

3.12 PUBLIC HEALTH AND SAFETY

PUBLIC HEALTH AND SAFETY SYNOPSIS

The Navy considered all potential stressors and the following have been analyzed for public health and safety:

- Underwater energy
- In-air energy
- Physical interactions
- Indirect impacts from sediment and water quality changes

Preferred Alternative

- Because of the Navy's standard operating procedures, impacts to public health and safety would be unlikely.

3.12.1 INTRODUCTION AND METHODS

3.12.1.1 Introduction

This section analyzes potential impacts on public health and safety within the Atlantic Fleet Training and Testing (AFTT) Study Area (Study Area). Unlike military training and testing activities conducted within a fenced-in boundary of an installation on land, public access to areas at sea or overlying airspace cannot be physically controlled. The Navy coordinates use of these areas internally by scheduling activities and by issuing warnings and notices to the public before conducting potentially hazardous activities (Section 3.12.2.2, Safety and Inspection Procedures). Areas of heightened sensitivity to public health and safety concerns within the Study Area include areas where the public may be close to certain activities (e.g., pierside testing or littoral training).

Generally, the greatest potential for a proposed activity to affect the public is in coastal areas because of the concentration of public activities. These coastal areas could be close to dive sites and other recreational areas where the collective health and safety of groups of individuals who could be exposed to the hazards associated with training and testing would be of concern. Most commercial and recreational marine activities (with the exception of commercial shipping) are close to the shore, usually limited by the capabilities of the boat used. Commercial and recreational fishing activities may extend as far out as 100 nautical miles (nm) from shore, but many are closer to the shoreline.

3.12.1.2 Methods

The baseline for public health and safety was derived from federal regulations, Department of Defense (DoD) directives, and Navy instructions for training and testing. The directives and instructions provide specifications for mission planning and execution that describe criteria for public health and safety considerations. The baseline for public health and safety was derived from training and testing activities under the No Action Alternative and under the Study Area shown in Figure 2.6-1.

The alternatives were evaluated based on two factors: the potential that a training or testing activity could impact public health and safety and the degree to which those activities could have an impact. The likelihood that the public would be near a training or testing activity determines the potential for

exposure to the activity. If the potential for exposure exists, the degree of the potential impacts on public health and safety, including increased risk for injury or loss of life, was determined. If the potential for exposure does not exist, there would be no impacts on public health and safety. Isolated incidents and other conditions that affect single individuals, although important for safety awareness, are not considered in this assessment (e.g., airborne noise effects are not addressed in this section).

3.12.2 AFFECTED ENVIRONMENT

3.12.2.1 Overview

The area of interest for assessing potential impacts on public health and safety is the United States (U.S.) Territorial Waters of the east and gulf coasts (seaward of the mean high water line to 12 nm). Military, commercial, institutional, and recreational activities take place simultaneously in the Study Area (see Figure 3.12-1) and have coexisted safely for decades. These activities coexist because there are rules and practices that lead to safe use of the waterway or airspace. The following paragraphs briefly discuss the rules and practices for recreational, commercial, and military use in sea surface areas and airspace.



Figure 3.12-1: Simultaneous Activities within the Study Area

3.12.2.1.1 Sea Space

Most of the sea space in the Study Area is accessible to recreational and commercial activities; however, some activities are prohibited or restricted in certain areas. These restrictions can be permanent or temporary. The National Oceanic and Atmospheric Administration issues nautical charts that reflect designated restricted zones. In accordance with Title 33 Code of Federal Regulations (C.F.R.) 72, the U.S. Coast Guard and the Department of Homeland Security publish marine information pertaining to sea space (e.g., danger zones and restricted areas, Figures 3.11-4 through 3.11-7 in Section 3.11, Socioeconomic Resources). Notices to Mariners provide information to private and commercial vessels

regarding temporary closures of areas. These navigational warnings are disseminated by broadcast notices on maritime frequency radio, weekly publications by the appropriate U.S. Coast Guard Navigation Center, and global positioning system navigation charts. They provide information about duration and location of closures due to activities that are hazardous to surface vessels. Civilian vessel operators are responsible for being aware of designated danger areas in surface waters and any Notices to Mariners that are in effect. Operators of recreational or commercial vessels have a duty to abide by maritime requirements as administered by the U.S. Coast Guard.

3.12.2.1.2 Airspace

Most of the airspace in the Study Area is accessible to general aviation (recreational, private, corporate) and commercial aircraft; however, like waterways, some areas are temporarily off limits to civilian and commercial use. The Federal Aviation Administration has established Special Use Airspace that refers to airspace of defined dimensions wherein activities must be confined because of their nature or wherein limitations may be imposed upon aircraft operations that are not part of those activities (Federal Aviation Administration 2011). Special Use Airspace in the Study Area includes the following:

- **Restricted Airspace:** Areas where aircraft are subject to restriction due to the existence of unusual (often invisible) hazards to aircraft (e.g., release of ordnance). Some areas are under strict control of the DoD, and some are shared with nonmilitary agencies.
- **Military Operations Area:** Areas typically below 18,000 feet (ft.) used to separate certain nonhazardous military flight activities from instrument flight rules traffic and to identify visual flight rules traffic where these activities are conducted.
- **Warning Area:** Areas of defined dimensions, extending from 3 nm outward from the coast of the United States, that serve to warn nonparticipating aircraft of potential danger.
- **Air Traffic Controlled Assigned Airspace:** Airspace that is Federal Aviation Administration-defined and is not over an existing operating area. This airspace is used to contain specified activities, such as military flight training, that are segregated from other instrument flight rules air traffic.

