FINAL WATER AREA MUNITIONS STUDY (WAM) NSWC INDIAN HEAD MD
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MALCOLM PIRNIE

FINAL
WATER AREA MUNITIONS STUDY
NAVAL DISTRICT WASHINGTON
INDIAN HEAD, MARYLAND

FEBRUARY 2005

Prepared for:

Naval District Washington, Indian Head
101 Strauss Ave
Indian Head, Maryland 20640-1542

Prepared by:

MALCOLM PIRNIE, INC.
300 East Lombard Street
Suite 610
Baltimore, MD 21202

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WATER AREA MUNITIONS STUDY
NAVAL DISTRICT WASHINGTON
INDIAN HEAD, MARYLAND

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Reviewed and Approved by:

for

Jeffrey R. Bennett, P.E., DEE
Program Officer
Malcolm Pirnie, Inc.

Heather Polinsky

Heather Polinsky
Program Manager
Malcolm Pirnie, Inc.

Malcolm Pirnie, Inc., prepared this report at the direction of Engineering Field Activity Northeast. This document should be used only with the approval of the Engineering Field Activity, Northeast. This report is based, in part, on information provided in other documents, and is subject to the limitations and qualifications presented in the referenced documents.

FEBRUARY 2005

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ACRONYMS

AMSL	At Mean Sea Level
AP	Armor Piercing
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
CD	Compact Disc
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CSM	Conceptual Site Model
CWM	Chemical Warfare Material
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DMM	Discarded Military Munitions
EFANE	Engineering Field Activity, Northeast
EO	Explosive Ordnance
EOD	Explosive Ordnance Disposal
FUDS	Formerly Used Defense Site
IH	Indian Head
LANTDIV	Atlantic Division
MEC	Munitions and Explosives of Concern
MC	Munitions Constituents
MD	Maryland
msl	Mean Sea Level
MRP	Munitions Response Program
NAVFAC	Naval Facilities Engineering Command
NDW	Naval District Washington
RG	Record Groups
RPM	Remedial Project Manager
TNT	Trinitrotoluene
U.S.	United States
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers

USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
WAMS	Water Area Munitions Study
°F	Degrees Fahrenheit

GLOSSARY OF TERMS

Base Realignment and Closure (BRAC) – A Department of Defense (DoD) program that focuses on compliance and cleanup efforts at military installations undergoing closure or re-alignment, as authorized by Congress in four rounds of base closures for 1988, 1991, 1993, and 1995. (Defense Environmental Restoration Program [DERP] Management Guidance, September, 2001)

Closed Range – A range that has been taken out of service as a range and that either has been put to new uses that are incompatible with range activities or is not considered by the military to be a potential range area. A closed range is still under the control of a DoD component. (DERP Management Guidance, September, 2001)

Defense Site – All locations that are or were owned by, leased to, or otherwise possessed or used by the DoD. The term does not include any operational range, operating storage or manufacturing facility, or facility that is used or was permitted for the treatment or disposal of military munitions. (10 United States Code [U.S.C.] 2710(e)(1))

Discarded Military Munitions – Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 U.S.C. 2710(e)(2))

Explosive Ordnance Disposal (EOD) – The detection, identification, field evaluation, rendering-safe, recovery, and final disposal of unexploded explosive ordnance (UXO). It may also include the rendering-safe and/or disposal of EO (explosive ordnance) which has become hazardous by damage or deterioration, when disposal of such EO requires techniques, procedures, or equipment which exceed the normal requirements for routine disposal. (OPNAVINST 8027.1G, 14 Feb 92)

Explosives Safety – A condition where operational capability and readiness, personnel, property, and the environment are protected from the unacceptable effects of an ammunition or explosives mishap. (DoD Directive 6055.9 July 1996)

Formerly Used Defense Site (FUDS) – Real property that was formerly owned by, leased by, possessed by, or otherwise under the jurisdiction of the Secretary of Defense or the Components (including governmental entities that are the legal predecessors of DoD or the Components) and those real properties where accountability rested with DoD but where activities at the property were conducted by contractors (i.e., government-owned, contractor-operated (GOCO) properties) that were transferred from DoD control prior to October 17, 1986. The status of a site as a FUDS is irrespective of current ownership or current responsibility within the federal government. (DERP Management Guidance, September, 2001)

Munitions Constituents (MC) – Any materials originating from unexploded ordnance, discarded military munitions or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 U.S.C. 2710 (e)(4))

Munitions and Explosives of Concern (MEC) – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: unexploded ordnance, discarded military munitions or munitions constituents (e.g., Trinitrotoluene [TNT], Cyclotrimethylenetrinitramine) present in high enough concentrations to pose an explosive hazard. (OUSD(AT&L) 18 December 2003)

Operational Range – A range that is under the jurisdiction, custody, or control of the Secretary of Defense and that is used for range activities, or although not currently being used for range activities, that is still considered by the Secretary to be a range and has not been put to a new use that is incompatible with range activities. (10 U.S.C. 101 (e)(3))

Other than Operational Range – Encompasses closed, transferred and transferring ranges.

Range – A designated land or water area set aside, managed, and used for range activities of the DoD. Ranges include firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access and exclusionary

areas, and airspace areas designated for military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration. (10 U.S.C. 101 (e)(3))

Transferred Range – A property formerly used as a military range that is no longer under military control and had been leased by the DoD, transferred, or returned from the DoD to another entity, including federal entities. This includes a range that is no longer under military control but was used under the terms of a withdrawal, executive order, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the federal land manager. (DERP Management Guidance, September, 2001)

Transferring Range – A range that is proposed to be transferred or returned from the DoD to another entity, including federal entities. This includes a range that is used under the terms of a withdrawal, executive order, act of Congress, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the federal land manager or property owner. An operational or closed range will not be considered a "transferring range" until the transfer is imminent. (DERP Management Guidance, September, 2001)

Unexploded Ordnance – Military munitions that have been primed, fused, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded either by malfunction, design, or any other cause. (10 U.S.C. 101(e)(5)).

EXECUTIVE SUMMARY

The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program (DERP) to address munitions and explosives of concern (MEC) (including unexploded ordnance (UXO) and discarded military munitions (DMM)) and munitions constituents (MC) at other than operational military ranges and other sites. Closed, transferred, and transferring military ranges and sites not located on an operational range are considered other than operational. This report addresses other than operational ranges and sites at an active installation. It may include transferring and/or transferred ranges and munitions disposal sites associated with an active installation if they are not included in BRAC or FUDS.

However, by definition munitions related sites located in water are not addressed under the MMRP. For example, deep-sea sites including former munitions disposal areas and ranges are not addressed under the MMRP. In order to document the history of these areas in a standard format, a Water Area Munitions Study (WAMS) report is compiled. This report represents the WAMS for the other than operational ranges associated with the Naval District Washington (NDW), Indian Head (IH).

NDW, IH is located in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, D.C and consists of both the Main Installation and the Stump Neck Annex. The 2,300-acre Main Installation is located at the point of a peninsula known as Cornwallis Neck, located at the confluence of the Potomac River and the Mattawoman Creek. The neighboring 1,100-acre Stump Neck Annex is located across Mattawoman Creek (to the south) from the Main Installation.

Activity at the Main Installation is reported to date back to 1890. The Main Installation has a varied history that covers most aspects of gun and weapons proving and powder and propellant development, manufacturing and testing. The Stump Neck Annex was acquired by the Navy in 1901 to support the growing activities of the Main Installation.

This WAMS Report includes five other than operational ranges at NDW, IH. Table ES-1 provides a summary of the NDW, IH other than operational ranges.

Table ES-1 Summary of the NDW, IH Other than Operational Ranges

Range Name	Size (acres)	Use	Dates of Use
Igniter Area	0.010	Igniter Disposal Area	Unknown
Water Impact Area	12,296	Rockets, Gun, and Underwater Explosion Testing	1891 – 1980s
Battle Range Firing Area	340	Projectiles Testing	Unknown
Sonar Training Area	2.1	Sonar Training Area	1980s – mid 1990s
Pope's Creek Site	44	Underwater Explosives Site	1947 - Unknown

IGNITER AREA

The Igniter Area occupies approximately 0.010 acres along the southeastern shoreline of the Indian Head Main Installation peninsula. The small promontory along which the Igniter Area is located is known as "Thieves Point." A small pile of igniters, the origin of which are unknown, was found at this site during an extremely low tide in 1996 or 1997. There is one structure, Building 1451, located on the promontory adjacent to the Igniter Area. The building, once used for storage, is now vacant and scheduled to be demolished by the installation. The promontory is a wetland and considered a species protection area. .

WATER IMPACT AREA

The Water Impact Area is approximately 12,296-acres in size, and is located between Chapman's Point, Maryland (MD) and the mouth of the Chopawamsic Creek. The Water Impact Area was reportedly used for battleship gun testing in the late 1800's and the early 1900's and rockets were fired into this area from a dock firing station at the Valley until 1946 or 1947. Also, parts of the Potomac River were used for gun testing. Underwater explosions were reported to have occurred in the Water Impact Area in 1961. The Potomac River near Indian Head is also listed as an underwater explosion test site in the 1988 Final Committee Report: Alternate Site Study for Underwater Explosion Testing. Accidental releases of remnants of ordnance and bulk propellants from the Large Motor Test Facility may have also occurred at this area. The area is currently used for recreational boating and fishing and public access to this site is not restricted.

BATTLE RANGE FIRING AREA

The Battle Range Firing Area is approximately 340-acres in size and is located in the north-central section of Stump Neck Annex and extends from the Potomac River to the north bluff along the shoreline of the Mattawoman Creek. Although the exact period of use of this range could not be ascertained, the site was potentially used for battle range firing and studying underwater impacts in the early 1900's. High powered firing may have also occurred at this range as well. Recreational boating and fishing occurs along the shoreline of the Mattawoman Creek.

SONAR TRAINING

The Sonar Training Area is approximately 2.1 acres, of which approximately 1.5 acres is located within the Potomac River, and 0.6 acres is located on the adjacent shoreline of the Stump Neck Annex peninsula. The area was used for sonar training by Navy divers during the1980s to mid 1990s. During the training, inert ordnance items were submerged just off shore so divers could train in underwater ordnance identification. One torpedo casing, one underwater mine casing, and one bomb casing were visible at low tide approximately 75 feet from the water's edge, and it is not known if the items were inert ordnance associated with sonar training. The Sonar Training Area is currently a recreational waterway, while the land portion is undeveloped.

POPE'S CREEK SITE

The Pope's Creek Site is located off-site of the installation. The site is southeast of NDW, Indian Head, within the Potomac River in the town of Pope's Creek, Maryland. According to a public notice issued in the late 1940's, the Pope's Creek Site was used for underwater testing of demolition charges, and/or explosive material. The testing area was approximately 44 acres, while the publicized safety zone was approximately 841 acres. The Pope's Creek Site is currently a recreational waterway.

1. INTRODUCTION

The Department of Defense (DoD) has established the Military Munitions Response Program under the Defense Environmental Restoration Program (DERP) to address munitions and explosives of concern (MEC) (including unexploded ordnance (UXO) and discarded military munitions (DMM)) and munitions constituents (MC) at other than operational military ranges and other sites. Closed, transferred, and transferring military ranges and sites not located on an operational range are considered other than operational. This report addresses other than operational ranges and sites at an active installation. It may include transferring and/or transferred ranges and munitions disposal sites associated with an active installation if they are not included in BRAC or FUDS.

However, by definition munitions related sites located in water are not addressed under the Navy Munitions Response Program (MRP). For example, deep-sea sites including former munitions disposal areas and ranges are not addressed under the MRP. In order to document the history of these areas in a standard format, a Water Area Munitions Study (WAMS) report is compiled. This report represents the WAMS for the other than operational ranges associated with the Naval District Washington (NDW), Indian Head (IH).

This WAMS is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Installation Background
- Section 3 – Physical and Environmental Characteristics
- Section 4 – Summary of Data Collection Effort
- Section 5 – Site Characteristics – Main Installation
- Section 6 – Site Characteristics – Stump Neck Annex
- Section 7 – Site Characteristics – Off-Installation

The following supporting information is appended to this WAMS:

- References (Appendix A)
- Project Source Data – General (Appendix B)
- Project Source Data – Site Specific (Appendix C)
- Ordnance Technical Data Sheets (Appendix D)

1.1.Purpose

This WAMS report summarizes the history of munitions use for the Igniter Area, Water Impact Area, Battle Range Firing Area, Sonar Training Area, and the Pope's Creek Site at NDW, IH and provides an assessment of the current conditions with respect to MEC and MC. The WAMS provides the necessary information for Navy and regulatory decision-makers to develop a Conceptual Site Model (CSM) for the site. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link them. The CSM is the basis for the risk evaluation, prioritization, and remediation cost estimating, as necessary.

1.2.Project Management

This WAMS Report is being coordinated and managed by the Navy Engineering Field Activity Northeast (EFANE), a component of the Atlantic Division (LANTDIV) of the Naval Facilities Engineering Command (NAVFAC). The EFANE performs engineering functions for Navy installations throughout the northeast U.S. and is the Program Manager for this WAMS. Malcolm Pirnie, Inc. has been contracted to prepare this WAMS Report. The Navy Remedial Project Manager (RPM) from Naval Facilities Engineering Command Washington[1] (NAVFAC Washington) and the installation point of contact for NDW, IH provided valuable information and assistance throughout the WAMS data collection process. The Navy RPM is the responsible party for this WAMS Report.

1.3.Water Area Munitions Study Approach

The WAMS process for the NDW, IH involved collecting and reviewing existing and available information about the site; data collection activities included off-site and on-site research and interviews. The Malcolm Pirnie data collection team conducted the on-site portion of the data collection and visual survey during four multi-day site visits: June 23-27, 2003; November 17-21, 2003; December 1-2, 2003; and June 2-3, 2004. Substantial field time and multiple visits

[1] *On July 23, 2004 Engineering Field Activity Chesapeake (EFACHES) was decommissioned and is now part of Naval Facilities Engineering Command Washington (NAVFAC Washington).*

were required due to the large number of sites and potentially available data sources. A summary of the data collection process for NDW, IH is presented in Section 4.

This WAMS Report is inclusive and makes use of available data relating to munitions use at the NDW, IH, including historical records, field data, anecdotal evidence, interviews with site personnel, and professional knowledge and experience. It is based in part on information provided in documents referenced in Appendix A and is subject to the limitations and qualifications presented in the referenced documents.

2. INSTALLATION BACKGROUND

The following sections provide general information about NDW, IH including its location and setting; a brief history of the installation; its missions over time; and a history of munitions related training, storage, and usage.

2.1.Location and Setting

The location of NDW, IH and the other than operational ranges subject to this WAMS are identified on Map 2.1-1. The Main Installation covers approximately 2,300 acres of Cornwallis Neck in Charles County, MD. Cornwallis Neck is located at the confluence of the Potomac River and Mattawoman Creek. The neighboring 1,100-acre Stump Neck Annex is located across Mattawoman Creek (to the south) from the Main Installation. The town of Indian Head is located east of NDW, IH. The proximity of the town of Indian Head to the MD 210 corridor and wildlife management areas makes the area a destination of outdoors enthusiasts including boaters, hunters, and fisherman.

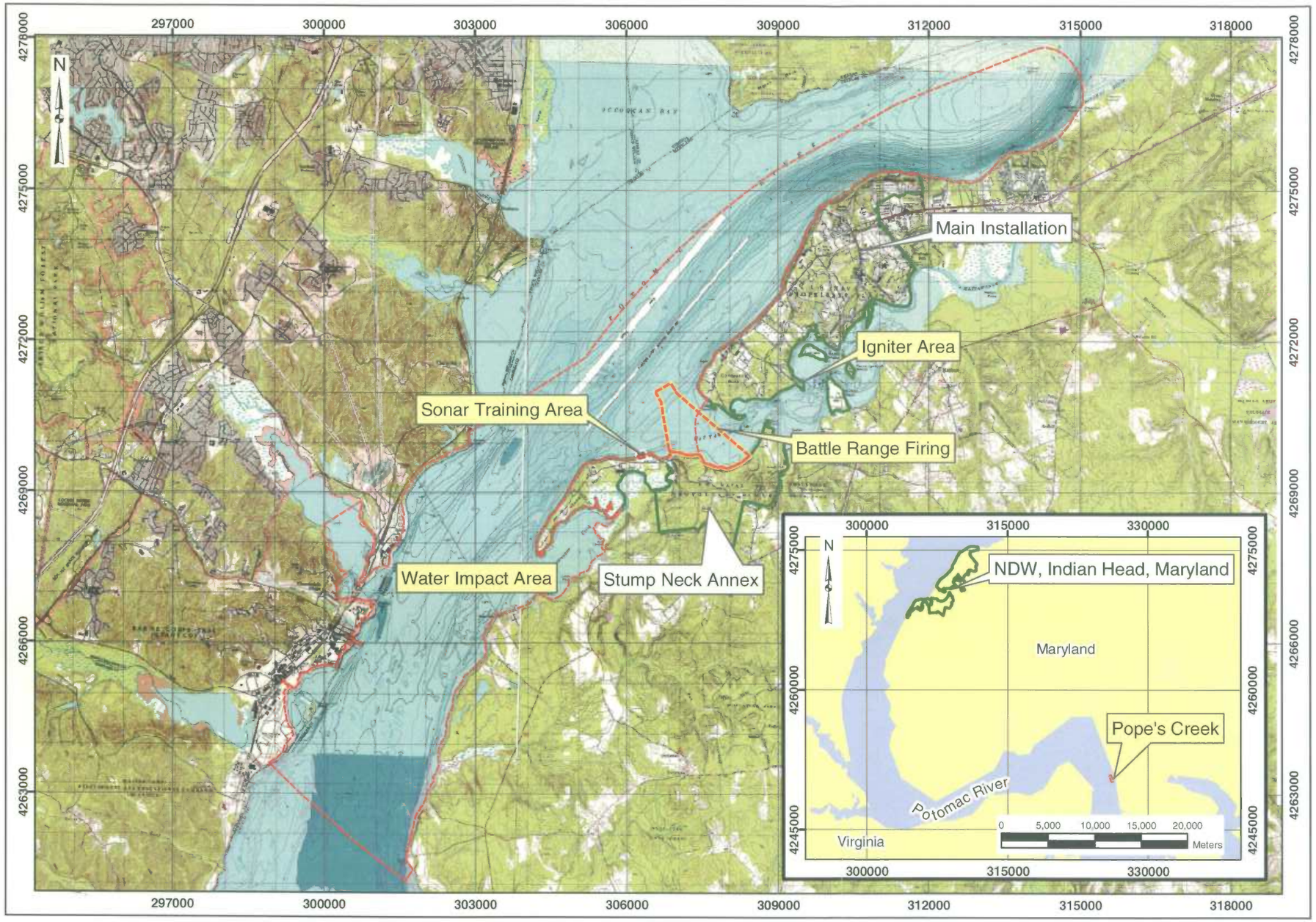
The population at NDW, IH consists of 2,200 civilians, 500 military personnel, 800 contractors, and 550 dependents. The 2000 U.S. Census indicates 3,422 residents for the town of Indian Head and 120,546 residents for Charles County.

Map 2.1-1 depicts the location of the WAMS sites at NDW, IH.

Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 2.1-1
Area Location Map



Legend

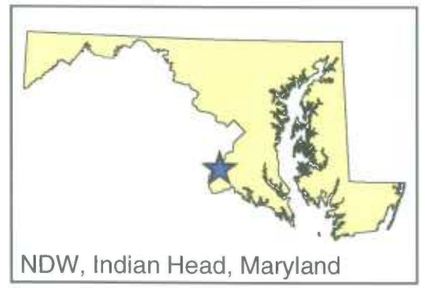
- Installation Boundary
- Sonar Training Area
- Battle Range Firing
- Water Impact Area
- Igniter Area
- Popes Creek

0 1,250 2,500 3,750 5,000 Meters

Data Source: USGS. 7.5 Minute Series
Topographic Survey - Bathymetric Map
Indian Head, MD-VA, 1981
Quantico, VA-MD, 1981

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005



2.2.Installation History

Established in 1890, NDW, IH is the Navy's oldest ordnance station. Throughout its long and distinguished history, the facility has proved guns, armor and propellants; developed and manufactured powder and propellants; and is recognized as a leader in energetics research and development. Shortly after operations commenced, additional property was acquired by the Navy to increase the size of the installation. The most notable acquisition was of the land that currently makes up the Stump Neck Annex, which was acquired for use in 1901 as an impact area and safety buffer.

With the opening of the nearby Dahlgren Naval Proving Ground in the early 1930s, the primary focus of NDW, IH turned from gun proving to powder manufacturing. Additional acquisition and improvement to the installation continued through the 1960s to increase operational capacity and safety buffers required for the manufacturing, testing and storing of energetic materials.

In recent decades, NDW, IH has come to be known as a center of excellence in the development and manufacture of specialized energetic materials used in demolition and propulsion. Now under the direction of the Naval Sea Systems Command, the current mission of NDW, IH is to:

- Provide services in energetics for all warfare centers through engineering, fleet and operational support, manufacturing technology, limited production, and industrial base support;
- Provide research, development, testing and evaluation of energetic materials, ordnance devices and components, and other engineering standards including chemicals, propellants, propulsion systems, explosives, pyrotechnics, warheads and simulators; and
- Provide support to all warfare centers, military departments and the ordnance industry for special weapons, explosives safety and ordnance environmental issues.

Table 2.2-1 summarizes the key milestones in the history of NDW, IH.

Table 2.2-1: Timeline of Historical Events at NDW, IH

Time Period	NDW, IH Milestones
1890 - 1900	• Constructed on 659 acres on Cornwallis Neck in 1890 as the *Naval Proving Ground* to test guns, armor, shells and mounts. • Within one year, added the 222.75-acre Mount Pleasant Farm.
1900 - 1910	• Factory constructed for smokeless powder production. • Stump Neck Annex property purchased in 1901 to extend firing range.
1910 -1920	• Work gradually moved from proving of guns and armor to include standardization of shells and powder. • Acquired 1,160 acres of land adjacent to the Main Installation in 1918. • 161 acres acquired for a railroad right-of-way running from the Naval Proving Ground to the Pennsylvania Railroad junction at White Plains, Maryland; 13.8-mile railroad spur constructed.
1920 – 1940	• Mission gradually shifted from a Naval gun proving ground to a chemical factory, research laboratory and an Explosive D factory. • Facility changed name to the *Naval Powder Factory.* • All proving ground activities were moved to Dahlgren, Virginia.
1940 – 1950	• Navy established *Explosives Investigation Laboratory* where extensive examination of captured enemy ordnance was performed. • Practical applications for the Explosive Ordnance Disposal (EOD) unit moved from Washington D.C. to Stump Neck Annex. • Joint forces EOD school led by Navy formed in 1947. • Propellant research and development added to installation mission. • Jet Propulsion Research Lab founded (1940-1944).
1950 – 1960	• Facility changed its name to the *Naval Propellant Plant.* • Research and development on the Polaris and other rocket programs began.
1960 – 1980	• Rum Point, an 80-acre promontory on the Mattawoman Creek, was acquired by condemnation in 1966. • Bullitts Neck, a separate 47-acre promontory in the Mattawoman Creek, was purchased in five small acquisitions (1965-1966). • The Naval Propellant Plant changed its name to the *Naval Ordnance Station* to reflect the diversification from propellants into related fields of chemistry, engineering, and production contract management.
1980 - 1990	• Full-scale production at the Naval Ordnance Station concentrated on several processes/products too unprofitable, too dangerous, or too difficult for the private sector to manufacture. • The Naval Ordnance Station became the center of excellence for the following technologies: guns, rockets and missiles; energetic chemicals; ordnance devices; missile weapon simulators; explosive process development engineering; and explosive safety, occupational safety and health, and environmental protection.
1990 - present	• EOD School at the Stump Neck Annex was closed in 1999. • Currently, the mission of the NDW, IH is to ensure operational readiness of U.S. and allied forces by providing the full spectrum technical capabilities necessary to rapidly move any "energetics" product from concept through production to operational deployment.

2.3.Munitions Related Training / Storage / Usage

Based on the historical use of NDW, IH it is evident that munitions training, storage and use has been extensive over the operational history of the installation. Since the establishment of NDW, IH, mission critical areas have included:

- Energetics research;
- Chemical/physical characterization;
- Detonation science;
- Weapons product development;
- Cartridge-actuated devices/propellant-actuated devices (CADs/PADs) ordnance evaluation.
- Underwater warheads;
- Nitramine gun/high-energy propellants;
- Weapon simulation;
- Chemical processing/nitration; and

Reported ordnance items accounted for at the installation include mines, torpedoes, rockets, missiles, small arms, mortars, grenades, bombs, Naval guns, explosives and their byproducts from testing and manufacture.

Other than operational ranges addressed in this WAMS: This section is limited to the other than operational ranges that are the subject of this WAMS. These ranges were either identified during the Navy Range Inventory process or as a result of the data collection for this WAMS. A brief description of the usage of each other than operational range is provided below:

IGNITER AREA

The Igniter Area occupies approximately 0.01 acres along the southeastern shoreline of the Indian Head Main Installation peninsula. A small pile of igniters were found at this site by installation personnel during an extremely low tide in 1996 or 1997. By their description, the igniters are assumed to be electric primers or electrically-primed rifle cartridges approximately .50 caliber in size. Based on the available information, the igniters are suspected to be M2 and/or M60 time blasting fuse igniters. In March of 2004, additional ordnance items were seen along the shoreline during another low tide event. These ordnance items are suspected to be MK 1 or MK 2 float signals and a 250, 500 or 750 pound old style bomb. The MC associated with this site include lead styphnate; the filler material used in M2 and M60 igniters and smoke composition; the filler material used in MK 1 and MK 2 float signals.

WATER IMPACT AREA

The Water Impact Area is approximately 12,296-acres in size, and is located between Chapman's Point, MD and the mouth of the Chopawamsic Creek. This site encompasses the Sonar Training Area and a portion of the Battle Range Firing Area. The Water Impact Area was reportedly used for battleship gun testing in the late 1800's and the early 1900's, safety danger zone (SDZ) for firing from the Valley from the early 1900s to approximately 1947, and underwater explosions in 1961. According to the Final Committee Report, charge sizes for the underwater explosions varied from 1 gram to 20 pounds of C-4 or similar explosives. Accidental releases of remnants of ordnance and bulk propellants from the Large Motor Test Facility may have also occurred at this area. Ordnance that may have strayed from targets and landed in the Water Impact Area include various calibers of guns (1-inch through 16-inch) with various projectiles, including armor piercing (AP) shells. Munitions constituents include explosive fillers, including black powder, smokeless powder, brown prismatic powder, emmensite, joveite, wet gun cotton, randite and other high explosives (e.g. Thorite). According to Mr. Jeff Morris, from NAVFAC Washington, this area was dredged in 1952 to recover munitions scrap for scrap metal recycling.

BATTLE RANGE FIRING AREA

The Battle Range Firing Area is approximately 340-acres in size located in the north-central section of Stump Neck Annex along the shoreline of the Mattawoman Creek; however, definitive geographical boundaries of the site could not be confirmed through historical documentation and employee interviews. Although the exact period of use of this range could not be ascertained, the site may have been used for battle range firing and studying underwater impacts in the early 1900's. High powered firing may have also occurred at this range as well. Based on the historical information, munitions included battle range firing using 3", 5", 8", 12", and 14" AP shells and high powered firing using pasteboard or similar targets. Ordnance remnants, bulk propellants, and underwater explosives may also exist at the Battle Range Firing Area. Potential MC include TNT and explosive D, a filler material used in AP shells.

SONAR TRAINING AREA

The Sonar Training Area consists of approximately 1.5 acres in the Potomac River, and 0.6 acres along the adjacent land of the Stump Neck Annex. The Sonar Training Area was used for sonar training by Navy divers during the 1980s to mid 1990s. Inert ordnance items such as sea mines, torpedoes, and depth charges were submerged just off shore so divers could train in underwater ordnance identification. According to Mr. Larry Kijek, the Division Head for Facilities,

Environmental, Occupational Safety and Explosive Safety, one torpedo casing, one underwater mine casing, and one bomb casing were visible at low tide approximately 75 feet from the water's edge, behind the helipad, near Building 2174. It is not known if the observed bomb casing was inert ordnance associated with sonar training. If non-inert items were present at the Sonar Training Area, associated munitions constituents potentially at the Sonar Training Area include TNT, explosives residuals, and metals.

POPE'S CREEK SITE

The Pope's Creek Site is located off-site, southeast of NDW, Indian Head, in the town of Pope's Creek, Maryland. The Site is approximately 44 acres, while the surrounding safety zone is approximately 841 acres. The Site is located approximately 1 to 2 miles north of the Potomac River Bridge, extending from the eastern shoreline of the Potomac River. The area is currently a recreational waterway. A Public Notice titled "Notice to Navigation Interests" dated June 2, 1947 informs boaters that "underwater explosions in the waters of the Potomac River in the vicinity of Pope's Creek, Maryland" will occur until further notice. Based on the public notice and size of the danger area, it is likely that underwater testing of demolition charges, and/or explosive material was being conducted. Munitions constituents potentially at the Pope's Creek Site include TNT.

3. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

The following sections provide general information for NDW, IH including its climate; topography; geology; soil and vegetation types; hydrology; hydrogeology; cultural and natural resources; and endangered species. Several of these sections refer to the land portion of or adjacent to the WAMS.

3.1.Climate

NDW, IH, located on the eastern shore of the Potomac River in Charles County, MD, has a continental-type climate with four well-defined seasons. Located in the middle latitudes of North America, atmospheric flow is from west to east. The Potomac River and its tributaries significantly affect the climate, moderating extreme temperatures and causing higher humidity at the NDW, IH. In the winter, the Blue Ridge and Appalachian mountain ranges located to the west of the NDW, IH obstruct the cold, continental air. The coldest period occurs in late January and early February, with low temperatures averaging 29 degrees Fahrenheit (°F). July is the warmest month with average high temperatures of 85°F. Precipitation is well distributed throughout the year, with July and August as the wettest months. Average annual precipitation is 44 inches. Maximum snow accumulation averages nine inches between November and March. The growing season lasts approximately 190 days, starting in mid-April.

3.2.Topography

This section describes the regional topography for Charles County, Main Installation and Stump Neck Annex. This applies to land portions of, or adjacent to, WAMS sites.

NDW, IH occupies two peninsulas along the eastern shore of the Potomac River. The Main Installation is located on the northern peninsula. The general topography of the mainland areas of Charles County can be described as gently rolling lands with a few steep slopes. This area includes many drainage swales and streams. Shoreline areas along the Potomac River are generally steeply sloped.

The Main Installation has a relatively low topographic profile. The highest point is the northeastern portion of the peninsula with an elevation of approximately 110 feet above mean sea

level (msl). The western border of the Main Installation (along the eastern Potomac River shoreline) is characterized by 40- to 50-foot bluffs, while the eastern portion (along Mattawoman Creek) is more gently sloping, although some areas with 10- to 40-foot bluffs exist.

The Stump Neck Annex has a relatively low topographic profile. The highest point is the northeaster portion of the peninsula at an elevation of approximately 140 feet above msl. The lowest points lie along the shorelines of the Stump Neck Annex adjacent to Mattawoman Creek and Chicamuxen Creek. These areas are mostly flat, tidal marsh areas, although several 50- to 60-foot bluffs exist along Mattawoman Creek.

3.3.Geology

NDW, IH lies within the Atlantic Coastal Plain Physiographic Province, eight to ten miles east of the Fall Line that marks the western extent of the physiographic province. The regional geology consists of a sedimentary wedge of Cretaceous to Quaternary, fluvial and marine deposits overlying crystalline Precambrian metamorphic and igneous bedrock. The sedimentary wedge dips and thickens eastward and ranges in thickness from 550 feet to 900 feet in the vicinity of NDW, IH (Vroblesky, 1991; Hiortdahl, 1990). It lies non-conformably on the crystalline basement rock surface, which dips to the east. The geologic units underlying NDW, IH, in stratigraphically ascending order, are the Lower Cretaceous Potomac Group, the Tertiary age Aquia Formation of the Pamunkey Group, fluvial-estuarine deposits of Tertiary to early Quaternary age, and undivided Quaternary deposits.

The lithology of the Potomac Group consists of interbedded clay, silt, sand, and gravel deposited in fluviodeltaic environments (Hiortdahl, 1990). The Potomac Group ranges in thickness from 650 to 750 feet in the vicinity of the Main Installation (Vroblesky, 1991; Harsh and Laczniak, 1990) and consists of three geologic units (in ascending stratigraphic order): the Patuxent Formation; the Arundel Formation; and the Patapsco Formation.

The Patuxent Formation consists of sand and pebbles with thin clay interbeds and is 300-400 feet thick in the study area. The Arundel Formation generally consists of a massive clay with abundant lignite and siderite concretions and is less than 100 feet thick beneath most of northwestern Charles County. The Patapsco Formation generally consists of sand and silt

separated by thick clay layers. The interpreted thickness of the Patapsco Formation in the study area varies from about 200 feet to more than 450 feet (Hiortdahl, 1997).

The Aquia Formation (Upper Paleocene) consists of marine deposits of olive black to olive gray, micaceous, glauconitic quartz sand interbedded with sand, silt, and clay. The formation is up to 80 feet thick in the NDW, IH area. The younger units of the Pamunkey Group and the Chesapeake Group have been removed by erosion in the study area.

Overlying the Aquia Formation are fluvial-sedimentary deposits consisting of gravel, sand, and loam. These sediments are referred to as "upland deposits" and range in age from Pliocene to early Pleistocene (Hiortdahl, 1997). The upland deposits crop out at the surface in the northern portion of NDW, IH where surface elevations exceed 40 feet. However, beneath most of the study area, the surficial sediments consist of Pleistocene paleochannel deposits and Holocene alluvial and paludal deposits (Hiortdahl, 1997). These deposits consist of gravel, sand, silt, clay, and peat mixtures with irregular bedding, with an aggregate thickness of zero to approximately 40 feet. The Aquia Formation and younger upland deposits are missing in many locations in the NDW, IH region due to erosion and deposition in Pleistocene and Holocene paleochannels. Where this occurs, the overlying Quaternary deposits directly overlie the Cretaceous formations.

3.4.Soil and Vegetation Types

This section describes the regional soil and vegetation for Charles County, Main Installation and Stump Neck Annex. This applies to land portions of, or adjacent to, WAMS sites.

Charles County is located within the inner Potomac Coastal Plain geologic province. The soils in this area are derived from unconsolidated marine sediments that vary from sandy to clayey in texture and from excessively well drained to poorly drained. Hydric and erodible soils are prevalent. High water tables, severe erosion, earth slides and hardpans are common.

The U.S. Department of Agriculture mapped the soils of the Main Installation in the Soil Survey of Charles County, MD, 1974. The primary soil series in this area are the Beltsville, Keyport, and Elkton Silt Loams. Some additional soil types found at the Main Installation are cut-and-fill land, gravelly land, and tidal marsh. The following discussion is a description of the soil types at the Main Installation.

The Beltsville Silt Loam is found primarily in the upland elevations of the northern portion of Indian Head. The Beltsville series soils consist of silt and sand with moderate amounts of clay. They are nearly level to moderately sloping, moderately deep, strongly acid, slowly permeable and well drained.

The Keyport and Elkton Silt Loams are found in the lower elevations of the southern portion of the Main Installation. They are both clayey silt loam soils and slowly permeable, with the Elkton series being the least permeable.

Cut-and-fill land, gravelly land and tidal marshes are found in the coastal areas of the Main Installation. Cut-and-fill lands are areas where the native soils have been removed and graded or filled with other material or soil. Gravelly land is composed of gravelly deposits with unidentifiable soil types due to severe erosion. Tidal marshes consist of materials ranging from sand to clay, with occurrences of peat and muck.

The land around the Main Installation is heavily vegetated. There are five basic vegetation types present including pine, hardwood, pine-hardwood mix, tidal and non-tidal wetlands, and urban landscape. The hardwoods and the pine-hardwood mix can be further subdivided into upland and wetlands divisions. Most of the forested land is either second or third growth; little, if any, virgin forest remains. The most abundant trees include the Virginia Pine, Sweet Gum, Red Oak, and Yellow Poplar.

The U.S. Department of Agriculture (USDA) mapped the soils of the Stump Neck Annex in the Soil Survey of Charles County, Maryland, 1974. The main soil series in this area are the Beltsville, and Keyport, and Elkton Silt Loams. Some additional soil types found at the Stump Neck Annex are cut-and-fill land, gravelly land, and tidal marsh, and Mattawan soil, and cut-and-fill land. The following discussion is a description of the soil types at the Stump Neck Annex.

The eastern area of the Stump Neck Annex is primarily composed of the Beltsville silt loam, with a small area of gravelly land. The Beltsville series soils consist of silt and sand with moderate amounts of clay. They are nearly level to moderately sloping, moderately deep, strongly acidic, slowly permeable and well drained. Gravelly land is composed of gravelly deposits with unidentifiable soil types due to severe erosion.

The western and central areas are primarily composed of tidal marsh and Keyport silt loam. Tidal marshes consist of materials ranging from sand to clay, with occurrences of peat and muck. The Keyport silt loam is a clayey silt loam soil that is slowly permeable.

A small area in the western end of the Stump Neck Annex is comprised of Mattawan loamy sand and cut-and-fill land. The Mattawan Series consists of soils that are nearly level to gently sloping, moderately well drained to well drained, and slowly permeable. These soils formed on uplands in a sandy mantle over loamy sediment. Cut-and-fill lands are areas where the native soils have been removed and graded or filled with other material or soil.

The land around the Stump Neck Annex is heavily vegetated. There are five basic vegetation types present including pine, hardwood, pine-hardwood mix, tidal and non-tidal wetlands, and urban landscape. The hardwoods and the pine-hardwood mix can be further subdivided into upland and wetlands divisions. Most of the forested land is either second or third growth; little, if any, virgin forest remains. The most abundant trees are Virginia Pine, Sweet Gum, Red Oak, and Yellow Poplar.

Hardwood forest dominates approximately 1,075 acres (nearly 50%) of NDW, IH. Species common to the upland portions of the hardwood forests include Red, White, and Chestnut Oak, Tulip Poplar, and Hickories. The wetland portion is typically comprised of Red Maple, Sweet Gum, Green Ash and American Sycamore.

The following species are common along the shoreline of the Potomac River: Black Persimmon, Grape, Sea Myrtle, False Indigo, Poison Ivy, Virginia Creeper, and Phlox. In addition, the following grasses are present: Gama Grass, Panic Grass, Bermuda Grass, and Finger Grass. Marsh areas are dominant along the shores of Mattawoman Creek. They are characterized by Jewelweed, Alger, Marsh Cattail, Weedgrass, Sedge, Three Square Bulrush, Wild Rice, Saltmarsh Cordgrass, Smartweek, and Marsh Mallow.

3.5.Hydrology

The three primary waterways in the area are the Potomac River, Mattawoman Creek, and Chixamuxen Creek. The Potomac River and Mattawoman Creek border the Main Installation, while Mattawoman Creek and Chixamuxen Creek border the Stump Neck Annex. The Potomac

River is a continuous, slow-moving, slightly brackish, tidal tributary to the Chesapeake Bay. Mattawoman Creek and Chixamuxen Creek are Potomac River tributaries and are also tidally influenced. Both have large floodplains and contain large expanses of tidal wetlands and marshes. Many small streams cross the area, most of which drain directly into one of the three major waterways. Wetlands and floodplains are valuable habitat for wildlife, important groundwater recharge areas, and filters for surface water runoff, thus minimizing siltation and erosion. They are also important aesthetic buffers, scientific resources and, in some cases, recreational areas.

Based on the drainage divides derived from the topography of the area shown in a 1983 Initial Assessment Study conducted at NDW, IH the majority of the natural drainage at the Main Installation flows to the Mattawoman Creek.

The Stump Neck Annex is bordered by and contains large tracts of both tidal and non-tidal wetlands. Wetlands and floodplains are valuable habitat for wildlife, important groundwater recharge areas, and filters for surface water runoff, thus minimizing siltation and erosion. They are also important aesthetic buffers, scientific resources, and, in some cases, recreational areas.

Based on the drainage divides derived from the topography of the area shown in a 1983 Initial Assessment Study conducted at NDW, Indian Head, the majority of the natural drainage at the Stump Neck Annex flows to both Mattawoman Creek and Chicamuxen Creek. Treated wastewater effluent is discharged directly to the Potomac River or Mattawoman Creek and is also discharged from outfalls to tributaries of these two waterways. The wastewater consists of industrial, sanitary, and storm effluents, or combinations thereof.

3.6.Hydrogeology

The hydrogeologic framework of the Indian Head area consists of a surficial aquifer and three major underlying confined aquifers: the lower Patapsco aquifer, upper Patuxent aquifer, and lower Patuxent aquifer. Although underlying the surficial aquifer, the upper Patapsco aquifer is considered a poor producer of groundwater in the area and is not considered to be a major aquifer at NDW, IH. Rather than continuous bodies of sands, the individual confined aquifers consist of multiple sand layers interbedded with lower permeability layers. The aquifers are described in detail below.

Surficial aquifer: Shallow, unconfined to semi-confined groundwater at the NDW, IH occurs in the surficial aquifer from near surface to approximately 45 feet below ground surface (bgs), with water-table elevations ranging from sea level to approximately 65 feet above msl. Depending on location, the surficial aquifer is composed of Quaternary paleochannel deposits, Tertiary to Quaternary upland deposits, the Aquia Formation, or even sediments of Patapsco Formation. Typically, the shallow groundwater occurs in perched water-bearing zones and is recharged from infiltration (Hart, 1983). In some lowland areas, surface water intrusion may be an additional source of recharge of the shallow aquifer along the edge of water bodies and during periods of high tide. Shallow groundwater flow follows topography and discharges to local surface water bodies.

The descriptions and hydrogeologic properties of the confined aquifers presented in this section are derived primarily from Andreasen (1999).

Lower Patapsco aquifer: The lower Patapsco aquifer lies at 70-200 feet below msl in the study area, with a thickness ranging from 65-140 feet. The transmissivity of the lower Patapsco aquifer ranges from about 190 to 700 square feet per day (ft^2/d) near Indian Head. The aquifer is underlain by relatively low permeability sediments of the Patapsco Formation and is underlain by the low permeability Arundel Clay. In most places, the Arundel Clay serves as an effective confining unit between the lower Patapsco and upper Patuxent aquifers, although a hydraulic connection occurs where the Arundel Clay is thin or more heterogeneous.

The lower Patapsco aquifer is the principal water-supply aquifer at NDW, IH. Potable water supply wells at NDW, IH are typically screened in multiple sand layers within this aquifer at an average depth of 200 to 300 feet. These potable water wells serve an approximate population of 4,050 people, including civilian and enlisted Navy employees and contractor employees. Although none of the NDW, IH wells supply reserves or residences beyond the facility boundaries, the lower Patapsco aquifer is used extensively for domestic and municipal water supplies in northwestern Charles County. Several production wells are screened in this aquifer northeast of NDW, IH in and near the towns of Indian Head and Potomac Heights.

Upper Patuxent aquifer: The upper Patuxent aquifer lies at 400-600 feet below msl in the study area and is about 50-70 feet thick. The transmissivity of the upper Patuxent aquifer ranges from

about 150 to 2600 ft^2/d in northwestern Charles County. The aquifer is underlain by relatively low permeability sediments of the Patuxent Formation.

Lower Patuxent aquifer: The top of the lower Patuxent aquifer lies at 800–1,000 feet below msl in the study area and is about 100 feet thick. Few potable water wells are screened in the lower Patuxent aquifer due to availability of water from the overlying confined aquifers. The lower Patuxent aquifer is underlain by crystalline basement rock. Water levels in the upper and lower Patuxent aquifer are generally similar due to the leaky nature of the intervening confining unit.

3.7.Cultural and Natural Resources

This section describes the cultural and natural resources for Charles County, Main Installation and Stump Neck Annex. This applies to land portions of, or adjacent to, WAMS sites.

An archaeological reconnaissance survey of NDW, IH was conducted in 1985 (Barse, 1985). Forty-five sites representing prehistoric time periods from the Early Archaic through the Late Woodland/Contact transition period were identified. Four of these sites were considered to be eligible for nomination to the National Register of Historic Places as containing "categories of information that will help further the discipline of archaeology". It was reported that an additional eight sites might be eligible but that further investigation is needed.

A survey of historic buildings at NDW, IH was also conducted in 1985 and remnants dating back to the Civil War were found at the ravine leading up from the original Potomac River landing area. The reported findings included remnants of test guns and metal plates, which date back to the late 19th Century. The Single Base Powder Production Area, a series of buildings located on top of the bluff along the Potomac River, the water tower, the original power plant, the Victorian officers' quarters and the surgeon's house were reported to date to 1899. The review of cultural and natural resources is based on limited available information. No additional information was discovered to further assess cultural and natural resources.

3.8.Endangered and Special Status Species

This section provides the endangered and special status species for Charles County, Main Installation and Stump Neck Annex. This applies to land portions of, or adjacent to, WAMS sites.

