Animal Welfare Institute • Center for Biological Diversity • Cetacean Society International • Earthjustice • Environmental Protection Information Center • Friends of the Earth • Friends of Miller Peninsula State Park • Friends of the San Juans • The Humane Society of the United States • Humboldt Baykeeper • International Fund for Animal Welfare • InterTribal Sinkyone Wilderness Council • Klamath Forest Alliance • Natural Resources Defense Council • North Olympic Group, Sierra Club • Northcoast Environmental Center • Ocean Mammal Institute • Orca Network • Surfrider Foundation Humboldt Chapter • Surfrider Foundation, Mendocino Coast Chapter • Whale and Dolphin Conservation

By Electronic Submission and Regular Mail

April 15, 2014

Naval Facilities Engineering Command, Northwest
Attention: Ms. Kimberly Kler – NWTT EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Re: Draft Environmental Impact Statement/Overseas Environmental Impact Statement for Northwest Training and Testing

Dear Ms. Kler:

On behalf of our organizations and our millions of members, activists, and supporters, we write to submit comments on the Navy's Draft Environmental Impact Statement/ Overseas Environmental Impact Statement ("DEIS") for its training and testing activities in the Pacific Northwest. *See* 79 Fed. Reg. 4158 (January 24, 2014); 79 Fed. Reg. 5389 (January 31, 2014). Please include these comments in the administrative record.[1]

The Navy's compliance with the National Environmental Policy Act ("NEPA"), 42 U.S.C. 4321 *et seq.*, for its training and testing activities in the Pacific Ocean has entered a new phase. Building on compliance work for training and testing activities taking place in Hawaii and Southern California from December 2013 to December 2018, the Navy is providing a more comprehensive picture of the training and testing activities it is conducting and plans to conduct from 2015 to 2020 in the Pacific Northwest and the impacts to the environment from those activities. Unfortunately, it is a picture of unremitting harm: more than 500,000 instances of marine mammal "take"

[1] We are 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.

(behavioral impacts, harassment, injury) over five years (from 2015 to 2020), including almost 275,000 instances of temporary hearing loss, and more than 600 instances of permanent hearing loss from the use of sonar and explosives. DEIS at 3.4-150 to 151; 3.4-158 to 159. While these predictions of injury are shocking—and, we believe, still underestimate the harm to marine mammals from the Navy's activities—they confirm what stranding events have evidenced, scientists have studied, and the public has believed for years: Navy training and testing activities endanger whales and dolphins at intolerable levels. Unfortunately, the latest evidence of direct injury to marine mammals from naval activities is the stranding event that just occurred in Greece, where up to 11 Cuvier's beaked whales stranded on Crete between April 1 and April 6 concurrent with U.S., Israeli, and Greek naval exercises.

While the scale of impacts does not change the Navy's obligations under NEPA, it highlights why it so important that the Navy's DEIS fully comply with both the letter and spirit of the law. As Congress intended when it passed NEPA, faced with such harm, the DEIS must help decision makers make fully informed decisions on the proposed activities; after reviewing the DEIS, decision makers must understand the breadth of harm to impacted species, must be able to choose a course of action from a range of alternatives that provide options for meeting the Navy's goals while still reducing harm to species, and must have at their disposal a range of mitigation measures that will significantly lessen environmental impacts. For the reasons discussed in detail below, we believe that the DEIS fails to meet these requirements and does so in such a way that the failures cannot be remedied through the issuance of a final EIS. **Accordingly, we believe that the document must be thoroughly revised and reissued as a draft for further public review and comment.**

Our overriding concern is the Navy's failure to protect biologically important areas for marine mammals within the Northwest Training and Testing ("NWTT") Study Area. There is a general consensus among the scientific community, as NOAA has recognized, that "[p]rotecting marine mammal habitat is…the most effective mitigation measure currently available" to reduce the harmful impacts of mid-frequency sonar on marine mammals.[2] Nonetheless, the DEIS does not consider establishing any protection

[2] See Letter from Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere to Nancy Sutley, Chair, Council on Environmental Quality dated Jan. 19, 2010, *available at* http://www.nrdc.org/media/docs/100119.pdf; see also Agardy, T., Aguilar Soto, N., Cañadas, A., Engel, M., Frantzis, A., Hatch, L., Hoyt, E., Kaschner, K., LaBrecque, E., Martin, V., Notarbartolo di Sciara, G., Pavan, G., Servidio, A., Smith, B., Wang, J., Weilgart, L., Wintle, B., and Wright, A. A global scientific workshop on spatio-temporal management of noise. Report of workshop held in Puerto Calero, Lanzarote, (June 4-6, 2007); ECS Working Group: Dolman, S., Aguilar Soto, N., Notabartolo di Sciara, G., Andre, M., Evans, P., Frisch, H., Gannier, A., Gordon, J., Jasny, M., Johnson, M., Papanicolopulu, I., Panigada, S., Tyack, P., and Wright, A. Technical report on effective mitigation for active sonar and beaked whales. Working group convened by European Cetacean Society, (2009); OSPAR Commission, Assessment of the environmental impact of underwater noise. OSPAR Biodiversity Series, (2009); Parsons, E.C.M., Dolman, S.J., Wright, A.J., Rose, N.A., and Burns, W.C.G. Navy sonar and cetaceans: just how much does the gun need to smoke before we act? Marine Pollution Bulletin 56: 1248-1257 (2008).

