CALIFORNIA COASTAL COMMISSION
455 MARKET ST., SUITE 300
SAN FRANCISCO, CA 94105-2219
FAX (415) 904-5400
TDD (415) 597-5885

F13b

CD-0003-20 (Navy)

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EXHIBITS

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EXHIBIT 1

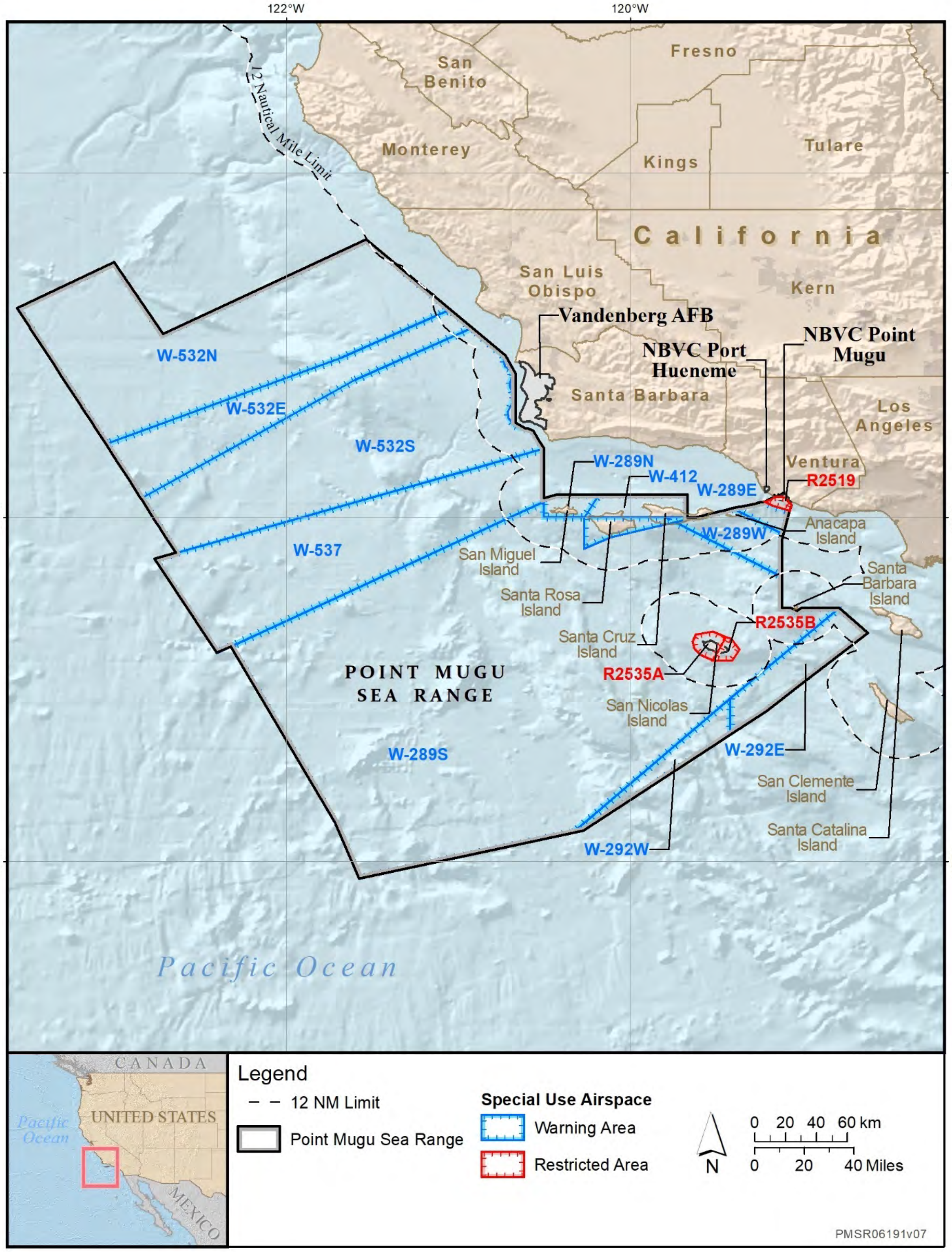

Figure ES-1: Point Mugu Sea Range Study Area

Training conducted in parallel with testing activities provides Fleet operators unique opportunities to train with ship and aircraft combat weapon systems and personnel in scripted warfare environments, including live-fire exercises. Combat ship crews train in conjunction with scheduled NAVSEA ship testing and qualification trials, to take advantage of the opportunity to provide concurrent training and familiarization for ship personnel in maintaining and operating installed equipment, identifying design problems, and determining deficiencies in support elements (e.g., documentation, logistics, test equipment, or training).

Concurrent with testing, surface training typically available on the PMSR includes tracking exercises, missile-firing exercises, gun-firing exercises, high-speed anti-radiation missile exercises, and shipboard self-defense system training (e.g., Phalanx [Close-in Weapons System], Rolling Airframe Missile, and Evolved Sea Sparrow Missile). These events are limited in scope and generally focus on one or two tasks. Missiles may be fired against sub-sonic, supersonic, and hypersonic targets. Certain training events designed for single ships are conducted to utilize unique targets only available for training at the PMSR.

Aviation warfare training conducted at PMSR, categorized as unit level training, is designed for a small number of aircraft up to a squadron of aircraft. These training events occur at PMSR as it is the only West Coast Navy venue to provide powered air-to-air targets. These events are limited in scope and generally focus on one or two tasks. These scenarios require planning and coordination to ensure safe and effective training.

2.3.2.1 Air Warfare

The mission of air warfare is to destroy or reduce enemy air and missile threats (including unmanned airborne threats). It serves two purposes: to protect U.S. forces from attacks from the air and to gain air superiority. Air warfare provides U.S. forces with adequate attack warnings, while denying hostile forces the ability to gather intelligence about U.S. forces.

Aircraft conduct air warfare through radar search, detection, identification, and engagement of airborne threats. Surface ships conduct air warfare through an array of modern anti-aircraft weapon systems such as aircraft-detecting radar, naval guns linked to radar-directed fire-control systems, surface-to-air missile systems, and radar-controlled guns for close-in point defense.

Testing of air warfare systems is required to ensure the equipment is fully functional under the conditions in which it will be used. Tests may be conducted on radar and other early-warning detection and tracking systems, new guns or gun rounds, and missiles. Testing of these warfare systems may be conducted on existing or new ships and aircraft. For some systems, tests are conducted periodically to assess operability of the systems or to support scientific research to assess new and emerging technologies.

2.3.2.1.1 Air-to-Air

Air-to-air scenarios involve the employment of an airborne weapon system against airborne targets. Missiles are fired from a fighter aircraft for both testing and training events. Range support includes range clearance, instrumentation, aerial target presentation and recovery, TM, and surveillance aircraft. The missiles are highly instrumented to record the intercept parameters and normally do not carry live warheads. However, the scenarios may require captive carry (inert), live motor but no warhead, or tactical full-capability rounds for firing and warhead detonation. The airborne targets are usually not destroyed and are recovered by boat or helicopter from the water for subsequent use.

2.3.2.1.2 Surface-to-Air

Surface-to-air scenarios evaluate the overall weapon system performance, warhead effectiveness, and software/hardware modifications or upgrades of ground-based and ship-based weapons systems. Missiles are fired from a ship or a land-based launcher against a variety of supersonic and subsonic airborne targets. The missiles are highly instrumented to record the intercept parameters and normally do not carry live warheads. Range support includes range clearance, instrumentation, aerial target presentation, TM and surveillance aircraft, and other related range support. These scenarios may include use of conventional ordnance for inert warheads or tactical full-capability rounds for firing and warhead detonation.

2.3.2.2 Electronic Warfare

The mission of EW is to degrade the enemy's ability to use electronic systems, such as communication systems and radar, and to confuse or deny them the ability to defend their forces and assets. EW is also used to detect enemy threats and counter their attempts to degrade the electronic capabilities of the Navy.

Typical EW activities include threat avoidance training, signals analysis for intelligence purposes, and use of airborne and surface electronic jamming devices (that block or interfere with other devices) to defeat tracking, navigation, and communications systems.

