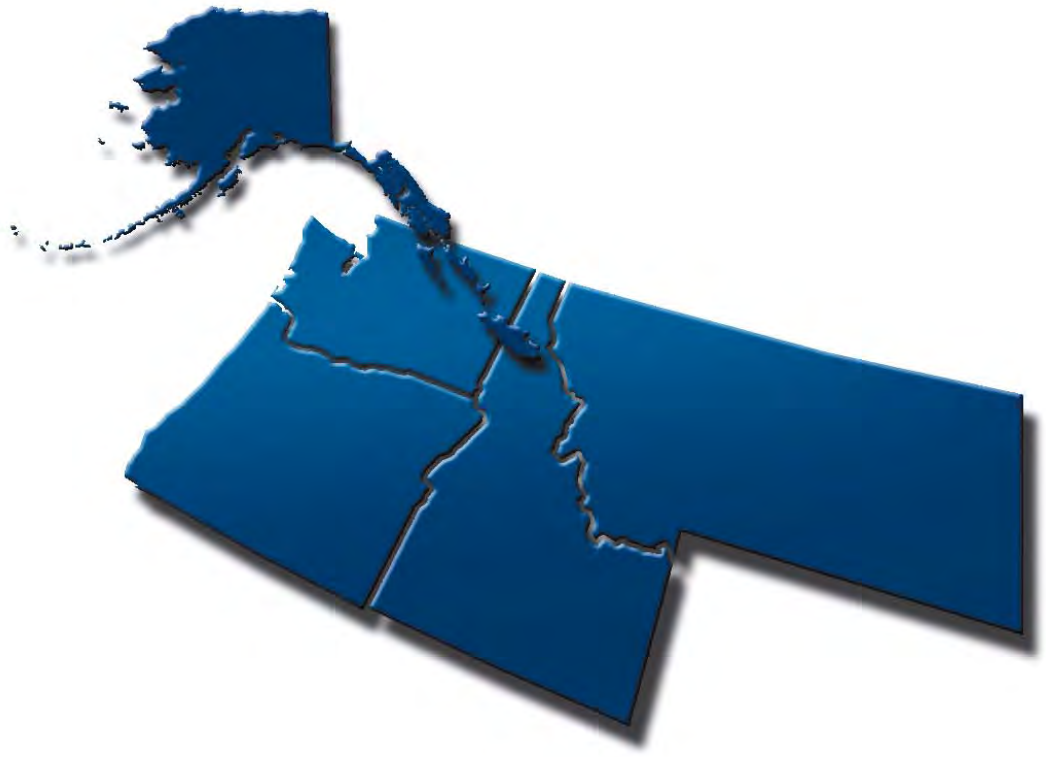
FINAL
May 3, 2013

Preliminary Assessment Report for Naval Defensive Sea Area

Kodiak Island
Alaska

Department of the Navy
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315



FINAL
PRELIMINARY ASSESSMENT REPORT FOR
NAVAL DEFENSIVE SEA AREA

KODIAK ISLAND
ALASKA

Naval Facilities Engineering Command Northwest
Silverdale, Washington

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DOCUMENT IDENTIFICATION

Document Title:	Final Preliminary Assessment Report for Naval Defensive Sea Area
Site Name/Location:	Kodiak Island, Alaska
Document Control No.:	0513.502 33762079.R-3
Report Coverage:	This document presents the results of a preliminary assessment conducted to evaluate the possible presence of munitions and explosives of concern in the marine environment within the Naval Defensive Sea Area at Kodiak Island resulting from training exercises and ordnance handling activities between 1940 and 1950.
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CONTENTS

CONTENTS (Continued)

APPENDICES

FIGURES

CONTENTS (Continued)

PLATE

TABLE

ABBREVIATIONS AND ACRONYMS

AA	antiaircraft
AATC	antiaircraft training center
ABW/HO	Air Base Wing History Office
AMNWR	Alaskan Maritime National Wildlife Refuge
AMTB	anti-motor-torpedo boat
DMM	discarded military munitions
HMX	cyclotetramethylene tetranitramine
km	kilometer
mils	angular measure where 6400 mils = 360^{o}
mm	millimeter
MC	munitions constituent
MEC	munitions and explosives of concern
MRP	Munitions Response Program
NAS	Naval Air Station
NARA	National Archives and Records Administration
NDSA	Naval Defensive Sea Area
NOB	Naval Operating Base
PA	preliminary assessment
RDX	cyclotrimethylene trinitramine
TNT	trinitrotoluene
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance

1.0 INTRODUCTION

The eastern portion of Kodiak Island was withdrawn from the public domain for naval purposes in November 1939. By 1941, naval expansion plans scheduled for Kodiak included a seaplane base, a section base, a submarine base, and ultimately a naval operating base (NOB). Army garrison troops arrived in 1941, and Army Air Corps units arrived in February 1942. Because Kodiak was slotted to be a major installation located in an isolated and vulnerable area, extensive harbor defenses were constructed to protect from aerial or surface attacks. As part of the defensive operations, the military maintained several coastal defense artillery (CDA) guns, antiaircraft (AA) guns, in-water mines, and air defense squadrons. The military performed target practice at in-water ranges and in-water bombing targets and laid mines in the water near the eastern portion of Kodiak Island. In 1972, the Navy transferred government-owned land and improvements to the Bureau of Land Management for Coast Guard use.

A Naval Defensive Sea Area (NDSA) is a water area set aside by executive order of the President of the United States because of its strategic nature, or for purposes of defense. The NDSA at Kodiak Island was established on March 22, 1941 by Executive Order 8717, included as Appendix A. This NDSA includes the territorial waters between the extreme high-water marks and the 3-mile marine boundaries.

According to 32 CFR Part 761, Subpart A §761.3 (a), there are three Naval Defensive Sea Areas (NDSAs) in Alaska that are under the control of the Secretary of the Navy: Kiska Island, Kodiak Island, and Unalaska Island. The Navy addresses in-water ranges at the NDSA for Kodiak Island in this preliminary assessment (PA) report. The Navy addresses the NDSAs for Kiska and Unalaska Islands in separate preliminary assessment reports. The Navy is not addressing any other area in Alaska with coastal defense artillery.

The Navy's Munitions Response Program (MRP) was established because the National Defense Authorization Act of 2000 required the Department of Defense to establish a program that addresses the potential explosives safety, health, and environmental issues caused by munitions and explosives of concern (MEC) and munitions constituents (MC) used or released at sites during past operations and activities. Because there was target practice at in-water ranges and bombing targets within the NDSA at Kodiak Island, the Navy initiated a PA of this NDSA.

Previous environmental and ordnance investigations conducted in similar water body areas have identified the potential for waters of NDSAs to be contaminated with MEC. Activities that may have resulted in MEC contamination included practice firing of CDA and AA guns at fixed and towed targets; aerial gunnery firing practice at surface targets; aerial bombing practice at fixed targets; ordnance lost overboard during handling activities; and in-water ordnance disposal.

1.1 PURPOSE

The purpose of a PA is to differentiate sites that pose little or no potential threat to human health and the environment from sites that warrant further investigation (USEPA 1991). The Navy completed this PA report to evaluate the potential for releases that may pose a potential threat to human health or the environment as a result of historical operations at in-water ranges and other areas suspected of containing MEC within the NDSA at Kodiak Island. The findings in the PA report were used to make recommendations for further action at the NDSA.

1.2 PROJECT SCOPE

The scope of this project consisted of reviewing records and preparing the related PA report. The records review includes an extensive search for information regarding historical operations of in-water practice ranges and ordnance handling points located within the NDSA at Kodiak Island. The PA report includes a summary of information assembled during a review of pertinent books, reports, public and private historical records, web sites, and aerial photographs. Interviews were conducted with individuals knowledgeable of MEC finds or historical ordnance activities.

This PA is based on a review of records located at facilities in the Seattle, Anchorage, and Washington, D.C. areas. Records that might exist at the Museum of the Aleutians on Unalaska Island and at the Kodiak Military History Museum located in Kodiak, Alaska were not included.

The records review included information held by the following agencies or facilities:

- U.S. Army Corps of Engineers (USACE), Alaska District
- National Archives and Records Administration (NARA) II, College Park Maryland
- NARA, Regional Branch, Seattle, Washington
- NARA, Regional Branch, Anchorage, Alaska
- Naval History and Heritage Command, Washington Navy Yard, Washington, D.C.
- Navy Department Library, Washington Navy Yard, Washington, D.C.
- 3rd Wing U.S. Air Force History Office, Anchorage, Alaska

- Anchorage Museum, Atwood Resource Center, Anchorage, Alaska
- University of Alaska Anchorage Consortium Library, Anchorage, Alaska
- Z.J. Loussac Library—Main Branch, Anchorage, Alaska

2.0 SITE BACKGROUND

2.1 SITE LOCATION AND SETTING

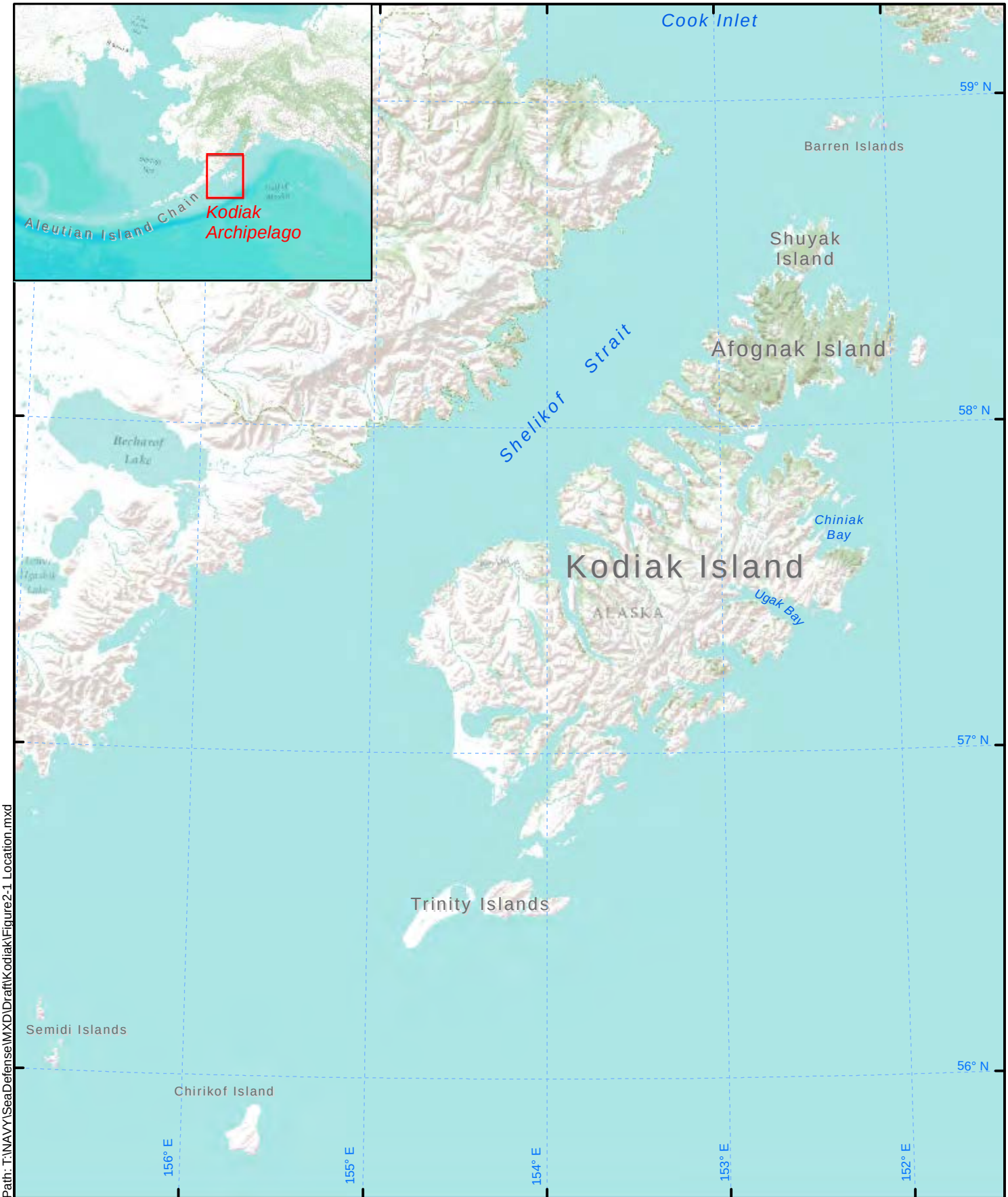
Kodiak Island is a large island situated in the Gulf of Alaska 25 miles (40 km) southeast of the Alaska Peninsula near the entrance to Cook Inlet. It is separated from the Alaska mainland by the Shelikof Strait. Kodiak Island is the largest of the 25 islands in the Kodiak Archipelago and the second largest island in the United States. The Kodiak Archipelago consists of all islands extending from the Barren Islands on the north to Chirikof Island and the Semidi Islands group to the south. Kodiak Island is approximately 100 miles (160 km) long and varies in width from 10 to 60 miles (16 to 96 km). It is located at 57° 28′ north latitude and 153° 26′ west longitude. Figure 2-1 shows the location of Kodiak Island and the relative position of the remaining islands of the Kodiak Archipelago.

Kodiak Island is situated at a convergent boundary between two tectonic plates that make up the Earth's crust. The more southern or Pacific Plate is being subducted under the more northern North American plate. This results in an area that is spotted with active and/or dormant volcanos and is very earthquake prone. Earthquakes with magnitudes greater than 7 on the Richter scale are common. The island is mountainous and heavily forested in the northeast portion of the island, but fairly treeless in the southwest. It has many deep, ice-free bays that provide sheltered anchorages for boats. One of the larger of these bays (Chiniak Bay) is located at the northeast end of the island.

A chart study conducted by the Plans Division of the Bureau of Aeronautics in the spring of 1927 indicated the need for the Navy to develop one main base and several subsidiary bases in the southern Alaskan sector, and the general vicinity of Kodiak appeared the best strategic location for the main base. In 1937, the Womens Bay area of Chiniak Bay was selected as the site of a future seaplane base and the Buskin River Flats area as a landing field (McDade 1945).

2.2 SITE DESCRIPTION

The study area for this PA consists of the known in-water range areas established for target firing of the coastal artillery and AA batteries installed on Kodiak Island by U.S. forces, known in-water practice bombing targets, and on-water ordnance handling locations within the 3-mile limit of the Kodiak NDSA. Figure 2-2 shows the extent of the Kodiak NDSA.



Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Figure2-1 Location.mxd

U.S. NAVY

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Naval Defensive
Sea Area
Kodiak Island, Alaska

0 9 18
Scale In Miles

Figure 2-1
Location of Kodiak Island and the Kodiak Archipelago, Alaska

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Naval Defensive
Sea Area
Kodiak Island, Alaska

Figure 2-2
Extent of the Naval Defensive Sea Area Surrounding Kodiak Island

2.3 SITE OWNERSHIP HISTORY

The U.S. purchased Alaska, which includes the Aleutians, from Russia in 1867. Construction of Navy facilities on Kodiak Island was authorized under an act of congress of April 25, 1939. General Order Number 126, dated November 8, 1939, withdrew public land and water on the eastern portion of Kodiak Island for naval purposes (McDade 1945). Construction of naval facilities activities began on September 23, 1939. On August 1, 1940, the Navy Department established the Alaskan Sector as a military command within the Thirteenth Naval District. This sector included the territorial limits of Alaska and its adjacent waters. By 1941, naval expansion plans scheduled for Kodiak included a seaplane base, a section base, a submarine base, and ultimately a naval operating base (NOB). Since Kodiak was slotted to be a major installation located in an isolated and vulnerable area, protection from aerial or surface attack needed to be addressed. More land area was needed, and additional executive orders and amendments provided the space (USACE 2002).

After World War II ended, the number of Navy and Army personnel at Kodiak rapidly began to decrease. However, between 1947 and 1953, Coast Guard activities increased. By October 1, 1950, NOB Kodiak was disestablished, and on July 1, 1952, Fort Greely was disestablished (USACE 2002).

On July 1, 1972, the Navy, with the approval of the Assistant Secretary of Defense, transferred government-owned land and improvements to the Bureau of Land Management for withdrawal for Coast Guard use. Currently the Integrated Support Command Kodiak remains on the former Navy property (USACE 2002). Coast Guard Air Station Kodiak is one of the largest units in the U.S. Coast Guard.

The City of Kodiak is located within the area protected by the former military coastal defenses on the east side of Kodiak Island. Fishing and diving in the waters around the City of Kodiak and within the NDSA of Kodiak Island are popular activities.

2.4 SITE OPERATIONS AND WASTE CHARACTERISTICS

Naval Air Station (NAS) Kodiak was established in February 1941 and commissioned on June 15, 1941, even though construction was not complete. Marines stationed at Chilkoot Barracks in Hanes, Alaska provided protection while the Navy and its contractors constructed Fort Greely and other harbor defense sites around the island. The Army eventually assigned one regiment of infantry minus one battalion, three batteries of 155-mm guns, two AA battalions, one mine planter, and one detachment of searchlights for harbor defense (USACE 2002). The first Army garrison troops arrived in April 1941. The Army had expanded its garrison troops on Kodiak to more than 11,000. Fixed defensive garrisons included Fort Abercrombie at Miller

Point, Fort Tidball on Long Island, and Fort J.H. Smith at Cape Chiniak (Alaska Geographic Society 1995).

The first Army Air Corps units, the 18th Fighter Squadron and 36th Bombardment Squadron, arrived in February 1942. Later the same year, the 111th Canadian Fighter Squadron also arrived (USACE 2002). Naval units stationed at Kodiak include Patrol Wing Four, as well as numerous visiting ships and submarines.

By June 9, 1942, NOB Kodiak (consisting of the NAS, Submarine Base, and the Section Base) was commissioned (McDade 1945). On July 1 of the same year the Submarine Base Kodiak was commissioned, though it was never used to its full potential. The Submarine Base Kodiak was decommissioned in May 1945. After 1942 the naval aerial mission decreased and airplane repair grew in importance, as did submarine repair activities. The Kodiak Island base never expanded beyond original plans since other bases were constructed farther west, to be closer to the action (USACE 2002).

On August 28, 1944, NAS Kodiak was assigned to the Naval Air Bases Command, Seventeenth Naval District. At the same time NAS Kodiak became headquarters of the Seventeenth Naval District with its commanding officer commander of the entire district (McDade 1945).

After World War II, the mission of NAS Kodiak was to maintain and operate facilities, provide services and materials to support operations of aviation activities and units of the Navy Operating Forces, and support other activities and units as designated by the Chief of Naval Operations. During the 1960s, the mission remained the same, but portions of the reservation and improvements were transferred to the Air Force. During the 1970s, the former Navy facilities were transferred to the Coast Guard. Today this is the largest Coast Guard station in the United States. Modern Coast Guard units stationed at Kodiak conduct patrols and search and rescue missions and provide fisheries enforcement (USACE 2002).

2.4.1 Historical Waste Management Practices

The primary waste of concern for this investigation is MEC and munitions constituents (MCs) (chemical aspects) within the marine environment of the NDSA surrounding Kodiak and the surrounding islands. MEC includes unexploded ordnance (UXO), discarded military munitions (DMM), and munitions constituents MCs in high enough concentrations as to present an explosive hazard. The use and handling of ordnance at Kodiak, resulted in waste entering the marine NDSA by the following mechanisms:

- Ordnance fired over water from CDA guns and AA batteries during target training and gun function testing that did not detonate as intended

- Ordnance dropped or fired at in-water targets, fixed or moving, from U.S. aircraft during target training and gun function testing that did not detonate as intended

- Ordnance lost into the water during transfer from transport ships to the shore, either at a fixed dock or at an explosive anchorage situated in the harbor away from shore installations

- Anti-ship mines that were sunk, not detonated, during harbor mine-sweeping activities

- Excess ordnance deliberately disposed of (referred to as DMM) into the marine environment at the conclusion of hostilities

Ordnance that was fired or dropped and did not detonate as intended is known as UXO. An unknown quantity of MEC was lost, discarded, deliberately dropped, or fired into the marine environment of the NDSA surrounding Kodiak and neighboring islands during World War II. As much as 30 percent of the explosive ordnance that was dropped or fired during World War II did not detonate as intended (Francis and Alama 2011).

USACE evaluated Kodiak Island under the Formerly Used Defense Sites program and presented the findings in a coordinated comprehensive cleanup plan (USACE 2005). The evaluation applied to the on-land hazards of potential ordnance explosive and chemical warfare material. Prior to 2012, the in-water ranges and targets in the NDSA were not evaluated.

2.4.2 Regulatory Compliance

The National Defense Authorization Act of 2000 required the Department of Defense to establish a program addressing military munitions as part of the Defense Environmental Restoration Program. The Navy's Munitions Response Program (MRP) complies with this requirement. The purpose of the MRP is to address the potential explosives safety, health, and environmental issues caused by MEC and MCs used or released on sites from past operations and activities. Based on Navy MRP policy (U.S. Navy 2007), the following criteria are used for inclusion of water sites in the MRP:

> Shallow water areas where munitions releases are known or suspected to have occurred prior to September 30, 2002, where Navy actions were responsible for the release, and where the site is not:
>
> - Covered by water deeper than 20 fathoms (120 feet)
> - Part of, or associated with, a designated operational range
> - A designated water disposal site

- A Formerly Used Defense Site
- A result of combat operations
- A maritime wreck
- An artificial reef

2.5 SOURCE CHARACTERIZATION

The sources of MEC released into the marine environment at NOB Kodiak and the surrounding facilities by U.S. forces consist of CDA and AA gun batteries, AA training centers (AATCs), supply transfer points, air combat units of the Eleventh Army Air Corps, and air units and ships attached to the Seventeenth Naval District.

Detailed records of training exercises, which are part of the operational records, were not required to be retained for the historical archives (Knechtmann 2012). Therefore, details of training exercises typically do not exist in the archived records. In rare instances, training exercise records may exist in the archive record if they were provided by a private individual (Knechtmann 2012). During the archived records search conducted in the summer of 2012, "plans of the day" for Kodiak were located in the Anchorage NARA. These plans of the day typically included firing notices that specified the type and location of guns to be fired that day and the ranging information.

