NATURAL RESOURCES DEFENSE COUNCIL

By Overnight Delivery

March 10, 2009

Kimberly Kler, Environmental Planner
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Re: Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the Northwest Training Range Complex

Dear Mrs. Kler:

On behalf of the Natural Resources Defense Council ("NRDC"), International Fund for Animal Welfare, The Humane Society of the United States, Animal Welfare Institute, International Ocean Noise Coalition, Ocean Mammal Institute, Friends of the Earth, Earthjustice, Whale and Dolphin Conservation Society, Cetacean Society International, People for Puget Sound, Friends of the San Juans, Preserve Our Islands, Dr. David Bain, Ph.D., Center for Biological Diversity, Oregon Shores Conservation Coalition, Willapa Hills Audubon Society, Conservation Northwest, Save Our Wild Salmon, Ocean Futures Society, and Jean-Michel Cousteau, and our millions of members and activists, thousands of whom reside in Washington, Oregon and California, I appreciate the opportunity to submit comments regarding the Navy's Draft Environmental Impact Statement/ Overseas Environmental Impact Statement ("DEIS") for the Northwest Training Range Complex ("NWTRC"). *See* 73 Fed. Reg. 79856 (Dec. 30, 2008). Please include these comments and attachments in the administrative record.[1]

At the outset we must note that this public comment period has been rife with problems. Initially given less than 45 days, the public's opportunity to comment was frustrated by numerous problems with the Navy's website, electronic comment portal and notice of

[1] We aware that comments may be submitted separately by government agencies, individual scientists, environmental organizations, and the public. All of these comments are hereby incorporated by reference. The comments that follow do not constitute a waiver of any factual or legal issue raised by any of these organizations or individuals and not specifically discussed herein.

public hearings. We received several reports from individuals who were unable to submit comments, unable to access information on the Navy's website and/or unaware of public hearings. The website itself was inoperable for much of the comment period, further impeding the public's ability to comment. In light of these difficulties and of the extensive range of activity proposed, NRDC requested an extension of the public comment period. In addition, the Congressional delegation from Oregon requested an extension of the public comment period until April 11, 2009 as well as additional hearings in Oregon. We commend the Navy for extending the public comment period until March 11, 2009 and adding a public hearing in Tillamook, Oregon, but also recognize that many people – particularly in Oregon – continue to be dissatisfied with the Navy's failure to provide additional hearings and adequate notification.

In addition, the DEIS makes repeated reference to a Biological Evaluation ("BE") that the Navy prepared to catalog the effects of its proposed alternatives on species listed as threatened or endangered under the Endangered Species Act. The BE was not included in the CD version of the DEIS and does not appear to be available on the Navy's website. As we discuss in more detail below, the potential effects of each of the alternatives on sensitive and listed species are one of the primary concerns associated with this proposal. The omission of the BE has severely curtailed the public's ability to meaningfully evaluate and comment upon the effects of the alternatives. We urge the Navy to publish the referenced biological assessment and extend the comment period to accept additional public comment on this key document.

We must also object to the Navy's piecemealing of expansion projects in the Pacific Northwest. On July 31, 2007, the U.S. Navy announced its intent to prepare an Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for expansion of its Northwest Training Range Complex. *See* 72 Fed. Reg. 41712 (July 31, 2007). Several of the undersigned organizations, including NRDC, objected to the Navy's attempt to improperly segment the NWTRC DEIS and the proposed NAVSEA NUWC Keyport Range Complex Extension project (73 Fed. Reg. 53002 (Sept. 12, 2008)) – which includes extending the Keyport Range, the Dabob Bay Range Complex, and the Quinault Underwater Tracking Range – because these projects are connected to one another both geographically and operationally. The National Environmental Policy Act, 42 U.S.C. 4321 *et seq.*, prohibits the Navy from segmenting these types of connected actions in different analyses and requires consideration of the impacts of such connected actions together in one EIS that comprehensively considers environmental effects. 40 C.F.R. § 1508.25(a)(1) (ii), (iii); id. § 1502.4(a).

The proposed increase in training activities within the NWTRC include intensive, year-round exercises employing active sonar as well as a battery of other acoustic sources and explosives detonations. Over 122,440 square nautical miles, the range engulfs the waters off Washington, Oregon and northern California. The Navy's preferred alternative would dramatically increase the amount of training in the NWTRC, including "range enhancements" such as the development of an underwater training minefield, Portable Undersea Tracking Range, and air and surface target services.

The Navy's envisioned NWTRC expansion would pose significant risk to whales, fish, and other wildlife that depend on sound for breeding, feeding, navigating, and avoiding predators—in short, for their survival. Many of the exercises proposed would employ mid-frequency active sonar, which has been implicated in mass injuries and mortalities of whales around the globe.[2] The same technology is known to affect marine mammals in countless other ways, inducing panic responses, displacing animals, and disrupting crucial behavior such as foraging. The NWTRC expansion would also affect fisheries and essential fish habitat, damage hard-bottom habitat, and release a variety of hazardous materials – such as thousands of rounds of spent ammunition and unexploded ordnance containing chromium, chromium compounds, depleted uranium and other hazardous materials – into coastal waters.

The National Environmental Policy Act requires the Navy to employ rigorous standards of environmental review, including a full explanation of potential impacts, a comprehensive analysis of all reasonable alternatives, a fair and objective accounting of cumulative impacts, and a thorough description of measures to mitigate harm. Unfortunately, the DEIS released by the Navy falls far short of these standards.

The Navy's DEIS does not properly analyze the environmental impacts of the limited alternatives it has proposed. Its analysis also substantially understates the potential effects of sonar on marine wildlife. For instance, the Navy fails to acknowledge risks posed to a wide range of marine species – including highly endangered Southern Resident killer whales and other marine mammals – and impacts to the Olympic Coast National Marine Sanctuary from the activities listed above, or from actions necessary to support the proposed increase in training, such as increased risk of oil spills.

Further, it concludes that only one harbor seal would suffer serious injury or die during the many hours of proposed sonar training. The Navy reaches this conclusion by excluding relevant information adverse to its interests, using approaches and methods that are unacceptable to the scientific community and ignoring entire categories of impacts. As discussed in detail in Appendix C and the attached critique by Dr. David Bain, the Navy's assessment of acoustic impacts is highly problematic.

Moreover, the Navy's analysis entirely fails to account for cumulative impacts for the years of anticipated activity. The Navy merely recites a list of potential impacts without actually taking the next step of analyzing the effects of those impacts. The Navy's repeated platitude that any impacts are short-term in nature and thus would not combine to produce cumulative effects not only lacks scientific validity, but also grossly misapprehends the definition of cumulative impacts under NEPA. 40 C.F.R. § 1508.7.

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[2] Military sonar generates intense sound that can induce a range of adverse effects in whales and other species – from significant behavioral changes to injury and death. The most widely reported and dramatic of these events are the mass strandings of beaked whales and other marine mammals that have been associated with military sonar use. A brief summary of the stranding record appears in Appendix B.

The failure to meaningfully assess these kinds of risks also necessarily infects the Navy's proposed mitigation measures and alternatives. The Navy fails to consider a variety of other options, alternatives, and common-sense mitigation measures – some employed by the Navy itself in previous training – that would reduce the impacts. What the Navy presents instead is an alternatives analysis and mitigation strategy so narrowly defined that it effectively disregards the environment.

The Navy can, and must, adopt meaningful measures to reduce the harmful impacts of sonar, including spatial and temporal restrictions for its training exercises. As described in detail in Appendix A and Section IV below, these measures should, at a minimum, include protecting the following areas:

- All inshore waters of Greater Puget Sound (including the Strait of Juan de Fuca and Strait of Georgia)
- Lower Continental Slope waters between 500 and 2,000 meter depth contours
- Outer coastal waters between the shoreline and the 100 meter depth contour
- Certain canyons and banks off Northern Washington State and Oregon
- The Olympic Coast National Marine Sanctuary

In sum, we urge the Navy to revise its impacts analysis consistent with federal law and to produce a mitigation plan – which includes protected areas – that truly maximizes environmental protection given the Navy's actual operational needs. We also urge the Navy to make available to the public the data and modeling on which its analysis is based.

I. Legal Framework: The National Environmental Policy Act

The National Environmental Policy Act of 1969 ("NEPA") "declares a broad national commitment to protecting and promoting environmental quality." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 348 (1989). NEPA establishes a national policy to "encourage productive and enjoyable harmony between man and his environment" and "promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." 42 U.S.C. § 4321. In order to achieve its broad goals, NEPA mandates that "to the fullest extent possible" the "policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [it]." 42 U.S.C. § 4332. To that end, NEPA requires that the potential environmental impacts of any "major Federal actions significantly affecting the quality of the human environment" be considered through the preparation of an environmental impact statement ("EIS"). *Robertson*, 490 U.S. at 348; 42 U.S.C. § 4332. This directive is known as a "set of action-forcing procedures" that require decision makers to take "a 'hard look' at environmental consequences." *Robertson*, 490 U.S. at 349 (quoting *Kleppe v. Sierra Club*, 427 U.S. 390, 410, n.21 (1976)).

Central to NEPA is its requirement that, before any federal action that "*may* significantly degrade some human environmental factor" can be undertaken, agencies must prepare an EIS. *Steamboaters v. F.E.R.C.*, 759 F.2d 1382, 1392 (9th Cir. 1985)

(emphasis in original). The requirement to prepare an EIS "serves NEPA's action-forcing purpose in two important respects." *Robertson*, 490 U.S. at 349. First, "the agency, in reaching its decision, will have available, and will *carefully consider, detailed information* concerning significant environmental impacts[,]" and second, "the relevant information will be made available to the larger audience that may also play a role in both the decisionmaking process and the implementation of that decision." *Id.* (emphasis added). As the Supreme Court explained: "NEPA's instruction that all federal agencies comply with the impact statement requirement…'to the fullest extent possible' [cit. omit.] is neither accidental nor hyperbolic. Rather the phrase is a deliberate command that the duty NEPA imposes upon the agencies to consider environmental factors not be shunted aside in the bureaucratic shuffle." *Flint Ridge Development Co. v. Scenic Rivers Ass'n*, 426 U.S. 776, 787 (1976).

The fundamental purpose of an EIS is to force the decision-maker to take a "hard look" at a particular action – at the agency's need for it, at the environmental consequences it will have, and at more environmentally benign alternatives that may substitute for it – before the decision to proceed is made. 40 C.F.R. §§ 1500.1(b), 1502.1; *Baltimore Gas & Electric v. NRDC*, 462 U.S. 87, 97 (1983). This "hard look" requires agencies to obtain high quality information and accurate scientific analysis. 40 C.F.R. § 1500.1(b). "General statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." *Klamath-Siskiyou Wilderness Center v. Bureau of Land Management*, 387 F.3d 989, 994 (9th Cir. 2004) (*quoting Neighbors of Cuddy Mountain v. United States Forest Service*, 137 F.3d 1372, 1380 (9th Cir. 1998)). The law is clear that the EIS must be a pre-decisional, objective, rigorous, and neutral document, not a work of advocacy to justify an outcome that has been foreordained.

In nearly every respect, the Navy's DEIS fails to meet the high standards of rigor and objectivity required under NEPA.

II. The Navy Fails to Properly Analyze Impacts on Marine Mammals

As set forth in further detail in Appendix A, a thorough review of the region's marine mammals and habitat indicates that the Navy's impacts analysis underestimates actual impacts on species. The Navy's analysis of marine mammal distribution, habitat abundance, population structure and ecology also contains false, misleading or outdated assumptions that impede consideration of reasonable alternatives and mitigation measures.

A. Impacts on Wildlife in the Olympic Coast National Marine Sanctuary

The NWTRC almost completely engulfs the Olympic Coast National Marine Sanctuary ("NMS"), a region of extraordinary biological diversity. Twenty-nine species of marine mammals occur in the Olympic Coast NMS, including eight threatened or endangered species of whales, otters and pinnipeds. The sanctuary provides important regular foraging habitat for humpback and killer whales, including the endangered Southern

Resident killer whale population (see below). Gray whales use the sanctuary during biannual migrations between calving and feeding areas, and a small, possibly distinct, group of gray whales known as "summer residents" use the area for feeding every summer. Additional cetacean species that have been observed in the waters of the sanctuary include: minke whales, fin whales, sei whales, sperm and pygmy sperm whales, blue whales, Hubb's beaked whales, Cuvier's beaked whales, Baird's beaked whales, Stejneger's beaked whales, Risso's dolphins, false killer whales, common dolphins, northern right whale dolphins, Pacific white-sided dolphins, Dall's porpoises, and harbor porpoises. Sea otters and pinnipeds such as Steller and California sea lions, harbor seals and elephant seals use near-shore areas within the sanctuary, haul out on land at a number of locations along the coast, and use deeper waters for foraging.

A recent NOAA report specifically identified both military activities and underwater noise pollution as two of several emerging threats to the Olympic Coast NMS.[3] The report recognizes that noise pollution has the potential to compromise habitat quality for the marine mammals, fish and other wildlife that inhabit the sanctuary. In particular, it finds that "an increase in Navy activity or areas of operation, if not properly controlled, could have potential to disturb the seabed, introduce pollutants associated with test systems, and produce sound energy that could negatively alter the acoustic environment within the sanctuary."[4] Indeed, there is a long history of incompatibility between increased naval exercises in the Olympic Coast NMS and preservation of the unique characteristics and species that led to its designation. In the mid-1990's, the Navy finally ended its bombing exercises at Sea Lion Rock after a protracted battle with wildlife advocates. The DEIS does not recognize that episode, nor does it include any specific mitigation measures or details about the Navy's planned operations within the sanctuary that would prevent a similar situation from developing in the future.

In addition to marine mammals, the Olympic Coast NMS includes habitat for abundant fish and invertebrate species, including many commercially important fish and shellfish. Thirty species of rockfish (including 13 species of concern in Washington state), as well as Pacific halibut, herring, Pacific cod, Pacific whiting, lingcod, sablefish, Dungeness crab, razor clams, and five species of Pacific salmon (Chinook, sockeye, pink, chum and coho) inhabit sanctuary waters.[5] Threatened species in the sanctuary include the Olympic Coast populations of Ozette sockeye salmon and bull trout. Unique assemblages of cold-water corals and sponges, including gorgonians, stony corals and giant cup corals, have been found in the deeper waters of the sanctuary.

Despite the abundance of marine mammals, fish and invertebrates, as well as habitat for those species, the DEIS dismisses or improperly minimizes any significant risk to fish

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[3] NOAA, Olympic Coast National Marine Sanctuary, Condition Report 2008 (September 2008), *available at* http://sanctuaries.noaa.gov/library/national/oc_conditionreport08.pdf.

[4] Id. at 31.

[5] Notably, habitat degradation is a contributing factor in salmon decline, making the protection of the Olympic Coast NMS all the more important.

and wildlife in this area. At a minimum, the Navy must provide a detailed analysis of the impacts on marine species in the Olympic Coast NMS. Further, given the federally-protected status of the Sanctuary and its importance to a host of endangered and threatened fish and wildlife, the Navy should prepare and evaluate an alternative that excludes the Olympic Coast NMS from training exercises.

B. Impacts on Southern Resident Killer Whales

The NWTRC overlaps with critical habitat designated for Southern Resident killer whales in Puget Sound, as well as those coastal waters vital to the whales' survival and recovery that were improperly excluded from NMFS' critical habitat designation. This population, which is recognized as a Distinct Population Segment and protected under the Endangered Species Act, declined by nearly 20% between 1996 and 2001. The Southern Residents remain at high risk. Since they were listed as endangered, the population has declined further to a mere 87 individuals in 2007 and recent reports are that another 7 whales died in 2008.[6] Several anthropogenic factors have been implicated in the decline, including high contaminant loads of PCBs, PBDEs and other toxics detected in blubber samples; declining prey availability as salmon (the whales' primary food source) have been decimated by freshwater habitat destruction, harmful hatchery practices, and historically poor harvest management; effects from vessels; and noise pollution.[7] NMFS recognizes acoustic effects and oil spills as among the principle potential threats facing this population, and in its Final Recovery Plan proposed to "continue agency coordination and use of existing ESA and MMPA mechanisms to minimize potential impacts from anthropogenic sound."[8]

Because of the considerable uncertainty regarding the relative impacts of noise, as well as other threats, any additional anthropogenic stressors to the population must be drastically reduced. Further, due to these anthropogenic factors, the Southern Residents are under tremendous stress and cumulative impacts must be fully evaluated. In particular, any additional incursions or increased activity both within and outside designated critical habitat must be carefully evaluated for impacts to the extinction probability and recovery prospects for this population. As demonstrated by the events of May 5, 2003 in the Strait of Juan de Fuca and Haro Strait (described in further detail in Appendix B), exposure to military sonar is known to disrupt the behavior of Southern Resident killer whales, and thus particular attention is warranted to the location of any exercises involving sonar. As a recent NMFS Draft Biological Opinion noted, "observations from an event that occurred in the Strait of Juan de Fuca and Haro Strait

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[6] See, e.g., Robert McClure, Are the orcas starving?, seattlepi.com (Oct. 24, 2008), available at http://seattlepi.nwsource.com/local/384854_orcas25.html (noting that as salmon numbers decline, seven killer whales have most likely died, bringing the population down to 83).

