3.4 Hazardous Materials and Waste

3.4 HAZARDOUS MATERIALS AND WASTE

3.4.1 Affected Environment

3.4.1.1 Introduction

3.4.1.1.1 Definition

This section describes hazardous materials used in and waste generated by Silver Strand Training Complex (SSTC) training. Most of hazardous materials and wastes are associated with vessels, ordnance, or other materials used on SSTC; if released into the environment, hazardous materials and wastes could pose a hazard to human health or the environment.

Hazardous materials are solid, liquid, semisolid, or gaseous chemical substances that are procured for specific uses, such as for vehicle operation. These chemical substances may pose a hazard to human health or the environment. In general, these materials pose hazards because of their quantity, concentration, or physical or chemical characteristics.

Hazardous wastes are solid wastes (i.e., used or expended materials for which no further use is possible or intended). Hazardous wastes may be generated through the use of hazardous materials that retain their hazardous character, or hazardous wastes may be generated through the use of non-hazardous materials in a manner that imparts one or more hazardous characteristics to the waste. A hazardous waste may be a solid, liquid, semisolid, or contain gaseous material that, alone or in combination with other substances, may (a) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to humans or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Hazardous wastes generally are regulated separately from hazardous materials, and typically are handled separately from hazardous materials.

3.4.1.1.2 Regional Setting

SSTC and Naval Air Station North Island (NASNI) are located in a heavily populated, urban area with a variety of land uses. These installations are located on the Silver Strand peninsula and are only accessible—to emergency personnel, residents, and visitors during an incident response—from the greater San Diego metropolitan area via Coronado Bridge to Coronado and through Imperial Beach on State Route (SR)-75.

3.4.1.1.3 Region of Influence

The Region of Influence (ROI) for hazardous materials is the area where these materials are used during training at SSTC and at the southern beaches of NASNI.

The ROI for hazardous wastes includes both SSTC and NASNI beaches where the wastes are generated and the onshore storage, transportation, and disposal facilities where the hazardous wastes are managed. The ROI also includes portions of San Diego Bay and the ocean offshore of SSTC.

3.4.1.2 Regulatory Framework

Hazardous materials and wastes are regulated by federal laws and regulations. The relevant laws to the Proposed Action include the Resource Conservation and Recovery Act (RCRA; 42 United States Code [U.S.C.] Section [§] 6901 et seq.), the Hazardous Materials Transportation Act (HMTA; 49 U.S.C. §5101 et seq.), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 U.S.C. §9601 et seq.), the Emergency Planning and Community Right to Know Act (EPCRA; 42 U.S.C. §§ 11,001-11,050), the Oil Pollution Act (OPA; 33 U.S.C. §2701 et seq.), the Toxic Substances Control Act (TSCA), and the Pollution Prevention Act of 1990 (PPA; 42 U.S.C. Chapter 133). Comprehensively,

the regulations adopted to implement these laws govern the storage, use, and transportation of hazardous materials and wastes from their origin to their ultimate disposal. The recovery and cleanup of environmental contamination resulting from accidental releases of these materials also are addressed in the regulations. In addition, the Military Munitions Response Program (MMRP; 10 U.S.C. §2710) addresses response actions at non-operational ranges. State of California laws and regulations generally implement federal requirements, but broaden their application or impose additional regulatory requirements in some areas.

3.4.1.2.1 Resource Conservation and Recovery Act (RCRA)

The Solid Waste Disposal Act (SWDA) (P.L. 89-272, 79 Stat. 992) of 1965 was enacted to address solid waste management. Hazardous wastes are defined by RCRA, the 1976 amendment to the SWDA. The SWDA was further amended by the Hazardous and Solid Waste Amendments of 1984.

RCRA applies only to materials that first meet the regulatory definition of a solid waste. RCRA specifically defines a hazardous waste as a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics, may cause or significantly contribute to an increase in mortality; or an increase in serious, irreversible, or incapacitating reversible illness; or pose a hazard to human health or the environment when improperly treated, stored, disposed of, or otherwise managed (40 Code of Federal Regulations [CFR] 261.10). A solid waste is a hazardous waste if it is not excluded from regulation as a hazardous waste under Section 261.4(b), and it is either a specifically listed waste or exhibits any ignitable, corrosive, reactive, or toxic characteristics (40 CFR Part 261, Subpart C).

Under RCRA, hazardous materials are considered solid wastes—and thus fall under the definition of hazardous wastes—if they are used in a manner constituting disposal, rather than for their intended purpose. Military munitions become subject to RCRA when transported off-range for storage, reclamation, treatment, disposal; if buried or land filled on- or off-range; or if they land off-range and are not immediately rendered safe or retrieved. Transportation, storage, and disposal of these items are governed by RCRA.

In 1997, the United States Environmental Protection Agency (USEPA) published its Final Military Munitions Rule (MMR) (40 CFR § 266.200-206). The MMR identifies when conventional and chemical military munitions become hazardous wastes under RCRA, and provides for their safe storage and transport. Under the MMR, military munitions include, but are not limited to, the following items:

- Confined gaseous, liquid, and solid propellants;
- Explosives;
- Pyrotechnics;
- Chemical and riot agents; and
- Smoke canisters.

The MMR defines training; research, development, test, and evaluation (RDT&E); and clearance of unexploded ordnance and munitions fragments on active or inactive ranges as normal uses of the product. When military munitions are used for their intended purpose, they are not considered to be a solid waste for regulatory purposes. Under the MMR, wholly inert items and nonmunitions training materials are not defined as military munitions. These materials are not excluded from regulation as hazardous wastes under RCRA.