According to the 1997 NDW, IH Wildlife Management Plan, four endangered species are located within NDW, IH. The four species are located at the Stump Neck Annex. Three of them are federally endangered: the American Bald Eagle, rainbow snake, and the joint-vetch (flowering plant of the pea family). The fourth species, the scaly blazing-star (perennial herb), is a species of special concern in the State of Maryland. As of the July 2001 Threatened and Endangered Plant/Animal Species of Charles County, Maryland report, the Department of Natural Resources Wildlife and Heritage Service still listed these four species as federal and state endangered for Charles County. Although these species are located at the Stump Neck Annex, their proximity to the Main Installation creates a potential for these species to be found there as well.

Protected species that are known to or have the potential to inhabit NDW, IH are listed in Table 3.8-1. None of the protected species are anticipated to inhabit any of the WAMS sites.

Table 3.8-1: Summary of Known or Potential Protected Species

Ecological Receptors	Species
Federal Endangered	• American Bald Eagle • Rainbow Snake • Joint-vetch
Federal Threatened	None Reported
State Endangered	Scaly blazing-star
State Threatened	None Reported
Other Ecological Receptors	American Shad, Alewife and Blueback Herring and other species that use the Potomac River as a travel route and spawning site.

*Sources of data include:

- NDW, IH Wildlife Management Plan, 1997.
- Threatened and Endangered Plant/Animal Species of Charles County, Maryland, July 2001. Maryland Department of Natural Resources.

4. SUMMARY OF DATA COLLECTION EFFORT

Five primary sources of information were researched as part of the data collection effort for the WAMS. The sources of data included:

1) historical archives;
2) personal interviews;
3) installation data repositories;
4) visual survey; and
5) off-site data sources and repositories, such as local libraries and museums.

These five sources of data are discussed below, along with their relative application to this WAMS.

4.1. Historical Archive Repositories (off-site)

The data collection team reviewed archival records located at the National Archives in College Park, Maryland, and in Washington, D.C. The data collection team researched the following records and record groups (RG) for documents relating to munitions usage at NDW, IH. An asterisk (*) indicates the material was photocopied.

Textual Records:

RG 71, Bureau of Yards and Docks

Naval Property Case Files, Boxes 580*, 581*, 582*, 583*, 584

Unprocessed Naval Property Case Files, Box 36

RG 72, Bureau of Aeronautics

Entry 67, Confidential Correspondence, 1922-1944, Boxes 977, 1205*

Entry 67-A, Confidential General Correspondence, 1945, Box

Entry 62-B, General Correspondence, 1943-1945, Boxes 2320, 2931, 2946, 2938, 2978, 2982, 2996, 2998, 3003, 3010, 3050, 3066, 3078, 3470,

RG 74, Bureau of Ordnance

Entry 25, General Correspondence, 1926-1944, Boxes 937*, 938*, 939*, 940, 941*

Entry 25-C, General Correspondence, Confidential, 1926-1939, Box 98

Entry 25-E, General Correspondence, Confidential, 1940-1942, Box 189*

Entry 25-I, General Correspondence, 1942, Confidential, Box 212*

Entry 25-J, General Correspondence, 1942, Restricted, Boxes 512*, 513*, 514

Entry 25-M, General Correspondence, 1943, Confidential, Box 389

Entry 25-O, General Correspondence, 1943, Restricted, Boxes 600-602

Entry 25-U, General Correspondence, 1944, Confidential, Boxes 557-561

Entry 25-V, General Correspondence, 1944, Restricted, Boxes 1031, 1032*, 1033-1035

Entry 1001, General Correspondence, 1907-1949

1947, Box 36

1948, Box 64

1949, Box 103

Entry 1003 A, General Correspondence, 1948, Boxes 129*, 173, 174, 175

Entry 1003 A, General Correspondence, 1949, Box 534*

Construction and Procurement Subject Files

1945, Boxes 828, 1222, 1256, 1257, 1264, 1265, 1284, 1285, 1354*, 1355*, 1356*, 1357*, 1358*, 1359*, 1360*, 1390-1393, 1443*, 1444*, 1445*, 1446*, 1488*, 1489*, 1600

1946, Boxes 309*, 310*, 311*

RG 127, U.S. Marine Corps, Office of the Commandant

General Correspondence, 1939-1850, Boxes 230, 840, 1805, 1806

RG 334, Records of Inter-Service Agencies, Armed Forces Explosives Safety Board

Entry 15, Explosion Files, 131, 234, 329

Cartographic Records:

RG 23, Coast and Geodetic Survey

Folders for Charts 559*, 560*

RG 57, U.S. Geological Survey

RG 71, Bureau of Yards and Docks

Maps for facility 502*, 509, codes 1, 2, 3, 15, 16, 32, 34, 42, 44-48

Series I microfilm, Rolls 500*, 501, 502, 503*, 516*

Series II Index Boxes 67-69, 73

Series II Microfilm, Reels 418*, 419*, 420, 444*, 1344*, 1345*

RG 77, Department of Army

Army Mapping Service, AMS-V833*

RG 385, Naval Facilities Engineering Command, 1917-1989

Architectural and Engineering Plans, Boxes 2, 185

Restricted UIC Architectural and Engineering Plans, Boxes C27, C28, C29, C30*, C31, C38*

Aerial Photographs:

RG 373, Defense Intelligence Agency

Can ON 38542

Still Photos:

RG 71, Bureau of Yards and Docks

Entry 71-CA, Construction Projects, 1879-1943, Box 191*

Entry 71-CB, Construction Projects, 1940-1943, Boxes 52, 136

Entry 71-CP, Construction Projects, 1941-1953, Boxes 33-35, 70, 78, 83

NAVAL HISTORICAL CENTER, WASHINGTON, D.C.

Photo Archives, Aerials *

Photo Archives, Card File

Operational Archives

Command Histories, 1945-1991*

NATIONAL ARCHIVES, REGIONAL OFFICE, PHILADELPHIA

RG 181, U.S. Naval Districts and Shore Establishments

Central Subject Files, Naval Powder Factory, 1907-1925, Boxes 1, 2, 3*, 4, 5, 6*, 7-11, 12*, 13*, 14, 15*, 16*, 17*, 18*, 19-30

Upon receipt of this information from the archive research subcontractor, Nicklason Research Associates, Malcolm Pirnie's project team organized the information by subject matter and reviewed the content for applicability to the WAMS process. The relevant information was then digitized and will be provided as a part of the project record contained in the compact disc (CD) to be submitted with the Final WAMS Report.

4.2.Personal Interviews

The following NDW, IH personnel were interviewed to obtain information on NDW, IH and specific sites (Table 4.2-1). Interviews were generally conducted during the site visits or via telephone Relevant interviews have been documented and are included in Appendix C.

Table 4.2-1: NDW, IH Personnel Interviewed during Site Visits

Name	Office
Dave Bode	Safety Department
Jeff Bossart	Natural Resources
Tom Cox	Public Works
Bruce Dalton	Safety Department, Retired
Jim Dolph	Navy Historian
Kathy Frey	Environmental Office
Jim Hersey	UXO Program Director
Frank James	Safety Department /EOD
Shawn Jorgensen	Environmental Office
Larry Kijek	EODTC Environmental/Safety
Elaine Magdinec	Environmental Office
Jack Meyers	EODTC Safety Department, Retired
Gordon Miller	Retired Marine Corp EOD

Table 4.2-1: NDW, IH Personnel Interviewed during Site Visits	
Name	**Office**
Heidi Morgan	Environmental Office
Jeff Morris	RPM NAVFAC Washington
William Penn	NDW, IH Retired
Wes Pero	Safety Department
Pete Perry	NDW, IH Retired
Allison Poe	Public Works Office/GIS Specialist
Ben Redmond	CH2MHill, VP of OE
Diana Rose	Environmental Office
Lou Scalafari	Former Public Works Office Employee
John Stacey	Public Works/Master Plan
David Stewart	Public Works/Utilities

4.3.On-Site Data Repositories

The following is a partial list of data sources accessed for this PA. A complete, detailed listing will be provided with the CD.

- NDW, IH Environmental Office
- NAVEODTECHDIV Environmental Office
- NDW, IH Natural Resources Office
- NDW, IH Cultural Resources Office
- NDW, IH NEPA Program Office
- NDW, IH Public Works Office
- NDW, IH Safety Office
- Ordnance and Explosives Support Office
- NAVEODTECHDIV Technical Library
- NDW, IH Technical Library
- NDW, IH Public Affairs Office
- NDW, IH Installation Repository ("The Barn")
- NDW, IH Public Works Map Room ("The Vault")
- NDW, IH Photo Lab

4.4.Visual Survey

The data collection team conducted a visual survey of each WAMS site/range as part of the data collection effort. The purpose of the visual survey was to identify any MEC ordnance related materials (e.g., expended rounds, fragmentation, range debris, old targets), any evidence of MC (such as ground scarring, stressed vegetation, or chemical residue) and/or surface features that could provide additional information to aid in the characterization of the site. The visual survey was also used to enhance, augment, or confirm the archival data and, in some cases, provide new data to the team. A description of the area surveyed and the results of the survey are provided in Sections 5, 6, and 7.

4.5.Off-Site Data Sources

The following off-site repositories were contacted by Malcolm Pirnie to obtain information for this PA. A listing of the informational resources provided is also listed.

Potomac Branch Library, Indian Head, MD - The book, *Praising the Bridge that Brought Me Over,* was provided.

Town Hall, Indian Head, MD - No relevant information was provided.

Maryland Historical Society, Baltimore, MD- Two books: *Maryland A to Z, A Topographical Dictionary* and *Gun Powder Town on the Potomac* and a newspaper article regarding town history were provided and reviewed.

Jim Dolph, Navy Industrial Historian

5. SITE CHARACTERISTICS – MAIN INSTALLATION

The following sections provide site-specific information about the WAMS sites associated with the Main Installation at NDW, IH, including history and site description; visual survey observation and results; munitions characterization; contaminant migration routes; receptors; site use; access controls and restrictions; and the conceptual site model.

5.1. Igniter Area

5.1.1. History and Site Description

The Igniter Area occupies approximately 0.01 acres along the southeastern shoreline of the Indian Head Main Installation peninsula. The small promontory along which the Igniter Area is located is also known as "Thieves Point." An aerial photo of the promontory off of which the Igniter Area is located is provided as Figure 5.1-1. The site boundaries as provided by the installation initially covered the entire promontory shoreline and according to the Naval Range Inventory, encompassed approximately 0.029-acres. The boundary was changed after further review. A small pile of igniters were found at this site during an extremely low tide in 1996 or 1997. Reportedly, several of the igniters were picked up and disposed of; however, it is not known if the disposal of the remaining igniters occurred. The igniters were described to be electric primers or electrically-primed rifle cartridges approximately .50 caliber in size. The origin of the igniters, the dates of use, or date of disposal are unknown. Interviews with former employees indicate that the igniters may have come from the Cast Plant.

Figure 5.1-1: Aerial Photograph of "Thieves Point"

In March of 2004, Ms. Heidi Morgan, NDW, IH Environmental Office, provided photographs of additional ordnance items seen along the shoreline during a low tide event. The ordnance items shown in Figure 5.1-2 appear to be float signals, MK 1 MOD 1 or MK 2 MOD 0. The ordnance item shown in Figure 5.1-3 appears to be a 250, 500 or 750 pound old style bomb.

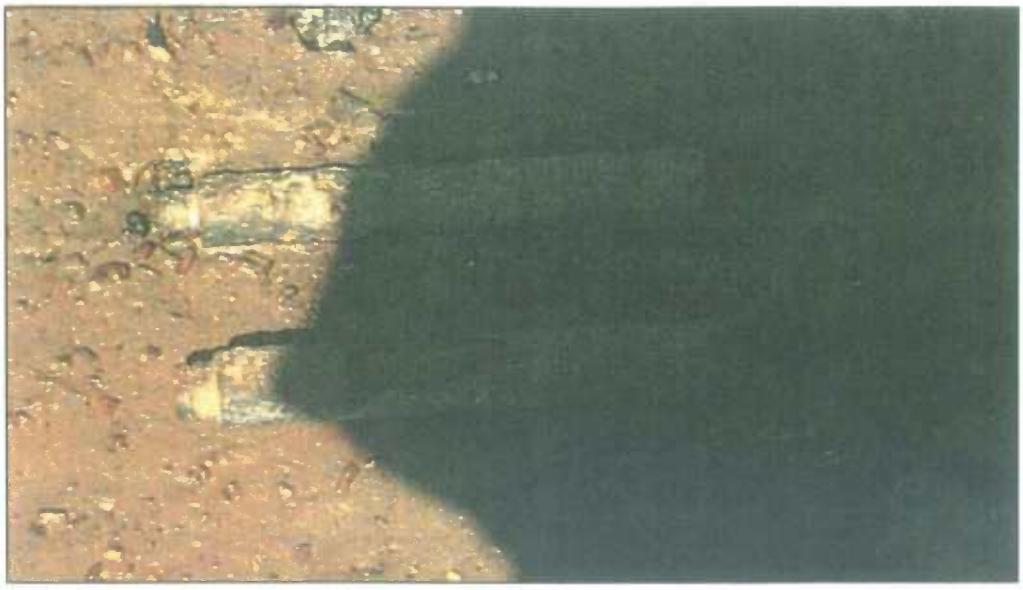


Figure 5.1-2: Possible float signal found during a low tide in the Igniter Area.

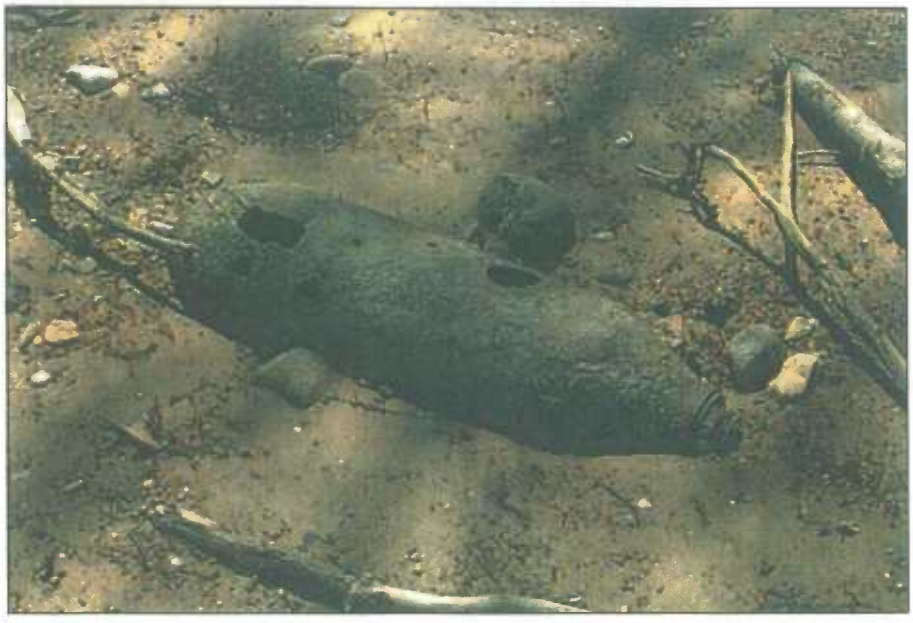


Figure 5.1-3: Possible old-style bomb found during low tide in the Igniter Area.

There is only one structure nearby, Building 1451, which is currently vacant. The Igniter Area is located offshore from the building. A picture of the shoreline in the Igniter Area is provided as Figure 5.1-4. The building shown in the photograph is Building 1451.

Figure 5.1-4: View of the shoreline in the Igniter Area.

5.1.1.1.Topography

Section 3.2 provides a general description of topography for NDW, IH. The Igniter Area is located along the shoreline of the Mattawoman Creek. The area is covered by water except during extremely low tides. The depth of the water at the site varies with the tide; however, the water in this area is relatively shallow. The topography of the site is flat to gently sloping.

5.1.1.2.Geology

Section 3.3 provides a geologic description for NDW, IH, which is applicable to the Igniter Area.

5.1.1.3.Soil and Vegetation Types

Section 3.4 provides a geologic description for NDW, IH. The soil at the Igniter Area consists of river sediments. The shoreline and adjacent land is considered tidal marsh. The soil in these areas range from sand to clay but can often be peaty as well. As this is a water range, there is no vegetation directly on site. Vegetation adjacent to the site, as illustrated in Figure 5.1-5, primarily consists of marshlands and uplands containing marsh grasses, low shrubs, and some trees. The area on the promontory is considered a wetland.

Figure 5.1-5: Vegetation along Mattawoman Creek shoreline in vicinity of the Igniter Area

5.1.1.4.Hydrology

Section 3.5 provides a description of hydrology for NDW, IH. The Igniter Area is located off a small promontory extending into the Mattawoman Creek at the southeast end of the Indian Head Main Installation peninsula. The Mattawoman Creek drains into the Potomac River. Wetlands exist on the eastern and southern portions of the promontory, which drain directly into the Mattawoman Creek.

5.1.1.5.Hydrogeology

Section 3.6 provides a description of regional hydrogeology for NDW, IH.

5.1.1.6.Cultural and Natural Resources

Section 3.7 provides a description of cultural and natural resources for NDW, IH. The entire promontory adjacent to the Igniter Area is currently designed as a species protection area by NDW, IH.

5.1.1.7.Endangered and Special Status Species

Section 3.8 provides a description of endangered and special status species for NDW, IH. No endangered or special status species are known to inhabit the Igniter Area. As this is a water range, the reported endangered and special status species noted in Section 3.8 are not likely to inhabit the Igniter Area.

5.1.2. Visual Survey Observations and Results

A site visit to the NDW, IH was conducted June 23–27, 2003. Personnel conducting the visual survey of the Igniter Area on June 23, 2003 included Mr. Shawn Jorgensen, Mr. Mike Baker, Mr. Robert Wiley, Mr. Stephen Rice, and Ms. Julie Grim. The visual survey was conducted by walking the shoreline adjacent to the site. The Igniter Area site lies offshore along a wooded and marshy area on a small promontory. Building 1451, formerly used for storage and the only structure near the site, is shown in Figure 5.1-6. Building 1451 is located at the end of Hussey Circle, formerly an extension of Greenslade Road. The Igniter Area is situated off shore to the northeast of the building. No evidence of the igniters were found during the visual survey. There were no indications of MEC observed during the visual survey since the site was covered with water at the time.

Figure 5.1-6: Building 1451 located at the end of Hussey Circle

A visual depiction of the site reconnaissance is provided on Map 5.1-1 located at the end of Section 5.1. Additional range/site details are illustrated on Map 5.1-2 also located at the end of Section 5.1.

5.1.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials known or suspected to be at the site. This includes both MEC and non-hazardous munitions related scrap (e.g., fragmentation, base plates, inert mortar fins).

The munitions associated with this site are igniters. By their description, the igniters are assumed to be electric primers or electrically-primed rifle cartridges approximately .50 caliber in size. A small pile of the igniters were found by installation personnel during extremely low tide in the late 1990s. Since this time, there have been no additional igniters recovered at the site. The date of disposal is unknown. Also unknown is the origin of the igniters. Based on the available information, the igniters are suspected to be M2 and/or M60 time blasting fuse igniters. M2 and M60 igniters are approximately 1.2 inches in diameter, 4.8 inches in length, and weigh 340 grams. They are weatherproof with a filler of lead styphnate. The time blasting fuse igniter is a pull-type assembly that is used to initiate a time blasting fuse. It may be used under all weather conditions and even underwater. Additional information on the M2 and M60 igniters is provided in Appendix D. In March of 2004, Ms. Heidi Morgan, NDW, IH Environmental Office, provided photographs of additional ordnance items seen along the shoreline during a low tide event. The ordnance items appear to be MK 1 MOD 1 or MK 2 MOD 0 float signals and a 250, 500 or 750 pound old-style bomb. Additional information on these ordnance items can be found in Appendix D.

Based on the information obtained during the data collection process, the Igniter Area is not suspected to contain Chemical Warfare Materiel (CWM) filled munitions or Depleted Uranium (DU) associated munitions.

5.1.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspect MEC Areas, and Areas Not Suspected to Contain MEC to indicate that MEC is known or is suspected to be at the site. The MEC presence is discussed below.

Map 5.1-3 illustrates the munitions characterization of the Igniter Area and is provided at the end of Section 5.1.

5.1.4.1.Known MEC Areas

There entire site is a known MEC Areas on site, based on the available information and the items found at the Igniter Area.

5.1.4.2.Suspected MEC Areas

There are no suspected MEC areas for the Igniter Area.

5.1.4.3.Areas Not Suspected to Contain MEC

Based on the available information on this site, there are no areas not suspected to contain MEC.

5.1.5. Ordnance Penetration Estimates

According to installation personnel, the igniters were found in a small pile on the shoreline of the Mattawoman Creek at an extremely low tide. From this information, it is assumed that the items were discarded at this location. The additional ordnance items found by Ms. Heidi Morgan, NDW, IH Environmental Office, during another low tide event are also assumed to have either been discarded or washed up from another location. As such, an ordnance penetration estimate is not applicable for the Igniter Area.

5.1.6. Munitions Constituents

MC associated with this site include lead styphnate; the filler material used in M2 and M60 igniters, and smoke composition; the filler material used in MK 1 MOD 1 and MK 2 MOD 0 float signals. Because the type of old-style bomb found could not be determined, the associated MC is not known. Lead styphnate is a primary explosive used in friction type primers. It is slightly soluble in water. Lead styphnate is easily ignited by flame, can be set off by shock and heat, and is sensitive to discharge of static electricity. Dry material can be ignited by a discharge of static electricity from the human body. It detonates at approximately 16,100 feet per second. Lead styphnate is more sensitive in a mixture than when used alone and is normally mixed with an oxidizing agent or fuel. Only a small amount of lead styphnate is present in each igniter. Based on the available information, including the size and location of the igniters, significant lead styphnate contamination is not expected.

5.1.7. Contaminant Migration Routes

Potential contaminant migration routes include tidal currents or wave action, shoreline erosion, and sedimentation. The Igniter Area is located on the shoreline of the Mattawoman Creek, which is affected by tides. Tidal currents and waves have the potential to erode the shoreline as well as to migrate, bury, or uncover MEC at the site. MC migration routes include erosion/deposition, water currents, tides and relocation during events such as heavy rain and storm surges.

5.1.8. Receptors

Potential human receptors at the Igniter Area are Navy personnel (military and civilian), commercial/recreational users and trespassers. Potential ecological receptors would include aquatic animals and plants as well as birds and small mammals. The potential exposure media for both human and ecological receptors pertaining to the Igniter Area are surface water/sediments, and the food chain. Human receptors may come in contact with MEC or MC through recreational activities such as wading, fishing or boating on the Mattawoman Creek. Fish and other aquatic organisms may become receptors through burrowing or feeding activities at the Igniter Area. As fishing is allowed in the area, human receptors can potentially contact MC through ingesting impacted fish collected in the Mattawoman Creek.

5.1.8.1.Nearby Populations

Charles County contains approximately 260 people per square mile according to the 2000 U.S. Census. NDW, IH and its tenant commands employ approximately 3,600 military and civilian personnel. Indian Head is the county's largest employer. Over 76 percent of employees at the base live within Charles County. Approximately 500 military and family members live on the installation. Recreation on and around the installation includes hunting and fishing by permit.

5.1.8.2.Buildings Near/Within Site

There is only one building located adjacent to the Igniter Area. Located on the small promontory off of the Mattawoman Creek, Building 1451 was formerly used for storage and is now vacant. The building was constructed in 1988 and is scheduled to be demolished by the installation.

5.1.8.3.Utilities On/Near Site

According to the 2003 Utilities Data map provided by the installation, there are no utilities on the promontory adjacent to the Igniter Area. However, during the visual survey overhead power lines were identified along Hussey Circle. It was unclear whether the electricity lines run to Building 1451.

5.1.9. Site Use

The Igniter Area is a water range located offshore of a small promontory. The entire promontory is currently designated as a species protection area by the installation. The land is not currently being used by the installation. Recreational activities such as boating, wading or fishing may take place on or around the Igniter Area. The Igniter Area may have been used for the disposal of igniters. The date of disposal is unknown.

5.1.10. Access Controls / Restrictions

Access to the Main Installation peninsula is limited by gated entrances, a security patrol and a perimeter fence. Only Navy personnel (military and civilian) and authorized contractors/visitors are allowed on the installation; however, the Igniter Area is located offshore. Access to the area is by way of Hussey Circle, which runs to the end of the small promontory off which the site is

located. The area can also be accessed by way of the Mattawoman Creek. There are no specific security measures to prevent access from the Mattawoman Creek.

The Igniter Area is covered by water, thus, there are no site specific restrictions. There are development restrictions on the adjacent promontory, which is a designated species protection area and a wetland.

5.1.11. Conceptual Site Model

This Conceptual Site Model (CSM) was developed following guidance documents issued by the USEPA for hazardous waste sites and the U.S. Army Corps of Engineers (USACE) for ordnance and explosives (OE) sites. Guidance documents included the USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (EPA/540/G-89/004) and the USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental Ordnance and Explosives (OE) Sites, which was final as of February 2003.

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link them. The CSM is the basis for the risk evaluation, prioritization, and remediation cost estimate.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.1-1 below.

Table 5.1-1: Conceptual Site Model Information Profiles – Igniter Area

Profile Type	Information Needs	Preliminary Assessment Findings
Range/Site Profile	Installation Name	NDW, IH
	Installation Location	Indian Head, Charles County, Maryland
	Range/Site Name	Igniter Area
	Range/Site Location	The Igniter Area is located along the shoreline of the Mattawoman Creek at the southeast corner of the Indian Head Main Installation peninsula.

Table 5.1-1: Conceptual Site Model Information Profiles – Igniter Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Range/Site History	Several igniters were found on the shore at an extremely low tide during the late 1990s. According to former installation personnel, igniters may have been discarded in this area from the Cast Plant. Additionally, in March 2004 several potential float signals, MK 1 MOD 1 or MK 2 MOD 0, and a 250, 500 or 750 pound old style bomb was observed at the Igniter Area during a low tide event. The date of the disposal is unknown.
	Range/Site Area and Layout	The 0.01-acre site is positioned on the shoreline of the Mattawoman Creek. The igniters were in an area below the mean low tide level. The area contains one vacant building.
	Range/Site Structures	Building 1451 is the only structure located near the site. It was formerly used for storage and is currently vacant.
	Range/Site Boundaries	N: Mattawoman Creek S: Building 1451 and Hussey Circle E: Mattawoman Creek W: Wooded area
	Range/Site Security	Security for the entire Main Installation peninsula facility includes partial fencing, lock/secured gates and security patrols. There are no specific access controls or restrictions for the Igniter Area. There are no specific security measures to prevent access from the Mattawoman Creek.
Munitions/ Release Profile	Munitions Types	Igniters, assumed to be electric primers or electrically primed rifle cartridges approximately .50 caliber in size. MK 1 MOD 1 and MK 2 MOD 0 float signals, and old-style bombs (type unknown).
	Maximum Probability Penetration Depth	Not applicable. The ordnance items were found on the sediment surface at an extremely low tide.
	MEC Density	Low.
	MEC Scrap/Fragments	None.
	Associated Munitions Constituents	Lead Styphnate, Smoke Composition.
	Migration Routes/Release Mechanisms	Erosion/redeposition, water currents, tides, and relocation during events such as heavy rains and storm surges.

Table 5.1-1: Conceptual Site Model Information Profiles – Igniter Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
Physical Profile	Climate	Indian Head has a continental-type climate with four well-defined seasons. The coldest period at Indian Head occurs in late January and early February, with low temperatures averaging 29°F. July is the warmest month with average maximum temperatures of 85°F. The normal annual precipitation is approximately 44 inches, normal monthly precipitation varying from 2.25 (February) to 4.60 (August) inches.
	Topography	The topography of the site is flat to gently sloping along the shoreline of the Mattawoman Creek.
	Geology	Indian Head and Stump Neck lie within the Atlantic Coastal plain physiographic province. The geology of the area is comprised of Precambrian igneous and metamorphic bedrock overlain by 500 to 600 feet of unconsolidated fluvial and marine deposits of the Potomac Group. The Potomac Group consists of, in descending order, the Patapsco, Arundel, and Patuxent Formations.
	Soil	River sediments
	Hydrogeology	The lower and middle sands of the Patapsco and Patuxent Formations of the Potomac Group are the main groundwater aquifers used for domestic purposes at Indian Head and Stump Neck. The average depth to the Patapsco Aquifer is 300 feet. Shallow unconfined to semiconfined groundwater occurs from near surface to approximately 29 feet bgs, with water-table elevations ranging from sea level to approximately 75 feet above sea level.
	Hydrology	The Igniter Area is located off shore of a small promontory extending into Mattawoman Creek at the southeast end of the Indian Head Main Installation peninsula. Wetlands exist on the eastern and southern portions of the promontory.
	Vegetation	Vegetation adjacent to the site primarily consists of marshland containing grasses, low brush, and some trees. Vegetation within the surrounding area includes coniferous-deciduous mix and palustrine forested.
Site Use and Exposure Profile	Current Site Use	The site and adjacent land is not currently in use. Building 1451 is vacant. The promontory is a wetland and considered a species protection area.

Table 5.1-1: Conceptual Site Model Information Profiles – Igniter Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Current Human Receptors	Navy personnel (military and civilian), commercial/recreational users, trespassers.
	Current Activities (frequency, nature of activity)	Recreational (fishing, boating).
	Potential Future Site Use	No future changes in site use are anticipated.
	Potential Future Human Receptors	Navy personnel (military and civilian), commercial/recreational users, trespassers.
	Potential Future Site Use-Related Activities:	Building 1451 is scheduled to be demolished.
	Zoning/Site Use Restrictions	There are development constraints in the area due to the wetland area on the promontory.
	Demographics/Zoning	Charles County population density is approximately 260 persons per square mile. NDW, IH and its tenant commands employ approximately 3,600 military and civilian personnel.
	Beneficial Resources	American Shad, Alewife and Blueback Herring use the Potomac River, Chicamuxen Creek and Mattawoman Creek as travel routes and spawning sites.
Ecological Profile	Habitat Type	The area provides wetland and shoreline habitats for various species of plants and animals.
	Degree of Disturbance	Low – The site is currently unused except for recreational activities. Other disturbances include erosion and sedimentation due to tidal currents and wave action.
	Ecological Receptors	
	Federal Endangered Species:	American bald eagle, rainbow snake, and sensitive joint-vetch
	Federal Threatened Species:	None
	State Endangered Species:	Scaly blazing-star
	State Threatened Species:	None
	Other Ecological Receptors:	American Shad, Alewife and Blueback Herring and other species that use the Potomac River as a travel route and spawning site.

Table 5.1-1: Conceptual Site Model Information Profiles – Igniter Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Receptors may have direct contact with MEC or MC through recreational activities or indirect contact with MC that has been incorporated into the food chain (bioaccumulated in plants and animals.

A key element of the CSM is the exposure pathway analysis. For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel (military and civilian), construction workers, recreational users or authorized visitors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel (military and civilian), construction workers, recreational users or authorized visitors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the impacted medium. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area.

MEC Interactions and Pathway Analysis

The pathway analysis for MEC is shown in Figure 5.1-7. Potential receptors include both human (Navy personnel (military and civilian), commercial/recreational user, and trespasser) and

ecological receptors (biota) that may contact the source medium. Pathways are shown for each medium and are discussed below.

Surface Sediment

Human and ecological receptors could potentially be affected by MEC at the sediment surface. Human receptors such as Navy personnel (military and civilian), commercial/recreational user or trespassers could disturb MEC through recreational activities such as wading and fishing. Activities, such as physical contact with sediments, could also affect biota.

Subsurface Sediment

The pathways for MEC in the subsurface are incomplete for all receptors because no intrusive activities, such as river dredging, are anticipated in the Igniter Area. MEC could, however, be transported to surface sediment by the tides, water currents, erosion/redeposition, and relocation during events such as heavy rains and storm surges.

MC Interactions and Pathway Analysis

The pathway analysis for MC is shown in Figure 5.1-8. Potential receptors include both human (Navy personnel (military and civilian), commercial/recreational user, and trespasser) and ecological receptors (biota) that may contact the source medium or other media at the Igniter Area that may be impacted. Pathways are shown for each medium and are discussed below.

Surface Water

Potential receptors including both human (Navy personnel (military and civilian), commercial/recreational user, and trespasser) and ecological receptors (biota) may potentially ingest or come into physical contact with surface water at the site. Biota can potentially ingest or come into physical contact with impacted surface water. Human receptors have the potential for physical contact and ingestion of impacted water through recreational activities such as wading or fishing.

Plant/Animal Uptake

A potentially complete pathway is indicated for biota exposed to MC at the Igniter Area via the food chain. MC may be taken up by plants and transferred through the food chain to feeding biota. There are no domestic animals on or near the Igniter Area, so the MC exposure pathway is

considered incomplete for all receptors. Fishing is known to occur on Mattawoman Creek; therefore, fish provide a potentially complete pathway for all receptors.

Surface Sediments

Human and ecological receptors could potentially be affected by MC at the sediment surface through ingestion or dermal contact. Human receptors such as Navy personnel (military and civilian), commercial/recreational user or trespassers could contact MC through recreational activities such as wading and fishing. Activities, such as physical contact with and ingestion of sediments, could also affect biota.

Subsurface Sediments

The ingestion and dermal contact pathways for MC in the subsurface are incomplete for all receptors because no intrusive activities, such as river dredging, are anticipated in the Igniter Area. MC could, however, be transported to surface water by the tides, water currents, erosion/redeposition, and relocation during events such as heavy rains and storm surges.

Figure 5.1-7: MEC Exposure Pathway Analysis: Igniter Area

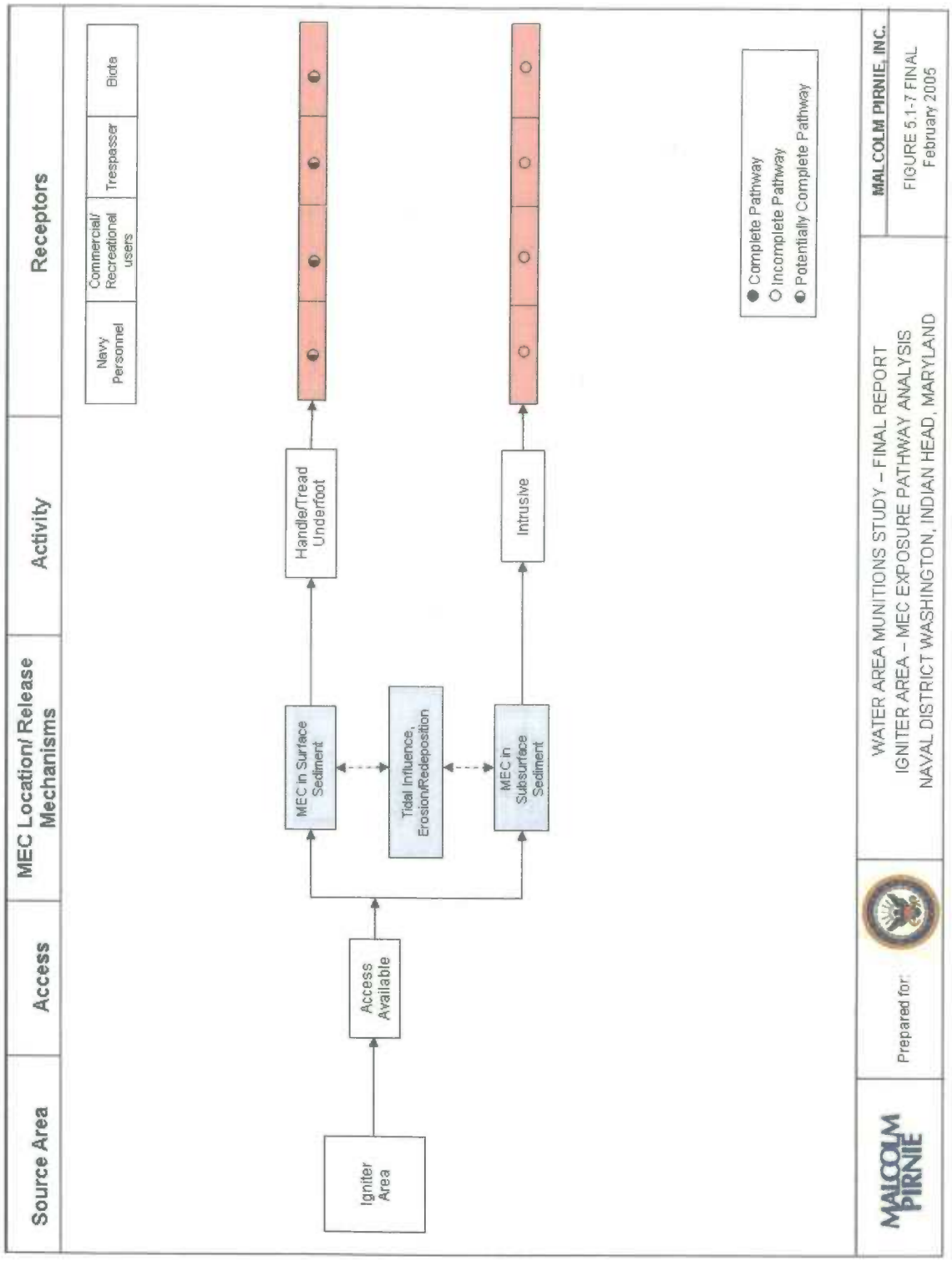
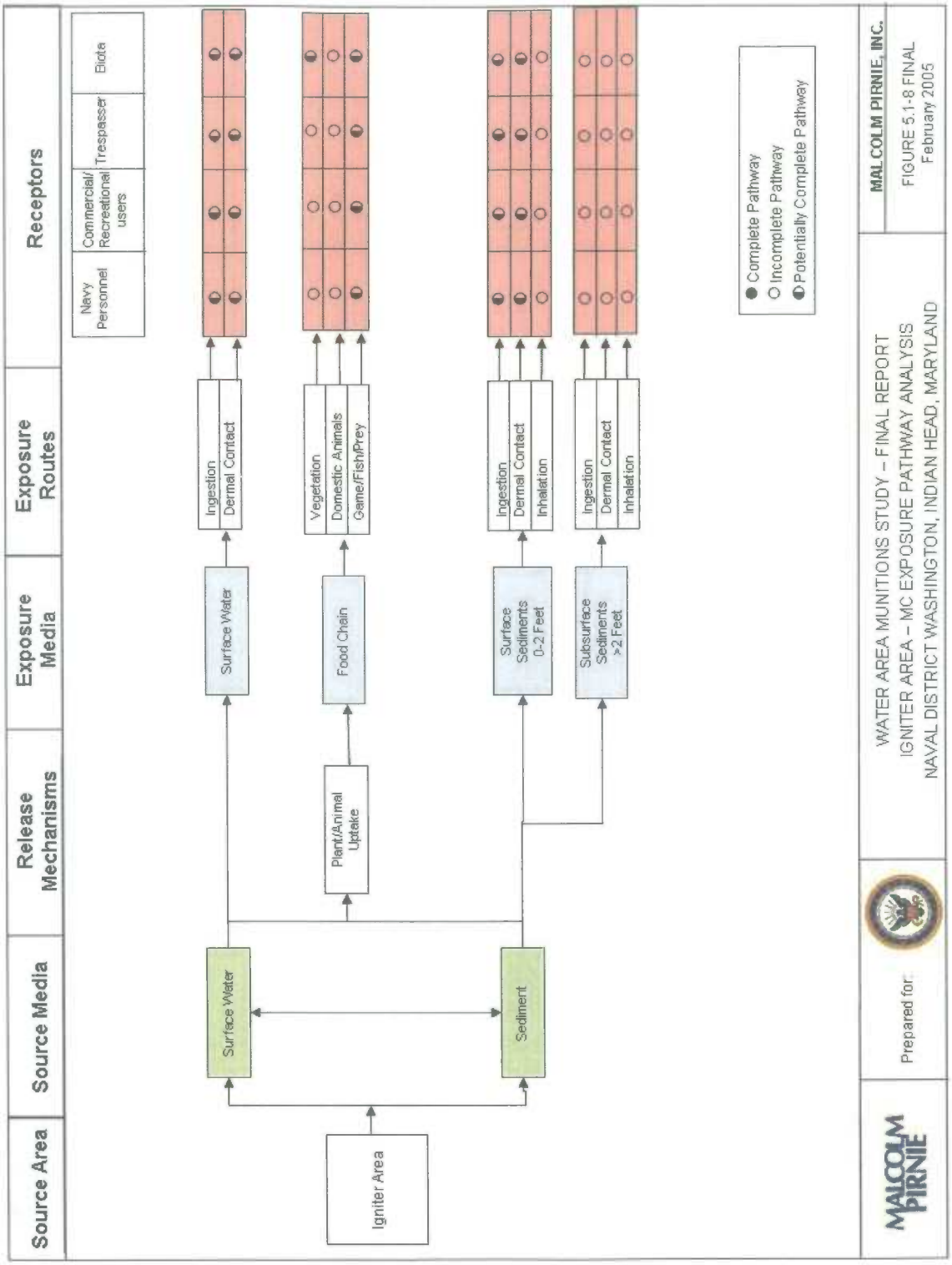


Figure 5.1-8: MC Exposure Pathway Analysis: Igniter Area



5.1.12. Summary

The Igniter Area is a 0.01 acre site located off shore of a small promontory extending into the Mattawoman Creek. According to installation personnel, a small pile of igniters were found during an extremely low tide in 1996 or 1997. Several of the igniters were reportedly picked up and disposed of. The igniters found at the site were described to be electric primers or electrically-primed rifle cartridges approximately .50 caliber in size. From the available information, the igniters are thought to be M2 or M60 weatherproof time blasting fuse igniters. These igniters are filled with lead styphnate; a primary explosive that is slightly water soluble. The date of disposal is unknown. Additional ordnance items identified as potentially MK 1 MOD 1 or MK 2 MOD 0 float signals and an old-style bomb were found by Ms. Heidi Morgan, NDW, IH Environmental Office, during a low tide event in March 2004. The float signals are filled with a smoke composition. There is one structure, Building 1451, located on the promontory adjacent to the site. The building, once used for storage, is now vacant and scheduled to be demolished by the installation. The promontory is a wetland and considered a species protection area. Contaminant migration routes for the Igniter Area include erosion/deposition, water currents, tides, and relocation during events such as heavy rains and storm surges.

Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 5.1-1
Visual Survey
Igniter Area

Legend

- Installation Boundary
- Site Reconnaissance
- Igniter Area

20 0 20 40 60 Meters

Data Source: USGS, DOQQ Indian Head, MD, 1998

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005

Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 5.1-2
Range/Site Details
Igniter Area

Legend

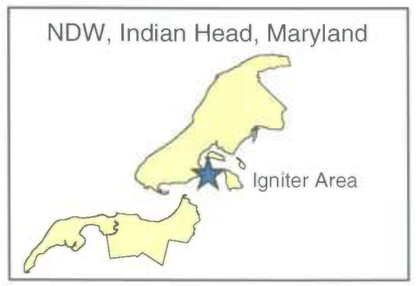
- Installation Boundary
- Contours
- Roads
- Structures
- Streams
- Wetlands
- Igniter Area

20 0 20 40 60 Meters

Data Source: USGS, DOQQ Indian Head, MD, 1998

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005



Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 5.1-3
Munitions Characterization
Igniter Area

Legend

- Installation Boundary
- Igniter Area

MEC Presence*

- Known
- Suspect

* MEC Presence was determined through review of historical documentation, interviews, and/or visual survey.

20 0 20 40 60 Meters

Data Source: USGS, DOQQ Indian Head, MD, 1998

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005

5.2. Water Impact Area

5.2.1. History and Site Description

The Water Impact Area is located between Chapman's Point, MD and the mouth of the Chicamuxen Creek and encompasses an area of approximately 12,296 acres. The Navy Range Inventory indicates that the Water Impact Area includes several different areas of operations: rockets and gun testing from The Valley where ordnance may have strayed from targets and landed in the water; remnants of ordnance and bulk propellant from Large Motor Test Facility incidents; and underwater explosion testing done in the Potomac River. The estimated acreage listed in the Naval Range Inventory is 100 acres, but it is noted that the range could extend from Chapman Point to Chopawamsic Creek, encompassing a larger area totaling 12,296 acres. The Water Impact Area also overlaps portions of the Battle Range Firing Area and the Sonar Training Area.

Battleship gun testing was conducted in the Water Impact Area from January 24, 1891 until July 21, 1921 from The Valley to the impact area at Stump Neck Annex and across the Potomac River into Virginia. Approximately several hundred rockets were fired from the dock firing station at The Valley through 1946 or 1947. Guns and rockets fired from The Valley may have missed intended impact areas and landed in the Water Impact Area. Additionally, approximately 8,000 yards of the Potomac River were used for gun testing. A U.S. Army Engineer District Washington Public notice dated December 23, 1960 stated underwater explosions in the Potomac River between Chapman's Point and the mouth of the Chicamuxen Creek would occur between January 2, 1961 and March 15, 1961. The types of munitions used to generate the explosions are unknown. Underwater explosions in the Potomac River near Indian Head were also noted in a memo from the Chief of Naval Material dated October 12, 1979. The test sites described in this memo are shown in Figure 5.2-1. According to Mr. Jeff Morris, from NAVFAC Washington this area was dredged in 1952 to recover munitions scrap for scrap metal recycling. Accidental releases from the Large Motor Test Facility of remnants of ordnance and bulk propellant may also have occurred into the Water Impact Area.