[7] NMFS, Recovery Plan for Southern Resident Killer Whales (*Orcinus orca*), (Jan. 17, 2008); See also NMFS, Draft Biological Opinion for the Long-Term Central Project and State Water Project Operations Criteria and Plan (Dec. 11, 2008).

[8] Id. at v.

in 2003 illustrate that mid-frequency sonar can cause behavioral disturbance."[9] NMFS further concluded that "[i]mpacts from [sonar] can range from serious injury and mortality to changes in behavior."[10]

Yet the DEIS completely dismisses the potential impacts of Navy sonar on the endangered Southern Resident killer whale community and their endangered salmonid prey.[11] In addition, as we discuss below, the expected increase in vessel traffic and training actions raises the risk of oil or hazardous waste spills both from Navy vessels and from accidents involving other vessels. But neither of those risks are analyzed or fully disclosed in the DEIS. To comply with NEPA, the Navy must fully analyze these impacts and set forth all reasonable mitigation measures to reduce them. At a minimum, the Navy should exclude critical habitat for the Southern Resident killer whales (i.e., the waters of Greater Puget Sound) from training exercises. In addition to the mitigation measures proposed in Section IV, the Navy should also monitor the location of Southern Residents whenever they are outside of the opening to the Strait of Juan de Fuca and report the location to the public with no more than a 24 hr delay between sighting and reporting.

C. Acoustic Impacts

To comply with NEPA, agencies must ensure the "professional integrity, including scientific integrity," of the discussions and analyses that appear in environmental impact statements. 40 C.F.R. § 1502.24. To that end, they must make every attempt to obtain and disclose data necessary to their analysis. The simple assertion that "no information exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. *See* 40 C.F.R. § 1502.22(a). Agencies are further required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods "generally accepted in the scientific community." 40 C.F.R. §§ 1502.22(2), (4), 1502.24. Such requirements become acutely important in cases where, as here, so much about a program's impacts depend on newly emerging science.

In this case, the Navy's assessment of impacts is consistently undermined by its failure to meet these fundamental responsibilities of scientific integrity, methodology,

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[9] See NMFS, Draft Biological Opinion for the Long-Term Central Project and State Water Project Operations Criteria and Plan at 111 (Dec. 11, 2008).

[10] Id. at 110.

[11] Declines in salmon abundance have contributed to the decline of the Southern Resident killer whale. As a recent NMFS draft Biological Opinion acknowledges, "When prey is scarce, whales must spend more time foraging than when it is plentiful. Increased energy expenditure and prey limitation could lead to lower reproductive rates and higher mortality rates. Food scarcity could cause whales to draw on fat stores, mobilizing contaminants stored in their fat and affecting reproduction and immune function." See NMFS, Draft Biological Opinion for the Long-Term Central Project and State Water Project Operations Criteria and Plan at 107 (Dec. 11, 2008).

investigation, and disclosure. As set forth in greater detail in Appendix C and the attached critique by Dr. Bain, the DEIS disregards a great deal of relevant information adverse to the Navy's interests, uses approaches and methods that would not be acceptable to the scientific community, and ignores whole categories of impacts. In short, it leaves the public with an analysis of harm—behavioral, auditory, and physiological—that is at odds with established scientific authority and practice. The Navy must revise its acoustic impacts analysis, including its thresholds and risk function, to comply with NEPA.

D. Other Impacts on Marine Mammals

The activities proposed for the NWTRC may have impacts that are not limited to the effects of ocean noise. Unfortunately, the Navy's analysis of these other impacts is cursory and inadequate.

First, the Navy fails to adequately assess the impact of stress on marine mammals, a serious problem for animals exposed even to moderate levels of sound for extended periods.[12] DEIS at 3.9-60 to 61. As the Navy has previously observed, stress from ocean noise—alone or in combination with other stressors, such as biotoxins—may weaken a cetacean's immune system, making it "more vulnerable to parasites and diseases that normally would not be fatal."[13] Moreover, according to studies on terrestrial mammals, chronic noise can interfere with brain development, increase the risk of myocardial infarctions, depress reproductive rates, and cause malformations and other defects in young—all at moderate levels of exposure.[14] Because physiological stress responses are highly conservative across species, it is reasonable to assume that marine mammals would be subject to the same effects, particularly—as appears to be the case here—if they are resident animals exposed repeatedly to a variety of stressors in the NWTRC. Yet despite the potential for stress in marine mammals and the significant consequences that can flow from it, the Navy unjustifiably assumes that such effects would be minimal.

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[12] See National Research Council, Ocean Noise and Marine Mammals.

[13] Navy, Hawaii Range Complex Draft Environmental Impact Statement/ Overseas Environmental Impact Statement at 5-19 to 5-20 (2007). Additional evidence relevant to the problem of stress in marine mammals is summarized in A.J. Wright, N. Aguilar Soto, A.L. Baldwin, M. Bateson, C.M. Beale, C.Clark, T. Deak, E.F. Edwards, A. Fernández, A. Godinho, L. Hatch, A. Kakuschke, D. Lusseau, D. Martineau, L.M. Romero, L. Weilgart, B. Wintle, G. Notarbartolo di Sciara, and V. Martin, Do marine mammals experience stress related to anthropogenic noise?, 20 International Journal of Comparative Psychology, 274-316 (2007); see also T.A. Romano, M.J. Keogh, C. Kelly, P. Feng, L. Berk, C.E. Schlundt, D.A. Carder, and J.J. Finneran, Anthropogenic Sound and Marine Mammal Health: Measures of the Nervous and Immune Systems Before and After Intense Sound Exposure, 61 Canadian Journal of Fisheries and Aquatic Sciences 1124, 1130-31 (2004).

[14] See, e.g., E.F. Chang and M.M. Merzenich, Environmental Noise Retards Auditory Cortical Development, 300 Science 498 (2003) (rats); S.N. Willich, K. Wegscheider, M. Stallmann, and T. Keil, Noise Burden and the Risk of Myocardial Infarction, European Heart Journal (2005) (Nov. 24, 2005) (humans); F.H. Harrington and A.M. Veitch, Calving Success of Woodland Caribou Exposed to Low-Level Jet Fighter Overflights, 45 Arctic vol. 213 (1992) (caribou).

Second, the Navy fails to consider the risk of ship collisions with large cetaceans, as exacerbated by the use of active acoustics. DEIS 3.9-6, 69. For example, right whales have been shown to engage in dramatic surfacing behavior, increasing their vulnerability to ship strikes, on exposure to mid-frequency alarms above 133 dB re 1 μPa (SPL)—a level of sound that can occur many tens of miles away from the sonar systems slated for the range.[15] DEIS 3.9-69. A conservative approach would assume that other large whales (which, as the DEIS repeatedly notes, are already highly susceptible to vessel collisions) are subject to the same hazard. For instance, fin whales also occur within the NWTRC and appear to be particularly vulnerable to ship strikes.[16] Indeed, in a recent 16-year survey of ship strikes in Washington State waters, fin whales "had the highest incidence of ante-mortem ship strike" of the seven species of large whales examined.[17] But in discussing the effects of vessels on fin whales, the DEIS presents only the most conclusory assertions about the whales' potential responses to approaching vessels and discounts both the risk and consequences of vessel strikes. *See* DEIS 3.9-89 (asserting only that it "is likely that fin and humpback whales would have little reaction to vessels that maintain a reasonable distance from the animals"); *id.* at 3.9-92, 106, 111 (Alternatives "would have no significant impact on marine mammals."). The DEIS fails to discuss even the potential for mortality or injury to fin whales from ship strikes. NEPA's hard look requires the Navy to undertake a far more detailed examination of this potentially significant source of mortality for fin whales under even the no action alternative, as well as from the 4 to 10 percent increase in vessel traffic that would occur under alternatives 1 and 2.

Third, in the course of its training activities, the Navy would release a host of toxic chemicals, hazardous materials and waste into the marine environment that could pose a threat to local wildlife over the life of the range. Nonetheless, the DEIS fails to adequately consider the cumulative impacts of these toxins on marine mammals from past, current, and proposed training exercises. DEIS 4-14 to 15. Careful study is needed into the way toxins might disperse and circulate within the area and how they may affect marine wildlife. The Navy's assumption that toxics would dissipate, become buried in sediment, or would be contained leads to a blithe conclusion that releases of hazardous material would have "no adverse effects." Given the level of training exercise increases proposed in the action alternatives, and the amount of ordnance and other hazardous materials necessary for that training, this discussion is inadequate under NEPA.

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[15] Nowacek et al., North Atlantic Right Whales, 271 Proceedings of the Royal Society of London, Part B: Biological Sciences at 227. The North Pacific right whale is an endangered species closely related to the studied North Atlantic right whale.

[16] See http://www.cascadiaresearch.org/WestportBm20090113.htm

[17] Annie B. Douglas, Incidence of ship strikes of large whales in Washington State, Journal of the Marine Biological Association of the United Kingdom, 2008, 88(6), 1121–1132, *available at* http://www.cascadiaresearch.org/reports/Douglas%20et%20al%202008-Incidence%20of%20ship%20strikes%20of%20large%20whales.pdf.

Fourth, the Navy does not adequately analyze the potential for and impact of oil spills, particularly to the endangered Southern Resident killer whales.[18] Because the Puget Sound area is home to the world's third largest Navy homeport, the nation's third largest container port complex, Canada's largest port, and one of this country's high volume oil ports, there is a significant existing risk of an oil spill. This risk is exacerbated by increasing the tempo and intensity of Navy training, which will involve more vessels, more transits, and longer missions throughout the range.[19] The largest oil spill to occur in Washington waters was a result of the Navy vessel *General Meiggs* (releasing 2.3 million gallons). More recently, on August 4, 2006, the USS *Nevada*, a Navy Trident submarine based at Naval Base Kitsap-Bangor, severed the towline of the tug Phyllis Dunlap and its barge at the entrance to the Strait of Juan de Fuca. Although the tug Phyllis Dunlap was transiting with two empty barges when the incident took place, and was able with support to reestablish its connection, this incident is very similar to one that occurred off Cape Flattery in October 2003 when the Navy sub USS *Topeka* separated an empty oil barge from its tow and indicates the potential for Navy activities to cause accidents at sea. NOAA considers the possibility of a large spill to be one of the most important short-term threats to killer whales and other coastal organisms in the northeastern Pacific.[20]

The Washington State Department of Ecology ranks coastal resources to be the most sensitive and most at risk from oil spills in the State. Though the largest spills in the history of Washington State have occurred off the Washington Coast, spill response today remains hindered by rough seas and lack of response gear appropriate to the operating environment. Even in light of this history and the extraordinarily valuable and sensitive coastal resources that occur in the NWTRC, the Navy currently has none of its spill response or salvage equipment stationed on the coast. Given the nature of the existing risk—let alone the Navy's proposal to expand its use of the range—and the extraordinary value of the marine and coastal resources within the NWTRC, the Navy must consider stationing such equipment under all of the alternatives discussed in the DEIS.

Finally, the Navy's analysis cannot be limited only to direct effects, *i.e.*, effects that occur at the same time and place as the training exercises that would be authorized. 40 C.F.R. § 1508.8(a). It must also take into account the activity's indirect effects, which, though reasonably foreseeable (as the DEIS acknowledges), may occur later in time or

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[18] NMFS recognizes oil spills as among the principle potential threats facing the population of Southern Resident killer whales. See NMFS, Recovery Plan for Southern Resident Killer Whales (*Orcinus orca*), (Jan. 17, 2008).

[19] We note that the Navy should include in its analysis and disclose to the public a chart that shows how its operating areas overlap shipping lanes, recommended routes, and Areas to Be Avoided as an indication of the potential for conflict with other vessels.

[20] Krahn, M. M., P. R. Wade, S. T. Kalinowski, M. E. Dahlheim, B. L. Taylor, M. B. Hanson, G. M. Ylitalo, R. P. Angliss, J. E. Stein, and R. S. Waples. 2002. Status review of southern resident killer whales (Orcinus orca) under the Endangered Species Act. NOAA Technical Memorandum NMFS-NWFSC-54, U.S. Department of Commerce, Seattle, Washington.

are further removed. 40 C.F.R. § 1508.8(b). This requirement is particularly critical in the present case given the potential for sonar exercises to cause significant long-term impacts not clearly observable in the short or immediate term (a serious problem, as the National Research Council has observed).[21] Thus, for example, the Navy must not only evaluate the potential for mother-calf separation but also the potential for indirect effects—on survivability—that might arise from that transient change. 40 C.F.R. § 1502.16(b).

Without further consideration of these impacts, and mitigation and alternatives developed to address those impacts, the DEIS does not pass NEPA muster.

E. Other Impacts on Wildlife

The activities proposed for the NWTRC will have impacts that are obviously not limited to the effects on marine mammals. As just one example, the potential impacts to vulnerable upland wildlife and their prey are not adequately disclosed or analyzed in the DEIS. Compared to the No Action Alternative, Alternatives 1 and 2 propose increases in flights over uplands areas. Air Combat Maneuvers will increase from 1353 to 2000 sorties, and HARM Missile Exercise activities will increase from 2724 to 3,000 sorties. Although we were able to find limited information regarding the proposed flights, including Figure 2-2, which provides reference, unfortunately, the scale of that figure makes it difficult to discern specific impacts.

Of particular concern are the potential impacts of low flights. In the Okanagan Military Operating Area ("MOA") segments B and C, and Roosevelt MOA section B, the lower limit flight altitude is just 300 feet. Although the DEIS states that the "preponderance of air activities occur at high altitudes," without any specific details, however, it remains unclear how many flights will be low altitude. The Final EIS must disclose how many low flights are included in Alternatives 1 and 2, as well as how much of an increase or decrease is this relative to the No Action Alternative. It must also evaluate the impacts of these flights on wildlife and recreation.

For instance, it is not clear what the impact of increased flights will be on vulnerable wildlife, such as federally and state listed species. The omission of the BE compounds our inability to understand and comment upon the Navy's conclusions. Section 3.11.2.2 includes a good discussion regarding how noise can impact wildlife generally, but there is no detail regarding impacts to specific species that will actually be impacted by the proposed actions. Flights close to the ground may disturb the natural behavior of vulnerable wildlife and cause them to flee. Effects may include: in the harsh mountain environment animals my flee to steep areas where the risk of falling or avalanche are higher; large amounts of energy might be expended as an animal flees through deep snow; predation might be more likely when an animal abandons cover; an animal may

[21] "Even transient behavioral changes have the potential to separate mother-offspring pairs and lead to death of the young, although it has been difficult to confirm the death of the young." National Research Council, Ocean Noise and Marine Mammals at 96.

abandon denning, nesting, or critical habitat; and prey may flee the area. The DEIS contains no discussion of these or other such issues. The Final EIS must evaluate and disclose potential impacts to specific species. It must discuss how such impacts be reduced or mitigated. In addition, for impacted species listed as threatened or endangered, the Navy must consult with NOAA or U.S. Fish and Wildlife Service to fully evaluate any impacts to these species or their critical habitat.

III. The Navy Failed to Analyze the Impacts on Fish and Fisheries

The DEIS also fails to evaluate the impacts of anthropogenic sound on fish and fisheries.[22] Though the architecture of their ears may differ, fish are equipped, like all vertebrates, with thousands of sensory hair cells that vibrate with sound; and a number of specialized organs like the abdominal sac, called a "swim bladder," that some species possess which can boost hearing. Fish use sound in many of the ways that marine mammals do: to communicate, defend territory, avoid predators, and, in some cases, locate prey.[23]

One series of recent studies showed that passing airguns can severely damage the hair cells of fish (the organs at the root of audition) either by literally ripping them from their base in the ear or by causing them to "explode."[24] Fish, unlike mammals, are thought to regenerate hair cells, but the pink snapper in these studies did not appear to recover within approximately two months after exposure, leading researchers to conclude that the damage was permanent.[25] It is not clear which elements of the sound wave contributed to the injury, or whether repetitive exposures at low amplitudes or a few exposures at higher pressures, or both, were responsible.[26]

Sound has also been shown to induce temporary hearing loss in fish. Even at fairly moderate levels, noise from outboard motor engines is capable of temporarily deafening some species of fish, and other sounds have been shown to affect the short-term hearing

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[22] As discussed above, declines in salmon are threatening the survival of the Southern Resident killer whales. As NMFS concluded, "[a]ny proposed action-related effects that decrease the availability of salmon, and Chinook salmon in particular, could adversely affect Southern Residents…" See NMFS, Draft Biological Opinion for the Long-Term Central Project and State Water Project Operations Criteria and Plan at 111 (Dec. 11, 2008). Unfortunately, the DEIS fails to fully evaluate the impacts on fish and thus on the species that depend on fish as prey.