2.5.1 Source Descriptions

Information reviewed for this PA report identified the following U.S. CDA and AA gun batteries in the vicinity of Kodiak Island (NARA II, NARA Anchorage, and NARA Seattle):

- Battery No. 1 located at Saint Peters Head, Fort J.H. Smith, Cape Chiniak:
  - Two-gun 8-inch CDA battery (403)
  - Two-gun 40-mm AA battery
  - Two .50-caliber machine guns
  - Two .30-caliber machine guns

- Battery No. 2 located at Chiniak Point, Fort J.H. Smith, Cape Chiniak:
  - Four-gun 155-mm CDA battery (F 42-5)
  - Two .50-caliber machine guns

- Battery No. 3 located on Buskin Hill, Fort Greely, Kodiak Island:
  - Four-gun 155-mm CDA battery (F 42-6) of the 250th Coastal Artillery Battalion
  - Two .50-caliber machine guns
- Battery No. 4 located at Deer Point, Fort Tidball, Long Island:
  - Four-gun 155-mm CDA battery (F 42-4) of the 250th Coastal Artillery Battalion
  - Two .50-caliber machine guns
- Battery No. 5 located at Castle Bluff, Fort Tidball, Long Island:
  - Two-gun 6-inch CDA battery (296)
  - Two-gun 40-mm AA battery
  - Two .50-caliber machine guns
  - Two .30-caliber machine guns
- Battery No. 6 located at Fort Abercrombie, Miller Point:
  - Two-gun 8-inch CDA battery (404)
  - Two-gun 40-mm AA battery
  - Two .50-caliber machine guns
  - Two .30-caliber machine guns
- Battery No. 7 located on Puffin Island:
  - Four-gun 90-mm anti-motor-torpedo boat (AMTB)
  - Two-gun 40-mm AA battery
  - Four .50-caliber machine guns
- Battery No. 8 located at Spruce Cape:
  - Four-gun 90-mm AMTB
  - Two-gun 40-mm AA battery
  - Two .50-caliber machine guns
- A 6-inch naval artillery battery located on Artillery Hill
- Twelve AA batteries identified in the vicinity of the seaplane base at Womens Bay that consisted of approximately four 40-mm and thirty-five 20-mm guns

- Fifty-two .30-caliber machine guns located at 26 coastal searchlight installations (two at each light)

Known locations of the U.S. gun batteries and searchlights are shown on Figure 2-3.

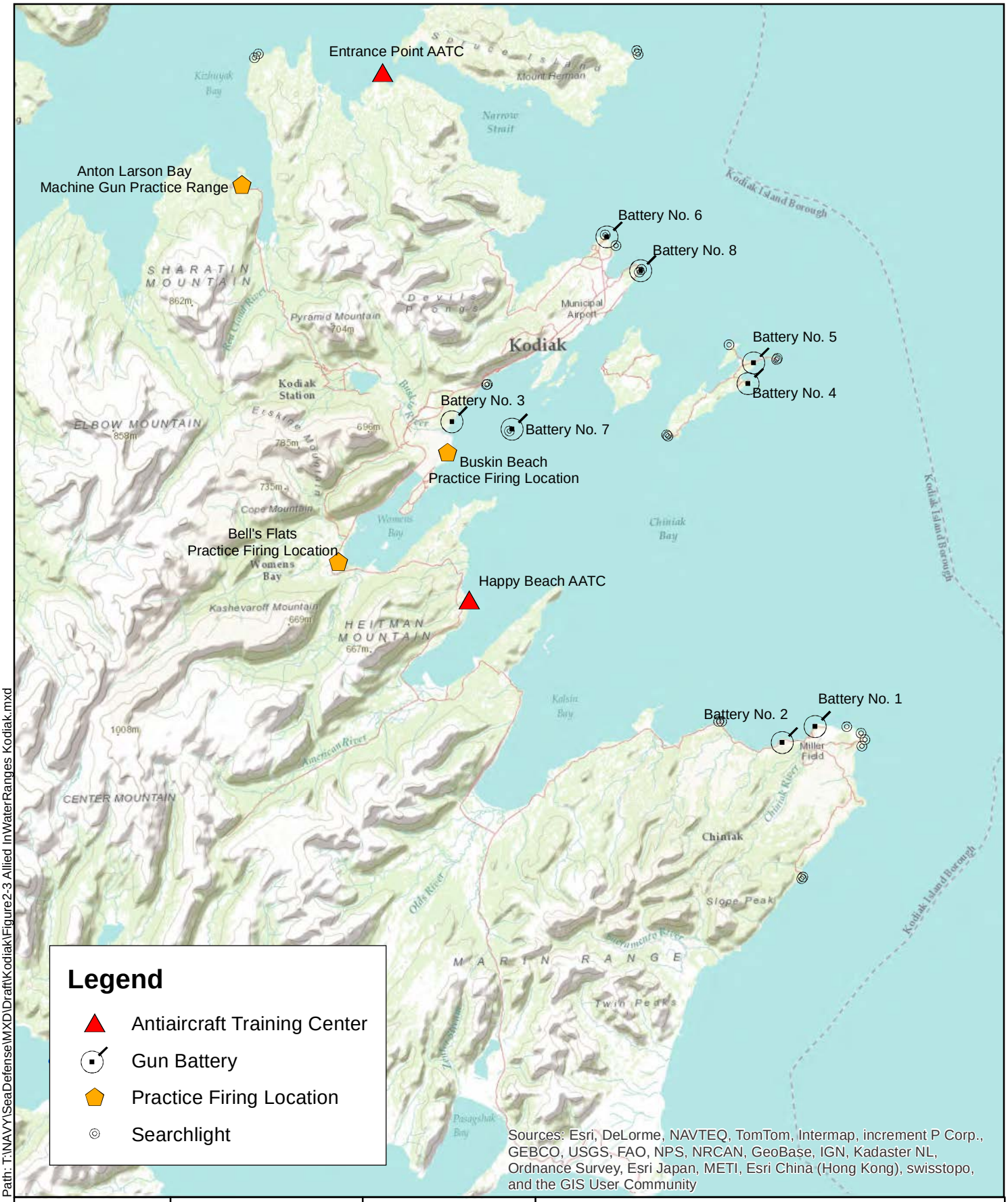
NOB Kodiak contained two AATCs where active firing occurred, one located at Entrance Point at the western entrance to Narrow Strait and a second at Happy Beach located between Womens Bay and Middle Bay. Firing at the Entrance Point AATC was directed from locations on a local topographic high with a stated danger area extending 6,000 yards into Marmot Bay between 315 and 000 degrees (Plan of the Day NOB Kodiak, September 30, 1943). Firing at the Happy Beach AATC was directed from the near beach area into Chiniak Bay, with a presumed danger area also extending 6,000 yards seaward between Spruce Cape and Humpback Rock. The locations of these AATCs are shown on Figure 2-3.

Information obtained during document review indicated that during 1942, approximately 575 anti-ship mines were placed in Chiniak Bay in three distinct mine fields located as follows:

- Between Humpback Rock and Midway Point on Chiniak Peninsula
- Between the northeast point of Long Island and Humpback Rock
- Between Woody Island and Long Island

The former locations of these mine fields are shown on Figure 2-4. During subsequent mine sweeping operations conducted in 1943 and 1944, their mooring chains were cut and the mines floated to the surface. Once on the surface, the mines were shot with machine guns until they either exploded or sank (Ostlund 2012). A total of 262 of the original 575 mines were accounted for once mine clearing operations ended. Fifty-five percent of the mines originally placed in Chiniak Bay were not accounted for during this operation (USACE 2001).

Three positions at NOB Kodiak are designated as explosive anchorage areas on a chart map of the area (NOAA 2004). Area number 1 is located between Zaimka Island and Puffin Island; area number 2 is located approximately 1/3 mile southwest of Blodgett Island; and area number 3 is located approximately ¼ mile north of Mary Island in Womens Bay. Figure 2-4 shows the locations of these three designated explosive anchorages. These areas were used by U.S. forces during the war period to offload ammunition and high explosives from transport ships. These areas were established to protect shore-based facilities from damage caused by accidental detonation of explosives during off-loading activities. Ordnance was off loaded onto barges for transfer to shore. Once on shore, ordnance was distributed to gun batteries.



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Sea Area
Kodiak Island, Alaska

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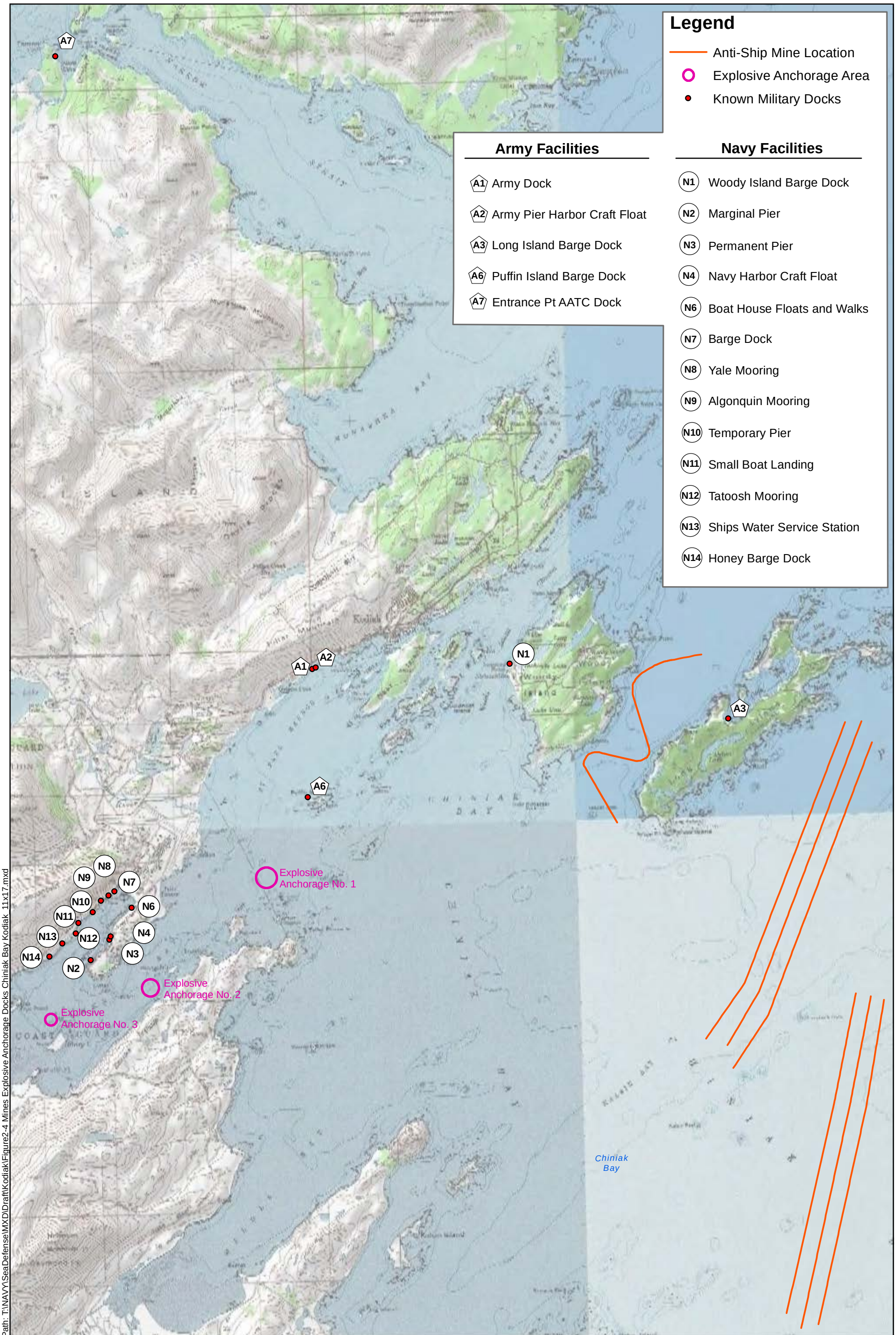
Scale In Miles

Figure 2-3
Known Locations of U.S. Gun Batteries and Antiaircraft Training Centers, Kodiak Island



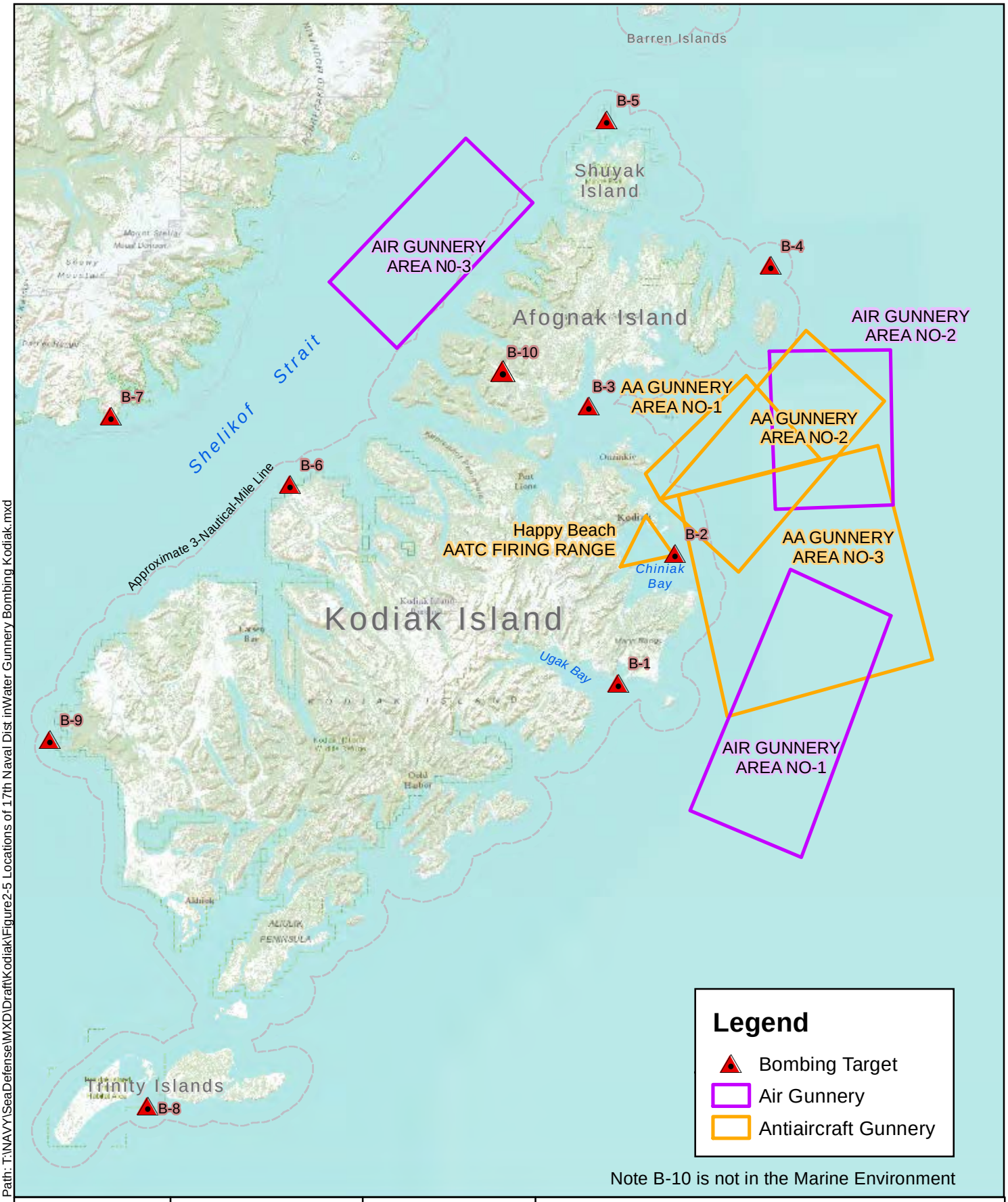
U.S. NAVY	Delivery Order 0040 Naval Defensive Sea Area Kodiak Island, Alaska	0 0.625 1.25 Scale In Miles	**Figure 2-4** **Location of Anti-Ship Mines, Explosive Anchorage Areas, and Known Military Docks Located in Chiniak Bay, Kodiak Island**

The Army maintained a main dock in Saint Paul Harbor, barge docks at Long Island (Fort Tidball), Chiniak (Fort J.H. Smith), Entrance Point, Baranof Cove, and Puffin Island. The Navy docks were clustered in Womens Bay. The locations of known docks are also shown on Figure 2-4. Location information for the Chiniak Dock and Baranof Cove Dock was not discovered during this PA. Occasionally, DMM were lost into the harbor during ordnance handling activities. Available information suggests that materials lost into the marine waters that did not present a danger or obstruction to shipping were not recovered. No record was found documenting the loss or recovery of MEC from the marine environment at these locations during this investigation.

Records indicate that during the 1940s, the Seventeenth Naval District established three air gunnery areas, three AA gunnery areas, and nine glide and dive bombing targets within the marine environment surrounding Kodiak Island (USACE 2001). These firing areas and bombing targets were used for training by air groups in the Kodiak Sector. The locations of the fixed gunnery areas, free gunnery areas, and bombing targets are shown on Figure 2-5.

The air gunnery areas were located approximately 7 to 25 miles southeast from Cape Chiniak (Area No. 1), approximately 15 to 35 miles east-northeast from Miller Point (Area No. 2), and in Shelikof Strait between Afognak Island and the Alaska Peninsula (Area No. 3). These air gunnery areas were used for aircraft bombing and strafing practice against towed targets. Two AA gunnery areas (No. 1 and No. 2) were located east-northeast from Miller Point and Long Island. A much larger AA gunnery area (No. 3) was located off Cape Chiniak. These three AA gunnery areas were used for ship-board AA training against towed targets. The glide and dive bombing targets were located as follows (Perry 1942 and McDade 1944):

1.	Long Island, Ugak Bay	57.4225943382 N	152.497916400 W
2.	Humpback Rock, Chiniak Bay	57.7075399573 N	152.250665014 W
3.	Stripe Rock, Marmot Bay	58.0432280860 N	152.594868281 W
4.	Sealion Rocks off Tonki Cape	58.3421585361 N	151.813364204 W
5.	Latax Rocks off Shuyak Island	58.6749760259 N	152.494529595 W
6.	Cape Ugat, Kodiak Island	57.8733640030 N	153.849342755 W
7.	Cape Ilktugitak, Alaska Peninsula	58.0237771390 N	154.600389523 W
8.	Dry Rock off Tugidak Island	56.4893779392 N	154.427848366 W
9.	Outer Seal Rock, Kodiak Island	57.3024355555 N	154.840656003 W



Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Figure2-5 Locations of 17th Naval Dist inWater Gunnery Bombing Kodiak.mxd

U.S. NAVY	Delivery Order 0040 Naval Defensive Sea Area Kodiak Island, Alaska	0 10 20 Scale In Miles	**Figure 2-5** **Location of Seventeenth Naval District in-Water Gunnery Areas and Bombing Targets in the Vicinity of Kodiak Island**

2.5.2 Historical Aerial Photo Evaluation

Aero-Data Corporation in Baton Rouge, Louisiana, performed an interpretation of aerial photography of selected areas of the Kodiak Island NDSA to assist in the evaluation of the in-water ranges. Their report is included as Appendix B. The time period of concern included the World War II era and post-war era. Aero-Data acquired aerial imagery, satellite imagery, maps, and oblique photographs from both public and private sources. The imagery and maps were registered to a common coordinate system and interpreted.

Several steps were performed to identify accurate locations of points in the aerial photographs. Vertical aerial photography and maps obtained for this study were georegistered. Photographs and maps were scanned to produce high-resolution digital images, which were placed into a stereoplotter to enable the user to accurately measure heights and distances. Finally, digital orthophotos of selected aerial photographs were created to remove most of the distortion caused by terrain displacement and tip and tilt in the mapping camera. As a result, each digital orthophoto accurately depicts the roads, buildings, and other significant features located within the sites in their true geographic position.

The photointerpretation identified several mooring points and docks where ships may have unloaded cargo. Many of the docks identified in the photointerpretation coincide with the docks identified in the historical military records, particularly in the Womens Bay area, and are shown on Figure 2-4. Additional docks identified in the photointerpretation near the city of Kodiak are believed to have been commercial and not military. There was no other record found to indicate that these docks near the city were used by the military. Similarly, the mooring points and a possible target buoy identified in the aerial photography do not appear to be locations where MEC is more likely present, because no corroborating record was found that ordnance handling or target practice occurred at these locations.

2.5.3 Evidence of Munitions and Explosives of Concern or Related Hazardous Substances in the Marine Environment

Historical records related to NOB Kodiak were reviewed to evaluate the magnitude of gun training exercises that occurred during war-time activities. This review discovered a partial set of Plan of the Day orders for NOB Kodiak. These orders identified nearly daily gunnery training exercises of one form or another on or surrounding Kodiak Island. Table 2-1 summarizes daily firing orders from discovered Plans of the Day for NOB Kodiak during 1943 where firing occurred over waters of the marine environment.