The Federal Facilities Compliance Act (FFCA) of 1992 amended RCRA to ensure a complete and unambiguous waiver of sovereign immunity with regard to administrative fines and penalties on federal

facilities. Under the FFCA, Navy facilities are required to comply with State hazardous waste substantive and procedural requirements, including obtaining State permits.

3.4.1.2.2 Hazardous Materials Transportation Act (HMTA)

For air, sea, or land transportation, the U.S. Department of Transportation defines a hazardous material as a substance or material that is capable of posing an unreasonable risk to health, safety, and property when transported in commerce (49 U.S.C. 5101, et seq.; 49 CFR 172.101, Appendix B). The HMTA regulates the transportation of hazardous materials, including ordnance.

3.4.1.2.3 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

Under CERCLA Section 101 (14), as amended by the Superfund Amendments and Reauthorization Act, a hazardous substance is defined as any substance that, due to its quantity, concentration, or physical and chemical characteristics, poses a potential hazard to human health and safety or to the environment. CERCLA has established national policies and procedures to identify and clean up sites contaminated in the past by hazardous substances. The Navy implements cleanups of CERCLA sites through the Installation Restoration Program (IRP).

The migration of hazardous substances from historical waste deposits can pose a risk to public health. The IRP was developed to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous materials spills at Department of Defense (DoD) facilities. The IRP is intended to be a tool for identifying and cleaning up any contaminant releases that could endanger public health, welfare, or the environment.

The IRP process has three phases. Phase I, the Site Inspection Phase, includes identifying potential hazardous waste sites through interviews, record searches, and minimal sampling. Phase II, the Remedial Investigation/Feasibility Study Phase, includes sampling and remediation design planning. Phase III is the Remedial Design/Remedial Action Phase, in which the site is remediated or secured. IRP sites on SSTC are addressed below.

3.4.1.2.4 Military Munitions Response Program (MMRP)

The MMRP addresses response actions at non-operational ranges where munitions and explosives of concern (MEC) or munitions constituents (MC) are present in the environment from historical uses. MEC is defined as unexploded ordnance (UXO), discarded military munitions, and MC present in high enough concentrations to pose an explosive hazard. MC in lower concentrations are not considered MEC, but may require a response based upon risk to human health or the environment.

The National Defense Authorization Act of 2002 required the DoD to create an inventory of MMRP sites in the United States (U.S.) (10 U.S.C. § 2710[a]) and to create a protocol with which to prioritize sites within each facility, state, or region and across the U.S. (10 U.S.C. Section 2710[b]). 10 U.S.C. Section 2710(a) states that sites that were or are under military control that have a demonstrated presence of MEC or MC contamination or are suspected of having MEC are eligible for entry into the MMRP.

3.4.1.2.5 Range Sustainability Environmental Program Assessment

The Range Sustainability Environmental Program Assessment (RSEPA) was developed to provide a consistent approach for assessing the environmental condition of operational ranges. The RSEPA is a range compliance management process to ensure long-term sustainability using a phase approach of assessment. The RSEPA process is applied to all operational test and training ranges within the U.S. and its territories where munitions are used or were used. The RSEPA process systematically assesses the present environmental compliance conditions and ensures best management practices are in place to

assure operational test and training ranges are not posing a significant off-site risk to human health or the environment.

3.4.1.2.6 Emergency Planning and Community Right to Know Act

Section 203 of Executive Order (EO) 13148 (Right-to-Know and Pollution Prevention) states that "[t]hrough timely planning and reporting under the EPCRA, Federal facilities shall be leaders and responsible members of their communities." Thus, a federal agency reports its use of hazardous and toxic chemicals in accordance with EPRCRA. Access to this information contributes to improvements in chemical safety and protection of local communities. The guidance for federal facilities has been incorporated into Chief of Naval Operations Instruction (OPNAVINST) 5090.1. For each installation, the Navy annually submits EPCRA 312, Tier II forms to the emergency responders (Fed Fire) and the San Diego County Certified Unified Program Agency (CUPA), and the EPCRA 313 Toxic Release Inventory (TRI) Form R to USEPA, with courtesy copies to the California Environmental Protection Agency (Cal-EPA) and the Regional Water Quality Control Board.

3.4.1.2.7 Oil Pollution Act (OPA)

OPA requires oil storage facilities and vessels to submit plans to the federal government describing how they will respond to large, unplanned releases. In 2002, OPA was amended by the Oil Pollution Prevention and Response; Non-Transportation-Related Onshore and Offshore Facilities; Final Rule (40 CFR Part 112). This Rule requires Spill Prevention, Control, and Countermeasure (SPCC) Plans and Facility Response Plans. These plans outline the requirements to plan for, and respond to, oil and hazardous substance releases. Oil and hazardous substance releases are reported and remediated in accordance with current Navy policy. Naval Amphibious Base (NAB) Coronado has a SPCC Plan; however, SSTC training does not store sufficient quantities of oil to require coverage under the plan.