[23] See, e.g., A.N. Popper, Effects of Anthropogenic Sounds on Fishes, 28(10) Fisheries 26-27 (2003); M.C. Hastings & A.N. Popper, Effects of Sound on Fish 19 (2005) (Report to the California Department of Transportation, Contract No. 43A0139), p., 19; D.A. Croll, Marine Vertebrates and Low Frequency Sound—Technical Report for LFA EIS 1-90 (1999).

[24] R. McCauley, J. Fewtrell, and A.N. Popper, High Intensity Anthropogenic Sound Damages Fish Ears, 113 Journal of the Acoustical Society of America 640 (2003).

[25] Id. at 641 (some fish in the experimental group sacrificed and examined 58 days after exposure).

[26] Id.

of a number of other species, including sunfish and tilapia.[27] For any fish that is dependent on sound for predator avoidance and other key functions, even a temporary loss of hearing (let alone the virtually permanent damage seen in snapper) will substantially diminish its chance of survival.[28]

Hearing loss is not the only effect that ocean noise can have on fish. For years, fisheries in various parts of the world have complained about declines in their catch after intense acoustic activities (including naval exercises) moved into the area, suggesting that noise is seriously altering the behavior of some commercial species.[29] A group of Norwegian scientists attempted to document these declines in a Barents Sea fishery and found that catch rates of haddock and cod (the latter known for its particular sensitivity to low-frequency sound) plummeted across a 1600 square-mile area surrounding an airgun survey; in another experiment, catch rates of rockfish were similarly shown to decline.[30] Drops in catch rates in these experiments range from 40 to 80 percent.[31] A variety of other species, herring, zebrafish, pink snapper, and juvenile Atlantic salmon, have also been observed to react to various noise sources with acute alarm.[32]

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[27] A.R. Scholik and H.Y. Yan, Effects of Boat Engine Noise on the Auditory Sensitivity of the Fathead Minnow, *Pimephales promelas*, 63 Environmental Biology of Fishes 203-09 (2002); A.R. Scholik and H.Y. Yan, The Effects of Noise on the Auditory Sensitivity of the Bluegill Sunfish, Lepomis macrochirus, 133 Comparative Biochemisty and Physiology Part A at 43-52 (2002); M.E. Smith, A.S. Kane, & A.N. Popper, Noise-Induced Stress Response and Hearing Loss in Goldfish *(Carassius auratus)*, 207 Journal of Experimental Biology 427-35 (2003); Popper, Effects of Anthropogenic Sounds at 28.

[28] See Popper, Effects of Anthropogenic Sounds at 29; McCauley et al., High Intensity Anthropogenic Sound Damages Fish Ears, at 641.

[29] See "'Noisy' Royal Navy Sonar Blamed for Falling Catches," Western Morning News, Apr. 22, 2002 (sonar off the U.K.); Percy J. Hayne, President of Gulf Nova Scotia Fleet Planning Board, "Coexistence of the Fishery & Petroleum Industries," www.elements.nb.ca/theme/fuels/percy/hayne.htm (accessed May 15, 2005) (airguns off Cape Breton); R.D. McCauley, J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, and K. McCabe, Marine Seismic Surveys: Analysis and Propagation of Air-Gun Signals, and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles, Fishes, and Squid 185 (2000) (airguns in general).

[30] A. Engås, S. Løkkeborg, E. Ona, and A.V. Soldal, Effects of Seismic Shooting on Local Abundance and Catch Rates of Cod *(Gadus morhua)* and Haddock *(Melanogrammus aeglefinus)*, 53 Canadian Journal of Fisheries and Aquatic Sciences 2238-49 (1996); J.R. Skalski, W.H. Pearson, and C.I. Malme, Effects of Sound from a Geophysical Survey Device on Catch-Per-Unit-Effort in a Hook-and-Line Fishery for Rockfish (Sebastes spp.), 49 Canadian Journal of Fisheries and Aquatic Sciences 1357-65 (1992). See also S. Løkkeborg and A.V. Soldal, The Influence of Seismic Exploration with Airguns on Cod (Gadus morhua) Behaviour and Catch Rates, 196 ICES Marine Science Symposium 62-67 (1993).

[31] Id.

[32] See J.H.S. Blaxter and R.S. Batty, The Development of Startle Responses in Herring Larvae, 65 Journal of the Marine Biological Association of the U.K. 737-50 (1985); F.R. Knudsen, P.S. Enger, and O. Sand, Awareness Reactions and Avoidance Responses to Sound in Juvenile Atlantic Salmon, Salmo salar L., 40 Journal of Fish Biology 523-34 (1992); McCauley et al., Marine Seismic Surveys at 126-61.

In their comments on the Navy's DEIS for the proposed Undersea Warfare Training Range off North Carolina, several fishermen and groups of fishermen independently reported witnessing sharp declines in catch rates of various species when in the vicinity of Navy exercises.[33] These reports are indicative of behavioral changes, such as a spatial redistribution of fish within the water column, that could affect marine mammal foraging as well as human fisheries. In addition, as NMFS has observed, the use of mid-frequency sonar could affect the breeding behavior of certain species, causing them, for example, to cease their spawning choruses, much as certain echolocation signals do.[34] The repetitive use of sonar and other active acoustics could have significant adverse behavioral effects on some species of fish and those who depend on them.

Moreover, as the Navy is aware after recently completing consultation with both NMFS (for salmon) and the U.S. Fish and Wildlife Service (for bull trout) over its Explosive Ordinance Disposal ("EOD") training exercises in Puget Sound, underwater explosions are responsible for high direct mortality to fish species present in the area. Indeed, the underwater detonation of just five pounds of plastic explosives has been observed to kill over 5,000 fish with swim bladders, with more accurate estimates ranging as high as 20,000 fish. While the DEIS notes that EOD activities have largely been shifted to Imperial Beach, CA, there are a variety of live-fire training exercises, some of which involve underwater explosions of torpedoes and other ordnance, that will take place in the NWTRC under all three alternatives. Given the variety of threatened and endangered fish species inhabiting these waters – including but not limited to salmon runs that the region is spending billions of dollars in an attempt to recover – the DEIS's failure to analyze these effects in any detail is stunning.

Although the nation's fish and wildlife agencies, and the studies detailed above document impacts to fish from both noise and underwater explosions, the DEIS nonetheless concludes that there would be no adverse effects on fish from its increased sonar training activities and explosive detonations. DEIS at 3.7-52 to 57. Such a conclusion is at odds with the scientific literature.

The Navy's conclusion also ignores the literature on noise exposure and fish development. A number of studies, including one on non-impulsive noise, show that intense sound can kill eggs, larvae, and fry outright or retard their growth in ways that may hinder their survival later.[35] Significant mortality for fish eggs has been shown to

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[33] See comments compiled by the Navy and posted on the Undersea Warfare Training Range EIS site, *available at* http://www.projects.earthtech.com/USWTR (e.g., comments of S. Draughon, S. Fromer, L. and F. Gromadzki, D. Pendergrast, and North Carolina Watermen United).

[34] Letter from Miles M. Croom, NMFS Southeast Regional Office, to Keith Jenkins, Navy (Jan. 31, 2006); see also J.J. Luczkovich, "Potential Impacts of the U.S. Navy's Proposed Undersea Warfare Training Range on Fishes" (2006) (presentation to Navy).

[35] See, e.g., C. Booman, J. Dalen, H. Leivestad, A. Levsen, T. van der Meeren, and K. Toklum, Effecter av luftkanonskyting på egg, larver og yngel (Effects from Airgun Shooting on Eggs, Larvae,

occur at distances of 5 meters from an airgun source; mortality rates approaching 50 percent affected yolksac larvae at distances of 2 to 3 meters.[36] With respect to mid-frequency sonar, the Navy itself has noted that "some sonar levels have been shown [in Norwegian studies] to be powerful enough to cause injury to particular size classes of juvenile herring from the water's surface to the seafloor."[37] Also, larvae in at least some species are known to use sound in selecting and orienting toward settlement sites.[38] Acoustic disruption at that stage of development could have significant consequences.[39] Although the Navy acknowledges that eggs and larvae may be more susceptible to sound, it caveats that acknowledgement with the excuse that "more well-controlled studies are needed." DEIS at 3.7-38. However, NEPA does not allow the Navy to ignore the valid scientific studies that have already been conducted simply because they are contrary to its interest.

After glossing over the effects of noise on fish in only two short paragraphs, the Navy capriciously dismisses the potential for adverse impacts on fish. DEIS 3.7-37 to 38. Such analysis does not meet the requirements of NEPA. The Navy must rigorously analyze the potential for behavioral, auditory, and physiological impacts on fish, including the potential for population-level effects, using models of fish distribution and population structure and conservatively estimating areas of impact from the available literature. 40 C.F.R. § 1502.22. It must also provide appropriate mitigation measures, such as avoidance of spawning grounds and of important habitat for fish species, especially hearing specialists. Finally, the Navy should consider excluding designated critical habitat for listed species such as salmon in the NWTRC from training exercises.

IV. The Proposed Mitigation Measures Fail to Protect Marine Wildlife

To comply with NEPA, an agency must discuss measures designed to mitigate its project's impact on the environment. *See* 40 C.F.R. § 1502.14(f). There is a large and growing set of options for the mitigation of noise impacts to marine mammals and other marine life, some of which have been imposed by foreign navies[40]—and by the Navy

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and Fry), 3 Fisken og Havet 1-83 (1996) (Norwegian with English summary); J. Dalen and G.M. Knutsen, Scaring Effects on Fish and Harmful Effects on Eggs, Larvae and Fry by Offshore Seismic Explorations, in H.M. Merklinger, Progress in Underwater Acoustics 93-102 (1987); A. Banner and M. Hyatt, Effects of Noise on Eggs and Larvae of Two Estuarine Fishes, 1 Transactions of the American Fisheries Society 134-36 (1973); L.P. Kostyuchenko, Effect of Elastic Waves Generated in Marine Seismic Prospecting on Fish Eggs on the Black Sea, 9 Hydrobiology Journal 45-48 (1973).

[36] Booman et al., Effecter av luftkanonskyting på egg, larver og yngel at 1-83.

[37] Navy, Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the Southern California Range Complex 3.7-66 to 3.7-67 (2008). On the Northwest Pacific range, the Navy would operate sonar at higher levels than those used in the Norwegian studies.

[38] S.D. Simpson, M. Meekan, J. Montgomery, R. McCauley, R., and A. Jeffs, Homeward Sound, 308 Science 221 (2005).

[39] Popper, Effects of Anthropogenic Sounds at 27.

[40] See S.J. Dolman, C.R. Weir, and M. Jasny, Comparative Review of Marine Mammal Guidance Implemented during Naval Exercises, __ Marine Pollution Bulletin __ (Dec. 12, 2008).

itself, in other contexts—to limit harm from high-intensity sonar exercises. Yet here the Navy does little more than set forth an abbreviated set of measures, dismissing effective measures out of hand.

All of the mitigation that the Navy has proposed for sonar impacts boils down to the following: a very small safety zone around the sonar source, maintained primarily with visual monitoring by personnel with other responsibilities, with aid from shipboard passive monitoring when personnel are already using such technology. Under the proposed scheme, operators would power-down the system if a marine mammal is detected within 1,000 yards and shut-down the system if a marine mammal is detected within 200 yards. DEIS at 5-9 to 12.

This mitigation scheme disregards the best available science on the significant limits of visual monitoring. Visual detection rates for marine mammals generally approach only 5 percent. Moreover, the species perhaps most vulnerable to sonar-related injuries, beaked whales, are among the most difficult to detect because of their small size and diving behavior. It has been estimated that in anything stronger than a light breeze, only one in fifty beaked whales surfacing in the direct track line of a ship would be sighted; as the distance approaches 1 kilometer, that number drops to zero.[41] The Navy's reliance on visual observation as the mainstay of its mitigation plan is therefore profoundly misplaced.

The Navy's ineffective mitigation measures are all the more remarkable given its adoption of more protective measures during previous training. For example, the Atlantic Fleet has repeatedly sited exercises beyond the continental shelf and Gulf Stream, relocated exercises out of important habitat and to avoid certain species, and used a technique called "simulated geography" to avoid canyons and near-shore areas on at least three of its major ranges. It has also restricted sonar use at night when marine mammals are harder to detect, as well as minimized the use of sonar from multiple sources at the same time.[42]

In this light, the Navy's claims that it cannot implement more protective mitigation measures ring false. DEIS at 5-22 to 28. Although the Navy goes to some pain to describe "alternative mitigation measures considered but eliminated" —primarily for "training effectiveness" reasons—its previous adoption of the same measures belies its argument. Clearly the Navy has done more to mitigate the harmful effects of sonar in previous exercises than what it proposes for the NWTRC. It can, and must, do more to mitigate the harm on marine wildlife.

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[41] J. Barlow and R. Gisiner, Mitigating, Monitoring, and Assessing the Effects of Anthropogenic Noise on Beaked Whales, 7 Journal of Cetacean Research and Management 239-249 (2006).

[42] Final Comprehensive Overseas Environmental Assessment for Major Atlantic Fleet Training Exercises February 2006, Prepared for United States Fleet Forces Command in accordance with Chief of Naval Operations Instruction 5090.1B pursuant to Executive Order 12114; *See also* Atlantic Fleet Exercises Using Mid-Frequency Sonar Mitigation Chart.

A. Protection Zones

To mitigate sonar's harmful effects on marine wildlife, the Navy should adopt protection zones in which sonar activity will be banned. Based on our preliminary analysis of marine mammal densities and habitat in the Pacific Northwest, we call for the following exclusion areas for sonar:

1) All inshore waters of Greater Puget Sound (including the Strait of Juan de Fuca and Strait of Georgia) – This area is one of the most important habitats for the Southern Resident community of killer whales (and their nearly-exclusive habitat in summer/autumn months). The population is listed as Endangered under the ESA. In addition, Greater Puget Sound also constitutes important habitat for many other marine mammal species, including minke whales, harbor porpoises, Dall's porpoises, and several species of pinnipeds. Another issue is that the enclosed nature of the Sound, with its many steep, reflective rock walls, heightens concerns about the behavior of sonar signals in this area.[43]

2) Lower Continental Slope waters between the 500 and 2,000 m depth contours – This area represents the most important habitat for beaked whales in the area. There is good supporting evidence for their preference for this type of habitat (see Appendix A), and due to the year-round presence of these animals, protection should occur throughout the year. Any Navy plan for the Northwest Pacific should, at minimum, avoid areas within this bathymetric range with unusual bottom topography (such as canyons), and should include a firm, multi-year commitment to sponsor fine-scale surveys with the aim of identifying important beaked whale habitat for avoidance.

3) Outer coastal waters between the shoreline and the 100 m depth contour (and buffer zone) – This area, bounded by the mainland shoreline and the 100 m contour, represents vital habitat for two discrete populations of harbor porpoise. The species is known for its high sensitivity to acoustic sources, responding strongly to various sources of anthropogenic noise at pressure levels well below 140 dB re 1 μPa.[44] Indeed, for its EIS on

[43] NMFS. 2005. Assessment of acoustic exposures on marine mammals in conjunction with USS *Shoup* Active Sonar Transmissions in the Eastern Strait of Juan de Fuca and Haro Strait, Washington, 5 May 2003 (noting the effects of reverberation).

[44] R.A. Kastelein, W.C. Verboom, M. Muijsers, N.J. Jennings and S. Van Der heul, The influence of acoustic emissions for underwater data transmission on the behaviour of harbor porpoises (*Phocoena phocoena*) in a floating pen. Marine Environmental Research 59:287-307 (2005); R.A. Kastelein, A.N. Jennings, W.C. Verboom, D. De Haan and N.M. Schooneman, Differences in the response of a striped dolphin *(Stenella coeruleoalba)* and a harbour porpoise (*Phocoena phocoena*) to an acoustic alarm. Marine Environmental Research 61:363-378 (2006); NMFS 2005; P. Olesiuk, M.A. Bigg and G.M. Ellis. Life history and population dynamics of resident killer whales (*Orcinus orca*) in

Atlantic Fleet sonar training, the Navy included in its take estimates any harbor porpoise exposed to sound pressure levels above 120 dB. The species' use of near-coastal habitats only adds to its vulnerability. To protect this sensitive species and near-coastal habitat, a robust buffer zone should be applied beyond the 100 m contour, and exercises should be planned to eliminate or minimize ship movements towards shore when sonar systems are active.

4) Canyons and Banks of Northern Washington State and Oregon – The "Prairie," Juan de Fuca Canyon, Swiftsure Bank, Barkley and Nitnat Canyons, and Heceta Bank are used as important feeding habitat for humpback whales and other species. These areas should be avoided at least during the main humpback whale feeding season from June to October.

5) Olympic Coast National Marine Sanctuary – As noted in Section II.A and Appendix A, the Sanctuary provides habitat for twenty-nine species of marine mammals, including foraging habitat for Southern Resident killer whales and humpback whales, and other species. A recent NOAA report found that "an increase in Navy activity or areas of operation, if not properly controlled, could have potential to disturb the seabed, introduce pollutants associated with test systems, and produce sound energy that could negatively alter the acoustic environment within the sanctuary."[45] Any Navy plan for the training range must include measures to eliminate or very substantially limit the number of exercises taking place in Sanctuary waters.

