FINAL

FIVE-YEAR REVIEW REPORT
FOR
SITES 1, 6, 7, 12, 16, AND 19

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

CONTRACT TASK ORDER 0254

Prepared for:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
Norfolk, Virginia

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SEPTEMBER 2002

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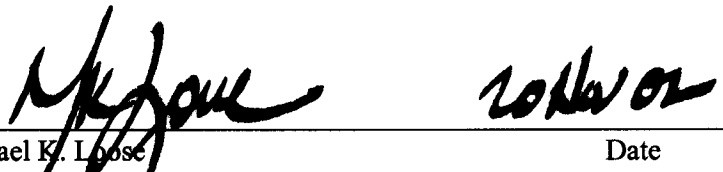
SEPTEMBER 2002

This report documents completion of the five-year review for Sites 1, 6, 7, 12, 16, and 19 at Naval Weapons Station Yorktown as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR).

Approved by:



Michael K. Loose Date
Rear Admiral, Civil Engineer Corps, USN
Commander, Atlantic Division, Naval Facilities Engineering Command

EXECUTIVE SUMMARY

This is the first five-year review conducted at Naval Weapons Station (WPNSTA) Yorktown. The five-year review is required since hazardous substances, pollutants, or contaminants remain at one or more of the sites at levels requiring restrictive measures. This review was conducted from May 2002 to June 2002 in accordance with EPA's Comprehensive Five-Year Review Guidance (EPA, 2001) and includes the following sites:

Site 1 – Dudley Road Landfill - The selected remedy for this site included the removal and disposal and/or recycling of surface debris, excavation and off-site disposal of the arsenic-contaminated soil hotspot, restoration of the existing soil cover, and implementation of institutional controls. The remedial action has been completed and is protective of human health and the environment. No issues or deficiencies were identified during the five-year review.

Site 6 – Explosives-Contaminated Wastewater Impoundment - The selected remedy for this site was limited excavation, ex-situ biological treatment, soil cover, and residue removal. Remedial activities are currently underway and are anticipated to be completed by Fiscal Year 2004. The remedy is expected to be protective of human health and the environment. No issues or deficiencies were identified during the five-year review.

Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area - The selected remedy for this site was no further action with the implementation of institutional controls (land-use and aquifer-use restrictions) since contaminated media was removed to commercial/industrial remediation levels during the 1996 Pilot Study. The remedial action has been completed and is protective of human health and the environment. No issues or deficiencies were identified during the five-year review.

Site 12 – Barracks Road Landfill - The selected remedy for this site included capping the landfill with a geosynthetic clay liner and constructing erosion control along slopes of the stream channel. The remedial action has been completed and is protective of human health and the environment. No issues or deficiencies were identified during the five-year review.

Site 16 – West Road Landfill - the selected remedy involved taking no further remedial actions (including sampling) at the site with the exception of institutional controls. The remedial action has been completed and is protective of human health and the environment. No issues or deficiencies were identified during the five-year review.

Site 19 – Conveyor Belt Soil at Plant 1 - The selected remedy for this site included the dismantling and disposal of the conveyor belt and removing explosives-contaminated soil beneath the belt. The remedial action has been completed and is protective of human health and the environment. No issues or deficiencies were identified during the five-year review.

Institutional controls prohibiting residential development have been implemented at all six sites. In addition, long-term monitoring of environmental media is conducted at Sites 1, 6, 7, and 12 to evaluate the effectiveness of the remedial actions.

Based on results of the five-year review, continued implementation of institutional controls at all sites and long-term monitoring at Sites 1, 6, 7, and 12 is recommended. The next five-year review for Sites 1, 6, 7, 12, 16, and 19 is required by September 2007, five years from the date of this review.

FIVE-YEAR REVIEW SUMMARY FORM

Site Identification

Site Name: Naval Weapons Station Yorktown — EPA ID: VA8170024170

Region: 03 — State: VA — City/County: Yorktown

Site Status

NPL Status: Final

Remediation Status: Ongoing Operation

Multiple OUs: Yes

Construction Completion Date: N/A

Has the site been put into reuse? No

Review Status

Lead Agency: U.S. Navy

Who Conducted the review (EPA Region, State, Federal Agency): Federal Facility

Author Name: Marlene Ivester/Shana Conley

Author Title: Project Manager/Project Engineer

Author Affiliation: Baker Environmental, Inc.

Review Period: From: May 2002 — To: June 2002

Date(s) of Site Inspection: 06 June 2002

Type of Review: Statutory — Review Number: 1

Triggering Action: Remedial Action Initiation at Site 12

Trigger Action Date: July 1997

Due Date: End of Fiscal Year 2002 (September 2002)

Issues:

No issues were identified during the five-year review.

Recommendations and Follow-up Actions:

Based on a comprehensive review of available site data, no additional action, besides continuing current institutional controls and long-term monitoring at applicable sites, is recommended at this time. Signs shall be posted at each site to facilitate regional inspections and to protect the integrity of the remedial activities.

Protectiveness Statement(s):

Since the remedial actions at Sites 1, 7, 12, 16, and 19 are protective, the sites are protective of human health and the environment. At Site 6, the remedy is expected to be protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Other Comments:

None.

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
ARARs	Applicable or Relevant and Appropriate Requirements
Baker	Baker Environmental, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
DoN	Department of the Navy
FFA	Federal Facility Agreement
LANTDIV	Naval Facilities Engineering Command, Atlantic Division
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NPL	National Priorities List
OHM	OHM Remediation Services Corp.
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
Shaw	Shaw Environmental and Infrastructure, Inc.
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCA	trichloroethane
TCE	trichloroethene
TCL	Target Compound List
TNT	trinitrotoluene
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WPNSTA	Naval Weapons Station

1.0 INTRODUCTION

This Five-Year Review Report has been prepared by Baker Environmental, Inc. (Baker) under the Department of the Navy's (DoN's) Comprehensive Long-Term Environmental Action Navy (CLEAN) II contract administered by the Naval Facilities Engineering Command, Atlantic Division (LANTDIV). This review was conducted from May 2002 through June 2002.

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify deficiencies found during the review, if any, and recommendations to address them. The lead agency must implement five-year reviews consistent with CERCLA and the NCP. CERCLA §121(c), as amended states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP Part 300.430(f)(4)(ii) of the CFR states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the first five-year review for Site 1 (Dudley Road Landfill), Site 6 (Explosives-Contaminated Wastewater Impoundment), Site 7 (Plant 3 Explosives-Contaminated Wastewater Discharge Area), Site 12 (Barracks Road Landfill), Site 16 (West Road Landfill), and Site 19 (Conveyor Belt Soil at Plant 1) at WPNSTA Yorktown. The five-year review is required since hazardous substances, pollutants, or contaminants remain at one or more of the sites at levels requiring restrictive measures.

This is the first five-year review conducted at WPNSTA Yorktown. The remaining sites at the Station that are in early stages of contamination assessment and remedial action are:

- *Site 2 – Turkey Road Landfill* – Remedial Investigation/Feasibility Study (RI/FS)
- *Site 3 – Group 16 Magazine Landfill* – No Further Action (NFA)
- *Site 4 – Burning Pad Residue Landfill* – Regulatory Review of Record of Decision (ROD)
- *Site 5 – Surplus Transformer Storage Area* – NFA

- *Site 8 – NEDED Contaminated Wastewater Discharge Area* – Regulatory Review of ROD
- *Site 9 – Plant 1 Contaminated Wastewater Discharge Area* – NFA
- *Site 11 – Abandoned Explosive Burning Pits* – Regulatory Review of ROD
- *Site 17 – Holm Road Landfill* – NFA
- *Site 18 – Building 476 Discharge Area* – Regulatory Review of ROD
- *Site 21 – Battery and Drum Disposal Area* – Regulatory Review of ROD
- *Site 22 – Burn Pad* – Regulatory Review of ROD
- *Site 23 – Teague Road Disposal Area* – RI/FS
- *Site 24 – Former Aviation Field* – RI/FS
- *Site 25 – Building 373 Rocket Plant* – RI/FS
- *Site 26 – Mark 48 Waste Otto Fuel Tank* – RI/FS
- *Site 27 – Chemical Lab Neutralization Unit and Drainage Area* – RI/FS
- *Site 28 – X-Ray Facility Tank Drain Field* – RI/FS
- *Site 29 – Lee Pond* – RI/FS
- *Site 30 – Bracken Road Incinerator* – RI/FS

This five-year review was conducted through a review of remedial action objectives and the selected remedy contained in each site ROD. This information was compared to subsequent remediation documents and performance and confirmatory data collected throughout the remediation process. Site inspections and interviews are also presented to support the findings of the review process.

2.0 SITE CHRONOLOGY

Table 2-1 provides an abbreviated chronology of events for the sites included in this five-year review.

Table 2-1
Chronology of Site Events

Event	Date
Initial Assessment Study	July 1984
Confirmation Study	June 1986 – June 1988
NPL Listing	15 October 1992
Federal Facility Agreement (FFA)	August 1994
Site 1	
Round One Remedial Investigation	October 1992
Round Two Remedial Investigation	February 1996
Feasibility Study	October 1997
ROD Signed	09 June 1999
Remedial Action	July 1999 – April 2000
Initiation of Long-term Monitoring	May 2000
Final Closeout Report	June 2001
Site 6	
Round One Remedial Investigation	October 1992
Round Two Remedial Investigation	February 1996
Feasibility Study	May 1998
ROD Signed	13 October 1998
Bioremediation Remedial Action	August 1998 – March 1999
Final Closeout Report for Bioremediation	December 1999
Initiation of Long-term Monitoring	May 2000
Site 7	
Round One Remedial Investigation	October 1992
Pilot Study	December 1996
Round Two Remedial Investigation	February 1998
Feasibility Study	May 1998
ROD Signed	13 October 1998
Initiation of Long-term Monitoring	May 2000

Table 2-1 Chronology of Site Events	
Site 12	
Round One Remedial Investigation	October 1992
Round Two Remedial Investigation	February 1996
Feasibility Study	June 1996
ROD Signed	16 April 1997
Remedial Action	July 1997 – November 1997
Final Closeout Report	January 1998
Initiation of Long-term Monitoring	July 1998
Site 16	
Round One Remedial Investigation	October 1992
Removal Action	February 1994
Round Two Remedial Investigation	September 1994
ROD Signed	29 September 1995
Site 19	
Round One Remedial Investigation	October 1992
Feasibility Study	June 1997
ROD Signed	23 March 1998
Remedial Action	April 1998 – September 1999
Final Closeout Report	April 2000

3.0 SITE BACKGROUND

WPNSTA Yorktown is a 10,624 acre installation located on the Virginia Peninsula in York and James City Counties and the City of Newport News (Figure 3-1). The Station is bounded on the northwest by the Naval Supply Center Cheatham Annex, the Virginia Emergency Fuel Farm, and the future community of Whittaker's Mill; 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 community of Lackey.