3.4.1.2.8 Toxic Substances Control Act (TSCA)

TSCA requires reporting, record-keeping, and testing, and establishes restrictions on chemical substances or mixtures. TSCA also addresses the use and disposal of specific chemicals, such as asbestos and lead-based paint. In general, TSCA limits the manufacture, distribution, use, and disposal of chemical substances that pose a threat to human health. At one time, asbestos was commonly included in building materials such as concrete, masonry, caulks, flooring and ceiling tiles, and mastics; and lead was often used in exterior paints. Friable asbestos is present on and around the foundations of demolished buildings on SSTC-S.

3.4.1.2.9 Pollution Prevention Act of 1990 (PPA)

The PPA focuses on source reduction, reducing pollution through changes in production, operation, and use of raw materials. The PPA addresses other practices that increase efficiency in the use of natural resources, or protect natural resources through conservation.

3.4.1.2.10 State Laws and Regulations

Cal-EPA develops, implements, and enforces the State's environmental protection laws that ensure clean air, clean water, clean soil, safe pesticides, and waste recycling and reduction. Cal-EPA is comprised of several agencies, boards, departments, and offices, with no single entity having sole authority for hazardous materials and wastes. Within Cal-EPA, the Department of Toxic Substances Control (DTSC) is responsible for the use, storage, transport, and disposal of hazardous materials. DTSC regulates hazardous waste, pollution prevention, and clean-up of contamination. However, Cal-EPA delegates much of its responsibility for hazardous materials management to local governments, under the CUPA program.

Local governments and communities form CUPAs to effectively manage the acquisition, maintenance, and control of hazardous materials in their jurisdictions, and to avoid overlapping roles among federal,

State, and local agencies. In Southern California, CUPAs have typically formed on a county-by-county basis. In San Diego County, the CUPA is the San Diego Department of Environmental Health, which is responsible for hazardous materials and hazardous wastes regulation. State hazardous materials and hazardous wastes laws are summarized in Table 3.4-1.

Table 3.4-1: State of California Laws

Law / Regulation	Description
Hazardous Materials Release Response Plans and Inventory Act (6.95 Health and Safety Code [HSC]) / 19 California Code of Regulations (CCR), Division 2, Chapter 4	Requires facilities using hazardous materials to prepare hazardous materials business plans, and establishes the California Accidental Release Prevention Program
Hazardous Waste Control Act (6.5 HSC / 22 CCR, Division 4.5)	Regulates the generation, transportation, storage, treatment, and disposal of hazardous waste
Safe Drinking Water and Toxic Enforcement Act (Proposition 65; 6.6 HSC / 22 CCR, Division 4)	Regulates the discharge of contaminants to groundwater

The Navy complies with applicable State regulations under EO 13148, Greening the Government Through Leadership in Environmental Management; DoD Directive 4165.60, Solid Waste Management; and Navy guidelines for hazardous materials and wastes management found in OPNAVINST 5090.1.

3.4.1.3 Hazardous Materials

3.4.1.3.1 Management

According to the Navy's *Waste Management Plan* for Navy Region Southwest, hazardous material business plans and unified facility permits are required for all Navy facilities that store hazardous materials exceeding 200 cubic feet of a compressed gas, 500 pounds of a solid, or 55 gallons of a liquid (Department of the Navy [DoN] 2007). These hazardous materials business plans provide guidance and direction on the use, storage, and compliance activities for hazardous materials. Adherence to approved plans assures that hazardous materials used for training are properly managed.

3.4.1.3.2 Transport

Transport on public roads of dangerous substances—hazardous materials and nonfused munitions—is controlled and regulated by the federal Department of Transportation (49 CFR 177). The State enforces federal transportation safety regulations within its jurisdiction. Generally, munitions and other dangerous articles may be transported on public highways if proper safety procedures are followed. Bulk hazardous material loads are prohibited from using Coronado Bridge, so hazardous materials for Naval Base Coronado (NBC) must be transported via Imperial Beach on SR-75.

3.4.1.3.3 Use

Hazardous materials currently used in support of physical aspects of SSTC training activities include petroleum products, coolants, cleaning compounds, batteries, explosives, and pyrotechnic materials. Most of the hazardous materials used at SSTC are stored in the Hazardous Material Minimization Center at NBC. Ordnance is stored in Ready Service Lockers.

Training activities involve numerous vehicles, aircraft, ships, boats, and support craft. These manned vessels do not intentionally release any hazardous constituents into the water. However, small amounts of diesel fuel or engine oil may leak onto the ground or into the water.

3.4.1.4 Hazardous Waste

3.4.1.4.1 Management

NAB Coronado, on which a portion of SSTC is located, is a Large-Quantity Generator and Transporter of hazardous waste under RCRA (USEPA RCRA Identification Number CA9170023130). NAB Coronado was last inspected by the San Diego CUPA in January 2008; at that time NAB was found to be in compliance with general generator requirements (USEPA 2009). SSTC training activities generate hazardous wastes primarily through operation of vehicles and equipment required for training. These waste streams include used batteries, spill cleanup materials, and used petroleum products. Commander, Navy Region Southwest prepared a *Hazardous Waste Management Plan* (HWMP) (DoN 2007) and a *Regional Explosive Hazardous Waste Management Plan* (DoN 2004) for Navy facilities in the San Diego region. These plans provide comprehensive and consistent guidance to personnel at SSTC-North (SSTC-N) and SSTC-South for characterization, storage, disposal, and record-keeping of RCRA and non-RCRA wastes.