B. Other Mitigation Measures

In addition to the specific protection zones set forth above, the Navy should adopt the following measures:

1) Seasonal avoidance of marine mammal feeding grounds, calving grounds, and migration corridors;

2) Avoidance of or extra protections in other federal and state marine protected areas, including the Waketickeh Creek Marine Protected Area, Copalis Marine Protected Area, Quillayute Needles Marine Protected Area, and other Marine Protected Areas in the areas considered.

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the coastal waters of British Columbia and Washing state. Reports of the International Whaling Commission 12:209-243 (1990).

[45] NOAA, Olympic Coast National Marine Sanctuary, Condition Report 2008 (September 2008).

3) Avoidance of bathymetry likely to be associated with high-value habitat for species of particular concern, including submarine canyons and large seamounts, or bathymetry whose use poses higher risk to marine species;

4) Avoidance of fronts and other major oceanographic features, such as the California Current and other areas with marked differentials in sea surface temperatures, which have the potential to attract offshore concentration of animals, including beaked whales;[46]

5) Avoidance of areas with higher modeled takes or with high-value habitat for particular species;

6) Concentration of exercises to the maximum extent practicable in abyssal waters and in surveyed offshore habitat of low value to species;

7) Use of sonar and other active acoustic systems at the lowest practicable source level, with clear standards and reporting requirements for different testing and training scenarios;

8) Expansion of the marine species "safety zone" to a 4km shutdown, reflecting international best practice, or 2 km, reflecting the standard prescribed by the California Coastal Commission;[47]

9) Suspension of relocation of exercises when beaked whales or significant aggregations of other species, such as killer whales, are detected by any means within the orbit circle of an aerial monitor or near the vicinity of an exercise;

10) Use of simulated geography (and other work-arounds) to reduce or eliminate chokepoint exercises in near-coastal environments, particularly within canyons and channels, and use of other important habitat;

11) Avoidance or reduction of training during months with historically significant surface ducting conditions, and use of power-downs during significant surface ducting conditions at other times;

12) Use of additional power-downs when significant surface ducting conditions coincide with other conditions that elevate risk, such as during exercises involving the use of multiple systems or in beaked whale habitat;

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[46] See, e.g., Carretta et al., U.S. Pacific Marine Mammal Stock Assessments: 2007 at 142 (reporting that "Baird's beaked whales have been seen primarily along the continental slope from late spring to early fall.").

[47] California Coastal Commission, Adopted Staff Recommendation on Consistency Determination CD-08606 (2007); Approved Letter from M. Delaplaine, California Coastal Commission, to Rear Adm. Len Hearing, Navy (Jan. 11, 2007).

13) Planning of ship tracks to avoid embayments and provide escape routes for marine animals;

14) Suspension or postponement of chokepoint exercises during surface ducting conditions and scheduling of such exercises during daylight hours;

15) Use of dedicated aerial monitors during chokepoint exercises, major exercises, and near-coastal exercises;

16) Use of dedicated passive acoustic monitoring to detect vocalizing species, through established and portable range instrumentation and the use of hydrophone arrays off instrumented ranges;

17) Modification of sonobuoys for passive acoustic detection of vocalizing species;

18) Suspension or reduction of exercises outside daylight hours and during periods of low visibility;

19) Use of aerial surveys and ship-based surveys before, during, and after major exercises;

20) Use of all available range assets for marine mammal monitoring;

21) Use of third-party monitors for marine mammal detection;

22) Establishment of long-term research, to be conducted through an independent agent such as the National Fish and Wildlife Foundation, on the distribution, abundance, and population structuring of protected species in the NWTRC, with the goal of supporting adaptive geographic avoidance of high-value habitat. Notably, additional critical habitat is likely to be identified in the NWTRC, and research should be undertaken to identify this critical habitat;

23) Application of mitigation prescribed by state regulators, by the courts, by other navies or research centers, or by the U.S. Navy in the past or in other contexts;

24) Avoidance of fish spawning grounds and of important habitat for fish species potentially vulnerable to significant behavioral change, such as wide-scale displacement within the water column or changes in breeding behavior;

25) Evaluating before each major exercise whether reductions in sonar use are possible, given the readiness status of the strike groups involved;

26) Dedicated research and development of technology to reduce impacts of active acoustic sources on marine mammals;

27) Establishment of a plan and a timetable for maximizing synthetic training in order to reduce the use of active sonar training;

28) Prescription of specific mitigation requirements for individual classes (or sub-classes) of testing and training activities, in order to maximize mitigation given varying sets of operational needs; and

29) Timely, regular reporting to NOAA, state coastal management authorities, and the public to describe and verify use of mitigation measures during testing and training activities.

Consideration of these measures is minimally necessary to satisfy the requirements of NEPA, and we note that similar or additional measures may be required under the Marine Mammal Protection Act, Endangered Species Act, and other statutes.

V. The Navy Fails to Properly Analyze Cumulative Impacts

In order to satisfy NEPA, an EIS must include a "full and fair discussion of significant environmental impacts." 40 C.F.R. § 1502.1. It is not enough, for purposes of this discussion, to consider the proposed action in isolation, divorced from other public and private activities that impinge on the same resource; rather, it is incumbent on the Navy to assess cumulative impacts as well, including the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future significant actions." *Id.* § 1508.7. A meaningful cumulative impact analysis must identify (1) the area in which the effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions—past, present, proposed, and reasonably foreseeable—that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate. *Grand Canyon Trust v. FAA*, 290 F.3d 339, 345 (D.C. Cir. 2002) (quotation and citation omitted). The Navy "cannot treat the identified environmental concern in a vacuum." *TOMAC v. Norton*, 433 F.3d 852, 863 (D.C. Cir. 2006) (*quoting Grand Canyon Trust*, 290 F.3d at 345).

The Navy's cumulative impact analysis fails to meet these basic requirements. Nowhere in its cumulative impact analysis does the Navy consider—let alone reach the conclusion—that the *sum* of the various environmental impacts that are enumerated will be limited. DEIS at 4-1 to 34. The Navy's analysis cannot provide such support because the Navy fails to explain what the sum of these impacts is expected to be. NEPA requires more than just a recital of possible impacts: it requires the Navy to actually analyze the overall impact of the accumulation of individual impacts. *Grand Canyon Trust*, 290 F.3d at 345. The DEIS fails to make this analysis.

The Navy must also consider the full effects of its sonar training. It simply assumes that all behavioral impacts are short-term in nature and cannot affect individuals or populations through repeated activity—even though the anticipated takes at its preferred alternative would affect the same populations.

Nor does the Navy consider the potential for acute synergistic effects from sonar training. Although the DEIS discusses the potential for ship strike in the training area (DEIS 4-24 to 25), it does not consider the greater susceptibility to vessel strike of animals that have been temporarily harassed or disoriented by certain noise sources. The absence of analysis is particularly glaring in light of the Haro Strait incident, in which killer whales and other marine mammals were observed fleeing away from the sonar vessel at high speeds.[48] Neither does the Navy consider the synergistic effects of noise with other stressors in producing or magnifying a stress-response.[49] For these reasons alone, the Navy should have concluded that the cumulative and synergistic impacts from sonar training are significant and focused its efforts to analyze and develop mitigation measures to avoid those impacts.

The Navy acknowledges that the NWTRC is crowded with human and military activities, many of which introduce noise, chemical pollution, debris, and vessel traffic into the habitat of protected species. DEIS at 4-22 to 27. Yet it inexplicably fails to conclude what the cumulative effects will be for all those activities.

Given the scope of the proposed action, the deficiencies of the Navy's cumulative impacts assessment represents a critical failure of the DEIS. At a minimum, the Navy must evaluate the potential for cumulative impacts on populations that would occur in and near the NWTRC, clearly define the extent of expected cumulative impacts, and assess the potential for synergistic adverse effects (such as from noise in combination with ship-strikes).

VI. The Navy Fails to Properly Analyze Reasonable Alternatives

NEPA requires agencies to consider alternatives to their proposed actions. To comply with NEPA, an EIS must "inform decision-makers and the public of the reasonable

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[48] Christopher Dunagan, Navy Sonar Incident Alarms Experts, Bremerton Sun, May 8, 2003.

[49] A.J. Wright, N. Aguilar Soto, A.L. Baldwin, M. Bateson, C.M. Beale, C.Clark, T. Deak, E.F. Edwards, A. Fernández, A. Godinho, L. Hatch, A. Kakuschke, D. Lusseau, D. Martineau, L.M. Romero, L. Weilgart, B. Wintle, G. Notarbartolo di Sciara, and V. Martin, Do marine mammals experience stress related to anthropogenic noise?, 20 International Journal of Comparative Psychology, 274-316 (2007); see also Andrew J. Wright, Natacha Aguilar Soto, Ann L. Baldwin, Melissa Bateson, Colin M. Beale, Charlotte Clark, Terrence Deak, Elizabeth F. Edwards, Antonio Fernández, Ana Godinho, Leila Hatch, Antje Kakuschke, David Lusseau, Daniel Martineau, L. Michael Romero, Linda Weilgart, Brendan Wintle, Giuseppe Notarbartolo-di-Sciara, and Vidal Martin, Anthropogenic noise as a stressor in animals: a multidisciplinary perspective, 20 International Journal of Comparative Psychology, 250-273 (2007).

alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. This alternatives requirement has been described in regulation as "the heart of the environmental impact statement." *Id.* § 1502.14. The courts describe the alternatives requirement equally emphatically, citing it as the "linchpin" of the EIS. *Monroe County Conservation Council v. Volpe*, 472 F.2d 693 (2d Cir. 1972). The agency must therefore "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." 40 C.F.R. § 1502.14(a). Consideration of alternatives is required by (and must conform to the independent terms of) both sections 102(2)(C) and 102(2)(E) of NEPA. Here, the Navy's alternatives analysis misses the mark.

A. Failure to Identify Environmental Impact-Based Alternatives

The Navy claims it "considers potential environmental impacts" while executing its responsibilities under federal law, including NEPA. DEIS at 1-1. But the Navy's alternatives were not selected to "inform decision-makers and the public" of how the Navy could "avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. Instead, as discussed in the DEIS and below, the Navy chose alternatives based on factors unrelated to the proposed action's environmental impacts.

Further, at no point in the DEIS does the Navy discuss how the alternatives pose different environmental choices for the public and decisionmakers. The DEIS fails entirely to comply with NEPA's regulations, requiring the Navy to "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among option by the decisionmaker and the public." 40 C.F.R. § 1502.14. The Navy fails to sharply define the environmental issues applicable to each alternative and include these differences in a comparison of alternatives. There is simply no comparison of the risks and benefits of each alternative site showing what is and is not known and what species and habitats would be most at risk from each alternative.

B. Identification of Alternative Sites

The DEIS does not include any discussion of alternative sites, instead proposing a No Action alternative (maintaining the current level of activities), Alternative 1 (increasing training activities and force structure changes), and the preferred Alternative 2 (increasing training activities, force structure changes and range enhancements). The Navy's analysis is devoid of geographic alternatives. The information the Navy does include indicates that factors of convenience and cost dominated the decision. Factors of mere convenience alone cannot dictate an agency's choice of alternatives to evaluate in an EIS. An agency must discuss all reasonable alternatives—those that will accomplish the purpose and need of the agency and are practical and feasible—not simply those it finds most convenient. 40 C.F.R. § 1502.14. "The primary purpose of the impact statement is to compel federal agencies to give serious weight to

environmental factors in making discretionary choices." *I-291 Why? Ass'n v. Burns*, 372 F.Supp. 233, 247 (D. Conn. 1974). If an agency is permitted to consider and compare the environmental impacts of its proposed action with only equally convenient alternatives—and permitted to omit from such analysis any alternatives that are less convenient, no matter that they might result in significant environmental benefits—this purpose would be thwarted.

Carefully siting the activities proposed to occur in the range to avoid concentrations of vulnerable and endangered species and high abundances of marine life is the most critical step the Navy can take in reducing the environmental impacts of this project. Because the Navy has failed to undertake an alternatives analysis that allows it to make an informed siting choice, however, the DEIS is inadequate and must be revised.

C. Other Reasonable Alternatives

The DEIS fails to consider any alternatives beyond increasing the level of training. Therefore, many reasonable alternatives are missing from the Navy's analysis that might fulfill that purpose while reducing harm to marine life and coastal resources. For example:

(1) The DEIS fails entirely to consider seasonal restrictions on the use of the range. Instead, all of the action alternatives propose year-round use without regard to seasonal variations in marine mammal and fish abundance. This is true despite the well-documented seasonal migrations of numerous endangered species. For example, the Southern Resident killer whale population is concentrated in the Greater Puget Sound area during the summer and autumn months, and is found along the Washington Coast at other times of the year. Studies have shown that killer whales engage in dramatic flight behavior in response to mid-frequency signals.[50] Yet the DEIS fails even to consider the feasibility of avoiding the whales' seasonal habitat, or any other seasonal variation in marine life abundance (such as migration routes). Omitting even the mere *consideration* of any alternative that recognizes the need to protect endangered and sensitive marine life is unacceptable.

(2) The DEIS fails to include a range of mitigation measures among its alternatives. Many such measures have been employed by the U.S. Navy in other contexts, as discussed in Section IV; and there are many others that should be considered. Such measures are reasonable means of reducing harm to marine life and other resources on the proposed range, and their omission from the alternatives analysis renders that analysis inadequate.

[50] See,. e.g., NMFS, Assessment of Acoustic Exposures on Marine Mammals in Conjunction with *USS Shoup* Active Sonar Transmissions in the Eastern Strait of Juan de Fuca and Haro Strait, Washington—5 May 2003 at 4-6 (2005).

(3) The Navy declines to consider a reduction in the level of proposed training in the NWTRC. Yet the Navy's assumption that sonar exercises must occur at the level proposed may well be an artifact of the Navy's Tactical Training Theater Assessment and Planning Program (TAP) process, which, in requiring separate environmental analysis of existing ranges and operating areas, seems to assume *a priori* that exercises cannot be reapportioned.

(4) The Navy's statement of purpose and need contains no language that would justify the limited set of alternatives that the Navy considers (or the alternative it ultimately prefers). Yet it is a fundamental requirement of NEPA that agencies preparing an EIS specify their project's "purpose and need" in terms that do not exclude full consideration of reasonable alternatives. 40 C.F.R. § 1502.13; *City of Carmel-by-the-Sea v. United States Dep't of Transp.*, 123 F.3d 1142, 1155 (9th Cir. 1997) (*citing Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 196 (D.C. Cir. 1991)). "The existence of a viable but unexamined alternative renders an environmental impact statement inadequate," *Idaho Conservation League v. Mumma*, 956 F.2d 1508, 1519 (9th Cir. 1992), and an EIS errs when it accepts "as a given" parameters that it should have studied and weighed. *Simmons v. U.S. Army Corps of Eng'rs*, 120 F.3d 664, 667 (7th Cir. 1997).

In sum, the DEIS shortchanges or omits from its analysis reasonable alternatives that might achieve the Navy's core aim of testing and training while minimizing environmental harm. For these reasons, we urge the Navy to revise its DEIS to adequately inform the public of all reasonable alternatives that would reduce adverse impacts to whales, fish, and other resources. 40 C.F.R. § 1502.1.

VII. The Navy Fails to Analyze the Impacts on Wildlife Viewing Interests and Recreation

Just as it fails to consider the direct, indirect, and cumulative impacts of the NWTRC on the region's marine mammals and other fish and wildlife, the DEIS does not adequately consider the NWTRC's effects on wildlife viewing and other wildlife-dependent recreational interests. The DEIS makes no mention of the value lost from the harm to marine mammals that attract a number of our organizational members and members of the public to the potentially affected areas of the Pacific Northwest. Nor does it address the potential economic value lost from decreased tourism, particularly those areas centered on observing whales and other marine mammals in their natural habitats.[51] Neither does it address the effects of increased and low-level flights on backcountry recreation in areas where people fish, hunt, hike, backpack, ski, and test their survival skills in a wild environment.

[51] For example, NMFS observed in a recent Draft Biological Opinion, "Southern Residents are the primary driver for a multi-million dollar whale watching industry in the Pacific Northwest." See NMFS, Draft Biological Opinion for the Long-Term Central Project and State Water Project Operations Criteria and Plan at 111 (Dec. 11, 2008).

One of NEPA's explicit purposes is to "assure esthetically and culturally pleasing surroundings," 42 U.S.C. 4331(b)(2), and caselaw makes clear that an agency must adequately consider such recreational impacts in its NEPA analysis. *See, e.g., Lujan v. NWF*, 497 U.S. 871, 887 (1990) ("no doubt that recreational use and aesthetic enjoyment are among the sorts of interests NEPA [was] specifically designed to protect"); *LaFlamme v. FERC*, 852 F.2d 389, 401 (1988) (because "there were substantial questions raised regarding whether the project may significantly affect recreational use in the project area, and that FERC failed to explain or discuss" these impacts, the court found that "this record reflects a decision which is neither 'fully informed or well-considered,'" and therefore concluded the agency's decision not to prepare an EIS was unreasonable).

