NWS Yorktown Pier Area along York River, present day

INTRODUCTION

Naval Weapons Station (NWS) Yorktown encompasses 13,250 acres on the Virginia Peninsula in York and James City counties and the City of Newport News, Virginia.

The site of the Installation was acquired on August 7, 1918, and at that time it was the largest naval installation in the world. The Installation was originally named the Naval Mine Depot and its initial mission was to produce mines for the North Sea barrage during World War I. When the Armistice was signed on November 11, 1918, the Installation's mission evolved to receipt and storage of returned mines and provision of ordnance support for the peacetime Navy.

During much of its history, NWS Yorktown hosted various tenant commands in support of their mission. In July 1919, an aviation training camp was established. Its landing field, Aviation Field Yorktown, was considered one of the best landing fields in the country at the time. Following the first World War, an aviation training school was established there to provide the first advanced aviation training for naval pilots in bombing, torpedo, and gunnery operations. 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, 1958, the Station's 40th anniversary, the name was changed to NWS Yorktown, in recognition of a much expanded mission for naval ordnance. As part of the Navy's Mid-Atlantic installation claimant consolidation, Cheatham Annex, formerly an annex of the Fleet Industrial Supply Center, Norfolk, was incorporated with the station on October 1, 1998. Cheatham Annex was commissioned in 1943 for use as an assembly and shipping point for materials being shipped overseas during World War II.

Today the Installation is a hub of activity. The Installation and its tenant commands work together as a team to provide ordnance logistics, technical, supply and related services to the Atlantic Fleet. NWS Yorktown hosts 37 tenant commands which include the Navy Munitions

Installation Mission

To provide responsive, quality support for explosive ordnance storage, maintenance, logistics, research and development, and support services; expeditionary logistics training and operations; warfare training for Sailors, Marines, and other Services; and to serve as a premier recreational destination for servicemembers and dependents.

Aerial View of NWS Yorktown (present day)

Command, Navy Munitions Command CONUS East Division, the Naval Ophthalmic Support and Training Activity, the Marine Corps Security Force Regiment, Fleet Industrial Supply Center, Navy Expeditionary Logistics Support Group, Naval Expeditionary Medical Support Command, Navy Cargo Handling Battalion One and 19 departments. Additionally, Cheatham Annex is home to the largest Morale, Welfare and Recreation Outdoor Recreation facility on the East Coast.

Current land use throughout much of the Installation is restricted within explosive safety quantity distance arcs of munitions storage areas. Much of the Installation is wooded and dissected by ravines and tributaries that drain to the York River. Several ponds are used for catch-and-release fishing.

The community surrounding the Installation is made up primarily of residences and recreational space, with some commercial and industrial areas. The Installation shares almost 14 miles of the York River shoreline with the National Park Service (NPS). The York River is heavily used for both commercial and recreational fishing and boating.

BACKGROUND

NWS Yorktown was added to the National Priorities List (NPL) in 1992 and Cheatham Annex was added to the NPL in 2001. Federal Facility Agreements were signed for NWS Yorktown and Cheatham Annex in 1995 and 2005, respectively, after which Environmental Restoration Program (ERP) Partnering Teams were chartered to streamline closure of ERP sites by using consensus-based site management strategies following the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

Although Cheatham Annex has been incorporated into NWS Yorktown, a separate partnering team manages the ERP for Cheatham Annex because the annex has its own Federal Facility Agreement.

The partnering teams consist of representatives from Navy Facilities Engineering Command (NAVFAC), United States Environmental Protection Agency (USEPA), Virginia Department of Environmental Quality (VDEQ). The teams are supported by Navy technical and legal experts and a variety of specialized environmental contractors. Each team works in accordance with a Partnering Deliverable, which

outlines the team's framework for implementing the ERP and includes the team's Mission, Goals, and Measures of Success. The teams meet 4 to 6 times a year to set schedules with interim milestones and develop site strategies.