WPNSTA Yorktown, originally named the United States Mine Depot, was established in 1918 to support the laying of mines in the North Sea during World War I. The establishment of the depot was the culmination of a search process, begun in 1917 at the request of Congress, to locate an Atlantic coast site for a weapons handling and storage facility. For 20 years after World War I, the depot received, reclaimed, stored, and issued mines, depth charges, and related materials. During World War II, the facility was expanded to include three additional 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 United States Mine Depot was redesignated as the United States Naval Weapons Station (i.e., WPNSTA Yorktown). 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.

On October 15, 1992, WPNSTA Yorktown was included on the National Priorities List (NPL). An FFA between the United States Environmental Protection Agency (USEPA) Region III, the Commonwealth of Virginia, and the DoN was finalized in August of 1994 for WPNSTA Yorktown. The FFA is intended to cover the investigation, development, selection, and implementation of Response Actions for all releases or threatened releases of hazardous substances, contaminants, hazardous wastes, hazardous constituents, or pollutants at or from WPNSTA Yorktown.

3.1 Physical Characteristics

3.1.1 General Physiography

WPNSTA Yorktown is located in the southeast portion of Virginia on the York-James Peninsula. The Station is located in central York County and is part of James City County and Newport News City. The

Station is situated in the Atlantic Coastal Plain Physiographic Province. This province extends from the Atlantic Ocean westward for 75 to 90 miles where it borders the Piedmont Physiographic Province. The Coastal Plain consists of unconsolidated sediments, with its topography split into a number of terraces of different elevations each bounded by scarp (cut out) features. These terraces and scarps were formed by the fluctuating levels of the sea and subsequent shoreline erosion process over geologic history (Brockman et al., 1997).

The Coastal Province is comprised of four terraces. The terraces from highest to lowest are: Lackey Plain, Croaker Flat, Huntington Flat, and Grafton Plain. Three scarps are also found within this province; the Kingsmill, the Lee Hall, and the Camp Peary. The WPNSTA Yorktown study area includes only the Lackey Plain and Croaker Flat terraces and the Camp Peary scarp along the York River (Brockman et al., 1997).

3.1.2 Regional Geology

The Atlantic Coastal Plain Physiographic Province is underlain by unconsolidated sediment of Quaternary, Tertiary, and Cretaceous ages that dip gently to the southeast and have a combined thickness of approximately 1,900 feet in the vicinity of WPNSTA Yorktown (Teifke, 1973). There are nine geologic formations that are identified beneath WPNSTA Yorktown, dating from the early Miocene to late Pleistocene. Two of the nine formations, the Yorktown and Eastover Formations, are further subdivided into four and two members, respectively. Seven of the nine formations comprise the York County shallow aquifer system. Under the Lackey Plain terrace (within the Station), the Windsor and Chuckatuck Formations are dominant. These formations are composed of a series of sand and silt deposited in marine and estuarine environments. The thickness of these deposits is estimated to vary from 0- to 40-feet at WPNSTA Yorktown (Johnson, 1972; Mixon, et al., 1989). The Bacons Castle Formation unconformably underlies the Windsor Formation and is described as a clayey silt and silty fine-grained sand. The unit rests unconformably on the weathered top of the Upper Yorktown Formation of Pliocene age. Under the Croaker Flat terrace and the Camp Peary scarp region of WPNSTA Yorktown along the York River, the Shirley Formation unconformably overlies a clay of uncertain designation (Brockman et al., 1997). Identification of the Yorktown Formation has been well established with the presence of calcite-cemented shells and shell fragments which are common characteristics of the upper portion of the formation.

3.1.3 WPNSTA Hydrogeology

The Atlantic Coastal Plain sediments are the most important source of potable water in the region. Recharge to the groundwater system is derived from precipitation. Approximately 50 percent of the precipitation is lost to evapotranspiration. The remaining 50 percent either results in surface runoff or infiltrates and is introduced into the groundwater regime. Recharge of aquifers may occur at the surface near outcrop zones, or from downward migration from overlying strata.

The hydrogeology of the York County shallow aquifer system at WPNSTA Yorktown is comprised of the following five units in descending order: (1) the Columbia aquifer, (2) the Cornwallis Cave confining unit, (3) the Cornwallis Cave aquifer, (4) the Yorktown confining unit, and (5) the Yorktown-Eastover aquifer. Below this shallow aquifer system is the Eastover-Calvert confining unit (Brockman et al., 1997).

The undivided York County shallow aquifer system exists where one or more of the confining units commonly present in other areas of the county is absent (typically adjacent to the York River), and two or more aquifers form one hydraulic unit. The Columbia aquifer consists of sandy deposits which exist under confined (water table) conditions. Clayey or silty sediments typically comprise the Cornwallis Cave confining unit which underlies the Columbia aquifer. Most of York County is underlain by the Columbia aquifer and Cornwallis Cave confining unit, but the units are missing in areas of western and west-central York County and at WPNSTA Yorktown along the York River in an area referred to as the Camp Peary scarp. The Cornwallis Cave aquifer consists of sandy and shelly sediments and is defined by the water table (where unconfined). This aquifer is usually distinguished by the discontinuous shell hash deposits of the Yorktown Formation but for the most part this aquifer is comprised of silt and clay, with minor amounts of fine grained sand. The Yorktown confining unit which underlies the Cornwallis Cave aquifer is comprised of clay and silt and is usually distinguishable by its dark greenish gray color. The Yorktown-Eastover aquifer underlies the Yorktown confining unit, which is comprised of sandy and shelly sediments. It is typically confined, but locally may be unconfined (e.g., adjacent to the York River).

3.2 History of Contamination

The following sites are included in this five-year review and are discussed in the following sections:

- Site 1 – Dudley Road Landfill
- Site 6 – Explosives-Contaminated Wastewater Impoundment

- Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area
- Site 12 – Barracks Road Landfill
- Site 16 – West Road Landfill
- Site 19 – Conveyor Belt Soil at Plant 1

3.2.1 Site 1 – Dudley Road Landfill

Site 1, the Dudley Road Landfill, is approximately 6 acres in size and is located just north of the headwaters of Indian Field Creek (Figure 3-2). A dirt road runs through the site and a dirt mound is located in the northern portion of the site. The majority of the area is cleared, but is surrounded by woods.

Site 1 was originally used for sand mining, but became a landfill as depressional areas created by mining activities were used for waste disposal. The landfill was operated under a Conditional Permit issued by the Commonwealth of Virginia. Disposed materials reportedly included asbestos insulation from steam piping; oil, grease, paint, and solvent containers; nitramine-contaminated carbon; household appliances; scrap metal banding; construction rubble; plastic lens grinding wastes; tree limbs; lumber; packaging wastes; electrical wires; and waste oil. General waste disposal occurred from approximately 1965 to 1979, but a portion of the site was reportedly used for plastic lens grinding waste disposal until 1983. The landfill is covered by approximately two feet of soil.

The general topography at Site 1 is level (near the landfill) with a slight slope to the east and more pronounced slopes east and south of the site toward Indian Field Creek. Thus, the majority of surface water from the site drains toward Indian Field Creek.

Previous investigations at Site 1 identified a hotspot of arsenic-contaminated soil. In addition, potential volatile organic compound (VOC)-contaminated groundwater was identified, but requires additional investigation and will be addressed as part of Groundwater Operable Unit (OU) I (Baker, 1999).

3.2.2 Site 6 – Explosives-Contaminated Wastewater Impoundment

Site 6 covers approximately 94 acres and includes the area surrounding Buildings 109, 110, and 501; the explosives-contaminated wastewater impoundment area with the associated flume; an excavated area; and a tributary to Felgates Creek (Figure 3-3). The site generally slopes to the west toward the impoundment area. The buildings in the study area are surrounded by earthen berms that affect surface water runoff direction. Currently, the impoundment area collects only surface water runoff from the area between

Buildings 109 and 110. A system of trenches and piping from Building 109 discharged to the flume and impoundment areas during operations. Building 109 is no longer in use and the flume was removed.

The impoundment area was formerly used during the years of 1942 through 1975 as a settling basin for nitramine-contaminated wash down water. The contaminated wastewater was generated from the explosives reclamation facility at Building 109 and from weapons loading operations at Building 110. This wastewater flowed along concrete flumes in what has been designated as the flume area. The explosives reclamation facility released solvents such as trichloroethene (TCE) and trichloroethane (TCA) and nitramine/nitroaromatic compounds such as TNT and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) to the impoundment area. The weapons reclamation operations released solvents and nitramine compounds to the impoundment area by means of a concrete-lined drainage channel or flume that emanated from Building 109. In 1975, a carbon adsorption tower was installed to treat the contaminated wastewater before it was discharged from Building 109 and 110 into the flume area. In 1986, the effluent from the tower was diverted to the sanitary sewer. The impoundment area currently collects only surface water runoff from the area between Buildings 109 and 110 (Baker, 1998a).

North of the impoundment area, an excavated area has been identified (Figure 3-3). This area is currently wooded, but concrete rubble and miscellaneous debris are evident in the area. The history of the excavated area is not documented. The area may have been a former soil borrow pit, from which soil was obtained to construct the dam for the impoundment.

3.2.3 Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area

Site 7 is a 300-foot long (approximate length) drainage area located adjacent to wetlands and along a small tributary to Felgates Creek, approximately 1-mile upstream from the confluence of Felgates Creek and the York River (Figure 3-3). The buildings in the study area are surrounded by earthen berms that affect surface water runoff direction. The Site 7 study area generally slopes toward a ravine located along the southern portion of the study area. The actual study area for Site 7 covers approximately 62 acres and includes the area surrounding Buildings 375, 502, 503, and 504 (collectively known as Loading Plant 3) as well as a drainage area. The drainage area discharges to a small tributary of Felgates Creek. Site 7 received nitramine-contaminated wastewater from Loading Plant 3 between 1945 and 1975. In 1975, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge to the drainage area. In 1986, the discharge from the tower was diverted to the sanitary sewer. Site 7 did not receive discharge from Plant 3 after this date.

Excavation of contaminated soil and sediment for the full-scale Pilot Study of explosives-contaminated soil and sediment in 1996 removed contaminants that posed potential risks to both human health and the environment. Soil and sediment were removed to protect individuals exposed under commercial/industrial land use scenarios and not residential property use (Baker, 1998a).

3.2.4 Site 12 – Barracks Road Landfill

The Site 12 study area contains Site 12 proper and the surrounding study area which are located in the eastern portion of WPNSTA Yorktown (Figure 3-4). The Site 12 study area encompasses 92 acres and is located near the Industrial Area of WPNSTA Yorktown.