Testing of EW systems is conducted to improve the capabilities of systems and ensure compatibility with new systems. Testing involves the use of aircraft, surface ships, and submarine crews to evaluate the effectiveness of electronic systems. Similar to training activities, typical EW testing activities include the use of airborne and surface electronic jamming devices (including testing chaff and flares) to defeat tracking and communications systems. Chaff tests evaluate newly developed or enhanced chaff, chaff dispensing equipment, or modified aircraft systems' use against chaff deployment. Flare tests evaluate deployment performance and crew competency with newly developed or enhanced flares, flare dispensing equipment, or modified aircraft systems' use against flare deployment. EW also includes DE weapons tests, including HEL and HPM systems from land, vessels and aircraft.

2.3.2.3 Surface Warfare

The mission of surface warfare is to obtain control of sea space from which naval forces may operate, and entails offensive action against other surface, subsurface, and air targets while also defending against enemy forces. In surface warfare, aircraft use guns, air-launched cruise missiles, or other precision-guided munitions; ships employ torpedoes, naval guns, and surface-to-surface missiles; and submarines attack surface ships using torpedoes or submarine-launched, anti-ship cruise missiles.

Surface warfare training includes surface-to-surface gunnery and missile exercises, air-to-surface gunnery and missile exercises, submarine missile or torpedo launch activities, and other munitions against surface targets.

Testing of weapons used in surface warfare is conducted to develop new technologies and to assess weapon performance and operability with new systems, such as unmanned systems. Tests include various air-to-surface guns and missiles, surface-to-surface guns and missiles, and bombing tests. Testing activities may be integrated into training activities to test aircraft or aircraft systems in the delivery of munitions on a surface target. In most cases, the tested systems are used in the same manner in which they are used for Fleet training activities.

2.3.2.3.1 Air-to-Surface

Air-to-surface tests evaluate the integration of a missile or other weapons system into DoD aircraft, or the performance of the missile/system itself. Missiles are fired from an aircraft against a variety of mobile seaborne targets and fixed aim points. The missiles are highly instrumented to record the intercept parameters and normally do not carry live warheads. Range support includes range clearance, instrumentation, surface target presentation and recovery, TM, surveillance aircraft, and fixed land targets. These tests may include use of conventional ordnance for captive carry (inert), live motor but no warhead, or tactical full-capability rounds for firing and warhead detonation. The seaborne targets are usually not destroyed and are recovered for subsequent use.

2.3.2.3.2 Surface-to-Surface

Surface-to-surface tests evaluate the overall weapon system performance, warhead effectiveness, and software/hardware modifications or upgrades of ground-based and ship-based weapons systems. Missiles are fired from a ship or a land-based launcher against a variety of mobile seaborne targets and fixed aim points. The missiles are highly instrumented to record the intercept parameters and normally do not carry live warheads. Surface targets include mobile seaborne targets and land-based fixed aim points. Range support includes range clearance, instrumentation, surface target presentation and recovery, TM, surveillance aircraft, and fixed land targets. These tests may include use of conventional ordnance for inert warheads or tactical full-capability rounds for firing and warhead detonation. The seaborne targets are usually recovered for subsequent use.

2.3.2.3.3 Subsurface-to-Surface

Subsurface launches use either subsonic cruise missiles, which are aerodynamically guided jet-engine powered missiles that fly with constant speed to deliver a warhead at specified fixed aim point targets over a long distance with high accuracy; or ballistic missiles, which are rocket-propelled self-guided missiles that follow a ballistic trajectory with the objective of delivering one or more warheads to a predetermined target. A ballistic missile is only guided during relatively brief periods of flight, and most of its trajectory is unpowered and governed by gravity and air resistance if in the atmosphere. Both types of missiles are considered a component of subsurface-to-surface events. The PMSR supports the launch phase of a ballistic missile test; the launch and initial missile travel of a cruise missile test; and, on occasion, the terminal phase of a cruise missile test. These tests evaluate the overall weapon system performance, warhead effectiveness, and software/hardware modifications or upgrades of submarine-launched weapons systems. Range support includes range clearance, instrumentation, TM and surveillance aircraft, and other related range support.

2.3.3 Point Mugu Sea Range Systems

Activities on the PMSR may include the use of a variety of platforms and systems (aircraft; support vessels and range craft, ships, and submarines; targets; and ordnance). The following sections provide information on each of these systems and their use.

2.3.3.1 Range Aircraft

Range aircraft that support the mission of the PMSR fall into three categories: range surveillance and instrumentation, logistics, and testing and training platforms (including target launch). Range aircraft are based at Point Mugu, assigned to NAWCWD at other locations, or contracted to support specific tests. Typical aircraft may include F-35, F/A-18, MH-60, E2, and P-3. For purposes of the Draft PMSR EIS/OEIS, aircraft activities are referred to as a sortie. An aircraft sortie consists of a takeoff, the assigned mission, and a subsequent landing by a single aircraft. Aircraft sorties typically last a few hours depending on the type of aircraft and the mission. The PMSR is divided into defined areas to allow multiple events to occur simultaneously and to maintain a safety margin for concurrent testing and associated training activities.

2.3.3.2 Range Vessels

Vessel types supporting the PMSR include tugs, target boats, range support boats (e.g., aviation rescue boats, Navy's Self Defense Test Ship) based out of Port Hueneme, and ships (e.g., destroyers, cruisers, aircraft carriers, submarines) that are based at Port Hueneme. A vessel activity is referred to as an event. An event may include a vessel entering the sea range, accomplishing its assigned mission, and then exiting the range. Events can last from a few hours to several days. The smaller support vessels are fuel limited and generally do not have crew accommodations to allow for an extended stay afloat on the PMSR. The larger vessels can remain on the range for extended periods supporting extensive testing and training activities. Typical Navy vessels may include Guided Missile Cruiser, Guided Missile Destroyer, Amphibious Assault Ship, and Littoral Combat Ship.

2.3.3.3 Targets

Testing and training on the PMSR require a large array of representative targets, both airborne and surface targets. Typical airborne target systems include small jet-powered drones, supersonic missiles, and full-scale unmanned fighter aircraft, which can be flown via remote control from the ground. Most target systems are not destroyed during testing or training and are recovered for reuse. Airborne targets can be launched from aircraft or from surface launch sites at NBVC Point Mugu, SNI, or from a support vessel. Representative types of aerial targets and missiles may include BQM and GQM series. Representative surface targets may include Mobile Ship Target, Fast Attack Craft Target, High-Speed Maneuvering Surface Target, Low-Cost Modular Target, and QST-35.

2.3.3.4 Munitions

Military munitions are used throughout the PMSR. Munitions are an integral component of most PMSR events, as new systems must receive a validated end-to-end evaluation prior to being introduced to the fleet for combat use. Munition use is organized by type and includes bombs, projectile ammunition from various naval weapon systems, missiles, and rockets. Munitions may contain high explosives or be inert, depending on the mission objective.

2.3.4 Expanded Technologies and Capabilities Since 2002 Environmental Impact Statement/Overseas Environmental Impact Statement

Since the 2002 PMSR EIS/OEIS, expanded mission capabilities have been implemented and covered under separate environmental planning documents as discussed in Section 1.7.4 (Related Environmental Documents) of the Draft PMSR EIS/OEIS, and the Coastal Consistency Determination as described (refer to Section 1.4, Previous Coastal Consistency Compliance, of this Consistency Determination). The Draft PMSR EIS/OEIS consolidates these actions and provides an updated analysis by resource area if applicable. These mission capabilities fall within the existing warfare areas presented above, and associated documents are incorporated by reference as applicable for each resource area in the Draft PMSR EIS/OEIS.

2.3.4.1 Electronic Warfare Combat

Under the Proposed Action, NAWCWD would expand EW capabilities on the PMSR to provide representative near-shore, littoral, and open water environments to test military systems against EW threats, as well as train crews against representative EW threats. The EW range can be structured to simulate early warning radar, shipboard anti-aircraft artillery and missile fire control radar, and land-based anti-aircraft artillery and missile fire control radar. The PMSR would provide Range users with threat simulators, operations and range control, instrumentation, time-space-position information, TM, optical and communications, data processing and display systems, signal monitoring, and calibration of systems.

The use of EW range threat emitters would include up to 20 specialized mobile radars (radar signal emulator systems) positioned around the PMSR, including positions at Point Mugu, SNI, SCI, Vandenberg Air Force Base, and Laguna Peak. The radar signal emulator systems are mobile and self-contained and emulate multiple threat signals using frequencies similar to those used for satellite communications, cordless phones, Bluetooth devices, and weather radar systems. Other EW technologies include a wide range of pulsed, continuous wave, Doppler, and multispectral emitters. These systems operate over multiple frequency spectrums including infrared, radio frequency, electro-optical, and millimeter wave.