The Installation's community involvement program for the ERP includes the Restoration Advisory Board (RAB), created in 1994. The RAB is co-chaired by the Installation's Commanding Officer and a community member. The RABs meet semi-annually to provide an information exchange between community members, the Navy, USEPA, and VDEQ. In addition, the Installation connects with the community through public meetings, two public websites, an Information Repository at the Yorktown Public Library, fact sheets, and announcements in the local paper.

Environmental Restoration at NWS Yorktown is challenging due to the Installation's mission, size, and environmental conditions.

To date, 85 potentially contaminated Installation Restoration and Munitions Response sites, solid waste management units, and areas of concern (AOCs) have been identified for evaluation based on previous assessments and investigations. Sixty-one of those sites have been closed with No Further Action. Of the 24 active ERP sites, more than half are currently in the Remedial Investigation (RI)/Feasibility Study (FS) phase, and a majority of the sites are complex as a result of multimedia contamination, a variety of contaminants and challenging physical characteristics. Seventy-five percent of the Installation is located within restricted areas of explosive safety quantity distance arcs of munitions storage areas. Much of the landscape is bisected by water bodies and ravines. The historical activities conducted at the site have resulted in a wide range of contaminants requiring cleanup including volatile organic compounds (VOCs), semivolatile organic compounds, pesticides, polychlorinated biphenyls, metals, explosives constituents, dioxins/furans, per- and polyfluoroalkyl substances (PFAS), radiological constituents, and munitions and explosives of concern (MEC). Additionally, the ERP faced challenges resulting from several partnering team member changes during the achievement period.

Despite the challenges, the ERP for the Installation continued to progress the sites through the CERCLA process. During the achievement period 5 work plans, 9 sampling and analysis plans, 1 RI report, 1 FS, 1 removal action completion report, 1 proposed plan, and 1 record of decision were finalized.

The key initiatives for the ERP during this achievement period included:

- Initiation of a PFAS Preliminary Assessment to identify potential PFAS sources, identify areas requiring investigation, identify potential receptors and migration pathways, evaluate the need for an expedited response, and set priorities for an Installation-wide Site Inspection (SI) for PFAS in accordance with the EPA's Unregulated Contaminant Monitoring Regulation 3 (UCMR 3).
- Enhancement of Green and Sustainable Remediation (GSR) practices to reduce potential negative environmental, societal, and economic impacts that could occur during or as a result of environmental restoration while ensuring all regulatory requirements are met.
- Enhancement of ongoing public awareness and engagement in the cleanup.

Environmental Restoration at NWS Yorktown is conducted in accordance with the following agreements:

- **NWS Yorktown Federal Facility Agreement (September 1994)**
- **Cheatham Annex Federal Facility Agreement (March 2005)**
- **NWS Yorktown Site Management Plan (November 2019)**
- **Cheatham Annex Site Management Plan (November 2019)**
- **NWS Yorktown Fourth Five-year Review Report (March 2018)**
- **NWS Yorktown/Cheatham Annex Community Involvement Plan (November 2014)**

SUMMARY OF ACCOMPLISHMENTS

Accelerated Environmental Cleanup

During this achievement period two areas (approximately 18 acres) were released for unrestricted use/unlimited exposure (UU/UE):

NWS Yorktown Munitions Response Site UXO 3: UXO 3 consists of the remnants of a former wooden pier area where only pilings remain below the water surface (former Pier R-1) along the shoreline of the York River at NWS Yorktown. Former Pier R-1 consisted of a 1,100-foot-long trestle and 600-foot-long berthing area. Construction of Pier R-1 was completed in 1920 to facilitate munitions loading to ships. By the 1970s Pier R-1 was used for recreational purposes and by the early 2000s the pier had been destroyed by a hurricane.

An SI was conducted from 2013 through 2016 for UXO 3 to investigate the potential for discarded military munitions to be present as a result of undocumented releases during historical loading operations. The investigation area included a buffer around Pier R-1 and an associated small boat landing. No MEC or MEC-related items were identified during the investigation and an After Action Report documented a no further action determination for current land use around the inspected approximate 17-acre study area. As a result, the active pier, which is adjacent to the Pier R-1 area, is no longer encumbered by any restrictions at the Pier R-1 area.