Site 12 proper contains three former disposal areas. One of the former disposal areas, designated as Area A, is partially wooded and covers approximately 4.4 acres. An incinerator building and a smoke stack were located within Area A. The incinerator building contained two incinerators which were formerly used to burn industrial and non-industrial wastes. The ash from the incinerators was disposed of in a topographic low area or ditch that leads to Ballard Creek and is located immediately southwest of the incinerator building. A stream channel flows through this ditch and into Ballard Creek. Another former disposal area, designated as Area B/C, covers approximately 1.6 acres. A portion of Area B/C is an open field. Other portions are wooded and contain steep slopes and ravines. The third former disposal area has been designated the Wood/Debris Disposal Area and covers approximately 3.3 acres. The Wood/Debris Disposal Area was created when wood and miscellaneous construction debris were disposed and pushed into a ravine toward Ballard Creek. The disposed material was then covered with soil. The Wood/Debris Disposal Area is an open field with visible debris protruding out along the backside of this area adjacent to Ballard Creek. A ditch with an intermittent stream channel is located adjacent to the Wood/Debris Disposal Area (Baker, 1997a).

The former disposal areas at Site 12 were in operation from approximately 1925 to the mid-1960s. During this time, the disposal areas received an estimated 1,400 tons of waste. Wastes reported to have been disposed of at the three disposal areas include refuse, scrap wood, piping, steel containers, and nitramine-contaminated packaging. It is likely that solvents were also disposed.

With respect to Area A, wastes were transported to the site by truck and railcar and open-burned prior to disposal. In addition, the two incinerators located at Area A were used to burn a variety of waste taken from ships coming from foreign ports. Ash from incineration activities was disposed of on the hillside behind the incinerator building. The hillside trends toward the ditch which bisects Area A. Ash from wastes that were open-burned in the northern section of Area A were spread across the top of Area A

toward the incinerator to the south. Scrap metal, charred wood and cloth, and glass have been observed in the ash.

The Wood/Debris Disposal Area was reportedly used for disposal of lumber (not matching specifications), wooden pallets, and miscellaneous construction debris which are still presently visible on the backside of the area in the vicinity of Ballard Creek (Baker, 1997a).

3.2.5 Site 16 – West Road Landfill

Site 16 is approximately 5 acres in size located adjacent to West Road near Lee Road (Figure 3-5). The northern portion of the site is adjacent to a set of railroad tracks and is primarily flat and grass covered. The remaining portion of the site is currently wooded. The eastern, southern, and western sides of the site dip into drainage pathways that run in a southerly direction. Eventually, these drainage pathways move west into Felgates Creek, which drains into the York River, approximately 1.5 miles from the site.

Site 16 was operated from the 1950s to the early 1960s as a dump site. Wastes reported to have been disposed include: dry carbon-zinc (Leclanche) batteries, banding materials, pressure transmitting fluid, unknown types of chemicals, mine casings, construction debris, and 55-gallon drums (contents unknown). During a waste characterization investigation, most of the waste at Site 16 was identified as being surficial debris. Mine casings, batteries, drums, scrap metal, and construction debris were identified in several areas across the surface of the site.

Only one small area containing waste at depth was encountered at Site 16. Located underneath a pile of drums, this small waste area contained common refuse material including glass, cans, and newspapers. The refuse material was encountered at a depth of two feet below ground surface and extended to a depth of approximately nine feet. Based on this waste characterization study, this waste was disposed of by filling in the slope edge of the site and then covering it.

A 1994 Removal Action removed the surficial debris and waste, thereby, removing the potential sources of contamination from the site (Baker, 1995).

3.2.6 Site 19 – Conveyor Belt Soil at Plant 1

Site 19 consists of soil surrounding a conveyor belt, which was formerly used to transport packaged TNT powder from Plant 1 to Building 98 (Figure 3-6). The conveyor belt, which runs northeast to southwest, is located within an earthen trench. Several buildings and sheds are located within the Site 19 study area.

The Site 19 conveyor belt was enclosed on top and along its sides. TNT dust was released to the soil below and around the conveyor belt during loading activities as high explosives were moved along the conveyor belt to the kettles at Plant 1. In addition, past operational practices involved the routine spraying of the conveyor walls and floors with water to control the potential buildup of TNT dust. This water likely dripped onto the ground surface below the conveyor. A hotspot location of aluminum in soil around Building 527 with potential ecological risks to terrestrial receptors was also identified during previous investigations (Baker, 1998b).

4.0 REMEDIAL ACTIONS

4.1 Site 1 – Dudley Road Landfill

4.1.1 Remedy Selection

The ROD for Site 1 was signed on 09 June 1999. Remedial Action Objectives (RAOs) were developed for this site based on results of the RI/FS and consisted of mitigating the potential for direct contact of arsenic in soils exceeding the final remediation goal by human receptors (Baker, 1997b). The selected remedy for this site included the removal and disposal and/or recycling of surface debris, excavation and off-site disposal of the arsenic-contaminated soil hotspot, restoration of the existing soil cover, and implementation of institutional controls. Institutional controls include land use controls that prohibit residential development at the site and activities that interfere with the integrity of the soil cover (Baker, 1999). As stated in Section 3.2.1, groundwater at Site 1 requires additional investigation and will be addressed as part of Groundwater OU I.

4.1.2 Remedy Implementation

Shaw Environmental and Infrastructure, Inc. (Shaw) (formerly OHM Remediation Services Corp. [OHM]) mobilized to the site in July 1999 to begin remediation activities. Remediation activities completed by Shaw/OHM consisted of the removal and disposal of metal surface debris, the excavation and off-site disposal of approximately 400 tons of arsenic-contaminated waste, and the restoration of the soil cover (Shaw/OHM, 2001). Land use controls prohibiting residential development at the site and interference of the soil cover were implemented through informal restrictions. The site is inaccessible to the general public and prohibits residential development since the installation still holds the same mission of supporting national military strategy. Figure 3-2 shows the land use restriction area at Site 1.

4.1.3 Current Status

Inspections are performed periodically to verify the integrity of the soil cover and are conducted as part of the wildlife resource restoration program. In addition, annual long-term monitoring of groundwater, surface water, and sediment has been initiated at Site 1. All environmental media samples are analyzed for target compound list (TCL) VOCs. Long-term monitoring at Site 1 is performed to detect contaminant migration via deep groundwater to the surface water and sediment of Indian Field Creek. At the time of the five-year review, only one sampling event had been completed.

4.2 Site 6 – Explosives-Contaminated Wastewater Impoundment

4.2.1 Remedy Selection

The ROD for Site 6 was signed on 13 October 1998. RAOs developed for the site based on results of the RI/FS (Baker, 1998c) included:

- Mitigating direct exposure to potential human and ecological receptors to contaminated sediment in the drainage flume area. Evaluating the condition of the impoundment area and better evaluating the potential for risk to ecological receptors.

- Reducing or eliminating potential secondary sources of VOC and/or nitramine contamination associated with Solid Waste Management Unit (SWMU) 179 and Area of Concern (AOC) C. This includes the contents of the drains that are located under Building 109.

- Mitigating direct exposure to potential ecological receptors to contaminated shallow soil in the Site 6 excavated area with cadmium and zinc concentrations exceeding final remediation goals.

The selected remedy for this site included: limited excavation of contaminated soil, ex-situ biological treatment, placing a soil cover, and residue removal. The remedy consisted of excavating approximately 1,000 cubic yards of polynuclear aromatic hydrocarbon (PAH) and explosives contaminated soil and sediment at the flume area and treating the explosives-contaminated material on-site with an ex-situ bioremediation process. PAH-contaminated material was disposed of off-site. To prevent extensive disturbance to the marshy area at the impoundment area, the selected remedy included no active remediation at the impoundment area. Additionally, the selected remedy included long-term monitoring of sediment, surface water, and groundwater to assess conditions at the impoundment area; installing a soil cover at the existing Site 6 excavated area; and removing residue from the trenches under Building 109 (Baker, 1998a). However, long-term monitoring is not the final remedy for groundwater at Site 6 which will be addressed as part of Groundwater OU I.

4.2.2 Remedy Implementation

Shaw/OHM mobilized to the site in August 1998 to begin remediation activities. Remediation activities completed by Shaw/OHM consisted of the excavation and off-site disposal of PAH-contaminated soil and the excavation and placement into the biocell of explosives-contaminated soil (Shaw/OHM, 1999). On-going remedial activities not completed during the 1998 remedial action include installation of the soil cover at the excavation area and residue removal from the trenches under Building 109. Shaw/OHM is

currently in the third phase of a six phase action to complete the soil cover. These remaining activities are anticipated to be completed in Fiscal Year 2004. Institutional controls prohibiting residential development at the site were implemented through informal restrictions. The site is inaccessible to the general public and prohibits residential development since the installation still holds the same mission of supporting national military strategy. Institutional controls are required since remediation activities were based on a commercial/industrial receptor scenario. Figure 3-3 shows the land use restriction areas at Site 6.

4.2.3 Current Status

Annual long-term monitoring of groundwater, surface water, and sediment has been initiated at Site 6 to determine the effectiveness of the remedial action. Groundwater samples are analyzed for TCL VOCs, nitramines, and target analyte list (TAL) inorganics (total and dissolved). Surface water and sediment samples are analyzed for TCL VOCs, nitramines, and total TAL inorganics. At the time of the five-year review, only one sampling event had been completed.

4.3 Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area

4.3.1 Remedy Selection

The ROD for Site 7 was signed on 13 October 1998. RAOs were not developed for this site because the RI/FS did not identify any potential threat to human or ecological receptors (Baker, 1998a). The selected remedy for this site was no further action with the implementation of institutional controls since contaminated media was removed to commercial/industrial remediation levels during the 1996 Pilot Study. The selected remedy also included long-term monitoring of groundwater. However, this is not the final remedy for groundwater at Site 7 which will be addressed as part of Groundwater OU I.

4.3.2 Remedy Implementation

Institutional controls prohibiting residential development at the site were implemented through informal restrictions. The site is inaccessible to the general public and prohibits residential development since the installation still holds the same mission of supporting national military strategy. Figure 3-3 shows the land use restriction area at Site 7.

4.3.3 Current Status

Annual long-term monitoring of groundwater has been initiated at Site 7. Groundwater samples are analyzed for TCL VOCs, nitramines, and TAL inorganics (total and dissolved). At the time of the five-year review, only one sampling even had been completed.

4.4 Site 12 – Barracks Road Landfill

4.4.1 Remedy Selection

The ROD for Site 12 was signed on 16 April 1997. RAOs were developed for this site based on results of the RI/FS and consisted of preventing erosion of soil in Area A, preventing the potential for direct contact exposure to lead-contaminated soil by human and ecological receptors, and remediating the soil so lead meets a remediation level of 400 mg/kg (Baker, 1996). The selected remedy for this site included the following activities for Area A:

- Excavating the soil and removing debris located on steep slopes, spreading excavated soil over flat portions of Area A, and backfilling the excavated area with clean soil.
- Placing and compacting 12 inches of clay or a material with similar permeability over the resulting soil pile. Placing and compacting six inches of topsoil over the clay/clay equivalent material.
- Constructing erosion control along the steep slopes located along the stream channel within Area A.
- Implementing land use restrictions and long-term monitoring of surface water at Area A.