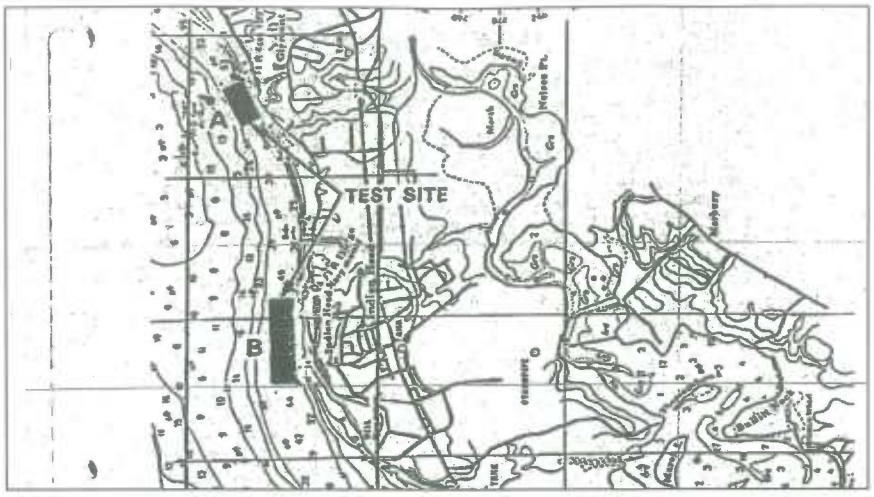


Figure 5.2-1: 1979 map showing test sites located within the Water Impact Area

5.2.1.1.Topography

Section 3.2 provides a general description of the topography for NDW, IH. The Water Impact Area is a water range; therefore there is no site specific topography.

5.2.1.2.Geology

Section 3.3 provides a geologic description for NDW, IH. There is no site specific geologic information available for the Water Impact Area.

5.2.1.3.Soil and Vegetation Types

Section 3.4 provides soil and vegetation types for NDW, IH. Submerged Aquatic Vegetation (SAV) was observed during a visual range survey conducted along the Mattawoman Creek (tributary to the Potomac River) shoreline of the Battle Range Firing Area on June 3, 2004. Therefore, it is expected SAV would occur in the Mattawoman Creek sections of the Water Impact Area and is also expected to inhabit the Potomac River and Chicamuxen Creek sections of the Water Impact Area as well. Soil in the Water Impact Area consists of river sediments.

5.2.1.4.Hydrology

Section 3.5 provides a description of hydrology at NDW, IH. The three principal waterways in the vicinity of the Water Impact Area are the Potomac River, Mattawoman Creek, and Chicamuxen Creek. The Potomac River is a tidally influenced estuary and is slightly brackish. The Mattawoman Creek and Chicamuxen Creek are tributaries to the Potomac River and are also tidally influenced. Depth of water at the Water Impact Area ranges from zero at the shoreline to 6 meters in the center of the Potomac River.

5.2.1.5.Hydrogeology

Section 3.6 provides a description of hydrogeology for Indian Head and the Stump Neck Annex.

5.2.1.6.Cultural and Natural Resources

Section 3.7 provides general cultural and natural resources for NDW, IH. There is no available data on site specific cultural and natural resources for the Water Impact Area.

5.2.1.7.Endangered and Special Status Species

Section 3.8 provides information on endangered and special status species at NDW, IH. No endangered or special status species are known to inhabit the Water Impact Area. As this is a water range, the reported endangered and special status species noted in Section 3.8 are not likely to inhabit the Water Impact Area.

5.2.2. Visual Survey Observations and Results

A visual survey of the Water Impact Area has not been conducted and is not anticipated. Range/site details are illustrated on Map 5.2-1 also located at the end of Section 5.2.

5.2.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials known or suspected to be at the site. This includes both MEC and non-hazardous munitions related scrap (e.g., fragmentation, base plates, inert mortar fins).

According to historical documentation, practically all forms of Naval ordnance used from the 1890s until the 1920s had been tested and/or developed at The Valley. Ordnance that may have strayed from targets and landed in the Water Impact Area include various calibers of guns (1-inch through 16-inch) that were proved at The Valley with various projectiles, including AP shells. Tested shells contained different types of explosive fillers, including black powder, smokeless powder, brown prismatic powder, emmensite, joveite, wet gun cotton, randite and other high explosives (e.g. Thorite).

Accidental releases from the Large Motor Test Facility of remnants of ordnance and bulk propellant and underwater explosion testing may also have occurred into the Water Impact Area. The maximum charge weight for underwater explosion testing was 80 pounds. The Potomac River near Indian Head is also listed as an underwater explosion test site in the 1988 Final Committee Report: Alternate Site Study for Underwater Explosion Testing. According to the Final Committee Report, charge sizes varied from 1 gram to 20 pounds of C-4 or similar explosives. Other types of munitions fired into or at the Water Impact Area remain are not known. Additional information on these ordnance items can be found in Appendix D.

The Water Impact Area is not suspected to contain CWM filled munitions, electrically fuzed munitions, or DU associated munitions.

5.2.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspect MEC Areas, and Areas Not Suspected Contain MEC to indicate that MEC is known or is suspected to be at the site. The MEC presence is discussed below.

Map 5.2-2 illustrates the munitions characterization of the Water Impact Area and is provided at the end of Section 5.2.

5.2.4.1.Known MEC Areas

There are no known MEC Areas at the Water Impact Area. .

5.2.4.2.Suspected MEC Areas

The entire Water Impact Area is considered a suspect MEC area based on historic use of the range. MEC may be located in this range resulting from possible underwater explosion testing and explosives formerly fired into this area. Accidental releases from the Large Motor Test facility of ordnance remnants and bulk propellant, may have occurred in the Water Impact Area. Also, a map depicting the range fan from firing at The Valley indicates that impacts from The Valley may have occurred in the area.

5.2.4.3.Areas Not Suspected to Contain MEC

There are no areas in the Water Impact Area not suspected to contain MEC.

5.2.5. Ordnance Penetration Estimates

The penetration depth of munitions fired at or into the Water Impact Area remains unknown.

5.2.6. Munitions Constituents

Based on the history of the range with the testing an assortment of Naval ordnance, potential MC present at the Water Impact Area could include explosive fillers, including black powder, smokeless powder, brown prismatic powder, emmensite, joveite, wet gun cotton, randite, propellants and other high explosives (e.g. Thorite).

5.2.7. Contaminant Migration Routes

Contaminants at the Water Impact Area have the potential to migrate within the surface water/sediments and subsurface sediments at the Potomac River, the Mattawoman Creek, and the

Chicamuxen Creek. Migration routes and release mechanisms could occur from dredging, erosion and redeposition, water currents, and relocation during events such as heavy rains and storm surges. It is anticipated that the Potomac River is periodically dredged. Recreational activities such as fishing and crabbing could also disturb sediments.

5.2.8. Receptors

Potential human receptors at the Water Impact Area include Navy personnel (military and civilian), commercial/recreational users and trespassers. Potential ecological receptors would include aquatic animals and plants as well as birds and small mammals. The potential exposure media for both human and ecological receptors pertaining to the Water Impact Area are surface water/sediments, and the food chain. Human receptors may come in contact with MEC or MC through recreational activities such as wading, fishing or boating on the Mattawoman Creek, the Chicamuxen Creek and the Potomac River. Fish and other aquatic organisms may become receptors through burrowing or feeding activities at the Water Impact Area. As fishing is allowed in the area, human receptors can potentially contact MC through consumption.

5.2.8.1.Nearby Populations

Nearby populations are as discussed in Section 5.1.8.1.

5.2.8.2.Buildings Near/Within Site

This section is not applicable to the Water Impact Area because it is entirely a water range.

5.2.8.3.Utilities On/Near Site

This section is not applicable to the Water Impact Area because it is entirely a water range.

5.2.9. Site Use

The Water Impact Area was historically used for battleship gun testing in the late 1800's and early 1900's. Rockets were also fired into the Water Impact Area until 1946 or 1947. Underwater explosions were reported to have occurred in 1961 and the Potomac River near Indian Head is listed as an underwater explosion test site in the 1988 Final Committee Report:

Alternate Site Study for Underwater Explosion Testing. Accidental releases from the Large Motor Test facility may have occurred in this range as well.

Current site use of the Water Impact Area is dominated by recreational and commercial users of the Potomac River, the Mattawoman Creek, and the Chicamuxen Creek who boat and fish in these waterways.

5.2.10. Access Controls / Restrictions

The Water Impact Area consists of public waterways with no access controls or restrictions.

5.2.11. Conceptual Site Model

A general description of the CSM is provided in Section 5.1.11.

The CSM is presented in a series of information profiles that presents information about the site. The information profiles are included in Table 5.2-1below.

Table 5.2-1: Conceptual Site Model Information Profiles – Water Impact Area

Profile Type	Information Needs	Preliminary Assessment Findings
Range/Site Profile	Installation Name	NDW, IH
	Installation Location	Indian Head, Charles County, Maryland
	Range/Site Name	Water Impact Area
	Range/Site Location	The Water Impact Area is located south of Chapman's Point, MD and north of the mouth of the Chicamuxen Creek.
	Range/Site History	Battleship gun testing was conducted in the Water Impact Area from January 24, 1891 until July 21, 1921. Gun and rocket fire from The Valley may have missed intended targets and landed in the Water Impact Area. Underwater explosions may have occurred between Chapman's Point and the mouth of the Chicamuxen Creek between January and March 1961.
	Range/Site Area and Layout	The Water Impact Area is a 12,296-acre underwater site.
	Range/Site Structures	None

Table 5.2-1: Conceptual Site Model Information Profiles – Water Impact Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Range/Site Boundaries	N: Chapman's Point, north of Indian Head S: Mouth of the Chicamuxen Creek E: Mattawoman Creek, Potomac River W: Potomac River
	Range/Site Security	Security for the entire Main Installation peninsula facility includes partial fencing; lock/secured gates and security patrols. There are no specific access controls or restrictions for the Water Impact Area because the area is a public waterway. There are no specific security measures to prevent access from the Potomac River, Mattawoman Creek or Chicamuxen Creek.
Munitions/ Release Profile	Munitions Types	Various calibers of guns (1-inch through 16-inch) that were proved at The Valley with various projectiles, including AP shells. Possible remnants of ordnance and bulk propellant and underwater explosions. Charge sizes for the underwater explosions varied from 1 gram to 20 pounds of C-4 or similar explosives.
	Maximum Probability Penetration Depth	Unknown
	MEC Density	Since this site is underwater, a visual survey could not be conducted, therefore, MEC density is unknown.
	MEC Scrap/Fragments	Since a visual survey was not conducted, the presence of MEC scrap/fragments is unknown.
	Associated Munitions Constituents	Explosive fillers, including black powder, smokeless powder, brown prismatic powder, emmensite, joveite, wet gun cotton, randite and other high explosives (e.g. Thorite).
	Migration Routes/Release Mechanisms	Dredging, erosion/redeposition, water currents, tides, and relocation during events such as heavy rains and storm surges.
Physical Profile	Climate	Indian Head has a continental-type climate with four well-defined seasons. The coldest period at Indian Head occurs in late January and early February, with low temperatures averaging 29°F. July is the warmest month with average maximum temperatures of 85°F. The normal annual precipitation is approximately 44 inches, normal monthly precipitation varying from 2.25 (February) to 4.60 (August) inches.

Table 5.2-1: Conceptual Site Model Information Profiles – Water Impact Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Topography	Water range; not applicable.
	Geology	Indian Head and Stump Neck lie within the Atlantic Coastal plain physiographic province. The geology of the area is comprised of Precambrian igneous and metamorphic bedrock overlain by 500 to 600 feet of unconsolidated fluvial and marine deposits of the Potomac Group. The Potomac Group consists of, in descending order, the Patapsco, Arundel, and Patuxent Formations.
	Soil	River sediments.
	Hydrogeology	The lower and middle sands of the Patapsco and Patuxent Formations of the Potomac Group are the main groundwater aquifers used for domestic purposes at Indian Head and Stump Neck. The average depth to the Patapsco Aquifer is 300 feet. Shallow unconfined to semiconfined groundwater occurs from near surface to approximately 29 feet bgs, with water-table elevations ranging from sea level to approximately 75 feet above sea level.
	Hydrology	The Water Impact Area consists of portions of the Potomac River, Chicamuxen Creek and Mattawoman Creek which borders both Indian Head Main Installation and Stump Neck Annex.
	Vegetation	Aquatic vegetation.
Site Use and Exposure Profile	Current Site Use	The Water Impact Area is used for recreational boating and fishing.
	Current Human Receptors	Navy personnel (military and civilian), commercial/recreational users, and trespassers.
	Current Activities (frequency, nature of activity)	Recreational (fishing, boating); commercial (dredging)
	Potential Future Site Use	No future changes in site use are anticipated.
	Potential Future Human Receptors	Navy personnel (military and civilian), commercial/recreational users, and trespassers.
	Potential Future Site Use-Related Activities:	No future changes in site use are anticipated.
	Zoning/Site Use Restrictions	None.

Table 5.2-1: Conceptual Site Model Information Profiles – Water Impact Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Demographics/Zoning	Charles County population density is approximately 260 persons per square mile. NDW and its tenant commands employ approximately 3,600 military and civilian personnel.
	Beneficial Resources	American Shad, Alewife and Blueback Herring use the Potomac River, Chicamuxen Creek and Mattawoman Creeks as travel routes and spawning sites. The Chicamuxen Wildlife refuge is located adjacent to this site.
Ecological Profile	Habitat Type	Aquatic.
	Degree of Disturbance	High – It is anticipated that the Potomac River is periodically dredged. Recreational activities such as fishing and crabbing may also disturb sediments.
	Ecological Receptors	
	Federal Endangered Species:	American bald eagle, rainbow snake, and sensitive joint-vetch.
	Federal Threatened Species:	None.
	State Endangered Species:	Scaly blazing-star.
	State Threatened Species:	None.
	Other Ecological Receptors:	American Shad, Alewife and Blueback Herring and other species that use the Potomac River as a travel route and spawning site.
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Receptors may have direct or indirect contact with MC that exist in the environment or have been incorporated into the food chain.

A general description of the CSM pathway analysis is provided in Section 5.1.11.

MEC Interactions and Pathway Analysis

The pathway analysis for MEC is shown in Figure 5.2-2. Potential receptors include both human (Navy personnel (military and civilian), commercial/recreational user, and trespasser) and ecological receptors (biota) that may contact the source medium. Pathways are shown for each medium and are discussed below.

Surface Sediment

Human and ecological receptors could potentially be affected by MEC at the sediment surface. Human receptors such as Navy personnel (military and civilian), commercial/recreational user or trespassers could disturb MEC through recreational activities such as wading and fishing. These activities would take place close to the shoreline in shallower water. Activities, such as physical contact with sediments, could also affect biota.

Subsurface Sediment

The pathways for MEC in the subsurface are potentially complete for all receptors because intrusive activities, such as river dredging, are anticipated in the Water Impact Area. MEC could also be transported to surface sediment by the tides, water currents, erosion/redeposition, river dredging and relocation during events such as heavy rains and storm surges.

MC Interactions and Pathway Analysis

The pathway analysis for MC is shown in Figure 5.2-3. Potential receptors include both human (Navy personnel (military and civilian), commercial/recreational user, and trespasser) and ecological receptors (biota) that may contact the source medium or other media at the range that may be impacted. Pathways are shown for each medium and are discussed below.

Surface Water

Potential receptors including both human (Navy personnel (military and civilian), commercial/recreational user, and trespasser) and ecological receptors (biota) may potentially ingest or come into physical contact with surface water at the site. Biota can potentially ingest or come into physical contact with impacted surface water. Human receptors have the potential for physical contact and ingestion of impacted water through recreational activities such as wading or fishing.

Plant/Animal Uptake

A potentially complete pathway is indicated for biota exposed to MC at the Water Impact Area via the food chain. MC may be taken up by plants and transferred through the food chain to feeding biota. There are no domestic animals on or near the former range, so the domestic animals MC exposure pathway is considered incomplete for all receptors. Fishing is known to occur on the Potomac River, Mattawoman Creek and Chicamuxen Creek; therefore, fish provide a potentially complete pathway for all receptors.

Surface Sediments

Human and ecological receptors could potentially be affected by MC at the sediment surface through ingestion or dermal contact. Human receptors such as Navy personnel (military and civilian), commercial/recreational user or trespassers could contact MC through recreational activities such as wading and fishing. These activities would take place close to the shoreline in shallower water. Activities, such as physical contact with and ingestion of sediments, could also affect biota.

Subsurface Sediments

The ingestion and dermal contact pathways for MC in the subsurface are potentially complete for all receptors because intrusive activities, such as river dredging, are anticipated in the Water Impact Area. MC could also be transported to surface water by the tides, water currents, erosion/redeposition, river dredging, and relocation during events such as heavy rains and storm surges

Figure 5.2-2: MEC Exposure Pathway Analysis: Water Impact Area

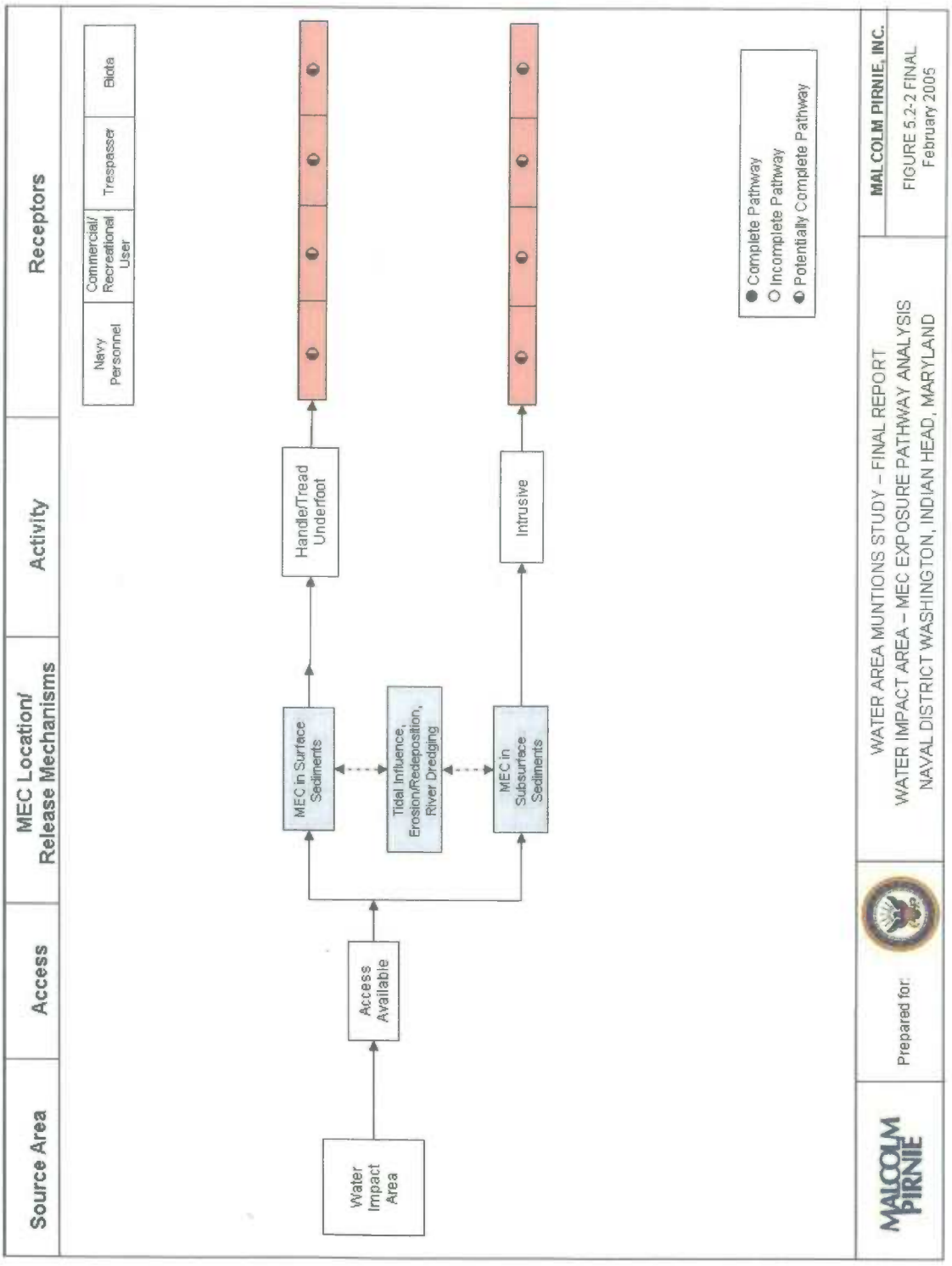
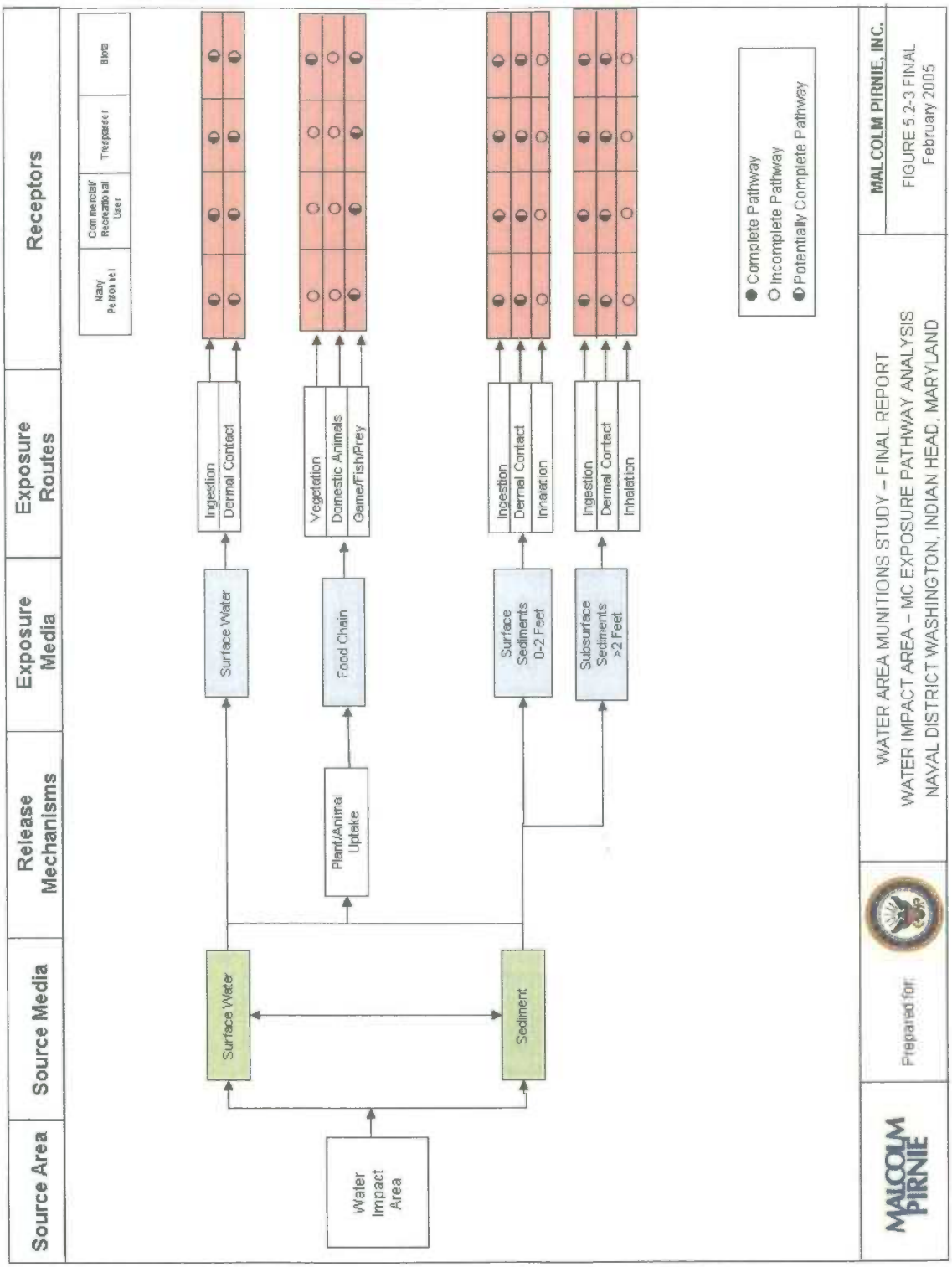


Figure 5.2-3: MC Exposure Pathway Analysis: Water Impact Area



5.2.12. Summary

The Water Impact Area is approximately 12,296 acres in size and is located between Chapman's Point, MD and the mouth of the Chopawamsic Creek. The area is currently used for recreational boating and fishing and public access to this site is not restricted.

Battleship gun testing was conducted in the Water Impact Area from January 24, 1891 until July 21, 1921 from The Valley to the impact area at Stump Neck Annex and across the Potomac River into Virginia. Rockets were fired into this area from a dock firing station at The Valley until 1946 or 1947. Also, parts of the Potomac River were used for gun testing. Underwater explosions were reported to have occurred in the Water Impact Area in 1961. Underwater explosions in the Potomac River near Indian Head were also noted in a memo from the Chief of Naval Material dated October 12, 1979. The Potomac River near Indian Head is also listed as an underwater explosion test site in the 1988 Final Committee Report: Alternate Site Study for Underwater Explosion Testing. Accidental releases of remnants of ordnance and bulk propellants from the Large Motor Test Facility may have also occurred at this area.

While a visual survey of the Water Impact Area could not be conducted, the entire site is classified as a suspect MEC area based on historical information. Ordnance that may have strayed from targets and landed in the Water Impact Area include various calibers of guns (1-inch through 16-inch) that were proved at The Valley with various projectiles, including AP shells. Potential MC include explosive fillers, including black powder, smokeless powder, brown prismatic powder, emmensite, joveite, wet gun cotton, randite and other high explosives (e.g. Thorite).

Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 5.2-1
Range/Site Details
Water Impact Area

Legend

Installation Boundary

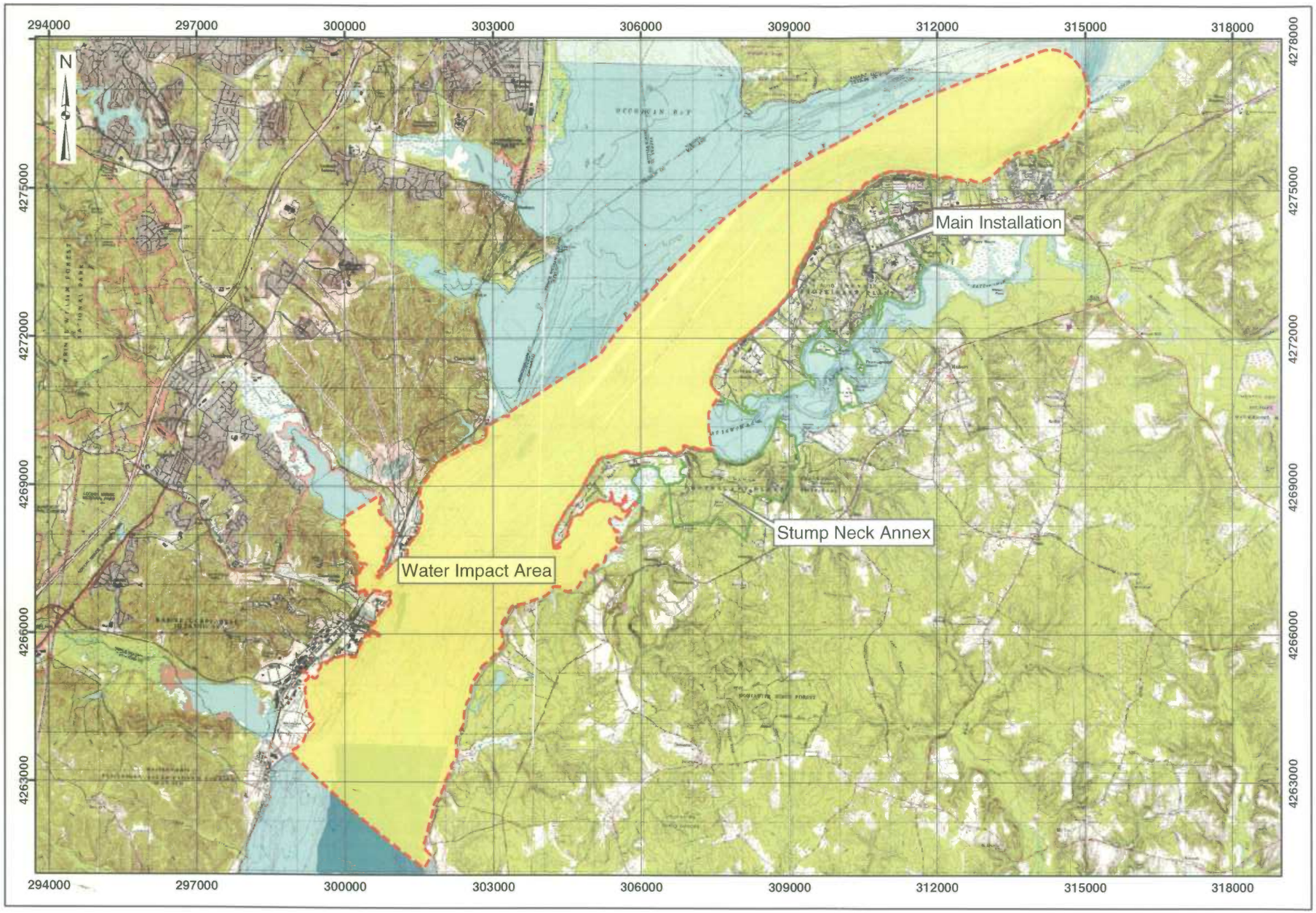
Water Impact Area

0 1,250 2,500 3,750 5,000 Meters

Data Source: USGS. 7.5 Minute Series
Topographic Survey - Bathymetric Map
Indian Head, MD-VA, 1981
Quantico, VA-MD, 1981

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005



Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 5.2-2
Munitions Characterization
Water Impact Area

Legend

- Installation Boundary
- Water Impact Area

MEC Presence*

- Known
- Suspect

* MEC Presence was determined through review of historical documentation, interviews, and/or visual survey.

0 1,250 2,500 3,750 5,000 Meters

Data Source: USGS. 7.5 Minute Series
Topographic Survey - Bathymetric Map
Indian Head, MD-VA, 1981
Quantico, VA-MD, 1981

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005

6. SITE CHARACTERISTICS – STUMP NECK ANNEX

The following sections provide site-specific information about the sites associated with Stump Neck Annex at NDW, IH, including history and site description; visual survey observation and results; munitions characterization; contaminant migration routes; receptors; site use; access controls and restrictions; and the conceptual site model.

6.1. Battle Range Firing Area

6.1.1. History and Site Description

The Battle Range Firing Area is located in the north-central section of Stump Neck Annex and extends from the Potomac River to the north bluff along the shoreline of the Mattawoman Creek. The estimated area of the Battle Range Firing Area is approximately 340-acres in size. Approximately 184 acres of the site is overlapped by the Water Impact Area. A photograph depicting current conditions at the Battle Range Firing Area is shown below (Figure 6.1-1).

Figure 6.1-1: Current Conditions at the Battle Range Firing Area

The Navy Range Inventory indicates the Battle Range Firing Area site was used to test projectiles. A Naval correspondence document dated July 30, 1910 stated battle range firing was conducted with 3", 5", 8", 12", and 14" AP shells fired at the KATAHDIN target, an experimental U.S. Navy ram ship. It is assumed that the KATAHDIN was located in the Potomac River near the confluence with Mattawoman Creek. This correspondence document also stated high powered firing into the "north bluff" using pasteboard or similar targets was also considered. Firing towards the "north bluff" would likely have been conducted with the same munitions types as were used for the KATAHDIN target. Based on the location of the north bluff (Map 6.1-2) and text in the correspondence document that states that, "Such work can only be carried out on special occasions, when the river is clear and the weather favorable," it is assumed that firing of this type would have been executed from a point in the Potomac River. The development of the pasteboard targets, however, could not be

confirmed. Mr. Larry Kijek, the Division Head for Facilities, Environmental, Occupational Safety and Explosive Safety, speculated after reviewing the 1910 correspondence that firing may have occurred from the water into the "north bluff". This statement could not be confirmed and it is unknown if battle range firing from the water using these targets ever occurred. Thus, the boundaries and the size of the Battle Range Firing Fan are estimated based on the location of the north bluff and the information contained in the 1910 correspondence.

6.1.1.1.Topography

Section 3.2 provides a general description of topography for NDW, IH. Elevations at the Battle Range Firing Area vary from 0 to approximately 50 feet above sea level. The topography of the area is characterized by bluffs which steeply slope to the north towards the Mattawoman Creek. The northern portion of the range is approximately 0 - 5 feet above sea level, while the southern, eastern, and western portions are approximately 20 to 50 feet above sea level, respectively.

6.1.1.2.Geology

Section 3.3 provides a geologic description for NDW, IH.

6.1.1.3.Soil and Vegetation Types

Section 3.4 provides a description of the soil and vegetation types at NDW, IH. Sandy soils along the shoreline of the Mattawoman Creek at the Battle Range Firing Area containing visible oxidation streaks were observed during the visual survey conducted on June 3, 2004. The shoreline along the Mattawoman Creek was rocky containing sparse, wetland vegetation. Submerged Aquatic Vegetation (SAV) was observed in the Mattawoman Creek adjacent to the shoreline of the Battle Range Firing Area.

6.1.1.4.Hydrology

Section 3.5 provides a description of hydrology at NDW, IH. The Battle Range Firing Area includes the Mattawoman Creek and portions of the Potomac River. The Mattawoman Creek is a tributary to the Potomac River and is tidally influenced. Based on current topography, it is expected surface water at the Battle Range Firing Area drains to the north into the Mattawoman Creek.

6.1.1.5.Hydrogeology

Section 3.6 provides a description of hydrogeology for NDW, IH.

6.1.1.6.Cultural and Natural Resources

Section 3.7 provides general cultural and natural resources for NDW, IH. There are no site specific cultural or natural resources for the Battle Range Firing Area.

6.1.1.7.Endangered and Special Status Species

As discussed in Section 3.8, endangered and special status species are reported to exist at the Stump Neck Annex. As this is a water range, the reported endangered and special status species noted in Section 3.8 are not likely to inhabit the Battle Range Firing Area.

6.1.2. Visual Survey Observations and Results

A visual survey of the Battle Range Firing Area was conducted on June 3, 2004. Personnel conducting the range visit included Ms. Rhonda Stone, Mr. Hien Dinh, Mr. Svend Egholm, Ms. Julie Grim, Mr. Dan Hains, Mr. Bobby Atkinson, Mr. Ricardo Campos, Ms. Alicia LoGalbo, and Ms. Heidi Morgan. The Battle Range Firing Area was inspected by a modified perimeter walk along Mattawoman Creek shoreline, the open grass field, and the wooded areas. A random pattern was used to survey the grass field. Approximately 30 percent of the range was visually surveyed during the range visit. No evidence of MEC or MC was observed at the Battle Range Firing Area during the visual survey.

A visual depiction of the site reconnaissance is provided on Map 6.1-1 located at the end of Section 6.1. Additional range/site details are illustrated on Map 6.1-2 also located at the end of Section 6.1.

6.1.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials known or suspected to be at the site. This includes both MEC and non-hazardous munitions related scrap (e.g., fragmentation, base plates, inert mortar fins).

Based on the historical information, munitions included battle range firing using 3", 5", 8", 12", and 14" AP shells and high powered firing using pasteboard or similar targets. Additional information on these ordnance items can be found in Appendix D. Munitions from the Water Impact Area may also be present at the Battle Range Firing Area as the sites are overlapping. Information on the Water Impact Area can be found in Section 5.2.3.

The Battle Range Firing Area is not suspected to contain CWM filled munitions, electrically fuzed munitions, or DU associated munitions.

6.1.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspect MEC Areas, and Areas Not Suspected Contain MEC to indicate that MEC is known or is suspected to be at the site. The MEC presence is discussed below.

Map 6.1-3 illustrates the munitions characterization of the Battle Range Firing Area and is provided at the end of Section 6.1.

6.1.4.1.Known MEC Areas

The Battle Range Firing Area is not classified as a known MEC area since no MEC was observed during the visual survey and only limited historical documentation has been found that support the possibility of MEC at the Battle Range Firing Area.

6.1.4.2.Suspected MEC Areas

No MEC was observed during the visual survey and only limited historical documentation has been found that support the possibility of MEC at the Battle Range Firing Area. However, since 184 acres of the site is encompassed by the Water Impact Area, this area is suspect for MEC.

6.1.4.3.Areas Not Suspected to Contain MEC

Since the Battle Range Firing Area is only partially encompassed by the Water Impact Area, the remaining 156 acres are not suspected to contain MEC.

6.1.5. Ordnance Penetration Estimates

The penetration depth of munitions potentially fired in the Battle Range Firing Area is unknown.

6.1.6. Munitions Constituents

No evidence of MC was observed during the visual survey and only limited historical documentation has been found that support the possibility of MC at the Battle Range Firing Area. If firing did occur from the Potomac to the north bluff, MC would include explosives or metals. Potential MC from the Water Impact Area could also be found in this area. Information about the Water Impact Area is presented in Section 5.2.6.

6.1.7. Contaminant Migration Routes

Migration routes include dredging, erosion/deposition, water currents, tides and relocation during events such as heavy rain storms and storm surges.

6.1.8. Receptors

Potential human receptors include authorized Navy personnel (military and civilian), commercial/recreational users, and trespassers. Plant and animal biota are also potential receptors. Because no MEC or MC is suspected from the Battle Range Firing Area, however, pathways to receptors are incomplete. Any potentially complete pathways would exist because of

the overlapping Water Impact Area. Information on receptors for the Water Impact Area is presented in Section 5.2.8.

6.1.8.1.Nearby Populations

Nearby populations are as discussed in Section 5.1.8.1.

6.1.8.2.Buildings Near/Within Site

There are no buildings located within half a mile of the Battle Range Firing Area.

6.1.8.3.Utilities On/Near Site

No utilities are located at the Battle Range Firing Area as this is a water range.

6.1.9. Site Use

Based on limited historical documentation, the Battle Range Firing Area may have been used for testing projectiles and was possibly used for high powered firing into the "north bluff" using pasteboards or similar targets.

Current site use includes recreational boating and fishing in the Potomac River and the Mattawoman Creek. The majority of the area along the north bluff is currently undisturbed. The current Master Plan reflects no foreseen changes in the site use-related activities at the range.

6.1.10. Access Controls / Restrictions

The Battle Range Firing Area is located on the Stump Neck Annex, which is a fenced and guarded installation. Access to the area is not controlled once on the installation. There is no fence along the Mattawoman Creek shoreline; therefore it is potentially accessible via the creek.

The wetlands located along portions of the Mattawoman Creek shoreline are protected under Executive Order 11990, which prohibits construction in a wetland area unless there is no practicable alternative and all possible measures are taken to minimize the environmental impacts. Wetlands are also protected under Section 404 of the Clean Water Act, which requires a

permit to be obtained from the Army Corps of Engineers before any work in a wetland can commence. The wetland found along the land portion of the Battle Range Firing Area is under the category of Palustrine forested broad-leaved deciduous wetland.

6.1.11. Conceptual Site Model

A general description of the CSM is provided in Section 5.1.11.

The CSM is presented in a series of information profiles that presents information about the site. The information profiles are included in Table 6.1-1 below.

Table 6.1-1: Conceptual Site Model Information Profiles – Battle Range Firing Area

Profile Type	Information Needs	Preliminary Assessment Findings
Range/Site Profile	Installation Name	NDW, IH
	Installation Location	Indian Head, Charles County, Maryland
	Range/Site Name	Battle Range Firing Area
	Range/Site Location	The Battle Range Firing Area is located in the north-central section of Stump Neck Annex and extends from the Potomac River to the north bluff along the shoreline of the Mattawoman Creek.
	Range/Site History	Battle range firing may have been conducted with 3", 5", 8", 12", and 14" AP shells fired at the north bluff using pasteboard or similar targets. The actual development of the targets could not be confirmed and it is unknown if battle range firing from the water using these targets ever occurred. The site overlaps the Water Impact Area.
	Range/Site Area and Layout	The Navy Range Inventory lists this site as a site used for testing projectiles. The site is approximately 340-acres in size; however, the geographical boundaries of the site based on historical documentation could not be confirmed
	Range/Site Structures	None.
	Range/Site Boundaries	N: Potomac River S: Mattawoman Creek E: Mattawoman Creek W: Mattawoman Creek

Table 6.1-1: Conceptual Site Model Information Profiles – Battle Range Firing Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Range/Site Security	Security for the entire Stump Neck Annex includes partial fencing, lock/secured gates and security patrol. There are no specific access controls or restrictions for the Battle Range Firing Area. Access to the site may be gained from the Mattawoman Creek since there is no fence along the shoreline.
Munitions/ Release Profile	Munitions Types	Projectiles associated with 3", 5", 8", 12", and 14" AP shells; munitions related to the Water Impact Area.
	Maximum Probability Penetration Depth	Unknown.
	MEC Density	The Battle Range Firing Area is not suspected to contain MEC. No MEC or MC was observed during the visual survey.
	MEC Scrap/Fragments	No MEC scrap/fragments were observed during the visual survey.
	Associated Munitions Constituents	Potential MC, while not anticipated, include explosives and metals.
	Migration Routes/Release Mechanisms	Dredging, erosion/redeposition, water currents, tides, and relocation during events such as heavy rains and storm surges
Physical Profile	Climate	Indian Head has a continental-type climate with four well-defined seasons. The coldest period at Indian Head occurs in late January and early February, with low temperatures averaging 29°F. July is the warmest month with average maximum temperatures of 85°F. The normal annual precipitation is approximately 44 inches, normal monthly precipitation varying from 2.25 (February) to 4.60 (August) inches.
	Topography	Water range, not applicable.
	Geology	Indian Head and Stump Neck lie within the Atlantic Coastal plain physiographic province. The geology of the area is comprised of Precambrian igneous and metamorphic bedrock overlain by 500 to 600 feet of unconsolidated fluvial and marine deposits of the Potomac Group. The Potomac Group consists of, in descending order, the Patapsco, Arundel, and Patuxent Formations.

Table 6.1-1: Conceptual Site Model Information Profiles – Battle Range Firing Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Soil	Sandy soils along the shoreline of the Mattawoman Creek at the Battle Range Firing Area containing visible iron oxidation streaks were noted on the visual survey conducted on June 3, 2004.
	Hydrogeology	The lower and middle sands of the Patapsco and Patuxent Formations of the Potomac Group are the main groundwater aquifers used for domestic purposes at Indian Head and Stump Neck. The average depth to the Patapsco Aquifer is 300 feet. Shallow unconfined to semiconfined groundwater occurs from near surface to approximately 29 feet bgs, with water-table elevations ranging from sea level to approximately 75 feet above sea level.
	Hydrology	The Battle Range Firing Area includes the Mattawoman Creek and the Potomac River. The Mattawoman Creek is a tributary to the Potomac River and is tidally influenced. Surface water drains to the north into the Mattawoman Creek.
	Vegetation	The shoreline along the Mattawoman Creek in the Battle Range Firing Area was rocky with sparse wetland vegetation. SAV was observed in the Mattawoman Creek adjacent to the shoreline of the Battle Range Firing Area.
Site Use and Exposure Profile	Current Site Use	Recreational boating and fishing occurs in the Potomac River and the Mattawoman Creek.
	Current Human Receptors	Navy personnel (military and civilian), commercial/recreational users, and trespassers.
	Current Activities (frequency, nature of activity)	Recreational (fishing, boating); commercial (dredging)
	Potential Future Site Use	No future changes in site use are anticipated.
	Potential Future Human Receptors	Navy personnel (military and civilian), commercial/recreational users, and trespassers.
	Potential Future Site Use-Related Activities:	No future changes in site use are anticipated.
	Zoning/Site Use Restrictions	None.
	Demographics/Zoning	Charles County population density is approximately 260 persons per square mile, while NDW, Indian Head and its tenant commands employ approximately 3,600 military and civilian personnel.

Table 6.1-1: Conceptual Site Model Information Profiles – Battle Range Firing Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Beneficial Resources	American Shad, Alewife and Blueback Herring use the Mattawoman Creek and Potomac River as travel routes and spawning sites.
Ecological Profile	Habitat Type	Low lying shrubs sparsely vegetate the shoreline of the Mattawoman Creek. Tidal wetlands were observed. SAV habitat was observed in the shallow waters along the shoreline of the Mattawoman Creek.
	Degree of Disturbance	High – it is anticipated that the Potomac River is periodically dredged. Recreational activities on the river such as fishing and crabbing may also disturb sediments.
	Ecological Receptors:	
	Federal Endangered Species:	American bald eagle, rainbow snake, sensitive joint-vetch.
	Federal Threatened Species:	None.
	State Endangered Species:	Scaly blazing-star.
	State Threatened Species:	None.
	Other Ecological Receptors:	American Shad, Alewife and Blueback Herring and other species that use the Potomac River as a travel route and spawning site.
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	No MEC or MC is suspected in the Battle Range Firing Area.