Cheatham Annex AOC 1 North: Site AOC 1 North is a wooded 0.75 acre debris disposal area. Waste, including railroad ties, metal, and empty drums remained in place and was identified as a potential source for potential unacceptable future risk. The site is unrestricted to Navy personnel and recreational users who use a nearby pond for recreation.

After evaluating several alternatives, the team decided to excavate and dispose of the waste. This removal action allows for UU/UE and does not require ongoing inspections and maintenance to ensure long-term protectiveness.

During removal activities, 290 tons of concrete debris and 237 tons of zinc-contaminated soil at the AOC were removed. Confirmation samples indicated that no unacceptable risk to human health or the environment remained and no further action for AOC 1 North is required. The approximate 1-acre site has been returned to the Installation for UU/UE.

Cheatham Annex AOC 1 After Site Restoration

Munitions loading operations along Pier R-1 circa 1920

Separating Concrete for Recycling at Cheatham Annex AOC 1

Innovative Technology Demonstration/ Validation and Implementation

NWS Yorktown Sites 9 and 19 Passive Soil Gas Sampling: Sites 9 and 19 were used for mine loading activities from the late 1930s through the 1990s. Historical site documentation indicates that organic solvents, explosives, and metals were used in the mine preparation and loading activities performed in the former buildings and structures at the sites. During RI field activities, elevated VOC concentrations were observed in surface water samples collected from a drainage channel to the east of a former building; however, the source of the VOCs was not known. Therefore, passive soil sampling was used to identify a potential source area.

Passive soil gas surveys utilize adsorbent samplers that are placed in the subsurface to adsorb VOCs in soil gas without forcing the flow rate of gas, in order to yield a more representative sample than active soil gas methods. Use of the passive samplers allows sampling of all locations concurrently, helping to normalize the temporal variations in soil gas concentrations.

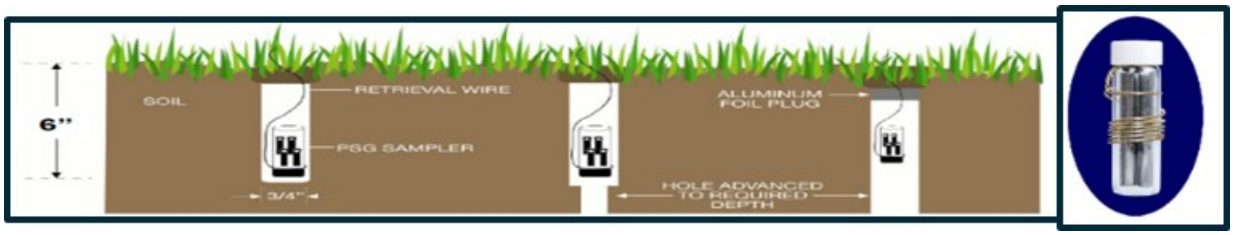
The samplers are able to provide data over a large area in a more cost-effective manner than using a more traditional method such as direct push technology sampling or membrane interface probe investigation. The results were used to refine the conceptual site model and select locations for installation of monitoring wells. The groundwater data collected from the monitoring wells correlated well with the results of the passive soil gas samples, which allowed for delineation of the groundwater plume and completion of the RI fieldwork phase.

Cheatham Annex Mobile Data Collection: Traditionally, field documentation is completed on paper at the job site. This documentation is later digitized and the digitized files are checked for accuracy. In an effort to increase efficiencies with field data collection, field forms were developed for use on field projects at Cheatham Annex. The field forms (Survey123) were used in conjunction with mobile mapping (collector) and the mobile Geographical Information System data collection methods resulted in unified, accurate, and centralized data collection, along with robust data sharing and presentation. The forms have since been used as templates for mobile data collection at nine other Navy installations.