The selected remedy included no further action for Area B/C and the Wood/Debris Disposal Area. The selected remedy included land use restrictions and aquifer use restrictions throughout Area A, Area B/C, and the Wood/Debris Disposal Area to prohibit the use of groundwater as a drinkable source. This remedy also includes the implementation of long-term monitoring of groundwater across the study area, and surface water and sediment from Ballard Creek and its tributaries (Baker, 1997a).

4.4.2 Remedy Implementation

Shaw/OHM mobilized to the site in July 1997 to begin remediation activities. Remediation activities included demolition of the incinerator facility, incinerator stack, and a one-story maintenance shed. 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 fill. Metal debris scattered throughout the site was sent to a recycling facility (Shaw/OHM, 1998). Institutional controls prohibiting residential development at the site and interference of the cap were implemented through informal restrictions. The site is inaccessible to the general public and prohibits residential development since the installation still holds the same mission of supporting national military strategy. Figure 3-4 shows the land use restriction area at Site 12.

4.4.3 Current Status

Inspections are performed periodically to verify the integrity of the cap and are conducted as part of the wildlife resource restoration program. In addition, long-term monitoring of groundwater and sediment is conducted at Site 12 and is currently in the fourth year of monitoring. Groundwater and sediment are sampled and analyzed annually for TCL VOCs (groundwater) and Resource Conservation and Recovery Act (RCRA) 8 Metals (groundwater and sediment). Groundwater is also sampled and analyzed semi-annually for RCRA 8 Metals. Long-term monitoring at Site 12 is performed to monitor groundwater to determine if TCE detected within the shallow aquifer is migrating downgradient or through a semiconfining unit into the deeper aquifer. Additionally, long-term monitoring will determine the effectiveness of the removal action by monitoring the sediment within the Ballard Creek watershed.

4.5 Site 16 – West Road Landfill

4.5.1 Remedy Selection

The ROD for Site 16 was signed on 29 September 1995. RAOs were not developed for this site because there was no identified potential threat to human or ecological receptors. Since the Removal Action conducted in 1994 mitigated potential unacceptable risks to human health and the environment under the current and predicted future land use for WPNSTA Yorktown, the selected remedy involved taking no further remedial actions (including sampling) at the site with the exception of institutional controls (land-use restrictions and aquifer-use restrictions).

The selected remedy included land-use restrictions to restrict future land development of the Site 16 area for residential purposes and aquifer-use restrictions to disallow the placement of potable supply wells within the site area (Baker, 1995).

4.5.2 Remedy Implementation

Institutional controls prohibiting residential development at the site and placement of potable supply wells were implemented through informal restrictions. The site is inaccessible to the general public and prohibits residential development since the installation still holds the same mission of supporting national military strategy.

4.5.3 Current Status

No additional activities have been conducted at this site since there are no unacceptable risks under current scenarios for the environmental media at Site 16.

4.6 Site 19 – Conveyor Belt Soil at Plant 1

4.6.1 Remedy Selection

The ROD for Site 19 was signed on 23 March 1998. RAOs developed for this site based on results of the RI/FS included mitigating direct exposure to 2,4,6-TNT and RDX in soils by commercial/industrial workers and ecological receptors and indirectly eliminating the potential ecological effects associated with aluminum and other organics in surface soil. The selected remedy for Site 19 involved the dismantling and disposal of the conveyor belt, removing soil containing concentrations of explosives exceeding remediation levels (to a depth of approximately 4 feet bgs) beneath the belt, and transporting the soil to an existing biocell on the Station. Soil was treated to remediation levels protective of human health and the environment, removed from the cell, and applied to the ground around the biocell. In addition, an aluminum hotspot located around Building 527 was excavated and placed in the conveyor belt excavation (Baker, 1998b).

4.6.2 Remedy Implementation

Shaw/OHM mobilized to the site in April 1998 to begin remediation activities. Remediation activities included the dismantling and disposal of the conveyor belt system. Activities also included excavating approximately 1,000 cubic yards of explosives-contaminated soil to a total depth of 4 feet. The explosives-contaminated soil was placed in the Site 22 biocell for bioremediation of the soil to contaminate concentrations below remediation levels. In addition, approximately 60 cubic yards of aluminum-contaminated soil was excavated to a depth of 6 inches. The aluminum-contaminated soil was placed in the bottom of the conveyor belt trench excavation and subsequently backfilled with clean fill (Shaw/OHM, 2000). Institutional controls prohibiting residential development at the site were

implemented through informal restrictions. The site is inaccessible to the general public and prohibits residential development since the installation still holds the same mission of supporting national military strategy. Figure 3-6 shows the land use restriction area at Site 19.

4.6.3 Current Status

No additional activities have been conducted at Site 19 since there is no contaminated soil exceeding final remediation levels remaining at the site.

5.0 FIVE-YEAR REVIEW PROCESS

Baker Environmental, Inc. conducted this five-year review of Sites 1, 6, 7, 12, 16, and 19 at WPNSTA Yorktown. The following tasks were conducted as part of the five-year review: community involvement, document review, data review, site inspection, and interviews. Findings of the five-year review are discussed in the following sections.

5.1 Community Involvement

The community was informed of the initiation of the five-year review during the Restoration Advisory Board (RAB) meeting in May 2002. The draft five-year review report was presented during the August 2002 RAB meeting. Upon completion and signature of the Final Five-Year Review Report, Baker will present a brief summary that includes a short description of remedial actions reviewed, deficiencies, recommendations, follow-up actions that are directly related to protectiveness of the remedy, date of the next five-year review, determination of whether the remedy is expected to be protective of human health and the environment, and where a copy of the complete report can be obtained.

5.2 Document Review

This five-year review consisted of a review of relevant site documents. This included the review of RODs, Remedial Action Reports, and long-term monitoring reports. Specific documents reviewed are listed in the references section (Section 11.0).

5.3 Data Review

5.3.1 Applicable or Relevant and Appropriate Requirements Review

Applicable or Relevant and Appropriate Requirements (ARARs) developed for each of the sites during the ROD phase were reviewed as part of the five-year review process. Table 5-1 provides a summary of the ARARs identified for each site and identifies any changes to the ARARs. No additional ARARs were identified during the five-year review. There were no significant changes in the ARARs or site contaminants; therefore, site risks were not recalculated.

5.3.2 Long-Term Monitoring

Annual long-term monitoring is conducted at Sites 1, 6, 7, and 12. Long-term monitoring of environmental media is not required at Sites 16 and 19. Groundwater, surface water, and sediment at Site 1 is sampled and analyzed for TCL VOCs. Long-term monitoring at Site 1 is performed to detect

contaminant migration via deep groundwater to the surface water and sediment of Indian Field Creek. At the time of the five-year review, one sampling event had been completed and a report documenting the results of the analyses is in progress. Therefore, analytical data from the long-term monitoring program will be reviewed as part of the next five-year review.

Groundwater, surface water, and sediment at Site 6 and groundwater at Site 7 is sampled and analyzed for TCL VOCs, nitramines, and TAL inorganics. Long-term monitoring at Site 6 and Site 7 is performed to determine the effectiveness of the remedial actions. At the time of the five-year review, one sampling event had been completed and a report documenting the results of the analyses is in progress. Therefore, analytical data from the long-term monitoring program will be reviewed as part of the next five-year review.

Groundwater and sediment at Site 12 is sampled and analyzed annually for TCL VOCs (groundwater) and RCRA 8 Metals (groundwater and sediment). Groundwater is also sampled and analyzed semi-annually for RCRA 8 Metals. Long-term monitoring at Site 12 is performed to monitor groundwater to determine if TCE detected within the shallow aquifer is migrating downgradient or through a semiconfining unit into the deeper aquifer. Additionally, long-term monitoring will determine the effectiveness of the removal action by monitoring the sediment within the Ballard Creek watershed. At the time of the five-year review, Site 12 was in the beginning of a fourth year of monitoring. Analytical results of the long-term monitoring program indicate that the remedial action is functioning as intended by the ROD (Baker, 2000; Baker, 2001).

5.4 Site Inspection

Baker personnel conducted a site inspection on 06 June 2002 as part of the five-year review. The purpose of the inspection was to assess the protectiveness of the remedies. The site inspection included visiting each site to verify current site conditions. Inspections verified that current site conditions were not adversely impacting actions completed in accordance with the selected remedy for each site.

In addition to the site inspection, interviews were conducted with Mr. Jeffrey Harlow, LANTDIV Remedial Project Manager, and Ms. Valerie Walker, WPNSTA Yorktown Installation Restoration Program Manager. The interviews verified current site conditions and future plans of the sites, if any. The site inspection and interviews did not identify any deficiencies that required corrective action.

5.4.1 Site 1 – Dudley Road Landfill

No significant issues were identified regarding the cover and no activities were observed that violated the institutional controls. No issues or deficiencies were noted during the interviews.

5.4.2 Site 6 – Explosives-Contaminated Wastewater Impoundment

Site 6 is in the third phase of a multi-phase remedial action. The site inspection verified that no activities violating the institutional controls regarding residential development had occurred. No issues or deficiencies were noted during the interviews.

5.4.3 Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area

No significant issues were noted during the inspection or interviews. No activities were observed that violated the institutional controls.

5.4.4 Site 12 – Barracks Road Landfill

No significant issues were identified regarding the cap and no activities were observed that would have violated the institutional controls. The Tri-Lock® drainage area was inspected for erosion control and no deficiencies were found. No additional issues were noted during the interviews.

5.4.5 Site 16 – West Road Landfill

No significant issues were noted during the inspection or interviews. No activities were observed that violated the institutional controls.

5.4.6 Site 19 – Conveyor Belt Soil at Plant 1

No significant issues were noted during the inspection or interviews. No activities were observed that violated the institutional controls.

6.0 ASSESSMENT

6.1 Site 1 – Dudley Road Landfill

6.1.1 Effectiveness of Remedy

Results of the five-year review indicate that the remedy is functioning as intended by the ROD and is protective of human health and the environment. The selected remedy at Site 1 included the removal and disposal of surface debris, excavation and off-site disposal of the arsenic-contaminated soil hotspot, restoration of the existing soil cover, and implementation of institutional controls. Institutional controls were implemented at the site to prohibit residential development and these controls are protective of human health and the environment. Long-term monitoring of groundwater, surface water, and sediment is conducted to detect contaminant migration via deep groundwater to the surface water and sediment of Indian Field Creek. As only one sampling event has occurred since the implementation of the long-term monitoring program, conclusions regarding the effectiveness of the remedy will be evaluated in the next Five-Year Review Report. Figure 6-1 is a photograph of Site 1 following completion of the remedial action.