A general description of the CSM pathway analysis is provided in Section 5.1.11.

No MEC was observed during the visual survey and historical documentation does not provide definitive evidence that this area was a target for battle range firing. Therefore, an Exposure Pathway Analysis Figure for MEC was not completed. For MEC exposure pathways related to the overlapping Water Impact Area, refer to Figure 5.2-2

Since no MEC is suspected at this range, the presence of MC is unlikely. As such, an Exposure Pathway Analysis Figure for MC was not completed. For MC exposure pathways related to the Water Impact Area, refer to Figure 5.2-3.

6.1.12. Summary

The Battle Range Firing Area is approximately 340-acres in size and is located in the north-central section of Stump Neck Annex and extends from the Potomac River to the north bluff along the shoreline of the Mattawoman Creek. The area may have been used for battle range firing in the early 1900's; however, this is unconfirmed. High powered firing may have also occurred at this range.

Environmental sampling data from the Battle Range Firing Area has not been collected and therefore, is not available for analysis. No visible signs of the Battle Range Firing Area currently exist. Recreational boating and fishing occurs in the Potomac River and the Mattawoman Creek.

No MEC was observed during the visual survey and historical documentation does not provide definitive evidence that this area was a target for battle range firing. However, because the site is partially encompassed by the Water Impact Area, the overlapping portion is considered suspect for MEC.

Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 6.1-1
Visual Survey
Battle Range Firing

Legend

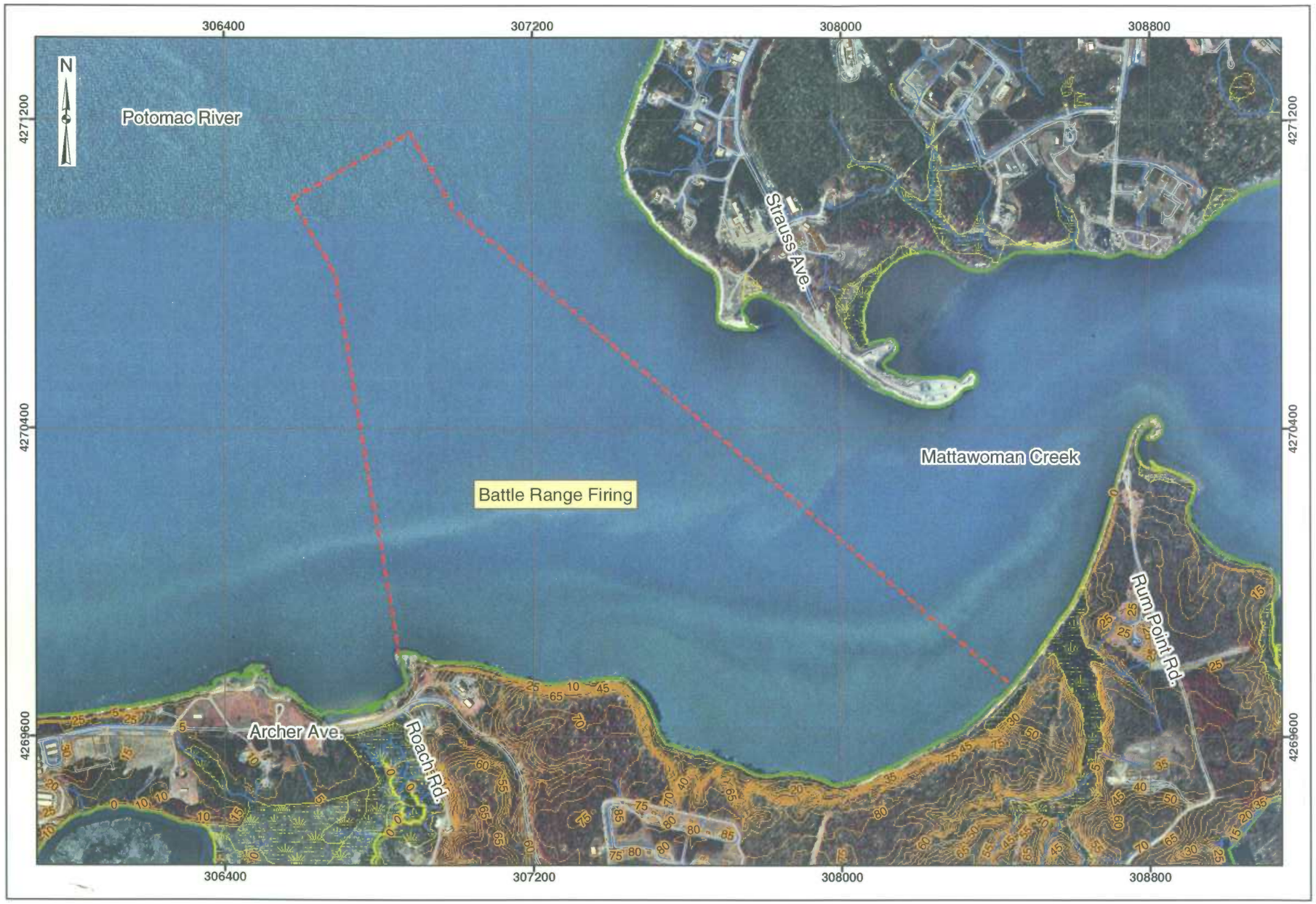
- Installation Boundary
- Site Reconnaissance
- Battle Range Firing

150 0 150 300 450 Meters

Data Source: USGS, DOQQ Indian Head, MD, 1998

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005



Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 6.1-2
Range/Site Details
Battle Range Firing

Legend

- Installation Boundary
- Structures
- Roads
- Streams
- Contours
- Wetlands
- Battle Range Firing

150 0 150 300 450 Meters

Data Source: USGS, DOQQ Indian Head, MD, 1998

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
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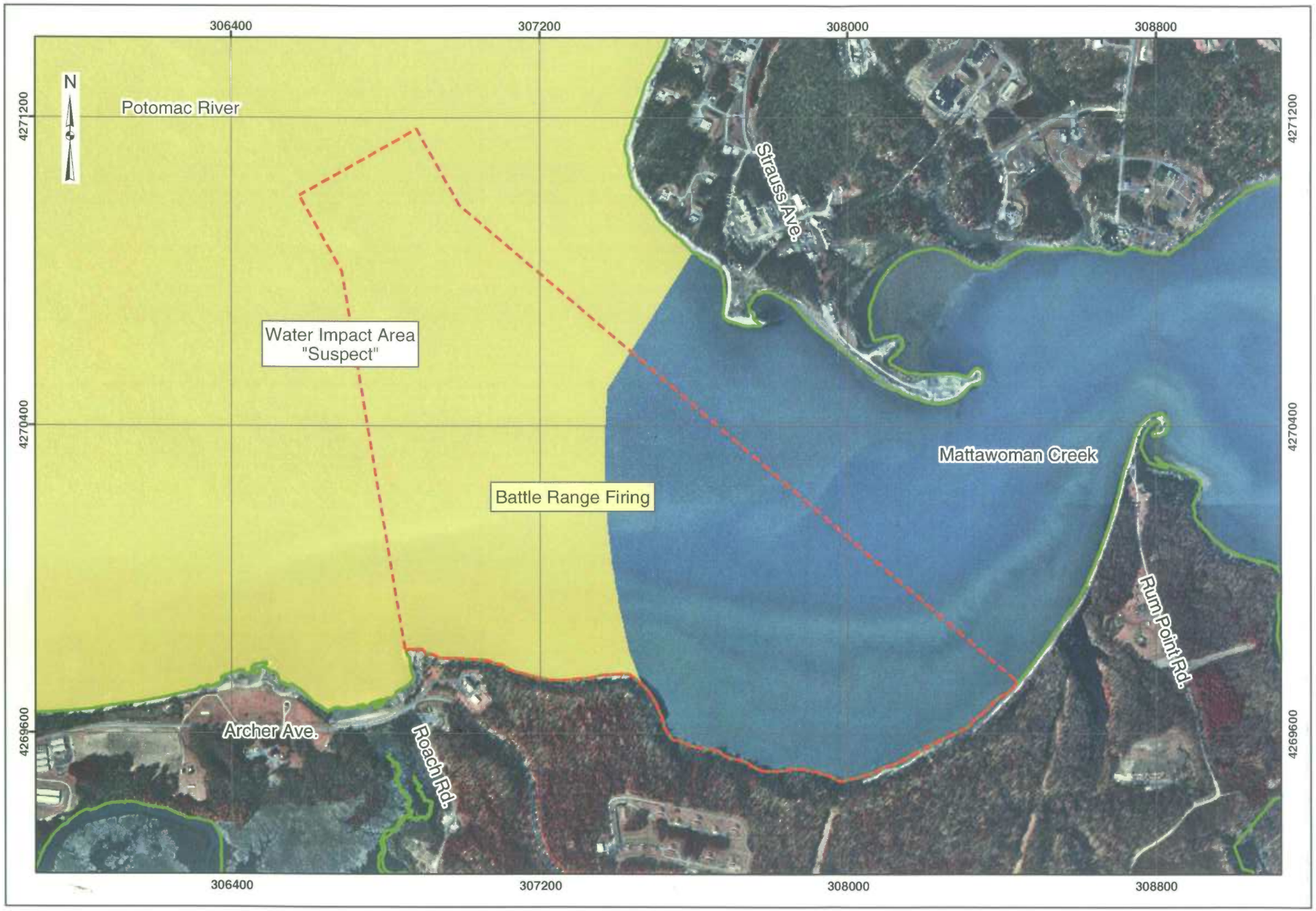


Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 6.1-3
Munitions Characterization
Battle Range Firing

Legend

- Installation Boundary
- Battle Range Firing

MEC Presence*

- Known
- Suspect

The "Suspect" area displayed on this map corresponds to The Valley.

* There is no evidence of MEC Presence as determined through historical documentation, interview, and/or visual survey. Visual observations and/or historical documentation indicate that MC may be present at the site, but MC Presence has not been confirmed by sampling or other means.

150 0 150 300 450 Meters

Data Source: USGS, DOQQ Indian Head, MD, 1998

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005

6.2. Sonar Training Area

6.2.1. History and Site Description

The Sonar Training Area, consisting of approximately 1.5 acres over water and 0.6 acres over land, is located in the north-central portion of the Stump Neck Annex. The area is also encompassed within the boundaries of the Water Impact Area. The Sonar Training Area extends out from the shoreline into the Potomac River (Figure 6.2-1) and was used for sonar training by Navy divers during the 1980s to mid 1990s.

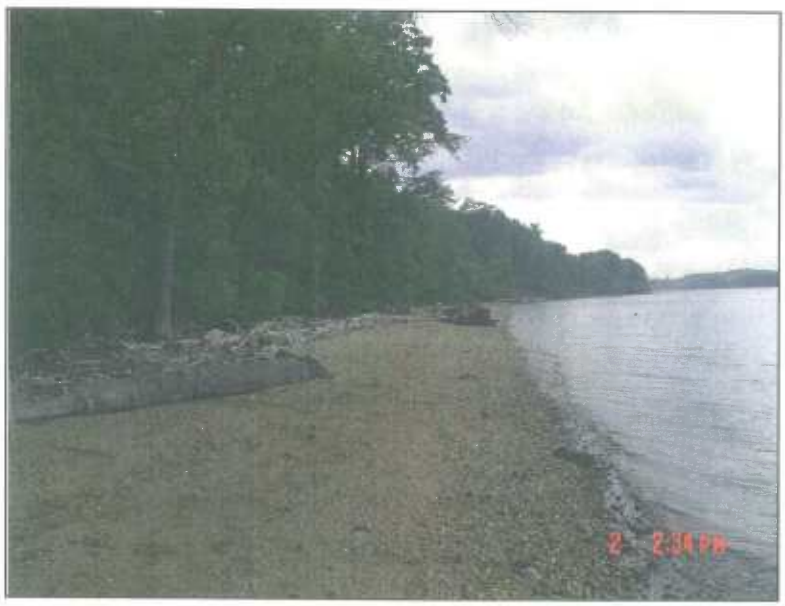


Figure 6.2-1: Current Conditions of Sonar Training Area along Potomac River

Inert ordnance items were submerged off shore so divers could train in underwater ordnance identification. Some inert ordnance items that may have been used in this training area are sea mines, torpedoes, and depth charges. According to Mr. Larry Kijek, the Division Head for Facilities, Environmental, Occupational Safety and Explosive Safety, one torpedo casing, one underwater mine casing, and one bomb casing were visible at low tide approximately 75 feet from the shoreline, behind the helipad, near Building 2174. The origin of these materials is not known.

6.2.1.1.Topography

Section 3.2 provides a general description of topography for NDW, IH. The majority of the Sonar Training Area is located in the Potomac River. The land portion is relatively flat to gently sloping

6.2.1.2.Geology

Section 3.3 provides a geologic description for NDW, IH. This general description is applicable to the Sonar Training Area.

6.2.1.3.Soil and Vegetation Types

Section 3.4 provides a description of the soil and vegetation types at NDW, IH. The majority of the Sonar Training Area is located in the Potomac River, with a soil type of river sediment. The land portion of the Sonar Training Area lies within the Potomac River basin in the Atlantic Coastal Plain and consists of gravel, sand, silt and clay. The on-land portion of the site is a beach with little vegetation. The remainder of the site contains aquatic vegetation.

6.2.1.4.Hydrology

Section 3.5 provides a description of hydrology at NDW, IH. The Sonar Training Area is located within the Potomac River, which is a tidally influenced water body.

6.2.1.5.Hydrogeology

Section 3.6 provides a description of hydrogeology for NDW, IH. This information is applicable to the area of the Sonar Training Area.

6.2.1.6.Cultural and Natural Resources

Section 3.7 provides information on cultural and natural resources for NDW, IH. There are no site specific cultural or natural resources at the Sonar Training Area.

6.2.1.7.Endangered and Special Status Species

As discussed in Section 3.8, endangered and special status species are reported to exist at the Stump Neck Annex of NDW, IH and thus, have the potential to inhabit the land portion of the Sonar Training Area.

6.2.2. Visual Survey Observations and Results

A visual survey of the Sonar Training Area was conducted on June 2, 2004. Malcolm Pirnie personnel who conducted the visual survey included Ms. Julie Grim, Ms. Rhonda Stone, Mr. Svend Egholm, Mr. Dan Hains, Ms. Alicia LoGalbo, and Mr. Ricardo Campos. Ms. Heidi Morgan, NDW Environmental Office, accompanied the team. Only a minimal portion of the Sonar Training Area was visible from the shoreline. The visual survey revealed no evidence of MEC/MC at the site.

A visual depiction of the site reconnaissance is provided on Map 6.2-1 located at the end of Section 6.2. Additional range/site details are illustrated on Map 6.2-2 also located at the end of Section 6.2.

6.2.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials known or suspected to be at the site. This includes both MEC and non-hazardous munitions related scrap (e.g., fragmentation, base plates, inert mortar fins).

Based on interviews with site personnel regarding the Sonar Training Area, it is expected that inert ordnance items (i.e., sea mines, torpedoes, and depth charges) were used at the Sonar Training Area during the 1980s to mid 1990s. According to Mr. Larry Kijek, the Division Head for Facilities, Environmental, Occupational Safety and Explosive Safety, one torpedo casing, one underwater mine casing, and one bomb casing were visible at low tide approximately 75 feet from the water's edge, behind the helipad, near Building 2174. It is not know if the observed bomb casing was inert ordnance associated with sonar training. Additional information on these ordnance items can be found in Appendix D. The site may also contain munitions associated

with the Water Impact Area, which encompasses the Sonar Training Area. For information on munitions at the Water Impact Area, refer to Section 5.2.3.

The Sonar Training Area is not suspected to contain CWM filled munitions, electrically fuzed munitions, or DU associated munitions.

6.2.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspect MEC Areas, and Areas Not Suspected Contain MEC to indicate that MEC is known or is suspected to be at the site. The MEC presence is discussed below.

Map 6.2-3 illustrates the munitions characterization of the Sonar Training Area and is provided at the end of Section 6.2.

6.2.4.1.Known MEC Areas

Based on historical documents and information obtained during the data collection process, there are no known MEC areas at the Sonar Training Area.

6.2.4.2.Suspected MEC Areas

Since a bomb casing was observed, and it is not known if the observed bomb casing was inert, the entire Sonar Training Area is a suspected MEC Area. This area is also suspect based on munitions use associated with the overlapping Water Impact Area.

6.2.4.3.Areas Not Suspected to Contain MEC

There are no areas of the Sonar Training Area not suspected to contain MEC.

6.2.5. Ordnance Penetration Estimates

There is no associated penetration depth with the munitions used at the Sonar Training Area.

6.2.6. Munitions Constituents

Based on interviews with site personnel regarding the Sonar Training Area, it is expected that inert ordnance items (i.e. sea mines, torpedoes, and depth charges) were used at the Sonar Training Area, therefore no MC is expected. Because the origin of the ordnance items present at the Sonar Training Area is unknown, associated munitions constituents potentially at the Sonar Training Area include TNT, explosives residuals, and metals. For MC associated with the overlapping Water Impact Area, refer to Section 5.2.6.

6.2.7. Contaminant Migration Routes

Environmental media through which MC may migrate from the Sonar Training Area include soil, groundwater, surface water, and sediment. On the land portion of the Sonar Training Area, direct human or biota contact with surficial and subsurface soil is possible if the soil is disturbed. Based on a review of hydrogeological data, it is unlikely that MC in shallow groundwater would migrate to the potable deeper aquifers that are used as a water supply. In the water portion of the Sonar Training Area, migration routes include erosion/redeposition, water currents, tides and relocation during events such as heavy rains and storm surges. Recreational activities such as fishing and crabbing could also potentially disturb sediments.

6.2.8. Receptors

Potential human receptors include authorized Navy personnel (military and civilian), commercial/recreational users, and trespassers. Potential ecological receptors would include aquatic animals and plants as well as birds and small mammals. The potential exposure media for both human and ecological receptors pertaining to the Sonar Training Area are surface water/sediments, and the food chain. Human receptors may come in contact with MEC or MC through recreational activities such as wading, fishing or boating on the Potomac River. Fish and other aquatic organisms may become receptors through burrowing or feeding activities at the Igniter Area. As fishing is allowed in the area, human receptors can potentially contact MC through ingesting impacted fish collected in the Potomac River.

6.2.8.1.Nearby Populations

Section 5.1.8.1 provides information on nearby populations for NDW, IH.

6.2.8.2.Buildings Near/Within Site

There are no buildings located within the Sonar Training Area. The closest structure is Building 2174.

6.2.8.3.Utilities On/Near Site

There are no utilities located within the Sonar Training Area. However, potable water utilities, electric lines, and sanitary sewer lines are located to the south of the Sonar Training Area.

6.2.9. Site Use

The Sonar Training Area was used for sonar training by Navy divers during the 1980s to mid 1990s. Currently, the area is used for recreational boating and fishing.

6.2.10. Access Controls / Restrictions

The Sonar Training Area is located on the Stump Neck Annex, which is a fenced and guarded installation. Access to the area is not controlled once on the installation. There is no fence along the Potomac River shoreline; therefore the Sonar Training Area is potentially accessible to trespassers via the creek. There are no known site use/development restrictions for the range.

6.2.11. Conceptual Site Model

A general description of the CSM is provided in Section 5.1.11.

The CSM is presented in a series of information profiles that presents information about the site. The information profiles are included in Table 6.2-1 below.

Table 6.2-1: Conceptual Site Model Information Profiles – Sonar Training Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
Range/Site Profile	Installation Name	NDW, IH
	Installation Location	Indian Head, Charles County, Maryland
	Range/Site Name	Sonar Training Area
	Range/Site Location	The site is located in the Potomac River along the north-central portion of Stump Neck Annex, directly across from a picnic area, north of Archer Ave., in the vicinity of Building 2174.
	Range/Site History	Used for sonar training activities by Navy divers during the 1980s to mid 1990s. The site is overlapped by the Water Impact Area.
	Range/Site Area and Layout	The Sonar Training Area is 2.1 acres and extends out from the shoreline into the Potomac River
	Range/Site Structures	The closest structure is Building 2174.
	Range/Site Boundaries	N: Potomac River S: Shoreline, Archer Ave E: Mattawoman Creek W: Potomac River
	Range/Site Security	Security for the entire Stump Neck Annex includes partial fencing, lock/secured gates and security patrol. There are no specific access controls or restrictions for the Sonar Training Area. Access to the site may be gained from the Potomac River since there is no fence along the shoreline.
Munitions/ Release Profile	Munitions Types	Inert ordnance items (i.e., sea mines, torpedoes, and depth charges); munitions associated with the Water Impact Area.
	Maximum Probability Penetration Depth	No associated penetration depth.
	MEC Density	MEC density is unknown since a visual survey was only performed from the shoreline.
	MEC Scrap/Fragments	No MEC/MC was evident during the visual survey, however, according the Mr. Larry Kijek, one torpedo casing, one underwater mine casing, and one bomb casing were visible at low tide approximately 75 feet from the water's edge.
	Associated Munitions Constituents	TNT, explosives residuals, metals

Table 6.2-1: Conceptual Site Model Information Profiles – Sonar Training Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Migration Routes/Release Mechanisms	Erosion/redeposition, water currents, tides, and relocation during events such as heavy rains and storm surges.
Physical Profile	Climate	Indian Head has a continental-type climate with four well-defined seasons. The coldest period at Indian Head occurs in late January and early February, with low temperatures averaging 29°F. July is the warmest month with average maximum temperatures of 85°F. The normal annual precipitation is approximately 44 inches, normal monthly precipitation varying from 2.25 (February) to 4.60 (August) inches.
	Topography	The majority of the site is located in the Potomac River. The land portion is relatively flat.
	Geology	Indian Head and Stump Neck lie within the Atlantic Coastal plain physiographic province. The geology of the area is comprised of Precambrian igneous and metamorphic bedrock overlain by 500 to 600 feet of unconsolidated fluvial and marine deposits of the Potomac Group. The Potomac Group consists of, in descending order, the Patapsco, Arundel, and Patuxent Formations.
	Soil	The majority of the site is located in the Potomac River. The land portion lies within the Potomac River basin in the Atlantic Coastal Plain and consists of gravel, sand, silt and clay.
	Hydrogeology	The lower and middle sands of the Patapsco and Patuxent Formations of the Potomac Group are the main groundwater aquifers used for domestic purposes at Indian Head and Stump Neck. The average depth to the Patapsco Aquifer is 300 feet. Shallow unconfined to semiconfined groundwater occurs from near surface to approximately 29 feet bgs, with water-table elevations ranging from sea level to approximately 75 feet above sea level.
	Hydrology	The majority of the site is located in the Potomac River, which is a tidally influenced water body.
	Vegetation	The on-land portion of the site is a beach with little vegetation. The remainder of the site contains aquatic vegetation.
Site Use and	Current Site Use	Recreational (fishing, boating).

Table 6.2-1: Conceptual Site Model Information Profiles – Sonar Training Area		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
Exposure Profile	Current Human Receptors	Navy personnel (military and civilian), commercial/recreational users and trespassers.
	Current Activities (frequency, nature of activity)	Recreational (fishing, boating).
	Potential Future Site Use	No future changes in site use are anticipated.
	Potential Future Human Receptors	Navy personnel (military and civilian), commercial/recreational users and trespassers.
	Potential Future Site Use-Related Activities:	No future changes in site use are anticipated.
	Zoning/Site Use Restrictions	None.
	Demographics/Zoning	Charles County population density is approximately 260 persons per square mile. NDW and its tenant commands employ approximately 3,600 military and civilian personnel.
	Beneficial Resources	American Shad, Alewife and Blueback Herring use the Potomac River, Chicamuxen Creek and Potomac River as travel routes and spawning sites.
Ecological Profile	Habitat Type	Aquatic.
	Degree of Disturbance	Low –Recreational activities on the river such as fishing and crabbing may also disturb sediments.
	Ecological Receptors	
	Federal Endangered Species:	American Bald Eagle, rainbow snake, and the joint-vetch.
	Federal Threatened Species:	None
	State Endangered Species:	Scaly blazing-star
	State Threatened Species:	None
	Other Ecological Receptors:	American Shad, Alewife and Blueback Herring and other species that use the Potomac River as a travel route and spawning site.
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Aquatic biota may have direct contact with MEC that exist in the environment. Aquatic biota may have direct or indirect contact with MC that exist in the environment or have been incorporated into the food chain.

A general description of the CSM pathway analysis is provided in Section 5.1.11.

MEC Interactions and Pathway Analysis

The pathway analysis for MEC is shown in Figure 6.2-2. Potential receptors include both human (Navy personnel (military and civilian), commercial/recreational user, and trespasser) and ecological receptors (biota) that may contact the source medium. Pathways are shown for each medium and are discussed below.

Surface Sediment

Human and ecological receptors could potentially be affected by MEC at the sediment surface. Human receptors such as Navy personnel (military and civilian), commercial/recreational user or trespassers could disturb MEC through recreational activities such as wading and fishing. Activities, such as physical contact with sediments, could also affect biota.

Subsurface Sediment

The pathways for MEC in the subsurface are incomplete for all receptors because no intrusive activities, such as river dredging, are anticipated in the Sonar Training Area. MEC could, however, be transported to surface sediment by the tides, water currents, erosion/redeposition, and relocation during events such as heavy rains and storm surges.

MC Interactions and Pathway Analysis

The pathway analysis for MC is shown in Figure 6.2-3. Potential receptors include both human (Navy personnel (military and civilian), commercial/recreational user, and trespasser) and ecological receptors (biota) that may contact the source medium or other media at the Sonar Training Area that may be impacted. Pathways are shown for each medium and are discussed below.

Surface Water

Potential receptors including both human (Navy personnel (military and civilian), commercial/recreational user, and trespasser) and ecological receptors (biota) may potentially ingest or come into physical contact with surface water at the site. Biota can potentially ingest or come into physical contact with impacted surface water. Human receptors have the potential for physical contact and ingestion of impacted water through recreational activities such as wading or fishing.

Plant/Animal Uptake

A potentially complete pathway is indicated for biota exposed to MC at the Sonar Training Area via the food chain. MC may be taken up by plants and transferred through the food chain to feeding biota. There are no domestic animals on or near the former range, so the MC exposure pathway is considered incomplete for all receptors. Fishing is known to occur on Potomac River; therefore, fish provide a potentially complete pathway for all receptors.

Surface Sediments

Human and ecological receptors could potentially be affected by MC at the sediment surface through ingestion or dermal contact. Human receptors such as Navy personnel (military and civilian), commercial/recreational user or trespassers could contact MC through recreational activities such as wading and fishing. Activities, such as physical contact with and ingestion of sediments, could also affect biota.

Subsurface Sediments

The ingestion and dermal contact pathways for MC in the subsurface are incomplete for all receptors because no intrusive activities, such as river dredging, are anticipated in the Sonar Training Area. MC could, however, be transported to surface water by the tides, water currents, erosion/redeposition, and relocation during events such as heavy rains and storm surges.

Figure 6.2-2: MEC Exposure Pathway Analysis: Sonar Training Area

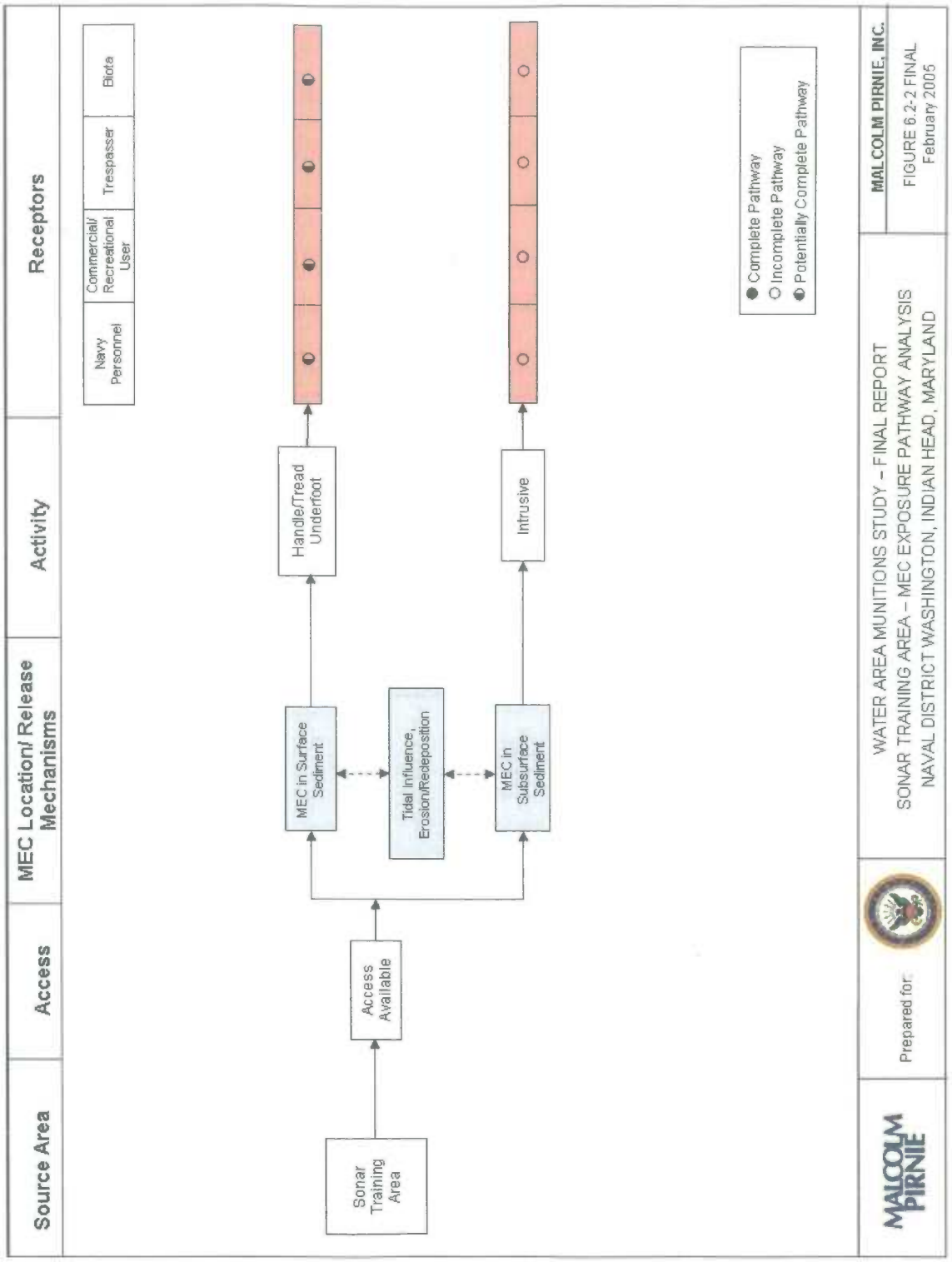
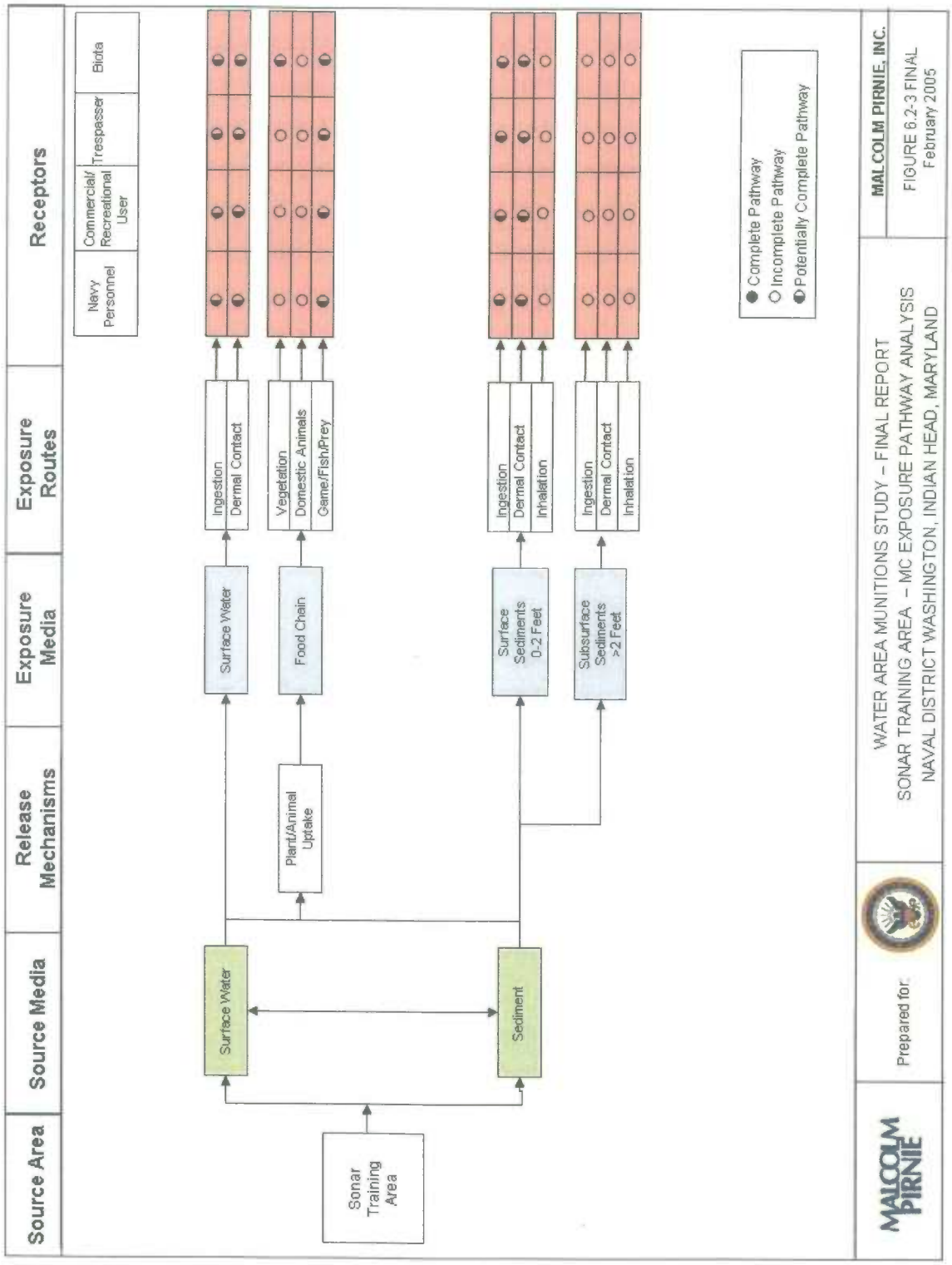


Figure 6.2-3: MC Exposure Pathway Analysis: Sonar Training Area



6.2.12. Summary

From information gathered during the PA, the Sonar Training Area was used for sonar training by Navy divers during the 1980s to mid 1990s. Inert ordnance items were submerged just off shore so divers could train in underwater ordnance identification. One torpedo casing, one underwater mine casing, and one bomb casing were observed at low tide approximately 75 feet from the water's edge, behind the helipad, near Building 2174. It is not known if the observed bomb casing was inert ordnance associated with sonar training. Due to the potential that non-inert items were observed in the area, MEC or MC may be present at the Sonar Training Area, however types and/or quantities are unknown. Potential MC include TNT, explosives residuals, and metals.

Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 6.2-1
Visual Survey
Sonar Training Area

Legend

- Installation Boundary
- Site Reconnaissance
- Sonar Training Area

30 0 30 60 90 Meters

Data Source: USGS, DOQQ Indian Head, MD, 1998

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005

Water Area Munitions Study
NDW, Indian Head, Maryland

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Map 6.2-2
Range/Site Details
Sonar Training Area

Legend

- Installation Boundary
- Structures
- Roads
- Streams
- Contours
- Wetlands
- Sonar Training Area

30 0 30 60 90 Meters

Data Source: USGS, DOQQ Indian Head, MD, 1998

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005

Water Area Munitions Study
NDW, Indian Head, Maryland

MALCOLM PIRNIE

Map 6.2-3
Munitions Characterization
Sonar Training Area

Legend

- Installation Boundary
- Sonar Training Area

MEC Presence*

- Known
- Suspect

* MEC Presence was determined through review of historical documentation, interviews, and/or visual survey.

30 0 30 60 90 Meters

Data Source: USGS, DOQQ Indian Head, MD, 1998

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005

7. SITE CHARACTERISTICS – OFF INSTALLATION

The following sections provide site-specific information about the Pope's Creek Site area of the Potomac River, Southeast of the NDW, IH, including history and site description; visual survey observation and results; munitions characterization; contaminant migration routes; receptors; site use; access controls and restrictions; and the conceptual site model.

7.1. Pope's Creek Site

7.1.1. History and Site Description

The Pope's Creek Site is located off-site of the installation. The site is southeast of NDW, Indian Head, within the Potomac River near the town of Pope's Creek, Maryland. A Public Notice titled "Notice to Navigation Interests" dated June 2, 1947 informs boaters that "underwater explosions in the waters of the Potomac River in the vicinity of Pope's Creek, Maryland" will occur until further notice. The Public Notice includes a map of the location of this site (Figure 7.1-1). The testing area was approximately 44 acres, while the publicized safety zone was approximately 841 acres. The area where the actual explosions would take place is also shown on the map. The area is located approximately 1 to 2 miles north of the Potomac River Bridge, extending from the eastern shoreline of the Potomac River. Based on the public notice and size of the danger area shown in Figure 7.1-1, it is likely that underwater testing of demolition charges, and/or explosive material was being conducted. The type of munitions used in activities associated with this area is not known.

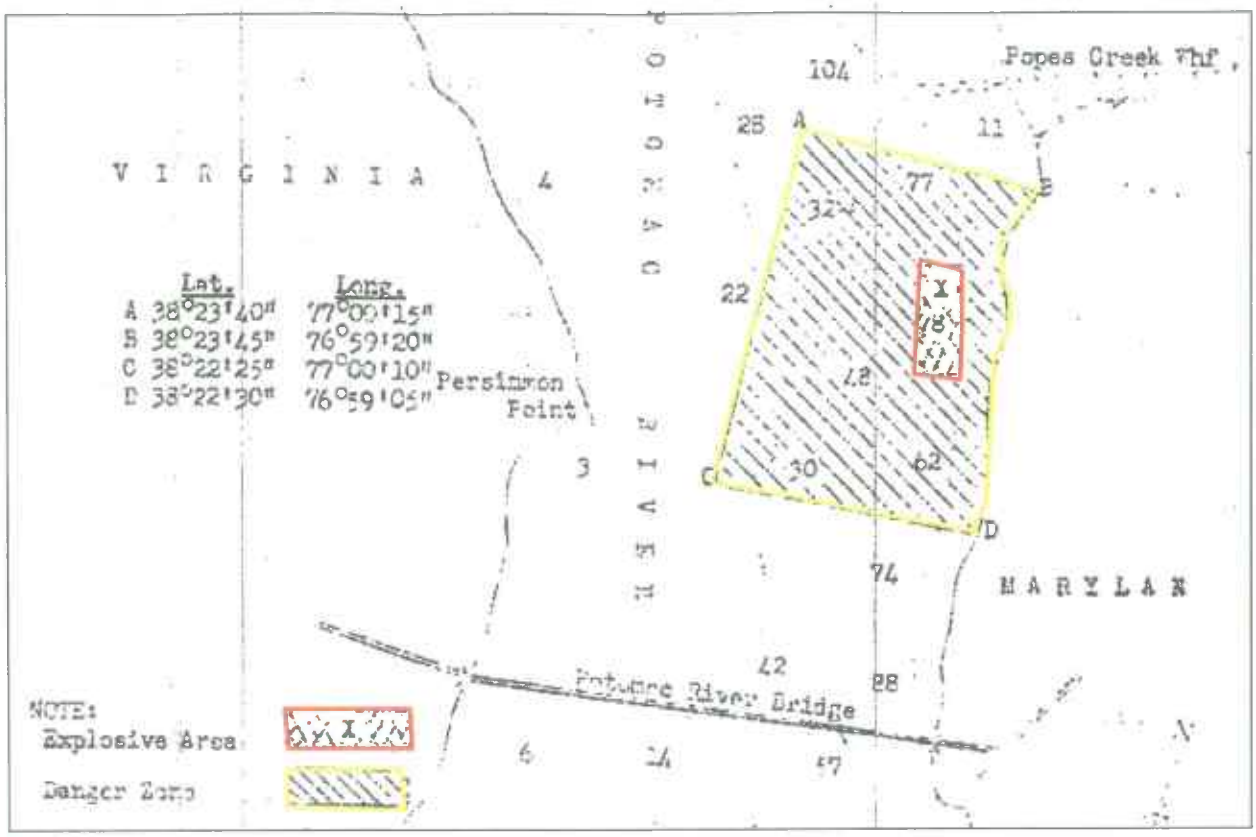


Figure 7.1-1: 1947 map showing Pope's Creek Site explosive area and danger zone.

7.1.1.1.Topography

The Popes Creek Site is located within the Potomac River. Elevation of the adjacent shoreline is approximately 100 feet above mean sea level.

7.1.1.2.Geology

The Pope's Creek Site lies within the Atlantic Coastal Plain Province which is underlain by a wedge of unconsolidated sediments including gravel, sand, silt, and clay, which overlaps the rocks of the eastern Piedmont along an irregular line of contact known as the Fall Zone. The regional geology consists of Tertiary deposits overlying crystalline Precambrian metamorphic and igneous bedrock. The geologic units underlying the Pope's Creek Site are the Calvert Formation of the Chesapeake Group and the Nanjemoy Formation of the Pamunkey Group. The lithology of the Calvert formation consists of interbedded dark green to dark bluish-gray, fine-grained argillaceous sand and sandy clay containing prominent shell beds and locally silica-cemented

sandstones. The Calvert Formation ranges in thickness from 0-150 feet. The Nanjemoy Formation consists of dark green to gray, argillaceous, glauconitic, fine- to medium-grained sand; and minor gray to pale brown clay and varies in thickness from 0-125 feet.

7.1.1.3.Soil and Vegetation Types

Soil type consists of river sediments. Aquatic vegetation is present throughout Pope's Creek Site.

7.1.1.4.Hydrology

Section 3.5 provides information on the hydrology for NDW, IH. Pope's Creek Site is located within the Potomac River, just south of the tributary creek, Pope's Creek.

7.1.1.5.Hydrogeology

Section 3.6 provides a description of hydrogeology for NDW, IH. This information is applicable to southern Maryland, and includes the Pope's Creek Site area.

7.1.1.6.Cultural and Natural Resources

A historic trail marking the escape route of John Wilkes Booth after assassinating President Abraham Lincoln lies along the edge of, and possibly crosses into, the Pope's Creek Site. A map showing the location of the trail is included as Figure 7.1-2. Also on the map is the location of Pope's Creek Site. The trail appears to pass through the danger area associated with the site, and along the edge of the boundary for the site.

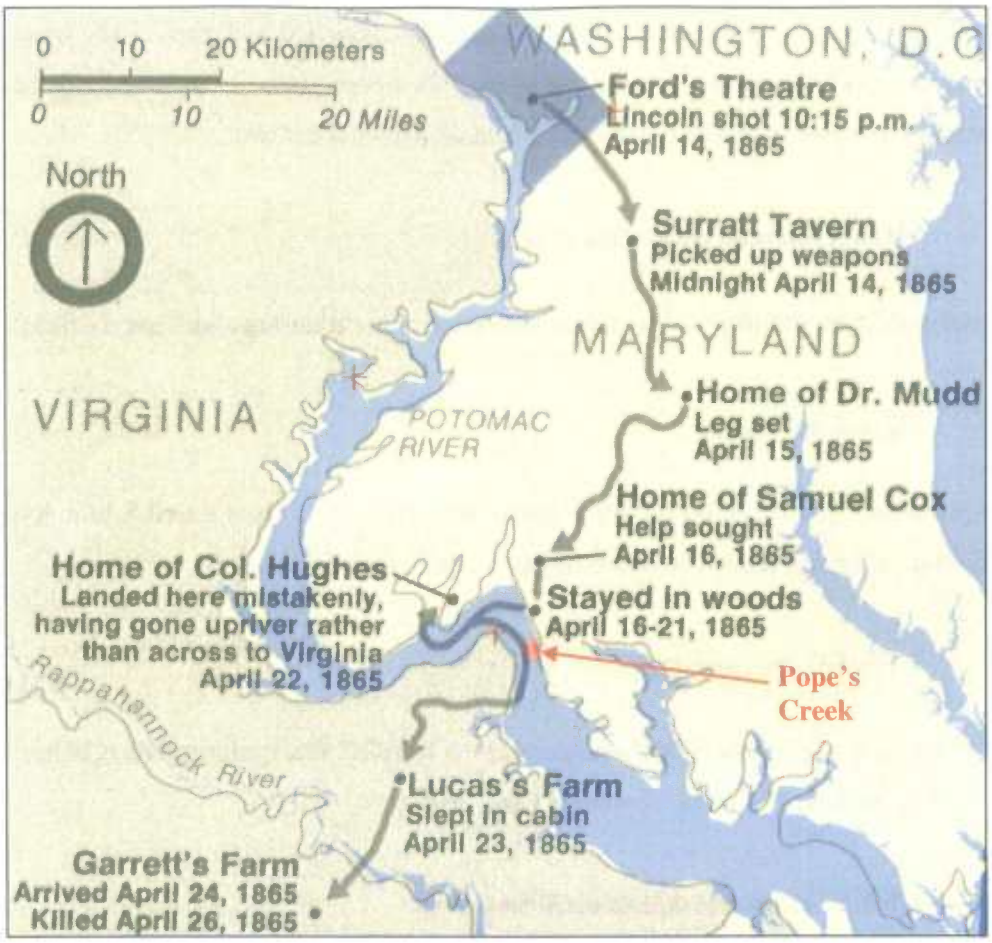


Figure 7.1-2: Historic trail marking the escape route of John Wilkes Booth.