Testing and scheduled training events on the EW range would include the use of aircraft, surface vessels, and weapon systems. The types of EW events would include electronic countermeasure, radar warning receiver, Unmanned Aircraft System operation, chaff and flare effectiveness evaluation, towed and air-launch decoy testing, anti-radiation missile flight testing to evaluate seekers and avionics, and tactics development, with all events falling within the existing EW mission area as described in Section 2.1.1.2 (Electronic Warfare) of the Draft PMSR EIS/OEIS.

2.3.4.2 Directed Energy Weapons Test

In 2015, an EA was prepared for DE Test Facilities on SNI to facilitate the testing of HEL and HPM systems. The EA analyzed establishing infrastructure on SNI to support directed energy testing and personnel training on the Sea Range (U.S. Department of the Navy, 2015a). The Proposed Action consists of establishing shooter sites, a target site, and supporting infrastructure. In addition, another EA was prepared in 2014 for PMSR Countermeasure Testing and Training (U.S. Department of the Navy, 2014). This EA included an analysis of DE activities associated with HEL and HPM systems with shooter and target locations within the PMSR, including NBVC Point Mugu as discussed in Section 1.2.3.2 (Naval Base Ventura County Point Mugu) of the Draft PMSR EIS/OEIS. Lastly, an EA was prepared for the construction of a DESIL on NBVC Point Mugu to support test functions in a land and sea environment (U.S. Department of the Navy, 2019a). DE activities originating from the DESIL and occurring on the PMSR would be the same types of activities previously analyzed under the 2014 Countermeasure Testing and Training EA (U.S. Department of the Navy, 2014). All DE activities fall within the existing EW mission area as described in Section 2.1.1.2 (Electronic Warfare) of the Draft PMSR EIS/OEIS.

Under the Proposed Action, there would be no changes to the HEL and HPM system parameters or testing and personnel training activities as described and analyzed in the 2015 SNI DE Test Facilities EA or the 2014 PMSR Countermeasures EA; these documents are incorporated by reference as applicable for each resource area in the Draft PMSR EIS/OEIS. For HEL and HPM testing and the testing and evaluation of other inbound non-warhead missiles, bombs and rockets may be fired at stationary targets located in the Land Impact Site on SNI. While these weapons are considered inert, some do use small pyrotechnic devices (e.g., spotting charges, live fuses).

2.3.4.3 Laser Systems

In 2010, an EA/Overseas EA (OEA) was prepared for laser testing and training on the PMSR. The EA/OEA analyzed an increase in testing, evaluation, and training activities under various weather conditions on the PMSR and included multiple types of lasers including weapons, designators, tracking lasers, and communications and range finders (U.S. Department of the Navy, 2010a). Testing and scheduled training activities involve directing laser energy at various types of fixed or dynamic targets from fixed or dynamic laser sources. Lasers could be operated from surface craft at sea, aircraft, or on land at SNI and be directed at targets at sea, in the air, or on land at SNI. Under the Proposed Action, there would be no changes to the laser platforms or target locations on and near SNI; however, the analysis is incorporated by reference as applicable for each resource area.

Under the Proposed Action, there would be no change to laser-based systems. Laser-based systems are used as sensors for atmospheric characterization measure atmospheric turbulence and transmission capabilities to predict the effects of the high-power lethal laser on its intended target. Current laser weapons are continuous wave; pulsed lasers may be used as range finders and other purposes. Both continuous-wave and pulsed lasers were analyzed in the 2010 Laser Testing and Training EA/OEA. All laser activities fall within the existing EW mission area as described in Section 2.1.1.2 (Electronic Warfare) of the Draft PMSR EIS/OEIS.

2.3.4.4 Radar and Microwave Systems

High-power radar studies have been infrequently performed on the PMSR, analogous to HPM testing. Under the Proposed Action, increases in radar and microwave testing on the PMSR are anticipated as the Navy studies the wavelengths, frequencies, and powers of radar and HPM systems in step with their development. HPM weapons will be employed on surface and subsurface vessels as well as aircraft. These HPM tests fall within the existing EW mission area as described in Section 2.1.1.2 (Electronic Warfare) of the Draft PMSR EIS/OEIS.

Requirements identified the use of existing Point Mugu test pads and locations on SNI as an HPM firing site to engage land, surface, and air targets. These land-based tests on a maritime environment would yield decisive experience before costly installation of HPM weapons on a test ship or Navy vessel.

2.3.4.5 Long-Range Weapons Delivery Systems

The Navy has initiated programs to deliver a new generation of precision, very long-range weapons that are designed to give the Navy the ability to quickly strike targets worldwide with almost no notice, along with anti-ship weapons that are able to safely engage and destroy high-value targets from extended range with superior odds against improving air defense systems. The extraordinary range and precise lethality of these programs are fully supported on the PMSR. Examples of long-range weapons include precision standoff missiles and hypersonic vehicle testing on the PMSR as discussed below. These long-range weapons systems' testing falls within the existing Air and Surface Warfare mission areas discussed in Section 2.1.1 (Primary Mission Areas) of the Draft PMSR EIS/OEIS.

2.3.4.5.1 Hypersonic Vehicle Test Program

The objective of the Hypersonic Vehicle Test Program is to develop and demonstrate key technologies to enable an air-launched tactical range hypersonic test vehicle for rapid response capabilities. Data collected during these tests are utilized to predict the performance of future, mature vehicle delivery systems. F-15, B-52, or similar aircraft serve as the primary platform for hypersonic test vehicle launches. Flight tests are typically conducted at altitudes of up to 80,000 feet and can range 450–2,000 miles, traveling at hypersonic speeds (over Mach 5). The flight vehicle is released and air-launched where its solid rocket motor booster will ignite. The spent booster or boosters and protective shroud then separate from the test vehicle, which will continue to travel in a westerly direction through the PMSR towards a pre-determined impact site in the broad open ocean.

Each event may involve three phases: a practice run, a dress rehearsal, and then the actual event. PMSR support for the event includes conducting surveillance, data monitoring, and the test itself. Multiple aircraft are used for each test: range clearance, surveillance, and one launch platform. The surveillance planes are used to monitor where the booster splashes and where the hypersonic vehicle lands. A series of sea- and air-based sensors are used to monitor and collect data from the time of ignition to the point of impact.

2.3.4.5.2 Precision Standoff Missiles

The Long Range Anti-Ship Standoff Missile is a stealthy long-range, precision-guided anti-ship missile developed from the successful Joint Air-to-Surface Standoff Missile – Extended Range and designed to meet the needs of Navy and Air Force strike aircraft, or launched from Guided Missile Destroyers and Guided Missile Cruisers with only software modifications to existing launch control systems. It leverages the same features as the Joint Air-to-Surface Standoff Missile – Extended Range, employing precision routing and guidance for use in day or night operations in any weather condition. It is equipped with a multi-modal sensor suite, weapon data link, and enhanced anti-jam Global Positioning System that allows it to detect and destroy specific targets within a group of numerous ships at sea. Long Range Anti-Ship Standoff Missiles will fly at medium altitude, then drop to low altitude for a sea-skimming approach to a target.

2.4 Effects Test

The effects test is a procedure where the project proponent determines whether the proposed activities comply with the federal consistency requirements of Section 307 of the CZMA (16 U.S.C. Section 1456) and its implementing regulations (15 C.F.R. Part 930). As defined in Section 304 of the CZMA, the term “coastal zone” does not include “lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal Government.” NBVC Point Mugu and SNI are owned and operated by the Navy and, therefore, are excluded from the coastal zone. A portion of SCI is owned by National Park Service (NPS) and The Nature Conservancy. The portions of land on SCI discussed in this determination are owned by The Nature Conservancy and are under lease to and controlled by the Navy. It should be noted that the NPS park boundary for the Channel Islands National Park (CINP) extends 1 NM from the shore of each island to include the submerged lands and waters surrounding the islands. The Navy recognizes that a portion of the project occurs within the coastal zone, namely test and training activities from shore out to 3 NM, and has the potential to affect uses and resources of the coastal zone. The Navy analyzed the effects of the Proposed Action by looking at reasonably foreseeable direct and indirect effects on any coastal use or resource, and by reviewing relevant management program enforceable policies (15 C.F.R. Part 930.33[a][1]) and the Coastal Resources Planning and Management Policies. Sections of the California Coastal Act relevant to this Proposed Action, as determined by the Navy, include the following: Article 2 – Public Access (Section 30210); Article 3 - Recreation (Section 30220); Article 4 – Marine Environment (Section 30230 and 30235); Article 5 – Land Resources (Sections 30240 and 30244); and Article 6 – Development (Section 30251, 30253, and 30255). Sections and Articles of the California Coastal Act not addressed below are not relevant to the Proposed Action.