Notices to Airmen are created and transmitted by government agencies and airport operators to alert aircraft pilots of any hazards en route to or at a specific location. The Federal Aviation Administration issues Notices to Airmen to disseminate information on upcoming or ongoing military exercises with resulting airspace restrictions. Civilian aircraft operators are responsible for being aware of restricted areas in airspace and any Notices to Airmen in effect. Pilots have a duty to abide by aviation rules as administered by the Federal Aviation Administration.

Weather conditions will dictate whether an aircraft (general aviation, commercial, or military) can fly under visual flight rules or instrument flight rules. Under visual flight rules, the weather is favorable and the pilot is required to remain clear of clouds by specified distances to ensure separation from other aircraft under the concept of see and avoid. Pilots flying under visual flight rules must be able to see outside of the cockpit, control the aircraft's attitude, navigate, and avoid obstacles and other aircraft based on visual cues. Pilots flying under visual flight rules assume responsibility for their separation from all other aircraft and are generally not assigned routes or altitudes by air traffic control.

During unfavorable weather, pilots must follow instrument flight rules. Factors such as visibility, cloud distance, cloud ceilings, and weather phenomena cause visual conditions to drop below the minimum required to operate by visual flight referencing. Instrument flight rules represent the regulations and restrictions a pilot must comply with when flying in weather conditions that restrict visibility. Pilots can

fly under instrument flight rules in visual flight rules weather conditions; however, pilots cannot fly under visual flight rules in instrument flight rules weather conditions.

3.12.2.2 Safety and Inspection Procedures

During training and testing, it is Navy policy to ensure the safety and health of personnel and the general public (U.S. Department of the Navy 2011c). The Navy achieves these conditions by considering a location when planning activities, scheduling and notifying potential users of an area, and making sure an area is clear of nonparticipants. The Navy also has a proactive and comprehensive program of compliance with applicable standards and implementation of safety management systems.

As previously stated, the greatest potential for a training or testing activity to affect the public is in coastal areas because of the concentration of public activities. When planning a training or testing event, the Navy considers proximity of the activity to public areas in choosing a location. Important factors considered include the ability to control access to an area; schedule (time of day, day of week); frequency, duration, and intensity of activities; range safety procedures; operational control of activities or events; and safety history.

The Navy's Fleet Area Control and Surveillance Facilities provide active management of assigned airspace, operating areas, ranges, and training and testing resources to enhance combat readiness of U.S. Fleet Forces Command units. The Navy schedules activities through the Fleet Area Control and Surveillance Facilities who will coordinate air and surface use of the operating areas (OPAREAs) with the Federal Aviation Administration and the U.S. Coast Guard, which will issue Notices to Airmen and Notices to Mariners, respectively.

During training and testing activities in the Study Area, the Navy ensures that the appropriate safety zone is clear of nonparticipants before engaging in certain activities such as weapon firing. Inability to obtain a "clear range" could result in the delay, cancelation, or relocation of an event. This approach ensures public safety during Navy activities that otherwise could harm nonparticipants. Current Navy practices employ the use of sensors and other devices (e.g., radar and big-eye binoculars) to ensure public health and safety while conducting training and testing activities. The following subsections outline the current requirements and practices for human safety as they pertain to range safety procedures, range inspection procedures, exercise planning, and scheduling and coordinating procedures for the Navy.

Training activities comply with the Fleet Area Control and Surveillance Facility procedures. Fleet Area Control and Surveillance Facilities Virginia Capes (VACAPES) and Jacksonville (JAX) have published safety procedures for activities on the offshore and nearshore areas (U.S. Department of the Navy 2011a, b). These guidelines (and others) apply to range users as follows:

- Navy personnel are responsible for ensuring that impact areas and targets are clear before commencing hazardous activities.
- The use of underwater ordnance must be coordinated with submarine operational authorities. The coordination also applies to towed sound navigation and ranging (sonar) arrays and torpedo decoys.
- Aircraft or vessels expending ordnance shall not commence firing without permission of the Range Safety Officer for their specific range area.
- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.

- Aircraft carrying ordnance to or from ranges shall avoid populated areas to the maximum extent possible.
- Strict on-scene procedures include the use of ship sensors, visual surveillance of the range from aircraft and range safety boats, and radar and acoustic data to confirm the firing range and target area are clear of civilian vessels, aircraft, or other nonparticipants.

Testing activities have their own comprehensive safety planning instructions (U.S. Department of the Navy 2008b, 2009). These instructions provide guidance on how to identify the hazards, assess the potential risk, analyze risk control measures, implement risk controls, and review safety procedures. They apply to all testing activities, including ground, waterborne, and airborne testing activities involving personnel, aircraft, inert minefields, equipment, and airspace. The guidance applies to system program managers, program engineers, test engineers, test directors, and aircrews that are responsible for incorporating safety planning and review when conducting test programs.

The following safety and inspection procedures are implemented, and the commanding officer is responsible for implementing safety and inspection procedures, for activities conducted inside and outside testing or training ranges. In the absence of specific guidance on matters of safety, the Navy follows the most prudent course of action. The following subsections contain information on the Navy's program of compliance with applicable standards and implementation of safety management systems.

3.12.2.2.1 Aviation Safety

The Navy procedures regarding planning and management of Special Use Airspace are provided in the Chief of Naval Operations Instruction 3770.2K, *Airspace Procedures and Planning Manual* (U.S. Department of the Navy 2007). Scheduling and planning procedures for air operations on range complexes (including testing activities in the Northeast Range Complexes) are issued through the Navy's Fleet Area Control and Surveillance Facilities VACAPES and JAX (U.S. Department of the Navy 2011b). Testing ranges have their own procedures for aviation safety, like the Naval Surface Warfare Center Panama City Division Instruction (U.S. Department of the Navy 2008b) and Naval Undersea Warfare Center Division, Newport Instruction (U.S. Department of Defense 2009).

