropping from the edge of the slope and along the beach. Test pits conducted in 1999 indicate that the waste post-dates World War I and does not appear to be associated with DuPont Penniman facility waste disposal (Baker, 2001c). A summary of relevant documents and action milestones is below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Field Investigation Report, Site 7 and AOC 2	Baker, 2001	01348

Nature and Extent of Potential Contamination

One sediment sample was collected and analyzed for VOCs, SVOCs, pesticides, PCBs, nitramines/nitroaromatics, and metals (Baker, 2001c). Of the detected constituents, only Aroclor-1260 and arsenic exceeded their respective RBC.

Potential Risks

No risk assessments have occurred.

Remedial Action(s)

No CERCLA remedial actions have taken place at AOC 8.

CERCLA Path Forward

- SSP Investigation
- SSP Report
- NFA SSP Decision Document or RI

Schedule 4-11 presents the FY08-09 schedule for Site AOC 8.

4.3 MMRP Sites

Because funding for both ERP and MMRP is managed by NAVFAC, sites classified as MMRP also are included in this SMP. The only MMRP site identified at CAX is the Marine Pistol and Rifle Range.

4.3.1 Marine Pistol and Rifle Range

The Marine Pistol and Rifle Range is approximately 7 acres in size in the northwest portion of CAX (**Figure 4-19**). The range was used from 1939 to 1970, exclusively for small-caliber munitions (less than 0.5 caliber rounds). A draft final PA (Malcolm Pirnie, 2004) was conducted for the range. The PA identified that only small arms were used, thus there is no potential for munitions and explosives of concern at the range. Old targets and a wooden backstop were observed at the range in 2004.

In 2007, an ESI was conducted at the Marine Pistol and Rifle Range. The evaluation and reporting of ESI results are in progress.

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LEGEND

Site Boundary

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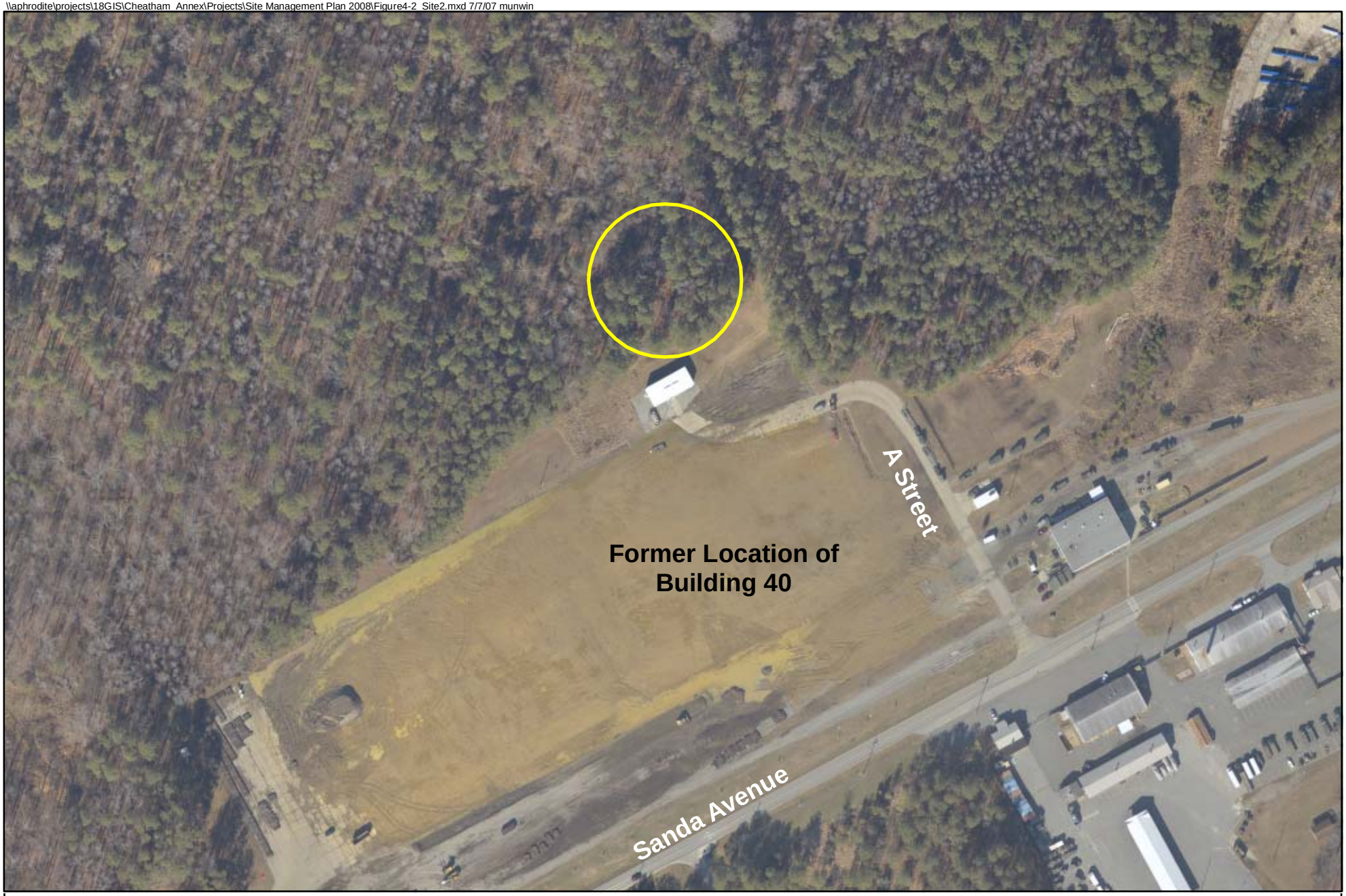
Figure 4-1
Site 1 - Landfill Near Incinerator
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

CH2MHILL

\\aphrodite\projects\18GIS\Cheatham_Annex\Projects\Site Management Plan 2008\Figure4-2_Site2.mxd 7/7/07 munwin



LEGEND

Site Boundary

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Figure 4-2
Site 2 - Contaminated Food Disposal Area
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

CH2MHILL

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LEGEND

Site Boundary

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Figure 4-3
Site 3 - Submarine Dye Disposal Area
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

CH2MHILL

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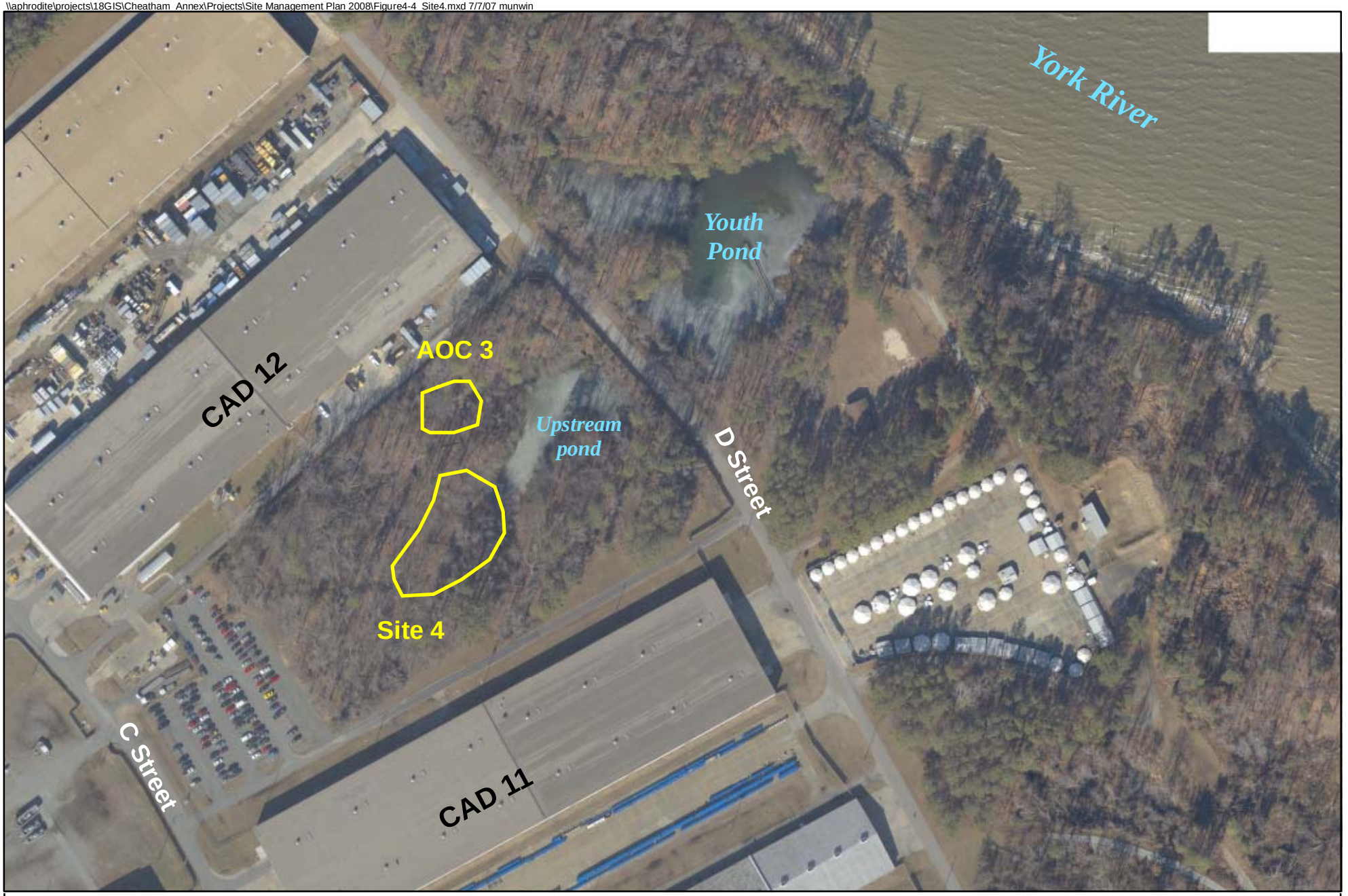

LEGEND

Site Boundary

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Figure 4-4
Site 4 - Outdated Medical Supply Disposal Area
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