For SSTC marine activities, environmental compliance policies and procedures applicable to shipboard operations are defined in OPNAVINST 5090.1. These instructions reinforce the Clean Water Act prohibition against discharging harmful quantities of hazardous substances into or upon U.S. waters out to 200 nautical miles. Navy ships are required to conduct operations in such a manner as to minimize or eliminate any adverse impacts on the marine environment.

There are several satellite accumulation areas and one 90-day accumulation area at SSTC. Hazardous waste is collected from the 90-day accumulation area and transported by a Defense Reutilization and Marketing Office contractor to an approved Treatment, Storage, or Disposal (TSD) facility.

3.4.1.4.2 CERCLA Sites

There are six IRP sites on SSTC-N. Five of these sites were identified during an initial assessment conducted in 1986. In 1993, subsequent studies resulted in a recommendation of further investigation for four of the sites and the exclusion from further investigation of Site 5 (now managed through the MMRP, as outlined in Section 3.4.1.4.3). Further investigation in 1995 resulted in a decision of no further action for Site 1 and identification of an additional IRP site (Site 6). Table 3.4-2 lists the five IRP sites and the status of each. One IRP site, a rubble disposal area, exists on SSTC-S. These sites generally resulted from historical generation of hazardous substances during activities such as vehicle maintenance and repair, burning of motor oils, releases of fuels and solvents from fueling facilities and equipment shops, and releases of sandblast grit and paint.

Table 3.4-2: SSTC Installation Restoration Program Sites

Site	Description	Status
1 (SSTC-N)	Building 603 disposal pit	Decision of no further action
2 (SSTC-N)	Old refuse disposal and burn area	Further investigation being conducted
3 (SSTC-N)	New paint shop site	Further investigation being conducted
4 (SSTC-N)	Sandblast grit disposal	Further investigation being conducted
6 (SSTC-N)	Morale, Welfare, and Recreation (MWR) Marina	Removal action conducted/Further investigation being conducted
10 (SSTC-S)	Rubble disposal area	No further investigation planned

Source: Navy Environmental Leadership Program 2000

At NASNI, 12 major IRP sites have been identified (Navy Environmental Leadership Program 2000). Of these, Sites 1, 5, 6, and 7 are located in areas adjacent to SSTC training on NASNI. These sites are described in Table 3.4-3.

Table 3.4-3: NASNI Installation Restoration Program Sites

Site	Description	Status
1 (NASNI)	Shoreline sediments. Sixteen outfalls known to have discharged industrial hazardous wastes in the past.	Some outfall areas have been remediated.
5 (NASNI)	Golf Course Garbage Disposal Area. Solid waste disposal area 1942-1965. Contained both solid and chemical wastes.	Perimeter monitoring is in place.
6 (NASNI)	Public Works Salvage Area. Removal action in 1996 removed polychlorinated biphenyl (PCB)-contaminated soils.	No further action recommended for this site.
7 (NASNI)	Building 39 runoff catchment area. Past use for gunnery school and missile engine test site.	No further remedial action recommended.

Source: Navy Environmental Leadership Program 2000

No IRP sites will be disturbed by SSTC training activities.

3.4.1.4.3 Military Munitions Response Program Sites

Approximately 40 acres of San Diego Bay shore located approximately two miles south of the City of Coronado served as a disposal area for dredge spoils from a 1966 San Diego Bay dredging project. The dredged material used to fill the site was later discovered to contain UXO from the military. In 1969, approximately seven feet of clean fill material was placed on top of the site.