Table 2-1
Summary of Firing Orders from Available Plans of the Day for NOB Kodiak

Date	Official Orders for Plan of the Day
January 28, 1943	120-mm guns fired from positions east of the Navy Dispensary toward Saint Paul's reefs, from 0900 to 1600 hours
January 29, 1943	155-mm guns fired from Point Chiniak on an azimuth of 15°, ranging from 10,000 to 12,000 yards, from 1100 to 1500 hours
January 31, 1943	155-mm guns fired from Spruce Cape on an azimuth of 95°, range 12,000 yards, from 1100 to 1500 hours
February 3, 1943	155-mm guns fired from Buskin Hill on an azimuth of 135°, from 1000 to 1500 hours
	6-inch naval gun fired from Artillery Hill, ranging 10,000 yards, from 1000 to 1500 hours
	90-mm guns fired from Buskin Hill on an azimuth of 135°, from 1000 to 1500 hours
February 11, 1943	155-mm guns fired from Deer Point, Long Island on an azimuth of 115°, range 10,000 yards, from 1100 to 1500 hours
February 25, 1943	155-mm guns fired from Buskin Hill on an azimuth of 135°, range 10,000 yards, from 0930 to 1400 hours
March 1, 1943	All 20-mm AA guns fired two functional rounds from the guns between 1100 and 1200 hours
	155-mm guns fired from Deer Point, Long Island at a towed target in the refuge water area, range approximately 10,000 yards, from 1000 to 1400 hours
March 5, 1943	155-mm guns fired from Deer Point, Long Island at a towed target in the refuge water area, range approximately 10,000 yards, from 1000 to 1400 hours
March 6, 1943	The Army fired 155-mm guns at Cape Chiniak, on an azimuth of 130°, approximate range 10,000 yards, from 1100 to 1500 hours.
March 9, 1943	155-mm guns fired from Spruce Cape at a towed target in the Miller Water Area and from Buskin Hill in the direction of the Broadwater Area, range approximately 10,000 yards, from 0930 to 1700 hours
	6-inch naval gun fired from Artillery Hill in the direction of the Broadwater Area, range approximately 10,000 yards, from 0930 to 1700 hour
	90-mm guns fired from Buskin Hill at a towed target, the direction of fire towards the Broadwater Area, range approximately 5,000 yards, from 0930 to 1700 hours
March 10, 1943	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay, direction of fire towards the sea, from 0800 to 1700 hours
March 12, 1943	The Army fired 155-mm guns at a towed target from positions on Buskin Hill, direction of fire to the eastward, approximate range 10,000 yards, time 0930 hours.
March 16, 1943	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay, from 0800 to 1700 hours
	155-mm guns fired at towed target from positions on Buskin Hill, direction of fire towards Broadwater Area, range about 10,000 yards, from 1300 to 1700 hours

Table 2-1 (Continued)
Summary of Firing Orders from Available Plans of the Day for NOB Kodiak

Date	Official Orders for Plan of the Day
March 21, 1943	The entire base was placed under notice of the potential for a Practice Air Raid Alert.
	At some time during the alert a tow plane made runs between Nyman's Peninsula and Kodiak and between Buskin Lake and Hangar #3.
	All guns of shore batteries that could bear on the sleeve towed by this plane within the established safety zones fired at the sleeve when so directed
	The danger area included the sea area between Cliff Point and Popof Island.
March 23, 1943	155-mm guns fired from positions on Long Island at a towed target in a southeasterly direction from 1000 to 1500 hours
	3-inch guns fired from positions on Long Island at a towed target, one gun in an easterly direction and one gun in a southerly direction
March 24, 1943	Between 0600 and 0900 Sunday, March 28, 1943, strafing attacks for practice by friendly aircraft and actual AA firing by shore batteries at towed sleeves took place at NOB and Fort Greely, Kodiak, Alaska.
	The danger area included Saint Paul's Harbor to the northwest of a line connecting Popof Island and Cliff Point and northeast of a line connecting the tip of Nyman's Peninsula and Mary Island.
May 6, 1943	3-inch guns fired from positions on Bell's Flats on an azimuth of 1108 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	30-caliber machine guns fired at kite or balloon targets from positions on Happy Beach at Middle Bay from 0800 to 1200 hours
May 29, 1943	Weather permitting, 20-mm guns fired at Entrance Point every Wednesday afternoon and all day Thursday and Friday; Danger Area 315^{o} to 000^{o} at 6,000 yards
	3-inch guns fired a trial fire problem from positions on Buskin Beach on an azimuth of 1900 mils, range approximately 6,000 yards, from 0630 to 1700 hour
	50-caliber machine guns and 37-mm AA guns from positions on Deer Point on Fort Tidball from 0800 to 1700 hours
	50-caliber machine guns and 37-mm AA guns from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
July 5, 1943	20- and 40-mm guns test fired between the hours of 0900 and 1000
	3-inch and 90-mm guns fired a trial fire problem from positions on Buskin Beach on an azimuth of 1900 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	3-inch guns fired from positions on Buskin Beach at a towed target from 0800 to 1700 hours

Table 2-1 (Continued)
Summary of Firing Orders from Available Plans of the Day for NOB Kodiak

Date	Official Orders for Plan of the Day
July 6, 1943	20- and 40-mm guns test fired between the hours of 0900 and 1000
	3-inch and 90-mm guns fired a trial fire problem from positions on Buskin Beach on an azimuth of 1900 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	.50-caliber machine guns and 37-mm AA guns from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	155-mm guns fired from positions on Kalsin Bay Beach, azimuth from 150^{o} to 225^{o}, from 0800 to 1700 hours
July 13, 1943	20- and 40-mm guns test fired between the hours of 0900 and 1000 hours
	90-mm guns fired a trial fire problem from positions on Buskin Beach on an azimuth of 1900 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	.30-caliber machine guns fired at balloon targets in Anton Larson Bay area in a northeasterly direction from 0800 to 1700 hours
	90-mm guns, 37-mm guns, and 81-mm mortars fired from positions on Buskin Beach on an azimuth from 600 to 1800 mils, maximum range 6,000 yards
August 2, 1943	20- and 40-mm guns test fired between the hours of 0900 and 1000
	90-mm guns fired a trial fire problem from positions on Buskin Beach on an azimuth of 1900 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	.30-caliber machine guns fired at balloon targets in Anton Larson Bay area in a northeasterly direction from 0800 to 1700 hours
	90-mm guns, 37-mm AA guns, and 81-mm mortars fired from positions on Buskin Beach, azimuth from 800 to 1800 mils, maximum range 6,000 yards
August 24, 1943	20- and 40-mm guns test fired between the hours of 0900 and 1000
	90-mm guns fired a trial fire problem from positions on Buskin Beach on an azimuth of 1900 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	.30- and .50-caliber machine guns fired at stationary targets in Anton Larson Bay area in a northeasterly direction from 0800 to 1700 hours
	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	37-mm subcaliber fired from Buskin Beach, azimuth 1750 to 2350 mils, approximate range 3000 yards, from 0800 to 1730 hours

Table 2-1 (Continued)
Summary of Firing Orders from Available Plans of the Day for NOB Kodiak

Date	Official Orders for Plan of the Day
September 7, 1943	20- and 40-mm guns test fired between the hours of 0800 and 1000
	90-mm guns fired a trial fire problem from positions on Buskin Beach on an azimuth of 1900 mils, range approximately 6,000 yards, from 0800 to 1700 hours.
	.30- and .50-caliber machine guns fired at stationary targets in Anton Larson Bay area in a northeasterly direction from 0800 to 1700 hours
	50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	37-mm subcaliber fired from Buskin Beach, azimuth 1750 to 2350 mils, approximate range 3000 yards, from 0800 to 1730 hours
September 9, 1943	20- and 40-mm guns test fired between the hours of 0800 and 1000
	Weather permitting, 2-mm guns fired at Entrance Point every Wednesday afternoon, Thursday all day, and Saturday morning; Danger Area 315^{o} to 000^{o} at 6,000 yards
	90-mm guns fired from positions on Buskin Beach on an azimuth of 1750 to 2350 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	30-and .50-caliber machine guns fired at stationary targets in Anton Larson Bay area in a northeasterly direction from 0800 to 1700 hours
	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	.50-caliber machine guns fired from Spruce Cape at a towed sleeve target on an azimuth of 0 to 2800 mils, from 0800 to 1700 hours
	37-mm subcaliber fired from Buskin Beach, azimuth 1750 to 2350 mils, approximate range 3000 yards, from 0800 to 1730 hours
September 16, 1943	20- and 40-mm guns test fired between the hours of 0800 and 1000
	Weather permitting, 20-mm guns fired at Entrance Point every Wednesday afternoon, Thursday all day, and Saturday morning; Danger Area 315^{o} to 000^{o} at 6,000 yards
	90-mm guns fired from positions on Buskin Beach on an azimuth of 1750 to 2350 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	.30- and .50-caliber machine guns fired at stationary targets in Anton Larson Bay area in a northeasterly direction from 0800 to 1700 hours
	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	.50-caliber machine guns fired from Spruce Cape at a towed sleeve target on an azimuth of 0 to 2800 mils, from 0800 to 1700 hours

Table 2-1 (Continued)
Summary of Firing Orders from Available Plans of the Day for NOB Kodiak

Date	Official Orders for Plan of the Day
September 17, 1943	90-mm guns fired at waterborne targets from positions on Buskin Beach on an azimuth of 1750 to 2350 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	.30 and .50-caliber machine guns fired at stationary targets in Anton Larson Bay area in a northeasterly direction from 0800 to 1700 hours
	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	.50-caliber machine guns fired from Spruce Cape at a towed sleeve target on an azimuth of 0 to 2800 mils, from 0800 to 1700 hours
September 18, 1943	Weather permitting, 20-mm gun fired at Entrance Point every Wednesday afternoon, Thursday all day, and Saturday morning; Danger Area 315^{o} to 000o at 6,000 yards
	90-mm guns fired from positions on Buskin Beach on an azimuth of 1750 to 2350 mils, range approximately 6,000 yards, from 0800 to 1700 hours
	.30- and .50-caliber machine guns fired at stationary targets in Anton Larson Bay area in a northeasterly direction from 0800 to 1700 hours
	.50-caliber machine guns and 37-mm AA guns from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
September 27, 1943	20- and 40-mm guns test fired between the hours of 0800 and 1000
	90-mm guns fired at waterborne targets from positions on Buskin Beach on an azimuth of 1750 to 2450 mils from 1300 to 1630 hours
	.50-caliber machine guns and 37-mm AA guns from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
September 30, 1943	20- and 40-mm guns test fired between the hours of 0800 and 1000
	Weather permitting, 20-mm guns fired at Entrance Point every Wednesday afternoon, Thursday all day, and Saturday morning; Danger Area 315^{o} to 000^{o} at 6,000 yards
October 29, 1943	.50-caliber machine guns and 37-mm AA guns fired from positions on Happy Beach at Middle Bay from 0800 to 1700 hours
	.50-caliber machine guns fired at balloon targets at Anton Larson Bay from 0800 to 1700 hours
November 24, 1943	20- and 40-mm guns test fired between the hours of 0800 and 1000
	Weather permitting, 20-mm guns fired at Entrance Point every Wednesday afternoon, Thursday all day, and Saturday morning; Danger Area 315^{o} to 000^{o} at 6,000 yards
December 16, 1943	This established a two-week AA gunnery training school that consisted of one week of classroom training at Hangar No. 1 and one week of active firing from Happy Beach. The active training consisted of firing of 40-mm, 20-mm, and .50-caliber rounds at towed targets.

Figure 2-6 shows the projected impact areas for these 1943 gunnery training activities based upon the discovered information as described in the respective Plans of the Day.

During the records search at the Anchorage Museum Atwood Resource Center, an official Navy photograph was discovered showing a 650-pound Mk 29 depth bomb that was snagged by fisherman in a net off Kodiak Island in 1974. This photograph is reproduced as Figure 2-7. No information regarding the location where this bomb was snagged was provided with this record.

Fishers have also encountered MEC from the seafloor as recently as 2012. There is evidence of an "explosives dumping area" approximately 100 miles south of Kodiak Island. Because this evidence of MEC is beyond the NDSA boundary around Kodiak Island, additional information about this specific location is included in Appendix C.

2.5.4 Estimated Quantity of Munitions and Explosives of Concern

No reasonable estimate of the quantity of MEC in the marine waters of the NDSA surrounding Kodiak Island can be determined from the information reviewed for this PA.

Very little information regarding the quantity of ordnance used during a typical training exercise was discovered during the review of archive records. No record was found indicating the number of coastal artillery rounds (90 mm and larger) fired during training activities at NOB Kodiak. However, quarterly reports of AA firing were discovered for three consecutive quarters.

For the quarter ending December 31, 1943, the AATC at NOB Kodiak reported consuming the following quantity of ordnance:

- 40 mm: 284 rounds (776 for the calendar year)
- 20 mm: 910 rounds (3,640 for the calendar year)

For the quarter ending March 31, 1944, the AATC at NOB Kodiak reported consuming the following quantity of ordnance:

- 40 mm: 507 rounds
- 20 mm: 19,316 rounds
- .50 caliber: 1,000 rounds

For the quarter ending June 30, 1944, the AATC at NOB Kodiak reported consuming the following quantity of ordnance:

- 40 mm: 2,274 rounds (2,781 for the calendar year)
- 20 mm: 35,198 rounds (54,514 for the calendar year)
- .50 caliber: 5,000 rounds (6,000 for the calendar year)

Given the extensive coastal artillery and AA gun training conducted at NOB Kodiak, the presence of bombing targets within the Kodiak Island NDSA, the reported fact that 55 percent of the anti-ship mines originally placed in Chiniak Bay were not accounted for during this removal operations, the significant quantity of on-water ordnance handling that occurred in Chiniak Bay, the assumption that up to 30 percent of ordnance may not have detonated as intended, and the snagging of a 650-pound depth bomb in a fishing net in 1974, there is a good possibility that MEC exists in the marine waters of the NDSA surrounding the islands of the Kodiak Archipelago.

Entrance Point AATC

Anton Larson Bay
Machine Gun
Practice Range

Battery No. 6

Battery No. 8

Battery No. 5

Battery No. 4

Approximate 3-Nautical-Mile Line

Battery No. 3

Battery
No. 7

Buskin Beach
Practice Firing
Location

Bell's Flats
Practice Firing
Location

Happy Beach
AATC

Chiniak
Bay

Battery No. 1

Battery No. 2

Kodiak

Legend

- Practice Air Raid Danger Area
- Practice Firing Area
- Practice Firing Area/Towed Target
- Practice Impact Area
- AMTB Armament
- Antiaircraft Training Center
- Gun Battery
- Practice Firing Location
- Searchlight

U.S. NAVY

Delivery Order 0040
Naval Defensive
Sea Area
Kodiak Island, Alaska

0 1.25 2.5
Scale In Miles

Figure 2-6
Projected Impact Areas for 1943 Gunnery Training Activities, NOB Kodiak

Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Figure2-6 Projected Impact Areas for 1943 Gunnery Training Activities NOB Kodiak.mxd

33762079_02.ai

Source: Official Navy Photograph

U.S.NAVY

Figure 2-7
650-Pound Mk 29 Depth Bomb
Snagged in a Fishing Net Off Kodiak Island, 1974

Delivery Order 0040
Naval Defensive
Sea Area
Kodiak Island, Alaska

3.0 EXPOSURE PATHWAYS AND TARGETS

This section of the PA report discusses the release mechanisms and associated exposure pathways for MEC residing in the marine environment. This includes evaluation of the surface water migration pathway, the sediment exposure pathway, and target organisms that are potentially exposed to the hazards.

3.1 MARINE SETTING

The Kodiak Island NDSA includes the territorial waters between the extreme high-water marks and the 3-mile marine boundaries according to Executive Order 8717 (Appendix A). Typical maximum water depths in this area reach approximately 30 to 80 fathoms (180 to 480 feet).

These waters are adjacent to portions of the Alaskan Maritime National Wildlife Refuge (AMNWR), established on December 2, 1980, when the Alaska National Interest Lands Conservation Act was signed into law by President Jimmy Carter. This combined 11 previously established refuges, totaling about 3 million acres, dating back to the early 1990s with 1.9 additional acres. The AMNWR includes a portion of Kodiak Island and several smaller islands within the Kodiak Archipelago. The purpose of the AMNWR is "to conserve fish and wildlife populations and the marine resources upon which they rely" and provide "the opportunity for continued subsistence uses by local residents."

3.2 PHYSICAL RELEASES PATHWAY

As stated previously, releases of MEC into marine surface water results from the following activities:

- Ordnance fired over water from CDA guns and AA batteries during target training and gun function testing
- Ordnance dropped or fired at in-water targets, fixed or moving, from military aircraft during target training and gun function testing
- Ordnance lost into the water during transfer from transport ships to the shore, either at a fixed dock or at an explosive anchorage situated in the harbor away from shore installations

- Anti-ship mines that were sunk, not detonated, during harbor mine sweeping activities
- DMM deliberately disposed of into the marine environment at the conclusion of hostilities

Reviewed records and interviews suggest that the activities listed above may have released DMM or UXO into the marine surface waters of the Kodiak NDSA.

A number of complex factors affect the fate and transport of MCs released in the underwater environment. These factors include the nature of the delivery of the ordnance item to the underwater environment, its potential for corrosion, and associated release of MCs.

Underwater releases of MCs can occur when casings deteriorate, (most notably from corrosion), rupture upon impact, or undergo a low-order detonation. MCs may be released immediately after impact or may be only partially contained within the remains of the delivery system. When ordnance undergoes a low-order detonation or breaks apart upon impact, the MCs, such as bulk explosives, can be scattered over the impact area (USEPA 2003).

3.3 CHEMICAL RELEASE PATHWAY

Because MEC can remain relatively intact in the marine environment, MCs can be released through pinhole cracks that develop over time as a result of corrosion, or through the screw threads linking the fuse assembly to the main charge.

Corrosion of the iron and steel in casings is a complex process that occurs in the presence of water and oxygen. The potential corrosiveness of the local environment can vary greatly. The effects of immersion and corrosion on the release of MCs in various underwater environments depend on site conditions. Even though saltwater is potentially more corrosive the higher the salt saturation, exposure to oxygen is a key requirement for corrosive effects. In environments where wave action and tides cause mixing with the atmosphere (typical of the Aleutian Islands), the oxygen content of the water, especially shallow water, can create a high potential for oxidation (USEPA 2003).

A variety of factors in the underwater environment may either reduce the potential for corrosion, or affect the nature of the release from an ordnance item releasing MCs. At higher pH levels, if the right conditions are present (e.g., carbon dioxide saturation or temperature), submerged or buried metal may develop a coating of calcium carbonate, with a corresponding increase in corrosion resistance. In the absence of oxygen, such as the anaerobic conditions that can exist where there are large concentrations of unoxidized metals, high content of organic matter, or in

deeper, cold waters, corrosion in the underwater environment can be virtually stopped. It is also possible that submerged MEC can develop a coating consisting of biological materials (e.g., coral, barnacles, plants, etc.) that can seal the item off from the environment, as well as make it more difficult to locate (USEPA 2003).

Although no empirical evidence exists regarding the rate of corrosion or encrustation acting on MEC in the marine environment at Kodiak Island, a photograph was taken of an unexploded depth bomb that was snagged in a net by fishermen during 1974. The photograph shows very little corrosion and/or encrustation of this ordnance item after approximately 30 years in the marine environment (Figure 2-7).

3.4 HUMAN EXPOSURE TARGETS

Although portions of the Kodiak Archipelago are within the AMNWR, commercial fishing does occur in the surrounding waters of the associated NDSA. In 2000, Kodiak ranked as the number three commercial fishing port in the United States in terms of value of seafood landed. More than one-third of the jobs in Kodiak are directly involved in the commercial fishing industry. The Port of Kodiak is "homeport" to more than 700 commercial fishing vessels, including some of Alaska's largest trawl, long-line, and crab vessels. Kodiak also has an active seasonal tourist industry with approximately 30,000 persons visiting the island per year, approximately 76 percent arriving during the summer months (Kodiak Chamber of Commerce 2012). Kodiak Island also has hundreds of miles of isolated beaches where recreational activities occur, such as beachcombing, tide-pooling, and extreme surfing. Water activities such as surfing and swimming at Kodiak are not popular because of the frigid air and water temperatures. Air temperature generally falls between 25 to 60 degrees Fahrenheit with water temperatures of 31 to 58 degrees Fahrenheit (from winter to summer).

Human exposure to MEC could occur through accidental direct contact resulting from commercial fishing, anchoring in an area, direct contact as a result of recreational or commercial dives into the marine environment of the NDSA, or direct contact by recreational beach users.

The risks from MEC in the underwater environment are driven by two different effects: the physical explosive hazard associated with direct encounter with DMM or UXO and the environmental health hazard associated with the release of the MCs contained in MEC. As mentioned in Section 2.4.2, current Navy policy is to include sites in the Navy's MRP where munitions releases in shallow water areas are known or suspected and for only those sites covered by water no deeper than 20 fathoms (120 feet) (U.S. Navy 2007), which is the approximate depth limit of recreational diving. Although MEC items may be located at depths

greater than 20 fathoms (120 feet), human and marine exposures at 20 fathoms (120 feet) or less are the primary exposures of concern in this report, based on the Navy's MRP policy.

During fishing operations, MEC items have been pulled up in fishing equipment at depths greater than 20 fathoms (120 feet). Although no fishers have recently encountered MEC within the NDSA at Kodiak Island, fishers in the Dutch Harbor Area pulled up MEC at depths greater than 20 fathoms as recently as 2012 and as described in Appendix C. Therefore, human exposure to MEC exists at depths greater than the 20-fathom (120-foot) limit specified in the Navy MRP.

The conceptual site model (CSM) of the Kodiak Island NDSA is presented as Figure 3-1. The populations of potential exposure to MEC are discussed in the following sections.

3.4.1 Recreational or Commercial Fishers

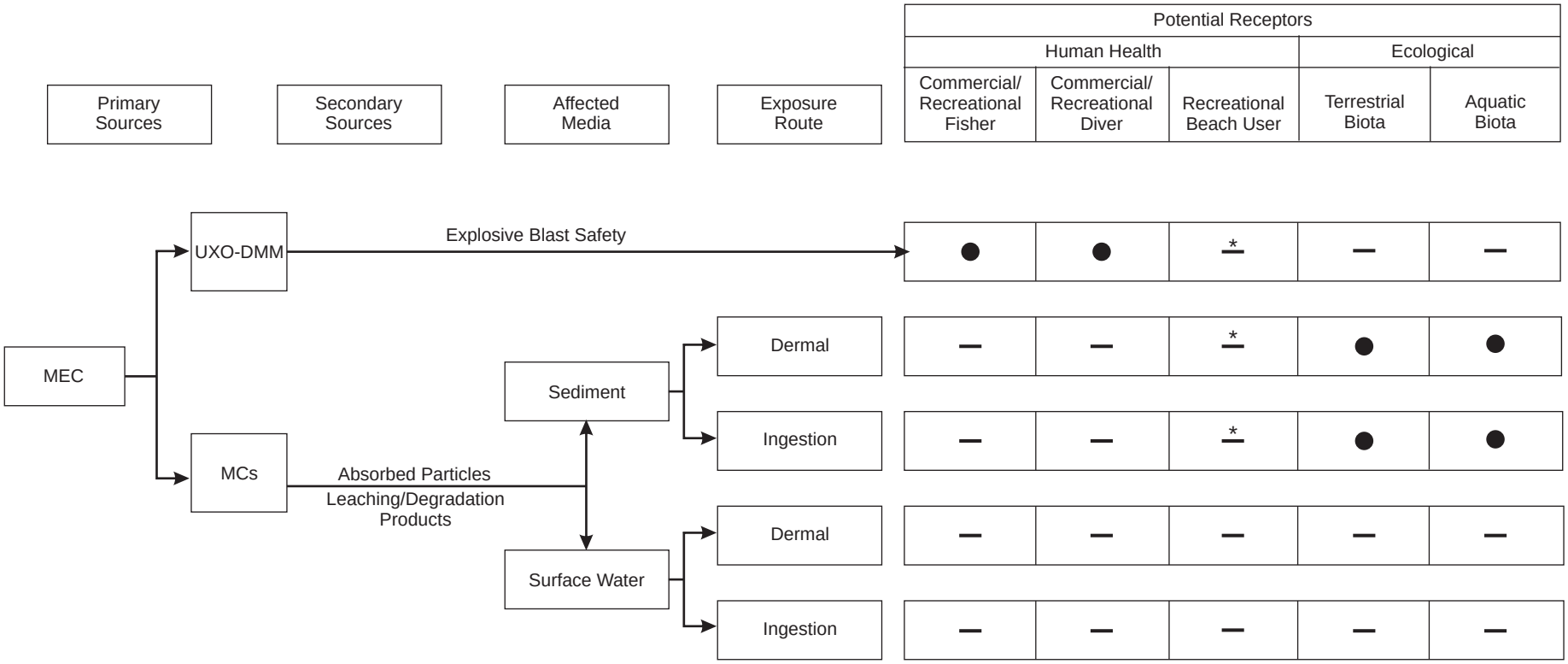
The physical explosive hazard is a completed pathway for fishers (recreational or commercial) who may accidently detonate DMM or UXO. Commercial fishers could potentially bring up MEC in their fishing nets, as reported in two articles which reported such an event in the Bering Sea near Dutch Harbor (Paulin 2012 and Rosenthal 2012a). In addition, a commercial vessel's anchor could potentially detonate or get caught on MEC on the seafloor. Therefore, potential physical explosive hazards for recreational or commercial fishers are considered complete and could potentially be significant.