CH2MHILL

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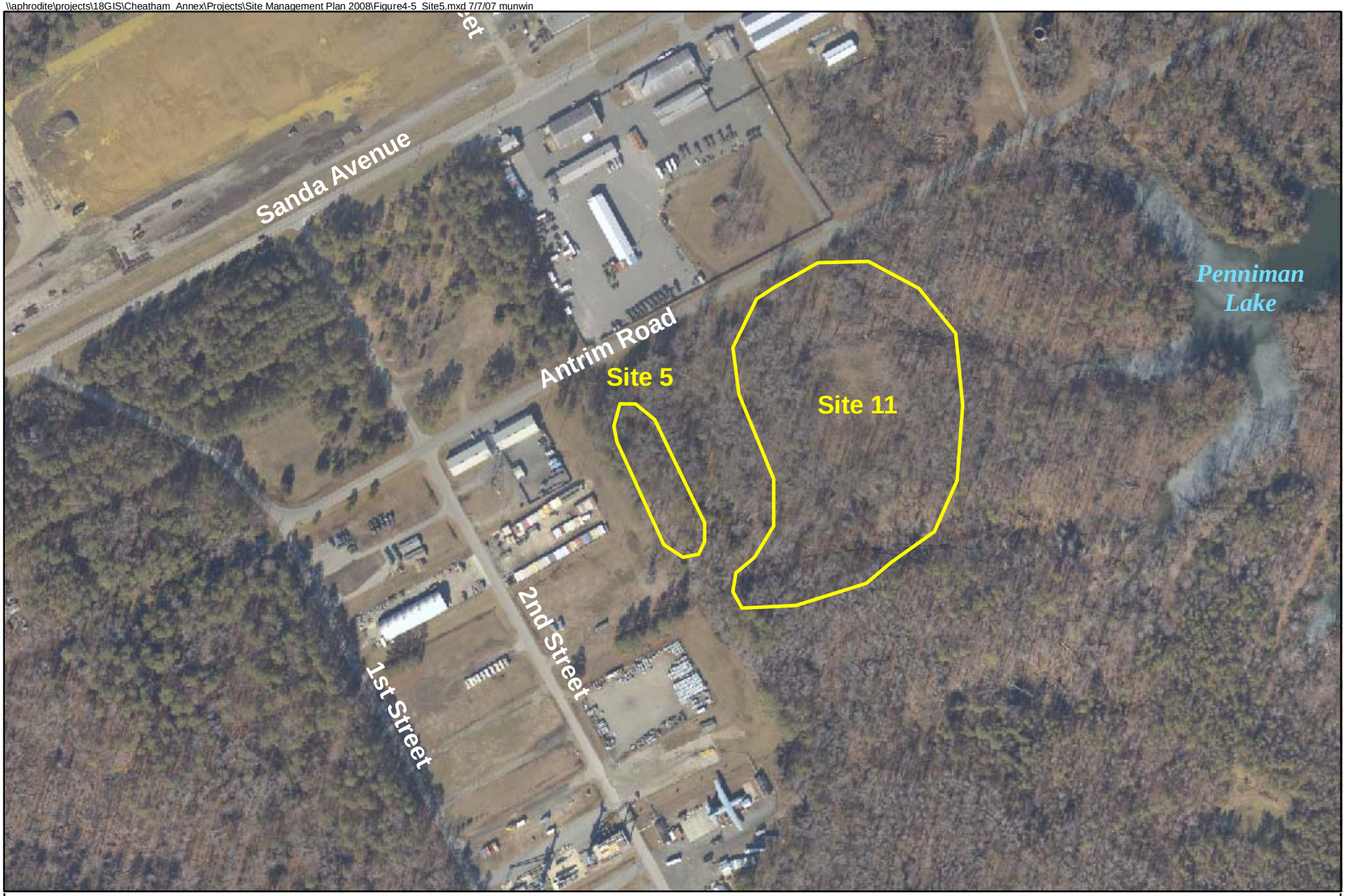

LEGEND

Site Boundary

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Figure 4-5
Site 5 - Photographic Chemicals Disposal Area
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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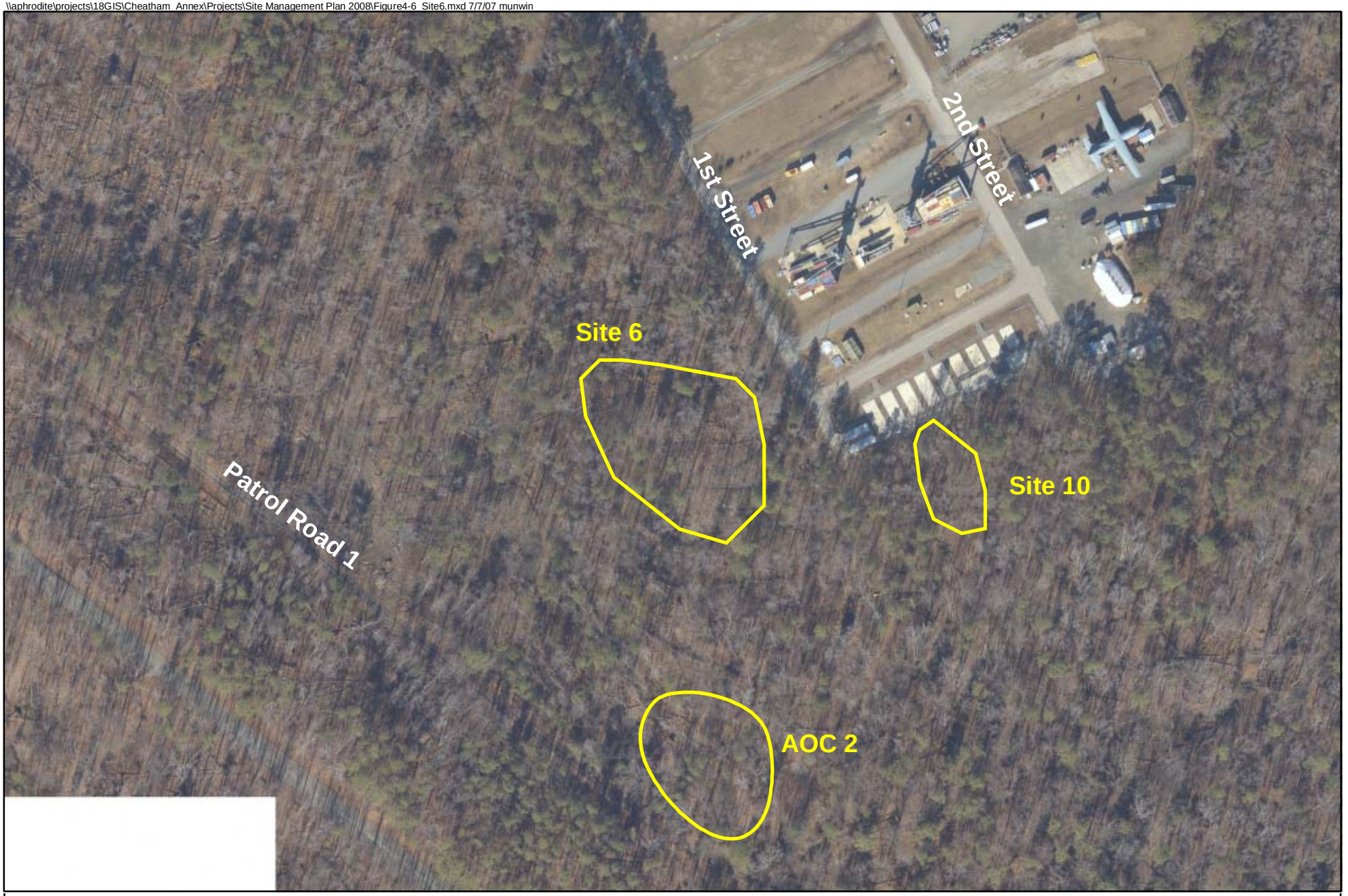

LEGEND

Site Boundary

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Figure 4-6
Site 6 - Spoiled Food Disposal Area
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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LEGEND

Site Boundary

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Figure 4-7
Site 7 - Old DuPont Disposal Area
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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LEGEND

Site Boundary

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Figure 4-8
Site 8 - Landfill Near Building CAD 14
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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LEGEND

Site Boundary

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Figure 4-9
Site 9 - Transformer Storage Area
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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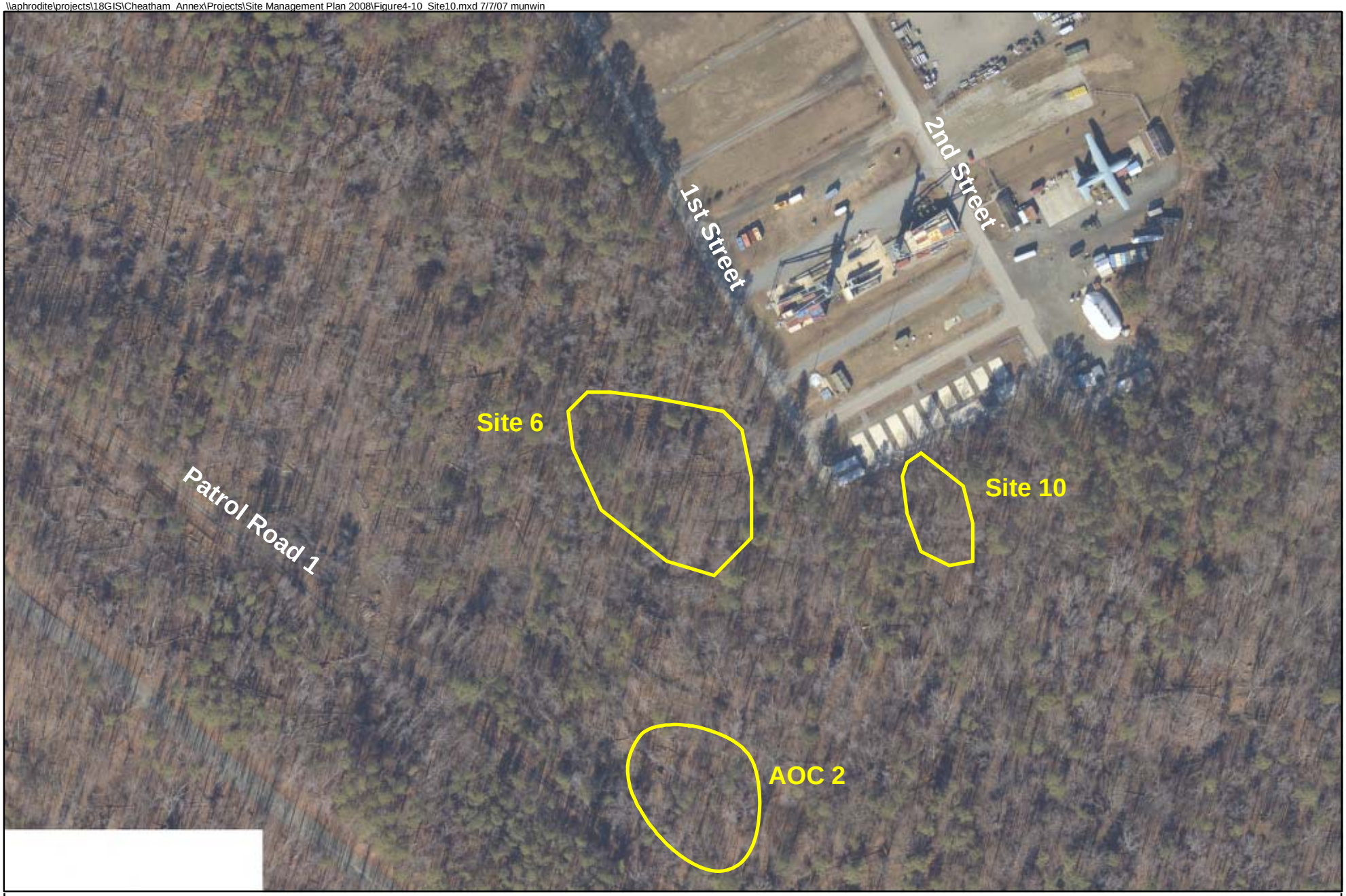