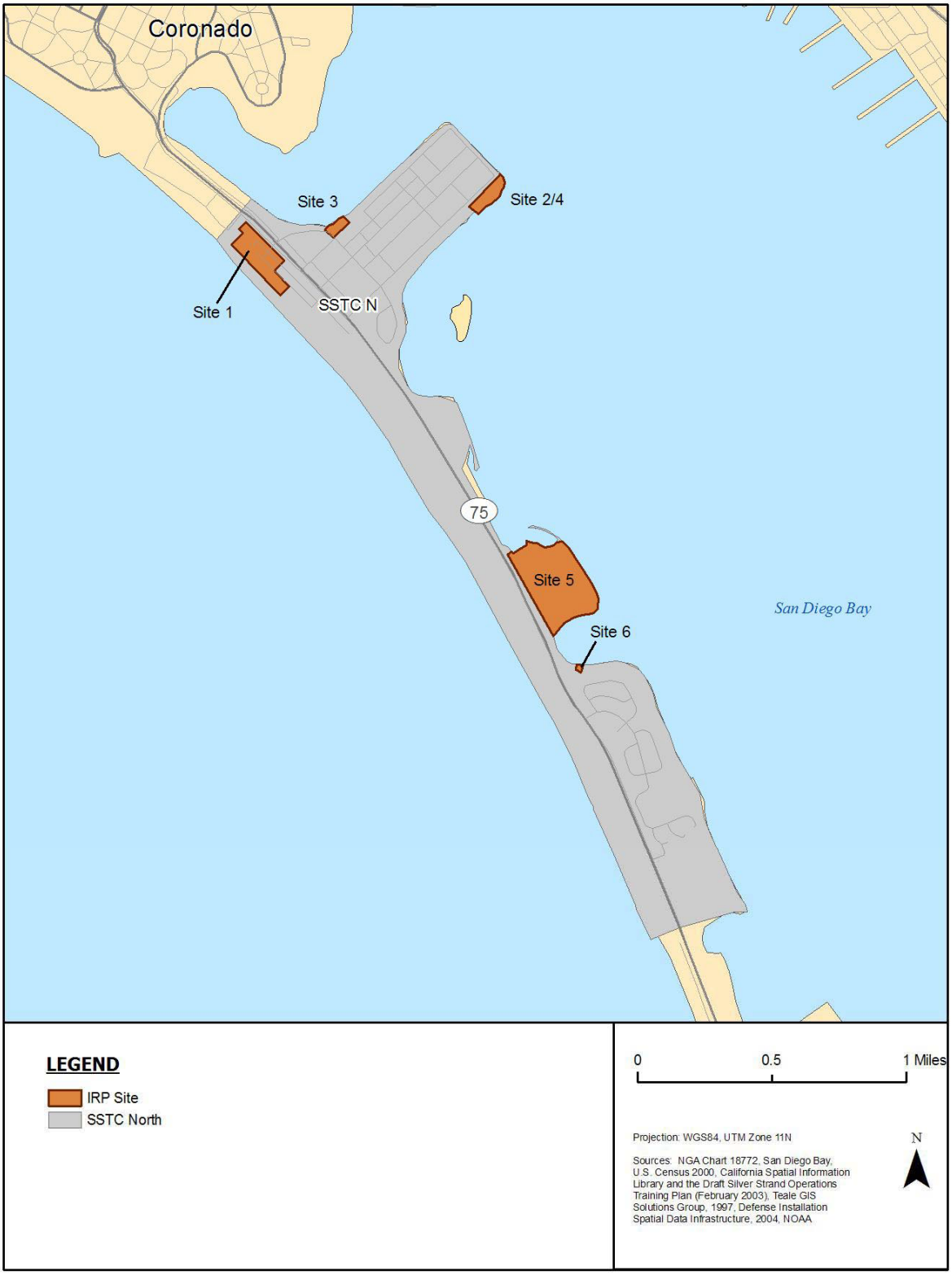
In 1984, the Navy set aside 75 acres on Silver Strand as a California least tern nesting preserve. The disposal area is located within the preserve. The location of this area is provided in Figure 3.4-1. This area was then designated as Delta South, and is now fenced and inaccessible to the public. The disposal area was included in the IRP during an initial assessment in 1986, and was designated as IRP Site 5. In 1990, a UXO sweep was conducted by the Navy, and the area was certified free of surface ordnance. The site, now referred to as MMRP Site 5, has been transferred to the MMRP, and is undergoing further investigation.

The only NASNI MMRP site is Site 8, which was moved from the IRP. This site is currently undergoing a Site Inspection. All IRP and MMRP sites are non-operational clean-up sites and ranges. No MMRP sites will be disturbed by SSTC training activities.

Delta South is a designated Navy training area per Fleet Area Control and Surveillance Facility, San Diego Instruction 3120.1E. It is frequently used by operational groups local to San Diego for land maneuvering and amphibious exercises; no live-fire activities are conducted at Delta South. Training at Delta South does not include intrusive activities such as digging; this restriction is considered sufficient to protect the safety of Navy operators.

3.4.1.5 Current Mitigation Measures

The Navy's general instructions (e.g., OPNAVINST 5090.1) and training activity planning and review processes ensure that hazardous materials and hazardous wastes are stored and handled appropriately. The Navy's current mitigation measures include its *HWMP*, *NBC Hazardous Substance Release Integrated Contingency Plan* (DoN 2008), and *Regional Explosive HWMP* (Section 3.4.1.4.1). Navy personnel also collect expended training materials at the conclusion of a training activity, to the extent practicable.



Source: Navy Environmental Leadership Program 2000

Figure 3.4-1: Location of SSTC-N IRP Sites

3.4.2 Environmental Consequences

This resource section focuses on groups of activities that could involve certain aspects of hazardous materials management. As discussed previously, similar types of activities are grouped together (agglomerated) for ease of analysis. Types of activities that could affect hazardous materials management are those that use hazardous materials, store bulk chemicals in the training area, generate hazardous wastes, or release hazardous constituents into the environment. These include Activities 4-7, 9-12, 25-28, 30-35, 37, 43, 48, 50, 56, 57, 59-62, 64, 71, 77 (Table 2-1) and N1, N3, N7-N9, and N11 (Table 2-2). Activities that do not involve the use of hazardous materials, storage of bulk chemicals or hazardous wastes on the site, or release hazardous constituents include the following: 1-3, 8, 13-24, 29, 36, 38-42, 44-47, 49, 51, 52-55, 58, 63, 65-70, 72-76 (Table 2-1) and N2, N4-N6, and N10 (Table 2-2). As noted in Section 3.4.1.4.3, IRP and MMRP sites would not be affected by current or proposed training activities at SSTC, and are not discussed further in the analysis.

3.4.2.1 Approach to Analysis

This section addresses hazardous materials and wastes in their broadest sense, because their definitions under various federal and State regulations—intended to accomplish diverse governmental objectives and constrained by specific legal authorities—are not entirely consistent with the actual environmental and human health effects of substances and materials and thus the following definitions are used. Hazardous materials and hazardous wastes were defined in Section 3.4.1.1.1. Hazardous constituents are hazardous materials or substances present at low concentrations within, or as a minor component of, a matrix, package, or construct that is nonhazardous in normal use (e.g., a radio battery).