In addition to the physical explosive hazards associated with DMM and UXO, there are also potential health hazards associated with exposure to the MCs released from ordnance items. However, because any release would be occurring into such an enormous volume of water that is subject to significant mixing by tidal movements and storms, the probability of fishers coming in direct contact with dangerous concentrations of MCs in the environment is remote. Therefore, this pathway is considered incomplete for recreational and commercial fishers.

3.4.2 Recreational or Commercial Divers

Recreational or commercial divers could come into direct contact with MEC during an underwater dive. Recreational or commercial divers will not typically dive deeper than 20 fathoms (120 feet). Divers could encounter MEC in these shallow waters. Therefore, the potential physical explosive hazard for recreational or commercial divers is considered complete.

As discussed above for fishers, potential health hazards associated with exposure to the MCs released from ordnance items would also be unlikely for recreational and commercial divers. The probability of divers coming in direct contact with MCs in the environment is remote. Therefore, this pathway is considered incomplete for recreational and commercial divers.



Legend

- ● Complete pathway
- — Incomplete pathway
- * Considered complete only if MEC are washed near or onto shoreline.
- MEC - munitions and explosives of concern
- DMM - discarded military munitions
- UXO - unexploded ordnance
- MCs - munitions constituents

U.S.NAVY

Figure 3-1
Conceptual Site Model

Delivery Order 040
Naval Defensive Sea Area
Kodiak Island, AK

3.4.3 Recreational Beach Users

Although MEC have washed ashore in the Aleutian Islands at other locations (BLM and USFWS 2006), there have been no reports of UXO or DMM being recovered along the shoreline of Kodiak Island. There was no documentation found during the records search that indicated MEC disposal in the shallow marine environment around Kodiak Island. Kodiak is a populated location, and in the absence of any reports of items washing up or being discovered on the beach, there is no evidence that this is a complete exposure pathway. Therefore, the physical explosive hazard and chemical hazard associated with MEC is considered an incomplete pathway for recreational beach users.

The main concerns regarding MCs in the NDSA at Kodiak Island are likely related to impacts to the marine environment, as discussed in the following section.

3.5 MARINE EXPOSURE TARGETS

Exposure to MEC in the surface water of the Kodiak NDSA is limited to mammals, birds, fish, and benthic creatures found in the marine environment. Marine mammals, birds, fish, and benthic creatures within the Kodiak Island NDSA could potentially have daily exposure to any MEC lost or discarded there. The risk to these creatures from detonation of the ordnance is remote. However, release of the constituents contained in the munitions could potentially impact the quality of the surface water and sediments and present a potential hazard to the marine environment. Direct exposure of munitions by marine receptors could occur when munitions are washed up during storm events or tidal action onto beaches or buried in sediment. Therefore, exposure to chemical constituents of the explosives within the ordnance can be considered a potentially complete pathway as the marine environment slowly corrodes the metal casings.

The major environmental concern associated with releases of MCs in the underwater environment is the impact to sediments. Sediments support biological communities that are food for marine life. The primary concerns include the following:

- The continued health of the biological community and its ability to support the ecosystem.
- Potential uptake of chemicals into the plants and sea life that ultimately form part of the food chain for people and marine life
- Chemical constituents of explosives that may be suspended in water and potentially available to marine life

Many MCs could be potentially toxic to aquatic organisms. However, the potential for aquatic toxicity is not completely understood because of the complexity of the marine environment. Aquatic toxicity is affected by the several factors that influence the fate and transport of the MCs and the dose exposure of the aquatic organism. MCs are often not detected in the marine environment because of a variety of factors that include advection, dispersion, diffusion, photolysis, plant uptake, and biotic transformation. There is also evidence that some of the common compounds of MCs, such as RDX, do not bioaccumulate in aquatic tissue (USEPA 2003). In contrast, some of the common metals of MCs, such as lead and mercury, may bioaccumulate in aquatic tissue. However, the effects of bioaccumulation depend on several factors: the concentrations of the chemicals (dose), the pathways by which receptors are exposed, the duration, and the sensitivity of the exposed populations.

Surface water in the immediate vicinity of a continuing source, such as constituents leaking from a cracked ordnance casing or a low-order detonation, may contain MCs in measurable quantities. The munitions compounds of interest include, but are not limited to, military explosive compounds such as trinitrotoluene (TNT), pentaerythriol tetranitrate, trinitramine (RDX), and cyclotetramethylene tetranitramine (HMX) as they occur in munitions, as well as any breakdown products. There are many factors affecting the fate and transport of these chemicals. TNT is more water soluble than RDX and HMX and is therefore more likely to be found in small concentrations in water. Since RDX and HMX have low water solubilities, they are more likely to be dispersed as small particles by currents to sediments (which may be uptaken by plants), or dispersed in the water column (which exposes the aquatic biota via ingestion or dermal contact).

MCs differ in how easily they bind to sediments. MCs not easily bound to sediments may act as a source of continuing release to water, or as a source for aquatic life uptake. Since TNT is more water soluble than RDX or HMX, it is less likely to bind to sediments and more likely to be immediately dissolved into water. However, TNT also tends to be more susceptible to photodegradation and biotransformation, particularly in shallow water. The process of biotransformation causes TNT's amino biotransformation products to bind to the humic acids in sediments more strongly than RDX or HMX. This tendency to bind to sediment can reduce the overall concentration of TNT's biotransformation products in water, in spite of their relatively higher water solubility compared to RDX and HMX.

Biouptake and bioaccumulation of MCs into the food chain via aquatic plants and other organisms that grow in sediments is not well understood. Research on phytoremediation has shown that plants can take up MCs such as TNT, RDX, and HMX, which will also undergo some biotransformation in the plants' tissues (USEPA 2003). Research has shown that TNT has very low bioacummulation potential (Yoo et al. 2006). RDX also has low bioconcentration potential in aquatic organisms (ATSDR 2012).

The MCs (including the most common ones, TNT, RDX, and HMX) are likely to present low ecological risk under expected exposure scenarios in the marine environment. Although there is not extensive research on the toxicological effects of munitions in the marine environment, a study in 2005 (Rosen and Lotufo) concluded that exposure to RDX did not cause toxicity in amphipods (invertebrate species). Furthermore, MCs typically undergo extensive transformation upon contact with marine sediment and have low potential for bioaccumulation in aquatic organisms. Therefore, the exposures of terrestrial and aquatic populations to MCs via sediment and surface water at Kodiak Island are considered complete yet insignificant.

4.0 SUMMARY AND CONCLUSIONS

This section presents a brief summary of the information presented in this PA report, as well as conclusions regarding the potential for exposure to MEC present in the marine environment by both human and marine targets species.

The stated objective of this project is to perform a review of activities related to the operations of in-water ranges located off Kodiak Island, Alaska. These operations include all activities that had the potential for release of ordnance into the marine environment that may pose a potential threat to human health or the environment.

4.1 IDENTIFIED SOURCES

The sources of MEC released into the marine environment of the Kodiak NDSA consists of CDA and AA gun batteries, two AATCs, on-water ordnance transfer operations, harbor mine removal operations, and air combat training by units of the Eleventh Army Air Corps and the Seventeenth Naval District. Locations identified by this PA where these actions occurred are shown on Plate 4-1 located in the back of this report. This plate also shows the ranges of CDA guns which are represented by the gray circles and arcs.

Information reviewed for this PA report identified U.S. CDA and AA gun batteries on Kodiak Island consisting of four 8-inch CDA guns, three 6-inch CDA guns, twelve 155-mm CDA guns, eight 90-mm AMTB guns, fourteen 40-mm AA guns, thirty-five 20-mm AA guns, eighteen .50-caliber machine guns associated with the gun batteries, and fifty-eight .30-caliber machine guns associated with the gun batteries and searchlight installations. The known locations of the U.S. gun batteries and searchlights are shown on Figure 2-3. The area covered by these gun batteries included a large expanse of ocean extending from Ugak Bay in the south, including all of Chiniak Bay, and all of Marmot Bay north of NOB Kodiak as shown on Plate 4-1.

Approximately 575 anti-ship mines were placed in Chiniak Bay in three distinct mine fields located between Humpback Rock and Midway Point on Chiniak Peninsula, the northeast point of Long Island and Humpback Rock, and Woody Island and Long Island as shown on Figure 2-4. Of the original 575 mines, 262 were accounted for once mine clearing operations ended.

Three areas within Womens Bay and Saint Paul Harbor were designated as explosive anchorages. These areas were used by U.S. forces to offload ammunition and high explosives from transport ships. Ordnance was off loaded onto barges for transfer to shore docks. The locations of the explosive anchorages and known docks are also shown on Figure 2-4.

Occasionally DMM were lost into the harbor during ordnance-handled operations. No record was found documenting the loss or recovery of DMM at these locations.

The Seventeenth Naval District established three air gunnery areas, three AA gunnery areas, and nine glide and dive bombing targets within the marine environment surrounding Kodiak Island (Figure 2-5). The three air gunnery areas and bombing targets were used for training by air groups in the Kodiak Sector, while the three AA gunnery areas were used for training by ship-board AA guns. As shown on Figure 2-5, all but one of the nine glide and dive bombing targets in the marine environment are wholly located within the Kodiak NDSA.

Two AATCs were operated on Kodiak Island during World War II. One was located at Happy Beach where 40- and 20-mm guns fired northeast over Chiniak Bay, the second was located at Entrance Point where guns of unconfirmed size (probably 40 and 20 mm) fired north over Marmot Bay. Daily records from NOB Kodiak that were reviewed for this PA identified impact areas for gun training exercises conducted from these and other locations during 1943. These documented impact areas are shown on Figure 2-6.

4.2 EXPOSURE PATHWAYS

The three populations of potential human exposure to MEC are recreational or commercial fishers, recreational or commercial divers, and recreational beach users. The physical explosive hazard is a complete pathway for both fishers and divers (recreational or commercial) who may accidently detonate MEC. All exposures associated with the recreational beach user are considered incomplete unless MEC washes up on shore.

Commercial fishers have been known to bring MEC up in their fishing nets or attached to their traps. In addition, a vessel's anchor could potentially detonate or get caught on MEC on the seafloor. Therefore, potential physical explosive hazards for recreational or commercial fishers are considered complete and could potentially be significant.

Recreational or commercial divers will not usually descend deeper than a maximum of 20 fathoms (120 feet). MEC could be encountered in these shallow waters by a diver. Areas of particular concern are former explosive anchorages, along docks, documented gun training impact areas, former minefield areas, and bombing targets. Except for eight of the nine bombing targets and the dock and impact area associated with the Entrance Point AATC, these areas are located within Chiniak Bay. The potential pathway for a physical explosive hazard to a diver is considered complete in these areas.

The recreational beach user who may beachcomb or wade in tide-pools was also considered a potential population of concern for exposure to MEC. However, there is no evidence of

ordnance disposal in shallow water near the shoreline and no reports of MEC being found on the shoreline at Kodiak Island. Therefore, all exposures associated with the recreational beach user are considered incomplete unless MEC is washed ashore.

Exposure to MCs within the ordnance can be considered a potentially complete pathway as the marine environment slowly corrodes the metal casings. The major environmental concern associated with releases of MCs in the underwater environment is the impact to sediments. Sediments support biological communities that are the food for marine life. However, the MCs are likely to present low ecological risk under expected exposure scenarios in the marine environment. Therefore, the exposures of terrestrial and aquatic populations to MCs via sediment and surface water within the Kodiak Island NDSA are considered complete yet insignificant.

4.3 AREAS POTENTIALLY CONTAINING MEC IN THE MARINE ENVIRONMENT

Five areas within the Kodiak Island NDSA have been identified as potentially containing DMM, practice-fired UXO, practice-dropped UXO, or ordnance lost in the water during transfer. To be consistent with the Navy MRP, each of these areas contain known or suspected munitions releases that occurred prior to September 30, 2002, where Navy actions were responsible for the release and the site is not covered by water deeper than 20 fathoms (120 feet). The specific areas are defined as follows:

- The areas surrounding the nine glide and dive bombing targets established by the Seventeenth Naval district and identified as B-1 through B-9 (Figure 4-1)
- The area associated with the Entrance Point AATC range fan as shown on Figure 4-2)
- The portion of Chiniak Bay west of the southern point of Woody Island, including Saint Paul Harbor, Womens Bay, and Happy Beach as shown on Figure 4-3: This area was heavily used as a target impact area during gun and AA training activities conducted during 1943, contains three marked explosive anchorages, and numerous known docks.

- The portion of Chiniak Bay north of Cliff Point and east of the southern point of Woody Island as shown on Figure 4-4: This area includes known anti-ship mine fields in the vicinity of Long Island and potential towed-target impact areas identified for gun training activities conducted during 1943.

- The portion of Chiniak Bay south of Cliff Point and east of the southern point Woody Island as shown on Figure 4-5: This area includes the Humpback Rock glide and dive bombing target and a known anti-ship mine field located between Humpback Rock and Cape Chiniak.

The Navy MRP does not address MEC that is in water greater than 20 fathoms (120 feet). However, because fishers can encounter MEC at depths greater than 20 fathoms (120 feet), recommendations that follow will address potential exposure to MEC in areas deeper than 20 fathoms to protect fishers from potential interactions with MEC.

4.4 RECOMMENDATIONS

Based on this preliminary assessment of the NDSA of Kodiak Island, the Navy recommends the following:

1. The Navy will perform a Site Inspection within the areas defined above where the water depth is less than 20 fathoms (120 feet). Because of the large size of the areas described above, in-water survey efforts should concentrate on portions of those areas where there appears to be a greater probability of finding MEC, based on historical information discovered during the record review. Those areas include the following:

    - Entrance Point AATC range fan (Figure 4-2)

    - Happy Beach AATC range fan (Figure 4-3)

    - Portions of Chiniak Bay, that were heavily used as gun training target impact areas (Figure 4-3)

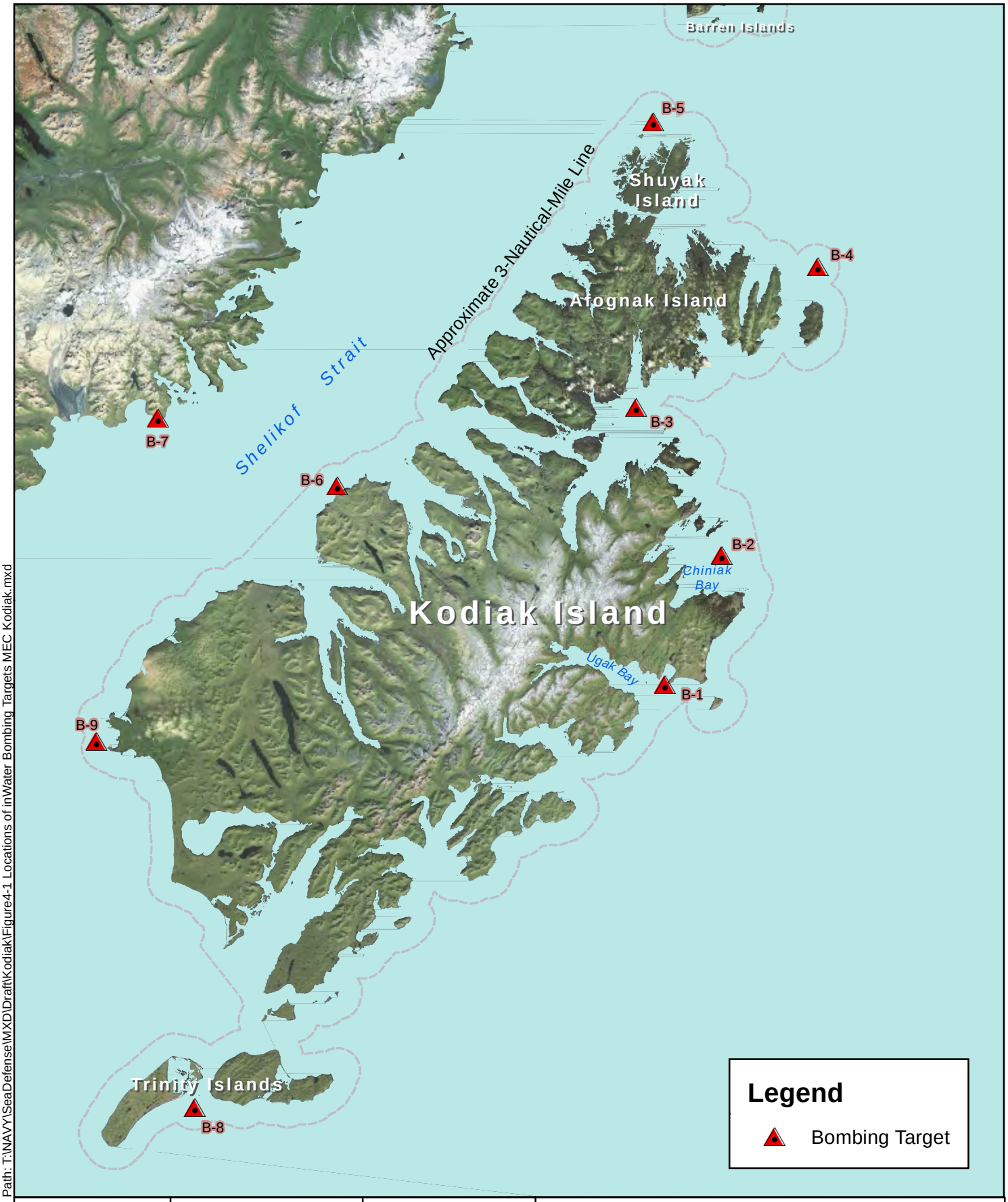
    - The three marked explosive anchorages (Figure 4-3)

    - Areas surrounding known military docks (Figures 4-2, 4-3, and 4-4)

- Areas where known anti-ship mine fields were located (Figures 4-4 and 4-5)

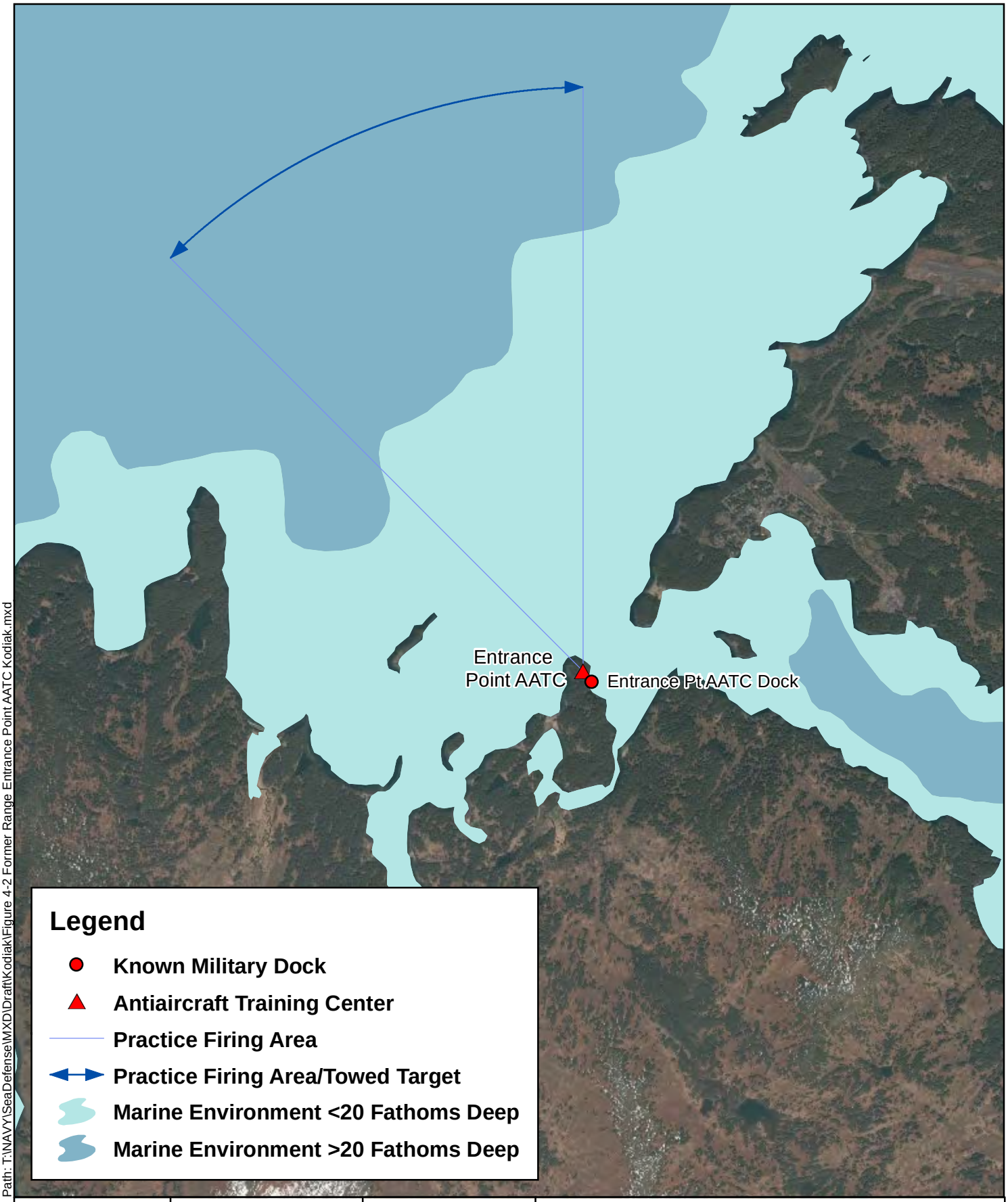
- The area surrounding the Humpback Rock glide and dive bombing target (Figure 4-5): Because of their remote and unprotected locations, site inspections are not recommended for the eight remaining glide and dive bombing targets identified in the Kodiak NDSA.