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Site Boundary

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Figure 4-10
Site 10 - Decontamination Agent Disposal Area Near First Street
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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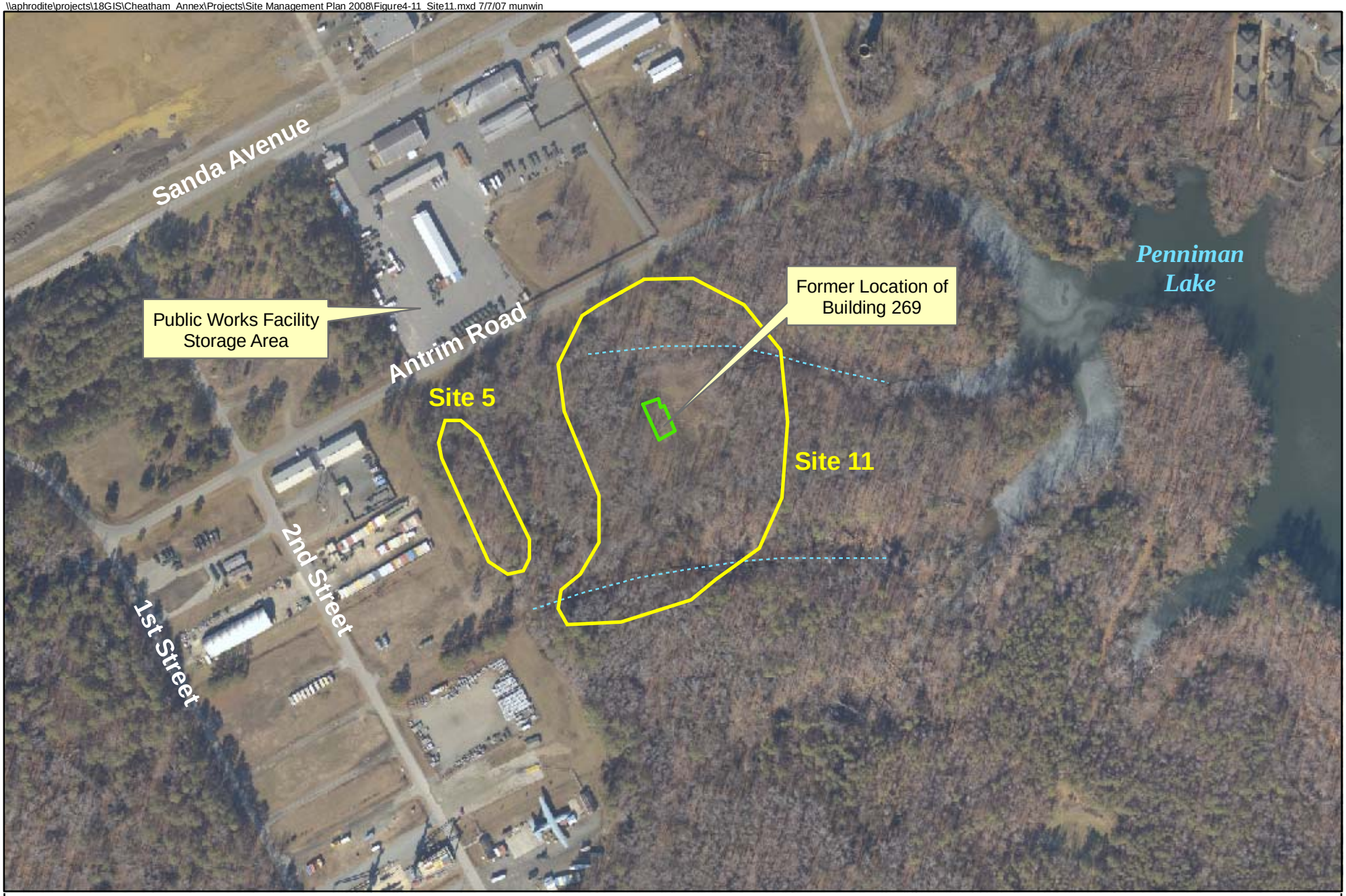

LEGEND

Site Boundary

Unnamed Tributary to Penniman Lake

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Feet

Figure 4-11
Site 11 - Bone Yard
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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LEGEND

Site Boundary

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Figure 4-12
Site 12 - Disposal Site Near Water Tower
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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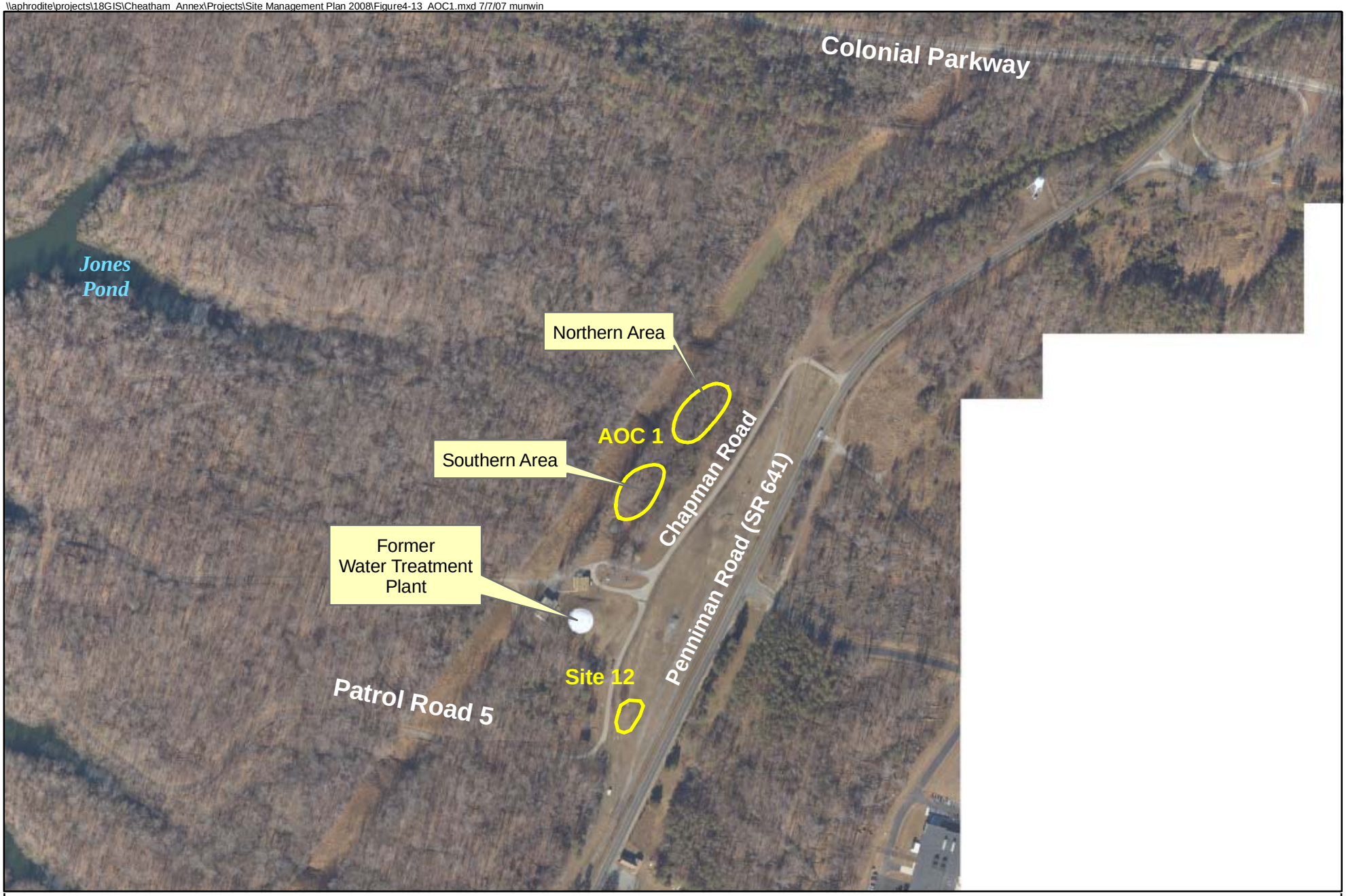

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Site Boundary

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Figure 4-13
AOC 1 - Scrap Metal Dump
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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LEGEND

Site Boundary

CAX Boundary / Fenceline

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Figure 4-14
AOC 2 - Dextrose Dump
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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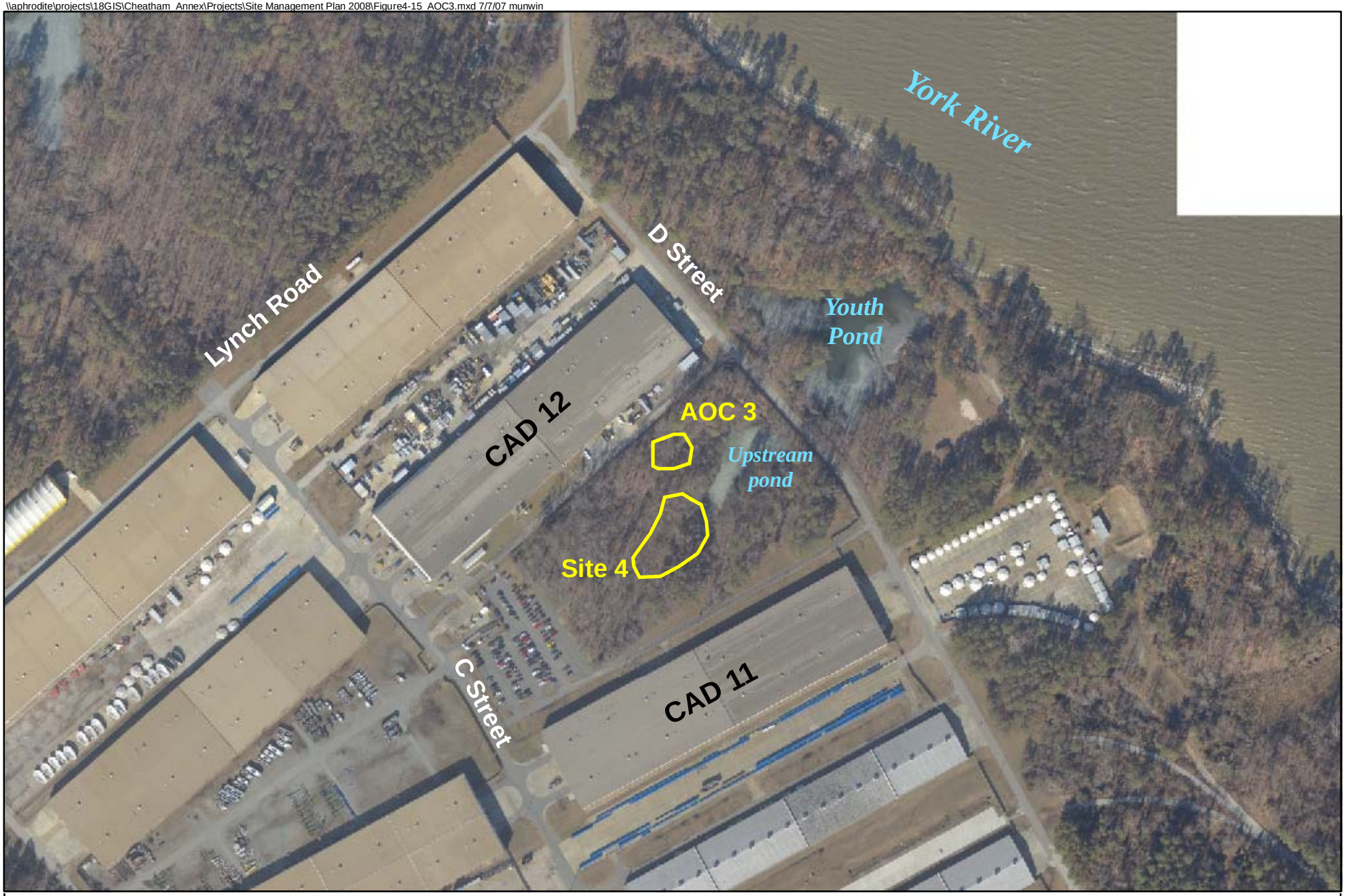

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Site Boundary

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Figure 4-15
AOC 3 - CAD 11/12 Pond Bank
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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LEGEND