Hazardous constituents often are used to enhance a material by increasing strength, reducing weight, improving reliability, lowering life-cycle costs, reducing wear, or slowing degradation. Hazardous constituents can be released from their parent material (matrix) when it is disturbed, degraded, or destroyed. The particular hazardous features of these hazardous constituents are generally recognized and understood by their users. Safe handling and pollution prevention measures are a routine part of systems programs to minimize and manage their effects throughout the acquisition process. Among the issues addressed are the types, amounts, and distribution of hazardous constituents associated with the Navy training activities outlined in Chapter 2 of this Environmental Impact Statement.

Materials that contain hazardous constituents include munitions, batteries, telemetry systems, fuel, and hydraulic fluid. Wastes that may contain hazardous constituents include waste oil, aerosols, batteries, used munitions, and cleaning compounds. These materials can affect human health or the environment through direct contact, or through leaching or dispersion of their hazardous constituents.

The significance of potential impacts associated with hazardous materials, constituents, substances, and wastes is based primarily on their characteristics, distribution, transportation, storage, and disposal. Factors used to assess significance include the extent or degree to which implementation of an alternative would substantially increase the human health risk or environmental exposure resulting from the storage, use, transportation, and disposal of these materials and substances. A second measure of significance is whether the use, transportation, storage, and disposal of hazardous items are consistent with the various federal and State laws regulating these materials.

3.4.2.1.1 Explosives

Explosives in modern military ordnance are generally solid-cast explosive fills, formed by melting the constituents and pouring them into steel or aluminum casings. Most new U.S. Navy formulations contain plastic-bonded explosives that use plastic or other polymer binders to increase their stability (Janes 2005, 2006). Royal Demolition Explosive (RDX)/High Melting Explosive (HMX) blends have generally replaced trinitrotoluene (TNT) in plastic-bonded formulations.

Munitions constituents of concern include cyclonitramines, such as RDX and HMX, and their degradation products. RDX is subject to photolysis and biodegradation once exposed to the environment. As a group, military-grade explosives have low water solubility (the amount of a substance that can dissolve into water) (Table 3.4-4), and are relatively immobile in water. The degradation and dissolution of these materials may be further slowed by the physical structure and composition of blended explosives, which contain multiple chemical compounds, often with additional binding agents. For example, Composition (C)-4 is 91 percent RDX and nine percent plasticizers. When military munitions are used for their intended purpose, they are not considered to be a hazardous waste under RCRA.

Table 3.4-4: Water Solubility and Degradation Products of Common Explosives

Compound	Water Solubility (milligrams per liter at 20°C)
Salt (sodium chloride) [for comparison]	357,000
Ammonium perchlorate	249,000
Picric acid	12,820
Nitrobenzene	1,900
Dinitrobenzene	500
Trinitrobenzene	335
Dinitrotoluene	160-161
Trinitrotoluene	130
Tetryl	51
Pentaerythritol tetranitrate	43
RDX	38
HMX	7
White phosphorus	4

Source: DoN 2007

3.4.2.1.2 Other Munitions Constituents

Other munitions constituents of concern include pyrotechnic (illumination and smoke) compounds, propellants, primers, and metals (e.g., iron, manganese, copper, lead, zinc, antimony, mercury) released from both initiation primers and ordnance casing corrosion. Common primers include lead azide, lead styphnate, and mercury fulminate. Pentaerythritol tetranitrate is a major component of detonation cord and blasting caps. Phosphorus, potassium perchlorate, and metal nitrates are common ingredients of pyrotechnics, flares, and smokes. In particular, the heavy metals tend to accumulate in surface soils because of their generally low solubility and their elemental nature—they may oxidize or otherwise react with natural substances, but do not break down in the manner of organic compounds.

3.4.2.1.3 Explosives Residues

The explosive residues generated when ordnance functions as designed (high-order detonation), or experiences a low-order detonation, generate constituents of concern. A high-order detonation is a complete detonation of maximum velocity that consumes almost all explosive constituents. Low-order detonation is either incomplete detonation or detonation at lower than maximum velocity, and explosive constituents remain along with combustion byproducts. The major explosive residues of organic nitrated compounds such as RDX include water, carbon dioxide, carbon monoxide, and nitrogen (Brinkley and Wilson 1943; John 1941 and 1943; Renner and Short 1980; Cook and Spillman 2000). High-order detonations result in almost complete conversion of explosives (99.997 percent or more [U.S. Army Corps of Engineers 2003]) into such inorganic compounds, whereas low-order detonations result in incomplete conversion (i.e., a mixture of the original explosive and its byproducts). For example, Table

3.4-5 lists the calculated chemical byproducts of high-order underwater detonation of RDX and Composition B, the military-grade mixture of RDX and plasticizers.

Table 3.4-5: Chemical Residue Composition of Underwater Detonations

Component	Percent by Weight, by Explosive Compound	
	RDX	Composition B
Nitrogen	37.0	29.3
Carbon dioxide	24.9	34.3
Water	16.4	8.4
Carbon monoxide	18.4	17.5
Carbon (elemental)	-	2.3
Ethane	1.6	5.4
Hydrogen	0.3	0.1
Propane	0.2	1.8
Ammonia	0.9	0.6
Methane	0.2	0.2
Hydrogen cyanide	<0.0	<0.0
Methyl alcohol	<0.0	-
Formaldehyde	<0.0	<0.0
Other compounds	<0.0	<0.0

Note: < indicates "less than"

Source: Renner and Short 1980.