7.1.1.7.Endangered and Special Status Species

There are no known endangered or special status species located at the Pope's Creek Site.

7.1.2. Visual Survey Observations and Results

A visual survey of Pope's Creek was not conducted. Range/site details for the Pope's Creek Site are illustrated on Map 7.1-1 located at the end of Section 7.1.

7.1.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials known or suspected to be at the site. This includes both MEC and non-hazardous munitions related scrap (e.g., fragmentation, base plates, inert mortar fins).

Based on the public notice and size of the danger area (Figure 7.1-1), it is likely that underwater testing of demolition charges, and/or explosive material were being conducted. However, the exact types of munitions are unknown.

Based on the information obtained during the data collection process, the Pope's Creek Site is not suspected to contain CWM filled munitions, electrically fuzed munitions, or DU associated munitions.

7.1.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspect MEC Areas, and Areas Not Suspected Contain MEC to indicate that MEC is known or is suspected to be at the site. The MEC presence is discussed below.

Map 7.1-2 illustrates the munitions characterization of the Pope's Creek Site and is provided at the end of Section 7.1.

7.1.4.1.Known MEC Areas

Based on historical documents and information obtained during the data collection process, there are no known MEC areas at the Pope's Creek Site.

7.1.4.2.Suspected MEC Areas

Based on its reported use as an underwater testing area, the entire Pope's Creek Site is a suspected MEC Area.

7.1.4.3.Areas Not Suspected to Contain MEC

There are no areas of the Pope's Creek Site not suspected to contain MEC.

7.1.5. Ordnance Penetration Estimates

Based on the use of this range for underwater testing of demolition charges, and/or explosive material, there is no associated penetration depth with the munitions used at the Pope's Creek Site.

7.1.6. Munitions Constituents

Based on the public notice and size of the danger area shown in Figure 7.1-1, it is likely that underwater testing of demolition charges, and/or explosive material were being conducted. However, the exact types of munitions are unknown. Munitions constituents potentially at the Pope's Creek Site include TNT.

7.1.7. Contaminant Migration Routes

Environmental media through which MC may migrate from the Pope's Creek Site include surface water and sediment. Migrations routes include dredging, erosion/redeposition, water currents, tides, and relocation by events such as heavy rains and storm surges. MC in sediments may migrate via plant/animal uptake.

7.1.8. Receptors

Potential human receptors include commercial/recreational users. Potential ecological receptors would include aquatic animals and plants as well as birds and small mammals. American Shad, Alewife and Blueback Herring and other species use the Potomac River as a travel route and spawning site. The potential exposure media for both human and ecological receptors pertaining to Pope's Creek are surface water/sediments, and the food chain. Human receptors may come in contact with MEC or MC through recreational activities such as wading, fishing or boating. Fish and other aquatic organisms may become receptors through burrowing or feeding activities. As

fishing is allowed in the area, human receptors can potentially contact MC through ingesting impacted fish collected in the Potomac River.

7.1.8.1.Nearby Populations

The Pope's Creek Site is located in Charles County, Maryland. Charles County contains approximately 260 people per square mile according to the 2000 U.S. Census. The nearby town of Newburg, MD has a population of approximately 2,716.

7.1.8.2.Buildings Near/Within Site

Three popular seafood restaurants are located just upstream of the Pope's Creek Site near the mouth of Pope's Creek.

7.1.8.3.Utilities On/Near Site

There are no utilities located within the Pope's Creek Site.

7.1.9. Site Use

The area of the Pope's Creek Site is currently used for recreational boating, fishing, and crabbing. The Potomac River is periodically dredged.

7.1.10. Access Controls / Restrictions

There are no access control features specific to the Pope's Creek Site. The site is located in a public waterway. There are no known site use/development restrictions for the area

7.1.11. Conceptual Site Model

A general description of the CSM is provided in Section 5.1.11.

The CSM is presented in a series of information profiles that presents information about the site. The information profiles are included in Table 7.1-1 below.

Table 7.1-1: Conceptual Site Model Information Profiles – Pope's Creek Site		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
Range/Site Profile	Installation Name	NDW, IH
	Installation Location	Indian Head, Charles County, Maryland
	Range/Site Name	Pope's Creek Site
	Range/Site Location	The site is located southeast of NDW, Indian Head, near Pope's Creek, Maryland. It lies approximately 1 to 2 miles north of the Potomac River Bridge, and extends west from the eastern shoreline of the Potomac River.
	Range/Site History	Activity involving underwater explosions.
	Range/Site Area and Layout	The testing area was approximately 44 acres, while the publicized safety zone was approximately 841 acres.
	Range/Site Structures	None reported.
	Range/Site Boundaries	N: Potomac River (near Pope's Creek tributary) S: Potomac River (near Route 301 bridge) E: Pope's Creek, MD (shoreline) W: Potomac River
	Range/Site Security	There is no site-specific security due to the fact that this is a public waterway.
Munitions/ Release Profile	Munitions Types	Potential munitions include demolition charges.
	Maximum Probability Penetration Depth	No associated penetration depth.
	MEC Density	Unknown.
	MEC Scrap/Fragments	Unknown. No visual survey was conducted.
	Associated Munitions Constituents	Possibly TNT
	Migration Routes/Release Mechanisms	Dredging, erosion/redeposition, water currents, tides, and relocation during events such as heavy rains and storm surges

Table 7.1-1: Conceptual Site Model Information Profiles – Pope's Creek Site		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
Physical Profile	Climate	The Pope's Creek Site has a continental-type climate with four well-defined seasons. The coldest period at the Pope's Creek Site occurs in late January and early February, with low temperatures averaging 29°F. July is the warmest month with average maximum temperatures of 85°F. The normal annual precipitation is approximately 44 inches, normal monthly precipitation varying from 2.25 (February) to 4.60 (August) inches.
	Topography	Elevation of the adjacent shoreline is approximately 100 feet AMSL.
	Geology	The Pope's Creek Site lies within the Atlantic Coastal Plain Province. The regional geology consists of Tertiary deposits overlying crystalline Precambrian metamorphic and igneous bedrock. The geologic units underlying the Pope's Creek Site are the Calvert Formation of the Chesapeake Group and the Nanjemoy Formation of the Pamunkey Group. The lithology of the Calvert formation consists of interbedded dark green to dark bluish-gray, fine-grained argillaceous sand and sandy clay containing prominent shell beds and locally silica-cemented sandstones. The Nanjemoy Formation consists of dark green to gray, argillaceous, glauconitic, fine- to medium-grained sand; and minor gray to pale brown clay.
	Soil	River sediments.
	Hydrogeology	The lower and middle sands of the Patapsco and Patuxent Formations of the Potomac Group are the main groundwater aquifers used for domestic purposes at Indian Head and Stump Neck. The average depth to the Patapsco Aquifer is 300 feet. Shallow unconfined to semiconfined groundwater occurs from near surface to approximately 29 feet bgs, with water-table elevations ranging from sea level to approximately 75 feet above sea level.
	Hydrology	The site is located within the Potomac River just south of Pope's Creek.
	Vegetation	Aquatic vegetation
Site Use and Exposure Profile	Current Site Use	Recreational boating and fishing.
	Current Human Receptors	Commercial/recreational users

Table 7.1-1: Conceptual Site Model Information Profiles – Pope's Creek Site		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Current Activities (frequency, nature of activity)	Recreational (fishing, boating); commercial (dredging)
	Potential Future Site Use	No future change in site use anticipated.
	Potential Future Human Receptors	Commercial/recreational users
	Potential Future Site Use-Related Activities:	No future change in site use anticipated.
	Zoning/Site Use Restrictions	None.
	Demographics/Zoning	Charles County population density is approximately 260 persons per square mile. The population of nearby Newburg, MD is 2,716.
	Beneficial Resources	American Shad, Alewife and Blueback Herring and other species use the Potomac River as a travel route and spawning site.
Ecological Profile	Habitat Type	Aquatic.
	Degree of Disturbance	High – it is anticipated that the Potomac River is periodically dredged. Recreational activities on the river such as fishing and crabbing may also disturb sediments.
	Ecological Receptors	
	Federal Endangered Species:	None reported.
	Federal Threatened Species:	None reported.
	State Endangered Species:	None reported.
	State Threatened Species:	None reported.
	Other Ecological Receptors:	American Shad, Alewife and Blueback Herring and other species that use the Potomac River as a travel route and spawning site.
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Aquatic biota may have direct contact with MEC that exist in the environment. Aquatic biota may have direct contact or indirect contact with MC that exist in the environment or have been incorporated into the food chain.

A general description of the CSM pathway analysis is provided in Section 5.1.11.

MEC Interactions and Pathway Analysis

The pathway analysis for MEC is shown in Figure 7.1-3. Potential receptors include both human (commercial/recreational user) and ecological receptors (biota) that may contact the source medium. Because Pope's Creek is located off-installation, naval personnel are not considered potential receptors for this site. Pathways are shown for each medium and are discussed below.

Surface Sediment

Human and ecological receptors could potentially be affected by MEC at the sediment surface. Human receptors such as commercial/recreational user could disturb MEC through recreational activities such as wading and fishing. Activities, such as physical contact with sediments, could also affect biota.

Subsurface Sediment

The pathways for MEC in the subsurface are potentially complete for all commercial/recreational users because intrusive activities, such as river dredging, are anticipated at the Pope's Creek Site. MEC could also be transported to surface sediment by the tides, water currents, erosion/redeposition, river dredging and relocation during events such as heavy rains and storm surges.

MC Interactions and Pathway Analysis

The pathway analysis for MC is shown in Figure 7.1-4. Potential receptors include both human (commercial/recreational user) and ecological receptors (biota) that may contact the source medium or other media at the range that may be impacted. Because Pope's Creek is located off-installation, naval personnel are not considered potential receptors for this site. Pathways are shown for each medium and are discussed below.

Surface Water

Potential receptors including both human (commercial/recreational user) and ecological receptors (biota) may potentially ingest or come into physical contact with surface water at the site. Biota can potentially ingest or come into physical contact with impacted surface water. Human receptors have the potential for physical contact and ingestion of impacted water through recreational activities such as wading or fishing.

Plant/Animal Uptake

A potentially complete pathway is indicated for biota exposed to MC at the Water Impact Area via the food chain. MC may be taken up by plants and transferred through the food chain to feeding biota. There are no domestic animals on or near the Pope's Creek Site, so the MC exposure pathway is considered incomplete for all receptors. Fishing is known to occur on the Potomac River; therefore, fish provide a potentially complete pathway for commercial/recreational user and biota.

Surface Sediments

Human and ecological receptors could potentially be affected by MC at the sediment surface through ingestion or dermal contact. Human receptors such as commercial/recreational users could contact MC through recreational activities such as wading and fishing. Activities, such as physical contact with and ingestion of sediments, could also affect biota.

Subsurface Sediments

The ingestion and dermal contact pathways for MC in the subsurface are potentially complete for commercial/recreational users and biota because intrusive activities, such as river dredging, are anticipated at the Pope's Creek Site. MC could also be transported to surface water by the tides, water currents, erosion/redeposition, river dredging, and relocation during events such as heavy rains and storm surges

Figure 7.1-3: MEC Exposure Pathway Analysis: Pope's Creek

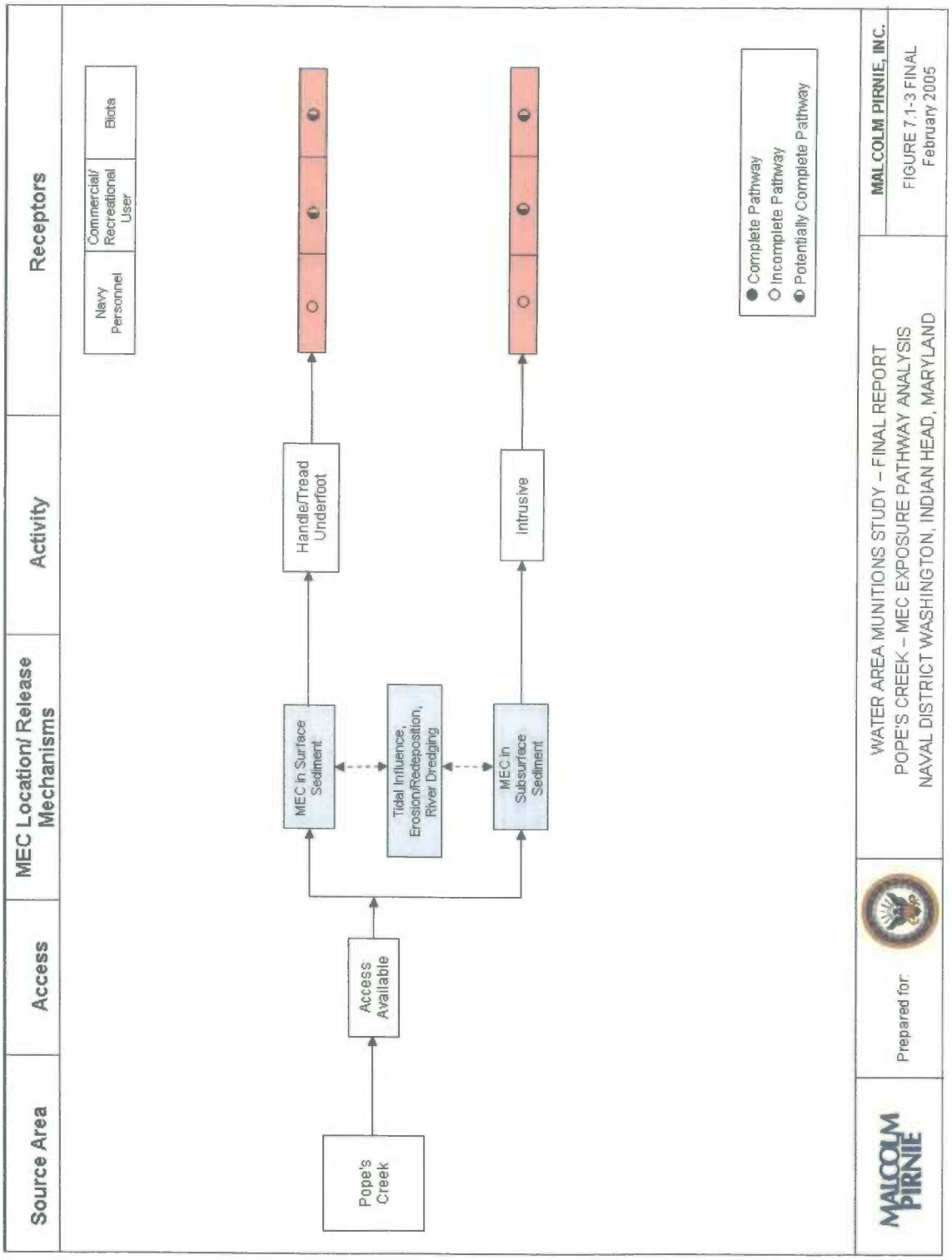
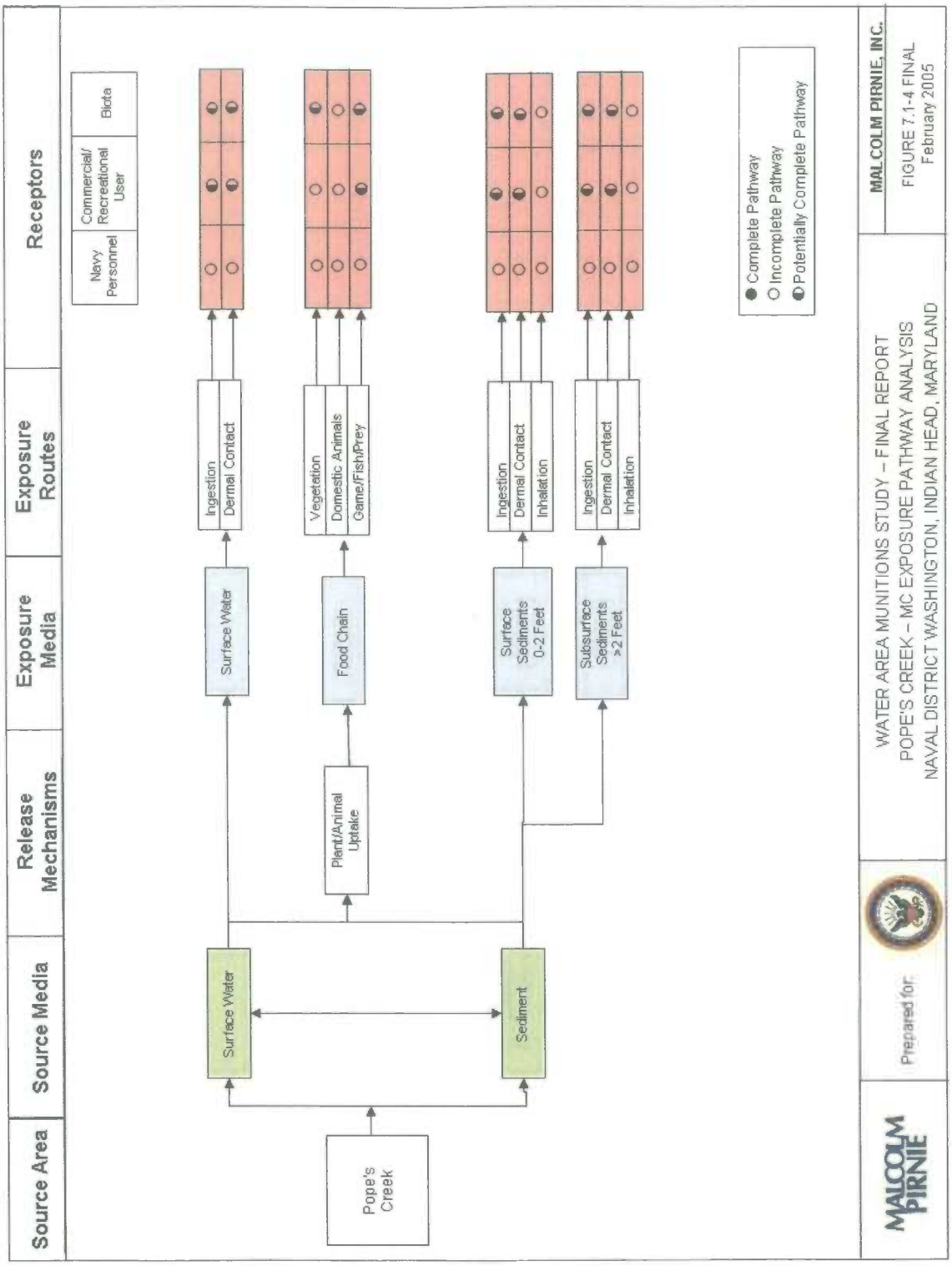


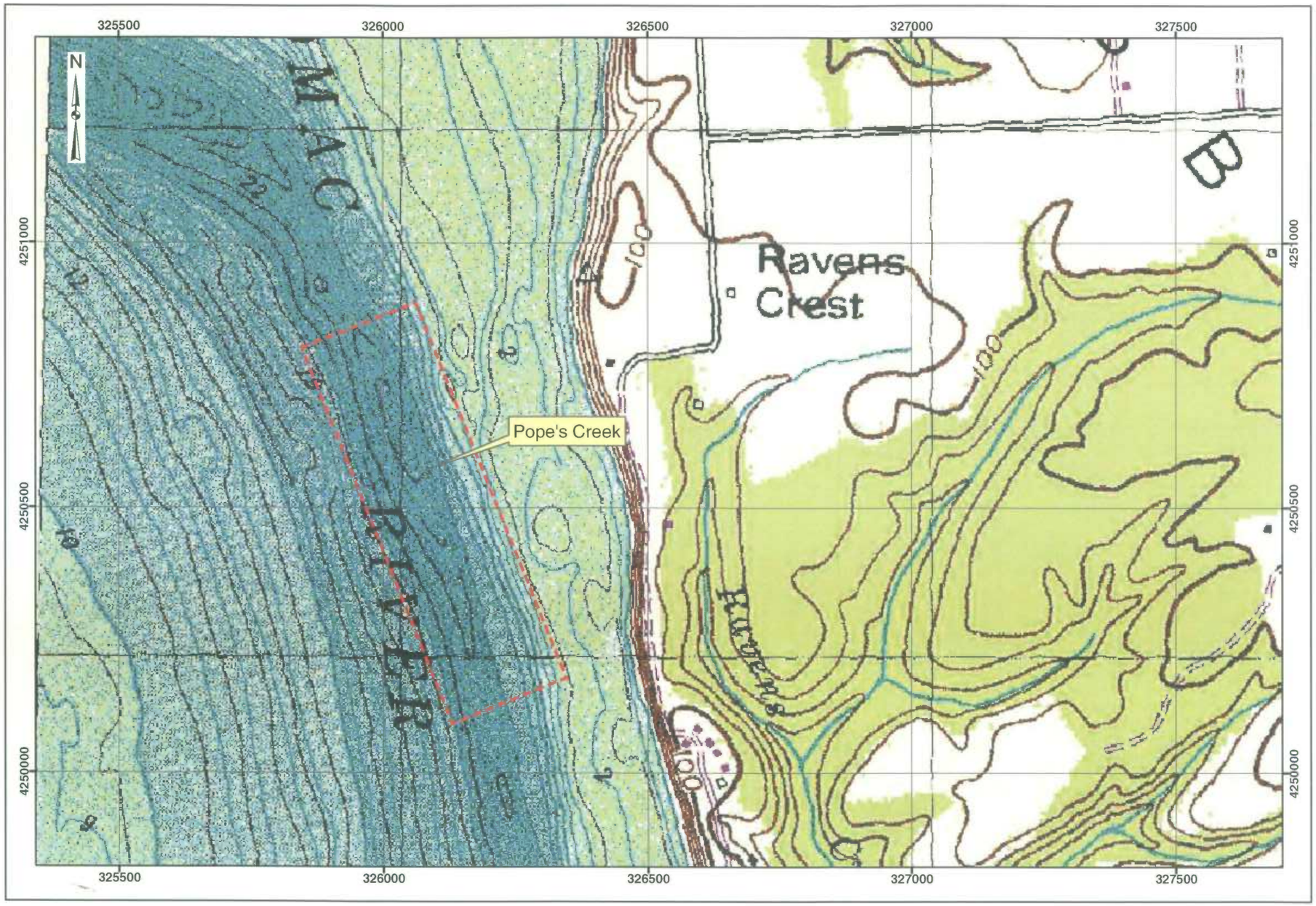
Figure 7.1-4: MC Exposure Pathway Analysis: Pope's Creek



7.1.12. Summary

The Pope's Creek Site is located southeast of NDW, Indian Head, within the Potomac River near the town of Pope's Creek, Maryland. The Site was used for underwater testing of demolition charges, and/or explosive material during the late 1940s according to a Public Notice titled "Notice to Navigation Interests" dated June 2, 1947. The testing area was approximately 44 acres, while the publicized safety zone was approximately 841 acres. Based on its reported use as an underwater testing area, the entire Pope's Creek Site is a suspected MEC Area. MC, possibly TNT, may be present at Pope's Creek; however types and/or quantities are not known.

Water Area Munitions Study
NDW, Indian Head, Maryland



Map 7.1-1
Range/Site Details
Pope's Creek

Legend

Installation Boundary

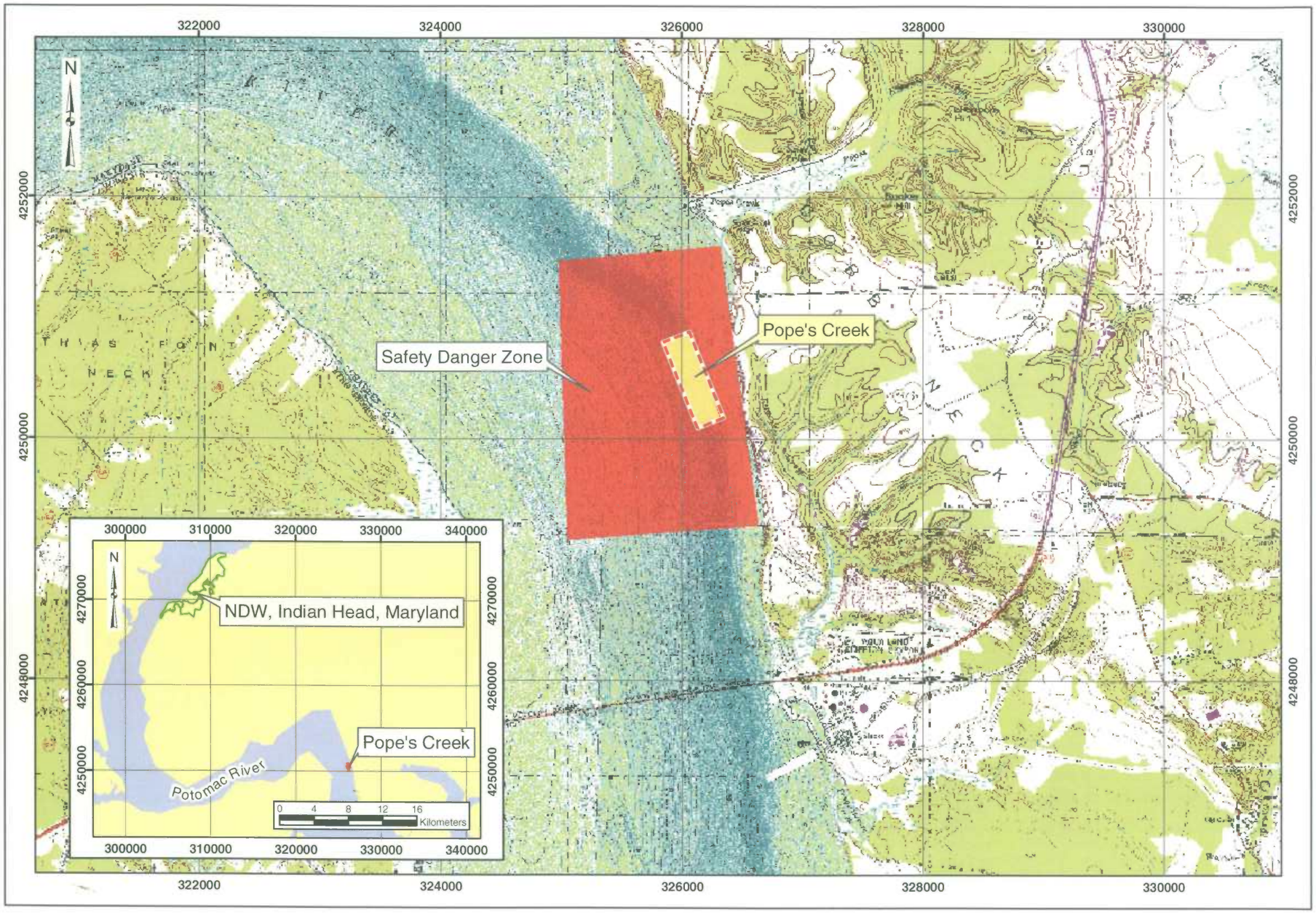
Pope's Creek

0 125 250 375 500 Meters

Data Source: USGS, 1971 7.5 Minute Series
Topographic Survey - Bathymetric Map
Pope's Creek, MD
Colonial Beach North, MD
Mathias Point, MD
Dahlgreen, VA

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
Date: February 2005



Water Area Munitions Study
NDW, Indian Head, Maryland

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Map 7.1-2
Munitions Characterization
Pope's Creek

Legend

- Installation Boundary
- Pope's Creek
- Safety Danger Zone

MEC Presence*

- Known
- Suspect

* MEC Presence was determined through review of historical documentation, interviews, and/or visual survey.

0 500 1,000 1,500 2,000 Meters

Data Source: USGS. 1971 7.5 Minute Series
Topographic Survey - Bathymetric Map
Pope's Creek, MD
Colonial Beach North, MD
Mathias Point, MD
Dahlgreen, VA

Coordinate System: UTM Zone 18N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munitions Study
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Naval Powder Facility 1948 (2), 1948
Naval Explosives Investigation Lab 1949, 1949
Naval Explosives Investigation Lab 1949 (2), 1949
Naval Explosives Investigation Lab 1949 (3), 1949
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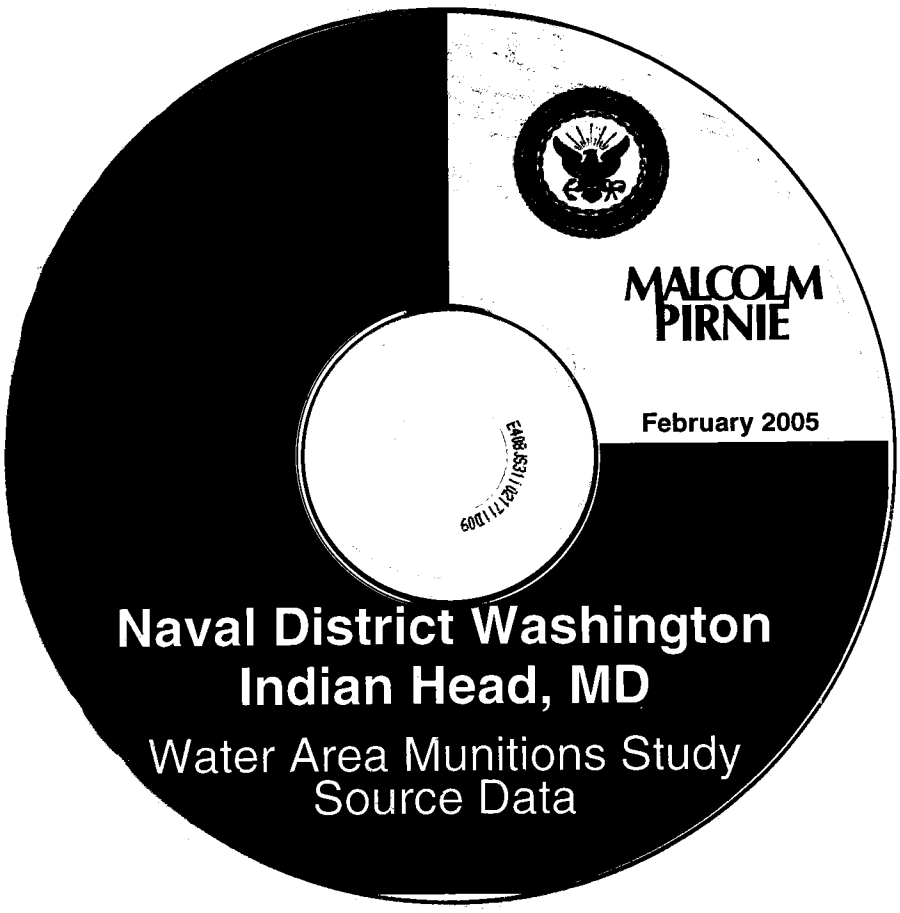
Appendix B: Project Source Data – General

(Included on enclosed CD)



Naval District Washington
Indian Head, MD

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Source Data

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PIRNIE

Appendix C: Project Source Data – Site Specific

(Included on enclosed CD)

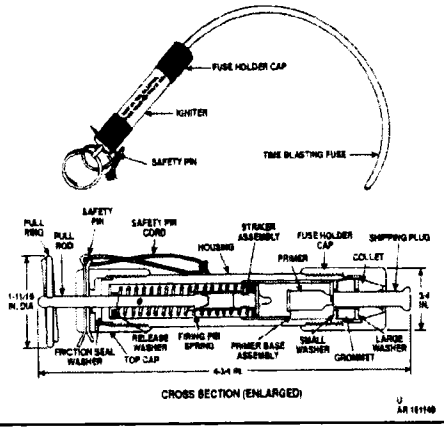
Appendix D: Ordnance Technical Data Sheets

IGNITER AREA

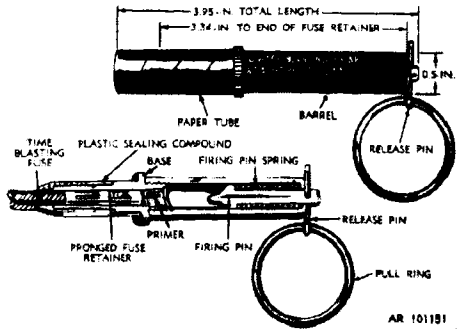
Ordnance Technical Data Sheet

Time Blasting Fuse Igniters

IGNITER, TIME BLASTING FUSE: M60, WEATHERPROOF



IGNITER, TIME BLASTING FUSE: M2, WEATHERPROOF



Nomenclature:	Igniters, Time Blasting Fuse: M2 and M60, Weatherproof
Ordnance Family:	Demolition Material
DODIC:	M766
Filler:	Lead Styphnate*
Filler weight:	Not Available
Item weight:	340 g
Diameter:	1.2 in.
Length:	4.8 in.
Fuze:	Not Applicable

Usage: The weatherproof time blasting fuse igniter M60 is a pull-type assembly and is used to initiate time blasting fuse. It maybe used under all weather conditions and even underwater. A watertight seal is formed only with the smooth surfaced time blasting fuse M700.

Functioning: After the fuse is inserted in the igniter and secured, the safety cotter pin is removed. A 10 to 30 pound pull on the pull ring brings the spring-loaded firing pin back to the release washer, which spreads the firing pin's jaws. This releases the firing pin from the knobbed end of the pull rod. Once released, the firing pin is driven by the compressed spring into the primer which fires and ignites the adjacent fuse. High-pressure gasses generated by the burning primer and fuse are vented to the atmosphere through the vent passage, eliminating a buildup of pressure which could rupture the igniter. When the fuse burns to the end a flame shoots out igniting a blasting cap or other explosive initiator.

M2 Description
Igniter M2 is a two-piece assembly of a barrel and a coupling base. The barrel is fitted with a firing mechanism, which consists of a firing pin, a firing pin spring and a release pin. The release pin is attached to a pull ring. The coupling base contains a percussion primer and a pronged fuse retainer. The base is protected, during shipment and storage, by a removable paper tube. Included in the package is plastic sealing compound.

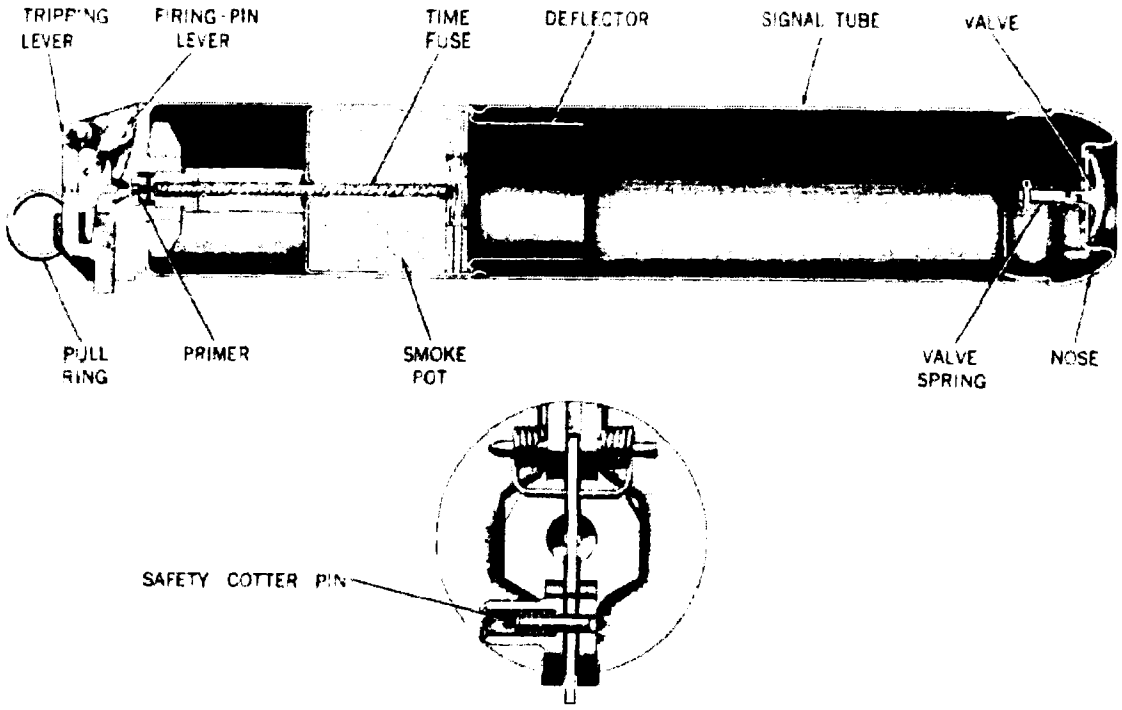
M60 Description
The igniter consists of three major assemblies: a firing mechanism, a fuse holder and a primer base. The firing mechanism has a housing with a threaded cap on one end. A firing pin, pull rod, release washer, and firing-pin spring are situated inside the housing. One end of the pull rod protrudes through the top cap and accepts the pull-ring and safety pin. The pull rod has a venting passage, which is opened only during firing when the pull rod is drawn out of the igniter body. A rubber friction seal washer, located between the top cap and the housing, seals the forward end of the housing. The fuse holder is assembled to the base.

*Lead Styphnate - A primary explosive used in friction type primers. Not a satisfactory explosives for use in detonators; usually mixed with an oxidizing agent or fuel. It is a crystalline material. The color varies: straw colored, deep yellow, orange yellow, or reddish brown. Lead styphanate is slightly soluble in water and less soluble in acetone. It is somewhat soluble in a 10 percent aqueous solution of ammonium acetate. Lead styphanate is approximately as sensitive as mercury fulminate to impact; has about the same order of friction sensitivity as lead azide and is more sensitive in mixture than when used alone. It is easily ignited by flame and can be set off by shock and heat, and is sensitive to discharge of static electricity. Dry material can be ignited by a discharge of static electricity from the human body. It detonates at 16,100 feet per second.

Reference: TM 43-0001-37, TM 43-0001-38

Ordnance Technical Data Sheet

Submarine Float Signal Mk2 Mod 2



Nomenclature:	Submarine Float Signal Mk2 Mod 2
Ordnance Family:	Pyrotechnics
DODIC:	Unknown
Filler:	Smoke Composition
Filler weight:	Unknown
Item weight:	1.81 k (4 lbs)
Diameter:	76.20 mm (3 in)
Length:	472.70 mm (18.61 in)
Maximum Range:	N/A
Fuze:	Percussion

Usage: This signaling device was designed to be launched at a maximum depth of 285 feet to produce a red, black, green, or yellow smoke display on the surface.

Description: This signal consists of a cylindrical aluminum tube, which is closed at one end by a rounded nose cap with concave center into which the blowout valve is fitted. At the base end is the firing mechanism. The case is stenciled to show the color of the smoke emitted.

Reference: OP 2213, Pyrotechnic, Screening, and Dye Marking Devices, 1 Oct 1965, Change 19, 1 Jan 1969

ORDNANCE DETAIL - PRINTER FRIENDLY SUMMARY

- - Select To See Information - - Go!

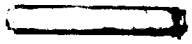
U.S. SIGNAL, SUB FLOAT, MK 1 MOD 1 & MK 2 MOD 0

IMAGES

External View

Cutaway View

Museum View



Field View

GENERAL INFORMATION

Description:

These float signals are used to mark the position of a submerged submarine, and for other marking purposes.

Country of Origin:

United States

Measurement Information:

Diameter/Width	Length	Weight
76.20 mm	457.20 mm	Not Available

Explosive Information:

Explosive/Filler Type	Net Explosive/Filler Weight
Smoke Composition	Unknown

Transportation and Disposal Summary:

Transportation	Disposal
Special instructions required for transportation.	Disposal by detonation.

HAZARDS

If the UXO has been recently emplaced, fired or dropped, seek technical assistance from military specialists.

IMAGES

Disposal View

INSTRUCTIONS

Note:

Follow these safety precautions when approaching or handling the item to confirm the indentification.

COCKED-STRIKER

Definition:

A cocked striker is a striker/ firing pin/ detonator that is held in a ready-to-fire position under spring tension and could function when disturbed or released.

Safety Precautions:

Do not jar or subject item to movement.

SMOKE INCENDIARY

Definition:

Smoke may cause severe dermatitis, as well as eye and respiratory irritation.

Safety Precautions:

If the smoke cannot be avoided, wear appropriate protective clothing and respiratory equipment.

EXPLOSIVE (HE)

Definition:

Explosive-loaded ordnance includes high and low explosives of all countries. High explosives burn/detonate at rates of a few inches to 1300 feet per second.

Safety Precautions:

Do not subject any explosive to heat, shock, fire, friction, or rough handling. High temperature can greatly increase the sensitivity of explosives. Exercise extreme caution when dealing with old, damaged and possibly deteriorated explosive loaded ordnance. Certain explosives may react with metal, other explosives, air, or chemicals in the earth to produce extremely sensitive explosive components.

If the UXO has been recently emplaced, fired or dropped, seek technical assistance from military specialists.

TRANSPORTATION

Before Transportation:

Whenever UXO is encountered, the presence of booby traps must be considered.

Damage to ordnance items that would normally be safe to transport could cause these items to become extremely hazardous if handled. It is critical that you firmly jar all UXO items remotely (such as by rope from a safe distance) before you attempt any hand movement or transportation.

During Transportation:

Whether you are transporting by hand or by vehicle, extreme care must be taken to ensure the UXO receives minimum jarring, bumping and shock.

If specified, you must maintain the item's physical orientation (base down, nose down, horizontal, etc.) throughout the transportation and disposal operations.

Specific Transportation Instructions:

If the striker is hung, do not transport. Blow in place. If the striker is impinged, jar remotely and then transport the munition to the disposal area.

DISPOSAL

Disposal Reminders:

Explosive disposal procedures and the explosive weights provided in ORDATA Online are based on the use of high quality military type explosives, such as Composition C-4 or TNT. If explosives of lesser quality are used, you are advised to compensate by increasing the quantity above that specified for the disposal.

The disposal procedures provided are for single UXO items only. Multiple-item and mass disposal operations can be very complex and extreme care must be taken when applying single-item disposal practices to these operations.

Specific Disposal Instructions:

Disposal by detonation. Counter Charge Main Charge using:

0.50 lb / 0.23 kg of explosive charge

Place charge on the top center of the munition.

FRAGMENTATION

Fragmenatation Reminders:

The displayed fragmentation distance provides protection - with a margin of safety - for personnel engaged in explosive disposal operations. It is possible that some extremely hazardous fragments may fly farther that the distance specified.

It is always prudent for you to take maximum advantage of available distance and cover when conducting disposal operations.

Specific Fragmenatation Information:

Unknown. Use 300 m as a minimum.

U.S. SIGNAL, SUB FLOAT, MK 1 MOD 1 & MK 2 MOD 0

ORDATA Online

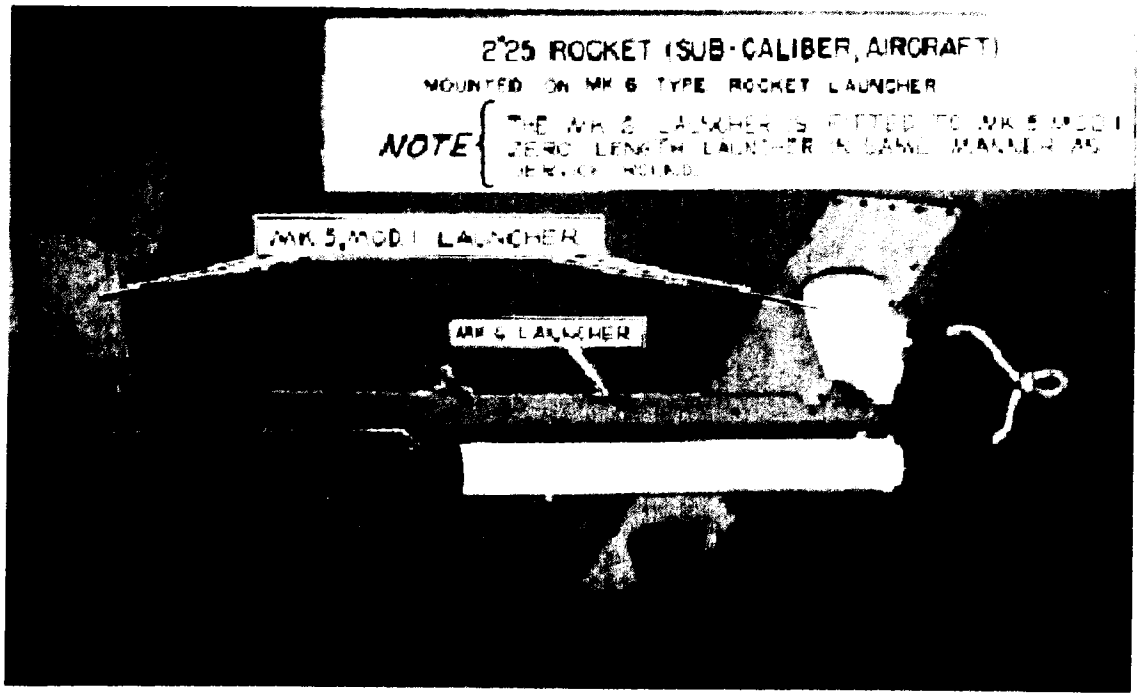
Questions, comments, or suggestions please email theWebmaster.