Aircrews involved in a training or testing exercise must be aware that nonparticipating aircraft and ships are not precluded from entering the area and may not comply with Notices to Airmen or Notices to Mariners. Aircrews are required to maintain a continuous lookout for nonparticipating aircraft while operating in warning areas under visual flight rules. In general, aircraft carrying ordnance are not allowed to fly over surface vessels.

3.12.2.2.2 Submarine Navigation Safety

Submarine crews use various methods to avoid collisions while they are surfaced, including visual and radar scanning, acoustic depth finders, and state-of-the-art satellite navigational systems. When transiting submerged, submarines use all available ocean navigation tools, including inertial navigation charts that calculate position based on the submerged movements of the submarine. Areas with surface vessels can then be avoided to protect both the submarines and surface vessels.

3.12.2.2.3 Surface Vessel Navigation Safety

The Navy practices the fundamentals of safe navigation. While in transit, Navy surface vessel operators are alert at all times, use extreme caution, use state-of-the-art satellite navigational systems, and are trained to take proper action if there is potential risk. Surface vessels are also equipped with trained and

qualified Navy lookouts. Individuals trained as lookouts have the necessary skills to detect objects or activity in the water that could potentially be a risk for the vessel.

For specific testing activities, like unmanned surface vehicle testing, a support boat will be used in the vicinity of the testing to ensure safe navigation. Before firing or launching a weapon or radiating a non-eyesafe laser, Navy surface vessels are required to determine that all safety criteria have been satisfied. When applicable, the surface vessel will use aircraft and other boats to aid in navigation. In accordance with Navy instructions presented in this chapter, safety and inspection procedures ensure public health and safety.

3.12.2.2.4 Sonar Safety

Surface vessels and submarines may use active sonar in the pierside locations listed in Chapter 2 and during transit to the training or testing exercise location. To ensure safe and effective sonar use, the Navy applies the same safety procedures for pierside sonar use as described under Section 3.12.2.2, Safety and Inspection Procedures.

Naval Sea Systems Command Instruction 3150.2, Appendix 1A, *Safe Diving Distances from Transmitting Sonar*, is the Navy's governing document for protection of divers during active sonar use (U.S. Department of the Navy 1999). This instruction provides procedures for calculating safe distances from active sonar. These procedures are derived from experimental and theoretical research conducted at the Naval Submarine Medical Research Laboratory and the Navy Experimental Diving Unit. Safety distances vary based on conditions that include diver dress, type of sonar, and duration of time in the water. Some safety procedures include measurements to be taken during testing activities to identify an exclusion area for nonparticipating swimmers and divers.

3.12.2.2.5 Electromagnetic Energy Safety

All frequencies (or wavelengths) of electromagnetic energy are referred to as the electromagnetic spectrum and include electromagnetic radiation and radio frequency radiation. Communications and electronic devices such as radar, electronic warfare devices, navigational aids, two-way radios, cell phones, and other radio transmitters produce electromagnetic radiation. While such equipment emits electromagnetic energy, some of these systems are the same as, or similar to, civilian navigational aids and radars at local airports and television weather stations. Radio waves and microwaves emitted by transmitting antennas are another form of electromagnetic energy, collectively referred to as radio frequency radiation. Radio frequency energy includes frequencies ranging from 0 to 3,000 gigahertz. Exposure to radio frequency energy of sufficient intensity at frequencies between 3 kilohertz and 300 gigahertz can adversely affect people, ordnance, and fuel.

To avoid excessive exposures from electromagnetic energy, military aircraft are operated in accordance with standard operating procedures that establish minimum separation distances between electromagnetic energy emitters and people, ordnance, and fuels (U.S. Department of Defense 2009). Thresholds for determining hazardous levels of electromagnetic energy to humans, ordnance, and fuel have been determined for electromagnetic energy sources based on frequency and power output, and current practices are in place to protect the public from electromagnetic radiation hazards (U.S. Department of Defense 2002, 2009). These procedures include setting the heights and angles of electromagnetic energy transmissions to avoid direct exposure, posting warning signs, establishing safe operating levels, activating warning lights when radar systems are operational, and not operating some platforms that emit electromagnetic energy within 15 nm of shore. Safety planning instructions provide clearance procedures for nonparticipants in operational areas before conducting training

(U.S. Department of the Navy 2011a, b) and testing (U.S. Department of the Navy 2008b, 2009) activities that involve underwater electromagnetic energy (e.g., mine warfare).

Mine warfare devices are analyzed under other resources in this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) because they emit electromagnetic energy. The electromagnetic effects from mine warfare devices are extremely localized, unlike radars and radios. Measures to avoid public interaction with mine warfare devices are effective at protecting the public from these effects.

3.12.2.2.6 Laser Safety

Lasers produce light energy. The Navy uses tactical lasers for precision range finding, as target designation/illumination devices for engagement with laser-guided weapons, and for mine detection and mine countermeasures. Testing activities would also include high energy laser weapons tests to evaluate the specifications, integration, and performance of an aircraft-mounted, high energy laser. The high energy laser would be used as a weapon to disable small surface vessels. Laser safety procedures for aircraft require an initial pass over the target before laser activation to ensure that target areas are clear. The Navy observes strict precautions and has written instructions in place for laser users to ensure that nonparticipants are not exposed to intense light energy. During actual laser use, aircraft run-in headings are restricted to avoid unintentional contact with personnel or nonparticipants. Personnel participating in laser training activities are required to complete a laser safety course (U.S. Department of the Navy 2008a).