VIII. Project Description and Meaningful Public Disclosure

Disclosure of the specific activities contemplated by the Navy is essential if the NEPA process is to be a meaningful one. *See, e.g., LaFlamme v. F.E.R.C.*, 852 F.2d 389, 398 (9th Cir. 1988) (noting that NEPA's goal is to facilitate "widespread discussion and consideration of the environmental risks and remedies associated with [a proposed action]"). As several groups and individuals identified in their scoping comments, the overall level of detail about the Navy's actions revealed in this process is a far cry from previous EISs and is so general as to undermine the ability to provide meaningful comment.[52]

With regard to noise-producing activities, for example, the Navy must describe source levels, frequency ranges, duty cycles, and other technical parameters relevant to determining potential impacts on marine life. The DEIS provides some of this information, but it fails to disclose sufficient information about active sonobuoys, acoustic device countermeasures, training targets, or range sources that would be used during the exercises. DEIS at 2-11 to 12. And the DEIS gives no indication of platform speed, pulse length, repetition rate, beam widths, or operating depths—that is, most of the data that the Navy used in modeling acoustic impacts.

The Navy—despite repeated requests—has not released or offered to release CASS/GRAB or any of the other modeling systems or functions it used to develop the biological risk function or calculate acoustic harassment and injury. *See, e.g.,* DEIS at Appendix D.

In addition, the DEIS makes repeated reference to a Biological Evaluation ("BE") that the Navy prepared to catalog the effects of its proposed alternatives on species listed as threatened or endangered under the Endangered Species Act. The BE was not included in the DEIS and is not available on the Navy's website. The omission of the BE has

[52] *See* September 28, 2007 Comments from Center For Biological Diversity, Dr. David Bain, Earthjustice, Fred Felleman, WAVE Consulting, Friends of the San Juans, National Wildlife Federation, Natural Resources Defense Council, People for Puget Sound, Save Our Wild Salmon, South Sound Orca Advocates, and Val Veirs, Ph.D, at 3-4 and attachments (noting level of detail in Navy's activities contained in Olympic National Marine Sanctuary EIS).

severely curtailed the public's ability to meaningfully evaluate and comment upon the effects of the alternatives. The Navy has also ignored repeated Freedom of Information Act requests regarding information and reports cited in the DEIS.

These models, reports, and requests for information must be made available to the public, including the independent scientific community, for public comment to be meaningful under NEPA and the Administrative Procedure Act. 40 C.F.R. §§ 1502.9(a), 1503.1(a) (NEPA); 5 U.S.C. § 706(2)(D) (APA). In addition, guidelines adopted under the Data (or Information) Quality Act also require their disclosure. The Office of Management and Budget's guidelines require agencies to provide a "high degree of transparency" precisely "to facilitate reproducibility of such information by qualified third parties" (67 Fed. Reg. 8452, 8460 (Feb. 22, 2002)); and the Defense Department's own data quality guidelines mandate that "influential" scientific material be made reproducible as well. We encourage the Navy to contact us immediately to discuss how to make this critical information available.

IX. Scope of Review

We are also concerned about the Navy's understanding of its obligations under applicable law. The Navy indicates that its analysis of "extraterritorial" activities, those activities that would take place outside U.S. territorial waters, was prepared under the authority of Executive Order 12114 rather than under NEPA. *See* DEIS at ES-6 to 7. Not only is this position on the scope of review inconsistent with the statute (*see, e.g., Environmental Defense Fund v. Massey*, 968 F.2d 528 (D.C. Cir. 1994) and *NRDC v. Navy*, No. CV-01-07781, 2002 WL 32095131 at *9-12 (C.D. Cal. Sept. 19, 2002)), but, insofar as it represents a broader policy, it provides further indication that current operations are likewise out of compliance. Most of the area used for sonar training is sited beyond the 12nm territorial boundary, within the U.S. Exclusive Economic Zone. If, as we expect, activities currently taking place there have not received their due analysis in a prior environmental impact statement, then the Navy is operating in ongoing violation of NEPA.

X. Compliance With Other Applicable Laws

A number of other statutes and conventions are implicated by the proposed activities. Among those that must be disclosed and addressed during the NEPA process are the following:

(1) The Marine Mammal Protection Act ("MMPA"), 16 U.S.C. § 1361 et seq., which requires the Navy to obtain a permit or other authorization from NMFS or the U.S. Fish and Wildlife Service prior to any "take" of marine mammals. The Navy must apply for an incidental take permit under the MMPA, and NRDC will submit comments regarding the Navy's application to NMFS at the appropriate time.

(2) The Endangered Species Act, 16 U.S.C. § 1531 et seq., which requires the Navy to enter into formal consultation with NMFS or the U.S. Fish and Wildlife Service, and receive a legally valid Incidental Take Permit, prior to its "take" of any endangered or threatened marine mammals or other species, including fish, sea turtles, and birds, or its "adverse modification" of critical habitat. *See, e.g.*, 1536(a)(2); *Romero-Barcelo v. Brown*, 643 F.2d 835 (1st Cir. 1981), *rev'd on other grounds*, *Weinberger v. Romero-Carcelo*, 456 U.S. 304, 313 (1982). Given the scope and significance of the actions and effects it proposes, the Navy must engage in formal consultation with NMFS and the U.S. Fish and Wildlife over the numerous endangered and threatened species in the NWTRC.

(3) The Coastal Zone Management Act, and in particular its federal consistency requirements, 16 U.S.C. § 1456(c)(1)(A), which mandate that activities that affect the natural resources of the coastal zone—whether they are located "within or outside the coastal zone"—be carried out "in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs." The Navy must fulfill its CZMA commitments along the Washington, Oregon and California coasts.

(4) The Magnuson-Stevens Fisheries Conservation and Management Act, 16 U.S.C. § 1801 et seq. ("MSA"), which requires federal agencies to "consult with the Secretary [of Commerce] with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken" that "may adversely affect any essential fish habitat" identified under that Act. 16 U.S.C. § 1855 (b)(2). In turn, the MSA defines essential fish habitat as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." 16 U.S.C. § 1802 (10). The NTWRC contains such habitat. As discussed at length above, anti-submarine warfare exercises alone have the significant potential to adversely affect at least the waters, and possibly the substrate, on which fish in these areas depend. Under the MSA, a thorough consultation is required.

(5) The Marine Protection, Research and Sanctuaries Act, 33 U.S.C. § 1401 et seq., which requires federal agencies to consult with the Secretary of Commerce if their actions are "likely to destroy, cause the loss of, or injure any sanctuary resource." 16 U.S.C. § 1434(d)(1). Since the Navy's exercises would cause injury and mortality of species, consultation is clearly required if sonar use takes place either within or in the vicinity of the sanctuary or otherwise affects its resources. Since sonar may impact sanctuary resources even when operated outside its bounds, the Navy should indicate how close it presently operates, or foreseeably plans to operate, to such sanctuary and consult with the Secretary of Commerce as required.

In addition, the Sanctuaries Act is intended to "prevent or strictly limit the dumping into ocean waters of any material that would adversely affect human

health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities" (33 U.S.C. § 1401(b)), and prohibits all persons, including Federal agencies, from dumping materials into ocean waters, except as authorized by the Environmental Protection Agency. 33 U.S.C. §§ 1411, 1412(a). The Navy has not indicated its intent to seek a permit under the statute.

(6) The Migratory Bird Treaty Act, 16 U.S.C. § 703 et seq. ("MBTA"), which makes it illegal for any person, including any agency of the Federal government, "by any means or in any manner, to pursue, hunt, take, capture, [or] kill" any migratory birds except as permitted by regulation. 16 U.S.C. § 703. After the District Court for the D.C. Circuit held that naval training exercises that incidentally take migratory birds without a permit violate the MBTA, (see *Center for Biological Diversity v. Pirie*, 191 F. Supp. 2d 161 (D.D.C. 2002) (later vacated as moot)), Congress exempted some military readiness activities from the MBTA but also placed a duty on the Defense Department to minimize harms to seabirds. Under the new law, the Secretary of Defense, "shall, in consultation with the Secretary of the Interior, identify measures-- (1) to minimize and mitigate, to the extent practicable, any adverse impacts of authorized military readiness activities on affected species of migratory birds; and (2) to monitor the impacts of such military readiness activities on affected species of migratory birds." Pub.L. 107-314, § 315 (Dec. 2, 2002). As the Navy acknowledges, migratory birds occur within the NWTRC. The Navy must therefore consult with the Secretary of the Interior regarding measures to minimize and monitor the effects of the proposed range on migratory birds, as required.

(7) Executive Order 13158, which sets forth protections for marine protected areas ("MPAs") nationwide. The Executive Order defines MPAs broadly to include "any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." E.O. 13158 (May 26, 2000). It then requires that "[e]ach Federal agency whose actions affect the natural or cultural resources that are protected by an MPA shall identify such actions," and that, "[t]o the extent permitted by law and to the maximum extent practicable, each Federal agency, in taking such actions, shall avoid harm to the natural and cultural resources that are protected by an MPA." *Id*. The Navy must therefore consider and, to the maximum extent practicable, must avoid harm to the resources of all federally- and state-designated marine protected areas.

The proposed activities also implicate the Clean Air Act and Clean Water Act as well as other statutes protecting the public health. The Navy must comply with these and other laws.

XI. Conflicts with Federal, State and Local Land-Use Planning

NEPA requires agencies to assess possible conflicts that their projects might have with the objectives of federal, regional, state, and local land-use plans, policies, and controls. 40 C.F.R. § 1502.16(c). The Navy's training and testing activities may affect resources in the coastal zone and within other state and local jurisdictions, in conflict with the purpose and intent of those areas. The consistency of Navy operations with these land-use policies must receive more thorough consideration.

XII. Conclusion

For the reasons set forth above, we urge the Navy to satisfy its obligations under NEPA and other applicable laws. To that end, the Navy should revise its DEIS, improving its impacts and alternatives analysis and establishing temporal and geographic protection zones to mitigate the harmful impacts of its training.

Thank you for your consideration of our comments, and we welcome the opportunity to discuss this matter with you at any time.

Sincerely,

Taryn Kiekow
Staff Attorney

APPENDIX A

RECOMMENDATIONS FOR MARINE PROTECTION ZONES IN THE NORTHWEST TRAINING RANGE COMPLEX

Thirty-seven species of marine mammals (seven mysticetes, 21 odontocetes, eight pinnipeds, and one additional carnivore) are known to occur in the area of the Pacific Northwest, although only 26 of these species regularly occur there – the rest are either rare or extralimital in the area. The vast majority of these species are cetaceans (whales, dolphins, and porpoises), although there are also a number of pinnipeds (seals, sea lions, and walruses) and a single fissiped carnivore (the sea otter *Enhydra lutris*).

Until the late 1960s and early 1970s, very little was known about marine mammals in the Pacific Northwest area. For the most part, only information from occasional strandings and specimen collections, along with miscellaneous opportunistic at-sea observations, were available (Scheffer and Slipp 1948; Wahl 1977; Stroud and Roffe 1979). The most detailed sighting information was from opportunistic records of biologists doing pelagic fur seal research, but the data were very sparse (Fiscus and Niggol 1965). Because of their coastal nature and frequent interaction with fisheries, pinnipeds received the bulk of the research interest (see Scheffer and Slipp 1944; Mate 1973; Everitt 1980; Everitt and Beach 1982; Steiger and Calambokidis 1986; Steiger et al. 1989; Huber et al. 2001).

Interest in marine mammals (especially cetaceans) dramatically increased in the early 1970s, with the passage of the Marine Mammal Protection Act and Endangered Species Act. Most early studies in the 1970s, 1980s, and early 1990s were conducted in the inshore waters of Greater Puget Sound, where the focus was on several species: harbor porpoises (Flaherty 1982; Raum-Suryan and Harvey 1988), Dall's porpoises (Miller 1989, 1990), minke whales (Dorsey 1983; Stern et al. 1990), and in particular killer whales (Balcomb et al. 1980; Bigg 1982; Balcomb and Bigg 1986; Olesiuk et al. 1990; Bigg et al. 1990). The killer whale studies in inshore waters of Washington State and southern British Columbia, Canada, were (and remain) the most detailed and comprehensive research done on the species anywhere in the world (see Krahn et al. 2002).

Throughout this time, other than for a few specific studies to examine the status of harbor porpoises on the outer coast (Barlow 1988; Barlow et al. 1988; Gearin et al. 1994; Osmeck et al. 1996), very little work was being done on the marine mammals of the open coasts of Washington and Oregon. However, with a set of ship surveys in 1989-1990 (Brueggeman 1992) and then a follow-up set of aerial surveys in 1992 (Green et al. 1993), we began to learn about marine mammals in the offshore waters of Oregon and Washington, and the first estimates of abundance for some species became available. However, these surveys still did not have good coverage of offshore waters of the outer continental shelf and slope.

In the summer of 1994, the Southwest Fisheries Science Center (SWFSC) conducted a set of experimental surveys off Oregon and Washington (Forney and Barlow 1994). A number of important sightings were made, but the data from these surveys remain largely unpublished and unavailable. It was not until 1996 that a large-scale set of surveys covering waters of virtually the entire U.S. EEZ were conducted by the SWFSC, and similar sets of surveys have been conducted every several years since then. The data from these latter surveys now provide information on the abundance of most species of cetaceans from the outer coast of Oregon and Washington (Barlow 2003; Barlow and Forney 2007). Calambokidis et al. (2004) recently combined focused surveys with data collected on the above surveys to clarify status of several species off Washington, and Norman et al. (2004) recently conducted a comprehensive analysis of stranding records for both Oregon and Washington.

Based on the above, we now have some understanding of the distribution and habitat preferences of most species of marine mammals that occur in the Pacific Northwest study area.

SPECIES OF PARTICULAR CONCERN

At least 15 marine mammal species occurring on the Northwest Pacific range should be regarded as of particular concern: those that are listed as Threatened or Endangered under the Endangered Species Act, and those that are considered particularly vulnerable to acoustic impacts due to small population sizes, localized habitat, or strong susceptibility to anthropogenic noise. These are the North Pacific right whale, blue whale, fin whale, sei whale, humpback whale, sperm whale, five species of beaked whales, killer whale, harbor porpoise, Steller sea lion, and sea otter. Areas in which these species are known to concentrate should be avoided. Among these species are:

Blue whale (*Balaenoptera musculus*)
The blue whale is listed as Endangered under the ESA, as well as on the IUCN Red List (Reeves et al. 2003). As the largest animals on earth, these creatures were heavily hunted to commercial extinction in the 20th century, but since cessation of whaling for this species, have shown evidence of recovery in many areas of their range. Blue whales were historically found throughout much of the Pacific Northwest area, at least seasonally, and the west coast stock currently numbers about 1,744 whales (CV = 28%) (Carretta et al. 2007). The population has clearly increased since the mid-20th century, but in recent years evidence for a continued increase is equivocal (Carretta et al. 2007).

Both visual and auditory data indicate the presence of blue whales along the entire west coast, though primary feeding areas for blue whales along the U.S. west coast appear to be in California waters. Sightings are occasionally made off the coast of Oregon, although sightings off Washington appear to be rare (Carretta et al. 2007). A blue whale was recently observed and photographed about 40 miles off the coast of Westport, WA near the Gray's Harbor Canyon.[53] In addition, acoustic contacts are also

[53] http://www.cascadiaresearch.org/WestportBm20090113.htm

sometimes made off Oregon (McDonald et al. 1994; Stafford et al. 1998), and this suggests that the species may occur there more often than sighting records indicate.

Humpback whale (*Megaptera novaeangliae*)
The humpback whale is listed as Endangered under the ESA, and as Vulnerable on the IUCN Red List (Reeves et al. 2003).

Although humpbacks have not been studied as intensively off Oregon and Washington as they have further south off California, annual feeding does occur in the Pacific Northwest study area, mostly within about 100 nautical miles of the coast (Carretta et al. 2007). Humpback whales are the most common large whale species seen off northern Washington in summer. Line transect surveys suggest that in most years between 1995 and 2000, approximately 100 humpback whales were present off northern Washington, but in 2002 the estimate increased to over 500 whales (Calambokidis et al. 2004). There is limited interchange of whales from this area with those further south in Oregon and California, suggesting the existence of a more-or-less distinct feeding aggregation in these waters (Calambokidis et al. 2004). Within their study site off the Olympic Peninsula, Calambokidis et al. (2004) found humpback whales to occur mostly in the northern part of the area, in a region informally known as the "Prairie." Other areas of concentration are near the mouth of Juan de Fuca Canyon, Swiftsure Bank, and an area between Barkley and Nitnat canyons (Calambokidis et al. 2004), all in Washington, and Heceta Bank, off Oregon (Green et al. 1992).

Humpbacks occupy the Pacific Northwest study area primarily in the summer (and to a lesser extent, autumn) seasons. In winter and spring months, west-coast humpbacks migrate to their breeding grounds in Mexico and Central America, although the exact migration corridor is not well known (Calambokidis et al. 2001). The evidence for a more-or-less-distinct feeding aggregation off northern Washington dictates that special caution be exercised in this area.