2. The Navy will perform a non-time-critical removal action (NTCRA) to initiate a Notice to Mariners and an information advisory to increase awareness of the presence of MEC in the area. The Navy will request that the National Oceanic and Atmospheric Administration include a Notice to Mariners on navigational charts for Kodiak Island. The warning will notify fishers and divers to be extremely careful when within the NDSA for Kodiak Island because MEC exist in the waters around Kodiak Island. In 2013 the Navy intends to distribute copies of an educational fact sheet titled *3Rs Explosives Safety Guide, Maritime Industry* (U.S. Army Technical Center for Explosives Safety 2010) to fishers in the main fishing ports in the Aleutians, which include Dutch Harbor and Kodiak areas. The colored 12-page fact sheet informs readers of the dangers of encountering munitions from the seafloor and promotes safety by following the "3Rs" of explosives safety: recognize, retreat, and report. A copy of this fact sheet is included in Appendix D.



Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Figure4-1 Locations of inWater Bombing Targets MEC Kodiak.mxd

U.S. NAVY	Delivery Order 0040 Naval Defensive Sea Area Kodiak Island, Alaska	0 10 20 Scale In Miles	**Figure 4-1** **Location of in-Water Bombing Targets Potentially Containing MEC in the Vicinity of Kodiak Island**



Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Figure 4-2 Former Range Entrance Point AATC Kodiak.mxd

U.S. NAVY

Delivery Order 0040
Naval Defensive
Sea Area
Kodiak Island, Alaska

0 2,000 4,000
Scale In Feet

Figure 4-2
Former Range Area Potentially Containing MEC Off the Entrance Point AATC, Kodiak Island

Kodiak Island
Woody Island
Woody Island Channel
Dog Bay
Saint Paul Harbor
Battery No. 3
Battery No. 7
Buskin Beach Practice Firing Location
Explosives Anchorage No. 1
Chiniak Bay
Cliff Point
Explosives Anchorage No. 3
Womens Bay
Explosives Anchorage No. 2
Bell's Flats Practice Firing Location
Happy Beach AATC
Broad Point
Middle Bay
A1
A2
A6
N1
N2
N3
N4
N6
N7
N8
N9
N10
N11
N12
N13
N14

Legend

- Antiaircraft Training Center
- Gun Battery
- Practice Firing Location
- Practice Impact Area
- Searchlight
- Known Military Docks
- Practice Air Raid Danger Area
- Practice Firing Area
- Practice Firing Area/Towed Target
- Explosive Anchorage Area
- Marine Environment <20 Fathoms Deep
- Marine Environment >20 Fathoms Deep

Army Facilities

- A1 Army Dock
- A2 Army Pier Harbor Craft Float
- A3 Long Island Barge Dock
- A6 Puffin Island Barge Dock

Navy Facilities

- N1 Woody Island Barge Dock
- N2 Marginal Pier
- N3 Permanent Pier
- N4 Navy Harbor Craft Float
- N6 Boat House Floats and Walks
- N7 Barge Dock
- N8 Yale Mooring
- N9 Algonquin Mooring
- N10 Temporary Pier
- N11 Small Boat Landing
- N12 Tatoosh Mooring
- N13 Ships Water Service Station
- N14 Honey Barge Dock

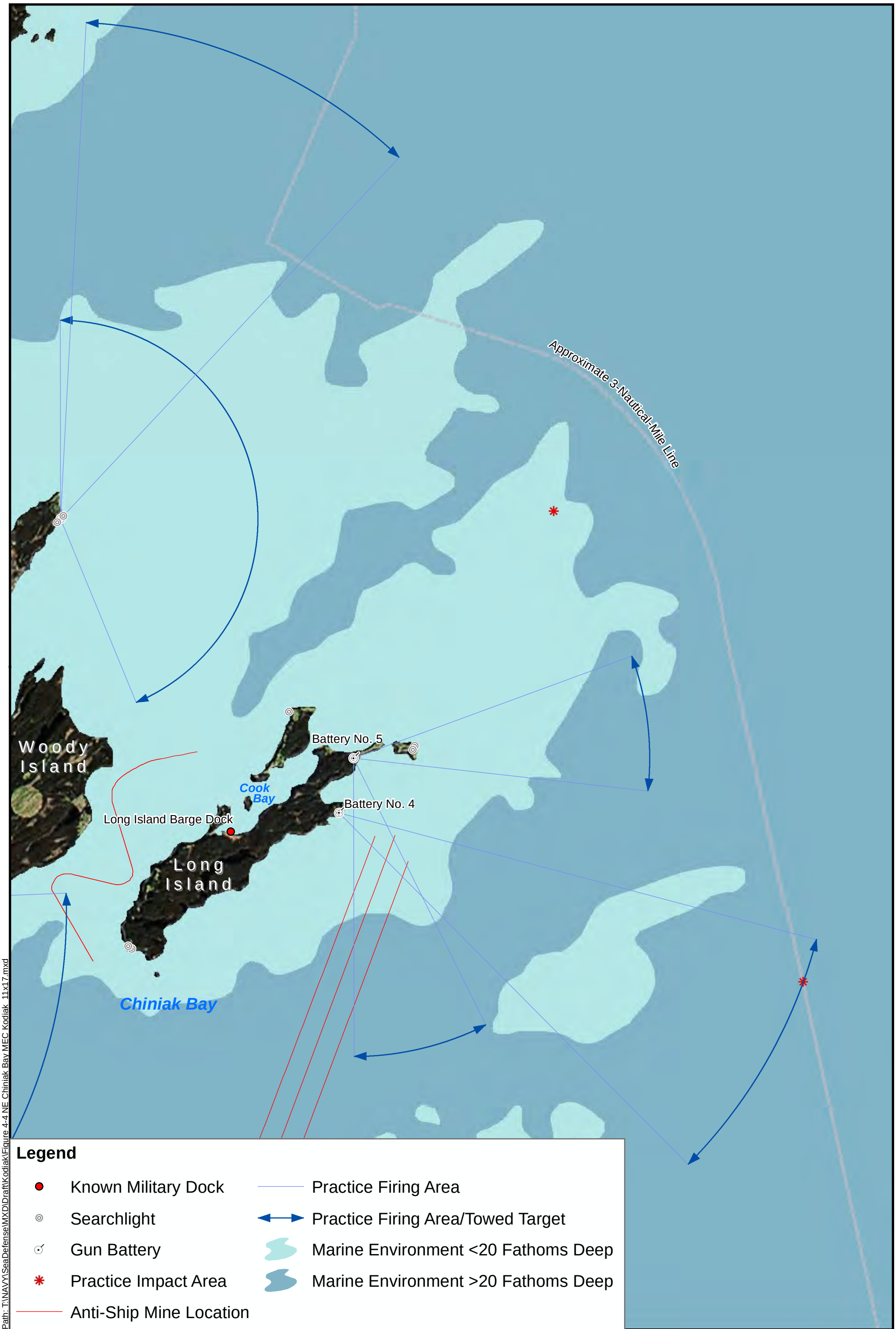
Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Figure4-3 NW Chiniak Bay St Paul Harbor Womens Bay MEC Kodiak 11x17.mxd

U.S. NAVY

Delivery Order 0040
Naval Defensive
Sea Area
Kodiak Island, Alaska

0 0.5 1
Scale In Miles

Figure 4-3
Locations in Northwestern Chiniak Bay, Saint Paul Harbor and Womens Bay Potentially Containing MEC, Kodiak Island



Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Figure 4-4 NE Chiniak Bay MEC Kodiak 11x17.mxd

U.S. NAVY	Delivery Order 0040 Naval Defensive Sea Area Kodiak Island, Alaska	0 0.5 1 Scale In Miles	**Figure 4-4** **Locations in Northeastern Chiniak Bay Potentially Containing MEC, Kodiak Island**

Long Island

Chiniak Bay

B-2

Approximate3-Nautical-Mile Line

Battery No. 1

Battery No. 2

Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Figure 4-5 SE Chiniak Bay MEC Kodiak_11x17.mxd

Legend

- Searchlight
- Gun Battery
- Practice Impact Area
- Anti-Ship Mine Location
- Practice Firing Area
- Practice Firing Area/Towed Target
- Glide/Dive Bombing Target
- Marine Environment <20 Fathoms Deep
- Marine Environment >20 Fathoms Deep

U.S. NAVY

Delivery Order 0040
Naval Defensive
Sea Area
Kodiak Island, Alaska

N

0 0.5 1

Scale In Miles

Figure 4-5
Locations in Southeastern Chiniak Bay Potentially Containing MEC, Kodiak Island

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APPENDIX A

Executive Order 871

EXECUTIVE ORDER 8717
ESTABLISHING KODIAK ISLAND NAVAL DEFENSIVE SEA AREA ALASKA

By virtue of the authority vested in me by the provisions of section 44 of the Criminal Code as amended (U.S.C., title 18, sec. 96), the territorial waters between extreme high-water mark and the three-mile marine boundary adjacent to the eastern portion of Kodiak Island, Alaska, in and about Women's Bay to the westward within a line bearing true north and south tangent to the eastern extremity of High Island, are hereby set apart and reserved as a naval defensive sea area for purposes of the national defense, such area to be known as "Kodiak Island Naval Defensive Sea Area".

At no time shall any vessel or other craft, other than public vessels of the United States, be navigated into Kodiak Island Naval Defensive Sea Area, unless authorized by the Secretary of the Navy.

The provisions of the preceding paragraph shall be enforced by the Secretary of the Navy, with the cooperation of the local law enforcement officers of the United States and of the Territory of Alaska; and the Secretary of the Navy is hereby authorized to prescribe such regulations as may be necessary to carry out such provisions.

Any person violating any of the provisions of this order shall be subject to the penalties provided by section 44 of the Criminal Code as amended (U.S.C ., title 18, sec. 96).

This order shall take effect ninety days after date hereof.

FRANKLIN D ROOSEVELT

THE WHITE HOUSE,

March 22, 1941.

APPENDIX B

Historical Aerial Photo Interpretation

STATEMENT OF OPINIONS
WAYNE M. GRIP
AERO-DATA CORPORATION
CONCERNING INTERPRETATION OF AERIAL PHOTOGRAPHS
OF KODIAK ISLAND NAVAL DEFENSIVE AREA

IN

THE ALEUTIAN ISLANDS, ALASKA

January 2013

Wayne M. Grip

Introduction
I was engaged to perform an historical aerial photography study of three areas within the Kodiak Island Naval Defensive Sea Area: Inner Harbor, Nyman Peninsula, and Midway Point. I was asked to obtain and interpret aerial photography primarily for the World War II time period.

Aerial Imagery and maps were acquired of these Sites from public sources. In addition, I obtained the USGS 1:63,360 topographic maps of Kodiak. The imagery and maps were registered to a common coordinate system and interpreted.

The primary purpose of this study was to use historical aerial photography to identify potential areas impacted by legacy ordnance activities.

Statement of Qualifications
My name is Wayne M. Grip. I have a BS degree in Geology from the University of Wisconsin, Madison. After I received my degree in Geology, I served as a cartographic officer in the US Air Force for four years from 1967 through 1971. In this position, I interpreted aerial photography and satellite imagery to produce air target charts (maps). Following my release from active duty, I worked for the Louisiana Department of Natural Resources (LADNR) for five years as a geologist. In this position, I flew photomissions and interpreted aerial photography to evaluate mining permit applications and to monitor oil and gas and mining operations. I also conducted many on-site inspections to determine the compliance of regulated facilities with environmental standards.

In 1982, I co-founded Aero-Data Corporation. I worked part-time for Aero-Data until 1985 when I left the LADNR and went full time with Aero-Data as its president. As of 2013, I have worked for Aero-Data for thirty years. I am currently the president and principal owner. Aero-Data specializes in aerial mapping and environmental studies using aerial photography and historical maps. I have over thirty-five years of professional experience in this field. I have served as an expert witness in the areas of photointerpretation, photogrammetry, and hydrology in both Federal and State courts in the United States. I am also an active licensed pilot with over 2,500 hours of flying time as pilot in command including over 1,000 hours of photomissions. In the past thirty years with Aero-Data Corporation, I have completed over 700 environmental site investigations in more than thirty states using historical aerial photography.

Information Considered
This report is based upon vertical stereoscopic aerial photography, oblique aerial photography, maps of the Site and my experience and training. Attachment A is a listing of the aerial photography and maps that I have relied upon.

Production of Geo-Registered Images and Maps
Following my standard procedures, I have produced geo-registered imagery of the vertical aerial photography obtained for this study. In addition, maps showing the boundary of the Sites and maps of other features were geo-registered to the aerial photography. The imagery and maps are included in the attachments to this report.

Methods and Materials

Aerial research and acquisition
The historical aerial photography study of the Sites began with research for available photo coverage from public and private vendors. Vertical and oblique imagery were acquired.

Because of the typically poor flying weather and remoteness of Kodiak Island, the availability of photography during the war years was very limited. Conventional aerial photography is normally taken of developed areas during clear weather with good visibility and lack of cloud cover. These conditions are very rare in the Aleutians.

The National Archives and Records Administration (NARA) catalog was researched using their Online Public Access (OPA) system. Through OPA, several record groups were identified as having possible photographic coverage. The record groups were as follows:

- RG 18 – Records of the Army Air Forces
- RG 23 – Records of the Coast and Geodetic Survey
- RG 37 – Records of the Hydrographic Office
- RG 80 – General Records of the Department of the Navy
- RG 373 – Records of the Defense Intelligence Agency

Aero-Data Corporation forwarded this information to Do You Graphics in Maryland, who performed onsite research at NARA to verify coverage. Upon completing their research, Do You Graphics sent Aero-Data Corporation the results of their findings. ***No stereoscopic aerial photographs from the requested World War II time period were found at NARA.***

After consulting with URS Group, Inc., Aero-Data Corporation ordered the following post-war NARA vertical stereoscopic aerial photographs**:**

- Kodiak Site 1 – Inner Harbor
    - 06/26/1947, 1:44,640, Black and White
    - 07/19/1947, 1:10,500, Black and White
- Kodiak Site 2 – Nyman Peninsula
    - 05/30/1947, 1:44,640, Black and White
    - 07/19/1947, 1:10,500, Black and White
- Kodiak Site 3 – Midway Point
    - 06/26/1947, 1:44,640, Black and White
    - 07/19/1947, 1:10,500, Black and White

Vertical stereoscopic aerial photography was obtained from the United States Geological Survey:

- Kodiak Site 1 – Inner Harbor
    - 07/03/1951, 1:42,000, Black and White
    - 08/18/1953, 1:6,538, Black and White
- Kodiak Site 2 – Nyman Peninsula
    - 07/03/1951, 1:42,000, Black and White
- Kodiak Site 3 – Midway Point
    - 8/14/1952, 1:42,000, Black and White

Additional photographic collections were reviewed, including the Alaska Digital Archives, which provides online access to the Alaska State Archives, Alaska State Library, Alaska State Museum and University of Alaska collections; the Library of Congress, the National Geodetic Survey; the Naval History and Heritage Command; the United States Department of Agriculture Aerial Photography Field Office; and the Alaska District of the United States Army Corps of Engineers. ***No stereoscopic aerial photography from World War II was available from these sources.***

Initial review and date verification
All imagery that was obtained was examined for proper geographic coverage of the Sites.

For the USGS stereoscopic imagery acquired, the date of the photomission was stamped by the provider directly on the edge of each individual frame. The date annotation was normally added to the film by the provider shortly after the film was developed. In recent years, the date annotation has been added to the film during the instant of image exposure. Date annotation on the image has been a common practice used in the aerial photo survey industry and military dating back to the 1920's.

The dates of the NARA, satellite and oblique photos were included in metadata and other documentation provided to us from the photo providers**.**

Scanning of Selected Photography
The aerial photographs from NARA and the USGS were purchased in the form of frames consisting of vertical stereoscopic photography in a 9" X 9" digital format. The NARA frames were scanned by Do You Graphics at a resolution of 16 microns. The USGS scanned the 1951 and 1952 frames at a resolution of 25 microns and the 1953 frames at a resolution of 14 microns. The scanned images are true reproductions of the original photography. They are not enhancements.

The oblique imagery was obtained in digital format**.**

Setting up the stereomodels
High resolution raster images for the USGS and NARA stereo dates of photography were then imported into a digital stereoplotter capable of providing stereoscopic viewing of the images at magnification levels ranging from 1x to 128x. The digital stereoplotter also allows precise mapping of significant environmental features, which are interpreted in the 3-D imagery.

Ground control (UTM Zone 5 NAD 83) was derived from the 8/11/2004 USGS orthophotos and the USGS 1:63,360 topographic map of the area. Distant mapped features, thousands of feet off the Sites but which were also visible in the aerial photography were measured (coordinates derived) from the satellite imagery and used as ground control points.

The coordinates of each selected visible ground control point were then entered into a control point file in the digital stereoplotter. The floating dot (measuring point) of the stereoplotter was carefully positioned by the operator with the hand controller, one point at a time, onto each of the visible control points and the coordinates of that point (from the ground control point file) were assigned to the image. When sufficient control points had been visited, accepted and the model checked for residual errors, the stereo model was then confirmed to be level, scaled and locked into the coordinate system. As a result, accurate measurements of heights and distances could now be made within the stereo model area by using the digital stereoplotter.

Digital Ortho Production
Next, using the stereomodels and digital stereoplotter, a digital orthophotos were produced of the USGS and NARA photography. A digital orthophoto is a two dimensional raster image produced from one or more frames of vertical aerial photography such that most of the distortion caused by terrain displacement and tip and tilt in the mapping camera has been removed, and the resulting raster image is accurately registered to a chosen coordinate system. As a result, each digital orthophoto accurately depicts the roads, buildings and other significant features located within the Sites in their true geographic position.

However, distortion caused by the height of buildings was not removed. As a result, the bases of these structures are displayed in their true position, while their tops may be displaced.

Digital orthophotos are widely accepted today by both government and industry as an improvement over the base maps and photomosaics previously used to show the locations of features within a geographic area. Digital orthophotos have the accuracy of a stereoplotter or land survey produced map with the resolution of a photograph. Digital orthophotomosaics are more accurate and easier to produce than photomosaics. Google Earth/ Google Maps are examples of software that uses digital orthophotos.

Photointerpretation

It is an accepted practice in photointerpretation to rely upon different types of information such as oblique aerial photography, ground photography, maps, ground surveys and site investigation studies in addition to vertical aerial photography and the interpreter's experience and training. This study relied primarily upon aerial photography, maps and my experience and training

Photointerpretation of the Sites was conducted on the digital stereoplotter using the same digital stereo models used to produce the digital orthophotos. The digital stereoplotter allowed me to view the Sites in 3-D on a stereo, 20" computer monitor or large computer projection screen, normally at magnification factors ranging from 8X to 32X while identifying and mapping the outlines of significant environmental features. I also reviewed the aerial photography in a time lapse format using a geographic information system containing the geo-registered orthophotos.

When necessary to map very small features, I could zoom to magnification factors as high as 128X. Generally speaking, zoom settings greater than 32X do not yield more detail, but they do help in carefully mapping small features.

The photointerpretation done with the digital stereoplotter captured all features in their true position. Each class of significant features mapped was recorded on a separate layer and color-coded. The vector files and images were then exported from the soft copy system to a personal computer for further use. The digital stereoplotter (soft copy) when used in this manner is an extremely powerful photointerpretation tool.

ArcGIS

The digital orthophotos with the interpretation overlays were next imported into ArcGIS. ArcGIS is a very popular geographic information system (GIS) produced by ESRI and sold throughout the world. For the purposes of this report, the interpreted images will be referred to as "mapped images".

The interpreted images, registered maps, oblique photography and ground photography located in the interpretations section of this report contain specific information which must be viewed by the reader in order to fully understand this report. The mapped images (Attachment B) constitute the primary source of information in this report. They were prepared so that they may be displayed using computer generated prints or a computer projection system running ArcGIS or PowerPoint software. ArcGIS provides a wide range of capabilities such as zooming, turning themes (layers) on and off and measuring distances.

Summary

I have mapped and identified a multitude of near shore mooring points and piers where ships may have been loaded and unloaded during the war within the Inner Harbor and Nyman Peninsula Study areas. These locations are depicted on the georegistered aerial photography and maps in this report. Due to their relatively small cross-section, the mooring points are only identifiable in the low altitude/higher resolution photography.

One possible target buoy/barge is identified on the south portion of the Inner Harbor Study area between Near Island and Rocky Islet. A larger mooring point with a barge attached is first identified on the 6/26/1947 imagery and continues to be visible through the 7/3/1951 imagery.

Although roads, pathways, and man-made activities are visible onshore in the Midway Point Study area, no mooring points or piers were visible offshore.