Last updated Wednesday, March 24, 2004

WATER IMPACT AREA

Ordnance Technical Data Sheet

U.S. ROCKET, 2.25-IN, PRACTICE, 2.25-IN NAVY A.R.



Nomenclature:	**U.S. ROCKET, 2.25-INCH, Practice, 2.25-IN Navy A.R.**
Ordnance Family:	Rockets
DODIC:	H116
Filler:	Propellant
Filler weight:	793.8
Item weight:	4.00 kg (8.8 lbs)
Diameter:	70.00 mm (2.25 in)
Length:	648.00 mm
Maximum Range:	N/A
Fuze:	M446 fuze assembly

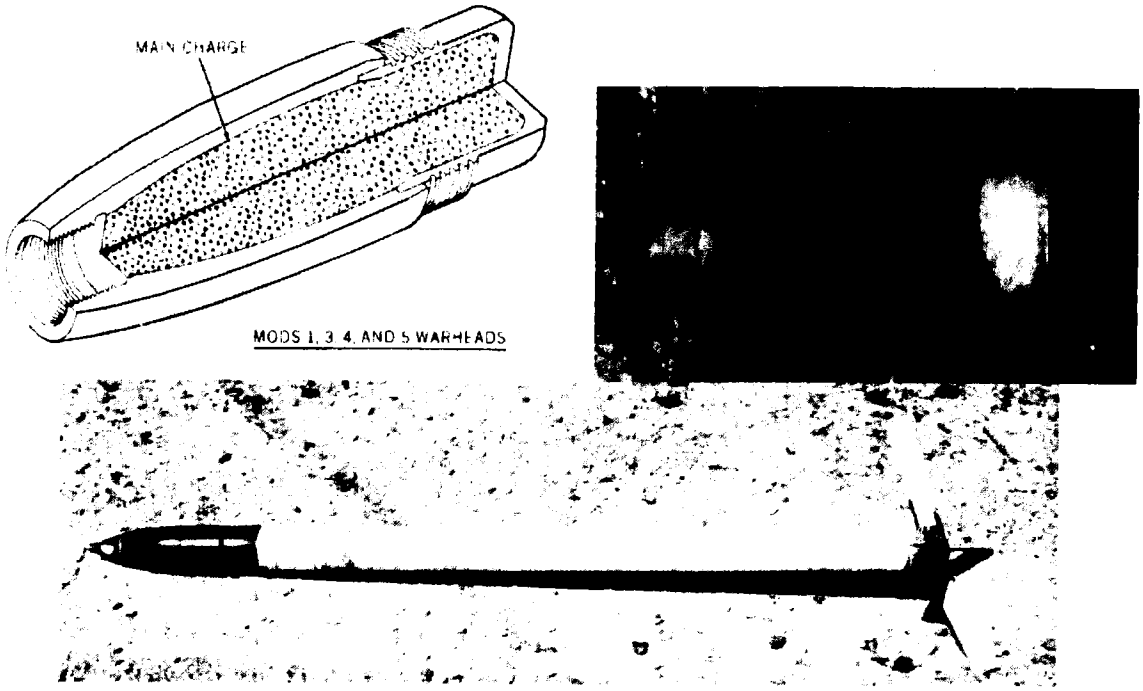
Usage: The 2.25-inch sub-caliber rocket for aircraft was developed for training purposes.

Description: For recognition purposes, the 2.25-inch motors Mk 10 and Mk 11 are painted white with black fins, while the Mk 12 and Mk 13 are grey with black fins. The warhead is made of metal.

Reference: ORDATA Online, MIDAS

Ordnance Technical Data Sheet

U.S. ROCKET WARHEAD, 2.75-INCH, FRAG



Nomenclature:	**U.S. ROCKET WARHEAD, 2.75-INCH, FRAG, MK 1 MODS 1, 3, 4, 5**
Ordnance Family:	Rockets
DODIC:	
Filler:	HBX-1*
Filler weight:	635.00 g (22.4 oz)
Item weight:	2.60 kg (5.7 lbs)
Diameter:	70.00 mm (2.75 in)
Length:	227.00 mm (8.937 in)
Maximum Range:	Not Provided
Fuze:	Impact fired

Usage: These are high-explosive fragmentation (HE-Frag) warheads. The weight of the warhead is 2.6 kilograms (5.7 pounds)

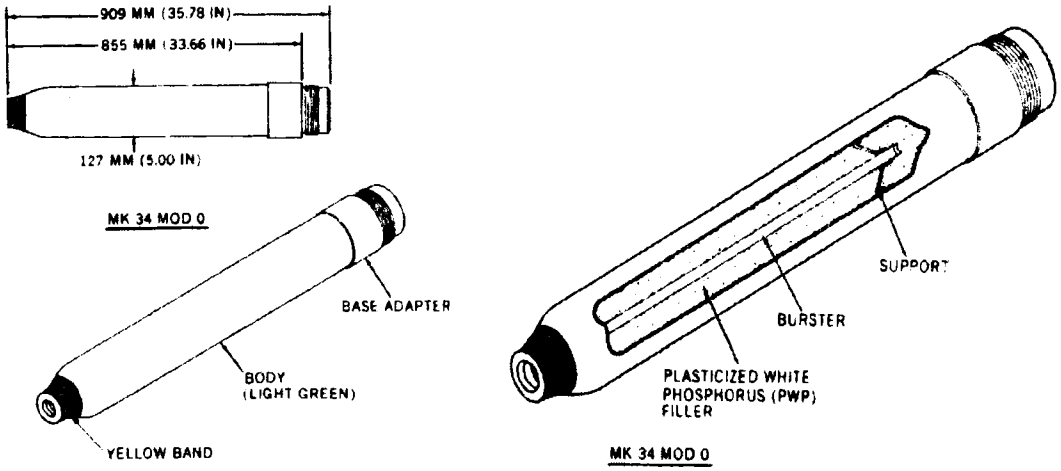
Description: The warheads are olive drab. Designation and other information are stenciled in yellow. A yellow band is painted around the nose of the warhead.

*HBX - High Blast Explosion HBX-1 and HBX-3 are binary explosives that are castable mixtures of RDX, TNT, powdered aluminum, and D-2 wax with calcium chloride.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. ROCKET WARHEAD, 5.0-INCH, SMOKE, MK 34 MOD 0



Nomenclature:	U.S. ROCKET WARHEAD, 5.0-INCH, SMOKE, MK 34 MOD 0
Ordnance Family:	Rockets
DODIC:	
Filler:	PWP (Plasticized White Phosphorous)
Filler weight:	9.00 kg (19.48 lbs)
Item weight:	23.60 kg (52.03 lbs)
Diameter:	127.00 mm (5 in)
Length:	909.00 mm (35.79 in)
Maximum Range:	Not Provided
Fuze:	Impact fired

Usage: The Mod 0 is a plasticized white phosphorus (PWP) smoke warhead used for target marking or incendiary purposes. The Mod 2 is a butyl rubber binder red phosphorus (RP) smoke warhead used for signaling or target marking.

Description: The Mod 0 warhead is painted light green, with a yellow band around the forward end. The nomenclature and the abbreviation PWP are stenciled in light red. The Mod 2 warhead body is painted gray and the fuze housing a light green with a yellow band around forward end similar to the Mod 0. The Mod 2 nomenclature and abbreviation RP are marked in black.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

Composition 4 (C-4)

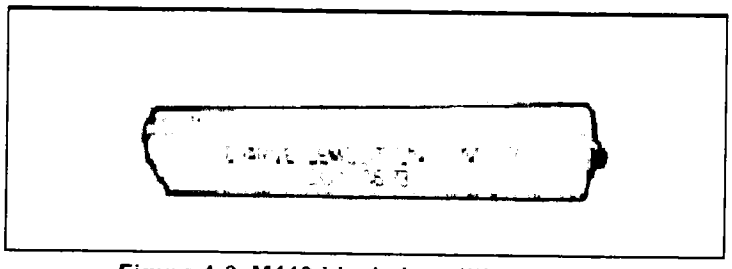


Figure 1-2. M112 block demolition charge

Composition C-4. This is a (91/9) RDX and plastic explosive composition. It is semiplastic putty-like material, dirty white to light brown in color, less sensitive, more stable, less volatile, and more brisant than composition C-3. It is a nonhydroscopic material that has found application in demolition blocks and specialized uses. The U.S. military is the primary manufacturer of C-4.

- **RDX** - 91 percent
- **Di(2-ethylhexyl) sebacate** - 5.3 percent
- **Polyisobutylene** - 2.1 percent
- **Motor oil** - 1.6 percent

Reference: ORDATA Online, MIDAS, Military Demolition Material List

Ordnance Technical Data Sheet

10" PROJECTILE, MK III (3)

Nomenclature:	**U.S. PROJECTILE, 10-IN, AP, MK III (3)**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	15.25 kg (33.62 lbs)
Item weight:	279.87 kg (617 lbs)
Diameter:	253.49 mm (9.98 in)
Length:	1.16 m (45.67 in)
Maximum Range:	Not provided
Fuze:	Not provided

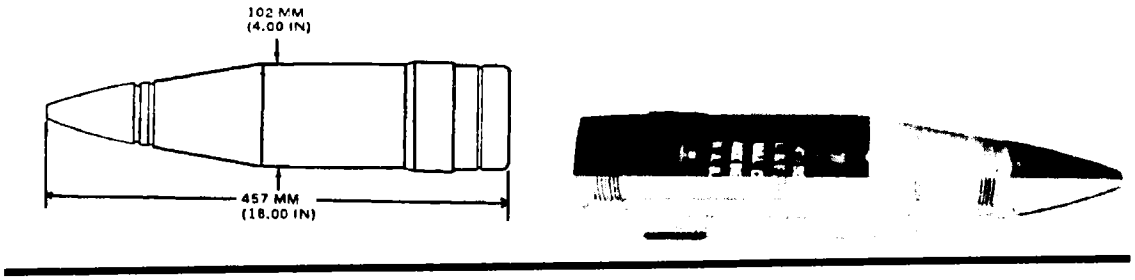
Usage: This is a spin stabilized, high explosive, armor-piercing projectile used against armored targets.

Description: The projectile is painted yellow or olive drab. The projectile is made of forged steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

4" PROJECTILE, MK 15



Nomenclature:	**U.S. PROJECTILE, 4-IN, HC, MK 15**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	1.23 kg (2.71 lbs)
Item weight:	14.97 kg (33 lbs)
Diameter:	102 mm (4.02 in)
Length:	457.20 mm (18 in)
Maximum Range:	Not provided
Fuze:	Not provided

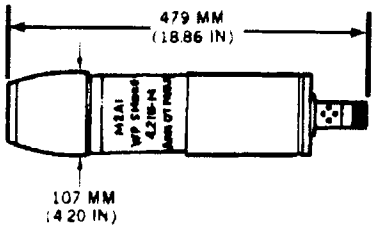
Usage: HIGH CAPACITY: These projectiles are used for shore bombardment, for antiaircraft guns, and for use against light ships and surface craft. This is a gun fired Navy projectile. It is used in 4"/50 guns.

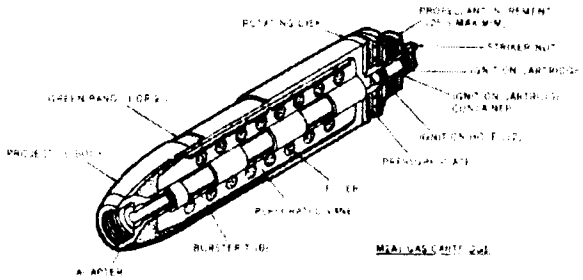
Description: These projectiles are designed to have a minimum wall thickness, and the largest explosive cavity consistent with the force of set-back. They are assembled, generally, with no-delay base fuzes, tracers, steel nose plugs, and auxiliary detonating fuzes. The steel nose plug may be removed and a point detonating or nose time fuze substituted. Its over-all color is green and comes in 3", 4", 5", 6", 8", 12", 14", and 16" sizes. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

U.S. CARTRIDGE, 4.2-INCH (107-MM), SMOKE, WP, M2, M2A1





Nomenclature:	Stokes 4.2 in Mortar Smoke (WP)
Ordnance Family:	Projectile
DODIC:	
Filler:	White Phosphorus
Filler weight:	3.40 kg (7.496 lbs)
Item weight:	11.30 kg (24.91 lbs)
Diameter:	107.00 mm (4.2 in)
Length:	479.00 mm (18.86 in)
Fuze:	Not Provided

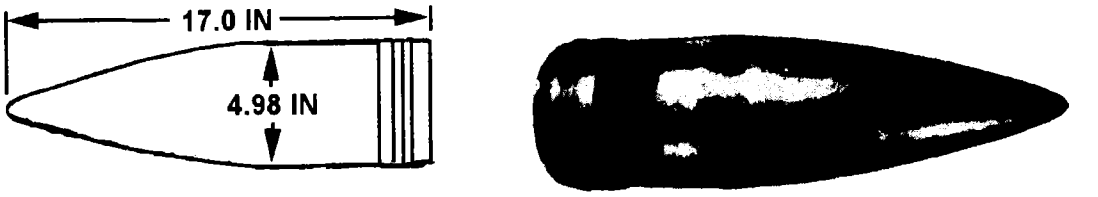
Usage: These are Army, spin-stabilized projectiles fired from mortars, to produce screening or spotting smoke and incendiary effects. The projectiles are filled with white phosphorus (WP), some obsolete M2-series smoke cartridges have a substitute filler of titanium tetrachloride (FM) or sulfur trioxide-chlorsulfonic acid (FS).

Description: Currently manufactured projectiles have light green projectile bodies with one yellow band and light red identification markings. Projectiles of earlier manufacture have gray bodies with one yellow band and yellow markings.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

5" PROJECTILE, MK 15 MODS 12-14



Nomenclature:	**U.S. PROJECTILE, 5-IN, COMMON, MK 15 MODS12-14**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Black Powder/TNT
Filler weight:	.77 kg (1.70 lbs)
Item weight:	22.68 kg (50.00 lbs)
Diameter:	127 mm (5.00 in)
Length:	431.80 mm (17.00 in)
Maximum Range:	Not provided
Fuze:	Not provided

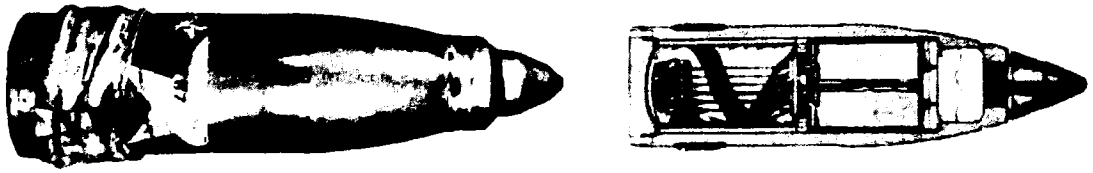
Usage: These projectiles are designed to penetrate approximately one-third their caliber of armor. They differ from Armor-Piercing and Special Common projectiles in that they have no cap or hood; the windshield threads directly to the body.

Description: The projectile body is slate grey. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 25 MODS 1-6



Nomenclature:	**U.S. PROJECTILE,5-IN, ILLUMINATING,MK 25 MODS 1-6**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Black Powder
Filler weight:	0.07088 kg (0.16 lbs)
Item weight:	17.94 kg (39.55 lbs)
Diameter:	126.75 mm (4.99 in)
Length:	787.40 mm (31 in)
Maximum Range:	Not provided
Fuze:	Various (see below)

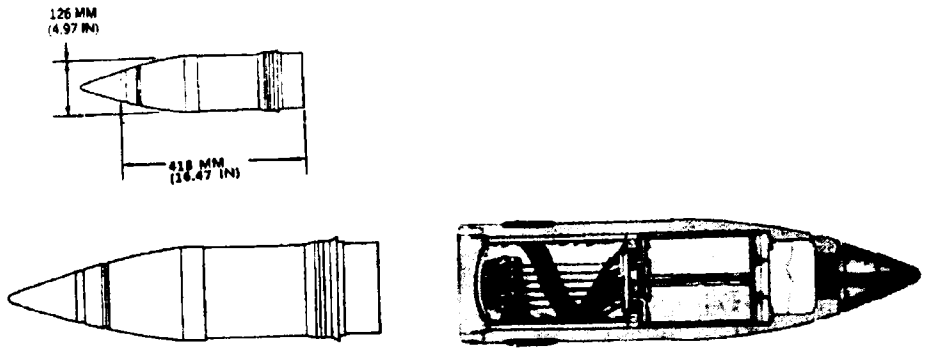
Usage: The Mod 2 projectile, used in the 5"/25 gun, is identical to the Mod 1, except for modification of the rotating band. When these projectiles are used in the 5"/51 bag gun, the Primer Mk 15 Mod 1 is used, and the Nose Fuzes Mk 50 and Mk 63 may be employed. Use of the Nose Fuzes Mk 50 and Mk 63 were not authorized with rounds used in the 5"/25 and 5"/51 case guns. The Illuminating Contents Mk 3 are used with projectiles Mods 1 through 4: projectiles Mods 5 and 6 are assembled with Illuminating Contents Mk 4 Mod 5 when used in the 5"/51 bag gun. Illuminating Contents Mk 3 when used in the 51"/51 case gun.

Description: The illuminating projectile is a thin case with a very small expelling charge just behind the fuze and an interior assembly of a star or candle with a parachute and a very lightly held base plug. Explosion of the expelling charge forces out the base and the interior assembly. The overall color of these projectiles is light blue with two white stars. The projectile is made of sheet metal.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 27 MODS 1-10



Nomenclature: **U.S. PROJECTILE,5-IN,ILLUMINATING,MK 27MODS 1-10**
Ordnance Family: Projectiles
DODIC:
Filler: Illuminant Composition
Filler weight: 0.00992 kg (0.022 lbs)
Item weight: 24.34 kg (53.66 lbs)
Diameter: 126 mm (4.96 in)
Length: 418 mm (16.47 in)
Maximum Range: Not provided
Fuze: Not Provided

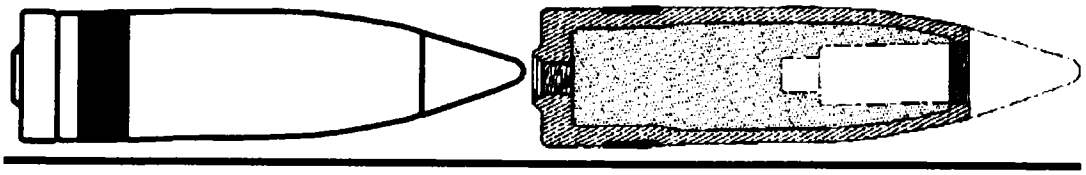
Usage: These projectiles are for illuminating targets by a parachute flare.

Description: Light blue with two white stars. The illuminating projectile is a thin case with a very small expelling charge just behind the fuze and an interior assembly of a star or candle with a parachute and a very lightly held base plug. Explosion of the expelling charge forces out the base and the interior assembly. The projectile is made of thin metal.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 28 MOD 9



Nomenclature:	**U.S. PROJECTILE, 5-IN, A.A. COMMON, MK 28 MOD 9**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	3.32 kg (7.32 lbs)
Item weight:	25.03 kg (55.18lbs)
Diameter:	126.75 mm (5 in)
Length:	525.78 mm (20.7 in)
Maximum Range:	Not provided
Fuze:	Mk 40-series fuze (VT)

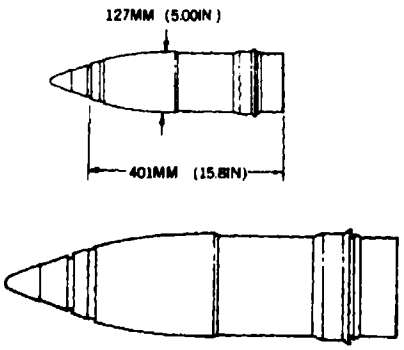
Usage: This projectiles are similar in construction to H.C. projectiles, except that a nose time or V.T. fuze is always assembled. It can be used for antiaircraft fire or, with the time fuze set on safe, used for bombardment. This projectile is fuzed with V.T. fuzes only. The projectile adapter is removed, and a gas-checked plug is inserted. No tracer or base fuze is used with this projectile. Fuze Mk 40 and Mods is currently replacing the Mk 32 and Mods in all assemblies.

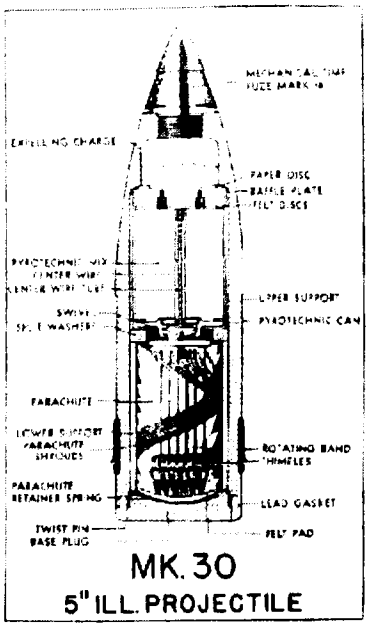
Description: The overall projectile color is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 30 MODS 1-8





Nomenclature:	**U.S. PROJECTILE,5-IN,ILLUMINATING, MK 30 MODS 1-8**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Black Powder
Filler weight:	0.07088 kg (0.16 lbs)
Item weight:	24.72 kg (54.50 lbs)
Diameter:	126.75 mm (4.99 in)
Length:	508 mm (20 in)
Maximum Range:	Not provided
Fuze:	Not Provided

Usage: This projectile is used to dispense parachute flares over a designated area. The projectile is light blue with two white stars. The projectile is made of steel.

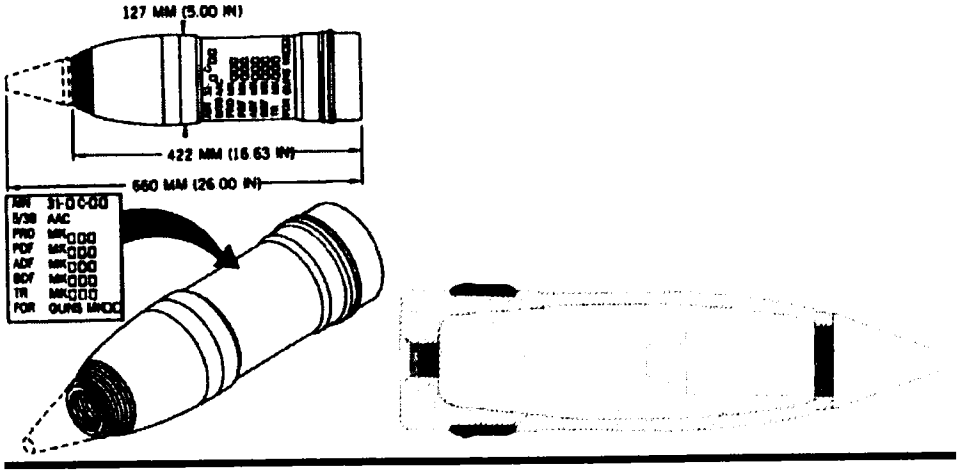
Description: The illuminating projectile is a thin case with a very small expelling charge just behind the fuze and an interior assembly of a star or candle with a parachute and a very lightly held base plug. Explosion of the expelling charge forces out the base and the interior assembly. When the nose time fuze functions, it ignites the black powder expelling charge, which in turn ignites the star or candle. The star or candle is a steel container in which is packed under heavy pressure an illuminating compound. The closed end of the star container is attached to the strand wires of a parachute. The parachute is carefully folded, and, with its strand wires, is rolled so that upon expulsion it opens, thereby suspending the candle or star. Because of the high velocity at which the projectile is traveling when ejection takes place, it is necessary to slow down the star-parachute assembly before the parachute becomes fully open. This is done by a center wire, one end of which secures the center of the parachute nearer to the star than when the parachute is in full release and causes the parachute to spill air, thereby preventing too great an initial

strain on the parachute. After the star has burned for a few seconds, the end of the center wire is released from its point of attachment in the star can. This permits the parachute to open fully.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 31 MODS 1-11



Nomenclature:	**U.S. PROJECTILE, 5-IN, A.A.COMMON, MK 31 MODS 1-11**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	3.29 kg (7.25 lbs)
Item weight:	25.03 kg (55.12 lbs)
Diameter:	126.75 mm (5 in)
Length:	525.78 mm (20.7 in)
Maximum Range:	Not provided
Fuze:	Various – see below

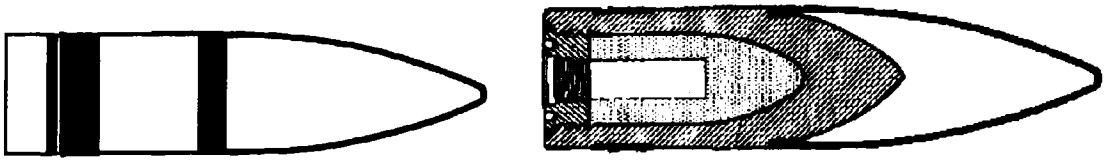
Usage: This is a spin stabilized Anti-aircraft projectile. This projectile is for use against aircraft. These projectiles are similar in construction to high capacity projectiles, except that a nose time or variable time fuze is always assembled. It can be used for antiaircraft fire or, with the time fuze set on safe, used for bombardment.
The Mk 31 projectile was originally designed to receive the Mk 13 base fuze, then it became obsolete. Which at that time was fitted only with variable time fuzes and a plug in the base. The Mk 40 fuze replaced the Mk 32 and Mods. With these fuzes, the projectile adapter was removed, and the Mk54 auxiliary detonating fuze was installed, replacing the previously used Mk 17 and Mk 46 fuzes. When the Mk 53 variable time fuze was used, the projectile adapter was removed and the Mk 44 auxiliary detonating fuze employed. This projectile was also issued blind loaded and plugged or blind loaded with tracer with adapter and Mk 6 tracer (or cut off Mk 13 base fuze) for target practice. Variable time fuzing is indicated by a 1/2" red band painted around the projectile 1/2" below the fuze protective cap.

Description: The overall projectile color is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 32 MODS 1-4



Nomenclature:	**U.S. PROJECTILE, 5-IN, COMMON, MK 32 MODS 1-4**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	1.66 kg (1.70 lbs)
Item weight:	24.49kg (53.99 lbs)
Diameter:	127 mm (5.00 in)
Length:	471.17 mm (18.55 in)
Maximum Range:	Not provided
Fuze:	Base Detonating

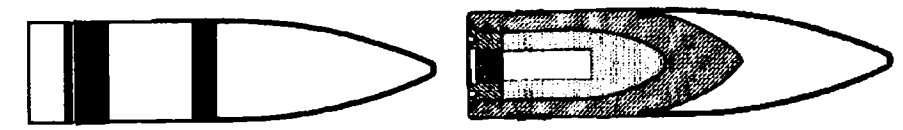
Usage: These projectiles are designed to penetrate approximately one-third their caliber of armor. They differ from Armor-Piercing and Special Common projectiles in that they have no cap or hood; the windshield threads directly to the body. Color is slate gray. Fuzing is Base detonating. The projectile is made of steel.

Description: The projectile body is slate gray. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 34 MOD 10



Nomenclature:	**U.S. PROJECTILE, 5-IN, COMMON, MK 34 MOD 10**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Composition A
Filler weight:	3.29 kg (7.25 lbs)
Item weight:	25.03 kg (55.18 lbs)
Diameter:	126.75 mm (4.99 in)
Length:	525.78 mm (20.7 in)
Maximum Range:	Not provided
Fuze:	Base detonating

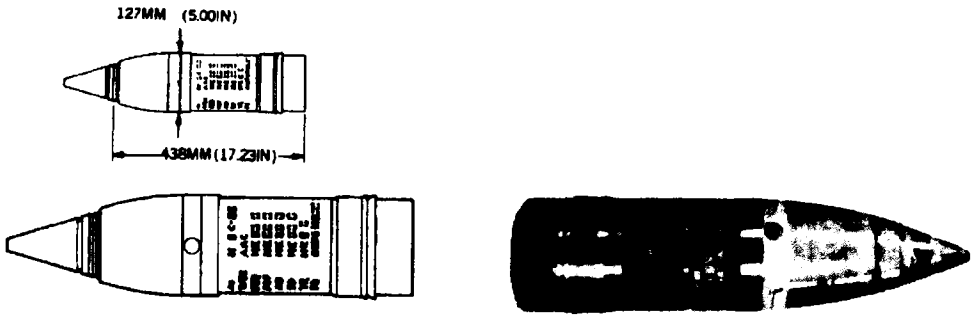
Usage: These projectiles are designed to penetrate approximately one-third their caliber of armor. They differ from Armor-Piercing and Special Common projectiles in that they have no cap or hood; the windshield threads directly to the body. Fuzing is base detonating.

Description: The overall color is slate gray. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 35 MODS 1 -12



Nomenclature:	**U.S. PROJECTILE, 5-IN, A.A.COMMON, MK 35 MODS 1-12**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	3.29 kg (7.25 lbs)
Item weight:	25.03 kg (55.18 lbs)
Diameter:	126.75 mm (4.99 in)
Length:	437.64 mm (17.23 in)
Maximum Range:	Not provided
Fuze:	Various – see below

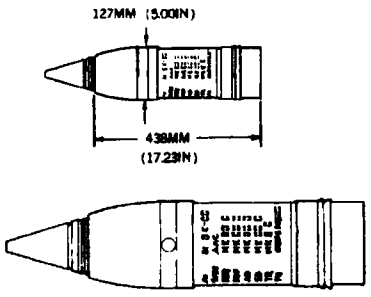
Usage: In many cases, the same projectile body is used for many of the different specific types by being assembled with different types or combinations of types of fuzes. For example, the Mk 41 5-inch 54-caliber projectile body is assembled as an AAC, HC, HE-CVT, HE-IR, HE-PD, HE-VT-NSD, and HE-VT-SD projectile. Most nose fuzes and rotating bands are not painted. A color coding system is employed to indicate the projectile type, the presence of a hazardous (explosive, incendiary, irritant, or toxic) filler, and the presence and color of a tracer, dye load, color burst, or smoke. Markings are stamped and stenciled on projectiles to provide complete identification information. Projectiles are stamped on or near the rotating band and/or on the base with their nomenclature and manufacturing information. Stenciled markings on the projectile body include nomenclature of the projectile or cartridge of which it is a component, manufacturing information such as manufacturers identification, lot number, and date, and type of filler for projectiles 40 millimeters and larger. Additional stenciled markings include the type of weapon, stock code or number, weight information for nonfixed projectiles and, in some cases, information on the fuze(s) and other components assembled in the projectile. The color of the stenciled markings is in accordance with the prescribed color coding system.

Description: The overall projectile color is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 36 MODS 1-4



Nomenclature:	**U.S. PROJECTILE, 5-IN, A.A.COMMON, MK 36 MODS 1-4**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	3.29 kg (7.25 lbs)
Item weight:	24.43 kg (53.89 lbs)
Diameter:	126.75 mm (4.985 in)
Length:	525.78 mm (20.7 in)
Maximum Range:	Not provided
Fuze:	Various – see below

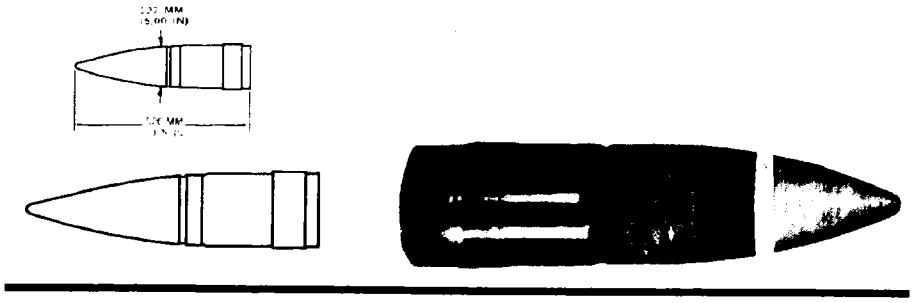
Usage: This is a Navy Projectile used in 5"/25 Guns. Its over-all length with nose fuze is 20.70 inches; without the nose fuze, it is 17.225 inches long. The diameter of the base is 4.973 inches and the diameter at the bourrelet is 4.985 inches. The distance from the base to the band is 2.43 inches and the width of the band is 2.00 inches. When the V.T. Fuzes are used, the projectile adapter is removed, and a gas-checked base-fuze plug, with no tracer, is fitted into the base. V.T. fuzes are authorized for use in Mods 2 -- 4 only of this projectile. The Auxiliary Detonating Fuze Mk 54 is replacing the Auxiliary Detonating Fuzes Mk 17 and Mk 46. The Auxiliary Detonating Fuze Mk 44 is used only in conjunction with the V.T. Fuze Mk 53. All Mods of the Projectile Mk 36 are authorized for use with A.P. steel nose caps and for designation as "H.C." projectiles. All Mods of the Projectile Mk 36 may also be issued B.L. & P. or B.L. & T. with the Tracer Mk 9 and adapter for target practice.

Description: The overall projectile color is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 38 MODS 1-3



Nomenclature:	**U.S.PROJECTILE,5",SPECIALCOMMON,MK 38MODS 1-3**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	0.92534 kg (2.04 lbs)
Item weight:	25.03 kg (55.18 lbs)
Diameter:	126.62 mm (4.98 in)
Length:	525.78 mm (20.7 in)
Maximum Range:	Not provided
Fuze:	Not Provided

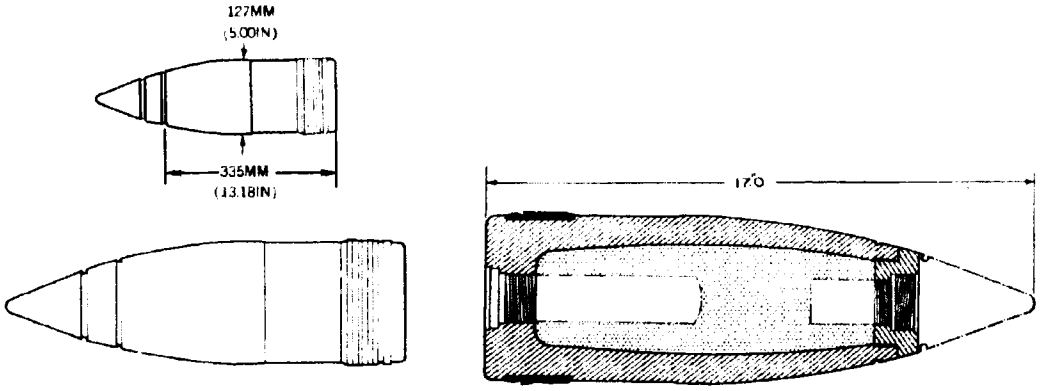
Usage: The 5-inch Special Common Mk 38 Mods 1, 2, and 3 are used in 5"/38 guns. This is a spin-stabilized projectile.

Description: The projectiles over-all color is slate gray and comes in sizes of 4", 5", 6" and 8". Its over-all length is 20.70 inches. The diameters of the base and at the bourrelet are 4.985 inches. The distance from the base to the band is 2.43 inches and the band is 2.25 inches wide. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 39 MODS 1 & 2



Nomenclature: **U.S. PROJECTILE, 5-IN, HC, MK 39 MODS 1 & 2**
Ordnance Family: Projectiles
DODIC:
Filler: Explosive D
Filler weight: 1.66 kg (3.66 lbs)
Item weight: 22.68 kg (50.00 lbs)
Diameter: 126.62 mm (4.98 in)
Length: 335 mm (13.18 in)
Maximum Range: Not provided
Fuze: Various (see below)

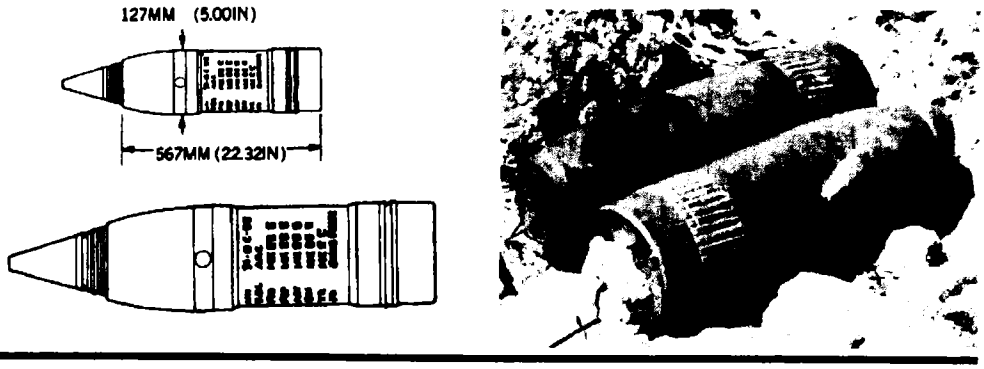
Usage: The 5-inch High Capacity (HC) Mk 39 Mods 1 & 2 are used in 5"/51 Bag or Case gun. The over-all length of this projectile is 17.0 inches; without the nose fuze, it is 13.18 inches long. The diameters of the base and at the bourrelet are both 4.985 inches. The distance from the base to the band is 1.15 inches and the width of the band is 2.0 inches. Only a very few 5"/51 guns were in service in the fleet. When employed in the 5"/51 case gun, Cartridge Case Mk 3 and Primer Mk 13 and all Mods are used. The Auxiliary Detonating Fuze Mk 54 replaced the Mk 17 and Mk 46 in all assemblies.

Description: These projectiles over-all color is green and it comes in the following sizes; 3", 4", 5", 6", 8", 12", 14", and 16".

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 41 MOD 0



Nomenclature:	**U.S. PROJECTILE, 5-IN, A.A.COMMON, MK 41 MOD 0**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	3.44 kg (7.58 lbs)
Item weight:	Not Provided
Diameter:	127 mm (5.00 in)
Length:	567 mm (22.32 in)
Maximum Range:	Not provided
Fuze:	Various – see below

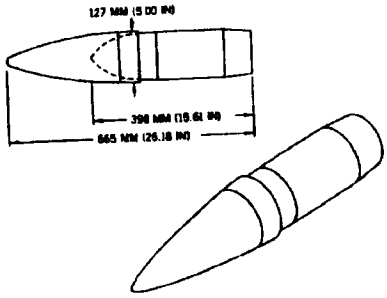
Usage: AAC projectiles are essentially HC projectiles with MT nose fuzes and are used against either aircraft or surface targets. AA projectiles are essentially AAC projectiles without base fuzes used strictly against aircraft. In many cases, the same projectile body is used for many of the different specific types by being assembled with different types or combinations of types of fuzes. For example, the Mk 41 5-inch 54-caliber projectile body is assembled as an AAC, HC, HE-CVT, HE-IR, HE-PD, HE-VT-NSD, and HE-VT-SD projectile. Most nose fuzes and rotating bands are not painted. A color coding system is employed to indicate the projectile type, the presence of a hazardous (explosive, incendiary, irritant, or toxic) filler, and the presence and color of a tracer, dye load, color burst, or smoke. Markings are stamped and stenciled on projectiles to provide complete identification information. Projectiles are stamped on or near the rotating band and/or on the base with their nomenclature and manufacturing information. The color of the stenciled markings is in accordance with the prescribed color coding system.

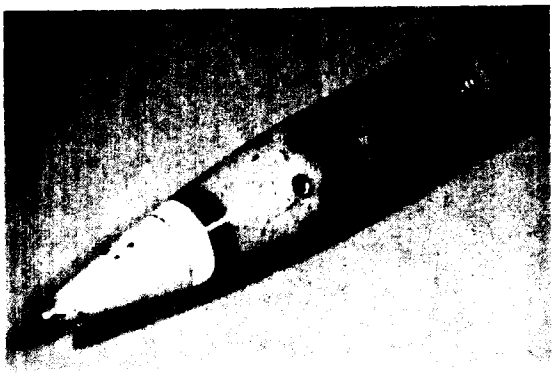
Description: The overall projectile color is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 42 MODS 0&1





Nomenclature:	**U.S.PROJECTILE, 5",SPECIALCOMMON,MK 42MOD 0&1**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	0.9707 kg (2.14 lbs)
Item weight:	31.75 kg (69.99 lbs)
Diameter:	126.62 mm (4.98 in)
Length:	660.42 mm (26 in)
Maximum Range:	Not provided
Fuze:	Base fuze

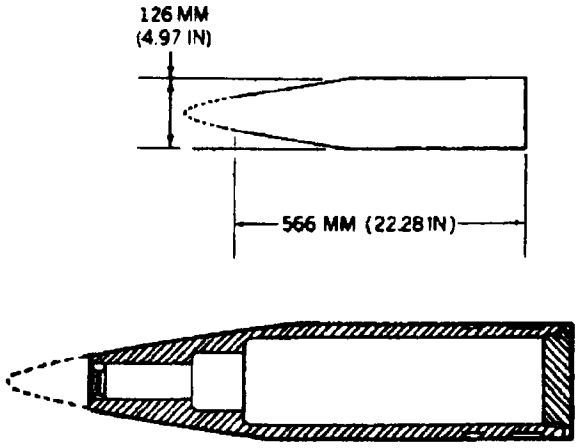
Usage: The 5-inch Special Common projectiles, Mk 42 Mods 0 & 1 are used in 5"/54 guns. These projectiles are designed to penetrate approximately one-third to one-half their caliber of armor.

Description: These projectiles differ from Armor-Piercing projectiles in that they do not have an armor-piercing cap and have a larger explosive cavity. The projectiles over-all color is slate gray and it comes in the sizes of 4", 5", 6" and 8". The over-all length is 26.0 inches; without its windshield, the projectile is 15.605 inches long. The diameter of the base is 4.26 inches and the diameter at the bourrelet is 4.985 inches. The distance from the base to the band 3.75 inches and the band is 2.25 inches wide. This projectile uses a Mk 64 Mod 0 base fuze. The Tracer Mk 9 may possibly be used in this projectile, although the Mk 5 is the preferred assembly. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 43 MOD 0



Nomenclature:	**U.S. PROJECTILE, 5-IN, ILLUMINATING, MK 43 MOD 0**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Black Powder
Filler weight:	0.07088 kg (0.16 lbs)
Item weight:	31.75 kg (70 lbs)
Diameter:	126.24 mm (4.97 in)
Length:	565.91 mm (22.28 in)
Maximum Range:	Not provided
Fuze:	Not Provided

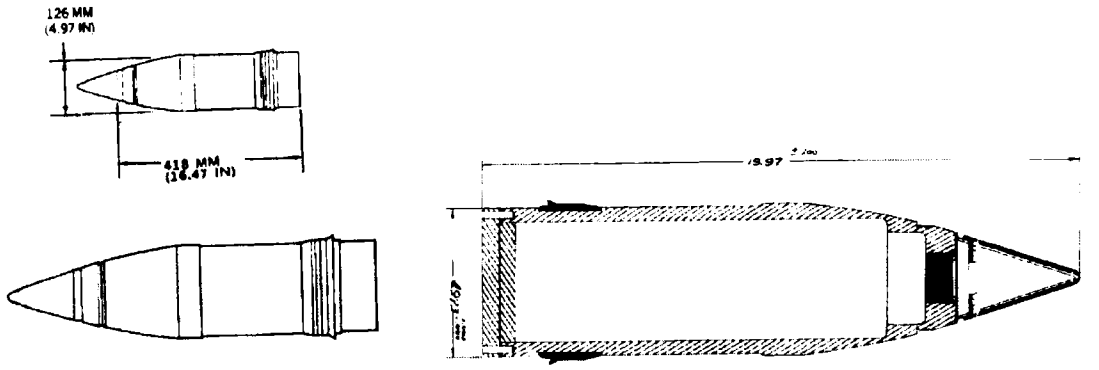
Usage: These projectiles are for illuminating targets by a parachute flare.