zones in the NWTT Study Area where training or testing could be limited or excluded, despite the common-sense efficacy of such measures.[3]

The Navy's failure is in stark contrast to both the unprecedented level of harm and the varied activities taking place over such a large area. In all, the NWTT Study Area encompasses air, surface, and subsurface operating areas, including a more than 120,000 square nautical mile offshore area extending approximately 250 nautical miles into the Pacific Ocean from the coastlines of Washington, Oregon, and Northern California, an area the size of the state of California. The Navy's preferred alternative would use many different sources and frequencies of active sonar, including over 2,500 hours from mid-frequency sources every year. DEIS at 3.0-29. These exercises would also employ a battery of other acoustic sources and explosives detonations in ocean surface and undersea areas, special use airspace, and training land areas.

The Navy's failure is particularly troubling in light of the emerging information on potentially important habitat for marine mammal populations in the NWTT Study Area. Over the last few years, the National Oceanic and Atmospheric Administration ("NOAA") has been guiding the work of two working groups to improve the tools available to agencies, including the Navy, to evaluate and mitigate the impacts of anthropogenic noise on marine mammals. The Working Groups' draft products were recently released and one key product of this effort was the Cetacean Density and Distribution Mapping Working Group's (CetMap) identification of density and distribution maps for marine mammal populations in the Pacific Northwest—potentially important habitat for marine mammals. Nonetheless, this information was not incorporated into the Navy's analysis through the development of reasonable alternatives or examined as possible mitigation measures based on limiting or excluding training and testing activities in these areas. The fact that the Navy must analyze this new information and determine how it will impact its development of alternatives and mitigation measures supports a revision of the DEIS, which would place the Navy's analysis of this critical information before the public, giving the public an opportunity to comment thereon.

As you know, NEPA 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 mandates and fails to satisfy the Navy's legal obligations under NEPA. Thus, the Navy must revise the environmental impacts, alternatives, cumulative impacts and mitigation analysis in the DEIS (described in detail in Appendix A) and reissue the document for public review and comment. It must also fully address the considerable scientific record that has developed around sonar and

[3] While the Atlantic Fleet has taken the important step of designating several planning awareness areas where it will, when feasible, avoid conducting major exercises, this mitigation measure is specific to the use of sonar during major exercises and does nothing to mitigate the harm from unit-level sonar exercises, the use of explosives, or testing activities.

whale injury and mortality, and adjust its acoustic impacts analysis and assessment model accordingly (discussed in Appendices B and C).

We also have concerns regarding the Navy's public meetings for the NWTT DEIS. We received feedback from numerous concerned citizens attending these open houses that the process was highly stage managed and discouraged effective public comment, that the Navy personnel on hand could not answer many of the questions asked about the DEIS, and that the hours and locations of these events were severely restricted. Indeed, as we have noted in the past, the Navy again failed to schedule any of these events in a major metropolitan area of the northwest coast. While we believe the locations the Navy chose are an acceptable starting point for public involvement, the Navy must recognize that citizens in more populated areas are also affected by the Navy's activities and their impacts on the environment.

The Navy Has Not Taken a "Hard Look" Under NEPA

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 v. Methow Valley Citizens Council*, 490 U.S. 332, 348 (1989); 42 U.S.C. § 4332. The fundamental purpose of an EIS is to compel decision-makers to take a "hard look" at a particular action—both at the environmental impacts it will have and at the alternatives and mitigation measures available to reduce those impacts—*before* a 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); *Robertson*, 490 U.S. at 349. While NEPA "does not commend the agency to favor an environmentally preferable course of action," an agency may only make a decision to proceed after taking a "hard look" at environmental consequences. *Sabine River Auth. v. Dep't of Interior*, 951 F.2d 669, 676 (5th Cir. 1992)(internal citations omitted).