3.12.2.2.7 High-Explosive Ordnance Detonation Safety

Pressure waves from underwater detonations can pose a physical hazard in surrounding waters. Before conducting an underwater training or testing activity, Navy personnel establish an appropriately sized exclusion zone to avoid exposure of nonparticipants to the harmful intensities of pressure. Naval Sea Systems Command Instruction 3150.2, Chapter 2, *Safe Diving Distances from Transmitting Sonar*, provides procedures for determining safe distances from underwater explosions (U.S. Department of the Navy 1999). In accordance with training and testing procedures for safety planning related to detonations (Section 3.12.2.2.8, Weapons Firing and Ordnance Expenditure Safety), the Navy uses the following general and underwater detonation procedures:

- Navy personnel are responsible for ensuring that impact areas and targets are clear before commencing hazardous activities.
- The use of underwater ordnance must be coordinated with submarine operational authorities.
- Aircraft or vessels expending ordnance shall not commence firing without permission of the Range Safety Officer or Test Safety Officer for their specific range area.
- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.
- Detonation activities will be conducted during daylight hours.

3.12.2.2.8 Weapons Firing and Ordnance Expenditure Safety

In accordance with safety and inspection procedures (U.S. Department of the Navy 2011b), any unit conducting firing and ordnance expenditure shall ensure that all possible safety precautions are taken to prevent accidental injury or property damage. The Officer Conducting the Exercise shall permit firing or jettisoning of aerial targets only when the area is confirmed to be clear of nonparticipating units, both civilian and military.

Safety is a primary consideration for all training and testing activities. The range must be able to safely contain the hazard area of the weapons and equipment employed. The hazard area is based on the size and net explosive weight of the weapon, and it includes a safety buffer around the target to account for items going off range or malfunctioning. The size of the buffer zone is determined by the type of activity. For activities with a large hazard area, special sea and air surveillance measures are implemented to make sure the area is clear before the activities commence. Before aircraft can drop ordnance, they are required to make a preliminary pass over the intended target area to ensure that it is clear of boats, divers, or other nonparticipants. Aircraft carrying ordnance are not allowed to fly over surface vessels.

Training and testing activities are delayed, moved, or cancelled if there is any question about the safety of the public. Target areas must be clear of nonparticipants before conducting training and testing. When using ordnance with flight termination systems (which terminate the flight of airborne missiles or launch vehicles when they veer from their targeted path), the Navy is required to follow standard operating procedures to ensure public health and safety. In those cases where a weapons system does not have a flight termination system, the size of the target area that needs to be clear of nonparticipants is based on the flight distance of the weapon plus an additional distance beyond the system's performance capability.

3.12.3 ENVIRONMENTAL CONSEQUENCES

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) potentially impact public health and safety. Tables 2.8-1 through 2.8-3 present the baseline and proposed training and testing activity locations for each alternative (including the number of events and ordnance expended). Each public health and safety stressor is introduced, analyzed by alternative, and analyzed for training and testing activities. Table F-1 in Appendix F shows the warfare areas and associated stressors that were considered for analysis of public health and safety. The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to public health and safety are the following:

- underwater energy
- in-air energy
- physical interactions

Part of Alternatives 1 and 2 includes the expansion of the Study Area boundary to the north Atlantic Ocean, the southern part of the Gulf of Mexico, and in shipyards. While Alternatives 1 and 2 would adjust locations and tempo of training and testing activities, existing safety procedures and standard operating procedures would be employed such that no new or additional impacts to public health and safety would occur. Therefore, the expansion of the Study Area boundary will not be addressed in the analysis below.

The potential for impacts on public health and safety were evaluated assuming the continued implementation of the Navy's current safety procedures for each training and testing activity or group of similar activities. Generally, the greatest potential for the proposed activities to be co-located with public activities would be in coastal areas because most commercial and recreational activities occur close to the shore.

Training and testing activities in the Study Area are conducted in accordance with guidance provided in Fleet Area Control and Surveillance Facility Instructions (U.S. Department of the Navy 2011a, b) and Test and Safety Planning Instructions (U.S. Department of the Navy 2008b, 2009). These instructions provide

operational and safety procedures for all normal range events. They also provide information to range users that is necessary to operate safely and avoid affecting nonmilitary activities such as shipping, recreational boating, diving, and commercial or recreational fishing. Ranges are managed in accordance with standard operating procedures that ensure public health and safety. Current requirements and practices (e.g., standard operating procedures) designed to prevent public health and safety impacts are identified in Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring.

3.12.3.1 Underwater Energy

Underwater energy can come from acoustic sources or electromagnetic devices. Active sonar, underwater explosions, airguns, and vessel movements produce underwater acoustic energy. Sound will travel from air to water during aircraft overflights. Electromagnetic energy can enter the water from mine warfare training devices and unmanned underwater systems. The potential for the public to be exposed to these stressors would be limited to individuals, such as recreational swimmers or self-contained underwater breathing apparatus (SCUBA) divers, that are underwater and within unsafe proximity of a training or testing event.

Underwater acoustic energy is generated from many of the proposed activities; however, not all rise to the level of consideration in this EIS/OEIS. The public might intermittently hear noise from ships if they are in the general vicinity of a training or testing event, but there would be no impact on public health and safety because of the infrequency and duration of events. Pierside integrated swimmer defense testing with underwater airguns is conducted during swimmer defense and diver deterrent training and testing activities; public health and safety would be ensured for these localized activities because access to pierside locations by nonparticipants is controlled for safety and security reasons. Because of the infrequency and short duration of the events, underwater acoustic energy from vessel movements, aircraft overflights, and airguns is not analyzed in further detail. Active sonar and underwater explosions are the only sources of underwater acoustic energy evaluated for potential impacts on public health and safety.

The proposed activities that would result in underwater acoustic energy include activities such as amphibious warfare, anti-surface warfare, anti-submarine warfare, mine warfare, civilian port defense, surface warfare testing, littoral combat ship testing, sonar maintenance, pierside sonar testing, and unmanned vehicle testing. A limited amount of active sonar would be used during transit between range complexes and training and testing locations.