The reader should review my interpreted and mapped photography while reading this report as it conveys the majority of my findings in my report**.**

ATTACHMENT A - AERIAL PHOTOGRAPHS AND MAPS

SITE	DATE	SOURCE	TYPE	PHOTO RATIO OR ORTHOPHOTO RESOLUTION	ROLL	FRAMES	DESCRIPTION
Kodiak Site 1 Inner Harbor	1949 Minor Revisions 1979	USGS	MAP	1:63,360			"Kodiak (D-2)" Topographic Map
Kodiak Site 1 Inner Harbor	6/26/1947	NARA	BW	1:44,460	USN-VP61-KOD-7	119-121	Stereoscopic Aerial Photography.
Kodiak Site 1 Inner Harbor	7/19/1947	NARA	BW	1:10,500	USN-VP61-KOD-SP Roll 1	58-60, 129-130	Stereoscopic Aerial Photography.
Kodiak Site 1 Inner Harbor	7/3/1951	USGS	BW	1:42,000	2	51-53	Stereoscopic Aerial Photography.
Kodiak Site 1 Inner Harbor	8/18/1953	USGS	BW	1:6,538	17	64-73	Stereoscopic Aerial Photography.
Kodiak Site 1 Inner Harbor	8/11/2004	USGS	COLOR	1 meter		Orthophoto	Monoscopic Aerial Photography.
Kodiak Site 2 Nyman Peninsula	4/23/1942	NARA	MAP				Map of Naval Air Station
Kodiak Site 2 Nyman Peninsula	6/30/1944	NARA	MAP				Map of Naval Operating Base
Kodiak Site 2 Nyman Peninsula	1949 Minor Revisions 1979	USGS	MAP	1:63,360			"Kodiak (C-2)" Topographic Map
Kodiak Site 2 Nyman Peninsula	1949 Minor Revisions 1979	USGS	MAP	1:63,360			"Kodiak (D-2)" Topographic Map
Kodiak Site 2 Nyman Peninsula	Circa 1942	NARA	BW	Oblique			Oblique Aerial Photograph
Kodiak Site 2 Nyman Peninsula	5/30/1947	NARA	BW	1:44,460	USN-VP61-KOD-1	25-27, 49-51	Stereoscopic Aerial Photography.
Kodiak Site 2 Nyman Peninsula	7/19/1947	NARA	BW	1:10,500	USN-VP61-KOD-SP Rolls 8 and 9	8: 59-61, 9: 109-111	Stereoscopic Aerial Photography.
Kodiak Site 2 Nyman Peninsula	7/3/1951	USGS	BW	1:42,000	2	72-74	Stereoscopic Aerial Photography.
Kodiak Site 2 Nyman Peninsula	8/11/2004	USGS	COLOR	1 meter		Orthophoto	Monoscopic Aerial Photography.
Kodiak Site 3 Midway Point	1949 Minor Revision 1988	USGS	MAP	1:63,360			"Kodiak (C-1)" Topographic Map
Kodiak Site 3 Midway Point	1949 Minor Revisions 1979	USGS	MAP	1:63,360			"Kodiak (C-2)" Topographic Map
Kodiak Site 3 Midway Point	6/26/1947	NARA	BW	1:44,460	USN-VP61-KOD-7	53-54, 64-66	Stereoscopic Aerial Photography.
Kodiak Site 3 Midway Point	7/19/1947	NARA	BW	1:10,500	USN-VP61-KOD-SP Rolls 3, 7	3: 13-15,7: 85-86	Stereoscopic Aerial Photography.

ATTACHMENT A - AERIAL PHOTOGRAPHS AND MAPS

SITE	DATE	SOURCE	TYPE	PHOTO RATIO OR ORTHOPHOTO RESOLUTION	ROLL	FRAMES	DESCRIPTION
Kodiak Site 3 Midway Point	8/14/1952	USGS	BW	1:42,000	9	12-14, 53-55	Stereoscopic Aerial Photography.
Kodiak Site 3 Midway Point	8/11/2004	USGS	COLOR	1 meter		Orthophoto	Monoscopic Aerial Photography.

Attachment B

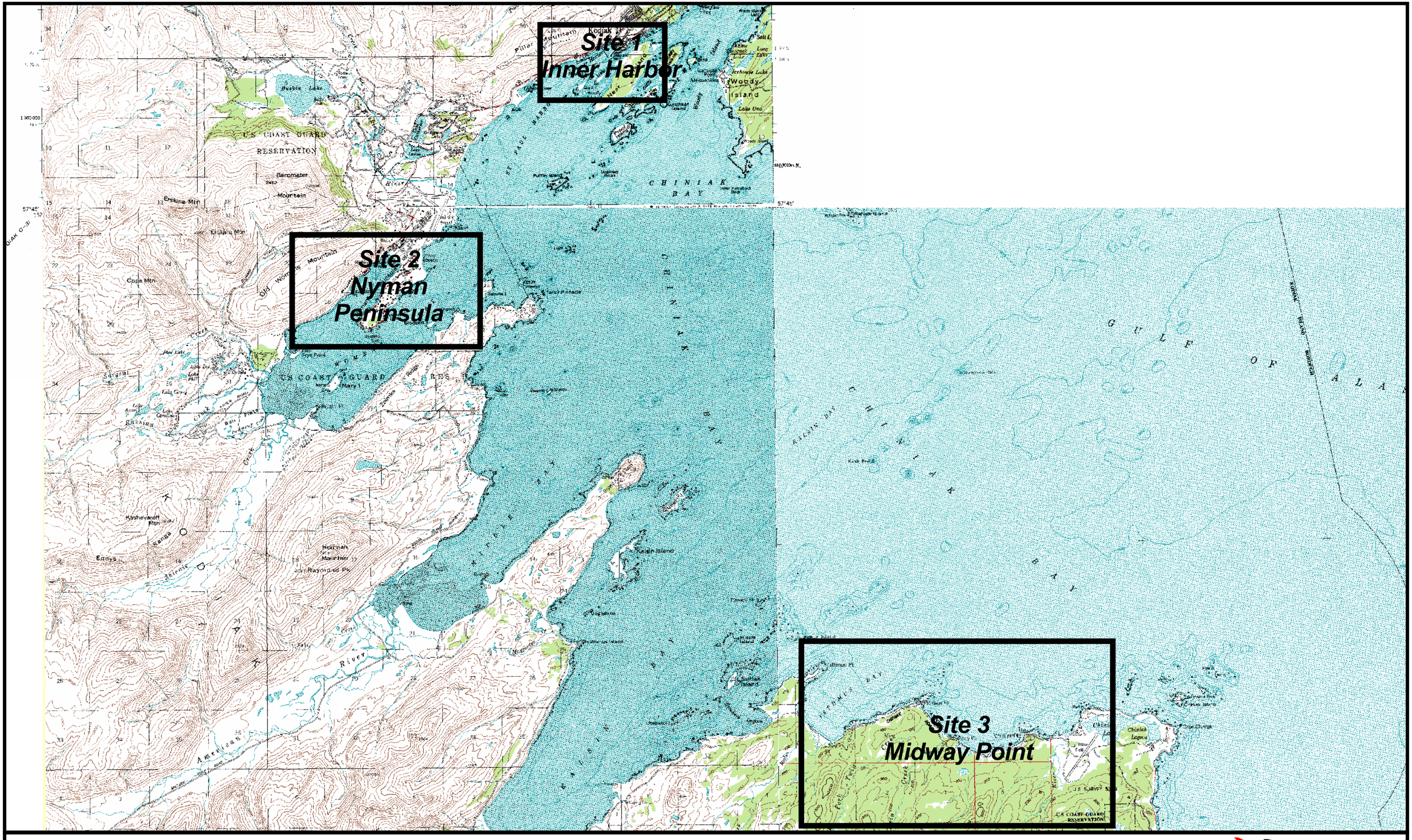

Exhibit 1 - Kodiak
Site Map

Image Source: USGS

N

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Environmental
Remote Sensing Consulting Services
Interpretation and Mapping
225.767.5725

533500 534000 534500 535000 535500 536000 536500

6405500

6405000

6404500

6404000

Mountain

Kodiak

500

Inner Harbor

Seaplane Base

Round I

Jski I

Gull I

Rocky Islet

Near Island

Near

Cove

Exhibit 2 - Kodiak Site 1
Inner Harbor
DRG

Film Source: USGS

900 0 900 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

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Exhibit 3 - Kodiak Site 1
Inner Harbor
6/26/1947

Image Source: NARA

534000 534500 535000 535500 536000 536500

900 0 900 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

- Possible Pier
- Mooring Point
- Approx. Ship/Boat Location

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533500 534000 534500 535000 535500 536000 536500

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Exhibit 4 - Kodiak Site 1
Inner Harbor
7/19/1947

Image Source: NARA

534000 534500 535000 535500 536000

900 0 900 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

- Possible Pier
- Mooring Point
- Approx. Ship/Boat Location

0

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533500 534000 534500 535000 535500 536000 536500

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Exhibit 5 - Kodiak Site 1
Inner Harbor
7/3/1951

Image Source: USGS

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900 0 900 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

- Possible Pier
- Mooring Point
- Approx. Ship/Boat Location

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Exhibit 6 - Kodiak Site 1
Inner Harbor
8/18/1953

Image Source: USGS

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900 0 900 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

- Possible Pier
- Mooring Point
- Approx. Ship/Boat Location

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Exhibit 7 - Kodiak Site 1
Inner Harbor
8/11/2004

Image Source: USGS

900 0 900 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

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225.767.5725

527000 527500 528000 528500 529000 529500 530000 530500 531000 531500

6400000 6399500 6399000 6398500 6398000 6397500

Mountain
1000
21
28
200
Military Seaplane Base
Peninsula
Ewe A
Finny Beach
Shannon Pt
Nyman
Peninsula Lake
B A Y
English
Blodgett I
100
Nyman Spit
Light

Exhibit 8 - Kodiak Site 2
Nyman Peninsula
DRG
Image Source: USGS

1000 0 1000 Feet
Tic Marks : UTM Zone 5N NAD83 Meters
N

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6400000 6399500 6399000 6398500 6398000 6397500

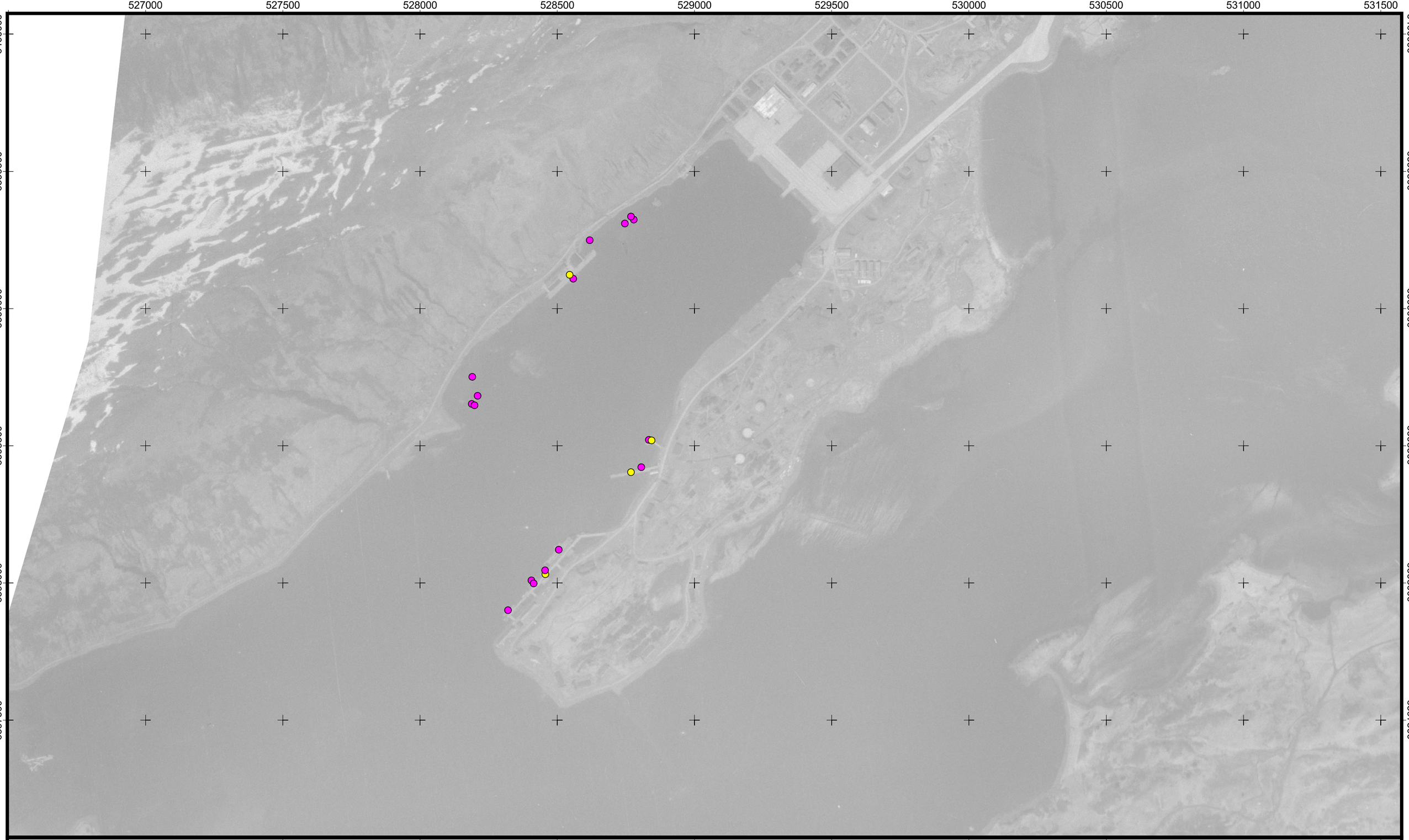

Exhibit 9 - Kodiak Site 2
Nyman Peninsula
5/30/1947

Image Source: NARA

527500 528000 528500 529000 529500 530000 530500 531500

1000 0 1000 Feet

Tic Marks : UTM Zone 5N NAD83 Meters

N

- Possible Pier
- Mooring Point
- Approx. Ship/Boat Location

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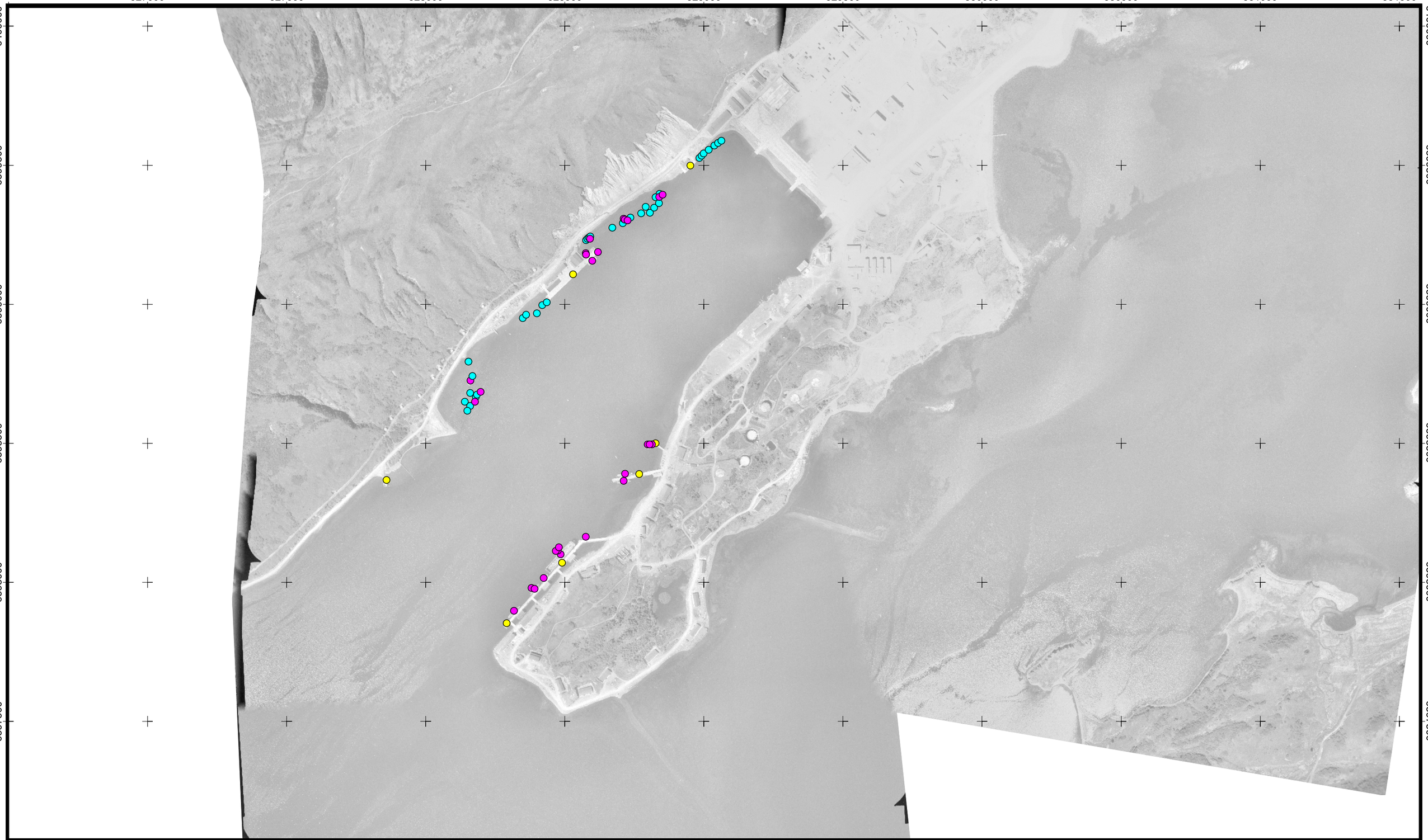

Exhibit 10 - Kodiak Site 2
Nyman Peninsula
7/19/1947
Image Source: NARA

527500 528000 528500 529000 529500 530000 530500 531500

1000 0 1000 Feet

Tic Marks : UTM Zone 5N NAD83 Meters

N

- Possible Pier
- Mooring Point
- Approx. Ship/Boat Location

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Exhibit 11 - Kodiak Site 2
Nyman Peninsula
7/3/1951

Image Source: USGS

527500 528000 528500 529000 529500 530000 530500 531500

1000 0 1000 Feet

Tic Marks : UTM Zone 5N NAD83 Meters

N

- Possible Pier
- Mooring Point
- Approx. Ship/Boat Location

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Exhibit 12 - Kodiak Site 2
Nyman Peninsula
8/11/2004

Film Source: USGS

527500 528000 528500 529000 529500 530000 530500 531500

1000 0 1000 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

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527000 527500 528000 528500 529000 529500 530000 530500 531000 531500

6400000 6399500 6399000 6398500 6398000 6397500

ENGLISH BAY

Exhibit 13 - Kodiak Site 2
Nyman Peninsula
6/30/1944

Map Source: NARA

527500 528000 528500 529000 529500 530000 530500 531500

1000 0 1000 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

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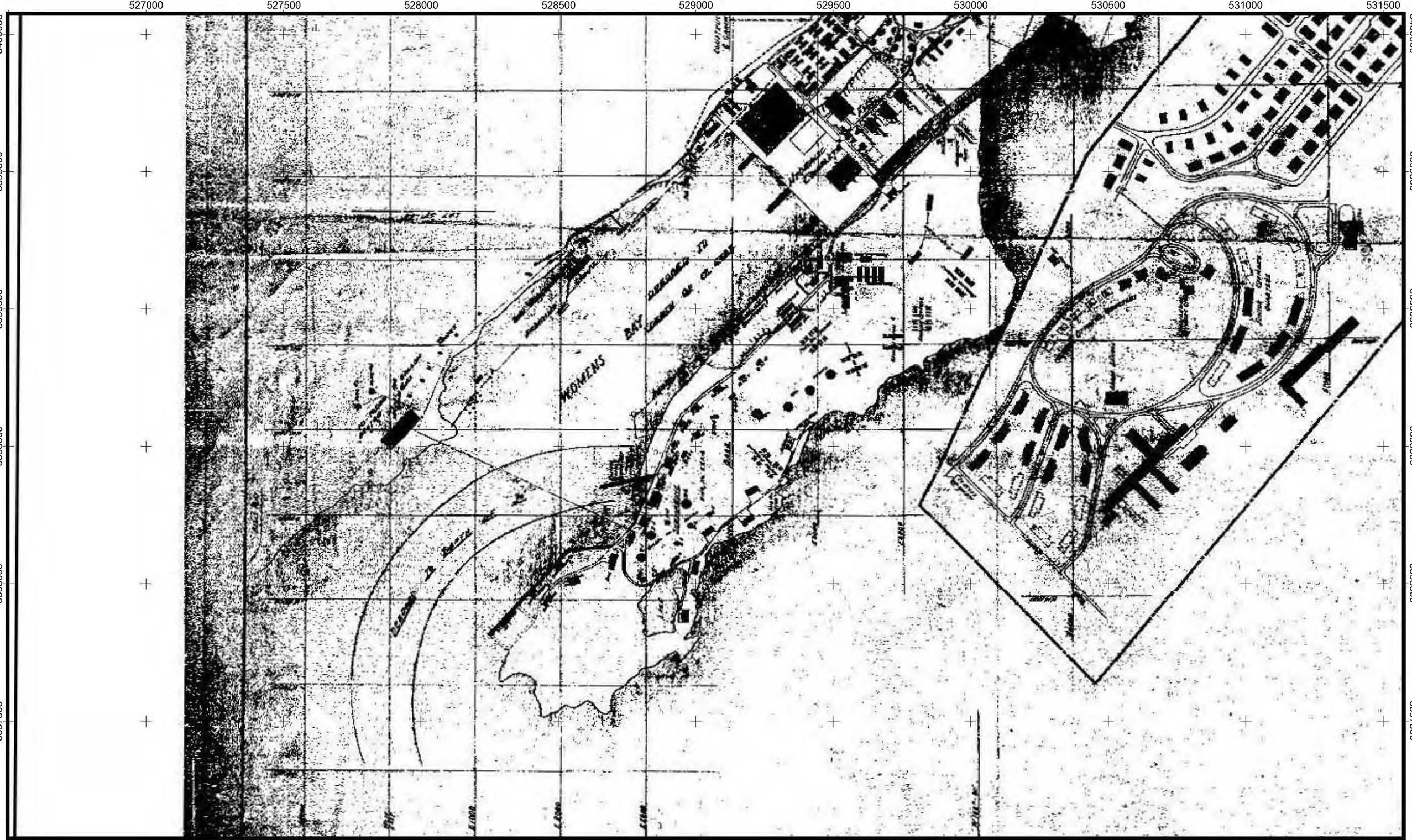

Exhibit 14 - Kodiak Site 2
Nyman Peninsula
4/23/1942
Map Source: NARA

1000 0 1000 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

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Circa 1942

Exhibit 15 - Kodiak Site 2
Nyman Peninsula
Circa 1942

Map Source: NARA

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541000 542000 543000 544000 545000 546000 547000 548000

6389000 6388000 6387000 6386000 6385000

Isthmus Pt
Is.
ISTHMUS BAY
Flex
Midway Pt
CHINIAK
ROAD
AMNWR
Pony Pt
Chiniak Pt
Mat
Red
Chinia
La
Miller
Field
Creek
Sawmill Lake
Twin
Fork
Twin Creek
River
U S SURVEY 57
U S COAST GUARD
RESERVATION
60
30
18
0
100
35
36
34
31
6
5
1
2
300
200
500
400