Prior to evaluating whether the Proposed Action complies with the State of California’s enforceable policies, the federal agency must first examine whether the Proposed Action would have a reasonably foreseeable effect on coastal zone uses or resources. Thus, the elements of the Proposed Action must first be examined to determine whether they have reasonably foreseeable effects before determining

Table C-1: Predicted Marine Mammal Effects per Year from Explosives

Common Name	Stock/DPS	Baseline			Alt 1			Alt 2		
		Behavioral Response	TTS	PTS	Behavioral Response	TTS	PTS	Behavioral Response	TTS	PTS
Blue whale*	Eastern North Pacific	1	1	0	7	4	0	2	2	0
Bryde's whale	Eastern Tropical Pacific	0	0	0	0	0	0	0	0	0
Fin whale*	California, Oregon, and Washington	2	2	0	14	7	1	3	3	1
Gray whale	Eastern North Pacific	1	1	0	9	5	0	4	3	0
	Western North Pacific†	0	0	0	0	0	0	0	0	0
Humpback whale*	California, Oregon, and Washington/Mexico DPS	1	1	0	7	4	0	2	2	0
	California, Oregon, and Washington/Central America DPS	0	0	0	1	0	0	0	0	0
Minke whale	California, Oregon, and Washington	0	0	0	2	1	0	0	0	0
Sei whale*	Eastern North Pacific	0	0	0	0	0	0	0	0	0
Baird's beaked whale	California, Oregon, and Washington	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	California Coastal	0	0	0	0	0	0	0	0	0
	California, Oregon, and Washington Offshore	1	1	0	5	5	1	1	2	0
Cuvier's beaked whale	California, Oregon, and Washington	0	0	0	0	0	0	0	0	0
Dall's porpoise	California, Oregon, and Washington	41	93	11	261	406	49	65	160	18
Dwarf sperm whale	California, Oregon, and Washington	3	7	1	20	31	6	5	12	2

Table C-1: Predicted Marine Mammal Effects per Year from Explosives (continued)

Common Name	Stock/DPS	Baseline			Alt 1			Alt 2		
		Behavioral Response	TTS	PTS	Behavioral Response	TTS	PTS	Behavioral Response	TTS	PTS
Harbor Porpoise	Morro Bay	0	0	0	0	0	0	0	0	0
Killer whale	Eastern North Pacific Offshore	0	0	0	0	0	0	0	0	0
	Eastern North Pacific Transient or West Coast Transient	0	0	0	0	0	0	0	0	0
Long-beaked common dolphin	California	7	7	2	66	44	9	13	14	3
Mesoplodont spp.	California, Oregon, and Washington	0	0	0	0	0	0	0	0	0
Northern right whale dolphin	California, Oregon, and Washington	0	0	0	3	2	1	1	1	0
Pacific white-sided dolphin	California, Oregon, and Washington	1	2	0	11	8	2	2	3	1
Pygmy killer whale	-	0	0	0	0	0	0	0	0	0
Pygmy sperm whale	California, Oregon, and Washington	3	7	1	20	31	6	5	12	2
Risso's dolphins	California, Oregon, and Washington	1	1	0	6	3	1	1	1	0
Short-beaked common dolphin	California, Oregon, and Washington	11	13	3	90	65	15	21	23	5
Short-finned pilot whale	California, Oregon, and Washington	0	0	0	0	0	0	0	0	0

Table C-1: Predicted Marine Mammal Effects per Year from Explosives (continued)

Common Name	Stock/DPS	Baseline			Alt 1			Alt 2		
		Behavioral Response	TTS	PTS	Behavioral Response	TTS	PTS	Behavioral Response	TTS	PTS
Sperm whale*	California, Oregon, and Washington	0	0	0	1	1	0	0	1	0
Striped dolphin	California, Oregon, and Washington	0	0	0	1	1	0	0	0	0
Harbor seal	California	24	20	4	202	120	14	44	36	7
Northern elephant seal	California	5	14	7	37	20	9	9	25	11
California sea lion	U.S. Stock	1	2	1	8	12	2	2	3	1
Guadalupe fur seal*	Mexico to California	0	0	0	1	1	0	0	0	0
Northern fur seal	California	0	0	0	0	0	0	0	0	0
Southern sea otter	Southern Sea Otter	0	0	0	0	0	0	0	0	0

* ESA-listed species within the PMSR Study Area. †Only the designated stock is ESA-listed.
Notes: PTS = permanent threshold shift; TTS = temporary threshold shift.

EXHIBIT 4

Biologically Important Areas with the PMSR

NRDC

Via Electronic Mail

November 4, 2020

Mr. Cassidy Teufel
California Coastal Commission
455 Market Street, Suite 300
San Francisco, CA 94105
Cassidy.Teufel@coastal.ca.gov

Dear Cassidy:

On behalf of the Natural Resources Defense Council ("NRDC"), we submit comments regarding the U.S. Navy's federal consistency determination for proposed activities in the Point Mugu Sea Range ("PMSR").

In view of the projected increase in Navy activity and its impacts on endangered baleen whales and other marine mammals, we respectfully recommend that the Commission conditionally concur with the Navy's Consistency Determination, setting the following conditions:

(1) The exclusion of Navy testing and training activities from all current designated Biologically Important Areas on the Point Mugu range, with a reopening of consistency review should an upcoming assessment by NMFS modify the existing areas;

(2) The adoption of measures to reduce ship-strike risk of fin whales, in areas of seasonally high fin whale concentrations (i.e., the 200 to 1000m isobath in Southern California, during the months of November through February);and

(3) The development and implementation of an effective dynamic monitoring-and-mitigation system, including (1) the design of a monitoring system that utilizes both Navy and extramural data sources and provides, at minimum, robust passive acoustic monitoring; (2) the publication of a full and transparent mitigation protocol, specifying command chains and real-time actions; and (3) a timely assessment of the system's effectiveness, with results made available to the Coastal Commission and the public.

The Navy is proposing a substantial increase in the number and tempo of testing and training activities on the Sea Range above current levels. This includes a 2300% increase in gunnery exercises (of all calibers), a 150% increase in surface-to-surface missiles, a 50% increase in air-to-surface missiles, a 35% increase in air-to-surface bombs, and a 10% increase in navy vessel operations (DEIS at 2-11, 2-14).[1] The additional activity is projected to lead to a 600% increase in behavioral responses from marine mammals, a 377% increase in temporary hearing loss, and a 335% increase in permanent hearing loss in marine mammal populations in the study area (DEIS at Appendix C). Despite the substantial intensification in activities and concomitant escalation in marine mammal harm, the Navy proposes no additional mitigation measures to minimize harm to the environment, and rejects outright any mitigation measures such as time-area restrictions to safeguard the high-value habitats for marine mammals that are present off the Channel Islands and the Central California coast. Notably, none of the "Biologically Important Areas" that the National Marine Fisheries Service and its subject matter experts have identified are protected.

The Navy's dismissal of habitat protection measures is inconsistent with California's Coastal Management Program, such as its requirements that "[m]arine resources shall be maintained, enhanced, and where feasible, restored," and that "[u]ses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes." Pub. Res. Code § 30230. It also runs contrary to multiple court opinions under the U.S. Marine Mammal Protection Act and other statutes. *See, e.g., Conservation Council for Hawai'i v. NMFS*, 97 F. Supp. 3d 1210, 1237-38 (D. Haw. 2015); *NRDC v. Pritzker*, 828 F.3d 1125, 1138 (9th Cir. 2016).

To justify its position, the Navy has argued, *first*, that climate change has undermined any confidence in the Biologically Important Areas that NMFS identified; and, *second*, that the Navy's proposed monitoring effort represents an effective, dynamic, monitoring-and-mitigation approach that should be used as an alternative. As discussed below, both of these arguments are wrong.

I. The importance of protecting Biologically Important Areas on the Point Mugu range

We recommend that the Commission condition its consistency finding on an exclusion of Navy testing and training activities from all current designated Biologically Important Areas. We further recommend that it require a reopening of consistency review should a second process modify the existing BIAs on the Point Mugu range.