6.1.2 Remedy Selection Criteria

Since the remedial action at Site 1 has been completed, ARARs identified during the RI/FS have been met and there have been no changes in the ARARs that affect the protectiveness of the remedy. RAOs developed for this site during the RI/FS have been achieved through the implementation of the remedial action. Based on results of the five-year review, there have been no changes in exposure pathways and no new contaminants or contaminant sources have been identified.

6.1.3 Changes to Site Conditions

Based on the site inspection conducted as part of the five-year review, conditions at Site 1 have not changed and no other new information is known that may affect the protectiveness of the remedy. No newly identified human health or ecological risks have been identified and there have been no natural disasters that have impacted the site in a way that decreases the effectiveness of the remedy.

6.2 Site 6 – Explosives-Contaminated Wastewater Impoundment

6.2.1 Effectiveness of Remedy

Remedial activities are currently underway at Site 6. The selected remedy at Site 6 included excavation of contaminated soil and the installation of a soil cover. Institutional controls were implemented at the site to prohibit residential development and these controls are protective of human health and the environment. Long-term monitoring of groundwater, surface water, and sediment is conducted to determine the effectiveness of the remedial action at Site 6. As only one sampling event has occurred since the implementation of the long-term monitoring program and the remedial action has not been completed, conclusions regarding the effectiveness of the remedy will be evaluated in the next Five-Year Review Report. Figure 6-2 is a photograph documenting conditions at Site 6 following completion of the second phase of the remedial action.

6.2.2 Remedy Selection Criteria

There have been no changes in the ARARs that affect the protectiveness of the remedy. RAOs identified for this site will be achieved through the implementation of the remedial action. Based on the results of the five-year review, short-term ecological exposure pathways have been identified due to construction associated with the remedial action. However, no new contaminants or contaminant sources have been identified.

6.2.3 Changes to Site Conditions

Based on the site inspection conducted as part of the five-year review, conditions at Site 6 have not changed and no other new information is known that may affect the anticipated protectiveness of the remedy. No newly identified human health or ecological risks have been identified and there have been no natural disasters that have impacted the site in a way that decreases the anticipated effectiveness of the remedy.

6.3 Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area

6.3.1 Effectiveness of Remedy

Results of the five-year review indicate that the remedy is functioning as intended by the ROD and is protective of human health and the environment. The selected remedy at Site 7 was no further action and the implementation of institutional controls. No further action was required since contaminated media

were removed to commercial/industrial remediation levels during the 1996 Pilot Study. Institutional controls were implemented at the site to prohibit residential development and these controls are protective of human health and the environment. Long-term monitoring of groundwater is conducted to determine the effectiveness of the remedial action at Site 7. As only one sampling event has occurred since the implementation of the long-term monitoring program, conclusions regarding the effectiveness of the remedy will be evaluated in the next Five-Year Review Report. Figure 6-3 is a photograph documenting conditions at Site 7.

6.3.2 Remedy Selection Criteria

Since the remedial action at Site 7 has been completed, ARARs identified during the RI/FS have been met and there have been no changes in the ARARs that affect the protectiveness of the remedy. RAOs were not developed for this site since the RI/FS did not identify any potential threat to human or ecological receptors. Based on results of the five-year review, there have been no changes in exposure pathways and no new contaminants or contaminant sources have been identified.

6.3.3 Changes to Site Conditions

Based on the site inspection conducted as part of the five-year review, conditions at Site 7 have not changed and no other new information is known that may affect the protectiveness of the remedy. No newly identified human health or ecological risks have been identified and there have been no natural disasters that have impacted the site in a way that decreases the effectiveness of the remedy.

6.4 Site 12 – Barracks Road Landfill

6.4.1 Effectiveness of Remedy

Results of the five-year review indicate that the remedy is functioning as intended by the ROD and is protective of human health and the environment. The selected remedy at Site 12 included capping the landfill with a geosynthetic clay liner. Institutional controls were implemented at the site to prohibit residential development and these controls are protective of human health and the environment. Long-term monitoring of groundwater and sediment is conducted to monitor groundwater to determine if TCE detected within the shallow aquifer is migrating downgradient or through a semiconfining unit into the deeper aquifer. Additionally, long-term monitoring will determine the effectiveness of the removal action by monitoring the sediment with the Ballard Creek watershed. Results of long-term monitoring conducted as of the five-year review indicate the remedy is functioning as intended by the ROD. Figure 6-4 is a photograph of Site 12 following completion of the remedial action.

6.4.2 Remedy Selection Criteria

Since the remedial action at Site 12 has been completed, ARARs identified during the RI/FS have been met and there have been no changes in the ARARs that affect the protectiveness of the remedy. RAOs developed for this site during the RI/FS have been achieved through the implementation of the remedial action. Based on results of the five-year review, there have been no changes in exposure pathways and no new contaminants or contaminant sources have been identified.

6.4.3 Changes to Site Conditions

Based on the site inspection conducted as part of the five-year review, conditions at Site 12 have not changed and no other new information is known that may affect the protectiveness of the remedy. No newly identified human health or ecological risks have been identified and there have been no natural disasters that have impacted the site in a way that decreases the effectiveness of the remedy.

6.5 Site 16 – West Road Landfill

6.5.1 Effectiveness of Remedy

Results of the five-year review indicate that the remedy is functioning as intended by the ROD and is protective of human health and the environment. The selected remedy at Site 16 was no further action (including sampling) and the implementation of institutional controls. Institutional controls were implemented at the site to prohibit residential development and these controls are protective of human health and the environment. Figure 6-5 is a photograph documenting conditions at Site 16.

6.5.2 Remedy Selection Criteria

Since the remedial action at Site 16 has been completed, ARARs identified during the RI/FS have been met and there have been no changes in the ARARs that affect the protectiveness of the remedy. RAOs were not developed for this site since the RI/FS did not identify any potential threat to human or ecological receptors. Based on results of the five-year review, there have been no changes in exposure pathways and no new contaminants or contaminant sources have been identified.

6.5.3 Changes to Site Conditions

Based on the site inspection conducted as part of the five-year review, conditions at Site 16 have not changed and no other new information is known that may affect the protectiveness of the remedy. No

newly identified human health or ecological risks have been identified and there have been no natural disasters that have impacted the site in a way that decreases the effectiveness of the remedy.

6.6 Site 19 – Conveyor Belt Soil at Plant 1

6.6.1 Effectiveness of Remedy

Results of the five-year review indicate that the remedy is functioning as intended by the ROD and is protective of human health and the environment. The selected remedy at Site 19 included the dismantling and disposal of the conveyor belt and removing explosives-contaminated soil. Institutional controls were implemented at the site to prohibit residential development and these controls are protective of human health and the environment. Figure 6-6 is a photograph of Site 19 following completion of the remedial action.

6.6.2 Remedy Selection Criteria

Since the remedial action at Site 19 has been completed, ARARs identified during the RI/FS have been met and there have been no changes in the ARARs that affect the protectiveness of the remedy. RAOs developed for this site during the RI/FS have been achieved through the implementation of the remedial action. Based on results of the five-year review, there have been no changes in exposure pathways and no new contaminants or contaminant sources have been identified.

6.6.3 Changes to Site Conditions

Based on the site inspection conducted as part of the five-year review, conditions at Site 19 have not changed and no other new information is known that may affect the protectiveness of the remedy. No newly identified human health or ecological risks have been identified and there have been no natural disasters that have impacted the site in a way that decreases the effectiveness of the remedy.

7.0 ISSUES

No issues or deficiencies were identified during this five-year review.

8.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

8.1 Site 1 – Dudley Road Landfill

Based on a comprehensive review of available site data, the implemented remedy is protective of human health and the environment, and no additional action, besides continuing current institutional controls is recommended at this time. Continued inspections of the landfill cover and long-term monitoring of groundwater, surface water, and sediment in accordance with the approved long-term monitoring plan is also recommended. An evaluation of the long-term monitoring program should be completed prior to, or as part of, the next five-year review. Signs shall be posted at the site to facilitate regional inspections and to protect the integrity of the remedial activities.

8.2 Site 6 – Explosives-Contaminated Wastewater Impoundment

Following completion of the remedial action, the selected remedy will be protective of human health and the environment. Continued implementation of institutional controls and long-term monitoring of groundwater, surface water, and sediment in accordance with the approved long-term monitoring plan is recommended. An evaluation of the long-term monitoring program should be completed prior to, or as part of, the next five-year review. Signs shall be posted at the site to facilitate regional inspections and to protect the integrity of the remedial activities.

8.3 Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area

Based on a comprehensive review of available site data, the implemented remedy is protective of human health and the environment, and no additional action, besides continuing current institutional controls is recommended at this time. Continued long-term monitoring of groundwater in accordance with the approved long-term monitoring plan is also recommended. An evaluation of the long-term monitoring program should be completed prior to, or as part of, the next five-year review. Signs shall be posted at the site to facilitate regional inspections and to protect the integrity of the remedial activities.

8.4 Site 12 – Barracks Road Landfill

Based on a comprehensive review of available site data, the implemented remedy is protective of human health and the environment, and no additional action, besides continuing current institutional controls is recommended at this time. Continued inspections of the landfill cap and long-term monitoring of groundwater and sediment in accordance with the approved long-term monitoring plan is also recommended. An evaluation of the long-term monitoring program should be completed prior to, or as

part of, the next five-year review. Signs shall be posted at the site to facilitate regional inspections and to protect the integrity of the remedial activities.

8.5 Site 16 – West Road Landfill

Based on a comprehensive review of available site data, the implemented remedy is protective of human health and the environment, and no additional action, besides continuing current institutional controls, is recommended at this time. Signs shall be posted at the site to facilitate regional inspections and to protect the integrity of the remedial activities.

8.6 Site 19 – Conveyor Belt Soil at Plant 1

Based on a comprehensive review of available site data, the implemented remedy is protective of human health and the environment, and no additional action, besides continuing current institutional controls, is recommended at this time. Signs shall be posted at the site to facilitate regional inspections and to protect the integrity of the remedial activities.

9.0 PROTECTIVENESS STATEMENTS

Remedial actions at Sites 1, 7, 12, 16, and 19 have been completed. Remedial activities at Site 6 are in the third phase of a multi-phase project. Upon completion of the remedial action, the site will be protective of human health and the environment.

9.1 Site 1 – Dudley Road Landfill

Since the remedial action at Site 1 is protective, the site is protective of human health and the environment.

9.2 Site 6 – Explosives-Contaminated Wastewater Impoundment

The selected remedy at Site 6 is not yet completed. The remedy is expected to be protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

9.3 Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area

Since the remedial action at Site 7 is protective, the site is protective of human health and the environment.