The effect of active sonar on humans varies with the frequency of sonar involved. Of the four types of sonar (very high, high, mid, and low frequency), mid-frequency and low-frequency sonar have the greatest potential to impact humans due to the range of human hearing. Underwater explosives cause a physical shock front that compresses the explosive material, and the pressure wave then passes into the surrounding water. Generally, the pressure wave would be the primary cause of injury. The effects of an underwater explosion depend on several factors, including the size, type, and depth of the explosive charge and where it is in the water column.

Electromagnetic energy is associated with systems like the Organic Airborne and Surface Influence Sweep, which emit an electromagnetic field and sound to simulate the presence of a ship. It can also be used to cause nearby mines to explode. Unmanned underwater vehicles, some unmanned surface vehicles, and towed devices use electromagnetic energy. Electronic warfare activities involve aircraft, surface ship, and submarine crews attempting to control portions of the electromagnetic spectrum to degrade or deny the enemy's ability to take defensive actions. Electromagnetic signals dissipate quickly

with distance from the source. There is a lack of evidence in the literature to infer any adverse health effects from most levels of electromagnetic energy, which is why no federal standards have been set for occupational exposures to this type of energy. Because standard operating procedures require an area to be clear of participants, platforms emitting higher energy levels are not operated within 15 nm of shore and the public would not be exposed to electromagnetic energy the way a worker could experience long-term, occupational exposures. In the unlikely event that an exposure did occur, the level of electromagnetic energy associated with the Proposed Action would not be enough to pose a health and safety risk to the public. Therefore, the use of electromagnetic devices was eliminated as a potential underwater energy stressor on public health and safety.

As previously stated, the potential for the public to be exposed to these stressors would be limited to individuals who are underwater and within unsafe proximity to an event. SCUBA diving is a popular recreational activity that is typically concentrated around known dive attractions such as reefs and shipwrecks. The Professional Association of Diving Instructors (one of several scuba diving instruction organizations) suggests that certified open-water divers limit their dives to 60 ft. (18 meters [m]). More experienced divers are generally limited to 100 ft. (30.5 m); in general, no recreational diver should exceed 130 ft. (40 m) (Professional Association of Diving Instructors 2011). These depths typically limit this activity's distance from shore. Therefore, training and testing activities closest to shore have the greatest potential to co-occur with the public.

Swimmers and recreational SCUBA divers are not expected to be near Navy pierside locations (which include shipyards) because access to these areas is controlled for safety and security reasons. Locations of popular offshore diving spots are well documented, and dive boats (typically well marked) and diver-down flags would be visible from the ships conducting the training and testing. Therefore, co-occurrence of recreational divers and Navy activities is unlikely. Swimmers and recreational divers are not expected to be near training and testing locations where active sonar, underwater explosions, and electromagnetic activities would occur because of the strict procedures for clearance of nonparticipants before conducting activities.

The U.S. Navy Dive Manual (U.S. Department of the Navy 1999) prescribes safe distances from active sonar sources and underwater explosions. Safety precautions regarding use of electromagnetic energy are specified in DoD Instruction 6055.11, *Protecting Personnel from Electromagnetic Fields* (U.S. Department of Defense 2002, 2009) and Military Standard 464A, *Electromagnetic Environmental Effects: Requirements for Systems* (U.S. Department of Defense 2002). These distances would be used as the standard safety buffers for underwater energy to protect public health and safety. If any unauthorized personnel are detected within the exercise area, the activity would be temporarily halted until the area is again cleared and secured.

3.12.3.1.1 No Action Alternative

3.12.3.1.1.1 Training

Under the No Action Alternative, active sonar training activities such as anti-submarine warfare, mine warfare, and sonar maintenance would continue at current levels and at current locations including the Northeast, VACAPES, Navy Cherry Point, JAX, and Gulf of Mexico (GOMEX) Range Complexes. Activities involving underwater explosions, such as anti-surface warfare and mine warfare, would also continue at current levels and at current locations. Current locations for underwater explosions include specific training areas in VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes, and the sinking exercise boxes outside of the range complexes.

The analysis indicates that there would be no impact on public health and safety from training activities using underwater energy, based on the Navy's implementation of strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area before commencing training activities involving underwater energy. Because of the Navy's safety procedures, the potential for training activities using underwater energy to impact public health and safety under the No Action Alternative would be unlikely.

3.12.3.1.1.2 Testing

Under the No Action Alternative, active sonar testing activities such as anti-submarine warfare, mine warfare, pierside sonar testing, unmanned vehicle testing, and sonar maintenance would continue at current levels and in current locations, including areas such as the Naval Undersea Warfare Center Division, Newport Testing Range; Narragansett Bay; CGULL OPAREA; Naval Surface Warfare Center Panama City Division Testing Range; and the VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes. Pierside testing of active sonar would continue to occur in Little Creek, Virginia; King's Bay, Georgia; and Port Canaveral, Florida. Testing activities involving underwater explosions, such as anti-air warfare, anti-surface warfare, anti-submarine warfare, mine warfare, and surface combatant sea trials would also continue at current levels and at current locations. Current locations for underwater explosions include specific training areas in VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes; Naval Surface Warfare Center Panama City Division Testing Range; South Florida Ocean Measurement Facility Testing Range; and the CGULL OPAREA.

The analysis indicates that there would be no impact on public health and safety from testing activities using underwater energy, based on the Navy's implementation of strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area before commencing testing activities involving underwater energy. Because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under the No Action Alternative would be unlikely.

3.12.3.1.2 Alternative 1

Alternative 1 consists of the activities in the No Action Alternative plus the expansion of the Study Area boundary and adjustments to locations and tempo of training and testing activities. This alternative includes changes in force structure (personnel, weapons, and assets) requirements, new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems.