Sperm whale (*Physeter macrocephalus*)
The sperm whale is listed as Endangered under the ESA and as Vulnerable on the IUCN Red List (Reeves et al. 2003). The period of most intense whaling activity targeting this species was in the 1800s (see Whitehead 2003); however, there are new threats to some populations, which may be affecting the animals to an unknown degree (see below). There are probably over 50,000 sperm whales in the eastern North Pacific, although the California/Oregon/Washington stock of sperm whales numbers only about 1,233 (CV = 41%) whales, and is quite variable, not showing any obvious trends in abundance (Barlow 2003; Carretta et al. 2007). The degree of interchange with concentrations of the species further offshore is not well known.

The sperm whale is largely a deep-water species, generally found past the edge of the continental shelf, although sperm whales do occasionally move close to coastlines (Rice 1989). Other areas of the world where concentrations of these whales occur are usually characterized by steep bottom topography near continental margins (e.g., canyons cutting into the continental shelf, steep slopes of oceanic archipelagos, offshore banks

and seamounts). Although such types of habitats exist in the study area, sperm whales in the area appear to be very widely scattered in offshore waters, and there are not any areas of known concentration of sperm whales in the main study area. Although large numbers of sperm whales exist within several thousand miles of the west coast, sightings near the coast are not particularly common (Carretta et al. 2007). For instance, sperm whales were not seen by Calambokidis et al. (2004) in their line transect study off northern Washington.

Sperm whales were the major targets of American commercial whaling operations in the 1800s, and continued to be heavily hunted in the eastern North Pacific in the 1900s. More than 318,800 sperm whales were reported killed in the North Pacific Ocean between 1800 and 1987 (Carretta et al. 2007). And there was massive under-reporting of catches by Soviet and Japanese operations, and the true total taken was probably at least 436,000 sperm whales (Brownell et al. 1998). A commercial whaling moratorium brought the hunt to a close in 1987. The lingering effects of these massive (and not fully-documented) takes, along with concerns about fishery bycatches and impacts from human-caused noise give biologists cause for concern about the status and recovery of sperm whale stocks in the North Pacific.

Beaked whales (family *Ziphiidae*)

The Ziphiidae is a large family of medium-sized whales, which are generally the most poorly known of all the cetaceans. This is at least partially related to their preference for deep, offshore waters (Heyning 1989; Mead 1989). At least five species occur in the Pacific Northwest area: Baird's beaked whale *Berardius bairdii*, Cuvier's beaked whale *Ziphius cavirostris,* Hubbs' beaked whale *Mesoplodon carlhubbsi,* Blainville's beaked whale *Mesoplodon densirostris*, and Stejneger's beaked whale *Mesoplodon stejnegeri*. Two additional species, Perrin's beaked whale *Mesoplodon perrini* and the Ginkgo-toothed beaked whale *Mesoplodon ginkgodens*, occur just south of the study area and could potentially move into the area (MacLeod et al. 2006). Like the *Kogia* spp., ziphiid species are often confused with each other and many records are not accurately identified to species (see Jefferson et al. 2008). For these reasons, they are often treated as a single group.

Little is known about abundance trends for beaked whales; most populations are considered "data deficient" by the IUCN. They are of particular concern here due to their recognized vulnerability to military sonar activities (see, e.g., Claridge 2006; Cox et al. 2006). Estimated abundance of Baird's beaked whales in U.S. west coast waters is 228 whales (CV = 51%), for Cuvier's beaked whales is 1,884 (CV = 68%), and for combined *Mesoplodon* spp. is 1,247 (CV = 92%) animals (Carretta et al. 2007).

The most detailed studies on beaked whale habitat preferences have been done in the Atlantic Ocean, off the Bahamas (MacLeod et al. 2004; MacLeod and Zuur 2005; Claridge 2006) and in the Mediterranean (Cañadas et al. 2002; Moulins et al. 2007), although there has been some work done in Hawaii (Baird et al. 2006) and the eastern tropical Pacific (Ferguson et al. 2006) as well.

All beaked whales are largely oceanic in distribution, and occur almost exclusively offshore of the shelf edge, and sightings are dispersed. They also seem to prefer waters with a sloping seabed (MacLeod 2005). In some areas, such as the Gulf of Mexico, there is a slight concentration in very deep waters with a depth range of about 1,000-3,000 m (Maze-Foley and Mullin 2006). Beaked whales of the genus *Mesoplodon* (mostly Blainville's) have been found to prefer relatively shallower waters (mostly less than 1,000 m (MacLeod and Zuur 2005; MacLeod et al. 2004; Claridge 2006; Baird et al. 2004, 2006), while Cuvier's beaked whales were found to prefer deeper waters greater than 1,000 m in depth (to more than 2,000 m) (Cañadas et al. 2002; MacLeod et al. 2004; Baird et al. 2006; Moulins et al. 2007). Cuvier's were most often seen in waters with a slope of 11-31 m/km (Moulins et al. 2007).

It is worth noting that during a 1994 marine mammal survey conducted by NOAA Fisheries off the coasts of Oregon and Washington (see Forney and Brownell 1996), several beaked whale sightings were made. On one spectacular day (27 July 1994), 17 beaked whale sightings were made, about half of them *Ziphius cavirostris* and the other half *Mesoplodon* spp. At least one of the mesoplodont sightings was of a group containing an adult male and the unique diagnostic characters of ***M. carlhubbsi*** could be clearly seen. Most of the beaked whale sightings were in an area of slick water (perhaps a large eddy), with abundant seabirds, tunas, baitfish, and surface invertebrates (T. A. Jefferson and R. L. Pitman, pers. obs.). It is unknown if this day was an anomalous event, but clearly there are reasonably large numbers of Cuvier's and mesoplodont beaked whales in this general area, at least some of the time.

There are no particular areas of known concentration for beaked whales in the area, but most species appear to have a general preference for waters of the lower continental slope. This habitat preference is probably most apparent for the Baird's beaked whale, which appears to have a strong preference for continental slope and seamount areas. However, Ferguson (2005) cautioned that the standard definition of beaked whale habitat used in the past tends to be too narrow, and these animals can actually be found in a wide range of conditions, from slopes to abyssal plains, and from well-mixed to highly-stratified (see also Ferguson et al. 2006). More work is clearly needed to accurately identify critical habitats for these animals in the Pacific Northwest area (see Ward et al. 2005), and any Navy plan for the Northwest Pacific should include a commitment to conduct fine-scale surveys and to avoid areas with beaked whale concentrations.

There is very little dive depth information available for any of the beaked whales, but recent studies using suction-cup time-depth recorders have shown that Blainville's beaked whales are capable of diving to at least 1,408 m, and Cuvier's beaked whales are capable of diving to at least 1,450 m (Baird et al. 2006). Due to their estimated low abundance, apparent concentration in deep water, and the high susceptibility of beaked whales to mid-frequency military sonar (see MacLeod and d'Amico 2006), a very conservative approach must be taken to protecting these animals.

Killer whale (*Orcinus orca*)

Killer whales are the most cosmopolitan of all cetacean species, and they have been recorded in virtually all marine waters, and even in some brackish and freshwater areas (Dahlheim and Heyning 1999). There are three different forms or ecotypes (these may eventually be listed as separate subspecies or even species) of killer whales that occur regularly in the Pacific Northwest study area: (1) southern residents, (2) transients, and (3) offshore residents. Total abundance of killer whales in U.S. west coast waters is estimated at 466 for the offshore resident form, 314 for transients, and the southern resident stock numbers roughly 80 whales (Angliss and Outlaw 2007; Carretta et al. 2007). In 2005, the southern resident population was listed as Endangered under the ESA (Carretta et al. 2007).

Eastern North Pacific transient killer whales range widely up and down the west coast, from California to Southeast Alaska, and the Pacific Northwest is used as an important part of their range. They probably occur throughout the entire study area, including the inshore waters of Greater Puget Sound, which they use for foraging on their primary prey, marine mammals (mostly harbor seals – Angliss and Outlaw 2007). The Eastern North Pacific offshore stock is less well known, due to its recent discovery. These animals have been sighted in widely-scattered locations off the coasts of California, Oregon and Washington, although they appear to be concentrated further offshore than the other forms and do not generally use the inshore waters of Greater Puget Sound or Haro Strait (Carretta et al. 2007). They, like the southern residents, appear to be fish-eaters. Both populations have been observed off the Olympic Peninsula of northern Washington (Calambokidis et al. 2004).

The southern resident stock is apparently a coastal population that ranges along the North American west coast from southeast Alaska to central California. However, the vast majority of sightings in summer/autumn months occur in the inshore waters of Washington and southern British Columbia (Greater Puget Sound). They feed extensively on the summer runs of salmon, which return to their natal streams to spawn, during the months of June to October, in the calm, protected waters. They have also been sighted in the open waters off the Olympic Peninsula in summer (Calambokidis et al. 2004). Anthropogenic noise is an issue of concern for all three populations of killer whales, and is of particular concern for the southern resident stock, which has a small population size and is considered to be at significant risk of extinction (Krahn et al. 2004).

Harbor porpoise (*Phocoena phocoena*)

The harbor porpoise, in the Pacific Ocean, is characterized by relatively small populations and very coastal habitats, making it highly vulnerable to human-caused impacts. There are six management stocks recognized by NOAA Fisheries in U.S. west coast waters, and two of them are of interest here: (1) the Oregon/Washington coast stock and (2) the Washington Inland Waters stock (Carretta et al. 2007). The Oregon/Washington coast stock is estimated to number 37,745 porpoises (CV=38%), and the Washington Inland Waters stock is estimated at 10,682 porpoises (Calambokidis et al. 2007).

The Oregon/Washington coast stock ranges along the outer coasts of Washington and Oregon, from the entrance of Haro Strait south to Cape Blanco and to about 50 km offshore. These animals are most common in the nearshore, shallow waters less than 100 m deep. The Washington Inland Waters stock is found in inshore waters of Greater Puget Sound, from the entrance of Haro Strait to southern Puget Sound and north to the U.S. border with Canada. Harbor porpoises are known for their high sensitivity to a range of anthropogenic sounds (e.g., Kastelein et al. 2005, 2006; NMFS 2005; Olesiuk et al. 2002).

RECOMMENDATIONS FOR PROTECTION ZONES

There are many protected areas around the world that provide some measure of protection of important habitat for marine mammals (see Hoyt 2005). Such areas, large and small, exist in at least 102 different coastal and even some land-locked countries (see Hoyt 2005). Based on our preliminary analysis, we call for the following exclusion areas for sonar in the Northwest Pacific:

1) All inshore waters of Greater Puget Sound (including the Strait of Juan de Fuca and Strait of Georgia) – This area is one of the most important habitats for the Southern Resident community of killer whales (and their nearly-exclusive habitat in summer/autumn months). The population is listed as Endangered under the ESA. In addition, Greater Puget Sound also constitutes important habitat for many other marine mammal species, including minke whales, harbor porpoises, Dall's porpoises, and several species of pinnipeds. Another issue is that the enclosed nature of the Sound, with its many steep, reflective rock walls, heightens concerns about the behavior of sonar signals in this area (see NMFS 2005, noting the effects of reverberation).

2) Lower Continental Slope waters between the 500 and 2,000 m depth contours – This area represents the most important habitat for beaked whales in the area. There is good supporting evidence for their preference for this type of habitat (see above), and due to the year-round presence of these animals, protection should occur throughout the year. Any Navy plan for the Northwest Pacific should, *at minimum*, avoid areas within this bathymetric range with unusual bottom topography (such as canyons), and should include a firm, multi-year commitment to sponsor fine-scale surveys with the aim of identifying important beaked whale habitat for avoidance.

3) Outer coastal waters between the shoreline and the 100 m depth contour (and buffer zone) – This area, bounded by the mainland shoreline and the 100 m contour, represents vital habitat for two discrete populations of harbor porpoise. The species is known for its high sensitivity to acoustic sources, responding strongly to various sources of anthropogenic noise at pressure levels well below 140 dB re 1 μPa (Kastelein et al. 2005, 2006; NMFS 2005; Olesiuk et al. 2002). Indeed, for its EIS on Atlantic Fleet sonar training, the Navy included in its take estimates any harbor porpoise exposed to sound pressure levels above 120 dB (Navy 2008). The species' use of near-coastal habitats only add to its vulnerability. To protect this sensitive species and near-coastal habitat, a robust buffer zone should be applied beyond the 100 m contour, and

exercises should be planned to eliminate or minimize ship movements towards shore when sonar systems are active.

4) Canyons and Banks of Northern Washington State and Oregon – The "Prairie", Juan de Fuca Canyon, Swiftsure Bank, Barkley and Nitnat Canyons, and Heceta Bank are used as important feeding habitat for humpback whales and other species. These areas should be avoided at least during the main humpback whale feeding season from June to October.

5) Olympic Coast National Marine Sanctuary – As noted above, the Sanctuary provides habitat for twenty-nine species of marine mammals, including foraging habitat for Southern Resident killer whales and humpback whales, and other species. A recent NOAA report found that "an increase in Navy activity or areas of operation, if not properly controlled, could have potential to disturb the seabed, introduce pollutants associated with test systems, and produce sound energy that could negatively alter the acoustic environment within the sanctuary" (NOAA 2008). Under the Navy's current proposal, the operations area within the Range Complex would virtually engulf the Sanctuary. Any Navy plan for the training range must include measures to eliminate or very substantially limit the number of exercises taking place in Sanctuary waters.

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APPENDIX B

IMPACTS OF SONAR

Strandings and Mortalities Associated with Sonar

Scientists agree, and the publicly available scientific literature confirms, that the intense sound generated by active sonar can induce a range of adverse effects in whales and other species, from significant behavioral changes to stranding and death. By far the most widely-reported and dramatic of these effects are the mass strandings of beaked whales and other marine mammals that have been associated with military sonar use.

Over the last decade, the association between military active sonar and whale mortalities has become a subject of considerable scientific interest and concern. That interest is reflected in the publication of numerous papers in peer-reviewed journals, in reports by inter-governmental bodies such as the IWC's Scientific Committee, and in evidence compiled from a growing number of mortalities associated with sonar. Yet the DEIS only glosses over these stranding incidents.

In March 2000, for example, sixteen whales from at least three species— including two minke whales—stranded over 150 miles of shoreline along the northern channels of the Bahamas. The beachings occurred within 24 hours of Navy ships using mid-frequency sonar in those same channels.[54] Post-mortem examinations found, in all whales examined, hemorrhaging in and around the ears and other tissues related to sound conduction or production, such as the larynx and auditory fats, some of which was debilitative and potentially severe.[55] It is now accepted that these mortalities were caused, through an unknown mechanism, by the Navy's use of mid-frequency sonar.

The Bahamas event is merely one of numerous mortality events coincident with military activities and active sonar that have now been documented, only some of which the Navy discusses:[56]

> (1) Canary Islands 1985-1991 – Between 1985 and 1989, at least three separate mass strandings of beaked whales occurred in the Canary Islands, as reported in *Nature*.[57] Thirteen beaked whales of two species were killed in the

[54] Commerce and Navy, Joint Interim Report at iii, 16.

[55] Id.

[56] The following is not a complete list, as other relevant events have been reported in Bonaire, Japan, Taiwan, and other locations. See, e.g., R.L. Brownell, Jr., T. Yamada, J.G. Mead, and A.L. van Helden, Mass Strandings of Cuvier's Beaked Whales in Japan: U.S. Naval Acoustic Link? (2004) (IWC SC/56E37); J.Y. Wang and S.-C. Yang, Unusual Cetacean Stranding Events of Taiwan in 2004 and 2005, 8 Journal of Cetacean Research and Management 283-292 (2006); P.J.H. van Bree and I. Kristensen, On the Intriguing Stranding of Four Cuvier's Beaked Whales, Ziphius cavirostris, G. Cuvier, 1823, on the Lesser Antillean Island of Bonaire, 44 Bijdragen tot de Dierkunde 235-238 (1974).

[57] M. Simmonds and L.F. Lopez-Jurado, Whales and the Military, 337 Nature 448 (1991).

February 1985 strandings, six whales of three species stranded in November 1988, and some twenty-four whales of three species stranded in October 1989—all while naval vessels were conducting exercises off shore.[58] An additional stranding of Cuvier's beaked whales, also coinciding with a naval exercise, occurred in 1991.[59] It was reported that mass live strandings occurred each time exercises took place in the area.[60]

(2) Greece 1996, 1997 – In 1996, twelve Cuvier's beaked whales stranded along 35 kilometers on the west coast of Greece. The strandings were correlated, by an analysis published in *Nature*, with the test of a low- and mid-frequency active sonar system operated by NATO.[61] A subsequent NATO investigation found the strandings to be closely timed with the movements of the sonar vessel, and ruled out all other physical environmental factors as a cause.[62] The following year saw nine additional Cuvier's beaked whales strand off Greece, again coinciding with naval activity.[63]

(3) Virgin Islands 1999 – In October 1999, four beaked whales stranded in the U.S. Virgin Islands as the Navy began an offshore exercise. A wildlife official from the Islands reported the presence of "loud naval sonar."[64] When NMFS asked the Navy for more information about its exercise, the Department's response was to end the consultation that it had begun for the exercise under the Endangered Species Act.[65] In January 1998, according to a NMFS biologist, a beaked whale "stranded suspiciously" at Vieques as naval exercises were set to commence offshore.[66]

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[58] Id.