Field studies conducted by the U.S. Army indicate that explosives residues include 0.003 percent or less of the original quantity of material detonated, although the amounts of explosives residues vary among different types of ordnance. Land-based studies show that, for large ordnance items such as bombs, high-order detonations may spread very small residual particles in the micron and submicron-sized range over hundreds of square meters. Individual quantities of explosives used at SSTC are much smaller than those tested by the Army, however, so the amount of original detonation material is smaller and the explosive velocity is lower. Given the nature of training events at SSTC, low order detonations, while possible, are not the desired training outcome and any remnants are retrieved to the greatest extent practical.

3.4.2.2 No Action Alternative

3.4.2.2.1 Hazardous Materials

Munitions

Various types of small, expendable training items are shot, thrown, dropped, or placed within the training areas. These items include smoke grenades, and flares of various types. These items are used in relatively small quantities for selected training activities, and are scattered over a large area. Recognizable items such as smoke grenades expended on the beach are collected, to the extent practicable, at the conclusion of the exercise. Items that are expended on the water, and fragments that are not recognizable as training materials (e.g., flare residue), generally are not collected.

Under the No Action Alternative, about 3,520 smoke grenades and flares are used at SSTC (Appendix C). At an average weight of about 0.85 pound per item (DoN 2008), about 2,990 pounds per year of these wastes (3,520 x 0.85 pound each = 2,990 pounds) would be generated. Solid flare and pyrotechnic residues may contain, depending upon their purpose and color, aluminum, magnesium, zinc, strontium, barium, cadmium, and nickel, as well as perchlorates. Although pyrotechnic residues include hazardous

constituents, most of them are present in small amounts or low concentrations, and are bound up in insoluble compounds. As inert, incombustible solids, with low concentrations of leachable metals, these materials do not meet the criteria for hazardous wastes.

Under the No Action Alternative, about 265,000 small arms rounds and simunitions (a non-lethal projectile used to simulate live fire) per year are fired at SSTC, including about 187,300 blanks, about 77,600 simunitions, and up to 150 shotgun shells (Appendix C). The blanks are assumed to leave no solid residues on the range. At an approximate weight of about 0.02 pound each, the expended simunitions of dye-coated plastics used during Close Quarter Combat (CQC)/Close Quarter Defense (CQD) training weigh about 0.8 tons. Expended materials accumulate in areas used for training activities, such as the CQC/CQD training facility. Exercise participants collect visible, expended training materials to the extent practicable.

Approximately 1,200-1,610 pounds per year of explosives (Appendix C) are used for surface and below water training (Table 3.5-7). The major byproducts of these detonations are nitrogen, carbon dioxide, water, and carbon monoxide. Only trace amounts of organic compounds are left following a detonation of explosives and are not expected to affect surrounding biological or physical resources.

Petroleum Products and Other Chemical Use

Under the No Action Alternative, petroleum products and other materials are stored in bulk, primarily at SSTC-N NAB Coronado; all maintenance and fueling of vehicles and vessels involved in training occurs there. Quantities of hazardous materials appropriate to the particular training event are transported to SSTC training areas. Materials potentially present in the training areas include various fuels, oil and hydraulic fluids, batteries of various types; pyrotechnical devices such as flares and smoke grenades; explosive items such as blanks, blasting caps, and explosives; paint; and water treatment chemicals used for Reverse Osmosis Water Purification Unit (ROWPU) (Activity 50, Table 2-1) training (sodium hexamonophosphate, sodium hypochlorite, and citric acid in 5-gallon pails).

Unintended releases of hazardous materials could pose a risk primarily to on-site military personnel, and secondarily to individuals in adjacent areas. However, over a recent three-year period (2005-2007), there were only four training-related spills (one on land and three on the water) that totaled less than 40 gallons. A single spill (ruptured bulldozer hydraulic line) accounted for 35 gallons, or almost 90 percent of the total. The other spills included oily waste or fuel; onsite personnel responded using spill response materials, such as absorbent pads. Thus, when these materials are used as intended, and in accordance with the Navy's safety policies and procedures, these materials do not pose a risk to on-site personnel or the community as active controls minimize spills and responses to spills are immediate.

3.4.2.2.2 Hazardous Wastes

Wastes from training activities at SSTC include waste petroleum products, used coolants, various types of expended training materials, brine and backwash from the ROWPU training, and batteries. Most of these waste types are nonhazardous, some (e.g., batteries) may qualify as universal wastes (wastes that are not designated as hazardous wastes, but containing materials that need to be prevented from release into the environment), and some of the wastes are hazardous under RCRA. Hazardous wastes are stored in satellite accumulation areas on SSTC and in a 90-day storage area at NAB Coronado, and transported along SR-75 by truck to regional hazardous waste TSD facilities. Under the No Action Alternative, SSTC would continue to produce similar quantities of hazardous wastes.

Hazardous wastes derived directly from SSTC training activities represent an insignificant portion of the volume of hazardous wastes shipped to regional and national waste disposal facilities. The State and

Federal government will continue to assure that such facilities have ample capacity to accommodate industrial, commercial, and governmental wastes in the future.

3.4.2.3 Alternative 1 (Preferred Alternative)

3.4.2.3.1 Hazardous Materials

Under Alternative 1, the amount of hazardous materials used for training at SSTC would increase over the No Action Alternative. Thus, the quantity of hazardous materials transported to SSTC along SR-75 and the hazardous materials at SSTC would increase. However, the maximum quantities of these materials stored on-site would not increase, because the increases would not trigger the need for expanded storage facilities. Consequently, impacts to the on-base hazardous materials management system would be the same as under the No Action Alternative.