Site Boundary

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Figure 4-16
AOC 6 - Penniman AOC
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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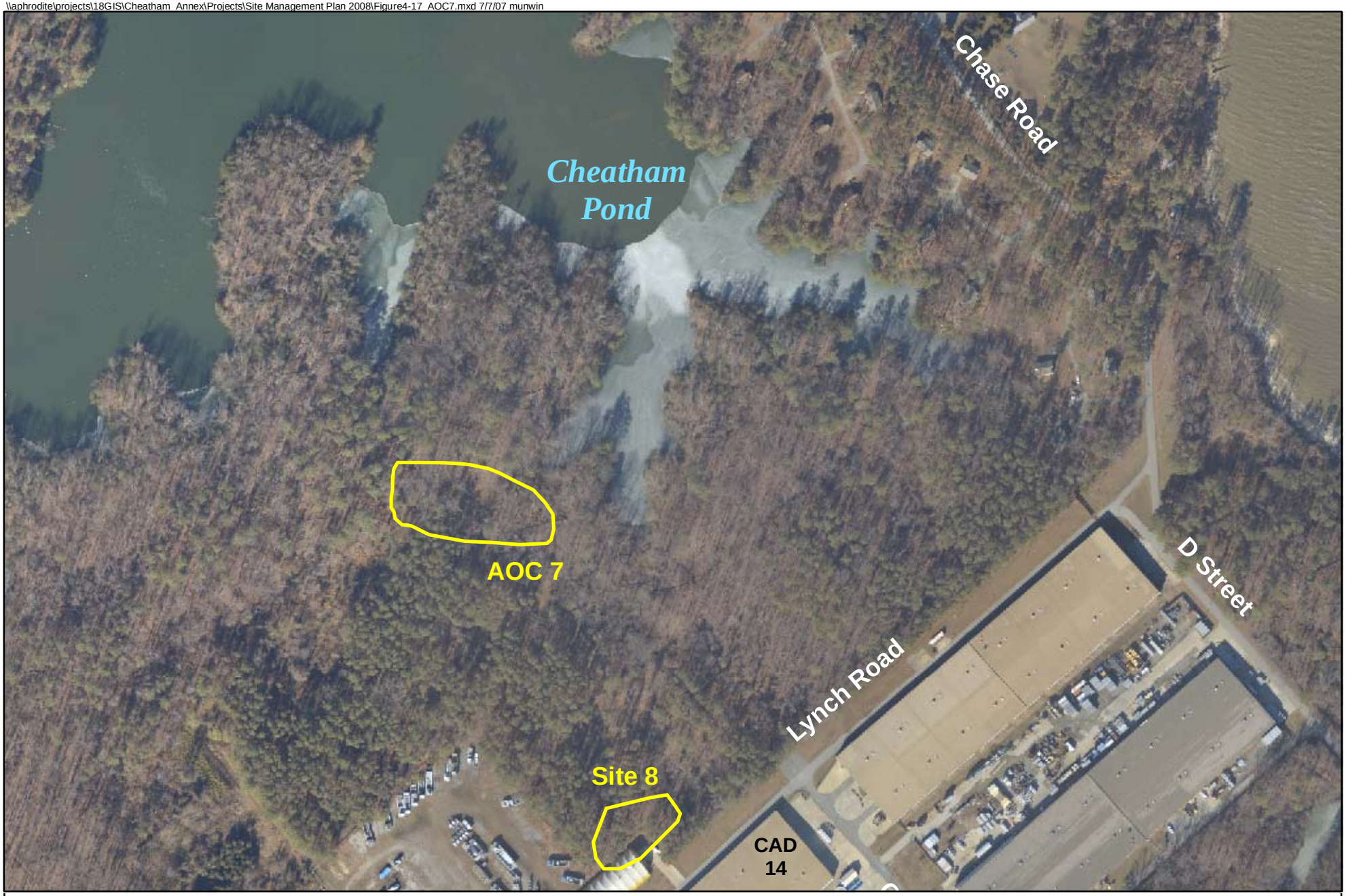

LEGEND

Site Boundary

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Feet

Figure 4-17
AOC 7 - Drum and Can Disposal Area
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

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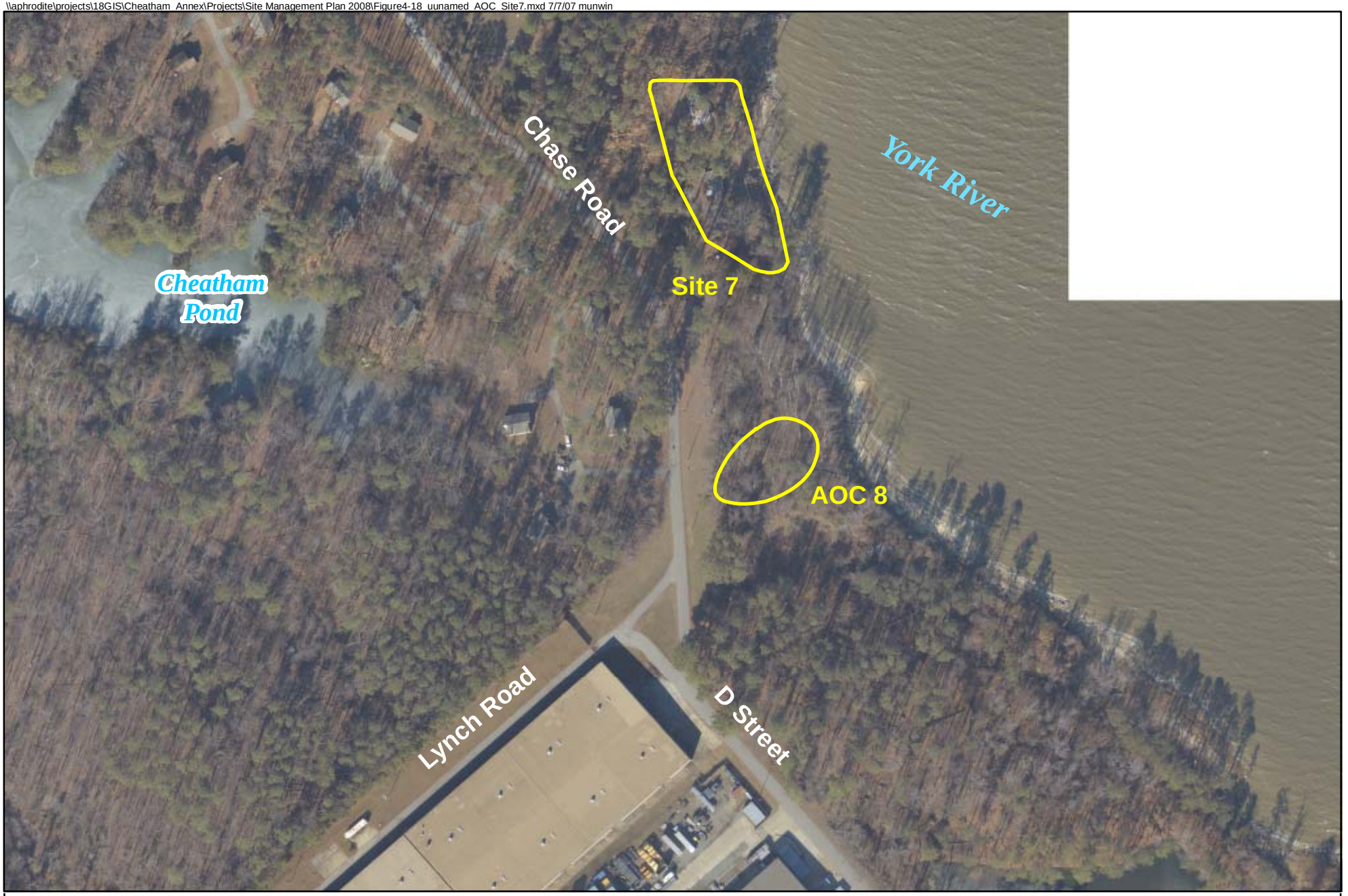

LEGEND

Site Boundary

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Figure 4-18
AOC 8 - Area South of Site 7
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

CH2MHILL

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LEGEND

Site Boundary

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Feet

Figure 4-19
Marine Pistol and Rifle Range Features
Site Management Plan for FY 2008 to 2009
CAX
Williamsburg, Virginia

CH2MHILL

Schedule 4-1
Site 1 SMP FY 08-09

ID	Task Name	Duration	Start	Finish
2	**Site 1**	**489 days**	**Thu 3/1/07**	**Tue 1/13/09**
3	Removal Action	152 days	Thu 3/1/07	Fri 9/28/07
4	Construction Close-out Report	140 days	Fri 9/14/07	Thu 3/27/08
5	TM for Risk Management of Groundwater	60 days	Fri 11/30/07	Thu 2/21/08
6	**PP for All Media (NFA)**	**255 days**	**Fri 6/29/07**	**Thu 6/19/08**
7	Preliminary PP	60 days	Fri 3/28/08	Thu 6/19/08
8	Gov't Comments	14 days	Fri 6/29/07	Wed 7/18/07
9	Issue Draft PP	30 days	Thu 7/19/07	Wed 8/29/07
10	Regulatory / Legal Review	60 days	Thu 8/30/07	Wed 11/21/07
11	Public Comment Period Draft Final PP	45 days	Thu 11/22/07	Wed 1/23/08
12	Issue Final PP	30 days	Thu 1/24/08	Wed 3/5/08
13	**ROD for All Media (NFA)**	**224 days**	**Thu 3/6/08**	**Tue 1/13/09**
14	Preliminary ROD	90 days	Thu 3/6/08	Wed 7/9/08
15	Gov't Comments	14 days	Thu 7/10/08	Tue 7/29/08
16	Issue Draft ROD	30 days	Wed 7/30/08	Tue 9/9/08
17	Regulatory / Legal Review	60 days	Wed 9/10/08	Tue 12/2/08
18	Issue ROD for Signature	30 days	Wed 12/3/08	Tue 1/13/09
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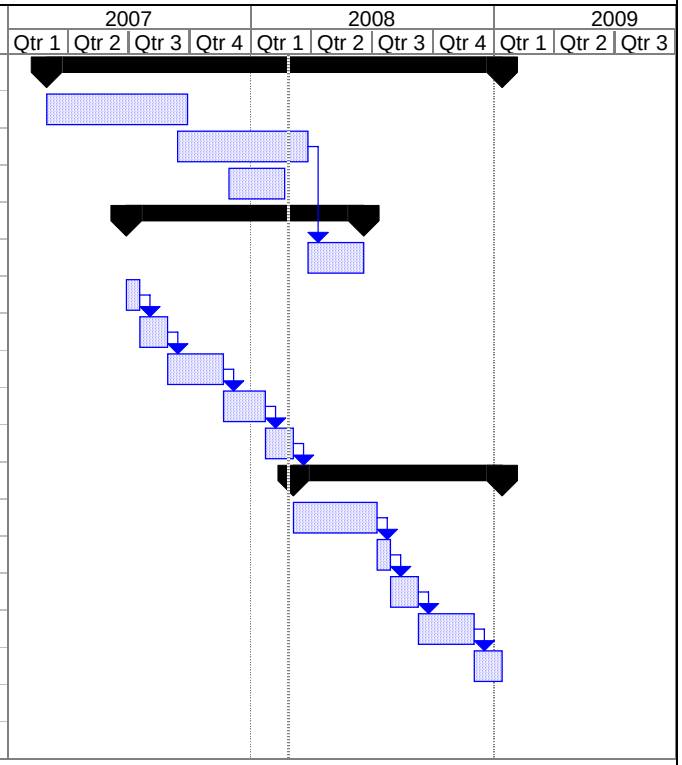