542000 543000 544000 545000 546000 547000

Exhibit 16 - Kodiak Site 3
Midway Point
DRG

Image Source: USGS

2000 0 2000 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

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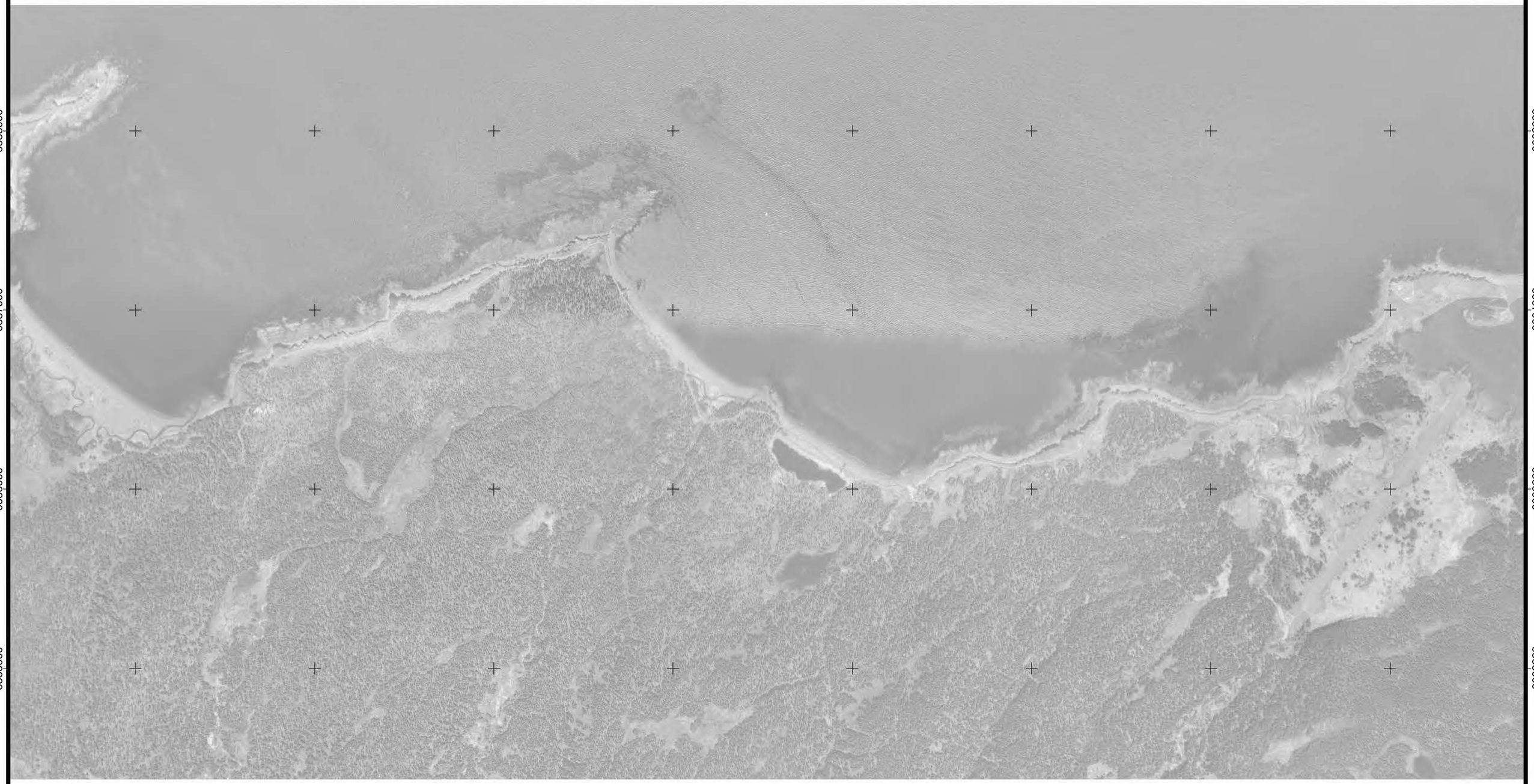

Exhibit 17 - Kodiak Site 3
Midway Point
6/26/1947

Image Source: NARA

542000 543000 544000 545000 546000 547000

2000 0 2000 Feet

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Tic Marks : UTM Zone 5N NAD83 Meters

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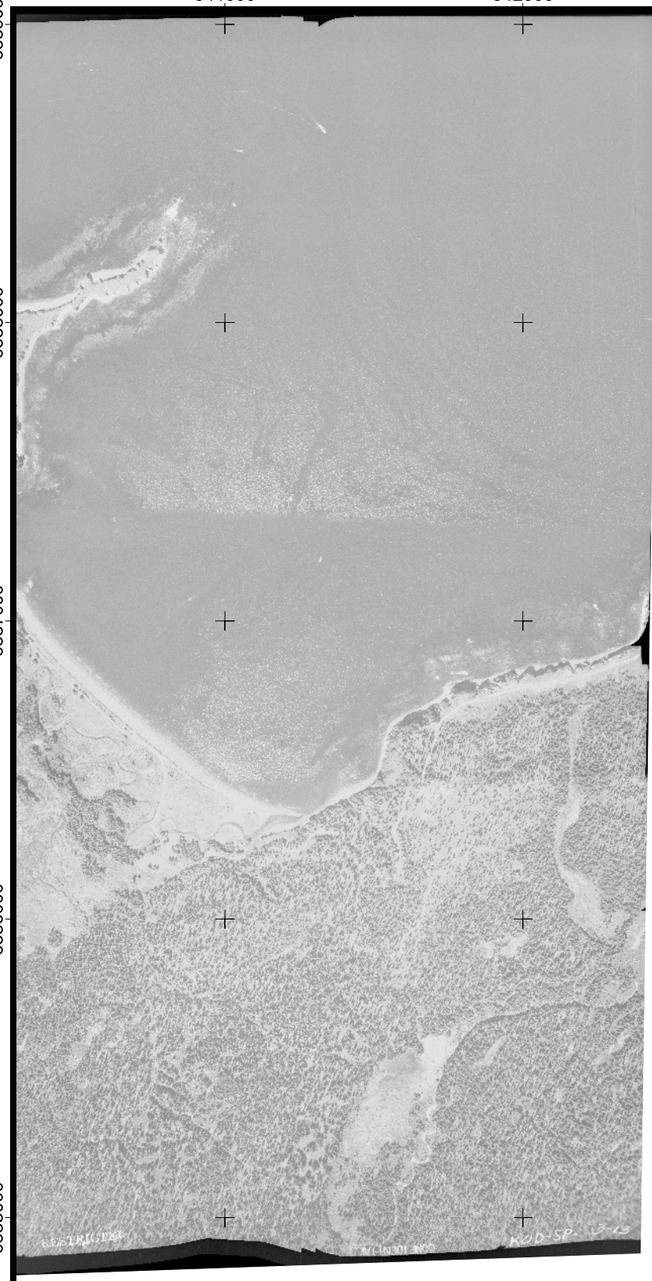

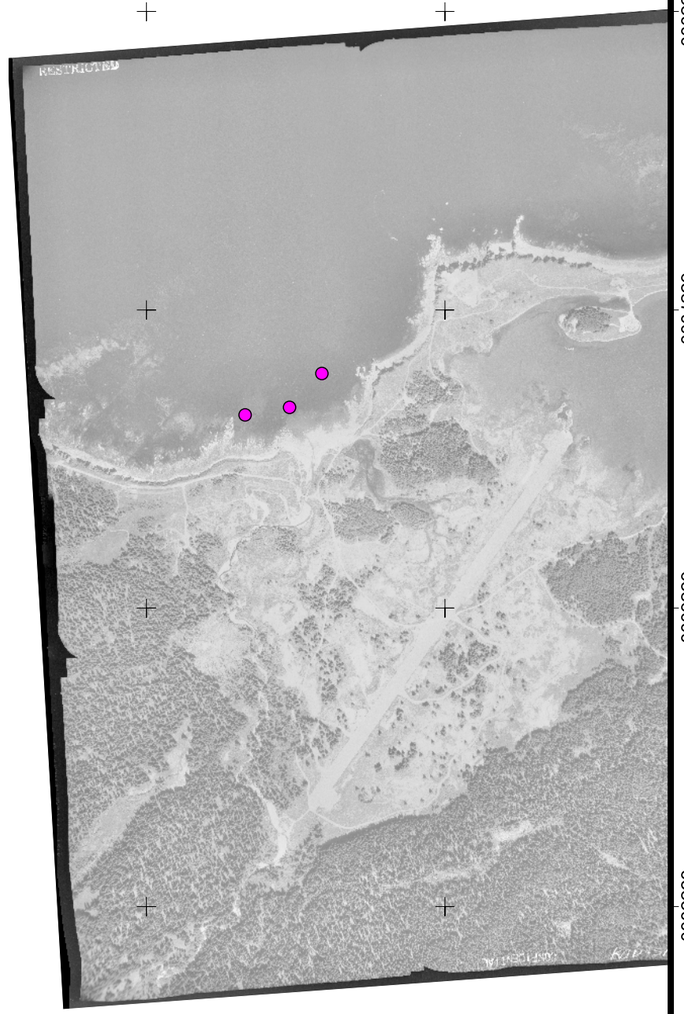

Exhibit 18 - Kodiak Site 3
Midway Point
7/19/1947

Image Source: NARA

542000 543000 544000 545000 546000 547000

2000 0 2000 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

- Possible Pier
- Mooring Point
- Approx. Ship/Boat Location

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6389000 6388000 6387000 6386000 6385000

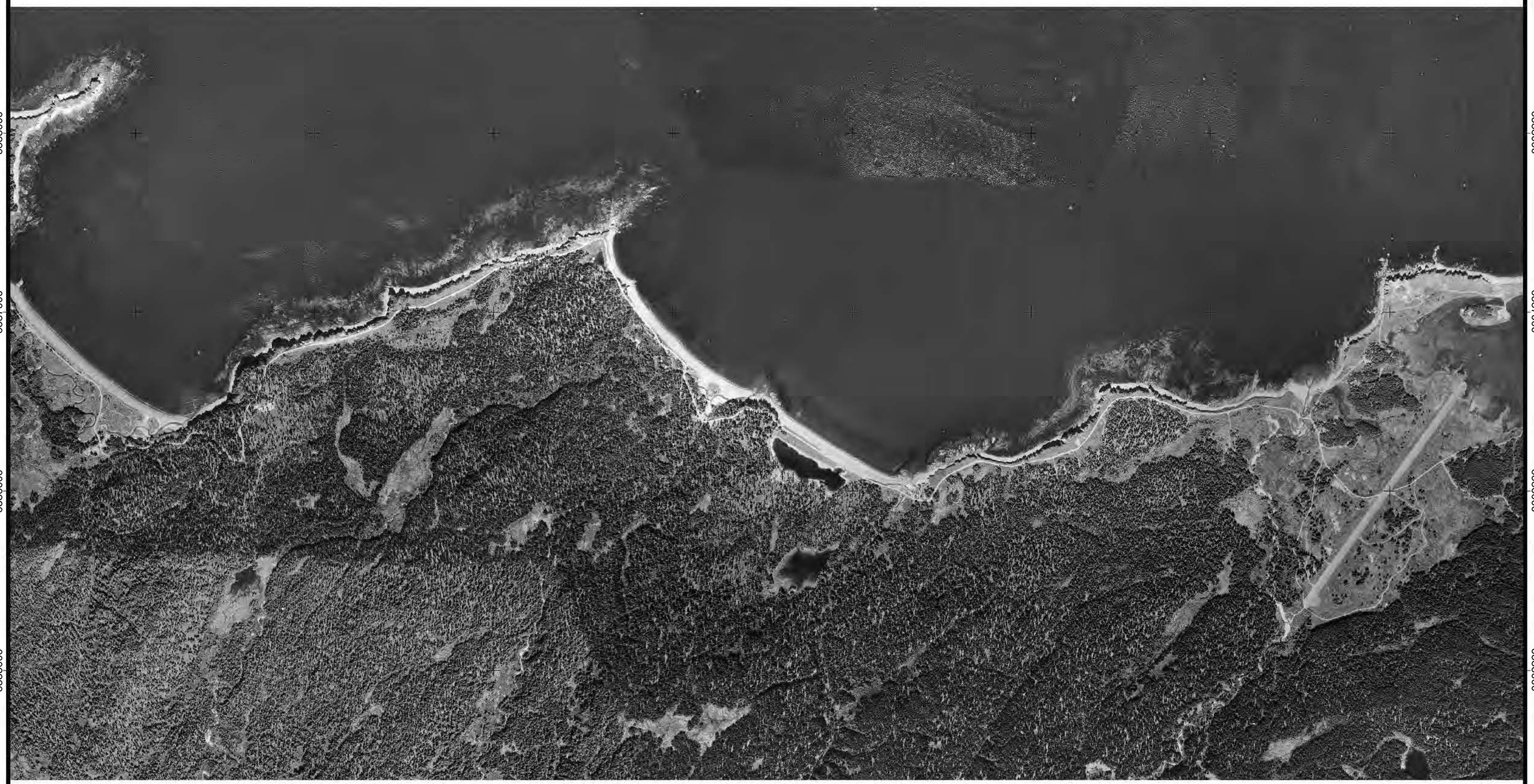

Exhibit 19 - Kodiak Site 3
Midway Point
8/14/1952

Image Source: USGS

542000 543000 544000 545000 546000 547000

2000 0 2000 Feet

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Tic Marks : UTM Zone 5N NAD83 Meters

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Exhibit 20 - Kodiak Site 3
Midway Point
8/11/2004

Film Source: USGS

542000 543000 544000 545000 546000 547000

2000 0 2000 Feet

N

Tic Marks : UTM Zone 5N NAD83 Meters

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Attachment C - Exhibit Notes

	Name	***Description***	***Notes***
Exhibit 1	Kodiak Site Map	Site Map on USGS Quad Map with areas of study delineated with black boxes	
Exhibit 2	Kodiak Site 1 - Inner Harbor DRG	Study area of Inner Harbor - USGS Quad Map	
Exhibit 3	Kodiak Site 1 - Inner Harbor 6/26/1947	Inner Harbor study area with 4 piers, 1 mooring point, and 11 ships identified	
Exhibit 4	Kodiak Site 1 - Inner Harbor 7/19/1947	Inner Harbor study area with 7 piers, 8 mooring points, and 29 ships identified	
Exhibit 5	Kodiak Site 1 - Inner Harbor 7/3/1951	Inner Harbor study area with 6 piers, 1 mooring point, and 6 ships identified	
Exhibit 6	Kodiak Site 1 - Inner Harbor 8/18/1953	Inner Harbor study area with 10 piers, 2 mooring points, and 64 ships identified	
Exhibit 7	Kodiak Site 1 - Inner Harbor 8/11/2004	Inner Harbor study area - 2004 Image	
Exhibit 8	Kodiak Site 2 - Nyman Peninsula DRG	Study area of Nyman Peninsula - USGS Quad Map	
Exhibit 9	Kodiak Site 2 - Nyman Peninsula 5/30/1947	Nyman Peninsula study area with 4 piers, 0 mooring points, and 16 ships identified	
Exhibit 10	Kodiak Site 2 - Nyman Peninsula 7/19/1947	Nyman Peninsula study area with 7 piers, 34 mooring points, and 27 ships identified	
Exhibit 11	Kodiak Site 2 - Nyman Peninsula 7/3/1951	Nyman Peninsula study area with 6 piers, 4 mooring points, and 12 ships identified	
Exhibit 12	Kodiak Site 2 - Nyman Peninsula 8/11/2004	Nyman Peninsula study area - 2004 Image	
Exhibit 13	Kodiak Site 2 - Nyman Peninsula 6/30/1944 Map	Nyman Peninsula study area historical map	
Exhibit 14	Kodiak Site 2 - Nyman Peninsula 4/23/1942 Map	Nyman Peninsula study area historical map	
Exhibit 15	Kodiak Site 2 - Nyman Peninsula Circa 1942 Oblique	Oblique Image of Nyman Peninsula	
Exhibit 16	Kodiak Site 3 - Midway Point DRG	Study area of Midway Point - USGS Quad Map	

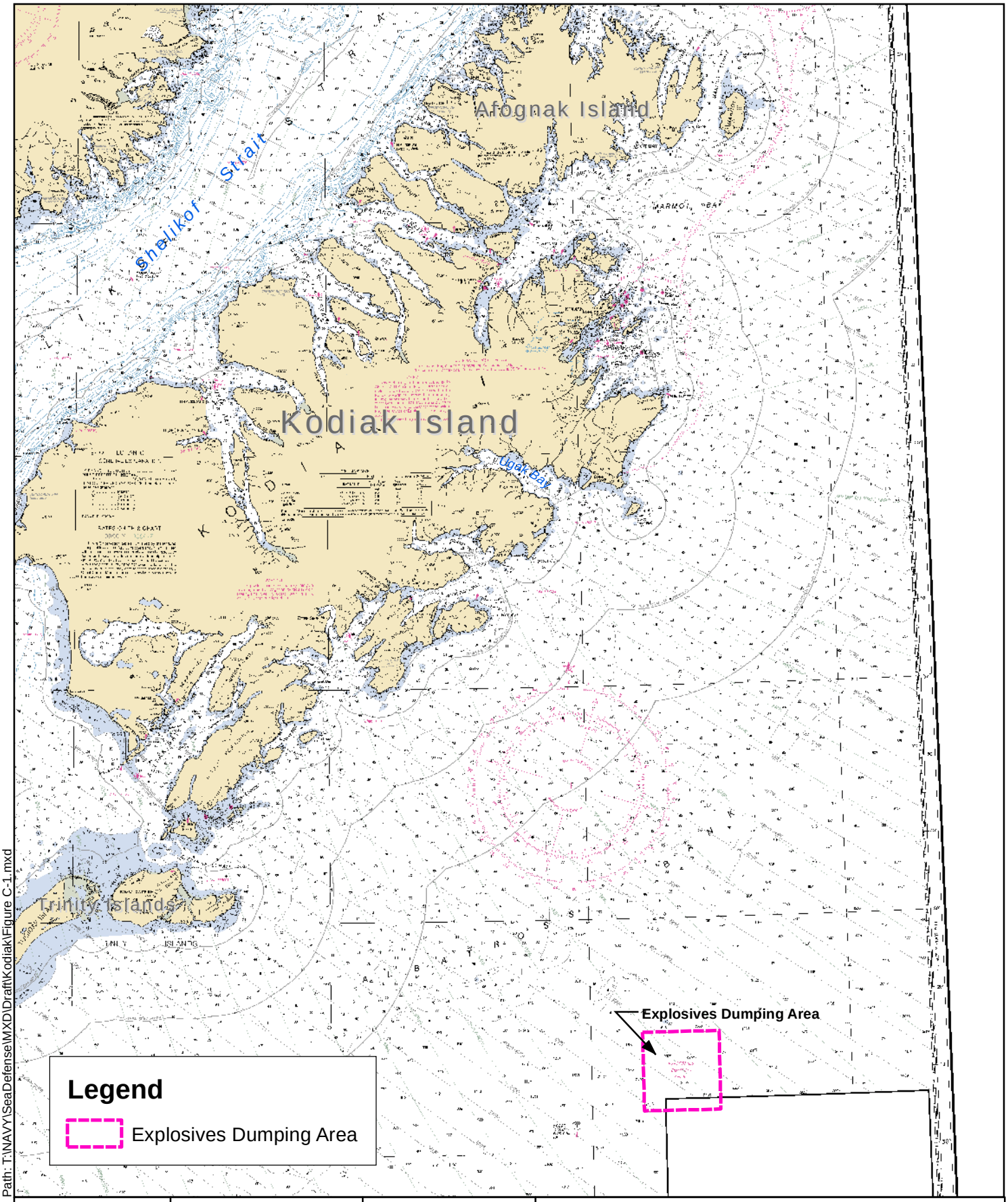
Exhibit 17	Kodiak Site 3 - Midway Point 6/26/1947	Midway Point study area with 0 piers, 0 mooring points, and 0 ships identified	
Exhibit 18	Kodiak Site 3 - Midway Point 7/19/1947	Midway Point study area with 0 piers, 0 mooring points, and 3 ships identified	
Exhibit 19	Kodiak Site 3 - Midway Point 8/14/1952	Midway Point study area with 0 piers, 0 mooring points, and 0 ships identified	
Exhibit 20	Kodiak Site 3 - Midway Point 8/11/2004	Midway Point study area - 2004 Image	

APPENDIX C
Evidence of Munitions and Explosives of Concern Located Outside of the NDSA

Although the Navy Munitions Response Program addresses MEC only within NDSAs at depths less than 20 fathoms, it is important to document locations of potential MEC disposal areas near Kodiak area, even though they may be beyond the NDSA boundary. It is also important to mention that fishers may still encounter MEC. This appendix identifies the location of an "explosives dumping area" in the marine environment beyond the NDSA boundary to the south of Kodiak Island.

An "explosives dumping area" is approximately 100 miles south of Kodiak as identified on Figure C-1 which is a portion of NOAA chart 16580. It is likely that this dumping area was associated with military activity at Kodiak.

Fishers still encounter MEC from the seafloor when they fish in parts of the Aleutians. As recently as June 2012, fishers from Dutch Harbor pulled up MEC from the seafloor. The crew of the fishing vessel *Aleutian Sable* pulled up what appeared to be a World War II era land mine (Paulin 2012 and Rosenthal 2012a). The land mine was snagged while fishing for sablefish using pots that were dragged along the sea floor during retrieval. The *Aleutian Sable* pulled up a second MEC item (projectile) on the same day (Rosenthal 2012b). The crew of the *Aleutian Sable* found the two ordnance items at position 54^{o}06'29" north latitude by 166^{o}38'01" west longitude (Henley 2012). This location is north of the Dutch Harbor area on the northern side of the Chelan Bank in approximately 400 fathoms (2,400 feet) of water. This location is presented in Appendix C of the Final Preliminary Assessment for Naval Defensive Sea Area, Unalaska Island.



Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Figure C-1.mxd

U.S. NAVY	Delivery Order 0040 Naval Defensive Sea Area Kodiak Island, Alaska	0 5 10 20 Scale In Miles	**Figure C-1** **Location of Explosives Dumping Area** **As Shown on NOAA Chart 16580** **Kodiak Island**

APPENDIX D
3Rs Explosives Safety Guide, Maritime Industry

3Rs Explosives Safety Guide

Maritime Industry

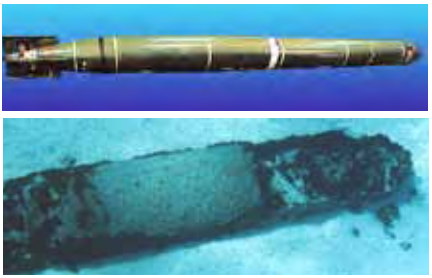
Recognize
Retreat
Report

DURING COMMERCIAL OPERATIONS SUCH AS FISHING, CLAMMING OR DREDGING; NETS; BOTTOM TENDING GEAR; AND DREDGES MAY CATCH OR DREDGE UP MUNITIONS FROM THE OCEAN. THESE MUNITIONS SHOULD BE CONSIDERED A SERIOUS DANGER TO A VESSEL AND ITS CREW.