Biologically Important Areas ("BIAs") represent "sites where cetaceans engage in activities at certain times that contribute to an individual's health and fitness and, ultimately, to the fecundity and survivorship of the population."[2] Within the west coast region, BIAs were identified for three species—blue whales, gray whales, and humpback whales—based on two considerations: (1) direct observations of feeding or surfacing patterns and associated species strongly suggestive of feeding (and in some cases documented with archival tag data), and (2) presence of concentrations and repeat sightings of animals in multiple years in an area and a time of year

[1] U.S. Department of the Navy, Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Point Mugu Sea Range (April 2020) (cited as "DEIS" here and throughout these comments).

[2] Van Parijs, S.M., "Letter of Introduction to the Biologically Important Areas Issue," Aquatic Mammals, vol. 41, p. 1 (2015).

where feeding was known to occur.[3] (At the time the analysis was undertaken in 2015, no BIAs were identified for fin whales due to limited or conflicting information.)[4]

NMFS and its experts focused their BIAs for the west coast on areas with consistently high sighting concentrations, using data from years of coastal small-boat surveys that were designed to maximize encounters with target species, as well as from other sources.[5] The nine BIAs for blue whales represent only 2% of U.S. waters in the West Coast region but encompass 87% of the sightings documented; similarly, the seven BIAs for humpback whales represent 3% of U.S. waters in the West Coast region, but the areas encompass 89% of the sightings documented.[6] As further evidence of the importance of these areas, a concordance was observed between a number of the BIAs—including the three blue whale and two humpback whale BIAs overlapping with the Point Mugu range—[7]and the mean predicted densities from habitat density models generated from the Southwest Fisheries Science Center's line-transect data, which have been collected systematically since the 1990s at 3- to 5-year intervals.[8]

Alteration of oceanographic conditions and processes due to climate change are expected to profoundly influence ecosystems and, in turn, marine mammal distributions.[9] For California, increasing variance and intensification of the North Pacific Gyre Oscillation and related central Pacific warming index are linked to unprecedented ecosystem variability, including changes in local food webs impacting the demographics of pelagic predators.[10] For example, the 2014-16 Pacific marine heatwave resulted in habitat compression of coastal upwelling, changes in availability of forage species (krill and anchovy), and a shoreward distribution shift of foraging whales.[11] It is pertinent, then, to examine whether the BIAs delineated on the Point Mugu range in 2015 still reflect important habitat areas under these changing environmental conditions—and it is clear from the best available science that they do.

Additional surveys conducted since the BIAs were published confirm the importance of these areas. The California Current Ecosystem Survey (CCES) was a 134-day survey (26 June – 8

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[3] Calambokidis, J., et al. "Biologically Important Areas for Selected Cetaceans Within U.S. Waters—West Coast Region," Aquatic Mammals, vol. 41, pp. 39-53 (2015).

[4] *Id.*

[5] *Id.*

[6] *Id.*

[7] For blue whales, (1) approximately 87% of the Point Conception/Arguello feeding area (1,743 km^{2})) lies within the Point Mugu Study Area; (2) approximately 61% of the Santa Barbara Channel-San Miguel feeding area (1,981 km^2) lies within the Study Area; and (3) the San Nicolas feeding area (427 km^2) is entirely contained within the Study Area. Both humpback whale foraging BIAs, (1) the Morro Bay to Point Sal feeding area and (2) the Santa Barbara Channel-San Miguel feeding area, are contained within the Study Area.

[8] Calambokidis et al., "Biologically important areas," *supra*.

[9] Silber, G.K., et al., "Projecting Marine Mammal Distribution in a Changing Climate," Frontiers in Marine Science, vol. 4, art. 413 (2017).

[10] Sydeman, W.J., et al., "Increasing variance in North Pacific climate relates to unprecedented ecosystem variability off California," Global Change Biology, vol. 19, pp. 1662-1675 (2013).

[11] Santora, J.A., et al., "Habitat compression and ecosystem shifts as potential links between marine heatwave and record whale entanglements," Nature Communications, vol. 11, art. 536 (2020).

December 2018) that occurred in two phases: Phase 1 (80 days) was conducted jointly with a South West Fisheries Science Center (SWFSC) coastal pelagic fish survey and in collaboration with Cascadia Research Collective, the latter working from small boats providing fine-scale coverage of the shelf; while Phase 2 (54 days) was a standard cetacean and ecosystem assessment survey with all data collected from NOAA ship *Reuben Lasker*.[12] The new survey data indicates that species distributions are largely similar to what has been observed in the past.[13] Preliminary modeling results point to the same conclusion. NMFS is currently updating its habitat density models based on the 2018 NOAA ship survey, and early (unpublished) results indicate that species distributions largely reflect those of the previous models that supported the BIAs.[14]

As noted in the Navy's own DEIS, blue whales "tend to return to the same feeding areas each year either due to persistence of foraging hotspots or due to learned behavior," suggesting that, "the identified feeding BIAs may be good indicators for where blue whales will be found despite year-to-year changes in prey availability" (DEIS at 3.7-30). Thus, although researchers are undoubtedly observing the effects of climate change on west-coast cetaceans,[15] there is no evidence to suggest that the existing BIAs no longer represent biologically important feeding areas for blue whales and humpback whales. To the contrary, there is evidence that some feeding BIAs for humpback whales are expanding.

The BIAs were intended by NMFS as a "living document," to be reviewed and revised for purposes of expanding the number of covered species and updating designated areas as new information becomes available.[16] NMFS is expected to complete its first review of the existing BIAs in 2021. As noted above, the best available evidence indicates that existing areas designated for blue and humpback whales on the Point Mugu range will not diminish in size; it is possible, however, that biologically important areas for other species will be identified. With that in mind, the Commission should consider requiring the Navy to reinitiate consistency review should NMFS' review result in modifications to the BIAs, for the narrow purpose of determining whether the Navy's action remains consistent with the state's Coastal Management Program.

The resilience of West Coast cetacean populations to unprecedented climatic and ecosystem change will be determined by the cumulative influence of natural phenomena and anthropogenic

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[12] See NOAA Fisheries, "California Current Ecosystem Survey 2018." Available at: https://www.fisheries.noaa.gov/west-coast/science-data/california-current-ecosystem-survey-2018.

[13] *See* Henry A.E., et al., "Report on the California Current Ecosystem Survey (CCES): Cetacean and Seabird Data Collection Efforts, June 26 – December 4, 2018," U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-636 (2020).

[14] Becker E.A., et al., "Habitat-based density estimates for cetaceans in the California Current Ecosystem based on 1991–2018 survey data," U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-### (in prep).

[15] *E.g.*, Santora, J.A., et al., "Habitat compression and ecosystem shifts as potential links between marine heatwave and record whale entanglements," *supra*.

[16] Calambokidis et al., "Biologically important areas," *supra*.

factors.[17] Since species are not equally vulnerable over their entire range, place-based protection measures—designated in habitat that have high concentrations of animals or that are important for vital behavior, such as breeding or foraging—can be effective in reducing cumulative impacts.[18] Contrary to the Navy's suggestions, recent evidence confirms the continued importance of the BIAs identified on the Point Mugu range. We strongly recommend that the Commission condition its concurrence, in part, on their protection.

II. Establishing mitigation to reduce ship-strike risk for fin whales

We recommend that the Commission condition its consistency finding on measures to reduce ship-strike risk of fin whales, in areas of seasonally high fin whale concentrations (i.e., the 200 to 1000m isobath in Southern California, during the months of November through February).

Tracking data clearly indicate a region of year-round residency of fin whales in the Southern California Bight, with a general trend for increased use of areas between Point Arena and Point Conception during summer.[19] Well over a third of all fin whale location fixes received from tagged fin whales off the Southern California coast were received from within the Point Mugu Sea Range.[20] Fin whales are known to be highly sensitive to underwater noise, and indeed the Navy's own analysis suggests that fin whales will experience significant behavioral effects and temporary and permanent hearing decrements as a result of the proposed activities.[21]

Scales et al. (2017) state that a resident subpopulation will require more targeted conservation strategies than a diffuse migratory population of fin whales.[22] No BIAs have been identified for fin whales to date, making geographic mitigations more difficult, although the Navy notes, in its application for MMPA authorization, that "fin whales typically congregate in areas of high productivity" in Southern California.[23]

Given the localized residency and the tendency of fins whales to congregate, restrictions related to vessel speed constitute an important mitigation measure that has not adequately been analyzed in the Navy's DEIS or consistency determination, and could contribute to effective mitigation of harm to fin whales, both as a result of reduced noise and reduced ship-strike risk.