3.12.3.1.2.1 Training

Active sonar training events would continue to occur at current locations under Alternative 1; however, in many circumstances, the potential areas for these activities are expanded (see tables in Chapter 2). Locations for active sonar training include the Northeast, VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes and Other AFTT Areas. While Alternative 1 would adjust locations and tempo of active sonar training activities, the Navy would continue implementation of standard operating and safety procedures; therefore, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

Activities involving underwater explosions, such as anti-surface warfare, mine warfare, and civilian port defense, would also continue at current locations. The proposed locations include the VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes, and the sinking exercise boxes outside the range complexes. While Alternative 1 would adjust locations and tempo of underwater explosions training

activities, the Navy would continue implementation of standard operating and safety procedures; therefore, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

Because of the Navy's safety procedures, the potential for training activities to impact public health and safety under Alternative 1 would be unlikely.

3.12.3.1.2.2 Testing

Locations and tempo of active sonar testing activities would increase over the No Action Alternative. Alternative 1 also includes the expansion of the Study Area boundaries plus changes in force structure (personnel, weapons, and assets) requirements, new or upgraded weapons and platforms, and the testing required for these systems.

Under Alternative 1, there would be an increase in active sonar testing activities such as anti-submarine warfare, mine warfare, pierside sonar testing, unmanned vehicle testing, sonar maintenance, and sonobuoy lot acceptance testing. These activities would continue to occur in areas such as Narragansett Bay; South Florida Ocean Measurement Facility Testing Range; Naval Surface Warfare Center Panama City Division Testing Range; Key West OPAREA; and the Northeast, VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes. Pierside testing of active sonar would continue to occur in Little Creek, Virginia; King's Bay, Georgia; and Port Canaveral, Florida; however, additional testing would occur pierside in places like Bath, Maine; Groton, Connecticut; Norfolk and Newport News, Virginia; and Pascagoula, Mississippi. While Alternative 1 would adjust locations and tempo of active sonar testing activities, the Navy would continue implementation of standard operating and safety procedures; therefore, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

Testing activities involving underwater explosions—such as anti-air warfare, anti-surface warfare, anti-submarine warfare, mine warfare, surface combatant sea trials, littoral combat ship testing, ship shock trials, combat ship qualifications, at-sea explosive testing, and sonobuoy lot acceptance testing—would occur in the Key West OPAREA; Northeast, VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes; Naval Surface Warfare Center Panama City Division Testing Range; and the South Florida Ocean Measurement Facility Testing Range. While Alternative 1 would adjust locations and tempo of testing activities involving underwater explosions, the Navy would continue implementation of standard operating and safety procedures; therefore, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

Because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under the Alternative 1 would be unlikely.

3.12.3.1.3 Alternative 2

Alternative 2 consists of the activities in the No Action Alternative plus adjustments to locations and tempo of training and testing activities. This alternative includes changes in force structure (personnel, weapons, and assets) requirements, new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems.

3.12.3.1.3.1 Training

Alternative 2 is identical to Alternative 1 in the increase in active sonar and underwater explosions over the No Action Alternative. Alternative 2 is also identical to Alternative 1 in the proposed locations for

these activities. As concluded under Alternative 1, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely. Because of the Navy's safety procedures, the potential for underwater training activities to impact public health and safety under Alternative 2 would be unlikely.

3.12.3.1.3.2 Testing

Alternative 2 would adjust locations and tempo of testing activities of active sonar and underwater explosions over the No Action Alternative. Similar to the analysis under Alternative 1, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely. Because of the Navy's safety procedures, the potential for underwater testing activities to impact public health and safety under Alternative 2 would be unlikely.

3.12.3.2 In-Air Energy

In-air energy stressors include sources of electromagnetic energy and lasers. The sources of electromagnetic energy include radar, navigational aids, and electronic warfare systems. These systems operate similarly to other navigational aids and radars at local airports and television weather stations throughout the United States. Electronic warfare systems emit electromagnetic energy similar to that from cell phones, hand-held radios, commercial radio stations, and television stations. Current practices are in place to protect Navy personnel and the public from electromagnetic energy hazards. These procedures include setting the heights and angles of electromagnetic energy transmissions to avoid direct human exposure, posting warning signs, establishing safe operating levels, and activating warning lights when radar systems are operational. Procedures also are in place to limit public and participant exposure from electromagnetic energy emitted by military aircraft.

As described in Section 3.0.5.3.2.2 (Lasers), two types of lasers are used under the Proposed Action. Low energy lasers are used to illuminate or designate targets, to guide weapons, and to detect or classify mines. High energy lasers are used as weapons to disable surface targets. The Navy would operate high energy laser equipment in accordance with procedures defined in Operational Naval Instruction 5100.23G, *Navy Safety and Occupational Health Program Manual* (U.S. Department of the Navy 2011c). These high energy light sources can cause eye injuries. A comprehensive safety program exists for the use of lasers. Current Navy practices protect individuals from the hazard of severe eye injury caused by laser energy. Laser safety requirements for aircraft require verification that target areas are clear before commencement of the exercise. In addition, during actual laser use, the aircraft run-in headings are restricted to preclude inadvertent lasing of areas where the public may be present.

Training and testing activities involving electromagnetic energy include electronic warfare activities that use airborne and surface electronic jamming devices to defeat tracking and communications systems. Training activities involving low energy lasers include anti-surface warfare, mine warfare, and civil port defense; there are no training activities that use high energy lasers. Testing activities involving low energy lasers include surface warfare; air operations at Naval Surface Warfare Center Panama City Division Testing Range; and mine warfare testing. High energy laser weapon testing activities are the only testing activities using high energy laser weapons and will occur only in the VACAPES Range Complex.

3.12.3.2.1 No Action Alternative

3.12.3.2.1.1 Training

Under the No Action Alternative, electronic warfare training activities involving electromagnetic energy sources would continue at current levels and in current locations, including the VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes. Laser targeting activities and mine detection activities using lasers would also continue at current levels within the VACAPES, Navy Cherry Point, and JAX Range Complexes.