As the DEIS makes clear, the proposed activities pose a significant risk to whales, fish, and other wildlife that depend on sound for breeding, feeding, navigating, and avoiding predators—in short, for their survival. Under every Alternative, the Navy would employ mid-frequency active sonar, which has been implicated in mass injuries and mortalities of whales around the globe.[4] 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 Navy expects to take more than 25 different species of marine mammals, including 8 species listed as endangered or threatened under the Endangered Species Act ("ESA"). DEIS at 3.4-4 to 9. The Pacific Fleet's training and testing activities would also affect fisheries and essential fish habitat, injure

[4] 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.

sea turtles, and release a large amount of hazardous and expended materials into the waters. *See* Appendices A and B for a detailed discussion of impacts.

While the Navy has made progress in assessing the impacts its activities have on the environment, it continues to underestimate harm by disregarding a great deal of relevant information and using approaches that are the opposite of precautionary when factoring uncertainty. As discussed in Appendix C, in revising its DEIS, the Navy must adjust its thresholds for impact and modeling by incorporating the considerable scientific record showing that impacts are even greater than the Navy estimates.

The Navy Fails to Identify and Analyze Reasonable Alternatives

As you are aware, both of the Navy's action alternatives (Alternative 1 and 2) would increase the amount of training and testing in the Pacific Northwest and subject marine mammals to a considerable level of harm, including hearing loss and significant behavioral reactions like habitat abandonment. Neither alternative presents an option that would significantly reduce the predicted harm to the marine environment and wildlife. For example, both of the Navy's alternatives result in the exact same number of marine mammal takes from training with sonar. For training then, the DEIS offers no alternative for a decision maker wishing to reduce the harm to marine mammals.

It is obvious that the Navy's alternatives were not selected to "inform decision-makers and the public" of how it could "avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. While the Navy presents two purportedly reasonable alternatives, which themselves cover only a very narrow range of options, it leaves no room for decision makers to choose anything but its preferred alternative, which is "*necessary* to support current and planned Navy training and testing *requirements*." DEIS at ES-8 (emphasis added). A decision maker that wishes to meet the Navy's needs is compelled to choose the preferred alternative.

While Alternative 2 also meets the Navy's strategic *necessity* and planned training and testing *requirements*, if a decision maker felt free to considering choosing it over the Navy's preferred alternative, he or she would be hard pressed to identify which alternative works to avoid or minimize adverse environmental impacts, let alone enhance the quality of the human environment. Both alternatives inflict a substantial amount of harm on marine life. Neither alternative was developed with an eye to minimizing adverse environmental impacts, but instead reflect differences entirely unrelated to the proposed action's environmental impacts. Such differences—in capabilities, tempo, and locations—are entirely based on operational needs, not on factors related to environmental impacts. As such, they fail to provide the public and decision makers with any options for significantly limiting the impact to marine wildlife. The development of alternatives in this manner violates NEPA, reflecting a classic *post hoc* rationalization for a decision unlawfully made *before* environmental impacts and reasonable alternatives were considered.

The Navy Fails to Consider Effective Mitigation

There is general consensus that protection areas—in which the use of mid-frequency sonar would not occur—represent the most effective means currently available to reduce the impacts of mid-frequency sonar on marine mammals.[5] In 2010, the National Oceanic Atmospheric Administration ("NOAA") completed a review of the Navy's sonar mitigation. It concluded that "ongoing mitigation efforts, in our view, must do more" to address uncertainties and protect marine mammals.[6] Nonetheless, the Navy's DEIS proposes the same mitigation scheme that NOAA found lacking. While NOAA emphasized the importance of habitat identification and avoidance, stating that "[p]rotecting important marine mammal habitat is generally recognized to be the most effective mitigation measure currently available," the Navy makes no provision for protecting areas in the NWTT Study Area.[7]

Appendix A contains a detailed description of mitigation measures that the Navy can—and should—adopt. At a minimum, however, the Navy must assess the value of marine mammal habitat in the NWTT Study Area and protect any higher-value areas identified. As noted, NOAA recently completed a series of workshops designed to learn more about important marine mammal habitats. The results of these workshops are now available and the Navy must assess the information and develop mitigation measures based on protecting such areas. To offer full protection to the marine mammals found in these regions, the Navy should develop mitigation measures that bar the use of sonar in the areas and provide a buffer for them that limits the received level of sound. At a minimum, the Navy should establish cautionary areas in these habitats.

Conclusion

Our organizations recognize the Navy's important role in ensuring national security. We also value the security a clean and healthy environment provides. National security and environmental integrity are not mutually exclusive, and we encourage the Navy to train and test in ways that protect the Pacific Northwest's valuable natural resources. Thus, for the reasons set forth above and in greater detail in the Appendices below and attached critique by Dr. David Bain, we urge the Navy to satisfy its obligations under NEPA and other applicable laws by revising its DEIS, taking a "hard look" at impacts and identifying and analyzing reasonable alternatives and mitigation measures that will significantly reduce the impact to the marine environment.[8] Upon revision the DEIS should be released to the public for review and comment.