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[17] Regan, T., Huntington, H.P., and Hovelsrud, G.K., "Conservation of Arctic marine mammals faced with climate change," Ecological Applications, vol. 18 (Supplement), pp. S166-S174 (2008).

[18] Game , E.T., et al., "Pelagic protected areas: the missing dimension in ocean conservation," Trends in Ecology and Evolution, vol. 24, pp. 360-369 (2009); Hooker, S.K., et al., "Making protected area networks effective for top predators," Endangered Species Research, vol. 13, pp. 203-218 (2011).

[19] Scales, K.L., Schorr, G.S., Hazen, E.L., Bograd, S.J., Miller, P.I., Andrews, R.D., Zerbini, A.N. and Falcone, E.A. "Should I stay or should I go? Modelling year-round habitat suitability and drivers of residency for fin whales in the California Current," Diversity and Distributions, vol. *23*(10), pp. 1204-1215 (2017).

[20] *Id.*

[21] Department of the Navy, "Request for regulations and Letter of Authorization for the incidental taking of marine mammals resulting from U.S. Navy testing and training activities in the Point Mugu Sea Range Study Area" (August 2020) (at p. 6-52).

[22] Scales, et al., "Should I stay or should I go?" *supra*.

[23] Department of the Navy, "Request for regulations and Letter of Authorization," *supra* (at p. 4-7).

The Navy fleet has reported two ship strikes, both of fin whales, in the last decade in waters adjacent to the Point Mugu Study Area. (DEIS at 3.7-34). This population is at particular risk of ship-strike on the naval range given their shallower-water foraging in relatively deep water.[24] As such, waters between the 200 m and 1000 m isobaths should be considered for time-area management so that, at minimum, ship-strike risk-reduction measures for fin whales can be implemented during the months of November through February, when the whales aggregate in the area.

III. Requiring an effective monitoring-and-mitigation system for marine mammals on the Point Mugu range

We recommend that the Commission condition its consistency finding on development and implementation of an effective monitoring-and-mitigation system, with the elements described below.

Time-area closures are the most effective available means of separating Navy training and testing activities from vulnerable species, but they are not sufficient. An effective monitoring-and-mitigation approach that allows the Navy to detect marine mammals in real- or near real-time and adjust training and testing activities contemporaneously to mitigate risk is an essential complement to time-area closures.

There are a number of basic elements that an effective mitigation-and-monitoring system must include; unfortunately, the Navy's proposal falls short of providing them. Instead, the Navy's DEIS and consistency determination offer little more than the limited visual monitoring that the Coastal Commission and the courts have repeatedly found inadequate to protect marine mammals. The Navy has suggested it can make use of outside data from the existing network of passive acoustic monitoring that occurs within the Pt. Mugu Sea Range, which certainly makes sense; however, the limitations of this data are also insufficient to drive an effective near real-time mitigation program.

To adequately monitor and mitigate harmful Navy activity to marine mammals, the Commission should require the Navy to identify and deploy monitoring technologies and protocols using real-time elements that are adaptable and of sufficient detection power.[25] This means using methods capable of detecting marine mammals both visually (including during periods of poor visibility and darkness) and acoustically across the potential impact zone. In addition to detection of marine mammals, full mitigation protocols must be developed, including command chains and

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[24] Falcone, E.A. and Schorr, G.S., "Distribution and demographics of marine mammals in SOCAL through photo-identification, genetics, and satellite telemetry" (2014) (report supported under Naval Postgraduate School grant N00244-10-1-0050); Rockwood, R. C., Calambokidis, J., and Jahncke, J., "High mortality of blue, humpback, and fin whales from modeling vessel collisions o the U.S. West Coast suggests population impacts and insufficient protection," PLoS ONE, vol. 12(8), e0183052 (2017).

[25] Nowacek, D.P., et al., "Responsible practices for minimizing and monitoring environmental impacts of marine seismic surveys with an emphasis on marine mammals," Aquatic Mammals, vol. 39, pp. 356-377 (2013).

real-time actions, and made public.[26] Ultimately, the effectiveness of such a system will depend on rapid and accurate communication of detection data to an analyst or decision maker who can implement responsive mitigation measures as appropriate.

A. The inadequacy of the Navy's proposal

For purposes of detection, the Navy relies primarily on a single "lookout" positioned on a vessel or aircraft to observe the mitigation zone for marine mammals and sea turtles.[27] For the reasons outlined below, these measures are wholly inadequate and must be strengthened to improve the probability of detection of marine mammals in at-sea conditions. Moreover, a near real-time monitoring and mitigation system must combine visual observations with other marine mammal detection methods to maximize coverage of the mitigation zone and detection probability.

Visual observations are insufficient due to marine mammal behavior and limitations in sighting conditions. Studies suggest that baleen whales exhibit behaviors that reduce their availability for detection by observers. For example, blue whale visual and acoustic detection rates differ seasonally and geographically within the Southern California Bight, suggesting that relying on a single detection mode (i.e. visual observers or passive acoustic monitoring) will fail to detect blue whales in all seasons and locations.[28] Off the U.S. East Coast, research has demonstrated that passive acoustic monitoring can provide a two- to ten-fold increase in the number of days that North Atlantic right whales are detected relative to visual methodologies.[29]

In addition to behavior, sighting conditions pose serious limitations to marine mammal detection. For even the most conspicuous large whale species, estimates of relative detection probability for a Beaufort Sea State of 6 is less than half that of a Beaufort Sea State of 0.[30] In line with Barlow (2015), the probability of sighting a blue or humpback whale decreases for every unit increase in sea state; in Beaufort 4 conditions, a sea state that often occurs off Southern California, the probability of detecting a blue whale that surfaces *directly on the vessel trackline* is 0.559 (CV=0.360); for humpback whales, it is 0.708 (CV=0.320).[31] And the detectability of large whale species even under ideal sighting conditions is likely to be significantly less than 100 percent given availability and perception biases other than those involving sea state. Further, in the absence of infrared technology, monitoring to detect marine mammals during periods of darkness is futile.

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[26] *Id.*

[27] Department of the Navy, "Request for regulations and Letter of Authorization," *supra* (at pp. 11-3 to 11-8).

[28] Oleson, E.M., et al., "Blue whale visual and acoustic encounter rates in the Southern California Bight," Marine Mammal Science, vol. 23, pp. 574-597 (2007).

[29] Clark, C.W., Brown, M.W., and Corkeron, P., "Visual and acoustic surveys for North Atlantic right whales, *Eubalaena glacialis*, in Cape Cod Bay, Massachusetts, 2001-2005: Management Implications," *Marine Mammal Science*, vol. 26, p. 837- 854 (2010).

[30] Barlow, J., "Inferring trackline detection probabilities, g(0), for cetaceans from apparent densities in different survey conditions," Marine Mammal Science, vol. 31, p. 923-943 (2015).

[31] *Id.*

Despite the Navy's reliance on lookouts as the only means of monitoring for marine mammal presence in an area of planned activities, the Navy acknowledges that in certain circumstances the lookout is responsible for other essential tasks, such as piloting an aircraft, that cripple the possibility of effective monitoring (DEIS at 5-9). Even for lookouts without mission-essential tasks, the observer is tasked to monitor for objects, activities or other signs of danger to the vessel (DEIS at 5-3). Lookouts with multiple tasks compound the risks described above that ultimately can lead to failure to visually observe marine mammals. Indeed, the Navy's own studies demonstrate that its lookouts fare much poorer in detecting animals than professional species observers.[32]

B. Benefits and limitations of external monitoring efforts on the Point Mugu range

The Navy has suggested that it may utilize existing outside monitoring efforts in its mitigation. That should certainly be required—much as the Navy's Atlantic Fleet uses external monitoring sources when carrying out training and testing in right whale habitat off the southeast. Yet, while such an approach would provide benefit, processing delays and geographic limitations make current efforts insufficient in themselves to serve as a foundation for a real-time monitoring and mitigation system on the Point Mugu range.