It is unlikely that the public would be exposed to electromagnetic energy sources or lasers under the No Action Alternative. Based on the Navy's strict safety procedures for use of lasers and electronic warfare, it is unlikely these activities would be conducted close enough to the public to pose an increased risk. Because of the Navy's safety procedures, the potential for these training activities to impact public health and safety under the No Action Alternative would be unlikely.

3.12.3.2.1.2 Testing

Under the No Action Alternative, electronic warfare testing activities involving electromagnetic energy sources would continue at current levels and in current locations, including the specific areas of the VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes and the Naval Surface Warfare Center Panama City Division Testing Range. Laser targeting activities and mine detection activities using lasers would continue at current levels and within current ranges and locations, including the VACAPES and JAX Range Complexes and the Naval Surface Warfare Center Panama City Division Testing Range. No high energy lasers would be used under this alternative.

It is unlikely that the public would be exposed to electromagnetic energy sources or lasers from testing activities under the No Action Alternative. Because of the Navy's strict safety procedures for use of lasers and electronic warfare, it is unlikely these activities would be conducted close enough to the public to pose an increased risk, and the potential for these testing activities to impact public health and safety under the No Action Alternative would be unlikely.

3.12.3.2.2 Alternative 1

Alternative 1 consists of the activities in the No Action Alternative plus adjustments to locations and tempo of training and testing activities. This alternative includes changes in force structure (personnel, weapons, and assets) requirements, new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems.

3.12.3.2.2.1 Training

Under Alternative 1, the number of training activities that use electromagnetic energy would increase and would occur within the VACAPES, Navy Cherry Point, JAX, Key West, and GOMEX Range Complexes. Laser targeting activities and mine detection activities using lasers would increase within the VACAPES, Navy Cherry Point, and JAX Range Complexes.

While Alternative 1 would adjust locations and tempo of training activities involving electromagnetic energy and lasers, the Navy would continue implementation of standard operating and safety procedures; therefore, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

3.12.3.2.2 Testing

Under Alternative 1, the number of testing activities that use electromagnetic energy would increase and would occur in the VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes. Laser targeting activities and mine detection activities using lasers would increase and would occur in the VACAPES and JAX Range Complexes. High energy laser equipment has undergone Navy review and approval and is designed to incorporate safety precautions and engineering controls to prevent mishaps. Alternative 1 also includes the use of high energy lasers in the VACAPES Range Complex as an adjustment to baseline activities.

While Alternative 1 would adjust locations and tempo of testing activities involving electromagnetic energy and lasers, the Navy would continue implementation of standard operating and safety procedures; therefore, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

3.12.3.2.3 Alternative 2

Alternative 2 consists of the activities in the No Action Alternative plus adjustments to locations and tempo of training and testing activities. This alternative includes changes in force structure (personnel, weapons, and assets) requirements, new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems.

3.12.3.2.3.1 Training

Alternative 2 is identical to Alternative 1 in the increase and of activities over the No Action Alternative. As concluded under Alternative 1, impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

3.12.3.2.3.2 Testing

Similar to the analysis under Alternative 1, Alternative 2 would involve an increase in electromagnetic energy and laser testing activities. Electromagnetic energy activities would occur in the Northeast, VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes. Laser targeting activities, including high energy laser testing activities, would occur in the VACAPES and JAX Range Complexes. While Alternative 2 would adjust locations and tempo of testing activities involving electromagnetic energy and lasers, the Navy would continue implementation of standard operating and safety procedures; therefore, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

3.12.3.3 Physical Interactions

Public health and safety could be impacted by direct physical interactions with Navy activities. As described in Section 3.0.5.3.3 (Physical Disturbance and Strike Stressors), Navy aircraft, vessels, targets, munitions, towed devices, seafloor devices, and other training and testing expended materials could have a direct physical encounter with recreational, commercial, institutional, and governmental aircraft, vessels, and users such as swimmers, divers, and anglers.

Both Navy and public aircraft operate under visual flight rules requiring them to observe and avoid other aircraft. In addition, Notices to Airmen advise pilots about when and where Navy training and testing activities are scheduled. Finally, Navy personnel are required to verify that the range is clear of nonparticipants before initiating any potentially hazardous activity. Together, these procedures would minimize the potential for adverse interactions between Navy and nonparticipant aircraft. Because of

standard operating procedures, private and commercial aircraft traversing the Study Area during training or testing activities are not subject to interactions with Navy aircraft, ordnance, and aerial targets.

Private and commercial vessels traversing the Study Area during training or testing activities are subject to interactions with Navy vessels, ordnance, and surface targets. Both Navy and public vessels operate under maritime navigational rules requiring them to observe and avoid other vessels. In addition, Notices to Mariners advise vessel operators about when and where Navy training and testing activities are scheduled. Finally, Navy personnel are required to verify that the range is clear of nonparticipants before initiating any potentially hazardous activity. Together, these procedures minimize the potential for adverse interactions between Navy and nonparticipant vessels.

Recreational diving within the Study Area takes place primarily at known diving sites such as shipwrecks and reefs. The locations of these popular dive sites are well documented, dive boats are typically well-marked, and diver-down flags are visible from a distance. As a result, dive sites would be easily avoided by ships conducting training or testing activities. Interactions between training and testing activities and recreational divers thus would be minimized, reducing the potential for collisions or ship strikes. Similar knowledge and avoidance of popular fishing areas would minimize interactions between training and testing activities and recreational fishing.