Task
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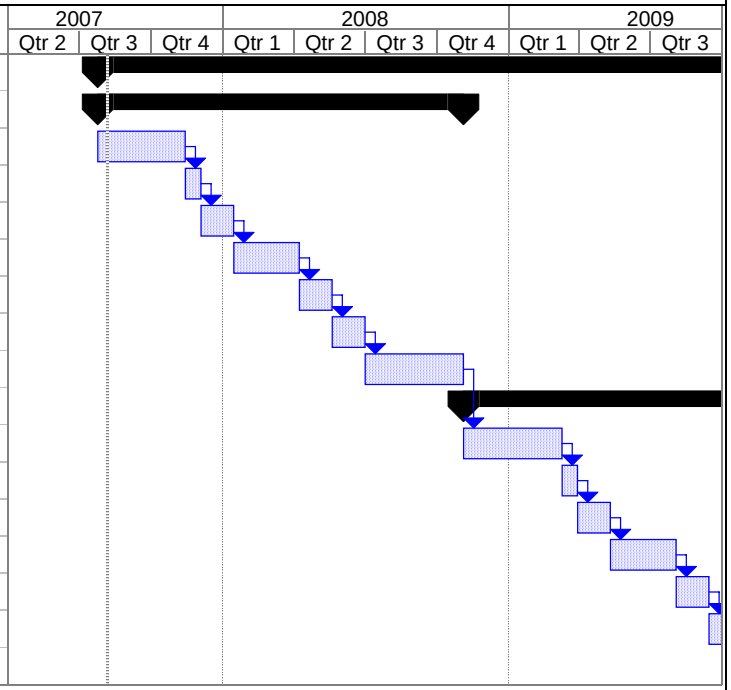
Schedule 4-2
Site 4 SMP FY08-09

ID	Task Name	Duration	Start	Finish
20	**Site 4**	**812 days**	**Thu 7/26/07**	**Fri 9/3/10**
21	**SSP Investigation**	**334 days**	**Thu 7/26/07**	**Tue 11/4/08**
22	CAX Site 4 & 9 work plan	80 days	Thu 7/26/07	Wed 11/14/07
23	Gov't comments	14 days	Thu 11/15/07	Tue 12/4/07
24	Issue Draft WP	30 days	Wed 12/5/07	Tue 1/15/08
25	Regulatory Review	60 days	Wed 1/16/08	Tue 4/8/08
26	Issue Draft Final WP	30 days	Wed 4/9/08	Tue 5/20/08
27	Issue Final WP	30 days	Wed 5/21/08	Tue 7/1/08
28	Field Investigation (and Laboratory)	90 days	Wed 7/2/08	Tue 11/4/08
29	**SSP Report (including SERA Step 3a)**	**254 days**	**Wed 11/5/08**	**Mon 10/26/09**
30	Preliminary SSP Report	90 days	Wed 11/5/08	Tue 3/10/09
31	Gov't comments	14 days	Wed 3/11/09	Mon 3/30/09
32	Issue Draft SSP Report	30 days	Tue 3/31/09	Mon 5/11/09
33	Regulatory Review	60 days	Tue 5/12/09	Mon 8/3/09
34	Issue Draft Final SSP Report	30 days	Tue 8/4/09	Mon 9/14/09
35	Issue Final SSP Report	30 days	Tue 9/15/09	Mon 10/26/09
36	**NFA SSP Decision Document or RI**	**224 days**	**Tue 10/27/09**	**Fri 9/3/10**



Task
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Schedule 4-3
Site 7 SMP FY08-09

ID	Task Name	Duration	Start	Finish
67	**Site 7**	**1232 days**	**Mon 11/12/07**	**Tue 7/31/12**
68	**Removal Action**	**440 days**	**Mon 11/12/07**	**Fri 7/17/09**
69	RA WP	120 days	Mon 11/12/07	Fri 4/25/08
70	Removal Action	180 days	Mon 4/28/08	Fri 1/2/09
71	Construction Close-out Report	140 days	Mon 1/5/09	Fri 7/17/09
72	**SSP Investigation**	**314 days**	**Mon 7/20/09**	**Thu 9/30/10**
73	CAX Site 7 WP	60 days	Mon 7/20/09	Fri 10/9/09
74	Gov't comments	14 days	Mon 10/12/09	Thu 10/29/09
75	Issue Draft WP	30 days	Fri 10/30/09	Thu 12/10/09
76	Regulatory Review	60 days	Fri 12/11/09	Thu 3/4/10
77	Issue Draft Final WP	30 days	Fri 3/5/10	Thu 4/15/10
78	Issue Final WP	30 days	Fri 4/16/10	Thu 5/27/10
79	Field Investigation (and Laboratory)	90 days	Fri 5/28/10	Thu 9/30/10
80	**SSP Report**	**254 days**	**Fri 10/1/10**	**Wed 9/21/11**
87	**NFA SSP Decision Document or RI**	**224 days**	**Thu 9/22/11**	**Tue 7/31/12**
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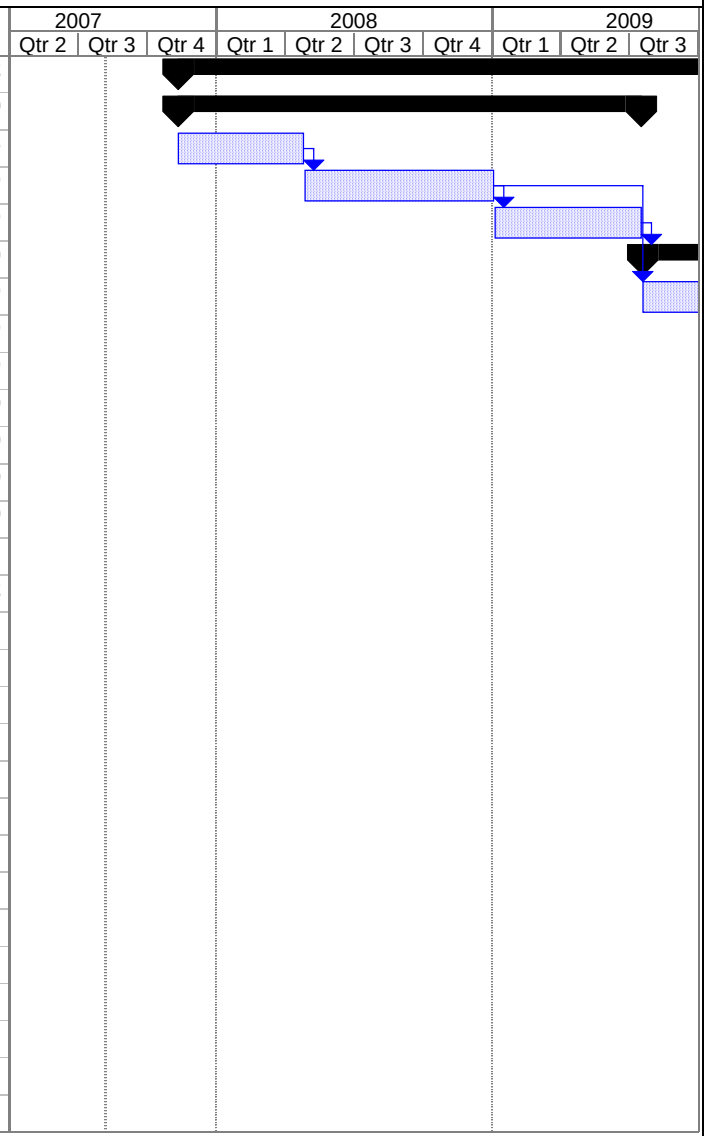

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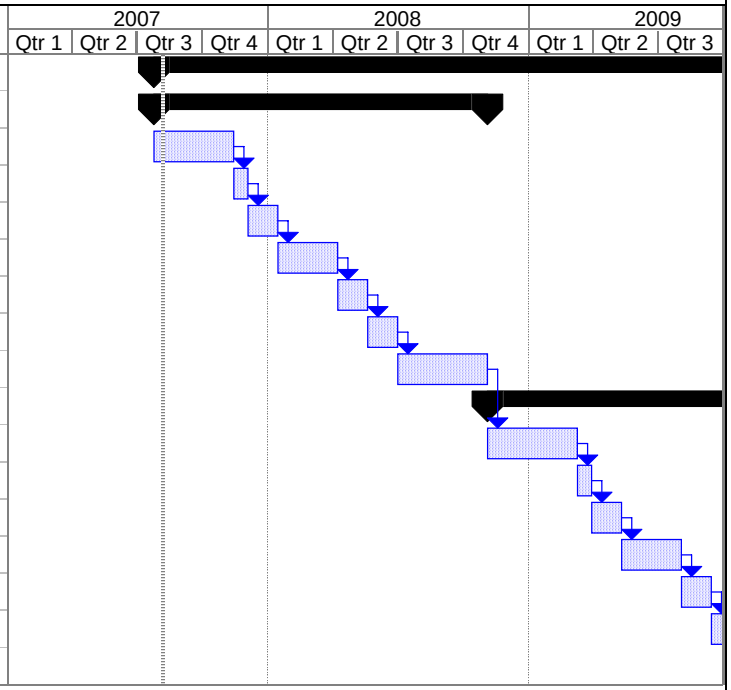
Schedule 4-4
Site 9 SMP FY08-09

ID	Task Name	Duration	Start	Finish
20	**Site 9**	**812 days**	**Thu 7/26/07**	**Fri 9/3/10**
21	**SSP Investigation**	**334 days**	**Thu 7/26/07**	**Tue 11/4/08**
22	CAX Site 4 & 9 work plan	80 days	Thu 7/26/07	Wed 11/14/07
23	Gov't comments	14 days	Thu 11/15/07	Tue 12/4/07
24	Issue Draft WP	30 days	Wed 12/5/07	Tue 1/15/08
25	Regulatory Review	60 days	Wed 1/16/08	Tue 4/8/08
26	Issue Draft Final WP	30 days	Wed 4/9/08	Tue 5/20/08
27	Issue Final WP	30 days	Wed 5/21/08	Tue 7/1/08
28	Field Investigation (and Laboratory)	90 days	Wed 7/2/08	Tue 11/4/08
29	**SSP Report (including SERA Step 3a)**	**254 days**	**Wed 11/5/08**	**Mon 10/26/09**
30	Preliminary SSP Report	90 days	Wed 11/5/08	Tue 3/10/09
31	Gov't comments	14 days	Wed 3/11/09	Mon 3/30/09
32	Issue Draft SSP Report	30 days	Tue 3/31/09	Mon 5/11/09
33	Regulatory Review	60 days	Tue 5/12/09	Mon 8/3/09
34	Issue Draft Final SSP Report	30 days	Tue 8/4/09	Mon 9/14/09
35	Issue Final SSP Report	30 days	Tue 9/15/09	Mon 10/26/09
36	**NFA SSP Decision Document or RI**	**224 days**	**Tue 10/27/09**	**Fri 9/3/10**



Task
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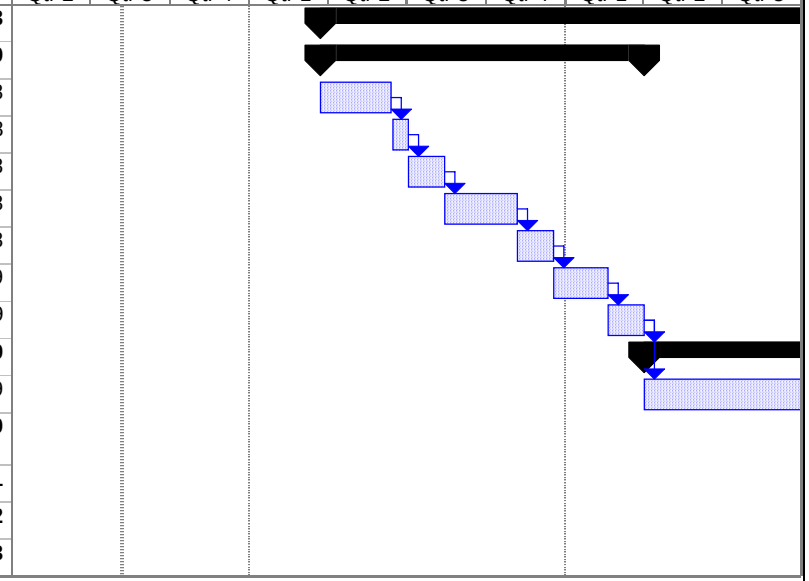
Schedule 4-5
Site 11 SMP FY08-09