9.4 Site 12 – Barracks Road Landfill

Since the remedial action at Site 12 is protective, the site is protective of human health and the environment.

9.5 Site 16 – West Road Landfill

Since the remedial action at Site 16 is protective, the site is protective of human health and the environment.

9.6 Site 19 – Conveyor Belt Soil at Plant 1

Since the remedial action at Site 19 is protective, the site is protective of human health and the environment.

10.0 NEXT FIVE-YEAR REVIEW

The next five-year review for Sites 1, 6, 7, 12, 16, and 19 is required by September 2007, five years from the date of this review. The next five-year review will cover all remedial activities not covered under the current review up through the time that the review in 2007 is completed.

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TABLE 5-1
POTENTIAL LOCATION- AND ACTION-SPECIFIC ARARs AND TBCs
FIVE-YEAR REVIEW REPORT
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

CITATION	COMMENTS	ROD ASSESSMENT	FIVE-YEAR REVIEW ASSESSMENT
LOCATION-SPECIFIC			
The Endangered Species Act of 1973 (16 USC 1531) (40 CFR Part 502)	Requires action to conserve endangered and threatened species and their critical habitats.	Potentially applicable at Site 12.	No significant changes.
Archaeological Resources Protection Act of 1979 (16 U.S.C 470aa-mm) (32 CFR Part 229; 43 CFR Part 7)	Archaeological resources encountered during excavation must be reviewed by Federal and Commonwealth archaeologists to determine if such resources should be preserved.	Potentially applicable at Sites 1 and 19.	No significant changes.
National Historic Preservation Act (32 CFR Parts 229 and 229.4; 43 CFR Parts 107 and 171.1-5)	Develops procedures for the protection of archaeological resources. Applicable to any excavation on site. If archaeological resources are encountered during soil excavation, they must be reviewed by Federal and Commonwealth archaeologists.	Potentially applicable at Sites 1, 6, and 12.	No significant changes.
Executive Order 11990, Protection of Wetlands; 40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6), and 6(c); 40 CFR 6.302 (a)	Action to minimize the destruction, loss, or degradation of wetlands.	Potentially applicable at Sites 1, 6, 12, and 19.	No significant changes.
Hazardous Waste Permit Program: The Flood Plain Standard 40 CFR 270.14(b)(II)(iii)	Information concerning the location of Site 12 with respect to the 100 year flood plain.	Potentially applicable at Site 12.	No significant changes.
Clean Water Act, Section 404; 40 CFR 230.10; 40 CFR 231 (231.1, 231.2, 231.7, 231.8)	Action to prohibit discharge of dredged or fill material into wetland without permit.	Potentially applicable at Sites 1, 6, and 19.	No significant changes.
Migratory Bird Treaty Act (16 U.S.C. 703-712)	Action to prohibit any disturbance to nesting sites of listed migratory birds will be implemented.	Potentially applicable at Site 6.	No significant changes.
Groundwater Protection Strategy	EPA policy to protect groundwater for its highest present or potential beneficial use. The strategy designates three categories of groundwater: Class 1 – Special Ground Waters Class 2 – Current and Potential Sources of Drinking Water and Waters Having Other Beneficial Uses Class 3 – Groundwater Not a Potential Source of Drinking Water and of Limited Beneficial Use	TBC requirement. Groundwater in the surficial aquifer is considered a Class 3.	No significant changes. Groundwater is monitored at Sites 1, 6, 7, and 12.

TABLE 5-1
POTENTIAL LOCATION- AND ACTION-SPECIFIC ARARs AND TBCs
FIVE-YEAR REVIEW REPORT
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

CITATION	COMMENTS	ROD ASSESSMENT	FIVE-YEAR REVIEW ASSESSMENT
LOCATION-SPECIFIC (Continued)			
Virginia Wetlands Regulations (4VAC20-390-10)	Regulates activities that impact wetlands.	Potentially applicable to activities that could impact site wetlands at Sites 1, 6, 12, and 19.	No significant changes.
Virginia Endangered Species Act and Virginia Board of Game and Inland Fisheries §3.1-1020 to 1030 and 2VAC5-320-10	Action to conserve endangered species or threatened species, including consultation with the Virginia Department of Game and Inland Fisheries, the Virginia Department of Agriculture and Consumer Services, and the Virginia Department of Conservation and Recreation.	Potentially applicable at Site 12.	No significant changes.
Virginia Water Protection Permit Regulations (9VAC25-200-10)	Delineates the procedures and requirements to be followed in connection with activities such as dredging, filling, or discharging any pollutant into, or adjacent to, surface waters, or any activity which impacts the physical, chemical, or biological properties of surface water (including wetlands).	Potentially applicable at Site 12.	No significant changes.
Chesapeake Bay Preservation Act, Code of Va. Sec. 10.1-2100 et seq., and the Chesapeake Bay Preservation Area Designation and Management Regulations (CBPA Regulations) (9VAC10-20-10 to 280)	Requires that certain locally designated tidal and non-tidal wetlands, as well as other sensitive land areas, be subject to limitations regarding land-disturbing activities, removal of vegetation, use of impervious cover, erosion and sediment control, stormwater management, and other aspects of land use that may have effects on water quality.	Potentially applicable at Site 12.	No significant changes.
ACTION-SPECIFIC			
Department of Transportation Rules for Hazardous Materials Transport 49 CFR 51	Regulates the transport of hazardous waste materials including packaging, shipping, and placarding.	Potentially applicable at Sites 12 and 19.	No significant changes.
Resource Conservation and Recovery Act (RCRA) Subtitle C	Regulates the treatment, storage, and disposal of hazardous waste.	Potentially applicable at Sites 1, 6, 12, and 19.	No significant changes.
Identification and Listing of Hazardous Waste (40 CFR Part 261)	Regulations concerning determination of whether or not a waste is hazardous based on characteristics or listing.	Applicable in determining waste classification.	No significant changes.

TABLE 5-1
POTENTIAL LOCATION- AND ACTION-SPECIFIC ARARs AND TBCs
FIVE-YEAR REVIEW REPORT
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

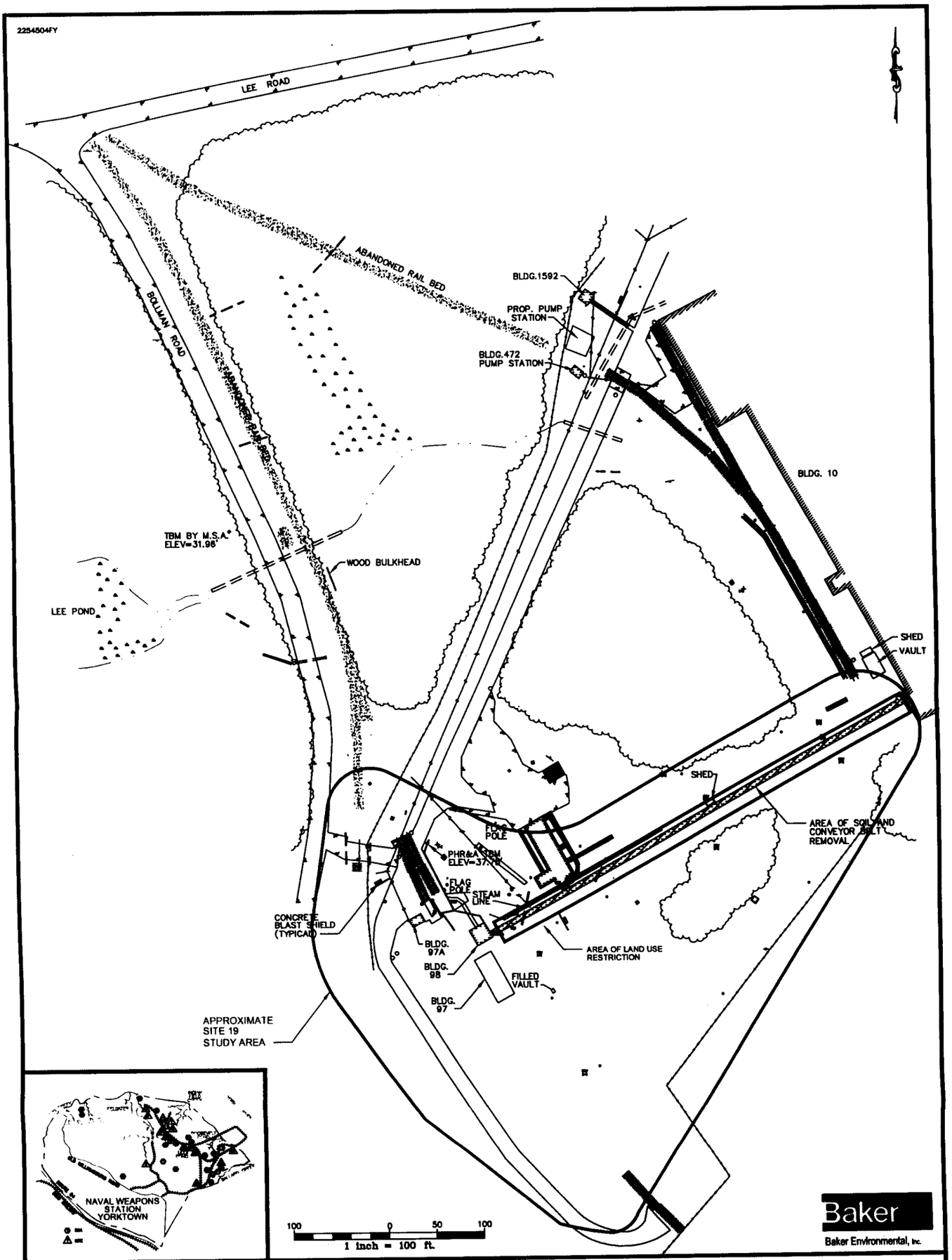
CITATION	COMMENTS	ROD ASSESSMENT	FIVE-YEAR REVIEW ASSESSMENT
ACTION-SPECIFIC (Continued)			
Treatment, Storage, and Disposal (TSD) of Hazardous Waste (40 CFR Parts 262-265, 266)	Regulates the treatment, storage, and disposal of hazardous waste.	Applicable in the event that wastes on site are classified as hazardous.	No significant changes.
Manifest Systems, Recordkeeping, and Reporting (40 CFR Part 264, Subpart E)	Regulates manifest systems related to hazardous waste treatment, storage, and disposal.	Applicable to remedial actions where hazardous waste is generated or transported.	No significant changes.
Releases from Solid Waste Management Units (40 CFR Part 264, Subpart F)	Regulates releases from solid waste management units.	All solid waste management units on site shall comply with requirements.	No significant changes.
Closure and Post-Closure (40 CFR Part 264, Subpart G)	Concerns the applicability of closure performance standards disposal, certification of closure, and post-closure care.	Potentially applicable at Site 19.	No significant changes.
Use and Management of Containers (40 CFR Part 264, Subpart I)	Regulates use and management of containers being stored at all hazardous waste facilities.	Applicable to containers stored on site.	No significant changes.
Surface Impoundments (40 CFR Part 264, Subpart K)	Regulates design, operating requirements, actions concerning leakage, rates, closure, and post-closure care.	Potentially applicable at Site 19.	No significant changes.
Land Treatment (40 CFR 264, Subpart M)	Regulates design, treatment demonstration, operating equipment, monitoring, and closure and post-closure care of the treatment cell and treatment area.	Potentially applicable at Site 6.	No significant changes.
National Emissions Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 61)	Standards promulgated under the Clean Air Act for significant sources of hazardous pollutants, such as vinyl chloride, benzene, trichloroethylene, dichlorobenzene, asbestos, and other hazardous substances. Considered for any source that has the potential to emit 10 tons of any hazardous air pollutant or 25 tons of a combination of hazardous air pollutants per year.	Applicable to releases or potential releases of hazardous pollutants.	No significant changes.