"Whale Safe"— "Whale Safe" is a technology-powered mapping and analysis tool displaying near real-time whale and ship data for the Santa Barbara Channel, with the goal of reducing the risk of fatal ship collisions with endangered whales.[33] The tool combines three near-real time data streams: (i) acoustic monitoring instruments that identify blue, humpback, and fin whale vocalizations; (ii) whale sightings recorded by trained observers aboard whale watch and tourism boats or aircraft with a mobile app; and (iii) predictive habitat models based on oceanographic data from the previous day. The data from these three streams are compiled and validated, and then disseminated to industry, managers, and the public.[34] They hold only limited value for the Navy, for the reasons discussed below.

(1) The Whale Safe acoustic monitoring system comprises a single moored DMON buoy programmed with LFDCS deployed in the Santa Barbara Channel in November 23, 2019.[35] The buoy transmits data to shore every two hours via the Iridium satellite system. Upon reception, the DMON/LFDCS detection data are immediately displayed on a publicly accessible website and reviewed once a day by an analyst, and the results of the analyst review are posted to the website and disseminated automatically to stakeholders.[36] The time lag between detection and verification of detections may take at least two and up to 24 hours; thus, the system may not be

[32] Watwood, S., Rider, S., Richlen, M., and Jefferson, T., *Cruise report: Marine species monitoring & lookout effectiveness study*, Submarine Commanders Course, February 2015, Hawaii Range Complex (2016) (prepared under Navy contract).

[33] Whale Safe. Available at: https://whalesafe.com/.

[34] *Id.*

[35] Robots4Whales. Available at: http://dcs.whoi.edu/sb1119/sb1119_buoy.shtml.

[36] Baumgartner, M.F., et al., "Persistent near real-time passive acoustic monitoring for baleen whales from a moored buoy: system description and evaluation," Methods in Ecology and Evolution, vol. 10, pp. 1476–89 (2019).

able to provide detections in a timely enough manner to inform Navy mitigation actions in real-time. In addition, the singular nature of the buoy means that it cannot be used to determine how many whales are present or to localize animals,[37] and its detection area would be limited to a small portion of the range.

(2) Whale sightings included on the Whale Safe platform are first recorded with the Whale Alert mobile app[38] (including the built-in Spotter Pro mode)[39] and are transmitted to a database when the boat returns to dock. Whale Alert "Trusted Observer" sightings can theoretically be transmitted to the app in near real-time, but an internet connection would be required at the time of the sighting. General whale alert sightings are reviewed by analysts at a frequency of once or twice per day before being uploaded to the app. These observations are combined with data obtained from monthly aerial surveys of the Santa Barbara Channel shipping lanes flown from 2017-2019. Unfortunately, all surveys have been on hold in 2020 because of restrictions posed by the pandemic. For each survey flight, two transects are flown that cover a distance of approximately 180 nautical miles and follow the north and southbound Santa Barbara Channel Traffic Separation Scheme ("TSS") from Oxnard to Pt. Arguello.[40] Survey data are uploaded at the end of each trip day (not in real-time). Thus, the whale sightings included on the Whale Safe platform—while extremely valuable from the standpoint of informing vessel speed measures in the Santa Barbara Channel to reduce collision risk—are not made available to inform real-time mitigation measures during Navy exercises, and spatial coverage is limited to the Santa Barbara Channel TSS.

(3) The predictive blue whale habitat model uses data collected from 104 satellite-tagged blue whales to statistically relate whale presence to environmental conditions. Then, the model considers environmental conditions in near real-time for the Southern California Bight from the previous day to estimate the probability of blue whale presence within each 10kmx10km grid cell.[41] While the blue whale model shows how suitable the habitat is for blue whales in each grid cell and thus provides an indication of when blue whales may occur in the area with high likelihood, the model does not predict whether or how many whales are present in a grid cell.[42] The model's direct application for real-time monitoring and mitigation may therefore be limited, depending on the information that the Navy requires for responsive action.

Scripps Institution of Oceanography acoustic recorders.— In addition to the Whale Safe system, Scripps Institution of Oceanography currently collects acoustic data from 27 recording locations in the Navy's SOCAL area, 16 of which are located within or just outside the boundary of the

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[37] Whale Safe, *supra.*

[38] Whale Alert. Available at: http://www.whalealert.org/.

[39] Spotter Pro. Available at: http://conserve.io/spotter-pro/.

[40] Whale Safe, *supra*; Sanctuary SIMoN Channel Islands Naturalist Corps. Available at: https://sanctuarysimon.org/dbtools/project-database/index.php?ID=100415; Sanctuary SIMoN Channel Islands Aerial Monitoring. Available at: https://sanctuarysimon.org/dbtools/project-database/index.php?ID=100512.

[41] Abrahms, B., et al., "Dynamic ensemble models to predict distributions and anthropogenic risk exposure for highly mobile species." Diversity and Distributions, vol. 25, pp. 1182–93 (2019).

[42] Whale Safe, *supra*.

Point Mugu. Unfortunately for mitigation purposes, all the recordings are archival and unsuitable for real-time access. Archival recording is also being carried out by NOAA and the Navy in the Channel Islands National Marine Sanctuary as part of SanctSound, the NOAA/ Navy Sanctuary Soundscape Monitoring Project."[43]

C. Available methods for improving detection of marine mammals

A number of detection methods exist to supplement the Navy's lookout monitoring and external monitoring efforts on the range. The Navy has not yet proposed using any of these methods in its dynamic mitigation efforts.

Infrared technology.— Infrared technology, relying on thermal differences between the target species and the environment, has shown promise for detection of a number of marine mammal species from vessels in darkness.[44] Infrared performance is relatively high during periods of darkness, but relatively low during rain, fog, and drizzle, and in sea states greater than Beaufort 4,[45] indicating that overall detection rates are likely to be maximized when complementary methods are used. Observer-based and passive acoustic monitoring are likely to be the most effective during high seas and precipitation; however, a combination of infrared and passive acoustic monitoring would be most effective when used in darkness. Even during periods of good visibility, a combination of MMOs, infrared, and passive acoustic monitoring would increase detections.[46] Accordingly, the Navy should use infrared equipment to support visual monitoring by MMOs and passive acoustic monitoring during periods of darkness. Ideally, the Navy would also partner with scientists and collect data that increases our understanding of the effectiveness of infrared technologies, with a view towards greater reliance on these technologies to commence activities during nighttime hours in the future.

Unmanned aerial systems.— Unmanned aerial systems ("UAS") have the potential to significantly augment marine mammal monitoring surveys and hold a variety of benefits relative to manned surveys, including mission safety, repeatability, and reduced operational costs. Perhaps most critically they enable long-range operations beyond detection ranges of human observers. According to a 2019 review paper, UAS have not been used for real-time mitigation monitoring; however, a number of existing technologies are ripe for field-testing and verification.[47] Powered aircraft, kites, and lighter-than-air aircraft are UAS types suitable for

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[43] SanctSound: NOAA Navy Sanctuary Soundscape Monitoring Project. Available at: https://www.iqoe.org/projects/sanctsound-noaa-navy-sanctuary-soundscape-monitoring-project/.

[44] Lathlean, J. and Seuront, L., "Infra-red thermography in marine ecology: methods, previous applications and future challenges," *Marine Ecology Progress Series*, vol. 514, pp. 263-277 (2014); Smith, H.R., et al., "A field comparison of marine mammal detections via visual, acoustic, and infrared (IR) imaging methods offshore Atlantic Canada," Marine Pollution Bulletin, vol. 154, p. 111026 (2020); Zitterbart, D.P., et al., "Scaling the Laws of Thermal Imaging–Based Whale Detection," *Journal of Atmospheric and Oceanic Technology*, vol. *37*, pp. 807-824 (2020).

[45] Smith, et al., "A field comparison," *supra*.