Munitions

Alternative 1 would generate substantially more expended munitions residues than the No Action Alternative. Under Alternative 1, about 5,190 smoke grenades and flares (Appendix C) would be used at SSTC, an increase over the No Action Alternative of about 48 percent. At an average weight of about 0.85 pound per item (DoN 2008), about 4,410 pounds per year of these wastes (5,190 x 0.85 pound each = 4,410 pounds) would be generated. Although pyrotechnic residues include hazardous constituents, these constituents are present in small amounts or low concentrations, and are bound up in insoluble compounds. As inert, incombustible solids with low concentrations of leachable metals, smoke and flare residues do not meet the criteria for hazardous wastes.

Under Alternative 1, about 343,000 small arms rounds and simunitions per year are fired at SSTC, including about 201,000 blanks, about 141,000 simunitions, and up to 1,400 shotgun shells. The blanks are assumed to leave no solid residues on the range. At an approximate weight of about 0.02 pound each, the expended simunitions of dye-coated plastics during CQC/CQD training weigh about 1.4 tons. Expended materials would accumulate in areas used for these training activities, such as in the CQC/CQD facility. Exercise participants would collect visible expended training materials to the extent practical.

About 2,451-3,480 pounds per year of explosives are used for surface and underwater training. As indicated in Table 3.4-4, the major byproducts of these detonations are nitrogen, carbon dioxide, water, and carbon monoxide. Only trace amounts of organic compounds would be left following an underwater detonation of explosives. At such concentrations, these substances would have no effect on water quality.

Petroleum Products and Other Chemicals

Under Alternative 1, the same types of petroleum products and other chemicals would be present on the beach during training exercises, and in the same quantities as the No Action Alternative. ROWPU training would continue at the same number of training activities as the No Action Alternative. Shore training activities requiring the presence of bulk chemicals would occur more frequently than the No Action Alternative. For these reasons, the potential effects of staging petroleum products and other bulk chemicals on the beaches during training would be somewhat greater than those described in the No Action Alternative.

3.4.2.3.2 Hazardous Wastes

Under Alternative 1, SSTC would produce more wastes than are produced under the No Action Alternative. Wastes from training activities at SSTC would include waste petroleum products, used coolants, various types of expended training materials, brine, and backwash from the ROWPU training, and batteries. Most of these waste types would be nonhazardous, some (e.g., batteries) may qualify as universal wastes, and some of the wastes are hazardous under RCRA. Hazardous waste shipments to TSD

facilities (primarily by truck along SR-75) would also increase. The number of hazardous waste satellite accumulation points and the size of the 90-day storage facility likely would not increase. The increase in waste generation would be accommodated within the existing management program. The maximum quantities of hazardous wastes stored on-site would not increase.

3.4.2.4 Alternative 2

The only difference between Alternative 1 and Alternative 2 is that all SSTC-N oceanside beach training areas would be available for Navy training, regardless of time of year under Alternative 2. Therefore, impacts associated with Alternative 2 would be the same as those described above for Alternative 1. Increased access and availability at SSTC-N training areas would not increase the use of hazardous materials or wastes.

3.4.3 Proposed Mitigation Measures

No adverse effects associated with hazardous materials or wastes were identified; therefore no mitigation measures are warranted. However, current mitigation measures, including implementation of practices outlined in Navy plans (listed in Section 3.4.1.5) and the collection of expended training materials, would continue to be implemented.

3.4.4 Unavoidable Adverse Environmental Effects

There are no unavoidable adverse environmental effects associated with hazardous materials and wastes as a result of implementation of any of the alternatives.

3.4.5 Summary of Effects

Table 3.4-6 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2.

Table 3.4-6: Summary of Effects

Alternative	Effects
No Action Alternative	• Use of expendable training materials deposits small amounts of training materials on the land ranges. Most of the degradation products of these materials are nonhazardous inorganic materials and are collected where feasible at the conclusion of training. Only trace amounts of nonhazardous organic compounds are left following a detonation of explosives and are not expected to affect surrounding biological or physical resources. • The Navy's existing hazardous materials management system is sufficient for handling hazardous materials needed for the baseline training activities. • The Navy's existing hazardous waste system is sufficient for handling hazardous wastes generated by baseline training activities.
Alternative 1	• Under this alternative, the amounts of expended training materials would increase. The weight of expended flare and smoke canister residues would increase and the amounts of residues from detonations of underwater explosives would increase. Despite these increases, the amounts of expended materials would not have an adverse effect on physical or biological aquatic resources. • The Navy's existing hazardous materials management system is sufficient for handling hazardous materials needed for the proposed training activities. • The Navy's existing hazardous waste management system is sufficient for handling of wastes generated by the Proposed Action.
Alternative 2	• Impacts would be similar to those for Alternative 1.
Mitigation Measures	• The Navy's general instructions (e.g., OPNAVINST 5090.1) and training activity planning and review processes serve to ensure that hazardous materials and hazardous wastes are stored and handled appropriately. The Navy's current mitigation measures include its business plan (Section 3.4.1.3.1), *HWMP*, *NBC Hazardous Substance Release Integrated Contingency Plan* (DoN 2008), and *Regional Explosive HWMP* (Section 3.4.1.4.1). Navy personnel also collect expended training materials at the conclusion of a training activity to the extent practicable.

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