TABLE 5-1
POTENTIAL LOCATION- AND ACTION-SPECIFIC ARARs AND TBCs
FIVE-YEAR REVIEW REPORT
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

CITATION	COMMENTS	ROD ASSESSMENT	FIVE-YEAR REVIEW ASSESSMENT
ACTION-SPECIFIC (Continued)			
Toxic Substance Control Act (TSCA) – PCB Spill Cleanup Policy (40 CFR Part 761)	Establishes the measure which EPA considers to be adequate cleanup for PCB contaminated sites.	Applicable to Site 12 Area A where PCBs were detected in soil samples.	No significant changes.
National Ambient Air Quality Standards (NAAQS) (40 CFR 50)	Standards for the following six criteria pollutants: particulates matter; sulfur dioxide, carbon monoxide; ozone; nitrogen dioxide; and lead. The attainment and maintenance of these standards are required to protect the public health and welfare.	TBC requirement.	No significant changes.
Virginia Solid Waste Management Regulations (9VAC20-80-10 to 790)	Regulates the disposal of solid wastes.	Applicable for solid (nonhazardous) waste.	No significant changes.
Virginia Hazardous Waste Management Regulations (9VAC20-60-10 to 1505)	Regulates the treatment, storage, and disposal of hazardous waste.	Applicable to remedial actions involving treatment, storage, or disposal of hazardous waste.	No significant changes.
Identification and Listing of Hazardous Waste (9VAC20-60-260)	Regulations concerning determination of whether a waste is hazardous based on characteristics or listing.	Applicable in determining waste classification.	No significant changes.
Releases from Solid Waste Management Units (9VAC20-60-790)	Regulates releases from solid waste management units.	All solid waste management units on site shall comply with requirements.	No significant changes.
Closure and Post-Closure (9VAC20-60-800)	Applies to the closure and post-closure care to prevent escape of hazardous waste to the environment.	Applicable for hazardous waste landfills.	No significant changes.
Use and Management of Containers (9VAC20-60-820)	Regulates use and management of containers being stored at all hazardous waste facilities.	Applicable to containers stored on site.	No significant changes.
Surface Impoundments (9VAC20-60-840)	Regulates design, operating requirements, actions concerning leakage, rates, closure, and post-closure care.	Potentially applicable at Site 19.	No significant changes.

TABLE 5-1
POTENTIAL LOCATION- AND ACTION-SPECIFIC ARARs AND TBCs
FIVE-YEAR REVIEW REPORT
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

CITATION	COMMENTS	ROD ASSESSMENT	FIVE-YEAR REVIEW ASSESSMENT
ACTION-SPECIFIC (Continued)			
Virginia Water Quality Standards (9VAC25-260-5 to 550)	Surface water quality standards based on water use and criteria class of surface water.	Applicable to remedial actions requiring discharge to surface water.	No significant changes.
Virginia Solid Waste Management Regulations (9VAC20-80-10)	Regulates the disposal of solid wastes.	Applicable for solid (nonhazardous) waste.	No significant changes.
Virginia Stormwater Management Regulations (4VAC3-20-10) and Virginia Erosion and Sediment Control Regulations (4VAC50-30-10)	Regulates stormwater management and erosion/sedimentation control practices that must be followed during land disturbing activities.	Applicable for remedial actions involving land disturbing activities.	No significant changes.



LEGEND

— · — · — – INTERMITTENT CREEK

——— – APPROXIMATE LIMIT OF STUDY AREA

——— – LAND USE RESTRICTION AREA

SOURCE: PATTON, HARRIS, RUST & ASSOCIATES, 1995.