[46] *Id.*

[47] Verfuss, U.K., et al., "A review of unmanned vehicles for the detection and monitoring of marine fauna," Marine Pollution Bulletin, vol. 140, pp. 17-29 (2019).

marine mammal monitoring and can be quickly deployed, and operated by no more than three or four persons.[48] A single UAS may carry one or several sensors, and individual images can be georeferenced using flight logs or additional Geographic Positioning System (GPS) information. Three imaging sensors that can detect radiation in different parts of the spectrum (Red Green Blue (RGB), thermal infrared or non-thermal infrared sensors) are suitable for marine animal monitoring from UAS with video or still imagery. UAS can achieve real-time or near real-time surveillance through the use of wireless modem technologies.[49]

It would therefore seem highly beneficial for the Navy to incorporate UAS as a component of a real-time monitoring and mitigation system. Given the nascent application of this technology, the Navy should conduct studies into its effectiveness in a range of environmental conditions representative of the Point Mugu range.[50]

Passive acoustic monitoring.— Considering the limitations of visual and digital observations, and without verified means of monitoring by infrared technology during darkness, the Navy must use passive acoustic monitoring at all times to maximize the probability of detection for marine mammals. However, it should be noted that passive acoustic monitoring without visual observers would also be insufficient as large whales seldom vocalize continuously and may go undetected. Near-real time passive acoustic systems have been developed for stationary installations, including moored buoys[51] and cabled hydrophones.[52] Mobile autonomous platforms such as electric gliders were developed a decade ago[53] and are increasingly used. Baumgartner et al. (2013)[54] first described a near-real time passive acoustic system developed to detect low frequency calls of baleen whales from long-endurance autonomous vehicles (comprising a digital acoustic monitoring instrument (DMON) programmed with the low-frequency detection and classification system (LFDCS) installed on a Slocum glider). The system was capable of detecting the calls of four species of baleen whale in real-time, and relaying information about those calls to shore every two hours, via an Iridium satellite communication system.[55] A subsequent study demonstrated that the presence of baleen whales can be accurately determine

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[48] For a full review of technical specifications, *see id.*

[49] *Id.*

[50] For illustrative study designs, *see* Bröker, K.C.A., et al. "A comparison of image and observer based aerial surveys of narwhal," Marine Mammal Science, vol. 35 pp. 1253-1279 (2019). *See also* Hodgson, A., et al., "Unmanned aerial vehicles for surveying marine fauna: assessing detection probability," Ecological Applications, vol. 27, pp. 1253-1267 (2017).

[51] *E.g.*, Van Parijs, S.M., et al., "Management and research applications of real-time and archival passive acoustic sensors over varying temporal and spatial scales," Marine Ecology Progress Series, vol. 395, pp. 21-36 (2009).

[52] *E.g.*, Klinck, H., et al., "Cetacean studies on the Mariana Islands Range Complex in March-April 2015: passive acoustic monitoring of marine mammals using gliders," Final Report. Prep. Command. US Pacific Fleet, Environ. Readiness Div. Pearl Harb. HI (2016).

[53] *E.g.,* Klinck, H., et al., "Near-real-time acoustic monitoring of beaked whales and other cetaceans using a Seaglider™," PLoS ONE, vol. 7, art. e36128 (2012).

[54] Baumgartner, M.F., et al., "Real-time reporting of baleen whale passive acoustic detections from ocean gliders," The Journal of the Acoustical Society of America, vol. 134, pp. 1814-1823 (2013).

[55] *Id.*

by human analysts using information about tonal sounds transmitted in near-real time from Slocum gliders.[56]

While gliders offer a promising and flexible solution for near real-time monitoring there remain a number a practical challenges, including self-noise, energy restrictions, and computing capacity, as well as limited glider-to-shore data transfer bandwidth.[57] It is therefore important that the technology be optimized for its intended mitigation protocol. A real-time monitoring system to detect baleen whales in shipping lanes to trigger vessel slow-downs may be optimized in a different manner to one used to detect animals and trigger mitigation during Naval exercises.[58]

The deployment of a network of appropriate spaced acoustic detection systems (moored, towed, or autonomous) prior to and during Navy activities would allow the detection and localization of vocalizing species capable of informing mitigation measures in real time.

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D. Elements of an effective dynamic monitoring system on the Point Mugu range

As described above, data streams sufficient to inform near real-time monitoring and mitigation do not presently exist on the Point Mugu range. In order to advance a dynamic approach, the Navy must: (1) design a comprehensive monitoring system (i.e., including visual or digital observations, infrared technologies, passive acoustic monitoring, and detection data sharing system); (2) publish a full and transparent mitigation protocol, including command chains and real-time actions; and (3) assess the system's effectiveness and make the results available to the Coastal Commission and the public. This much is essential, and we recommend that the Commission condition its concurrence, in part, on this requirement.

Additionally, we note the following priorities for the development of an effective system:

1. Optimize underwater gliders for near real-time acoustic detection and localization of endangered and protected whales.

Underwater glider-based acoustic monitoring offers a solution for collecting near real-time information on the presence and location of endangered and protected whales on the Point Mugu range. Gliders are small and easy to deploy and recover, and can monitor different areas while moving through the water (as opposed, for example, to fixed-bottom hydrophones). This makes gliders a particularly useful monitoring tool for Navy activities that are spatially and temporally dynamic. Gliders are starting to be deployed for near real-time monitoring and mitigation of marine mammals, including for ship strike avoidance of North Atlantic right whales in the

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[56] Baumgartner, M.F., et al., "Slocum gliders provide accurate near real-time estimates of baleen whale presence from human-reviewed passive acoustic detection information," Frontiers in Marine Science, vol. 7, art. 100 (2020).

[57] Kowarski, K.A., et al., "Near real-time marine mammal monitoring from gliders: Practical challenges, system development, and management implications," The Journal of the Acoustical Society of America, vol. 148, pp. 1215-1230 (2020).

[58] *See, e.g., id.*

Laurentian Channel, Canada;[59] and they should be deployed by the Navy, which had a hand in their development two decades ago and has used them for multiple purposes, including marine mammal research off Southern California. There remain a number of opportunities to optimize gliders for use as a mitigation tool, including by reducing masking from self-noise and glider movement, optimizing data transmission vs. power consumption, and improving species auto-detection and analyst confirmation in near-real time.[60] Regardless, gliders should be used as part of any dynamic mitigation system on the Point Mugu range.

2. Develop unmanned aerial vehicles (UAVs) to detect and localize endangered and protected whales.

UAVs are a promising tool for aerial surveillance of monitoring zones during naval activities as the technology offers a time-efficient, safe, and lower-cost alternative to airplane observers.[61] There are several UAV designs on the market and in development,[62] but the most appropriate systems for real-time monitoring during Navy operations have not yet been identified. In addition, the UAV should be paired with software that autodetects endangered and protected whales during flight and relays this information back to an analyst to evaluate the information and recommend appropriate mitigation measures. Autodetection software based on machine learning is in development;[63] however, software needs extensive field testing and validating before being deployed as a real-time monitoring tool.

3. Test and validate infrared cameras to improve marine mammal detection during darkness.

Infrared cameras can be an effective means of detecting marine mammals during periods of darkness, particularly when used in conjunction with passive acoustics.[64] An effort to validate the effectiveness of infrared cameras (i.e., false positive rates, accuracy of species classification) in the specific regions, thermal regimes, and seasons of Southern California will be necessary before the technology can be relied upon as part of a real-time monitoring and mitigation system.

4. Establish optimal real-time marine mammal detection data sharing system.
The effectiveness of a real-time monitoring and mitigation system will depend on rapid and accurate communication of detection data (*i.e.,* acoustic, UAV, and PSO/IR detections), from Navy and non-Navy sources, to an analyst or decision maker who can implement mitigation measures as appropriate. Ideally, the sharing of detection data would inform all vessels deployed

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[59] "Underwater glider helps save North Atlantic right whales from ship strikes," CBC News, August 30, 2020. Available at: https://www.cbc.ca/news/canada/new-brunswick/nb-north-atlantic-right-whales-underwater-glider-1.5701984.

[60] *See*, *e.g.*, Kowarski, K.A., et al., "Near real-time marine mammal monitoring from gliders," *supra*.

[61] Verfuss, U.K., et al., "A review of unmanned vehicles for the detection and monitoring of marine fauna," *supra*.

[62] *Id.*

[63] *E.g.*, Sullivan, K., et al. "Automated detection, tracking, and counting of gray whales," Thermosense: Thermal Infrared Applications XLII., vol. 11409, art. 1140906. International Society for Optics and Photonics (2020).

[64] See, Smith, H.R., *et al*., *supra*.

by the Navy as well as, while respecting security concerns, those of other ocean users operating in the same region.[65] Any protocol for dynamic mitigation must enable the sharing of different types of detection and localization data in an understandable way.

We appreciate the opportunity to comment on this determination.

Very truly yours,

Michael Jasny
Director, Marine Mammal Protection

Regan Nelson
Senior Advocate for Quiet Seas

[65] *See, e.g.,* "Mysticetus." Available at: https://www.mysticetus.com/.