Description: The illuminating projectile is a thin case with a very small expelling charge just behind the fuze and an interior assembly of a star or candle with a parachute. Illuminating projectiles are painted light blue with two white stars. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 44 MOD 1



Nomenclature: **U.S. PROJECTILE, 5-IN, ILLUMINATING, MK 44 MOD 1**
Ordnance Family: Projectiles
DODIC:
Filler: Black Powder
Filler weight: 0.07088 kg (0.16 lbs)
Item weight: 24.72 kg (54.50 lbs)
Diameter: 126.62 mm (4.98 in)
Length: 418 mm (16.46 in)
Maximum Range: Not provided
Fuze: Not Provided

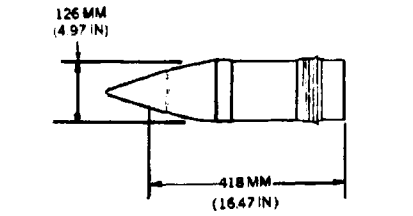
Usage: The 5-inch Illuminating Mk 44 Mod 1 is used in 5"/38 guns.

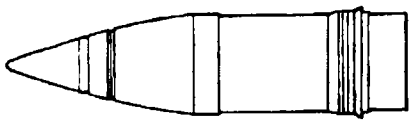
Description: The over-all length of this projectile with its nose fuze is 19.97 inches; without the nose fuze, it is 16.465 inches long. The diameter of the base is 4.973 inches and the diameter at the bourrelet is 4.985 inches. The distance from the base to the band is 2.43 inches and the width of the band is 2.25 inches. The weight of the loaded projectile is 54.5 pounds. It is filled with 2.5 ounces of black powder, which is an expelling charge; the flare is filled with magnesium. This projectile is light blue with two white stars and comes in 3", 4", 5", and 6" sizes. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 45 MOD 0





Nomenclature:	**U.S. PROJECTILE, 5-IN, ILLUMINATING, MK 45 MOD 0**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Black Powder
Filler weight:	0.07088 kg (0.16 lbs)
Item weight:	24.72 kg (54.50 lbs)
Diameter:	126.75 mm (4.99 in)
Length:	418 mm (16.46 in)
Maximum Range:	Not provided
Fuze:	Not Provided

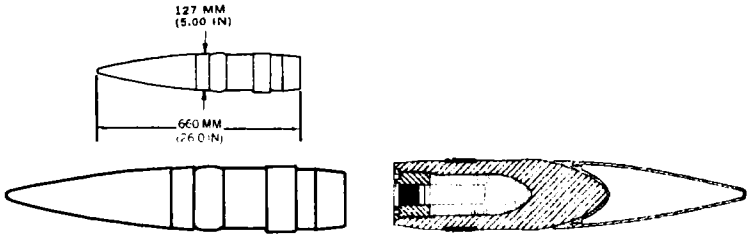
Usage: The 5-inch Illuminating Mk 45 Mod 0 is used in 5"/25 guns.

Description: The projectiles over-all length with nose fuze is 19.97 inches; without the nose fuze, it is 16.465 inches long. The diameter of the base is 4.968 inches, while the diameter at the bourrelet is 4.985 inches. The distance from the base to the band is 1.93 inches and the width of the band is 2.0 inches. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 46 MODS 1 & 2



Nomenclature:	**U.S.PROJECTILE,5",SPECIALCOMMON,MK 46MOD 1&2**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	0.92534 kg (2.04 lbs)
Item weight:	25.03 kg (55.18 lbs)
Diameter:	126.62 mm (4.98 in)
Length:	525.78 mm (20.7 in)
Maximum Range:	Not provided
Fuze:	Base fuze

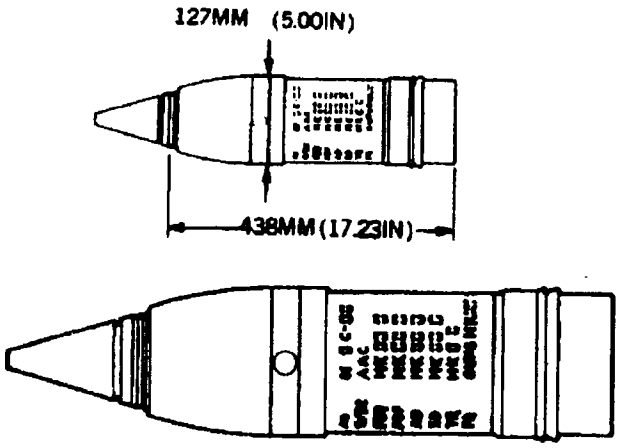
Usage: The 5-inch Special Common Mk 46 Mods 1 & 2 are used in 5"/38 guns. These projectiles are designed to penetrate approximately one-third to one-half their caliber of armor.

Description: These projectiles differ from Armor-Piercing projectiles in that they do not have an armor-piercing cap and have a larger explosive cavity. Its over-all color is slate gray and it comes in sizes of 4", 5", 6" and 8". The over-all length of the projectile with its cap is 20.70 inches; without the cap, it is 12.485 inches long. The diameters of the base and at the bourrelet are both 4.985 inches. The distance from the base to the band is 2.43 inches and the band is 2.25 inches wide. This projectile uses a base fuze, the Mk 20 Mods 0 - 2. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 47 MODS 0 & 1



Nomenclature:	**U.S. PROJECTILE, 5-IN, A.A.COMMON, MK 47 MODS 0&1**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	3.23 kg (7.12 lbs)
Item weight:	25.03 kg (55.18 lbs)
Diameter:	126.75 mm (4.985 in)
Length:	438 mm (17.24 in)
Maximum Range:	Not provided
Fuze:	Various – see below

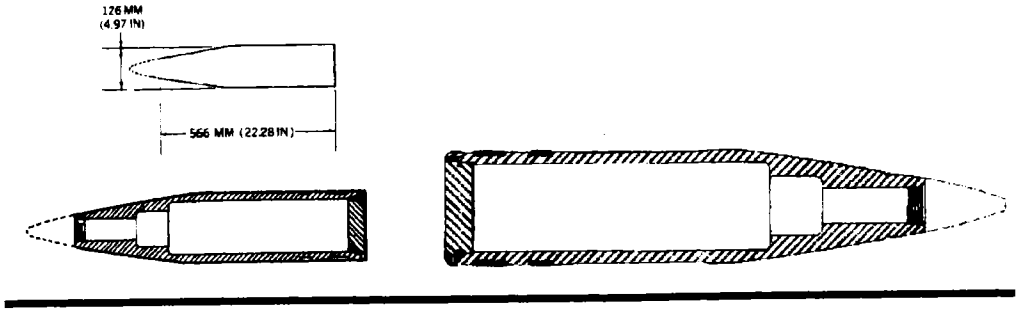
Usage: This is a spin stabilized anti-aircraft projectile. The 5-inch A.A. Common Mk 47 Mods 0 and 1 are used in 5"/38 guns. The projectiles over-all color is green and it only comes in the 5-inch size. The projectiles over-all length with its nose fuze is 20.70 inches. The diameters of the base and the diameter at the bourrelet are 4.985 inches. The distance from the base to the band is 1.93 inches and the width of the band is 2.25 inches. The Mod 1 differs from the Mod 0 in that the band seat has different knurling. Only a few thousand of these A.A. Common Projectiles Mk 47 were made. The Mk 47 was made to furnish a heavier projectile for some newer light-weight fuzes, hence maintaining a standard ballistic weight. However, it has been fuzed exactly like the Mk 35 up to the present time.

Description: The overall projectile color is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, MK 48 MOD 0



Nomenclature:	**U.S. PROJECTILE, 5-IN, ILLUMINATING, MK 48 MOD 0**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Black Powder
Filler weight:	0.07088 kg (0.16 lbs)
Item weight:	31.75 kg (69.99 lbs)
Diameter:	126 mm (4.96 in)
Length:	566 mm (22.28 in)
Maximum Range:	Not provided
Fuze:	Not Provided

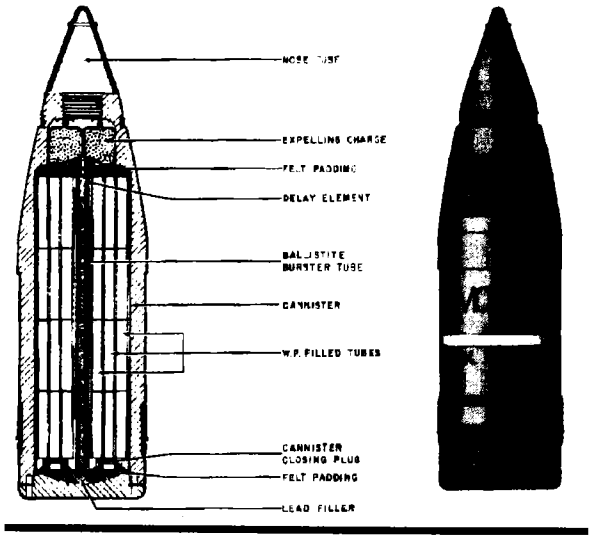
Usage: The 5-inch Illuminating Mk 48 Mod 0 projectile is used in 5"/54 gun.

Description: Its over-all length is 26.0 inches; without the nose fuze, it is 22.28 inches long. The diameter of the base is 4.973 inches and the diameter at the bourrelet is 4.985 inches. The projectile is identical in all respects to the Mk 43, except that it has a double rotating band. The Mk 48 Mod 0 is light blue with two white stars and comes in sizes of 3", 4", 5", and 6". The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, SMOKE, WP



Nomenclature:	**U.S. PROJECTILE, 5-IN, SMOKE, WHITE PHOSPHORUS**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Black Powder
Filler weight:	0.07088 kg (0.16 lbs)
Item weight:	24.04 kg (52.99 lbs)
Diameter:	127 mm (5 in)
Length:	508 mm (20 in)
Maximum Range:	Not provided
Fuze:	Not Provided

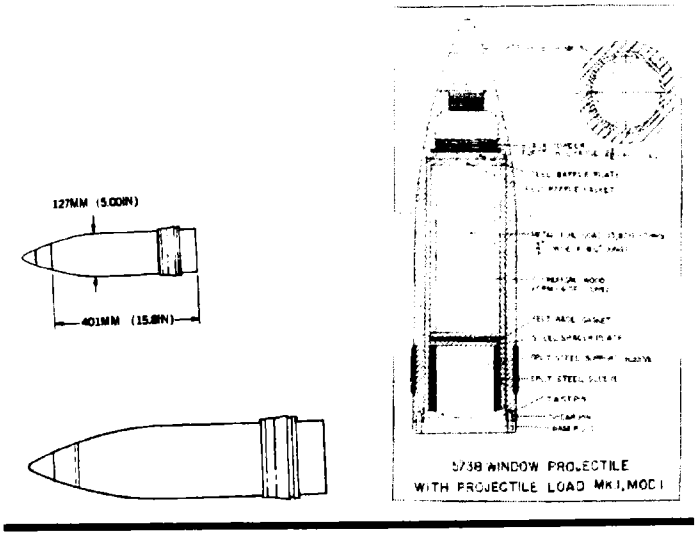
Usage: This is a spin stabilized, WP projectile.

Description: The projectile body, base plate, and expelling charge are the same as those for the 5-inch Illuminating Projectile Mk 30. The canister holding the W.P. filled tubes is of 0.03-inch thick sheet steel and measures 12.03 inches long by 3.9 inches in diameter. It is painted olive drab over all. Through the center of the canister is inserted a burster tube containing the ballistic burster charge, with a black powder delay fitted to the upper end of the tube. The canister is divided into four sections internally, with each section containing 42 W.P. filled steel tubes 0.5 inch in diameter and 2.86 inches long, 168 tubes in all. The canister is filled through the base with molten W.P. and closed with two 1/2-inch pipe plugs. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

5" PROJECTILE, WINDOW



Nomenclature:	**U.S.PROJECTILE, 5-IN, WINDOW**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	0.07088 kg (0.156 lbs)
Item weight:	24.77 kg (54.60 lbs)
Diameter:	126.75 mm (4.99 in)
Length:	508 mm (20 in)
Maximum Range:	Not provided
Fuze:	Time

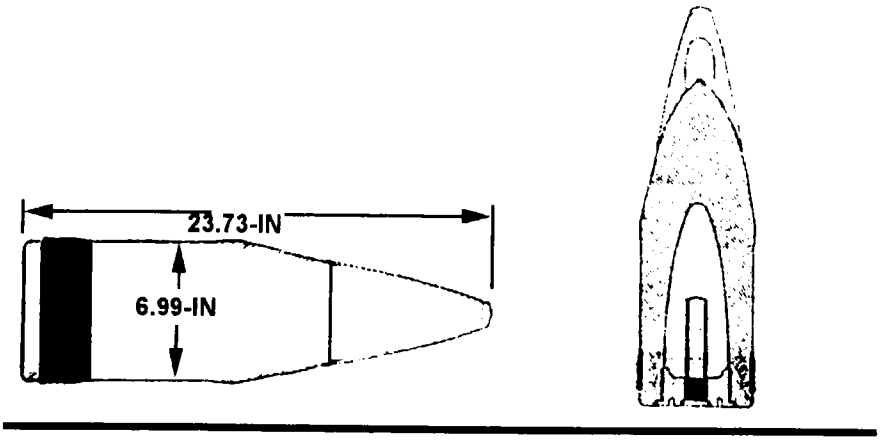
Usage: Window projectiles are designed to be fired from naval vessels to disrupt enemy radar operations. The projectile may be used to provide a false screen behind which ships may maneuver or approach undetected, or to provide a false target for enemy radar.

Description: The projectile itself consists of an illuminating projectile body fitted with a nose time fuze and an expelling charge of black powder. Ignition of the expelling charge by the fuze discharges a payload of foil strips which form a reflecting cloud for radar beams. The projectile is aluminum color.

Reference: ORDATA II

Ordnance Technical Data Sheet

7" PROJECTILE, MK 6 MOD 1



Nomenclature:	**U.S. PROJECTILE, 7-IN, AP, MK 6 MOD 1**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	1.96 kg (4.32 lbs)
Item weight:	74.84 kg (164.99 lbs)
Diameter:	177.55 mm (6.99 in)
Length:	600.46 mm (23.64 in)
Maximum Range:	Not provided
Fuze:	Not provided

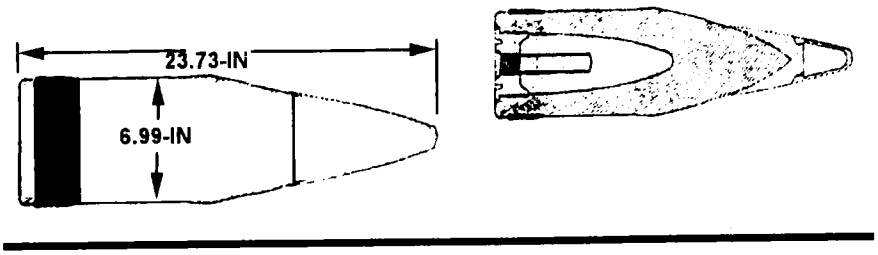
Usage: These projectiles are designed to penetrate an equal caliber of Class A armor plate.

Description: The windshield is made of either forged mild steel, steel stamping, or aluminum. The armor-piercing cap is secured to the projectile by peening the skirt of the cap into notches cut into the ogive of the body and by soldering the cap to the body with a special solder of low melting point. The body is of high-quality alloy steel, carefully forged and heat-treated, since it is the part which does the actual penetration. The rotating band has three primary functions: to seal the bore, to position and center the rear end of the projectile, and to rotate the projectile. A secondary function is to hold the projectile in place during loading and elevating for firing. The base plug closes off the explosive cavity and holds the base fuze or base fuze adapter. The overall color is black. Armor-piercing projectiles and common projectiles having a windshield may carry a spotting dye which colors the water on impact. The spotting dye in powder form is placed in the windshield before it is screwed on to the nose of the projectile. Water forces through the inlet holes covered by copper covers, dissolves the dye, and forces it out the outlet holes.

Reference: ORDATA II

Ordnance Technical Data Sheet

7" PROJECTILE, MK 10 MOD 2



Nomenclature:	**U.S. PROJECTILE, 7-IN, AP, MK 10 MOD 2**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	1.96 kg (4.32 lbs)
Item weight:	74.84 kg (164.99 lbs)
Diameter:	177.55 mm (6.99 in)
Length:	602.74 mm (23.73 in)
Maximum Range:	Not provided
Fuze:	Not provided

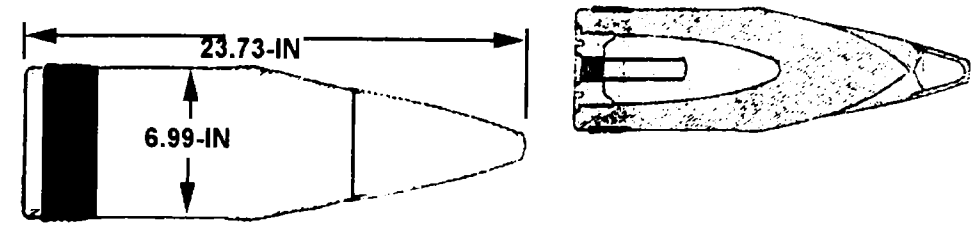
Usage: The 7-inch A.P. Mk 10 Mod 2 (Obsolete) projectile is used in the 7-inch/45 gun. These projectiles are designed to penetrate an equal caliber of Class A armor plate.

Description: The projectile is black. Armor-piercing projectiles and common projectiles having a windshield may carry a spotting dye which colors the water on impact in order that observers may spot the fall of shot. The spotting dye in powder form is placed in the windshield before it is scr The windshield is made of either forged mild steel, steel stamping, or aluminum. It has no special strength other than to prevent destruction during handling and set-back on firing. Windshields are screwed to the cap and are "set" by a center punch. The body is of high-quality alloy steel, carefully forged and heat-treated. The rotating band has three primary functions: to seal the bore, to position and center the rear end of the projectile, and to rotate the projectile. A secondary function is to hold the projectile in place during loading and elevating for firing. The rotating band is made of commercially pure copper or of cupro-nickel alloy containing 2.5% nickel, or in some cases a gilding metal consisting of 90% copper, 10% zinc. As a general rule, rotating bands are about one-third caliber in width. The base plug closes off the explosive cavity and holds the base fuze or base fuze adapter. Both the base fuze and base fuze adapter, if used, are sealed in place with a gas seal ring similar to that used on the base fuze.

Reference: ORDATA II

Ordnance Technical Data Sheet

7" PROJECTILE, MK 12 MODS 1 & 2



Nomenclature:	**U.S. PROJECTILE, 7-IN, AP, MK 12 MODS 1 & 2**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	1.81 kg (3.99 lbs)
Item weight:	74.84 kg (164.99 lbs)
Diameter:	177.80 mm (7 in)
Length:	538.99 mm (21.22 in)
Maximum Range:	Not provided
Fuze:	Various (see below)

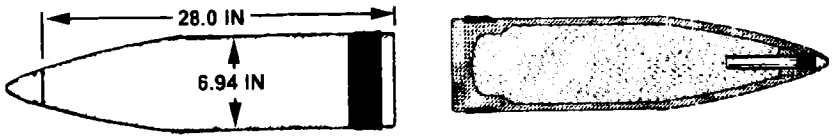
Usage: This is a spin stabilized, high explosive armor piercing projectile. These projectiles are designed to penetrate an equal caliber of Class A armor plate, according to test practice.

Description: The overall color of the projectile is black. Armor-piercing projectiles and common projectiles having a windshield may carry a spotting dye which colors the water on impact in order that observers may spot the fall of shot. The spotting dye in powder form is placed in the windshield before it is screwed on. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

7" PROJECTILE, MK 13 MODS 1&2



Nomenclature:	**U.S.PROJECTILE,7-IN,BOMBARDMENT,MK13MODS 1&2**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Cast TNT
Filler weight:	10.89 kg (24 lbs)
Item weight:	68.95 kg (152 lbs)
Diameter:	177.55 mm (6.99 in)
Length:	751.33 mm (29.58 in)
Maximum Range:	Not provided
Fuze:	Point detonating

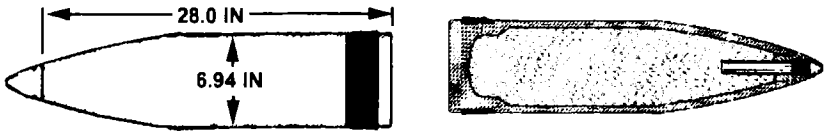
Usage: These projectiles were designed for field use or shore bombardment.

Description: They carry point detonating fuzes. The bombardment projectiles shape is similar to that of the field projectile.

Reference: ORDATA II

Ordnance Technical Data Sheet

7" PROJECTILE, MK 14 MOD 2



Nomenclature:	**U.S.PROJECTILE,7-IN,BOMBARDMENT,MK14 MOD 2**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Cast TNT
Filler weight:	10.89 kg (24 lbs)
Item weight:	69.76 kg (153.79 lbs)
Diameter:	176.28 mm (6.94 in)
Length:	731.52 mm (28.8 in)
Maximum Range:	Not provided
Fuze:	Point detonating

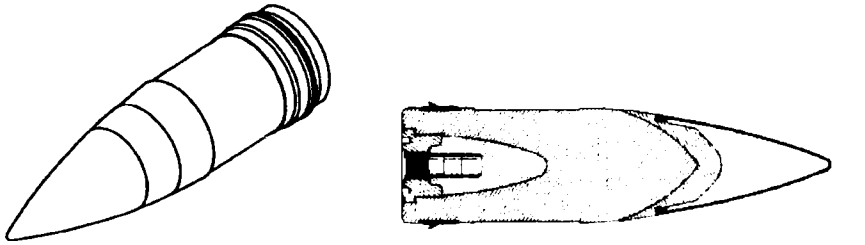
Usage: These projectiles were designed for field use or shore bombardment.

Description: They carry point detonating fuzes. The bombardment projectiles shape is similar to that of the field projectile.

Reference: ORDATA II

Ordnance Technical Data Sheet

8" PROJECTILE, ARMOR PIERCING



Nomenclature:	**U.S. PROJECTILE, 8-IN, AP, MK 19 MODS 1-6**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	1.65 kg (3.64 lbs)
Item weight:	Not provided
Diameter:	203 mm (7.99 in)
Length:	914 mm (35.98 in)
Maximum Range:	Not provided
Fuze:	Not provided

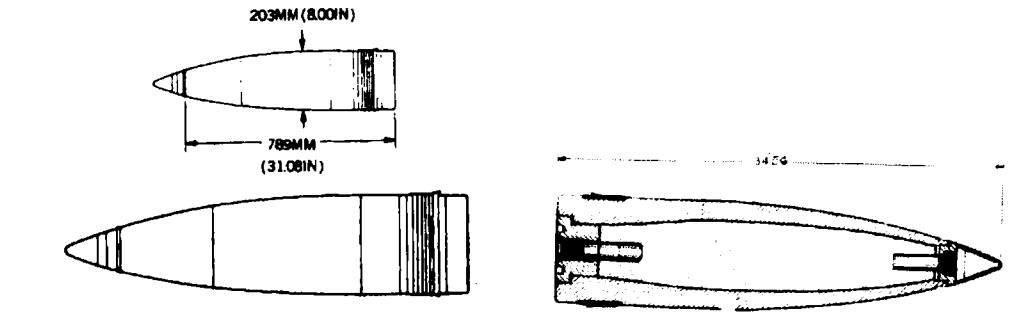
Usage: This is a complete round in which the separate components -- projectile, propelling charge, and primer -- are loaded into the gun separately, and is known as "separate loading" ammunition. Although the propelling charge may be in one section, it is usually divided into parts with each part assembled in a bag. These projectiles are subjected to a test against face hardened plate one (1) caliber in thickness.

Description: The exterior of the projectile from the rotating band to point, except bourrelet, is painted with a thin, hard, smooth, lead-free paint of the color black. The armor-piercing cap is of forged alloy steel, heat treated to have a hard face and relatively soft core.

Reference: ORDATA II

Ordnance Technical Data Sheet

8" PROJECTILE, HIGH EXPLOSIVE



Nomenclature:	**U.S. PROJECTILE, 8-IN, HC, MK 24 MODS 1-5**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	9.68 kg (21.34 lbs)
Item weight:	117.94 kg (260.01 lbs)
Diameter:	203 mm (7.99 in)
Length:	789.43 mm (31.08 in)
Maximum Range:	Not provided
Fuze:	Point Detonating/Base Detonating

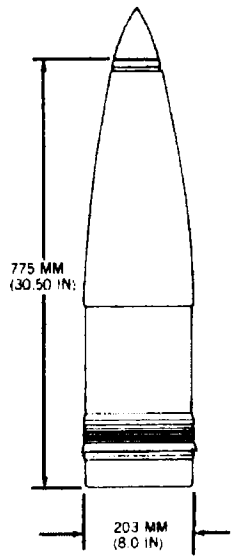
Usage: This is a Navy gun fired projectile. The figure shows appearance and dimensions of the projectile. HC projectiles are HE projectiles which usually have BD fuzes and PD nose fuzes, and are used against surface targets.

Description: AAC projectiles are essentially HC projectiles with MT nose fuzes and are used against either aircraft or surface targets. AA projectiles are essentially AAC projectiles without base fuzes used strictly against aircraft. In many cases, the same projectile body is used for many of the different specific types by being assembled with different types or combinations of types of fuzes. For example, the Mk 41 5-inch 54-caliber projectile body is assembled as an AAC, HC, HE-CVT, HE-IR, HE-PD, HE-VT-NSD, and HE-VT-SD projectile. The over-all color of the HC round is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

8" PROJECTILE, PRACTICE



MK 25 ALL MODS

Nomenclature:	**U.S. PROJECTILE, 8-IN, SMOKE-PUFF, MK 25**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Smoke Agent, Liquid
Filler weight:	0.1701kg (0.37 lbs)
Item weight:	118 kg (260.15 lbs)
Diameter:	203 mm (7.99 in)
Length:	775 mm (30.51 in)
Maximum Range:	Not provided
Fuze:	Not provided

Usage: This is a Navy spotting-marker smoke-puff projectile. This projectile is painted blue, except for an unpainted rotating band. There is a 70-MM (2.75-inch) wide light-green band and a 32-MM (1.25-inch) wide brown band on the forward end of the projectile. The nomenclature and loading data are stenciled in white on the projectile body. The projectile is steel with copper rotating bands.

Description: This projectile is painted blue, except for an unpainted rotating band. There is a 70-MM (2.75-inch) wide light-green band and a 32-MM (1.25-inch) wide brown band on the forward end of the projectile. The nomenclature and loading data are stenciled in white on the projectile body. The projectile is steel with copper rotating bands.

Reference: ORDATA II

Ordnance Technical Data Sheet

12" PROJECTILE, DECK PIERCING

Nomenclature:	**U.S. PROJECTILE, 12-IN, DECK PIERCING, M1911A**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	10.96 kg (24.16 lbs)
Item weight:	317.52 kg (700 lbs)
Diameter:	304.29 mm (11.97 in)
Length:	967.23 mm (38.08 in)
Maximum Range:	Not provided
Fuze:	Not provided

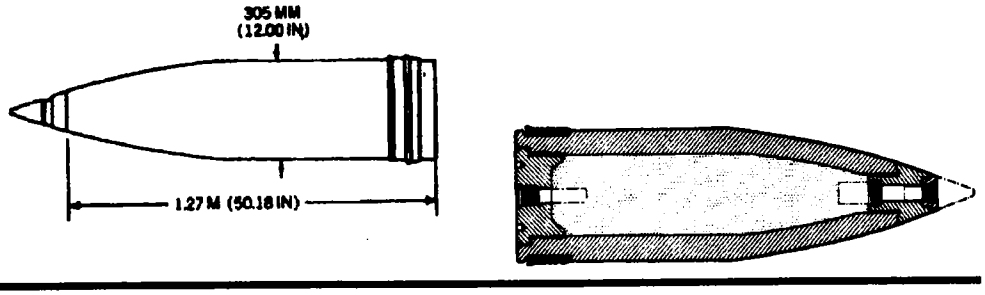
Usage: This is a spin stabilized, high explosive deck-piercing projectile used against armored naval sea craft.

Description: The projectile is painted yellow or olive drab. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

12" PROJECTILE, HIGH EXPLOSIVE



Nomenclature:	**U.S. PROJECTILE, 12-IN, HE, HC, MK 22**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	36.03 kg (79.43 lbs)
Item weight:	426.38 kg (940 lbs)
Diameter:	304.80 mm (12 in)
Length:	1.23 m (48.43 in)
Maximum Range:	Not provided
Fuze:	Point Detonating/Base Detonating

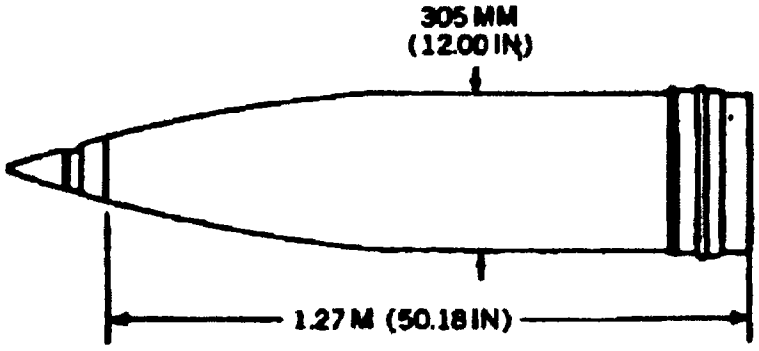
Usage: This is a spin stabilized, high explosive projectile.

Description: The 12-inch H.C. Projectile Mk 22 is merely a redesignation of the Mk 17. These projectiles are designed to have a minimum wall thickness, and the largest explosive cavity consistent with the force of set-back. The projectile body is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

U.S. PROJECTILE, 12-IN, H.C., MK 17 MOD 2



Nomenclature:	12 in MK 17 H.C.
Ordnance Family:	Projectile
DODIC:	Obsolete
Filler:	Explosive D
Filler weight:	36.03 kg (80.25 lbs)
Item weight:	426.38 kg (940 lbs)
Diameter:	406.00 mm (12 in)
Length:	1.37 m (4.495 ft)
Maximum Range:	Not provided
Fuze:	No delay base fuze

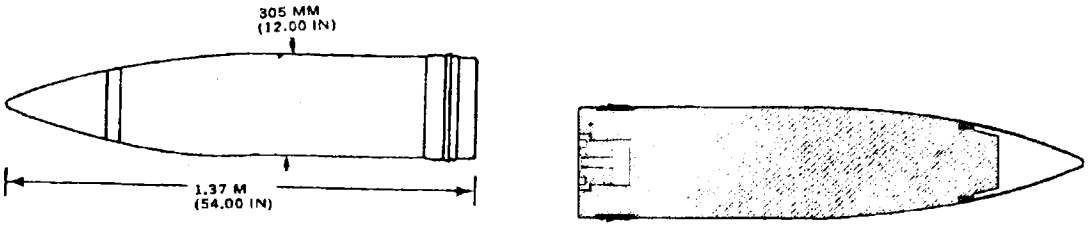
Usage: The HC (high-capacity) projectiles are designed to have a minimum wall thickness, and the largest explosive cavity consistent with the force of set-back. They are assembled, generally, with no-delay base fuzes, tracers, steel nose plugs, and auxiliary detonating fuzes. The steel nose plug may be removed and a point detonating or nose time fuze substituted. These projectiles are used for shore bombardment, for antiaircraft guns, and for use against light ships and surface craft.

Description: The over-all color of the HC round is green.

Reference: ORDATA Online

Ordnance Technical Data Sheet

12" PROJECTILE, TARGET PRACTICE



Nomenclature:	**U.S. PROJECTILE, 12-IN, TP, MK 19 MOD 1**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Not available
Filler weight:	N/A
Item weight:	517.10 kg (1140.01 lbs)
Diameter:	304.80 mm (12 in)
Length:	1.37 m (53.93 in)
Maximum Range:	Not provided
Fuze:	Not provided

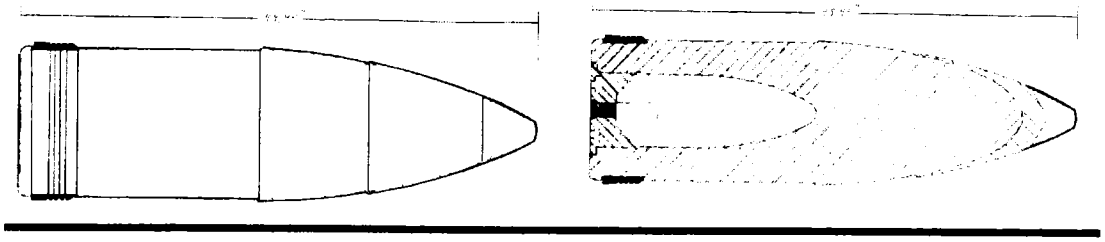
Usage: This is a Navy gun fired projectile. It is fired from the 12"/50 Mk 8 gun. These projectiles are similar in ballistic properties to service projectiles and are used for practice firing and training in marksmanship.

Description: They may be made from service projectiles or from components similar in shape to service projectiles. There is no provision for a spotting dye load in the windshield of the Mk 19 Mod 1. The projectile is red. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

14" PROJECTILE, MK 8 MODS 3,7,8&11



Nomenclature:	**U.S. PROJECTILE, 14-IN, ARMOR PIERCING, MK 8 MOD 3, 7, 8 & 11**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	15.56 kg (34.30 lbs)
Item weight:	635.95 kg (1402.03 lbs)
Diameter:	355.60 mm (14 in)
Length:	1.26 m (49.60 in)
Maximum Range:	Not provided
Fuze:	Not provided

Usage: Armor piercing projectiles are designed to penetrate an equal caliber of Class A armor plate.

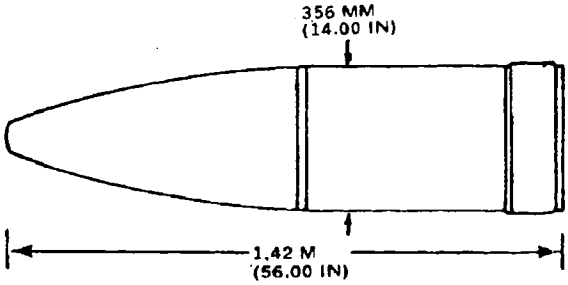
Description: Their windshield is made either of forged mild steel, steel stamping, or aluminum and has no special strength other than to prevent destruction during handling and setback on firing. Windshields are screwed to the cap and are "set" by a center punch. The armor piercing cap is secured to the projectile by peening the skirt of the cap into notches out into the ogive of the body and by soldering the cap to the body with a special low melting point solder. Caps are made, in general, of the same kind of steel as are the projectile bodies. The body is of high quality alloy steel carefully forged and heat treated and is the part that does the actual penetration. The bourrelet is the bearing surface of the projectile and rides on the lands of the rifle. This bearing surface is usually about one-sixth caliber in width and its surface is generally ground to a fine finish in order to reduce friction and to minimize wear on the lands of the gun. With the major caliber projectiles it has become standard practice to provide a rear bourrelet or bourrelets in addition to the forward bourrelet. Rear bourrelet or bourrelets will be just forward and behind the rotating band. The projectile is thus provided with better support in the gun and during the ejection from the muzzle. The base plug closes off the explosive cavity and holds the base fuze or base fuze adapter. Both the base plug and the base fuze adapter, if used, are both in place with a gas seal ring similar to that used on the base fuze. The base fuze is inserted through the base plug or base fuze adapter and is designed to detonate the projectile after penetration. After insertion it is closed with a gas check ring of copper and lead put in under hydraulic pressure to prevent the propelling gases from affecting the explosive filling. Armor piercing projectiles and the common projectile having a windshield may carry a spotting dye which colors the water on impact in order that the observers may spot the fall of shot. The spotting dye in powder form is placed in the windshield before it is screwed on the nose of the projectile. Upon impact with the water, the forward end of the windshield, having water inlet holes covered by a copper inlet cover, forces through the inlet cover, dissolves the dye and forces its way out the outlet holes. Armor piercing rounds are painted black. A special adapter with 1.5" diameter outside threads is required to fit

Mk 21 base fuzes in these projectiles. The Mod 7 projectile may also (be) issued Blind Loaded and Plugged or Blind Loaded and Traced with adapter and Mk 5 Mod 1 tracer for target practice.

Reference: ORDATA II

Ordnance Technical Data Sheet

14" PROJECTILE, MK 9



Nomenclature:	**U.S. PROJECTILE,14-IN,HIGH CAPACITY, MK 9**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	47.63 kg (105.00 lbs)
Item weight:	639.58 kg (1410.03 lbs)
Diameter:	355.60 mm (14 in)
Length:	1.42 m (55.91 in)
Maximum Range:	Not provided
Fuze:	Not provided

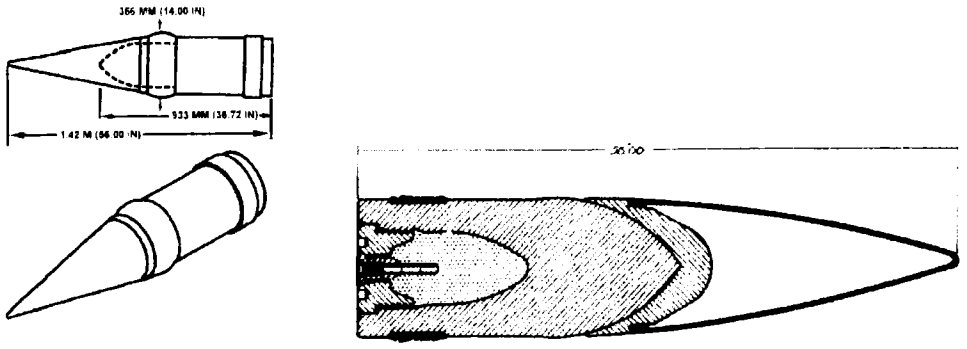
Usage: This is a Navy gun fired projectile. It is fired from the 14"/45 and 14"/50 guns.

Description: HC projectiles are HE projectiles which usually have BD fuzes and PD nose fuzes, and are used against surface targets. AAC projectiles are essentially HC projectiles with MT nose fuzes and are used against either aircraft or surface targets. AA projectiles are essentially AAC projectiles without base fuzes used strictly against aircraft. In many cases, the same projectile body is used for many of the different specific types by being assembled with different types or combinations of types of fuzes. For example, the Mk 41 5-inch 54-caliber projectile body is assembled as an AAC, HC, HE-CVT, HE-IR, HE-PD, HE-VT-NSD, and HE-VT-SD projectile. HC rounds are painted green. The body is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

14" PROJECTILE, MK 16 MODS 1-11



Nomenclature:	**U.S. PROJECTILE, 14-IN, ARMOR PIERCING, MK 16 MODS 1- 11**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	10.39 kg (22.91 lbs)
Item weight:	680.40 kg (1500.01 lbs)
Diameter:	355.02 mm (13.98 in)
Length:	1.42 m (55.91 in)
Maximum Range:	Not provided
Fuze:	Not provided

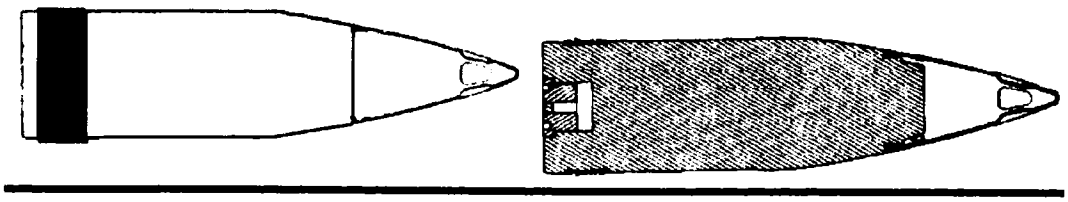
Usage: This is a spin stabilized high explosive, anti-armor projectile. The 14-inch A.P. Mk 16 Mods 1 - 11 are used in 14"/45 and 14"/50 caliber guns.

Description: The Mk 16 has an over-all color of black. Its over-all length, with cap and windshield is 56.00 inches; without cap and windshield is 36.72 inches. The diameter of the base is 13.977 inches and the diameter at the bourrelet is also 13.977 inches. The distance from the base to the band is 3.46 inches. The width of the band is 4.66 inches. The Mod 11 has a slight change in the cap design which moves the windshield threads further forward on the projectile. The projectile is made of steel

Reference: ORDATA II

Ordnance Technical Data Sheet

14" PROJECTILE, MK 17 MODS 1-3 & MK 18 MOD 1



Nomenclature:	**U.S. PROJECTILE,14-IN,Target, MK 17 Mods 1-3 & Mk 18 Mod 1**
Ordnance Family:	Projectiles
DODIC:	
Filler:	None
Filler weight:	Not available
Item weight:	680.40 kg (1500.02 lbs)
Diameter:	355.00 mm (13.97 in)
Length:	1.40 m (55.12 in)
Maximum Range:	Not provided
Fuze:	None

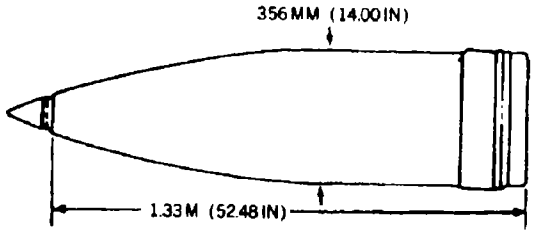
Usage: This is a Navy gun fired projectile. It is fired from the 14"/45 and 14"/50 guns.

Description: These projectiles are inexpensive productions, with the ballistic traits similar to the A.P. projectiles of their caliber. They are unfuzed and contain no explosive. On some types, a dye is loaded into the windshield, which on impact with the water is funneled out and spread through the water splash, thus distinguishing the origin of the salvo. The projectile body is red. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

14" PROJECTILE, MK 19 MODS 1-6



Nomenclature:	**U.S. PROJECTILE,14-IN,HIGH CAPACITY,MK 19MOD 1-6**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	47.27 kg (104.21 lbs)
Item weight:	578.34 kg (1275.02 lbs)
Diameter:	355.60 mm (14 in)
Length:	1.33 m (52.36 in)
Maximum Range:	Not provided
Fuze:	Not provided

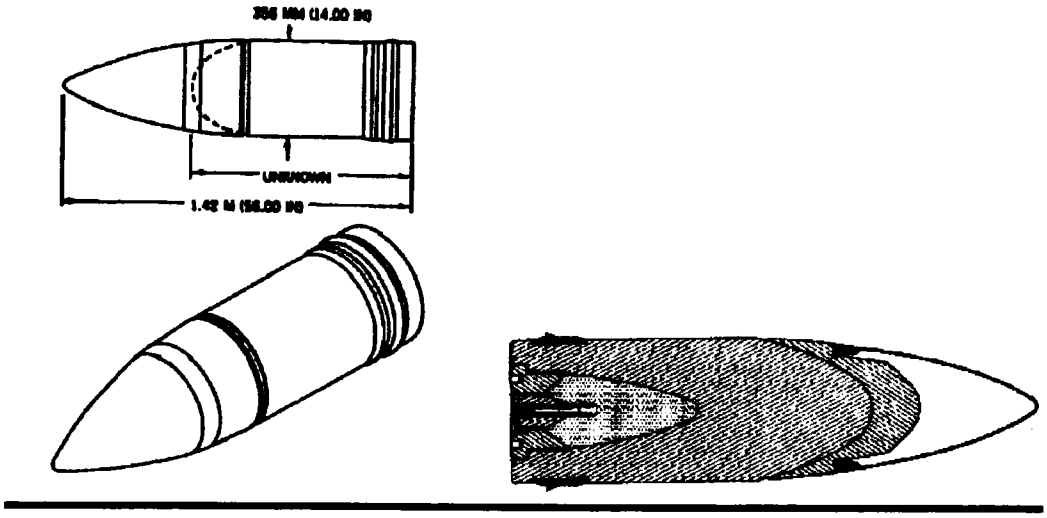
Usage: This is a Navy gun fired projectile. It is fired out of the 14"/50 guns, except the Mod 1 which is fired on the battleships New York and Texas using a 14"/45 gun.

Description: HC projectiles are HE projectiles which usually have BD fuzes and PD nose fuzes, and are used against surface targets. AAC projectiles are essentially HC projectiles with MT nose fuzes and are used against either aircraft or surface targets. AA projectiles are essentially AAC projectiles without base fuzes used strictly against aircraft. In many cases, the same projectile body is used for many of the different specific types by being assembled with different types or combinations of types of fuzes. For example, the Mk 41 5-inch 54-caliber projectile body is assembled as an AAC, HC, HE-CVT, HE-IR, HE-PD, HE-VT-NSD, and HE-VT-SD projectile. The over-all color of the HC round is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

14" PROJECTILE, MK 20 MOD 1



Nomenclature:	**U.S. PROJECTILE, 14-IN, ARMOR PIERCING, MK 20 MOD 1**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	10.39 kg (22.91 lbs)
Item weight:	680.40 kg (1500.01 lbs)
Diameter:	355.09 mm (13.98 in)
Length:	1.38 m (54.33 in)
Maximum Range:	Not provided
Fuze:	Not provided

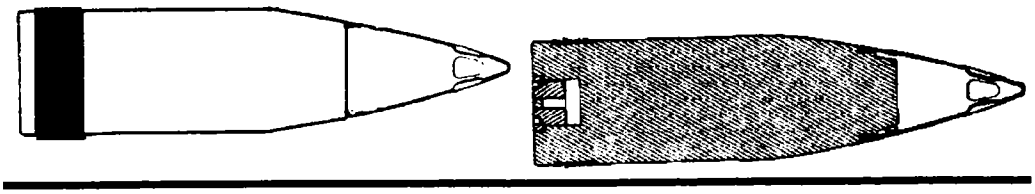
Usage: This is a spin stabilized high explosive, armor-piercing projectile. The 14-inch A.P. Mk 20 Mod 1 is used in 14"/45 caliber guns.