ID	Task Name	Duration	Start	Finish
533	**Site 11**	**1390 days**	**Mon 3/24/08**	**Fri 7/19/13**
534	**EE/CA and AM**	**269 days**	**Mon 3/24/08**	**Thu 4/2/09**
535	Preliminary EE/CA and AM	60 days	Mon 3/24/08	Fri 6/13/08
536	Gov't comments	14 days	Mon 6/16/08	Thu 7/3/08
537	Issue Draft EE/CA	30 days	Fri 7/4/08	Thu 8/14/08
538	Regulatory Review	60 days	Fri 8/15/08	Thu 11/6/08
539	Issue Draft Final EE/CA	30 days	Fri 11/7/08	Thu 12/18/08
540	Public Comment Period	45 days	Fri 12/19/08	Thu 2/19/09
541	Issue Final EE/CA/AM	30 days	Fri 2/20/09	Thu 4/2/09
542	**IRA**	**180 days**	**Fri 4/3/09**	**Thu 12/10/09**
543	Implement IRA	180 days	Fri 4/3/09	Thu 12/10/09
544	**Supplemental RI**	**254 days**	**Fri 12/11/09**	**Wed 12/1/10**
551	**FS (if appropriate)**	**224 days**	**Thu 12/2/10**	**Tue 10/11/11**
558	**PP (all media)**	**239 days**	**Wed 10/12/11**	**Mon 9/10/12**
565	**ROD (all media)**	**224 days**	**Tue 9/11/12**	**Fri 7/19/13**



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Schedule 4-6
AOC 1 SMP FY 08-09

ID	Task Name	Duration	Start	Finish
144	**AOC 1**	**852 days**	**Wed 5/9/07**	**Thu 8/12/10**
145	**SSP Investigation**	**344 days**	**Wed 5/9/07**	**Mon 9/1/08**
146	SSP work plan	90 days	Wed 5/9/07	Tue 9/11/07
147	Gov't comments	14 days	Wed 9/12/07	Mon 10/1/07
148	Issue Draft WP	30 days	Tue 10/2/07	Mon 11/12/07
149	Regulatory Review	60 days	Tue 11/13/07	Mon 2/4/08
150	Issue Draft Final WP	30 days	Tue 2/5/08	Mon 3/17/08
151	Issue Final WP	30 days	Tue 3/18/08	Mon 4/28/08
152	Field Investigation (and Laboratory)	90 days	Tue 4/29/08	Mon 9/1/08
153	**SSP Report**	**254 days**	**Tue 9/2/08**	**Fri 8/21/09**
154	Preliminary SSP Report	90 days	Tue 9/2/08	Mon 1/5/09
155	Gov't comments	14 days	Tue 1/6/09	Fri 1/23/09
156	Issue Draft SSP Report	30 days	Mon 1/26/09	Fri 3/6/09
157	Regulatory Review	60 days	Mon 3/9/09	Fri 5/29/09
158	Issue Draft Final SSP Report	30 days	Mon 6/1/09	Fri 7/10/09
159	Issue Final SSP Report	30 days	Mon 7/13/09	Fri 8/21/09
160	**NFA SSP Decision Document or RI**	**254 days**	**Mon 8/24/09**	**Thu 8/12/10**
161	Preliminary Document	90 days	Mon 8/24/09	Fri 12/25/09
162	Gov't comments	14 days	Mon 12/28/09	Thu 1/14/10
163	Issue Draft Document	30 days	Fri 1/15/10	Thu 2/25/10
164	Regulatory Review	60 days	Fri 2/26/10	Thu 5/20/10
165	Issue Draft Final Document	30 days	Fri 5/21/10	Thu 7/1/10
166	Issue Final Document	30 days	Fri 7/2/10	Thu 8/12/10
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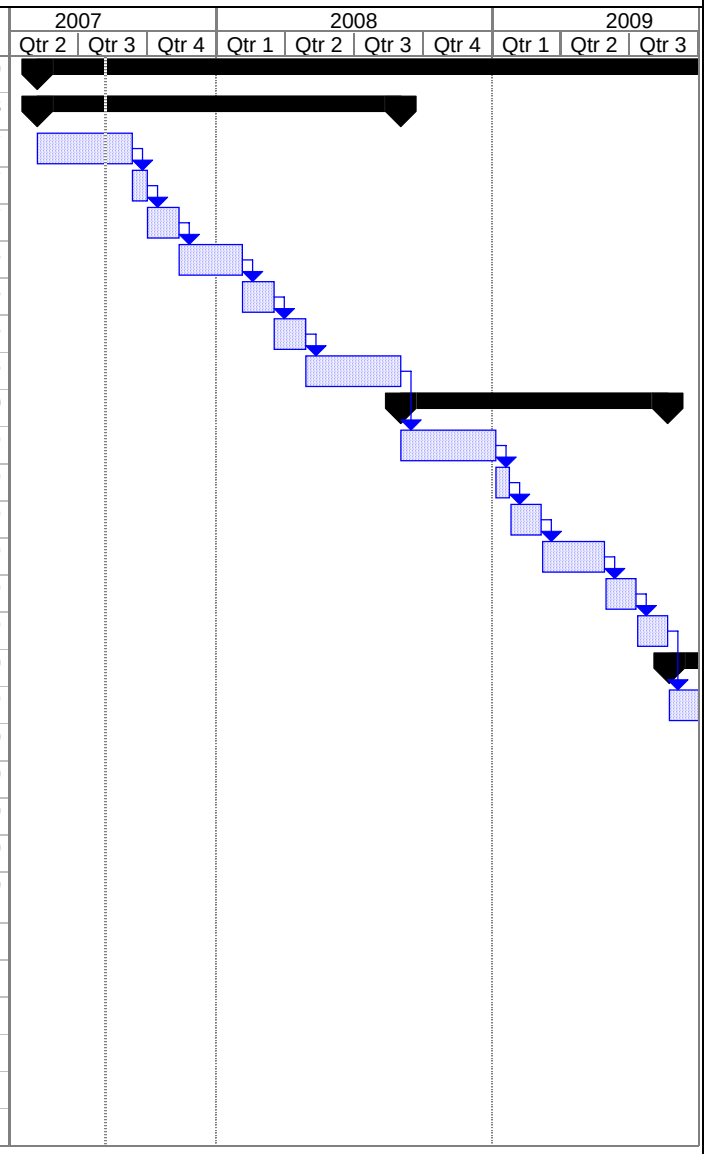

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Schedule 4-7
AOC 2 SMP FY 08-09

ID	Task Name	Duration	Start	Finish
144	**AOC 2**	**852 days**	**Wed 5/9/07**	**Thu 8/12/10**
145	**SSP Investigation**	**344 days**	**Wed 5/9/07**	**Mon 9/1/08**
146	SSP work plan	90 days	Wed 5/9/07	Tue 9/11/07
147	Gov't comments	14 days	Wed 9/12/07	Mon 10/1/07
148	Issue Draft WP	30 days	Tue 10/2/07	Mon 11/12/07
149	Regulatory Review	60 days	Tue 11/13/07	Mon 2/4/08
150	Issue Draft Final WP	30 days	Tue 2/5/08	Mon 3/17/08
151	Issue Final WP	30 days	Tue 3/18/08	Mon 4/28/08
152	Field Investigation (and Laboratory)	90 days	Tue 4/29/08	Mon 9/1/08
153	**SSP Report**	**254 days**	**Tue 9/2/08**	**Fri 8/21/09**
154	Preliminary SSP Report	90 days	Tue 9/2/08	Mon 1/5/09
155	Gov't comments	14 days	Tue 1/6/09	Fri 1/23/09
156	Issue Draft SSP Report	30 days	Mon 1/26/09	Fri 3/6/09
157	Regulatory Review	60 days	Mon 3/9/09	Fri 5/29/09
158	Issue Draft Final SSP Report	30 days	Mon 6/1/09	Fri 7/10/09
159	Issue Final SSP Report	30 days	Mon 7/13/09	Fri 8/21/09
160	**NFA SSP Decision Document or RI**	**254 days**	**Mon 8/24/09**	**Thu 8/12/10**
161	Preliminary Document	90 days	Mon 8/24/09	Fri 12/25/09
162	Gov't comments	14 days	Mon 12/28/09	Thu 1/14/10
163	Issue Draft Document	30 days	Fri 1/15/10	Thu 2/25/10
164	Regulatory Review	60 days	Fri 2/26/10	Thu 5/20/10
165	Issue Draft Final Document	30 days	Fri 5/21/10	Thu 7/1/10
166	Issue Final Document	30 days	Fri 7/2/10	Thu 8/12/10
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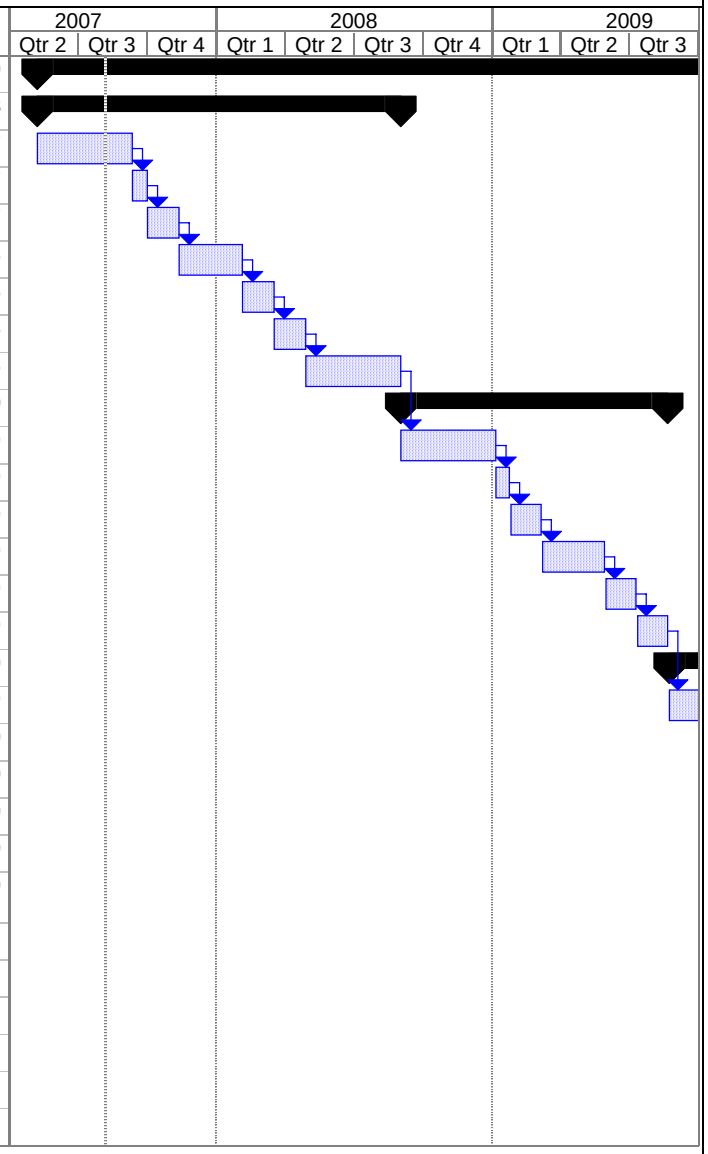