Many vessel crews tell sea stories about catching suspicious items in their nets or dredging gear. The lucky crews live to spin their own tales, while others become the subject of tragic sea stories.

Unexploded Ordnance Recovered During Dredging

In July 1965, such a tragedy took place aboard the fishing vessel *(FV) Snoopy*. The *FV Snoopy* was trawling for scallops off the coast of North Carolina when it caught a large cylinder in its net. A witness said he could clearly see a long round object swaying in the net amidships, over the deck.



A Clean Torpedo (top) and a Heavily Corroded Torpedo on the Seafloor (bottom)

What happened next is unclear; but an explosion caused the loss of the *FV Snoopy* and eight members of her crew.

What went wrong? Was it preventable? Could something have been done to save the crew? While all these questions were asked, no one but the *FV Snoopy's* crew knows what actually happened that day. However, the tale of the *FV Snoopy* is meaningful if others learn from this tragedy.

(Note: Both commercial and sport divers should also be aware of the hazards munitions present).

To protect your crew and vessel if you encounter or suspect you have encountered a munition at sea, follow the 3Rs of explosives safety: Recognize, Retreat, Report.

ORecognize
ORetreat
OReport

ORecognize

The military has conducted training and combat operations at sea for centuries. Prior to 1970, the U.S. military as well as the militaries of other nations also sea-disposed of excess, obsolete and unserviceable munitions either en route to port or as part of planned disposals. In the 1970s, the U.S. military stopped the practice, now only allowing it in an emergency. Mariners are cautioned they could encounter munitions during commercial operations, such as fishing or dredging. Using common sense and basic knowledge, Mariners can spin their own story rather than becoming a character in a tragic sea tale.

Various Recovered Projectiles

Munitions can be encountered anywhere at sea, not just in charted hazard areas. Munitions that may be encountered include mines, torpedoes, depth charges, artillery shells, bombs and missiles. These munitions, which can contain high explosives or chemical agents, can present a serious danger to a vessel and its crew.

Projectile and Cartridge Case on Seafloor

- Munitions, to include those that have been lying dormant in sea or fresh water for many years, should be considered extremely dangerous.
- In some cases, munitions that have been in water for a long period may become more sensitive.
- Regardless of whether encountered on land or recovered from the sea, munitions can explode when handled.
- Munitions submerged in sea or fresh water for any length of time may be:
  - Like new and easy to identify;
  - Heavily encrusted with sea growth and difficult to identify.

This guide includes drawings representative of munitions that may be encountered at sea. Drawings may help in recognizing suspect munitions.

MUNITIONS ARE DESIGNED TO BE DANGEROUS

Munitions are designed to injure, maim, or kill people, or to destroy equipment (e.g., vessels). The best protection from the potential hazards associated with munitions is to heed the warnings on nautical charts, avoid known disposal areas, and follow the 3Rs (Recognize, Retreat, Report).

CHEMICAL MUNITIONS AND CHEMICAL AGENTS

Beginning in World War I, the Department of Defense (then, the Department of War) designed toxic chemical agents to kill, seriously injure, or incapacitate an enemy. In the past, the United States and other countries sea-disposed chemical munitions and chemical agents in bulk containers, such as 55-gallon drums. As a result, some munitions or containers recovered from the sea may contain toxic chemical agents.

Recovered Chemical Filled Projectile

Vessel crews should be alert for conditions or signs that could indicate the presence of toxic chemical agents:

- Unusual odor from equipment or fish;
- A stinging sensation in the eyes, or burning or irritated skin;
- Corroded containers or suspicious clay-like lumps.

Chemical Filled Projectile Recovered from Clam Bed

IF CHEMICAL AGENTS ARE SUSPECTED, IMMEDIATE ACTION IS NECESSARY TO PROTECT THE CREW AND VESSEL.

If You Suspect You Have Encountered a Chemical Munition:

- Move all crew members up wind;
- Close all doors and hatches;
- Shut down all ventilation systems;
- Steam into the wind to carry contaminants away from the crew;
- Contact the U.S. Coast Guard for assistance

Munitions on the Seafloor

In case of physical contact with toxic chemical agents, immediately rinse the contaminated area with large amounts of water (if possible, use warm soapy water), even if no effects are felt.

Crewmembers should not work in a contaminated area and every effort should be made to prevent the spread of contaminants. Fishing vessels that have come into contact with toxic chemical agents must not bring their catch ashore until it has been checked and released by the appropriate state's Department of Environmental Health. Sea life contaminated by chemical agents is unsuitable for human or animal consumption.

A Clean Aerial Bomb Prepared for Shipping (above) and an Aerial Bomb on the Seafloor (below).

ORetreat

Because munitions present a potential explosive hazard, they should never be touched, moved or disturbed (handled); however, at sea, the specific action required will depend on the circumstances.

- If possible, crews should avoid bringing munitions (or suspect munitions) onboard. If a munition is ensnared or fouled in gear, retreat by carefully jettisoning the munition, or by cutting away the gear. If this is not possible, carefully secure the munition onboard and move and keep the crew as far away from the munition as possible.
- Great care should be taken to avoid bumping the munition; each action carries risk.

A Clean 5-inch Caliber Projectile (above) and Recovered 5-inch 38 Caliber Projectiles (below)

NEVER BRING A MUNITION OR SUSPECT MUNITION INTO PORT

Munitions Not On Board

If an actual or suspect munition is recovered:

- Immediately stop all operations;
- Do not bring the munition or gear containing it onboard, if possible;
- Do not allow the munition to come or remain along side the vessel where wave action may cause contact with the hull;

- If a munition is in the gear and has not been brought onboard, try to safely lower it back into the water and, as indicated below, note the position and report it to the U.S. Coast Guard.
- If in shallow water (less than 130 feet), lower the munition to the bottom, buoy off the net or dredge recovery lines (remain in the immediate area).
- If in deep water, stream the munition as far aft as possible and maintain steerageway as necessary.
- Remain in the area while awaiting assistance.

A Clean Rifle Grenade (above) and a Recovered Grenade. Item is about four inches long.

Munitions Onboard

- If the gear is brought over the deck with an actual or suspected munition, but remains suspended and can continue to be safely suspended in place or nearby, immediately:
- Secure the munition with guy lines to prevent further movement;
- Keep the crew away from that area.

If a suspect munition is brought onboard:

- Keep unneeded crew members as far away as possible.
- Decide whether to do one of the following:
  - Carefully jettison it, or
  - Retain it onboard.
- If jettisoned, note and report position.
- If retained onboard:
  - Limit handling and avoid hitting or bending any part of the munition;
  - Stow the munition on deck as far away as possible from heat sources, vibration and the crew, but limit handling;
  - Firmly chock and lash the munition to prevent movement;
  - Cover and/or wet to minimize the potential for:
    - Deterioration of metal parts and release of any fill;
    - Explosives to dry out and become sensitive to shock.
  - Keep crew away from item.
  - Request assistance (Channel 16--156.800 MHz).
- If within 2 or 3 hours of land, the safest measure is to notify the U.S. Coast Guard and move to a rendezvous area offshore.

Report

Careful observation is necessary prior to reporting, so that proper instructions and assistance can be provided. The information you provide may be combined with other reports to produce new warnings to mariners and update nautical charts.

Floating Mine Washed Up on Beach

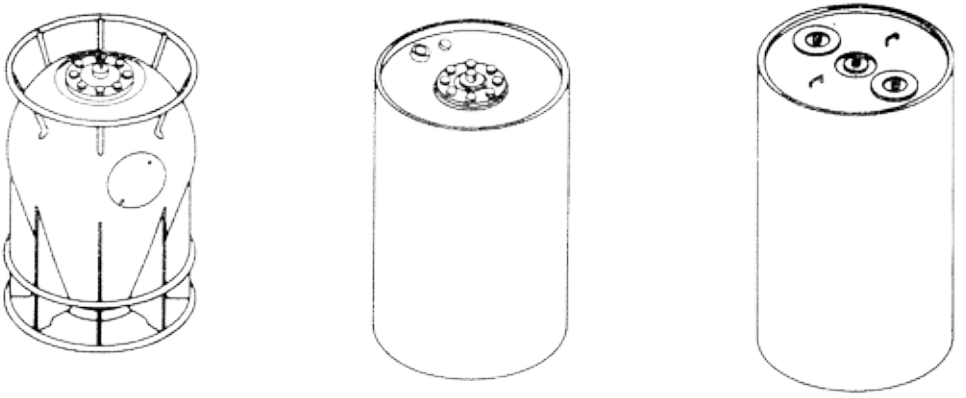
When actual or suspect munitions are encountered at sea, the vessel's captain should notify the U.S. Coast Guard and provide the below information, as soon as possible. (Note: If a munition is encountered while in port [e.g., during off loading or processing] call 911.)

- The vessel's position (use World Geodetic System 1984 [WGS-84] for reporting).
- If the exact position is unknown, give approximate coordinates, or a range and bearing from a charted feature.
- The activity being conducted when the munition was encountered (e.g., fishing, dredging).
- A general description of the munition's key features (size, shape, fins, props, markings) and condition. (Never attempt to clean, open, or tamper with a munition in any way).
- The action taken (e.g. stowed or jettisoned).
- If jettisoned, also provide:
  - The position of the release, water depth, and buoys or markings used;
  - A description of any entanglement (e.g., net, dredge) or other details.
- Any unusual odors, if noticed.
- Whether the munition was jettisoned:
  - In or near a charted munitions dump;
  - Near (within 1,000 yards of) any surface or sub-surface structures.

THE US COAST GUARD WILL NOTIFY THE APPROPRIATE MILITARY EXPLOSIVE ORDNANCE DISPOSAL UNIT TO ARRANGE FOR REQUIRED SUPPORT.

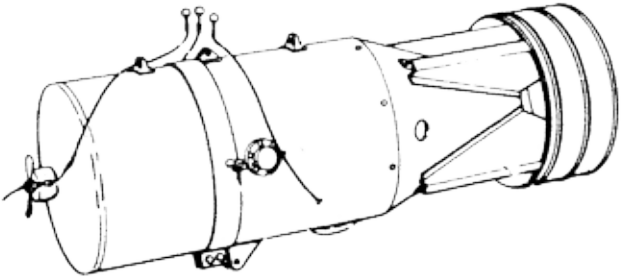
DEPTH CHARGES

Length 28" / Diameter 18" to 25"

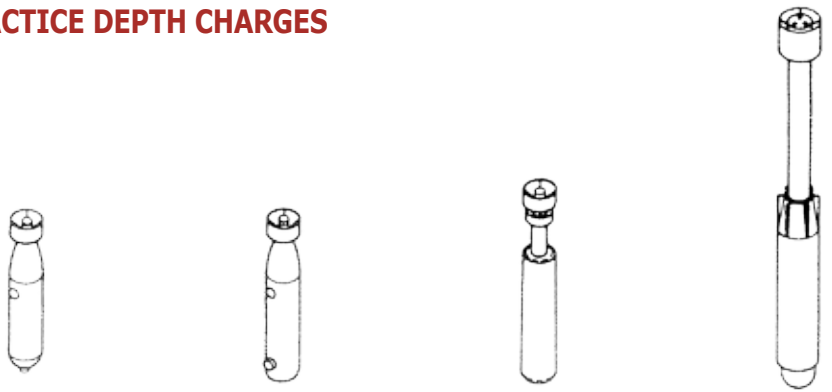


DEPTH BOMB

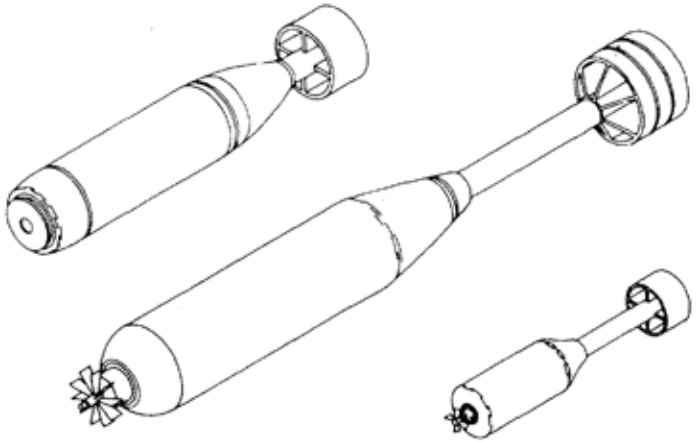
Length 50" to 59" / Diameter 15" to 18"



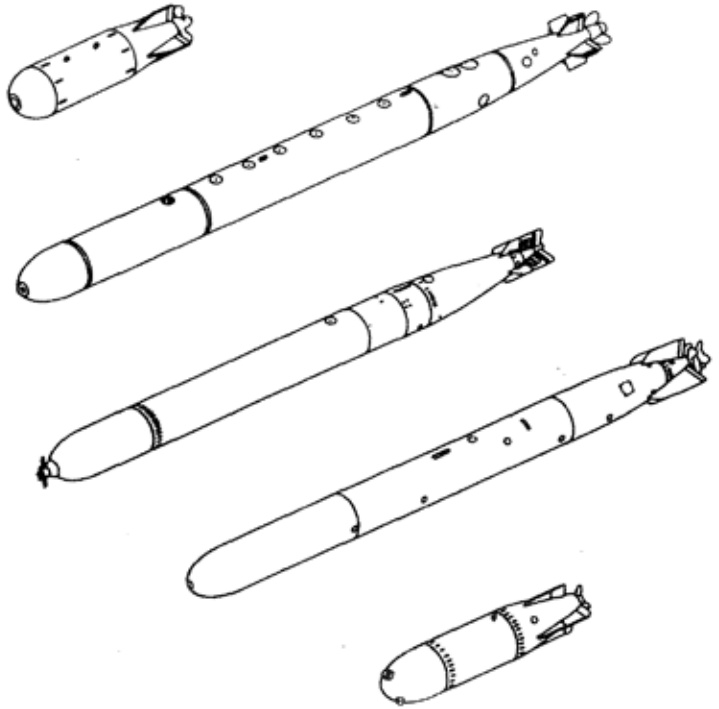
PRACTICE DEPTH CHARGES



PROJECTED ANTI-SUBMARINE-WARFARE WEAPONS



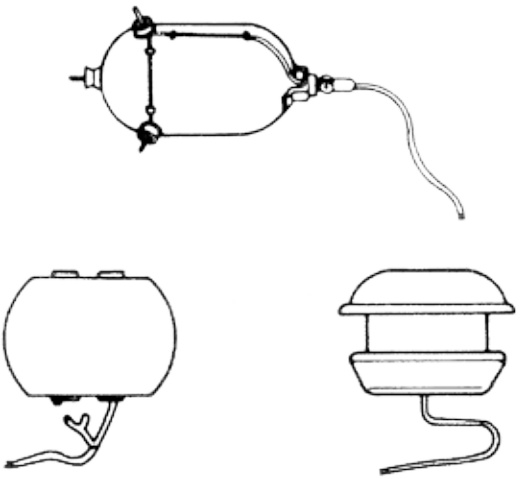
REPRESENTATIVE TORPEDOES



MISCELLANEOUS MINE FLOATS

Length 10" to 24"

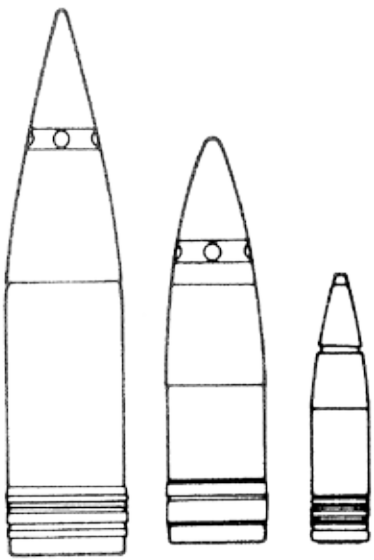
Diameter 12" to 18"



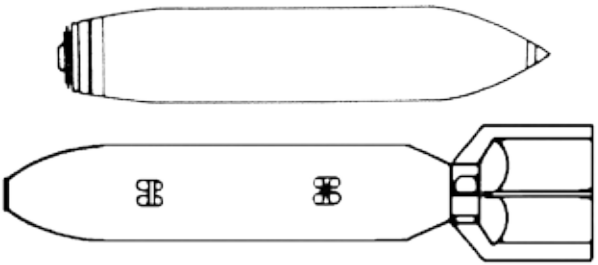
PROJECTILES

Lengths 20 mm to 16"

3" to 5" in Diameter (Typically)

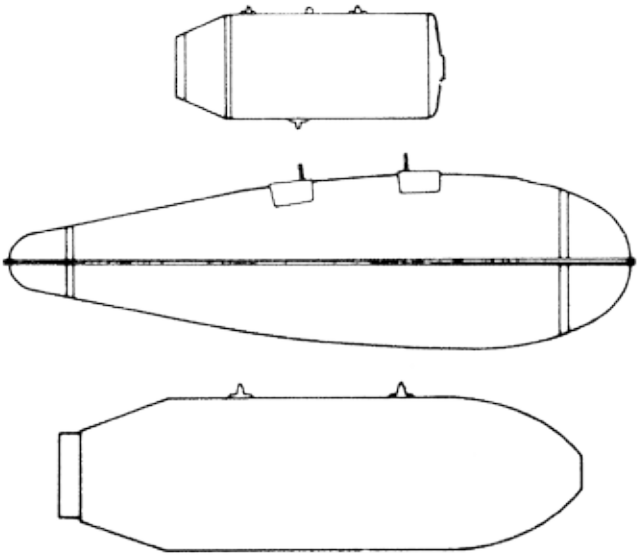


AERIAL BOMBS



Bomb Body Lengths 39" to 97"

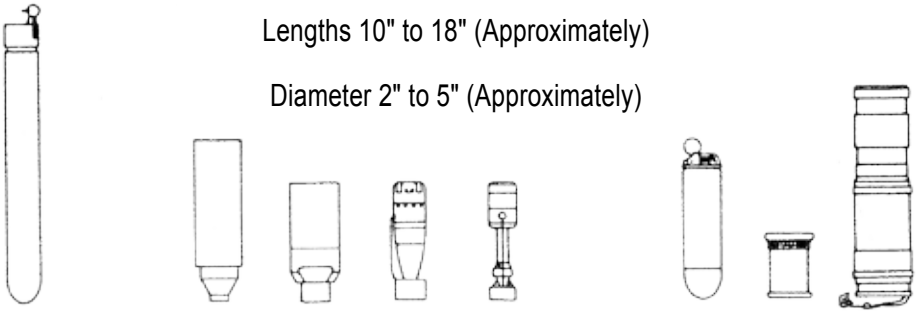
Diameter 7" to 19"



MARKERS AND SIGNALS

Lengths 10" to 18" (Approximately)

Diameter 2" to 5" (Approximately)



Don't Forget

- Munitions are dangerous and may not be easily recognizable!
- Avoid military and former military ranges and disposal areas!
- Do not bring munitions on-board!
- Never bring a munition into port, unless directed to do so by USCG!

Follow the 3Rs

Recognize

When you may have encountered a munition.

Retreat

If you know or suspect you have encountered a munition, jettison it or secure it and keep the crew from the immediate area.

Report

Immediately notify the US Coast Guard of the vessel's or munitions' location and provide a description of the munition.

Emergency contacts:

- In Port: Call 911
- At sea: Use Channel 16 (156.800 MHz)

For additional information call
U.S. Army Technical Center for Explosives Safety
at (918) 420-8919
or see

the US Army's UXO Safety Education website
https://www.denix.osd.mil/uxosafety

FEBRUARY 2010

Plate 4-1

Locations of Areas Potentially Containing Munitions and Explosives of Concern within the Naval Defensive Sea Area at Kodiak Island

Shuyak Island

Afognak Island

Kodiak Island

AIR GUNNERY AREA N0-3

Approximate 3-Nautical-Mile Line

AIR GUNNERY AREA NO-2

AA GUNNERY AREA NO-1

AA GUNNERY AREA NO-2

AA GUNNERY AREA NO-3

AIR GUNNERY AREA NO-1

B-4

B-3

B-2

(See Inset)

A7 Entrance Pt AATC

Anton Larson Bay Machine Gun Practice Range

Battery No. 6

Battery No. 8

N1

A1

A2

A3

Battery No. 5

Battery No. 4

Battery No. 3

Buskin Beach Practice Firing Location

Battery No. 7

A6

Explosive Anchorage No. 1

Explosive Anchorage No. 3

Explosive Anchorage No. 2

Bells Flats Practice Firing Location

Happy Beach AATC

Chiniak Bay

Battery No. 1

Battery No. 2

Ugak Bay

Bell

Known Military Docks

Navy Facilities

- N1 Woody Island Barge Dock
- N2 Marginal Pier
- N3 Permanent Pier
- N4 Navy Harbor Craft Float
- N6 Boat House Floats and Walks
- N7 Barge Dock
- N8 Yale Mooring
- N9 Algonquin Mooring
- N10 Temporary Pier
- N11 Small Boat Landing
- N12 Tatoosh Mooring
- N13 Ships Water Service Station
- N14 Honey Barge Dock

Army Facilities

- A1 Army Dock
- A2 Army Pier Harbor Craft Float
- A3 Long Island Barge Dock
- A6 Puffin Island Barge Dock
- A7 Entrance Pt AATC Dock

Legend

- Anti-Ship Mine Location
- Known Military Docks
- Explosive Anchorage Area
- Searchlight
- Practice Impact Area
- Glide/Dive Bomb Target
- AMTB Armament
- Antiaircraft Training Center
- Gun Battery
- Practice Firing Location
- Range Fan
- 20 Fathom Contour
- Practice Air Raid Danger Area
- Practice Firing Area
- Practice Firing Area/Towed Target
- Air Gunnery Area
- Ship Antiaircraft Gunnery Area
- 3 Nautical Mile

0 1 2 4 6 8
Scale In Miles

Path: T:\NAVY\SeaDefense\MXD\Draft\Kodiak\Plate 4-1 Areas Potentially Containing Munitions Explosives of Concern .mxd

U.S. NAVY

Delivery Order 0040
Naval Defensive
Sea Area
Kodiak Island, Alaska

Plate 4-1

Locations of Areas Potentially Containing Munitions and Explosives of Concern Within the Naval Defensive Sea Area at Kodiak