[59] V. Martín, A. Servidio, and S. Garcia, Mass Strandings of Beaked Whales in the Canary Islands, in P.G.H. Evans and L.A. Miller, Proceedings of the Workshop on Active Sonar and Cetaceans 33-36 (2004).

[60] Simmonds and Lopez-Jurado, Whales and the Military, 337 Nature at 448.

[61] A. Frantzis, Does Acoustic Testing Strand Whales? 392 Nature 29 (1998).

[62] See SACLANT Undersea Research Center, Summary Record, La Spezia, Italy, 15-17 June 1998, SACLANTCEN Bioacoustics Panel, SACLANTCEN M-133 (1998).

[63] Id.; A. Frantzis, The First Mass Stranding That Was Associated with the Use of Active Sonar (Kyparissiakos Gulf, Greece, 1996), in P.G.H. Evans and L.A. Miller, Proceedings of the Workshop on Active Sonar and Cetaceans 14-20 (2004).

[64] Personal communication of Dr. David Nellis, U.S. Virgin Island Department of Fish and Game, to Eric Hawk, NMFS (Oct. 1999); personal communication from Ken Hollingshead, NMFS, to John Mayer, Marine Acoustics Inc. (March 19, 2002).

[65] Letter from William T. Hogarth, Regional Administrator, NMFS Southeast Regional Office, to RADM J. Kevin Moran, Navy Region Southeast (undated); personal communication from Ken Hollingshead, NMFS, to John Mayer, Marine Acoustics Inc. (March 19, 2002).

[66] Personal communication from Eric Hawk, NMFS, to Ken Hollingshead, NMFS (Feb. 12, 2002).

(4) Bahamas 2000 – As described above.

(5) Madeira 2000 -- In May 2000, four beaked whales stranded on the beaches of Madeira while several NATO ships were conducting an exercise near shore. Scientists investigating the stranding found that the whales' injuries—including "blood in and around the eyes, kidney lesions, pleural hemorrhage"—and the pattern of their stranding suggest "that a similar pressure event [*i.e.*, similar to that at work in the Bahamas] precipitated or contributed to strandings in both sites."[67]

(6) Canary Islands 2002 – In September 2002, at least fourteen beaked whales from three different species stranded in the Canary Islands. Four additional beaked whales stranded over the next several days.[68] The strandings occurred while a Spanish-led naval exercise that included U.S. Navy vessels and at least one ship equipped with mid-frequency sonar was conducting anti-submarine warfare exercises in the vicinity.[69] The subsequent investigation, as reported in the journals *Nature* and *Veterinary Pathology*, revealed a variety of traumas, including emboli and lesions suggestive of decompression sickness.[70]

(7) Washington 2003 – In May 2003, the U.S. Navy vessel USS *Shoup* was conducting a mid-frequency sonar exercise while passing through Haro Strait, between Washington's San Juan Islands and Canada's Vancouver Island. According to one contemporaneous account, "[d]ozens of porpoises and killer whales seemed to stampede all at once . . . in response to a loud electronic noise echoing through" the Strait.[71] Several field biologists present at the scene reported observing a pod of endangered orcas bunching near shore and engaging in very abnormal behavior consistent with avoidance, a minke whale "porpoising" away from the sonar ship, and Dall's porpoises fleeing the vessel in large numbers.[72] Eleven harbor porpoises—an abnormally high number

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[67] D.R. Ketten, Beaked Whale Necropsy Findings 22 (2002) (paper submitted to NMFS); L. Freitas, The Stranding of Three Cuvier's Beaked Whales Ziphius Cavirostris in Madeira Archipelago—May 2000, in P.G.H. Evans and L.A. Miller, Proceedings of the Workshop on Active Sonar and Cetaceans 28-32 (2004).

[68] Vidal Martin et al., Mass Strandings of Beaked Whales in the Canary Islands, in Proceedings of the Workshop on Active Sonar and Cetaceans 33 (P.G.H. Evans & L.A. Miller eds., 2004); Fernández et al., 'Gas and Fat Embolic Syndrome', 42 Veterinary Pathology at 446-57.

[69] Fernández et al., 'Gas and Fat Embolic Syndrome', 42 Veterinary Pathology at 446; K.R. Weiss, Whale Deaths Linked to Navy Sonar Tests, L.A. Times, Oct. 1, 2002, at A3.

[70] Fernández et al., 'Gas and Fat Embolic Syndrome', 42 Veterinary Pathology at 446-57; Jepson et al., Gas-Bubble Lesions, 425 Nature at 575-76.

[71] Christopher Dunagan, Navy Sonar Incident Alarms Experts, Bremerton Sun, May 8, 2003.

[72] NMFS, Assessment of Acoustic Exposures at 6, 9.

given the average stranding rate of six per year—were found beached in the area of the exercise.[73]

(8) Kauai 2004 – During the Navy's conduct of a major training exercise off Hawaii, called RIMPAC 2004, some 150-200 whales from a species that is rarely seen near shore and had never naturally mass-stranded in Hawaii came into Hanalei Bay, on the island of Kaua'i. The whales crowded into the shallow bay waters and milled there for over 28 hours. Though the whales were ultimately assisted into deeper waters by members of a local stranding network, one whale calf was left behind and found dead the next day. NMFS undertook an investigation of the incident and concluded that the Navy's nearby use of sonar in RIMPAC 2004 was the "plausible, if not likely" cause of the stranding.[74]

(9) Canary Islands 2004 – In July 2004, four dead beaked whales were found around the coasts of the Canary Islands, within one week of an NATO exercise. The exercise, Majestic Eagle 2004, was conducted approximately 100 kilometers north of the Canaries. Although the three whale bodies that were necropsied were too decomposed to allow detection of gas embolisms, systematic fat embolisms were found in these animals.[75] The probability that the whales died at sea is extremely high.[76]

(10) North Carolina 2005 – During and just after a U.S. training exercise off North Carolina, at least thirty-seven whales of three different species stranded and died along the Outer Banks, including numerous pilot whales (six of which were pregnant), one newborn minke whale, and two dwarf sperm whales. NMFS investigated the incident and found that the event was highly unusual,

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[73] NMFS, Preliminary Report: Multidisciplinary Investigation of Harbor Porpoises (Phocoena phocoena) Stranded in Washington State from 2 May – 2 June 2003 Coinciding with the Mid-Range Sonar Exercises of the USS Shoup 53-55 (2004) (conclusions unchanged in final report). Unfortunately, according to the report, freezer artifacts and other problems incidental to the preservation of tissue samples made the cause of death in most specimens difficult to determine; but the role of acoustic trauma could not be ruled out. Id.

[74] B.L. Southall, R. Braun, F.M.D. Gulland, A.D. Heard, R.W. Baird, S.M. Wilkin, and T.K. Rowles, Hawaiian Melon-Headed Whale *(Peponacephala electra)* Mass Stranding Event of July 3-4, 2004 (2006) (NOAA Tech. Memo. NMFS-OPR-31); See also R.L. Brownell, Jr., K Ralls, S. Baumann-Pickering and M.M. Poole, Behavior of melon-headed whales, *Pepnoncephalia electra*, near oceanic islands, Marine Mammal Science, (publication pending 2009).

[75] A. Espinosa, M. Arbelo, P. Castro, V. Martín, T. Gallardo, and A. Fernández, New Beaked Whale Mass Stranding in Canary Islands Associated with Naval Military Exercises (Majestic Eagle 2004) (2005) (poster presented at the European Cetacean Society Conference, La Rochelle, France, April 2005); A. Fernández, M. Méndez, E. Sierra, A. Godinho, P. Herráez, A. Espinosa de los Monteros, F. Rodríguez, F., and M. Arbelo, M., New Gas and Fat Embolic Pathology in Beaked Whales Stranded in the Canary Islands (2005) (poster presented at the European Cetaecan Society Conference, La Rochelle, France, April 2005).

[76] Id.

being the only mass stranding of offshore species ever to have been reported in the region, and that it shared 'a number of features' with other sonar-related mass stranding events (involving offshore species which stranded alive and were atypically distributed along the shore). NMFS concluded that sonar was a possible cause of the strandings and also ruled out the most common other potential causes, including viral, bacterial, and protozoal infection, direct blunt trauma, and fishery interactions.[77]

(11) Spain 2006 – Four Cuvier's beaked whales stranded on the Almerian coast of southern Spain, with the same suite of bends-like pathologies seen in the whales that stranded in the Canary Islands in 2002 and 2004.[78] A NATO response force was performing exercises within 50 miles at the time of the strandings.

Some preliminary observations can be drawn from these incidents. For example, beaked whales, a group of deep-water species that are seldom seen and may in some cases be extremely rare, seem to be particularly vulnerable to the effects of active sonar. A 2000 review undertaken by the Smithsonian Institution, and reported and expanded by the IWC's Scientific Committee and other bodies, supports this conclusion, finding that every mass stranding on record involving multiple species of beaked whales has occurred with naval activities in the vicinity.[79] Indeed, it is not even certain that some beaked whale species naturally strand in numbers.

But the full magnitude of sonar's effects on these species—or on other marine mammals—is not known. Most of the world lacks networks to identify and investigate stranding events, particularly those that involve individual animals spread out over long stretches of coastline, and therefore the mortalities that have been identified thus far are likely to represent only a subset of a substantially larger problem. For example, most beaked whale casualties (according to NMFS) are bound to go undocumented because of the remote siting of sonar exercises and the small chance that a dead or injured animal would actually strand.[80] It is well understood in terrestrial ecology that dead and dying animals tend to be grossly undercounted given their rapid assimilation into the environment, and one would of course expect profound difficulty where offshore

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[77] A.A. Hohn, D.S. Rotstein, C.A. Harms, and B.L. Southall, Multispecies Mass Stranding of Pilot Whales (Globicephala macrorhynchus), Minke Whale *(Balaenoptera acutorostrata)*, and Dwarf Sperm Whales *(Kogia sima)* in North Carolina on 15-16 January 2005 (2006) (NOAA Tech. Memo. NMFS-SEFSC-53).

[78] International Whaling Commission, Report of the Scientific Committee, Annex K at 28 (2006) (IWC/ 58/Rep1).

[79] Marine Mammal Program of the National Museum of Natural History, Historical Mass Mortalities of Ziphiids 2-4 (Apr. 6, 2000); see also 2 J. Cetacean Res. & Mgmt., Supp., Annex J at § 13.8 (2000) (report of the IWC Scientific Committee, Standing Working Group on Environmental Concerns).

[80] J.V. Carretta, K.A. Forney, M.M. Muto, J. Barlow, J. Baker, and M. Lowry, U.S. Pacific Marine Mammal Stock Assessments: 2006 (2007).

marine species are concerned.[81] Along the eastern seaboard and in the Gulf of Mexico, all beaked whale sightings during NMFS shipboard surveys have occurred at considerable distances from shore.[82]

Furthermore, although the physical process linking sonar to strandings is not perfectly understood, the record indicates that debilitating and very possibly lethal injuries are occurring in whales exposed to sonar at sea—only some of which may then strand. As first reported in the journal *Nature*, animals that came ashore during sonar exercises off the Canary Islands, in September 2002, had developed large emboli in their organ tissue and suffered from symptoms resembling those of severe decompression sickness, or "the bends."[83] It has been proposed that the panic led them to surface too rapidly or pushed them to dive before they could eliminate the nitrogen accumulated on previous descents. This finding has since been supported by follow-on papers, by published work in other fields, and by expert reviews.[84] In any case, the evidence is considered "compelling" that acoustic trauma, or injuries resulting from behavioral responses, has in some way led to the deaths of these animals.[85]

Other Harmful Effects of Sonar

Strandings and mass mortalities, though an obvious focus of much reporting and concern, are likely only the tip of the iceberg of sonar's harmful effects. Marine mammals are believed to depend on sound to navigate, find food, locate mates, avoid

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[81] See, e.g., G. Wobeser, Investigation and Management of Disease in Wild Animals 13-15 (1994); P.A. Alison, C.R. Smith, H. Kukert, J.W. Deming, B.A. Bennett, Deep-Water Taphonomy of Vertebrate Carcasses: A Whale Skeleton in the Bathyal Santa Catalina Basin, 17 Paleobiology 78-89 (1991).

[82] G.T. Waring, E. Josephson, C.P. Fairfield, and K. Maze-Foley, eds., U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments—2006 at 232-33, 238, 288, 292, 296 (2007) (NOAA Tech. Memo. NMFS NE 201) (data from NMFS surveys, showing all beaked whales sightings at significant distances from shore).

[83] See P.D. Jepson, M. Arbelo, R. Deaville, I.A.P. Patterson, P. Castro, J.R. Baker, E. Degollada, H.M. Ross, P. Herráez, A.M. Pocknell, F. Rodríguez, F.E. Howie, A. Espinosa, R.J. Reid, J.R. Jaber, V. Martín, A.A. Cunningham, A. Fernández, Gas-Bubble Lesions in Stranded Cetaceans, 425 Nature 575-576 (2003); Fernández et al., 'Gas and Fat Embolic Syndrome', 42 Veterinary Pathology at 415.

[84] E.g., Cox et al., Understanding the Impacts. Of course it would be a mistake to assume that an animal must suffer bends-like injury or some other sort of acoustic trauma in order to strand. Some may die simply because the noise disorients them, for instance. See, e.g., NMFS, Assessment of Acoustic Exposures at 9-10.

[85] Cox et al., Understanding the Impacts; see also P.G.H. Evans and L.A. Miller, Concluding Remarks, in Proceedings of the Workshop on Active Sonar and Cetaceans 74 (2004); K.C. Balcomb and D.E. Claridge, A Mass Stranding of Cetaceans Caused by Naval Sonar in the Bahamas, 8(2) Bahamas Journal of Science 1 (2001); D.E. Claridge, Fine-Scale Distribution and Habitat Selection of Beaked Whales (2006) (M.Sc. thesis); E.C.M. Parsons, S.J. Dolman, A.J. Wright, N.A. Rose, and W.C.G. Burns, Navy Sonar and Cetaceans: Just How Much Does the Gun Need to Smoke before We Act? 56 Marine Pollution Bulletin 1248 (2008).

predators, and communicate with each other. Flooding their habitat with man-made, high-intensity noise interferes with these and other functions. In addition to strandings and non-auditory injuries, the harmful effects of high-intensity sonar include:

- temporary or permanent loss of hearing, which impairs an animal's ability to communicate, avoid predators, detect and capture prey, and avoid ship strikes;
- avoidance behavior, which can lead to abandonment of habitat or migratory pathways;
- disruption of biologically important behaviors such as mating, feeding, nursing, or migration, or loss of efficiency in conducting those behaviors;
- aggressive (or agonistic) behavior, which can result in injury;
- masking of biologically meaningful sounds, such as the call of predators or potential mates;
- chronic stress, which can compromise viability, suppress the immune system, and lower the rate of reproduction;
- habituation, causing animals to remain near damaging levels of sound, or sensitization, exacerbating other behavioral effects; and
- declines in the availability and viability of prey species, such as fish and shrimp.

Over the past 20 years, a substantial literature has emerged documenting the range of effects of ocean noise on marine mammals.[86]

Marine mammals are not the only species affected by undersea noise. Impacts on fish are of increasing concern due to several recent studies demonstrating hearing loss and widespread behavioral disruption in commercial species of fish and to reports, both experimental and anecdotal, of catch rates plummeting in the vicinity of noise sources. Further, the death of species not protected by federal law reduces prey available to listed species. And noise has been shown in several cases to kill, disable, or disrupt the behavior of invertebrates, many of which possess ear-like structures or other sensory mechanisms that could leave them vulnerable. It is clear that intense sources of noise are capable of affecting a wide class of ocean life.

[86] For a review of research on behavioral and auditory impacts of undersea noise, see, e.g., L.S. Weilgart, The Impacts of Anthropogenic Ocean Noise on Cetaceans and Implications for Management, 85 Canadian Journal of Zoology 1091-1116 (2007); W.J. Richardson, C.R. Greene, Jr., C.I. Malme, and D.H. Thomson, Marine Mammals and Noise (1995); National Research Council, Ocean Noise and Marine Mammals (2003); Whale and Dolphin Conservation Society, Oceans of Noise (2004).

APPENDIX C

CRITIQUE OF THE NAVY'S ACOUSTICS ANALYSIS

The Navy's assessment of acoustic impacts disregards a great deal of relevant information adverse to its interests, uses approaches and methodologies that would not be acceptable to the scientific community, and ignores whole categories of impacts.

Thresholds of Injury, Hearing Loss and Behavioral Change

At the core of the Navy's assessment of acoustic impacts are the thresholds it has established for physiological and behavioral effects. There are gross problems with the Navy's thresholds, as discussed below.