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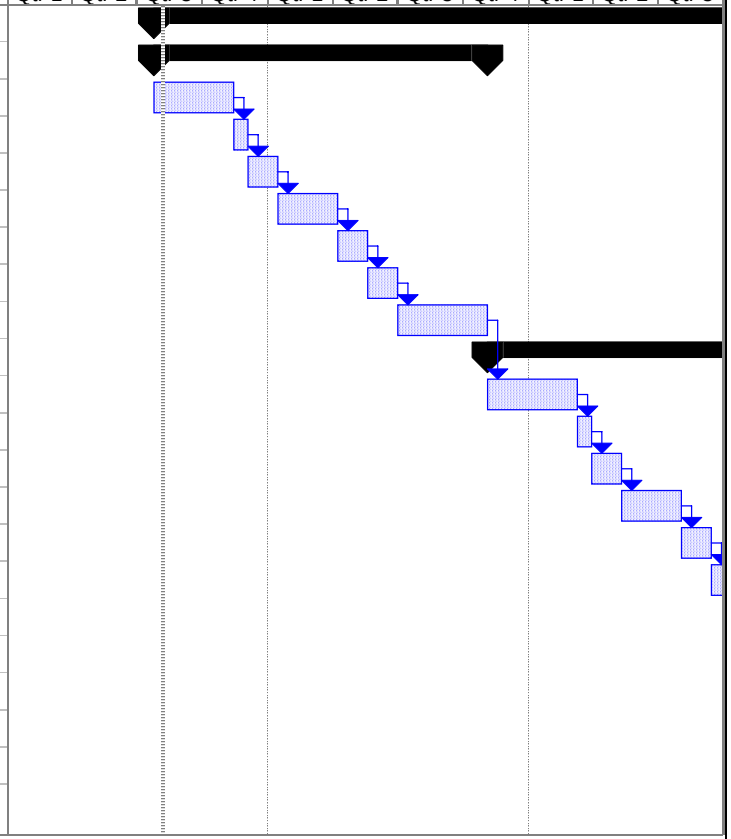
Schedule 4-8
AOC 3 SMP FY08-09

ID	Task Name	Duration	Start	Finish
20	**AOC 3**	**812 days**	**Thu 7/26/07**	**Fri 9/3/10**
21	**SSP Investigation**	**334 days**	**Thu 7/26/07**	**Tue 11/4/08**
22	Preliminary Work Plan	80 days	Thu 7/26/07	Wed 11/14/07
23	Gov't comments	14 days	Thu 11/15/07	Tue 12/4/07
24	Issue Draft WP	30 days	Wed 12/5/07	Tue 1/15/08
25	Regulatory Review	60 days	Wed 1/16/08	Tue 4/8/08
26	Issue Draft Final WP	30 days	Wed 4/9/08	Tue 5/20/08
27	Issue Final WP	30 days	Wed 5/21/08	Tue 7/1/08
28	Field Investigation (and Laboratory)	90 days	Wed 7/2/08	Tue 11/4/08
29	**SSP Report**	**254 days**	**Wed 11/5/08**	**Mon 10/26/09**
30	Preliminary SSP Report	90 days	Wed 11/5/08	Tue 3/10/09
31	Gov't comments	14 days	Wed 3/11/09	Mon 3/30/09
32	Issue Draft SSP Report	30 days	Tue 3/31/09	Mon 5/11/09
33	Regulatory Review	60 days	Tue 5/12/09	Mon 8/3/09
34	Issue Draft Final SSP Report	30 days	Tue 8/4/09	Mon 9/14/09
35	Issue Final SSP Report	30 days	Tue 9/15/09	Mon 10/26/09
36	**NFA SSP Decision Document or RI**	**224 days**	**Tue 10/27/09**	**Fri 9/3/10**
37	Preliminary Document	90 days	Tue 10/27/09	Mon 3/1/10
38	Gov't comments	14 days	Tue 3/2/10	Fri 3/19/10
39	Issue Draft Document	30 days	Mon 3/22/10	Fri 4/30/10
40	Regulatory/Legal Review	60 days	Mon 5/3/10	Fri 7/23/10
41	Issue Decision Document	30 days	Mon 7/26/10	Fri 9/3/10



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Schedule 4-9
AOC 6 SMP FY 08-09

ID	Task Name	Duration	Start	Finish
144	**AOC 6**	**852 days**	**Wed 5/9/07**	**Thu 8/12/10**
145	**SSP Investigation**	**344 days**	**Wed 5/9/07**	**Mon 9/1/08**
146	SSP work plan	90 days	Wed 5/9/07	Tue 9/11/07
147	Gov't comments	14 days	Wed 9/12/07	Mon 10/1/07
148	Issue Draft WP	30 days	Tue 10/2/07	Mon 11/12/07
149	Regulatory Review	60 days	Tue 11/13/07	Mon 2/4/08
150	Issue Draft Final WP	30 days	Tue 2/5/08	Mon 3/17/08
151	Issue Final WP	30 days	Tue 3/18/08	Mon 4/28/08
152	Field Investigation (and Laboratory)	90 days	Tue 4/29/08	Mon 9/1/08
153	**SSP Report**	**254 days**	**Tue 9/2/08**	**Fri 8/21/09**
154	Preliminary SSP Report	90 days	Tue 9/2/08	Mon 1/5/09
155	Gov't comments	14 days	Tue 1/6/09	Fri 1/23/09
156	Issue Draft SSP Report	30 days	Mon 1/26/09	Fri 3/6/09
157	Regulatory Review	60 days	Mon 3/9/09	Fri 5/29/09
158	Issue Draft Final SSP Report	30 days	Mon 6/1/09	Fri 7/10/09
159	Issue Final SSP Report	30 days	Mon 7/13/09	Fri 8/21/09
160	**NFA SSP Decision Document or RI**	**254 days**	**Mon 8/24/09**	**Thu 8/12/10**
161	Preliminary Document	90 days	Mon 8/24/09	Fri 12/25/09
162	Gov't comments	14 days	Mon 12/28/09	Thu 1/14/10
163	Issue Draft Document	30 days	Fri 1/15/10	Thu 2/25/10
164	Regulatory Review	60 days	Fri 2/26/10	Thu 5/20/10
165	Issue Draft Final Document	30 days	Fri 5/21/10	Thu 7/1/10
166	Issue Final Document	30 days	Fri 7/2/10	Thu 8/12/10
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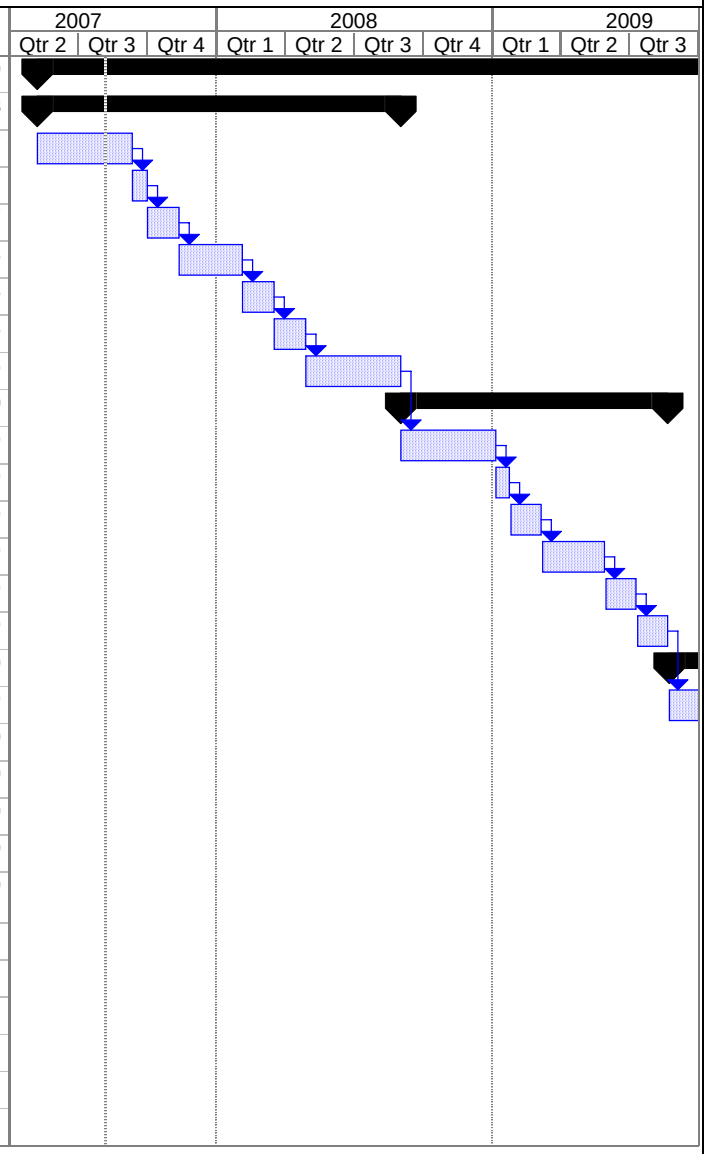

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Schedule 4-10
AOC 7 SMP FY 08-09

ID	Task Name	Duration	Start	Finish
144	**AOC 7**	**852 days**	**Wed 5/9/07**	**Thu 8/12/10**
145	**SSP Investigation**	**344 days**	**Wed 5/9/07**	**Mon 9/1/08**
146	SSP work plan	90 days	Wed 5/9/07	Tue 9/11/07
147	Gov't comments	14 days	Wed 9/12/07	Mon 10/1/07
148	Issue Draft WP	30 days	Tue 10/2/07	Mon 11/12/07
149	Regulatory Review	60 days	Tue 11/13/07	Mon 2/4/08
150	Issue Draft Final WP	30 days	Tue 2/5/08	Mon 3/17/08
151	Issue Final WP	30 days	Tue 3/18/08	Mon 4/28/08
152	Field Investigation (and Laboratory)	90 days	Tue 4/29/08	Mon 9/1/08
153	**SSP Report**	**254 days**	**Tue 9/2/08**	**Fri 8/21/09**
154	Preliminary SSP Report	90 days	Tue 9/2/08	Mon 1/5/09
155	Gov't comments	14 days	Tue 1/6/09	Fri 1/23/09
156	Issue Draft SSP Report	30 days	Mon 1/26/09	Fri 3/6/09
157	Regulatory Review	60 days	Mon 3/9/09	Fri 5/29/09
158	Issue Draft Final SSP Report	30 days	Mon 6/1/09	Fri 7/10/09
159	Issue Final SSP Report	30 days	Mon 7/13/09	Fri 8/21/09
160	**NFA SSP Decision Document or RI**	**254 days**	**Mon 8/24/09**	**Thu 8/12/10**
161	Preliminary Document	90 days	Mon 8/24/09	Fri 12/25/09
162	Gov't comments	14 days	Mon 12/28/09	Thu 1/14/10
163	Issue Draft Document	30 days	Fri 1/15/10	Thu 2/25/10
164	Regulatory Review	60 days	Fri 2/26/10	Thu 5/20/10
165	Issue Draft Final Document	30 days	Fri 5/21/10	Thu 7/1/10
166	Issue Final Document	30 days	Fri 7/2/10	Thu 8/12/10
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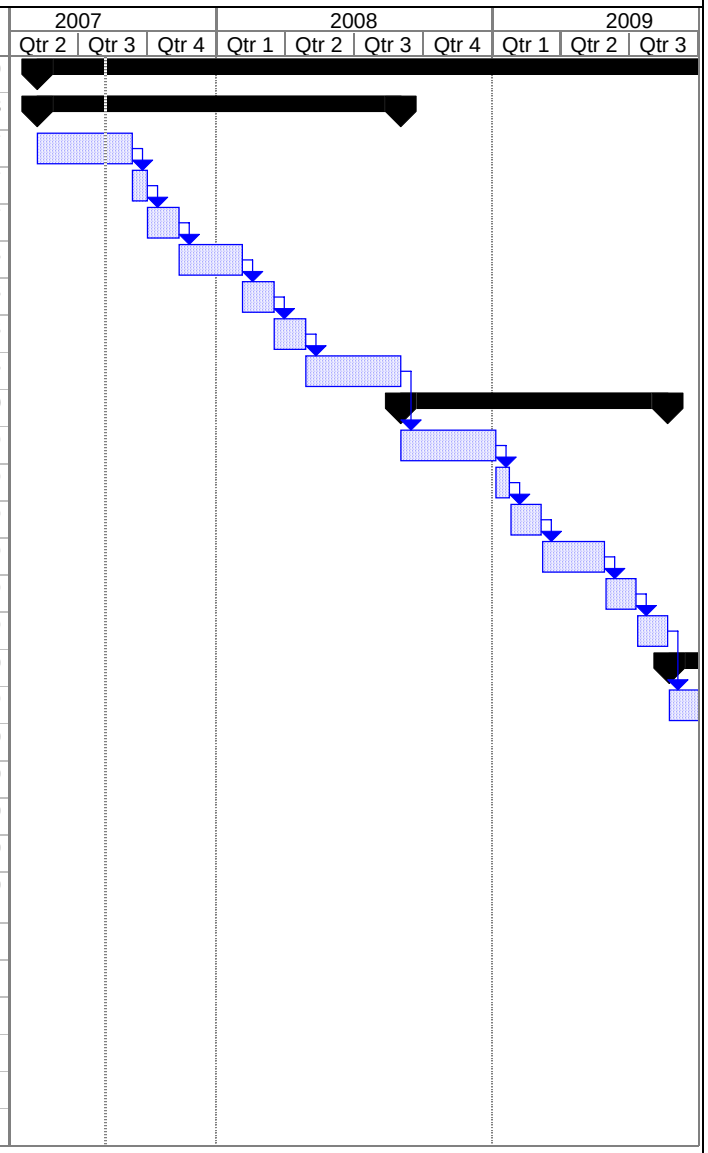