Description: The Mk 20 over-all color is black. Its over-all length is 54.38 inches. The diameters of the base and bourrelet are 13.977 inches. The distance from the base to the band is 3.46 inches and the width of the band is 4.66 inches. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

14" PROJECTILE, MK 21 MOD 1



Nomenclature:	**U.S. PROJECTILE, 14-IN, TARGET, MK 21 MOD 1**
Ordnance Family:	Projectiles
DODIC:	
Filler:	None
Filler weight:	Not available
Item weight:	680.40 kg (1500.03 lbs)
Diameter:	355.60 mm (14 in)
Length:	1.24 m (48.82 in)
Maximum Range:	Not provided
Fuze:	Not provided

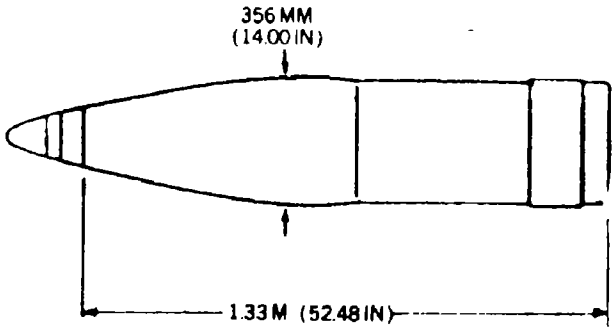
Usage: This target projectile was made to match the 14-inch A.P. Projectile Mk 20 for the U.S.S. Arkansas and Texas guns.

Description: These projectiles are inexpensive productions, with the ballistic traits similar to the A.P. projectiles of their caliber. The projectile body is red. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

14" PROJECTILE, MK 22 MOD 1



Nomenclature:	**U.S. PROJECTILE,14-IN,HIGH CAPACITY, MK 22 MOD 1**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	47.27 kg (104.21 lbs)
Item weight:	578.34 kg (1275.02 lbs)
Diameter:	355.60 mm (14 in)
Length:	1.33 m (52.36 in)
Maximum Range:	Not provided
Fuze:	Not provided

Usage: This is a Navy gun fired projectile. It is fired out of the 14"/50 guns. The Mk 22 is similar to the Mk 19 except the rotating band is only 2.25 inches from the base.

Description: HC projectiles are HE projectiles which usually have BD fuzes and PD nose fuzes, and are used against surface targets. AAC projectiles are essentially HC projectiles with MT nose fuzes and are used against either aircraft or surface targets. AA projectiles are essentially AAC projectiles without base fuzes used strictly against aircraft. In many cases, the same projectile body is used for many of the different specific types by being assembled with different types or combinations of types of fuzes. For example, the Mk 41 5-inch 54-caliber projectile body is assembled as an AAC, HC, HE-CVT, HE-IR, HE-PD, HE-VT-NSD, and HE-VT-SD projectile. The over-all color of the HC round is green. The projectile is made of steel.

Reference: ORDATA II

Ordnance Technical Data Sheet

16" PROJECTILE, MK 5 MODS 1-5

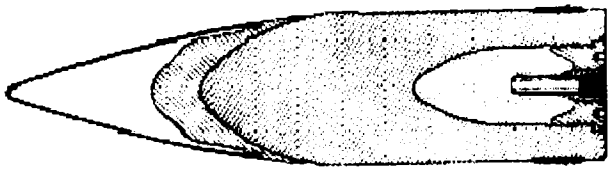


Figure 71. 16-inch A.P. Mk 5 Mods 1—5

Nomenclature:	16 Inch Armor Piercing
Ordnance Family:	Projectile
DODIC:	B634
Filler:	Explosive D
Filler weight:	± 18597g (41 lbs)
Item weight:	1224699 kg (2700 lbs)
Dia:	406.4 mm (16 in.)
Length:	1828.8 mm (72 in)
Fuze:	Base Fuze, Mk 21

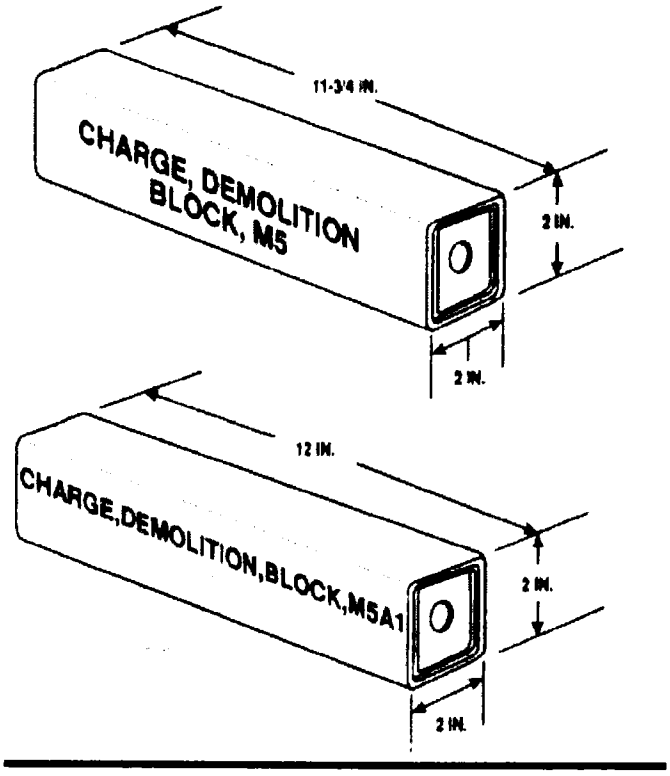
Usage: These projectiles have a hardened AP cap over the nose of the body to which the windshield is secured. The AP cap increases the penetration ability of the projectile. Most APC-T projectiles, and all Navy AP projectiles 3 inches and larger, incorporate a small HE main charge in the base with a BD fuze which detonates after the projectile penetrates a target.

Description: The armor-piercing cap is secured to the projectile. Caps are made of the same kind of steel, as are the projectile bodies. The body is of high quality alloy steel.

Reference: OP 1664

Ordnance Technical Data Sheet

CHARGE, DEMOLITION: BLOCK M5 AND M5A1



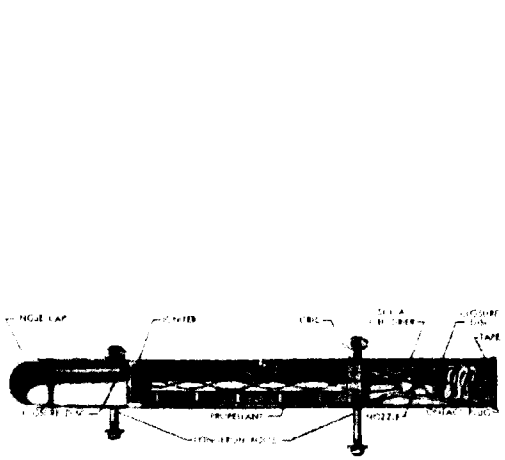
Nomenclature:	Block M5 and M5A1 Demolition Charge
Ordnance Family:	Demolition
DODIC:	M038
Filler:	M5 – Composition 3 (C 3); M5A1 – Composition 4 (C 4)
Filler weight:	2.5 lbs
Item weight:	2.5 lbs
Diameter:	2 inches
Length:	M5 – 11 ¾ inches; M5A1 – 12 inches
Fuze:	N/A

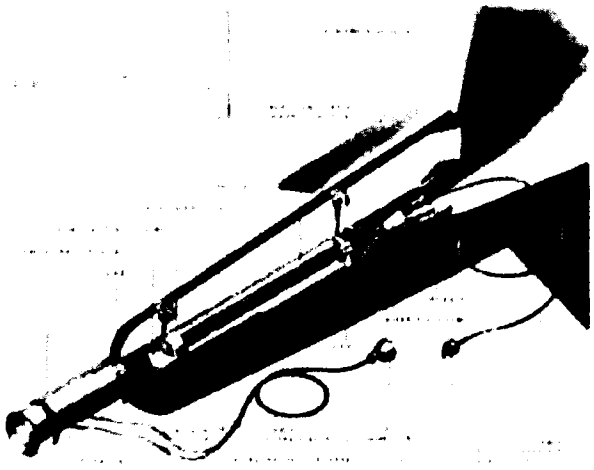
Usage: Block demolition charge M5 or M5A1 is plastic explosive and is used in almost all types of demolition work, primarily for cutting and breaching. Because of its moldability and high brisance, the explosive is ideally suited for steel cutting charges and for cutting irregular shaped targets. It is insoluble in water and may be used for underwater demolitions.

Description: Block demolition charge M5 contains Comp C3 and the M5A1 contains Comp C4. The charge is encased in a clear plastic container with a threaded cap well in each end (M5). Bulk explosive is obtained by cutting open the plastic container.

Ordnance Technical Data Sheet

U.S. ROCKET, 3.25-IN., TARGET, MK 1 & MK 2





Nomenclature:	Target, MK 1 & MK 2, 3.5 in
Ordnance Family:	Rocket
DODIC:	
Filler:	Propellant
Filler weight:	Not provided
Item weight:	Not provided
Diameter:	82.55 mm (3.5 in)
Length:	Not provided
Maximum Range:	Not provided
Fuze:	Electrically Fired

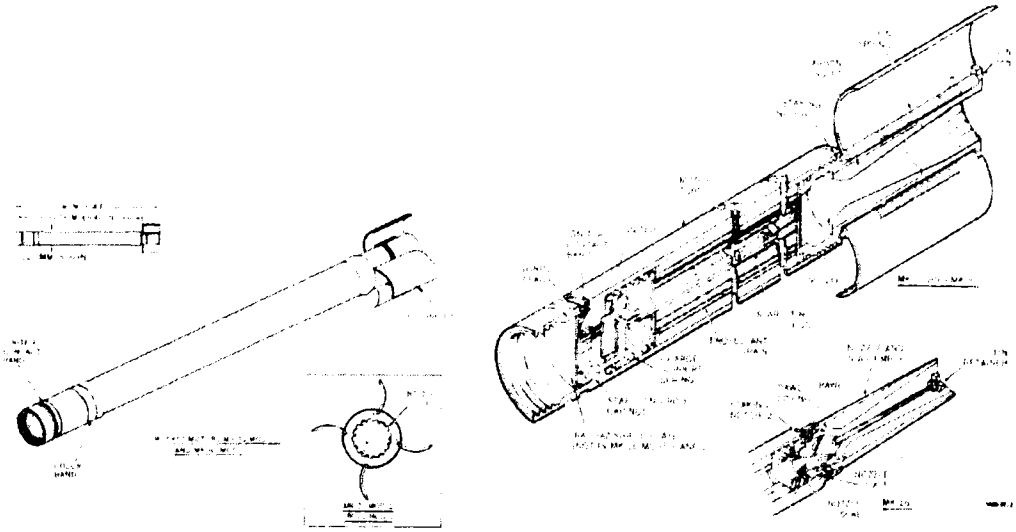
Usage: As a target for antiaircraft gunners, the rocket is projected with speeds approximately those of an aircraft.

Description: It consists of a rocket propulsive unit to which are attached large stabilizing fins, for maximum visibility. They all consist of a simple rocket motor with three large fins prepared from wooden frames and light-weight fiber board. The fins are 120 degrees apart, each attached by two lugs. The 3.25-inch Rocket Targets Mk 1 and Mk 2 consist of a motor 36 inches long, to which fins 18 inches by 34 inches are attached. An electrical connection is made by a standard 110-volt plug. The 3.25-inch Target Rocket Mk 1 is standardized at 425 m.p.h. and the Mk 2 at 300 m.p.h. On some models, a screamer is put over the nose end.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. ROCKET MOTORS, 5.0-INCH, MK 71 MODS 0, ZUNI



Nomenclature:	Zuni 5.0 in Rocket motor
Ordnance Family:	Rockets
DODIC:	J270
Filler:	Rocket Propellent, Double-Base
Filler weight:	15.40 kg (33.96 lbs)
Item weight:	30.40 kg (67.02 lbs)
Diameter:	127.00 mm (5 in)
Length:	1.78 m (5.84 ft)
Maximum Range:	Not provided
Fuze:	Electrically fired

Usage: These are general-purpose rocket motors used with various warheads for air-to-surface, air-to-air, and surface-to-air missions.

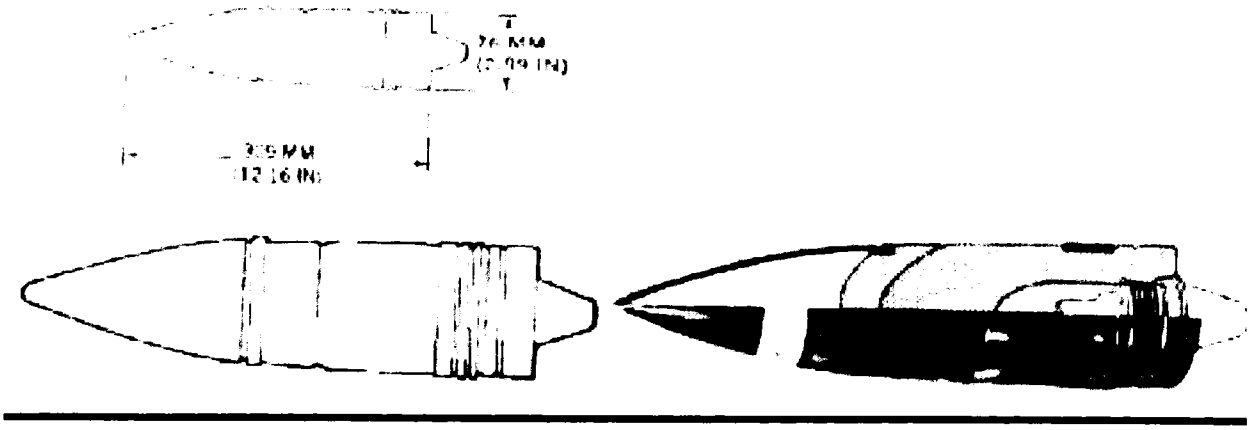
Description: The rocket motors are painted olive drab, white, or gray, with a brown band around the forward end. Nomenclature and manufacturing data are stenciled in black.

Reference: ORDATA Online.

BATTLE RANGE FIRING AREA

Ordnance Technical Data Sheet

3" Projectile, Mk 29 Mod 1 & 2



Nomenclature:	**U.S. PROJECTILE, 3-IN, AP, MK 29 MODS 1 & 2**
Ordnance Family:	Projectiles
DODIC:	Not Applicable
Filler:	Explosive D*
Filler weight:	136.08 g (0.31 lbs)
Item weight:	5.94 kg (13.10 lbs)
Diameter:	75.69 mm (2.98 in)
Length:	308.86 mm (12.16 in)
Maximum Range:	14,600 yards
Fragmentation Distance:	2,009 feet
Fuze:	Various

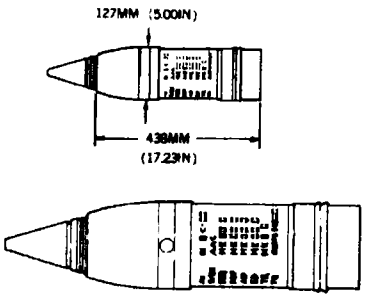
Usage: This a spin stabilized, high explosive, armor piercing projectile. 3-inch A.P. Mk 29 Mods 1 and 2: Guns used in; 3"/50.

Description: Overall length, inches; with cap and windshield is 12.16, Without cap and windshield is 6.91. Diameter of base, inches is 2.98. Distance base to band, inches is 1.35. Width of band, inches is 1.0. Diameter at bourrelet, inches is 2.985. The projectile is made of steel.

*Explosive D. This explosive is also known as Ammonium Picrate, ammonium 2,4,6-trinitrophenoloate, explosive D, and Dunnite. Ammonium picrate is the least sensitive to shock and friction of all military explosives. This makes it well suited for use as a bursting charge in armor-piercing projectiles. It is slightly inferior in explosive strength to TNT. It has a color of yellow, yellow-orange, or red. A main charge explosive used in explosive ordnance, which must withstand severe shock and stresses before detonating, such as armor piercing bombs and projectiles. Employed as the standard main charge for all Navy projectiles over 3-inch caliber.

Reference: ORDATA II

Ordnance Technical Data Sheet
5" Projectile, Mk 36 Mods 1-4



Nomenclature:	**U.S. PROJECTILE, 5-IN, A.A.COMMON, MK 36 MODS 1-4**
Ordnance Family:	Projectiles
DODIC:	
Filler:	*Explosive D
Filler weight:	3.29 kg (7.25 lbs)
Item weight:	24.43 kg (53.89 lbs)
Diameter:	126.75 mm (4.985 in)
Length:	525.78 mm (20.7 in)
Maximum Range:	Not provided
Fuze:	Various – see below

Usage: This is a Navy Projectile used in 5"/25 Guns. Its over-all length with nose fuze is 20.70 inches; without the nose fuze, it is 17.225 inches long. The diameter of the base is 4.973 inches and the diameter at the bourrelet is 4.985 inches. The distance from the base to the band is 2.43 inches and the width of the band is 2.00 inches. When the V.T. Fuzes are used, the projectile adapter is removed, and a gas-checked base-fuze plug, with no tracer, is fitted into the base. V.T. fuzes are authorized for use in Mods 2 -- 4 only of this projectile. The Auxiliary Detonating Fuze Mk 54 is replacing the Auxiliary Detonating Fuzes Mk 17 and Mk 46. The Auxiliary Detonating Fuze Mk 44 is used only in conjunction with the V.T. Fuze Mk 53. All Mods of the Projectile Mk 36 are authorized for use with A.P. steel nose caps and for designation as "H.C." projectiles. All Mods of the Projectile Mk 36 may also be issued B.L. & P. or B.L. & T. with the Tracer Mk 9 and adapter for target practice.

Description: The overall projectile color is green. The projectile is made of steel.

*Explosive D or also known as Ammonium Picrate is the least sensitive to shock and friction of all military explosives. Although less sensitive that TNT, it can be exploded by sever shock or friction. This makes it well suited for use as a bursting charge in armor-piercing projectiles, employed as the standard main charge for all Navy projectiles over 3 inch caliber. A product of picric acid, it is slightly inferior in explosive strength to

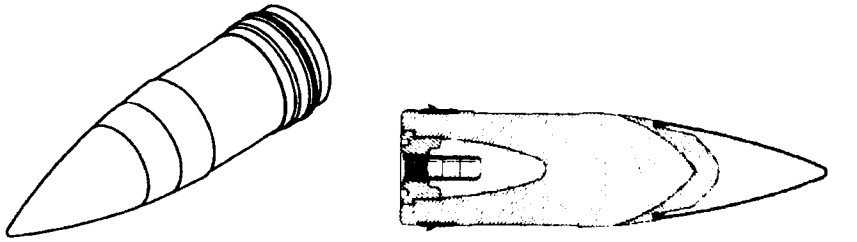
TNT. When heated, it does not melt but decomposes and explodes. It reacts slowly with metals; however, when wet, it may form sensitive and dangerous compounds with iron, copper and lead. It is difficult to detonate. When ignited in the open, it will burn readily like tar or resin.

It is a crystalline material that is yellow, yellow-orange, or red. It is slightly soluble in cold water and in soluble in hot water.

Reference: ORDATA II

Ordnance Technical Data Sheet

8" Projectile, Armor Piercing



Nomenclature:	**U.S. PROJECTILE, 8-IN, AP, MK 19 MODS 1-6**
Ordnance Family:	Projectiles
DODIC:	Not Applicable
Filler:	Explosive D*
Filler weight:	1.65 kg (3.64 lbs)
Item weight:	118 kg (260 lbs)
Diameter:	203 mm (7.99 in)
Length:	914 mm (35.98 in)
Maximum Range:	35,300 yards
Fragmentation Distance:	3,679 feet
Fuze:	Various

Usage: This is a complete round in which the separate components -- projectile, propelling charge, and primer -- are loaded into the gun separately, and is known as "separate loading" ammunition. Although the propelling charge may be in one section, it is usually divided into parts with each part assembled in a bag. These projectiles are subjected to a test against face hardened plate one (1) caliber in thickness.

Description: The exterior of the projectile from the rotating band to point, except bourrelet, is painted with a thin, hard, smooth, lead-free paint of the color black. The armor-piercing cap is of forged alloy steel, heat treated to have a hard face and relatively soft core.

*Explosive D. This explosive is also known as Ammonium Picrate, ammonium 2,4,6-trinitrophenoloate, explosive D, and Dunnite. Ammonium picrate is the least sensitive to shock and friction of all military explosives. This makes it well suited for use as a bursting charge in armor-piercing projectiles. It is slightly inferior in explosive strength to TNT. It has a color of yellow, yellow-orange, or red. A main charge explosive used in explosive ordnance, which must withstand severe shock and stresses before detonating, such as armor piercing bombs and projectiles. Employed as the standard main charge for all Navy projectiles over 3-inch caliber.

Reference: ORDATA II

Ordnance Technical Data Sheet
12" Projectile, Deck Piercing

Nomenclature:	**U.S. PROJECTILE, 12-IN, DECK PIERCING, M1911A**
Ordnance Family:	Projectiles
DODIC:	
Filler:	*Explosive D
Filler weight:	10.96 kg (24.16 lbs)
Item weight:	317.52 kg (700 lbs)
Diameter:	304.29 mm (11.97 in)
Length:	967.23 mm (38.08 in)
Maximum Range:	Not provided
Fuze:	Not provided

Usage: This is a spin stabilized, high explosive deck-piercing projectile used against armored naval sea craft.

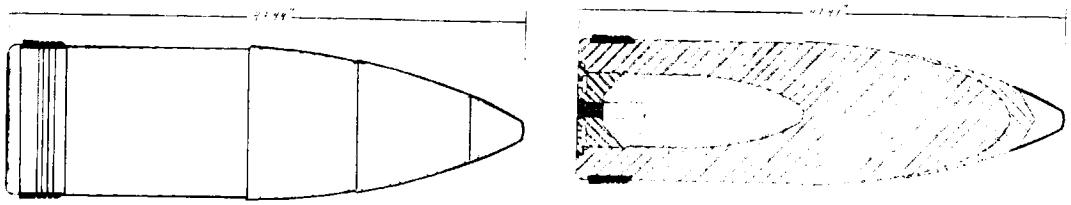
Description: The projectile is painted yellow or olive drab. The projectile is made of steel.

* Explosive D or also known as Ammonium Picrate is the least sensitive to shock and friction of all military explosives. Although less sensitive that TNT, it can be exploded by sever shock or friction. This makes it well suited for use as a bursting charge in armor-piercing projectiles, employed as the standard main charge for all Navy projectiles over 3 inch caliber. A product of picric acid, it is slightly inferior in explosive strength to TNT. When heated, it does not melt but decomposes and explodes. It reacts slowly with metals; however, when wet, it may form sensitive and dangerous compounds with iron, copper and lead. It is difficult to detonate. When ignited in the open, it will burn readily like tar or resin.

It is a crystalline material that is yellow, yellow-orange, or red. It is slightly soluble in cold water and in soluble in hot water.

Reference: ORDATA II

Ordnance Technical Data Sheet
14" Projectile, Mk 8 Mods 3,7,8&11



Nomenclature:	**U.S. PROJECTILE, 14-IN, ARMOR PIERCING, MK 8 MOD 3, 7, 8 & 11**
Ordnance Family:	Projectiles
DODIC:	
Filler:	Explosive D
Filler weight:	15.56 kg (34.30 lbs)
Item weight:	635.95 kg (1402.03 lbs)
Diameter:	355.60 mm (14 in)
Length:	1.26 m (49.60 in)
Maximum Range:	Not provided
Fuze:	Not provided

Usage: Armor piercing projectiles are designed to penetrate an equal caliber of Class A armor plate.

Description: Their windshield is made either of forged mild steel, steel stamping, or aluminum and has no special strength other than to prevent destruction during handling and setback on firing. Windshields are screwed to the cap and are "set" by a center punch. The armor piercing cap is secured to the projectile by peening the skirt of the cap into notches out into the ogive of the body and by soldering the cap to the body with a special low melting point solder. Caps are made, in general, of the same kind of steel as are the projectile bodies. The body is of high quality alloy steel carefully forged and heat treated and is the part that does the actual penetration. The bourrelet is the bearing surface of the projectile and rides on the lands of the rifle. This bearing surface is usually about one-sixth caliber in width and its surface is generally ground to a fine finish in order to reduce friction and to minimize wear on the lands of the gun. With the major caliber projectiles it has become standard practice to provide a rear bourrelet or bourrelets in addition to the forward bourrelet. Rear bourrelet or bourrelets will be just forward and behind the rotating band. The projectile is thus provided with better support in the gun and during the ejection from the muzzle. The base plug closes off the explosive cavity and holds the base fuze or base fuze adapter. Both the base plug and the base fuze adapter, if used, are both in place with a gas seal ring similar to that used on the base fuze. The base fuze is inserted through the base plug or base fuze adapter and is designed to detonate the projectile after penetration. After insertion it is closed with a gas check ring of copper and lead put in under hydraulic pressure to prevent the propelling gases

from affecting the explosive filling. Armor piercing projectiles and the common projectile having a windshield may carry a spotting dye which colors the water on impact in order that the observers may spot the fall of shot. The spotting dye in powder form is placed in the windshield before it is screwed on the nose of the projectile. Upon impact with the water, the forward end of the windshield, having water inlet holes covered by a copper inlet cover, forces through the inlet cover, dissolves the dye and forces its way out the outlet holes. Armor piercing rounds are painted black. A special adapter with 1.5" diameter outside threads is required to fit Mk 21 base fuzes in these projectiles. The Mod 7 projectile may also (be) issued Blind Loaded and Plugged or Blind Loaded and Traced with adapter and Mk 5 Mod 1 tracer for target practice.

Reference: ORDATA II

SONAR TRAINING AREA

Ordnance Technical Data Sheet

Composition 4 (C-4)

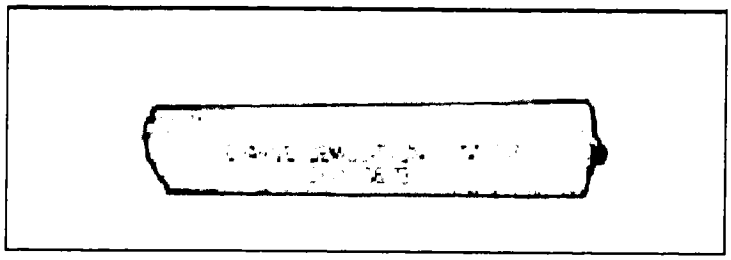


Figure 1-2. M112 block demolition charge

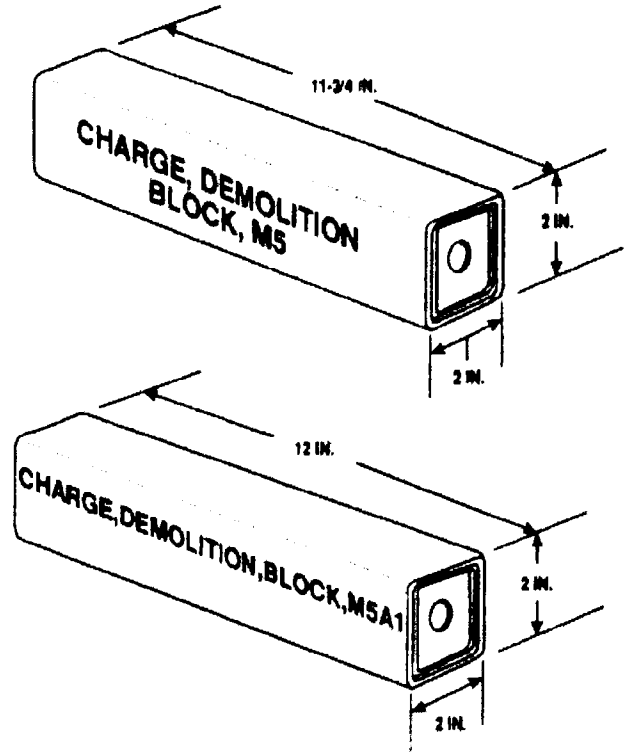
Composition C-4. This is a (91/9) RDX and plastic explosive composition. It is semiplastic putty-like material, dirty white to light brown in color, less sensitive, more stable, less volatile, and more brisant than composition C-3. It is a nonhydroscopic material that has found application in demolition blocks and specialized uses. The U.S. military is the primary manufacturer of C-4.

- **RDX** - 91 percent
- **Di(2-ethylhexyl) sebacate** - 5.3 percent
- **Polyisobutylene** - 2.1 percent
- **Motor oil** - 1.6 percent

Reference: ORDATA Online, MIDAS, Military Demolition Material List

Ordnance Technical Data Sheet

CHARGE, DEMOLITION: BLOCK M5 AND M5A1

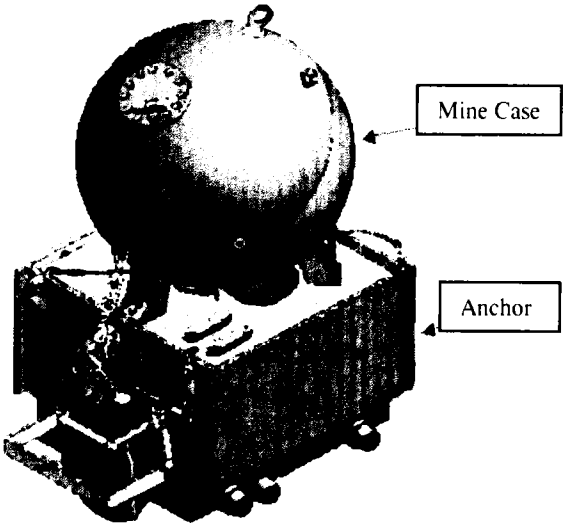


Nomenclature:	Block M5 and M5A1 Demolition Charge
Ordnance Family:	Demolition
DODIC:	M038
Filler:	M5 – Composition 3 (C 3); M5A1 – Composition 4 (C 4)
Filler weight:	2.5 lbs
Item weight:	2.5 lbs
Diameter:	2 inches
Length:	M5 – 11 ¾ inches; M5A1 – 12 inches
Fuze:	N/A

Usage: Block demolition charge M5 or M5A1 is plastic explosive and is used in almost all types of demolition work, primarily for cutting and breaching. Because of its moldability and high brisance, the explosive is ideally suited for steel cutting charges and for cutting irregular shaped targets. It is insoluble in water and may be used for underwater demolitions.

Description: Block demolition charge M5 contains Comp C3 and the M5A1 contains Comp C4. The charge is encased in a clear plastic container with a threaded cap well in each end (M5). Bulk explosive is obtained by cutting open the plastic container.

Ordnance Technical Data Sheet
MK 6 Moored Sea Mine



MK6 Case (from Solomon's Complex)

Nomenclature:	MK 6 Moored Sea Mine
Ordnance Family:	Naval Mines
DODIC:	N/A obsolete
Filler:	TNT
Filler weight:	± 136 kg (300 lbs)
Item weight:	635 kg (1400 lbs)
Diameter:	87 cm (34in)
Length:	N/A
Maximum Depth:	914 m (3000ft) moor depth
Fuze:	K-type pistol/Hertz horns Also maybe fired Contact/Galvanic/Magnetically

Usage: This mine was designed specifically for the North Sea Mine Barrage of World War I. However, as shown above, it was still being used operationally as late as 1978. The Mark 6 was very successful and remained in US inventories until 1985.

Description: The MK 6 mine consists of an 800-pound anchor connected by a mooring cable to a buoyant 500-pound mine case. The spherical mine case is loaded with 300 lbs of TNT. The entire mine was painted black. Training mines were inert-loaded with the firing wells empty and closed with watertight shipping covers. The spherical case was painted white with orange strips. The anchor was painted black

Reference: ORDATA Online, Mobile Mine Assembly Group

POPE'S CREEK SITE

Ordnance Technical Data Sheet

Composition 4 (C-4)

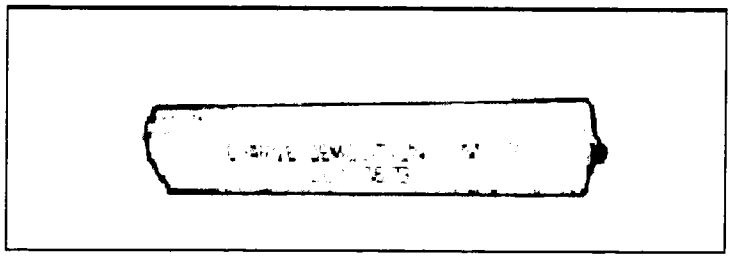


Figure 1-2. M112 block demolition charge

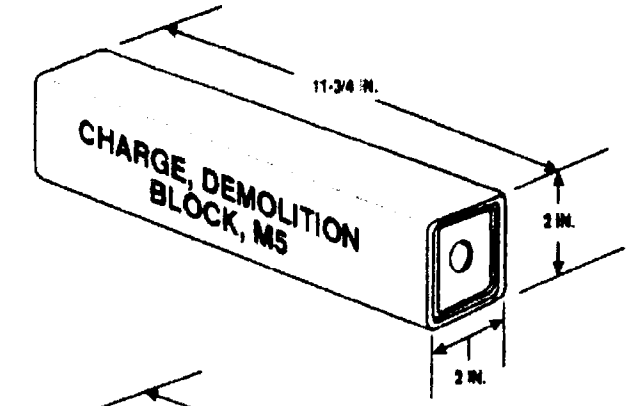
Composition C-4. This is a (91/9) RDX and plastic explosive composition. It is semiplastic putty-like material, dirty white to light brown in color, less sensitive, more stable, less volatile, and more brisant than composition C-3. It is a nonhydroscopic material that has found application in demolition blocks and specialized uses. The U.S. military is the primary manufacturer of C-4.

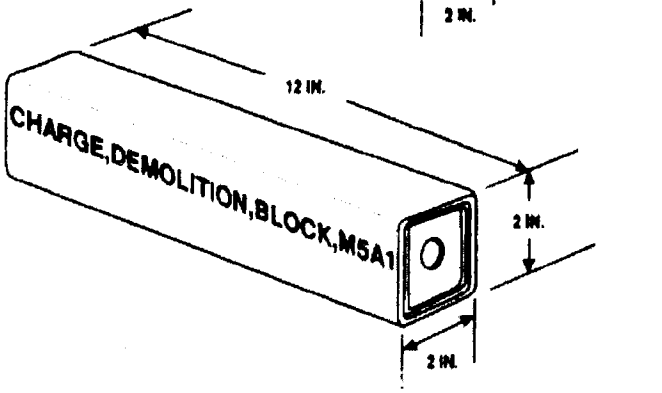
- **RDX** - 91 percent
- **Di(2-ethylhexyl) sebacate** - 5.3 percent
- **Polyisobutylene** - 2.1 percent
- **Motor oil** - 1.6 percent

Reference: ORDATA Online, MIDAS, Military Demolition Material List

Ordnance Technical Data Sheet

CHARGE, DEMOLITION: BLOCK M5 AND M5A1



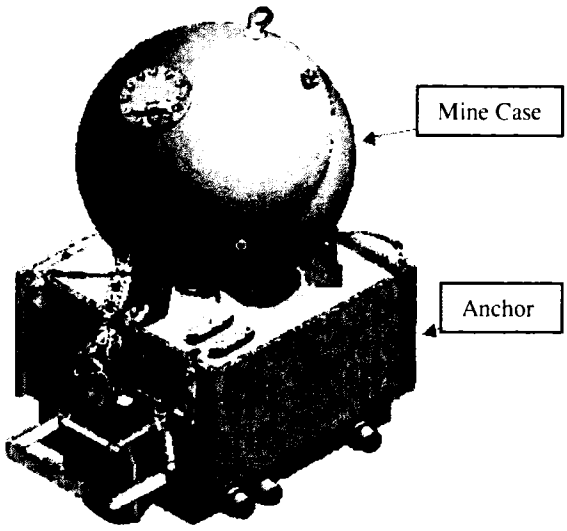


Nomenclature:	Block M5 and M5A1 Demolition Charge
Ordnance Family:	Demolition
DODIC:	M038
Filler:	M5 – Composition 3 (C 3); M5A1 – Composition 4 (C 4)
Filler weight:	2.5 lbs
Item weight:	2.5 lbs
Diameter:	2 inches
Length:	M5 – 11 ¾ inches; M5A1 – 12 inches
Fuze:	N/A

Usage: Block demolition charge M5 or M5A1 is plastic explosive and is used in almost all types of demolition work, primarily for cutting and breaching. Because of its moldability and high brisance, the explosive is ideally suited for steel cutting charges and for cutting irregular shaped targets. It is insoluble in water and may be used for underwater demolitions.

Description: Block demolition charge M5 contains Comp C3 and the M5A1 contains Comp C4. The charge is encased in a clear plastic container with a threaded cap well in each end (M5). Bulk explosive is obtained by cutting open the plastic container.

Ordnance Technical Data Sheet
MK 6 Moored Sea Mine



MK6 Case (from Solomon's Complex)

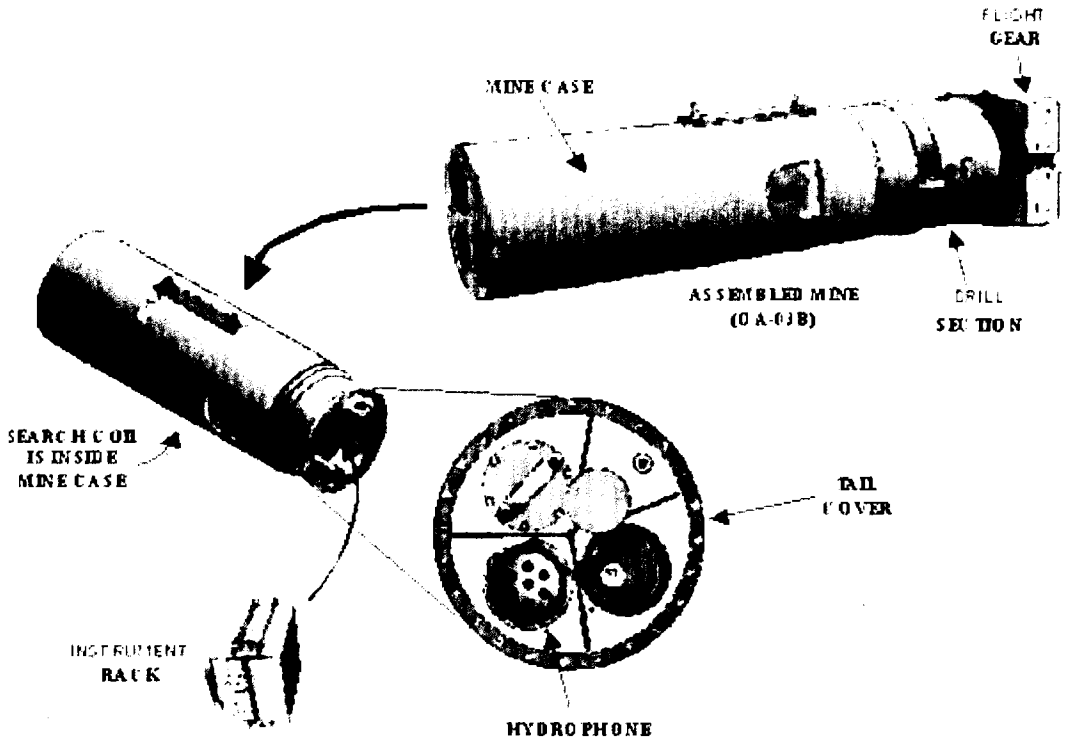
Nomenclature:	MK 6 Moored Sea Mine
Ordnance Family:	Naval Mines
DODIC:	N/A obsolete
Filler:	TNT
Filler weight:	± 136 kg (300 lbs)
Item weight:	635 kg (1400 lbs)
Diameter:	87 cm (34in)
Length:	N/A
Maximum Depth:	914 m (3000ft) moor depth
Fuze:	K-type pistol/Hertz horns Also maybe fired Contact/Galvanic/Magnetically

Usage: This mine was designed specifically for the North Sea Mine Barrage of World War I. However, as shown above, it was still being used operationally as late as 1978. The Mark 6 was very successful and remained in US inventories until 1985.

Description: The MK 6 mine consists of an 800-pound anchor connected by a mooring cable to a buoyant 500-pound mine case. The spherical mine case is loaded with 300 lbs of TNT. The entire mine was painted black. Training mines were inert-loaded with the firing wells empty and closed with watertight shipping covers. The spherical case was painted white with orange strips. The anchor was painted black

Reference: ORDATA Online, Mobile Mine Assembly Group

Ordnance Technical Data Sheet
MK 56 Naval Mine



Nomenclature:	MK 56 ASW Sea Mine
Ordnance Family:	Sea Mines (Aircraft-laid, moored mine)
DODIC:	
Filler:	HBX-3
Filler weight:	(360 Lbs)
Item weight:	909 kg (2000 Lbs)
Diameter:	307 c (22.4in)
Length:	290 c (114.3in)
Maximum Depth:	305 m (1000 ft)
Fuze:	Total field magnetic exploder

Usage: Aircraft laid, moored mine designed to defeat high-speed, deep operating Submarines.

Description: MK 56 mine case is stainless steel and is equipped with flight gear fro aircraft launching. When laid mine sinks to bottom where mine case and anchor separate and mooring takes place. Mine has a mud agitation device to prevent mine from becoming mired in mud/bottom sediment. The mine is also equipped with a weapon sterilization/scuttling system. Mine case normally painted OD green or flat black.

Reference/Sources: ORDATA Online, FAS Military Analysis Network, Current U.S. Mines, CSS Mine Warfare Life Cycle Management

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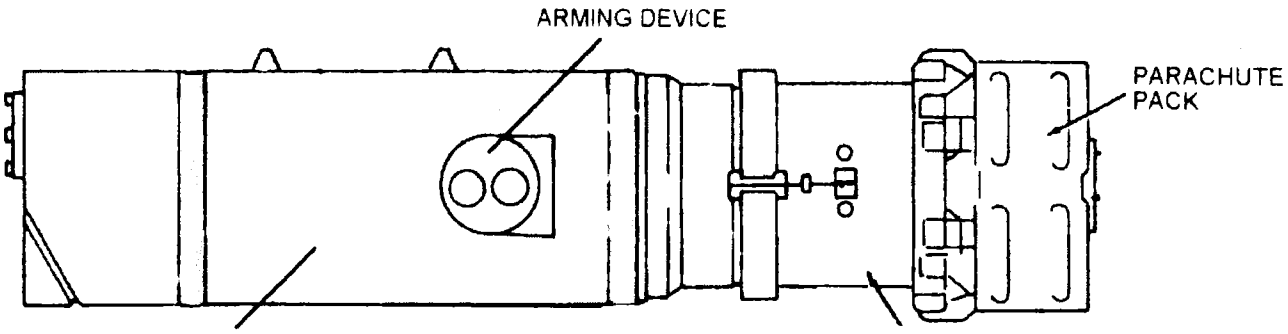
MK-50 River Mine



MK50 Air Launched Bottom Mine

Nomenclature:	MK 50 Sea Mine
Ordnance Family:	Naval Mines
DODIC:	N/A obsolete
Filler:	HBX-1
Filler weight:	Not provided
Item weight:	Not provided
Diameter:	Not provided
Length:	Not provided
Maximum Depth:	Not provided

Usage: Anti-ship, harbor denial.

Description: Influence fired, aircraft and surface laid shallow water bottom mine. The MK 50 Mine case normally painted OD green or Black, training versions painted orange with or without white stripes.

Reference: Minemen Association

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Triggering or Fuzes

Chemical Horn, contained acid and contact with the horn broke open the acid container which energized a battery and exploded the mine. By definition, this was a short ranged weapon and fields needed to be densely packed in order to be effective against shipping.

The **"K-pistol"** of the Mark 6 used a copper antenna which extended upwards to just below the surface. This was connected by a relay to a copper plate on the outside of the mine. Seawater acted as the electrolyte of a battery which would be formed when a ship with a steel hull approached. The current running down the antenna operated the relay and exploded the mine. This method allowed each mine to cover a wide area, meaning that fewer mines could be used than with the horn type. In modern terms, the "K" device exploited the Underwater Electric Potential (UEP) effect.

Magnetic triggers were originally only used on ground (bottom) mines. This is because if they were moored, the changing of the magnetic field as they rose and fell with the tide would set them off. Near the end of World War II, a trigger that measured the total field around it was developed. This device added up the fields in such a way that the tides did not affect it.

Acoustic mines measure sound of certain frequencies, usually those of propeller, engine and sonar noises.

Pressure detector fuzes measure the pressure wave created by a ship moving through the water. These were simultaneously developed by both Germany and the USA during World War II, but both held off deploying them for fear that the technology would be captured by the other side. They were first used in combat off the Normandy beaches and were heavily used against the Japanese home islands near the end of the war.