1. Permanent Threshold Shift

The Navy fails to specify the threshold for permanent threshold shift ("PTS") for cetaceans, which is the highest threshold for direct physical injury, anywhere in the main body of the DEIS. One must read to Appendix D to ascertain that the PTS for cetaceans is 215 dB re 1 $\mu Pa^{2\bullet}s$. Section 3.9 of the DEIS does, however, provide the PTS for pinnipeds: 226 dB re 1 $\mu Pa^{2\bullet}s$ for California Sea Lions, Steller Sea Lions and Northern Fur Seals, 203 dB re 1 $\mu Pa^{2\bullet}s$ for Harbor Seals and 224 dB re 1 $\mu Pa^{2\bullet}s$ for Northern Elephant Seals . DEIS at 3.9-65 to 66. These thresholds are inconsistent with the scientific literature.

For instance, the Navy disregards data gained from actual whale mortalities. The best available scientific evidence, as reported in the peer-reviewed literature, indicates that sound levels at the most likely locations of beaked whales beached in the Bahamas strandings run far lower than the Navy's threshold for injury here: approximately 150-160 dB re 1 μPa for 50-150 seconds, over the course of the transit.[87] A further modeling effort, undertaken in part by the Office of Naval Research, suggests that the mean exposure level of beaked whales, given their likely distribution in the Bahamas' Providence Channels and averaging results from various assumptions, may have been lower than 140 dB re 1 μPa.[88] Factoring in duration, then, evidence of actual sonar-related mortalities would compel a *maximum* energy level threshold for serious injury on the order of 182 dB re 1 $\mu Pa^{2\bullet}s$, at least for beaked whales. Indeed, to pay at least some deference to the literature, the Navy—under pressure from NMFS—has

[87] J. Hildebrand, "Impacts of Anthropogenic Sound," in T.J. Ragen, J.E. Reynolds III, W.F. Perrin, and R.R. Reeves, Conservation beyond Crisis (2005). See also International Whaling Commission, 2004 Report of the Scientific Committee, Annex K at § 6.3.

[88] J. Hildebrand, K. Balcomb, and R. Gisiner, Modeling the Bahamas Beaked Whale Stranding of March 2000 (2004) (presentation given at the third plenary meeting of the U.S. Marine Mammal Commission Advisory Committee on Acoustic Impacts on Marine Mammals, 29 July 2004).

previously assumed that non-lethal injury would occur in beaked whales exposed above 173 dB re 1 μPa^{2}•s.[89]

In addition, the DEIS glosses over – in a single paragraph – published research on bubble growth in marine mammals, which separately indicates the potential for injury and death at levels far lower than what the Navy proposes. DEIS at 3.9-66. According to the best available scientific evidence, as represented by multiple papers in flagship journals such as *Nature* and *Veterinary Pathology*, gas bubble growth is the causal mechanism most consistent with the observed injuries;[90] in addition, it was singularly and explicitly highlighted as plausible by an expert panel convened by the Marine Mammal Commission, in which the Navy participated.[91] The Navy concedes that exposure to sonar has been considered a "potential indirect cause of the death of marine mammals…resulting from gas and fat embolic syndrome" (DEIS at 3.9-66), but then fails to actually evaluate the potential impacts. NEPA requires agencies to evaluate all "reasonably foreseeable" impacts, which, by definition, include "impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." 40 C.F.R. § 1502.22. The scientific literature supporting bubble growth rises far above this standard, and the Navy's failure to incorporate it into its impact model is arbitrary and capricious. Thus, the Navy's refusal to consider these impacts is insupportable under NEPA. 40 C.F.R. §§ 1502.22, 1502.24.

Finally, the Navy's exclusive reliance on energy flux density levels ("ELs") as a unit of analysis is misplaced. DEIS at 3.9-65. It is appropriate for the Navy to set dual thresholds for behavioral effects, one based on ELs and one based on sound exposure levels ("SELs").

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[89] See, e.g., Navy, Joint Task Force Exercises and Composite Training Unit Exercises Final Environmental Assessment/ Overseas Environmental Assessment at 4-44, 4-46 to 4-47 (2007).

[90] See, e.g., A. Fernández, J.F. Edwards, F. Rodríguez, A. Espinosa de los Monteros, P. Herráez, P. Castro, J.R. Jaber, V. Martín, and M. Arbelo, 'Gas and Fat Embolic Syndrome' Involving a Mass Stranding of Beaked Whales (Family Ziphiidae) Exposed to Anthropogenic Sonar Signals, 42 Veterinary Pathology 446 (2005); P.D. Jepson, M. Arbelo, R. Deaville, I.A.P. Patterson, P. Castro, J.R. Baker, E. Degollada, H.M. Ross, P. Herráez, A.M. Pocknell, F. Rodríguez, F.E. Howie, A. Espinosa, R.J. Reid, J.R. Jaber, V. Martín, A.A. Cunningham, and A. Fernández, Gas-Bubble Lesions in Stranded Cetaceans, 425 Nature 575-576 (2003); R.W. Baird, D.L. Webster, D.J. McSweeney, A.D. Ligon, G.S. Schorr, and J. Barlow, Diving Behavior of Cuvier's (Ziphius cavirostris) and Blainville's (Mesoplodon densirostris) Beaked Whales in Hawai'i," 84 Canadian Journal of Zoology 1120-1128 (2006).

[91] T.M. Cox, T.J. Ragen, A.J. Read, E. Vos, R.W. Baird, K. Balcomb, J. Barlow, J. Caldwell, T. Cranford, L. Crum, A. D'Amico, G. D'Spain, A. Fernández, J. Finneran, R. Gentry, W. Gerth, F. Gulland, J. Hildebrand, D. Houser, T. Hullar, P.D. Jepson, D. Ketten, C.D. MacLeod, P. Miller, S. Moore, D. Mountain, D. Palka, P. Ponganis, S. Rommel, T. Rowles, B. Taylor, P. Tyack, D. Wartzok, R. Gisiner, J. Mead, and L. Benner, Understanding the Impacts of Anthropogenic Sound on Beaked Whales, 7 Journal of Cetacean Research & Management 177-87 (2006).

2. Temporary Threshold Shift

The DEIS sets its threshold for temporary hearing loss and behavioral effects, or "temporary threshold shift" ("TTS"), at 195 dB re 1 μPa^{2}•s for cetaceans, 206 dB re 1 μPa^{2}•s for California Sea Lions, Steller Sea Lions and Northern Fur Seals, 183 dB re 1 μPa^{2}•s for Harbor Seals and 204 dB re 1 μPa^{2}•s for Northern Elephant Seals. DEIS at 3.9-65 to 66. It bases its cetacean threshold primarily on a synthesis of studies on two species of cetaceans, bottlenose dolphins and beluga whales, conducted by the Navy's SPAWAR laboratory in San Diego and, to a lesser extent, by researchers at the University of Hawaii. DEIS at 3.9-65.

Notably, the Navy's extrapolation of data from bottlenose dolphins and belugas to all cetaceans is not justifiable. Given the close association between acoustic sensitivity and threshold shift, such an approach must presume that belugas and bottlenose dolphins have the best hearing sensitivity in the mid-frequencies of any cetacean. However, harbor porpoises and killer whales are more sensitive over part of the mid-frequency range than are the two species in the SPAWAR and Hawaii studies.[92] Furthermore, the animals in the studies may not represent the full range of variation even within their own species, particularly given their age and situation: the SPAWAR animals, for example, have been housed for years in a noisy bay.[93]

3. "Risk Function" for Behavioral Effects

There are many glaring problems with the Navy's adoption of an acoustic risk function to estimate the probability of behavioral effects. Dr. Bain sets forth a detailed critique, which is attached to this letter. Several problems are discussed below.

In contrast to the Navy's 2005 DEIS for the Undersea Warfare Training Range (which established a threshold of 190 dB re 1 μPa^{2}•s) and the threshold which NMFS insisted the Navy adopt during RIMPAC 2006 and subsequent exercises off California and Hawaii (173 dB re 1 μPa^{2}•s), here the Navy redefines its position by applying a dose-response risk function to measure behavioral effects that begins at 120 dB re 1 μPa and reaches its mean at 165 dB re 1 μPa. DEIS at 3.9-67. Agencies are not entitled to substantial deference under the Administrative Procedure Act when they reverse previously held positions. Some of the more significant problems with the Navy's new position include misusing SPAWAR and Haro Strait data, as well as failing to include data from the Hanalei Bay incident.

Once again, the Navy relies on studies of temporary threshold shift in captive animals for its primary source of data. DEIS 3.9-68 to 70. Marine mammal scientists have long recognized the deficiencies of using captive subjects in behavioral experiments, and to

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[92] Richardson et al., Marine Mammals and Noise at 209.

[93] M.L.H. Cook, Behavioral and Auditory Evoked Potential (AEP) Hearing Measurements in Odontocete Cetaceans (2006) (Ph.D. thesis).

blindly rely on this material, to the exclusion of copious data on animals in the wild, is not supportable by any standard of scientific inquiry. Cf. 40 C.F.R. § 1502.22. The problem is exacerbated further by the fact that the subjects in question, roughly two belugas and five bottlenose dolphins, are highly trained animals that have been working in the Navy's research program in the SPAWAR complex for years.[94] Indeed, the disruptions observed by Navy scientists, which included pronounced, aggressive behavior ("attacking" the source) and avoidance of feeding areas associated with the exposure, occurred during a research protocol that the animals had been rigorously trained to complete.[95] The SPAWAR studies have several other major deficiencies that NMFS, among others, has repeatedly pointed out. In relying so heavily on them, the Navy has once again ignored the comments of numerous marine mammal behaviorists on the Navy's USWTR DEIS, which sharply criticized the Navy for putting any serious stock in them.[96]

In addition, the Navy appears to have misused data garnered from the Haro Strait incident—one of only three data sets it considers—by including only those levels of sound received by the "J" pod of killer whales when the USS *Shoup* was at its closest approach. DEIS at 3.9-69. These numbers represent the maximum level at which the pod was harassed; in fact, the whales were reported to have broken off their foraging and to have engaged in significant avoidance behavior at far greater distances from the ship, where received levels would have been orders of magnitude lower.[97] Not surprisingly, then, the Navy's results are inconsistent with other studies of the effects of various noise sources, including mid-frequency sonar, on killer whales. We must insist that the Navy provide the public with its propagation analysis for the Haro Strait event, and also describe precisely how this data set, along with results from the SPAWAR and Nowacek et al. studies, were factored into its development of the behavioral risk function.

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[94] See, e.g., S.H. Ridgway, D.A. Carder, R.R. Smith, T. Kamolnick, C.E. Schlundt, and W.R. Elsberry, Behavioral Responses and Temporary Shift in Masked Hearing Threshold of Bottlenose Dolphins, *Tursiops truncatus*, to 1-Second Tones of 141 to 201 dB re 1 μPa (1997) (SPAWAR Tech. Rep. 1751, Rev. 1).

[95] C.E. Schlundt, J.J. Finneran, D.A. Carder, and S.H. Ridgway, Temporary Shift in Masked Hearing Thresholds of Bottlenose Dolphins, Tursiops truncatus, and White Whales, Delphinapterus leucas, after Exposure to Intense Tones, 107 Journal of the Acoustical Society of America 3496, 3504 (2000).

[96] See comments from M. Johnson, D. Mann, D. Nowacek, N. Soto, P. Tyack, P. Madsen, M. Wahlberg, and B. Møhl, received by the Navy on the Undersea Warfare Training Range DEIS. These comments are hereby incorporated into this letter. See also Letter from Rodney F. Weiher, NOAA, to Keith Jenkins, Naval Facilities Engineering Command Atlantic (Jan. 30, 2006); Memo, A.R. document 51, NRDC v. Winter, CV 06-4131 FMC (JCx) (undated NOAA memorandum).

[97] See,. e.g., NMFS, Assessment of Acoustic Exposures on Marine Mammals in Conjunction with *USS Shoup* Active Sonar Transmissions in the Eastern Strait of Juan de Fuca and Haro Strait, Washington—5 May 2003 at 4-6 (2005).

The Navy also fails to include data from the July 2004 Hanalei Bay event, in which 150-200 melon-headed whales were embayed for more than 24 hours during the Navy's Rim of the Pacific exercise. According to the Navy's analysis, predicted mean received levels (from mid-frequency sonar) inside and at the mouth of Hanalei Bay ranged from 137.9 dB to 149.2 dB.[98] The Navy has from the beginning denied any connection between its major international exercise and the mass stranding. However, the Navy's specious reasoning is at odds with the stranding behavior observed during the event and with NMFS' report on the matter, which ruled out every other known potential factor and concluded that sonar was the "plausible if not likely" cause.[99] The Navy's failure to incorporate these numbers into its methodology as another data set is unjustifiable.

Furthermore, the risk function should have taken into account the social ecology of some marine mammal species. For species that travel in tight-knit groups, an effect on certain individuals can adversely influence the behavior of the whole. (Pilot whales, for example, are prone to mass strand for precisely this reason; the plight of the 200 melon-headed whales in Hanalei Bay, and of the "J" pod of killer whales in Haro Strait, and the most recent stranding of melon-headed whales in the Philippines may be pertinent examples.) Should those individuals fall on the more sensitive end of the spectrum, the entire group or pod can suffer significant harm at levels below what the Navy would take as the mean. In developing its "K" parameter, the Navy must take account of such potential indirect effects. 40 C.F.R. § 1502.16(b).

We must also note that the Navy's exclusive reliance on sound pressure levels ("SPLs") in setting a behavioral threshold is misplaced. The discussion in the DEIS speaks repeatedly of uncertainty in defining the risk function and recapitulates, in its summary of the earlier methodology, the benefits implicit in the use of a criterion that takes duration into account. It is therefore appropriate for the Navy to set dual thresholds for behavioral effects, one based on SPLs and one based on energy flux density levels ("ELs").

Finally, the Navy's threshold is applied in such a way as to preclude any assessment of long-term behavioral impacts on marine mammals. It does not account, to any degree, for the problem of repetition: the way that apparently insignificant impacts, such as subtle changes in dive times or vocalization patterns, can become significant if experienced repeatedly or over time.[100]

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[98] Navy, 2006 Supplement to the 2002 Rim of the Pacific (RIMPAC) Programmatic Environmental Assessment D-1 to D-2 (May 2006).

[99] B.L. Southall, R. Braun, F.M.D. Gulland, A.D. Heard, R.W. Baird, S.M. Wilkin, and T.K. Rowles, Hawaiian Melon-Headed Whale *(Peponacephala electra)* Mass Stranding Event of July 3-4, 2004 (2006) (NOAA Tech. Memo. NMFS-OPR-31); See also R.L. Brownell, Jr., K Ralls, S. Baumann-Pickering and M.M. Poole, Behavior of melon-headed whales, *Pepnoncephalia electra*, near oceanic islands, Marine Mammal Science, (publication pending 2009).

[100] The importance of this problem for marine mammal conservation is reflected in a recent NRC report, which calls for models that, inter alia, translate such subtle changes into disruptions in key activities like feeding and breeding that are significant for individual animals. National Research

In sum, the Navy has established thresholds and a risk function that are fundamentally inconsistent with the scientific literature on acoustic impacts and with marine mammal science in general. Indeed, using these thresholds to support a final EIS would violate NEPA.

Modeling of Acoustic Impacts

The Navy bases its calculation of marine mammal impacts on a series of models that determine received levels of sound within a limited distance of a sonar array and then estimate the number of animals that would therefore suffer injury or disruption. It is difficult to fully gauge the accuracy and rigor of these models with the limited information that the DEIS provides; but even from the description presented here, it is clear that they are deeply flawed. Among the non-conservative assumptions that are implicit in the model:

(1) As discussed above, the thresholds established for injury and behavioral effects are inconsistent with the available data and are based, in part, on assumptions not acceptable within the field;

(2) The Navy does not properly account for reasonably foreseeable reverberation effects (as in the Haro Strait stranding incident),[101] giving no indication that its modeling sufficiently represents areas in which the risk of reverberation is greatest;

(3) The model fails to consider the possible synergistic effects of using multiple sources, such as ship-based sonars, in the same exercise, which can significantly alter the sound field. It also fails to consider the combined effects of multiple exercises, which, as NMFS indicates, may have played a role in the 2004 Hanalei Bay strandings;[102]

(4) In assuming animals are evenly distributed, the model fails to consider the magnifying effects of social structure, whereby impacts on a single animal within a pod, herd, or other unit may affect the entire group;[103] and

(5) The model, in assuming that every whale encountered during subsequent exercises is essentially a new whale, does not address cumulative impacts on the breeding, feeding, and other activities of species and stocks.

Council. Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects 35-68 (2005).

[101] NMFS, Assessment of Acoustic Exposures on Marine Mammals in Conjunction with *USS Shoup* Active Sonar Transmissions in the Eastern Strait of Juan de Fuca and Haro Strait, Washington, 5 May 2003 (2005).

[102] Southall et al., Hawaii Melon-Headed Whale at 31, 45.

[103] The effects of this deficiency are substantially increased by the Navy's use of a risk function, rather than an absolute threshold, to estimate Level B harassment.

Before issuing a final EIS, the Navy must revise its flawed modeling systems and make them available to the public.