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Schedule 4-11
AOC 8 SMP FY 08-09

ID	Task Name	Duration	Start	Finish
144	**AOC 8**	**852 days**	**Wed 5/9/07**	**Thu 8/12/10**
145	**SSP Investigation**	**344 days**	**Wed 5/9/07**	**Mon 9/1/08**
146	SSP work plan	90 days	Wed 5/9/07	Tue 9/11/07
147	Gov't comments	14 days	Wed 9/12/07	Mon 10/1/07
148	Issue Draft WP	30 days	Tue 10/2/07	Mon 11/12/07
149	Regulatory Review	60 days	Tue 11/13/07	Mon 2/4/08
150	Issue Draft Final WP	30 days	Tue 2/5/08	Mon 3/17/08
151	Issue Final WP	30 days	Tue 3/18/08	Mon 4/28/08
152	Field Investigation (and Laboratory)	90 days	Tue 4/29/08	Mon 9/1/08
153	**SSP Report**	**254 days**	**Tue 9/2/08**	**Fri 8/21/09**
154	Preliminary SSP Report	90 days	Tue 9/2/08	Mon 1/5/09
155	Gov't comments	14 days	Tue 1/6/09	Fri 1/23/09
156	Issue Draft SSP Report	30 days	Mon 1/26/09	Fri 3/6/09
157	Regulatory Review	60 days	Mon 3/9/09	Fri 5/29/09
158	Issue Draft Final SSP Report	30 days	Mon 6/1/09	Fri 7/10/09
159	Issue Final SSP Report	30 days	Mon 7/13/09	Fri 8/21/09
160	**NFA SSP Decision Document or RI**	**254 days**	**Mon 8/24/09**	**Thu 8/12/10**
161	Preliminary Document	90 days	Mon 8/24/09	Fri 12/25/09
162	Gov't comments	14 days	Mon 12/28/09	Thu 1/14/10
163	Issue Draft Document	30 days	Fri 1/15/10	Thu 2/25/10
164	Regulatory Review	60 days	Fri 2/26/10	Thu 5/20/10
165	Issue Draft Final Document	30 days	Fri 5/21/10	Thu 7/1/10
166	Issue Final Document	30 days	Fri 7/2/10	Thu 8/12/10
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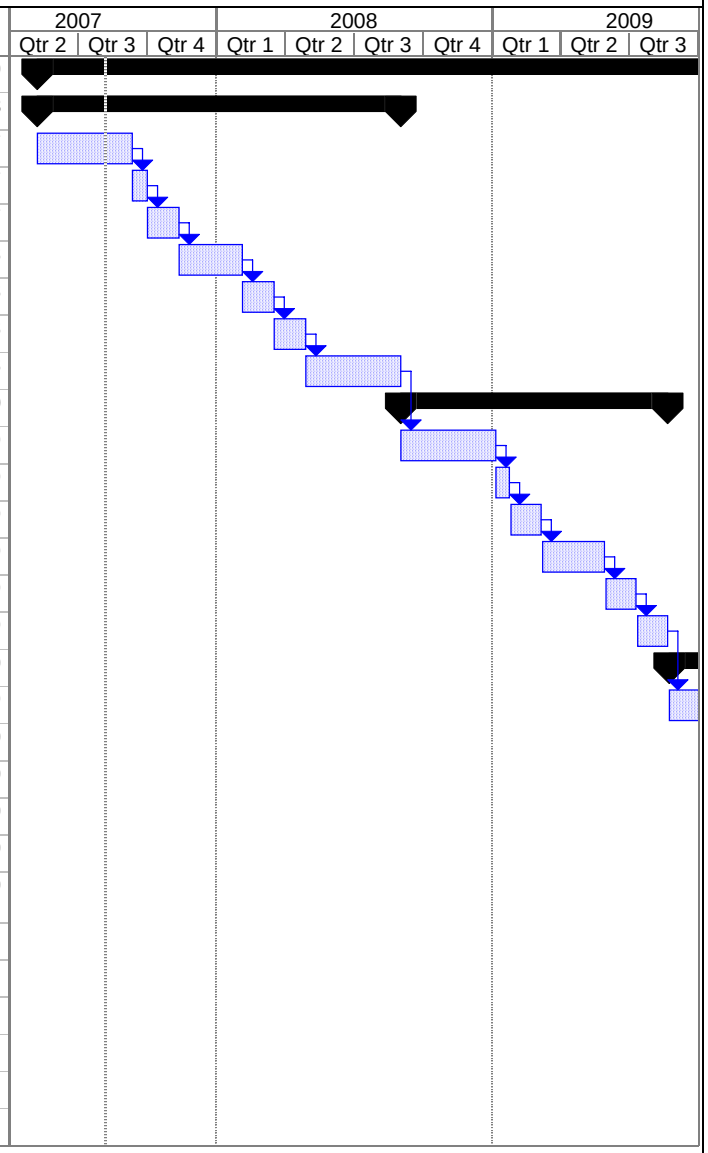

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SECTION 5

Land Use Planning

The WPNSTA Yorktown is developing a geographical information system (GIS) that will identify areas where RODs have identified LUCs to be maintained. **Figure 5-1** identifies the sites with LUCs and the boundaries of potential environmental impact areas. The Sites with LUCs in place are:

- Site 1 – Dudley Road Landfill
- Site 3 – Group 16 Magazine Landfill
- Site 6 – Explosive Impoundment, Flume Area and Excavation Area
- Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area
- Site 12 – Barracks Road Landfill
- Site 16 – West Road Landfill
- Site 17 – Holm Road Landfill
- Site 19 – Conveyor Belt Soils at Building 10

This information is made available to Base Planning personnel for environmental considerations during Base operational planning and decision making. This GIS information will also be used by Base Planning personnel to ensure that LUCs are maintained. If in the event DoD activities will influence the areas outlined or highlighted in **Figure 5-1**, the Navy Regional Project Manager will be consulted. Contact information is listed below:

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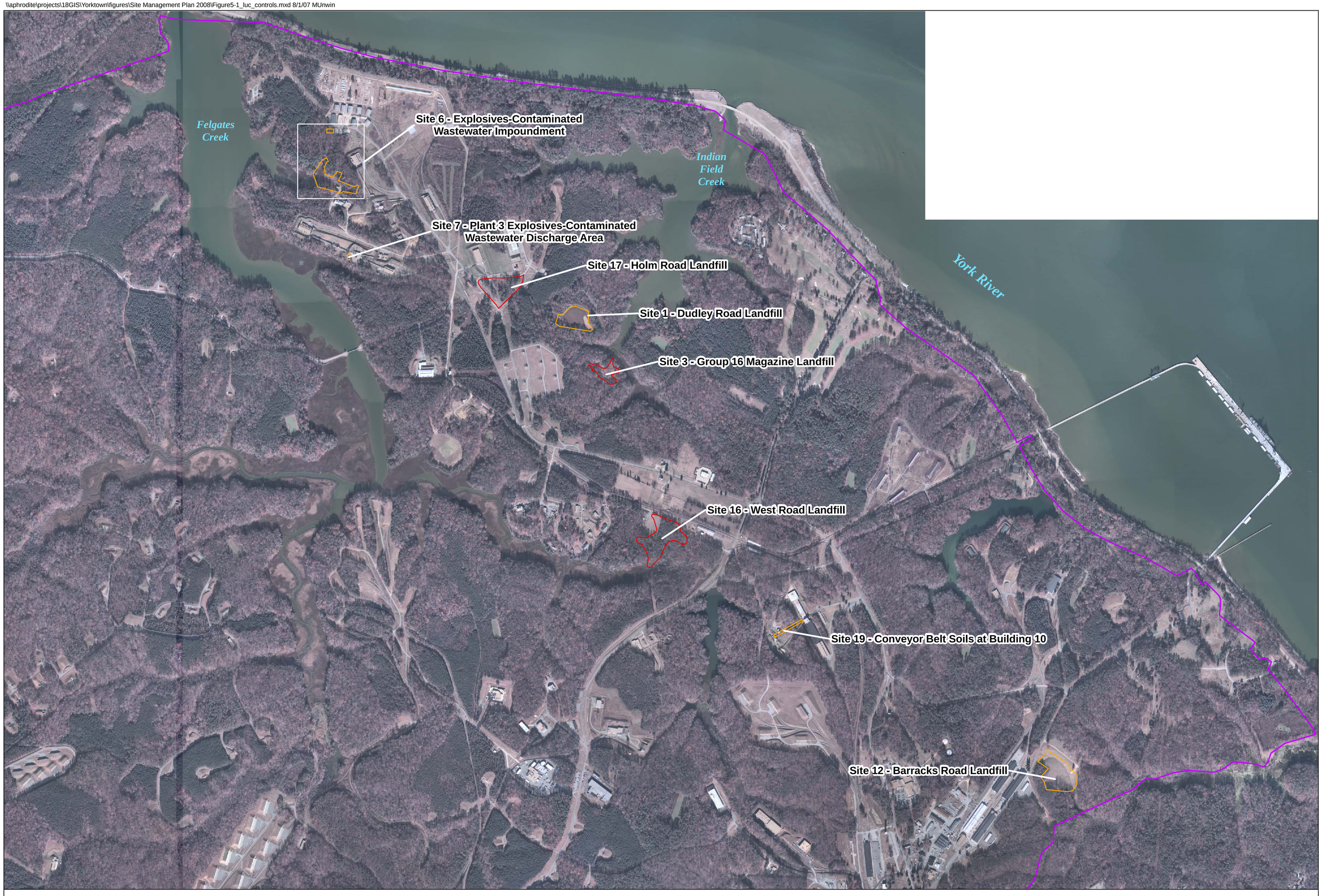

Legend

- Approximate Site Boundary (LUC RD in Progress)
- Land Use Control Boundary (Draft LUC RD Prepared)
- Base Boundary

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Feet

Figure 5-1
Sites with Land Use Controls
Site Management Plan for FY 2008 to 2009
WPNSTA Yorktown
Yorktown, Virginia

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SECTION 6

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