Field team creating digital boring logs

Partnerships Addressing Environmental Restoration Issues Between DoD and Other Entities

The ERP coordinated with the NPS, which owns land adjacent to the Installation, to obtain an access agreement that allowed completion of the RI at NWS Yorktown Site 23. Site 23, an area used for debris disposal from the 1940s to 1960, is located along the Installation property boundary, with a portion of the site adjacent to The Colonial National Historical Parkway. An unnamed tributary to the York River flows through the site and drains to a wetland area that is also located on the NPS property.



Passive Soil Gas Samplers (Beacon Environmental Services, Inc., 2019)

NWS Yorktown Site 23 Location

In order to evaluate the potential contaminant migration pathway from the site to the wetland, sediment and surface water samples needed to be collected in the wetland. An agreement was reached with the NPS to access their property and collect the samples.

Reducing Risk to Human Health and the Environment

NWS Yorktown Site 24 Removal Action: Historically, Site 24 was utilized as an aviation field until 1927, after which it was used for storage of miscellaneous debris and munitions on the surface and in underground. The site is currently used as a Joint Improvised Explosive Device Defeat Organization battle course. RI activities conducted at the site identified potential unacceptable risks to human health and the environment due to buried debris and contaminated soil. A non-time-critical removal action was initiated in 2016 to remove and dispose of the debris and contaminated soil offsite. Discovery of unexpected munitions and radiological materials during the removal have resulted in delays while safety controls and a path forward to address the munitions and radiological materials have been developed. Although delays have been experienced, risk to human health and the environment has been reduced through removal and offsite disposal of the following during the achievement period without impacting base operations at the site:

- Approximately 4,900 tons of impacted soil
- Approximately 116 tons of munitions debris (Material Deemed as Safe)

NWS Yorktown Site 24 Munitions Items (Material Deemed as Safe) Removal and Inspection

NWS Yorktown Site 24 Removal Action Excavated Soil Loadout

Cheatham Annex AOC 8 Removal Action: AOC 8 covers approximately 1.5 acres along the York River. The exact history of the site is unknown but it is believed this area was a soil borrow pit, later used for debris disposal. The site contained both buried and surface debris which could be seen cropping out from the edge of the slope and along the York River beach. Due to increasing water levels and storm severity, the northeastern boundary of AOC 8 was eroding into the York River during severe storm events. Although site debris had not yet been deposited in the York River it was likely to occur in the future. To address these concerns, the team agreed to a Time-Critical Removal Action to remove the surface and subsurface debris. The removal action began in April 2018 and was completed in January 2019.

In total over 22,000 tons of non-hazardous soil and 17 tons of metal debris were removed from site. Site restoration was conducted in accordance with an invasive species control plan to provide habitat and food for wildlife. Diverse native species were planted to develop emergent areas, understory areas, and canopy areas at the site. A total of 1,254 trees and shrubs were planted in the understory and canopy areas, and 6,300 herbaceous plug species were planted in the emergent wetland areas.

Cheatham Annex AOC 8
During Removal Action

Cheatham Annex AOC 8
After Removal Action and Site Restoration

After Hurricane Michael passed through Virginia in October 2018, high winds, rain, and waves caused bank erosion and approximately 15 feet of washout along the shoreline of the York River extending towards the excavation area on the eastern side of the site. To increase the resiliency of the site, approximately 138 tons of riprap was installed along the shoreline in November 2018.

Green Remediation

The following Green and Sustainable Best Management Practices were implemented during removal actions to reduce both cost and environmental footprint without adversely impacting schedule:

- Debris/waste was recycled
  - 140 tons of metal debris
  - 21 truck-loads of trees and stumps
  - 1 drum of mercury activated batteries
- Vegetation was reused on site
  - 200 cubic yards were shredded using a chipper and reused as organic ground cover and habitat enhancement
  - 20 cubic yards were reserved and reconstructed in piles to serve as cover for birds, small mammals, and amphibians during site restoration
- An FS was prepared for Site 1 to evaluate treatment alternatives for groundwater. Included in the FS was an analysis of the environmental footprint of each alternative using Sitewise which was incorporated into the comparative analysis of alternatives. The analysis also identified best management practices to be considered after remedy selection.