Commercial and recreational fishing activities could encounter military expended materials that could entangle fishing gear and could pose a safety risk. The Navy would continue to recover targets at or near the surface that were used during training or testing to ensure that they would not pose a collision risk. Unrecoverable pieces of military expended materials are typically small (such as sonobuoys), constructed of soft materials (such as target cardboard boxes or tethered target balloons), or intended to sink to the bottom after their useful function was completed, so they would not pose a collision risk to civilian vessels or equipment. Thus, these targets do not pose a safety risk to individuals using the area for recreation because the public would not likely be exposed to these items before they sank to the seafloor.

As discussed in Section 3.1 (Sediments and Water Quality), a west coast study categorized types of marine debris pulled up by a trawler during a groundfish survey. Military expended materials categorized as plastic, metal, fabric and fiber, and rubber accounted for 7.4, 6.2, 13.2, and 4.7 percent of the total count of items collected, respectively. The footprint of military expended materials in the Study Area is discussed in Section 3.3 (Marine Habitats), which concludes that if all military expended materials were located side by side in the Study Area, the footprint would be 0.185 square meters (m^2 ; 0.478 square kilometers [km^2]). Given the small footprint of military expended materials estimated here, it is unlikely the public would encounter military expended materials during recreational or commercial fishing activities.

Section 3.1 (Sediments and Water Quality) also discussed the low failure rate of munitions, which showed that most munitions operate as intended. While fishing activities may encounter undetonated ordnance, it would be unlikely because of the low density of munitions within the large size of the Study Area. The Army Corps of Engineers prescribes the following if military munitions are encountered: recognize when you may have encountered a munition, retreat from the area without touching or disturbing the item, and report the item to local law enforcement by calling 911 or the U.S. Coast Guard.

The analysis focuses on the potential for a direct physical interaction with aircraft, vessels, targets, or other expended materials. Virtually all proposed activities have potential for a direct physical interaction that could pose a risk to public health and safety, so the following analysis is not activity-specific. While some of the activities themselves may not pose potential for a direct physical interaction (like pierside testing), the platforms associated with the activity (aircraft, vessels, and towed devices) have potential for a direct physical interaction that could pose a risk. The greatest potential for a physical interaction would be along the coast because of the concentration of public activities.

3.12.3.3.1 No Action Alternative

3.12.3.3.1.1 Training

Under the No Action Alternative, training activities would continue at current levels and within current locations. The potential for a direct physical interaction between the public and aircraft, vessels, targets, or expended materials would not change from the baseline. The Navy implements strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area before commencing training activities.

The analysis indicates that there would be no impact on public health and safety from physical interactions with training activities, based on the Navy's implementation of strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area before commencing training activities involving physical interactions. Because of the Navy's safety procedures, the potential for training activities to impact public health and safety under the No Action Alternative would be unlikely.

3.12.3.3.1.2 Testing

Because the potential for a physical interaction is not activity-specific or location-specific, the analysis for the training activities above applies to testing activities under the No Action Alternative. As concluded above, because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under the No Action Alternative would be unlikely.

3.12.3.3.2 Alternative 1

Alternative 1 consists of the activities in the No Action Alternative plus adjustments to locations and tempo of training and testing activities. This alternative includes changes in force structure (personnel, weapons, and assets) requirements, new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems.

3.12.3.3.2.1 Training

Under Alternative 1, the number of training activities would increase. However, the increased number of aircraft and vessel movements or use of targets and expended materials would be conducted under the same safety and inspection procedures as under the No Action Alternative. While Alternative 1 would adjust locations and tempo of training activities, the Navy would continue implementation of standard operating and safety procedures; therefore, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

3.12.3.3.2.2 Testing

Because the potential for a physical interaction is not activity-specific or location-specific, the analysis for the training activities above applies to testing activities under Alternative 1. As concluded above,

because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under Alternative 1 would be unlikely.

3.12.3.3.3 Alternative 2

Alternative 2 consists of the activities in the No Action Alternative plus adjustments to locations and tempo of training and testing activities. This alternative includes changes in force structure (personnel, weapons, and assets) requirements, new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems.

3.12.3.3.3.1 Training

Under Alternative 2, the number of training activities would increase. However, the increased number of aircraft and vessel movements or use of targets and expended materials would be conducted under the same safety and inspection procedures as under the No Action Alternative. While Alternative 2 would adjust locations and tempo of training activities, the Navy would continue implementation of standard operating and safety procedures; therefore, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

3.12.3.3.3.2 Testing

Because the potential for a physical interaction is not activity-specific or location-specific, the analysis for the training activities above applies to testing activities under Alternative 2. As concluded above, because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under Alternative 2 would be unlikely.

3.12.4 SUMMARY OF POTENTIAL IMPACTS

3.12.4.1 Indirect Impacts

Public health and safety could be impacted if there were changes to sediment or water quality. Section 3.1 (Sediments and Water Quality) considers the impacts on marine sediments and water quality from explosives and explosion byproducts, metals, chemicals other than explosives, and other materials (marine markers, flares, chaff, targets, and miscellaneous components of other materials). The analysis determined that neither state nor federal standards or guidelines would be violated by the No Action Alternative, Alternative 1, or Alternative 2. Because these standards and guidelines are structured to protect human health, and the proposed activities do not violate them, there would be no indirect impacts on public health and safety from the training and testing activities proposed by the No Action Alternative, Alternative 1, or Alternative 2.

3.12.4.2 Combined Impact of All Stressors

Activities described in this EIS/OEIS that have potential to impact public health and safety include those that release underwater energy, in-air energy, or physical interactions, or that have indirect impacts from changes to sediments and water quality. Under the No Action Alternative, Alternative 1, or Alternative 2, these activities would be widely dispersed throughout the Study Area. Such activities also are dispersed temporally (i.e., few stressors would be present at the same time). For these reasons, no greater effects from the combined operation of more than one stressor are expected. The aggregate effect on public health and safety would not observably differ from existing conditions.

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