FIGURE 3-6
VICINITY MAP FOR SITE 19

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

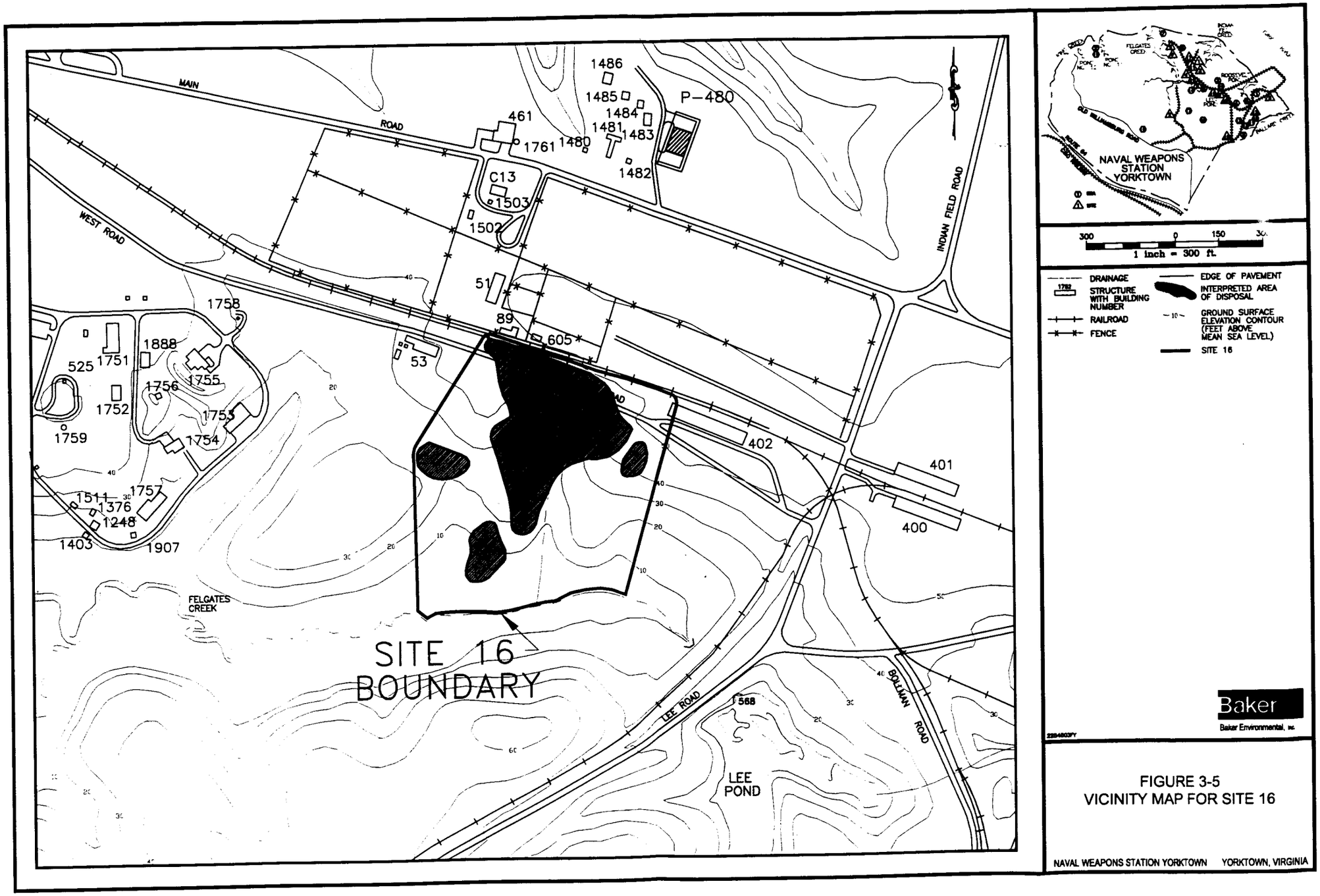


FIGURE 3-5
VICINITY MAP FOR SITE 16

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

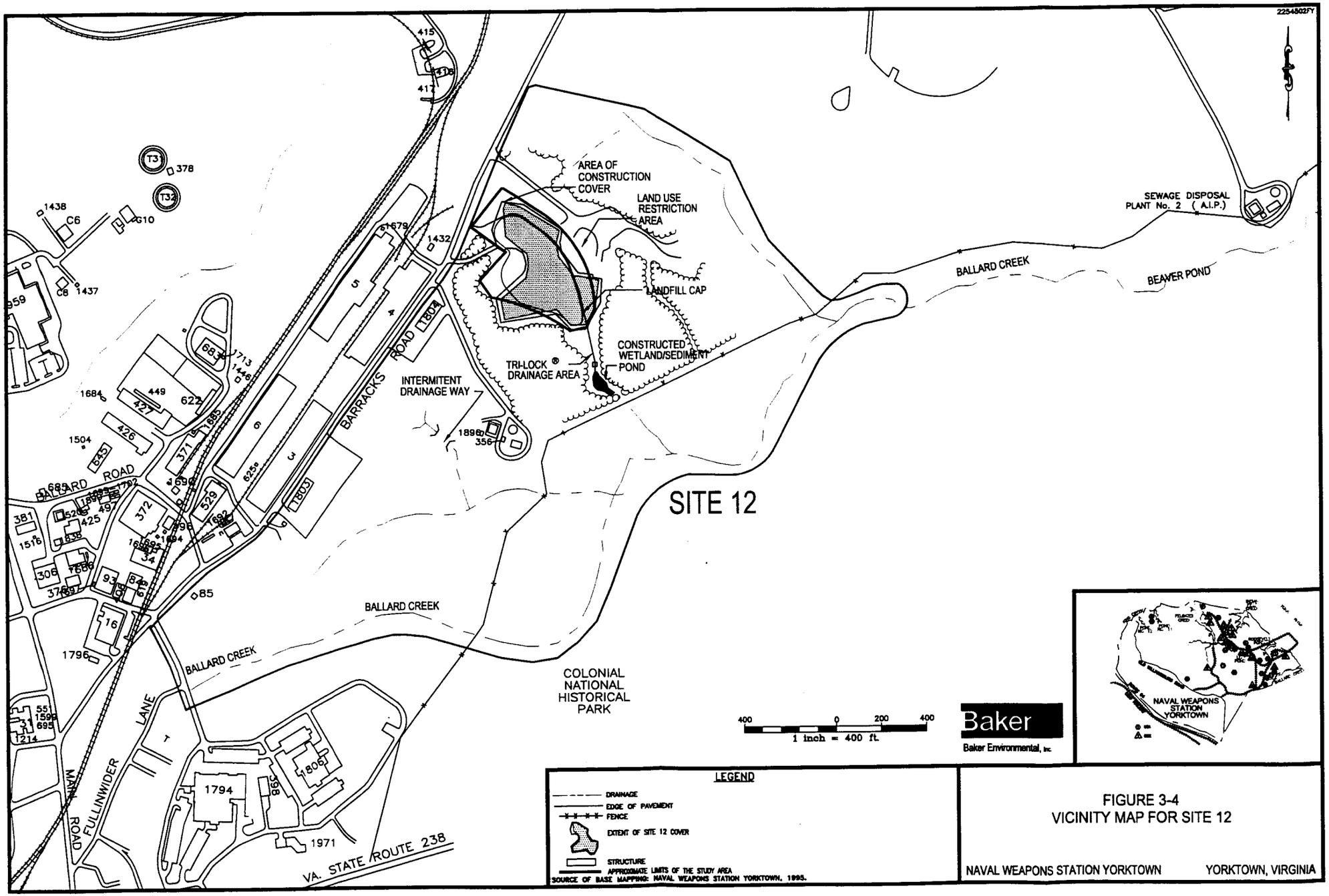


FIGURE 3-4
VICINITY MAP FOR SITE 12

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

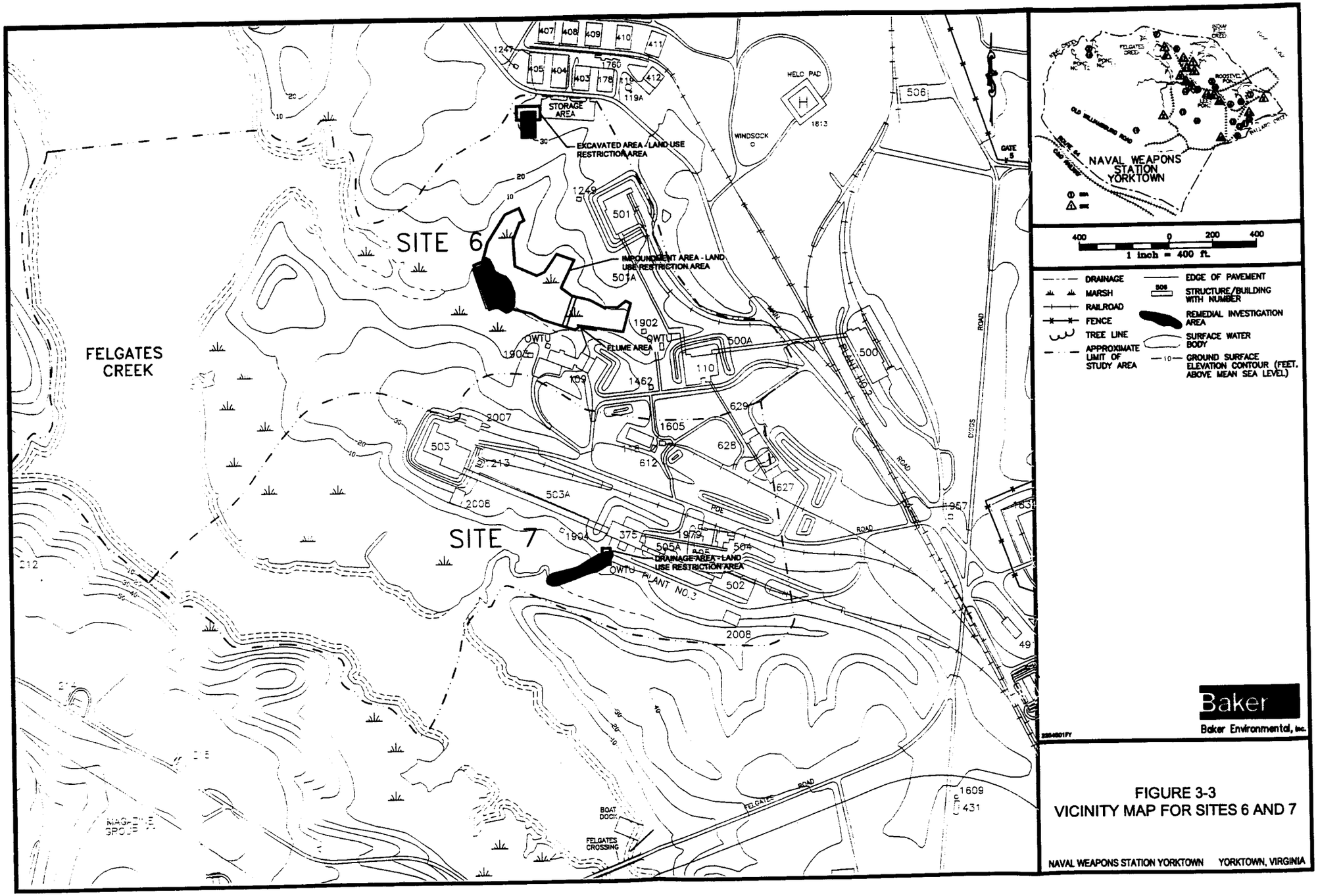


FIGURE 3-3
VICINITY MAP FOR SITES 6 AND 7

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

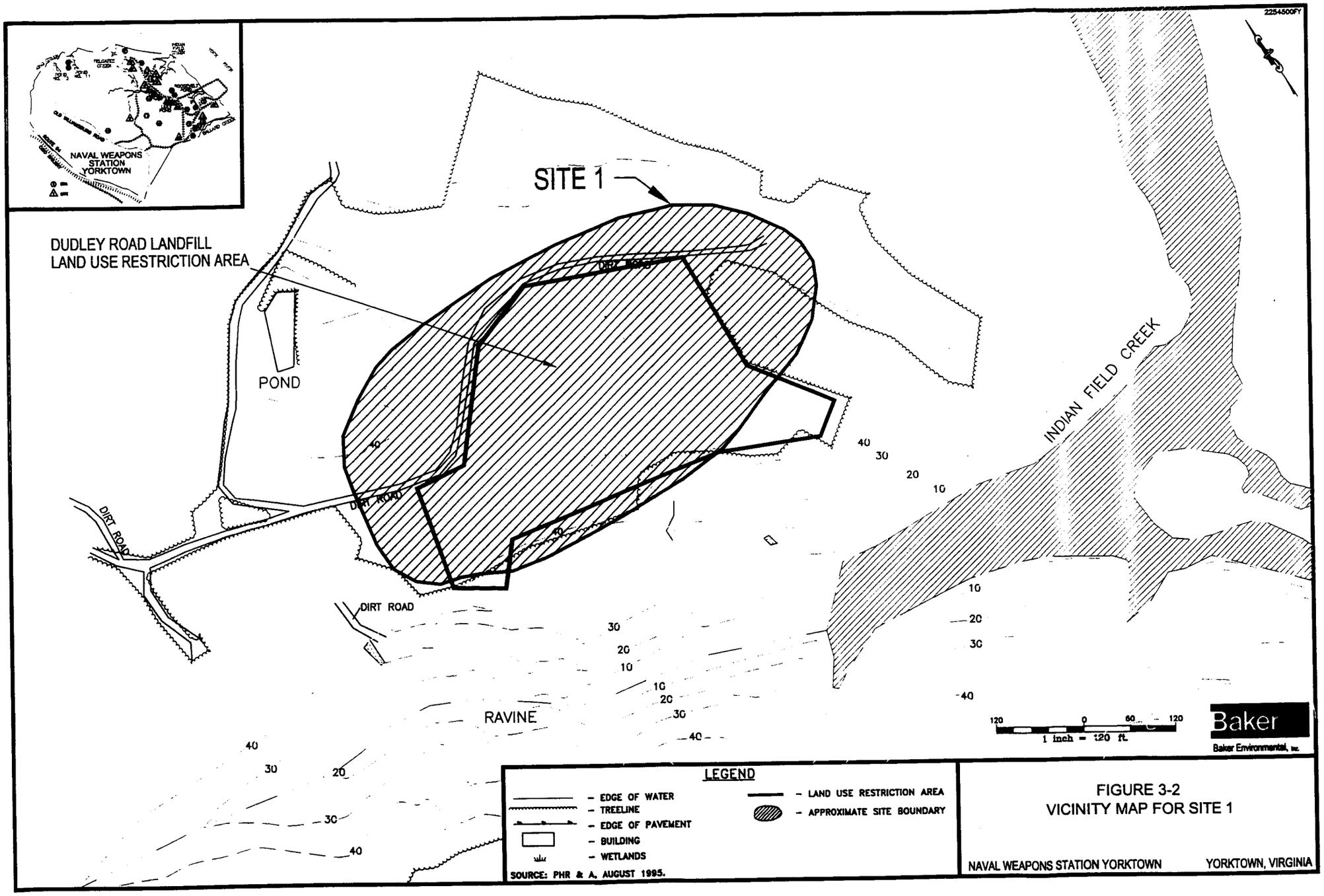

2254500FY
NAVAL WEAPONS STATION YORKTOWN
SITE 1
DUDLEY ROAD LANDFILL
LAND USE RESTRICTION AREA
POND
DIRT ROAD
DIRT ROAD
DIRT ROAD
DIRT ROAD
INDIAN FIELD CREEK
RAVINE
40
30
20
10
10
20
30
40
120 0 60 120
1 inch = 120 ft.
Baker
Baker Environmental, Inc.
LEGEND
- EDGE OF WATER
- TREELINE
- EDGE OF PAVEMENT
- BUILDING
- WETLANDS
- LAND USE RESTRICTION AREA
- APPROXIMATE SITE BOUNDARY
SOURCE: PHR & A, AUGUST 1995.
FIGURE 3-2
VICINITY MAP FOR SITE 1
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

FIGURE 6-1
SITE 1 PHOTOGRAPH
NAVAL WEAPONS STATION YORKTOWN

Baker

FIGURE 6-2
SITE 6 PHOTOGRAPH
NAVAL WEAPONS STATION YORKTOWN

Baker

FIGURE 6-3
SITE 7 PHOTOGRAPH
NAVAL WEAPONS STATION YORKTOWN

Baker

FIGURE 6-4
SITE 12 PHOTOGRAPH
NAVAL WEAPONS STATION YORKTOWN

Baker

FIGURE 6-5
SITE 16 PHOTOGRAPH
NAVAL WEAPONS STATION YORKTOWN

Baker

FIGURE 6-6
SITE 19 PHOTOGRAPH
NAVAL WEAPONS STATION YORKTOWN

Baker