---

[5] Supra, note 3.

[6] See Letter from Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere to Nancy Sutley, Chair, Council on Environmental Quality dated Jan. 19, 2010, *available at* http://www.nrdc.org/media/docs/100119.pdf

[7] Id.

[8] While the Navy states that its DEIS "will serves as NMFS' NEPA documentation for the rule-making process under the [Marine Mammal Protection Act]" (DEIS at ES-3), we note that without significant revision this DEIS cannot fulfill NMFS' obligations under NEPA. For example, the DEIS

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

Sincerely,

Zak Smith
Staff Attorney
NRDC

Miyoko Sakashita
Oceans Director
Center for Biological Diversity

Steve Mashuda
Staff Attorney
Earthjustice

Naomi A. Rose, Ph.D.
Marine Mammal Scientist
Animal Welfare Institute

William W. Rossiter
Executive Director, Advocacy, Science & Grants
Cetacean Society International

Amber Shelton
Online Organizer
Environmental Protection Information Center

Marcie Keever
Oceans & Vessels Program Director
Friends of the Earth

Darlene Schanfald, Ph.D.
President
Friends of Miller Peninsula State Park

Kyle A. Loring
Staff Attorney
Friends of the San Juans

Sharon Young
Marine Issues Field Director
The Humane Society of the United States

Jennifer Kalt
Policy Director
Humboldt Baykeeper

Elizabeth Allgood
US Campaigns Director
International Fund for Animal Welfare

Priscilla Hunter
Chairwoman
InterTribal Sinkyone Wilderness Council
(A Consortium of 10 Federally Recognized Tribes)

Kimberly Baker
Executive Director
Klamath Forest Alliance

Monica Fletcher
Chair
North Olympic Group, Sierra Club

---

defines a purpose and need that is unrelated to NMFS' statutory obligations and presents alternatives that are unrelated to NMFS' rulemaking.

Dan Ehresman
Executive Director
Northcoast Environmental Center

Marsha Green
President
Ocean Mammal Institute

Howard Garrett
Board President
Orca Network

Jennifer Savage
Chairperson
Surfrider Foundation, Humboldt Chapter

Walt Dooley
President
Surfrider Foundation, Mendocino Coast Chapter

Regina Asmutis-Silvia
Executive Director, NA
Whale and Dolphin Conservation

APPENDIX A

THE NAVY'S DEIS IS FATALLY FLAWED AND FAILS TO COMPLY WITH THE BASIC REQUIREMENTS OF NEPA

As set forth below, the Navy's DEIS does not meet the rigorous standards set forth in the National Environmental Policy Act. We urge the Navy to revise and then reissue its DEIS, substantially altering the approach it has taken thus far. The Navy's scope of review must be expanded, its alternatives analysis broadened, its mitigation plan significantly improved, and its impact assessment revised to reflect the scientific evidence of mid-frequency sonar's effects on marine life. These critical steps must be undertaken if the Navy's EIS is to comply with federal law.

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.

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, despite the length and information provided, the Navy's DEIS fails to meet the high standards of rigor and objectivity required under NEPA. The Navy has failed to conduct the "hard look" necessary to thoroughly examine the many environmental consequences of its proposed action.

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

The Navy's DEIS does not properly analyze environmental impacts. Despite the unprecedented level of harm the Navy predicts, its analysis nonetheless understates the potential effects of its training and testing activities on marine wildlife and fails to acknowledge risks posed to a wide range of marine species from its activities. Thus, after disclosing that its activities may result in more than 500,000 instances of temporary hearing loss and significant behavioral impacts and more than 125 instances of permanent hearing loss on the region's whales, dolphins, and other marine mammals, the DEIS concludes that no "marine mammal strandings or mortality would result from the operation of sonar during Navy exercises within the Study Area." DEIS at 3.4-166. The Navy reaches this conclusion despite acknowledging the importance of sound to marine mammal existence and the hundreds of thousands of instances of hearing loss its activities will inflict on marine mammals. For example, the Navy states that "it is likely that a relationship between the duration, magnitude, and frequency range of hearing loss could have consequences to biologically important activities (e.g., intraspecific communication, foraging, and predator detection) that affect survivability and reproduction." DEIS at 3.4-74. The Navy's statements are clearly contradictory; on the one hand the Navy states that a connection between survivability and hearing loss is likely, which must be placed in the context of its prediction of nearly 275,000 instances of temporary hearing loss, while on the other it concludes that no mortality will result from the use of sonar. The Navy's conclusions are unsupported by its own analysis. Finally, as discussed in detail in Appendix C and the attached critique by Dr. David Bain, the Navy's assessment of acoustic impacts is also highly problematic and likely underestimates the impacts to marine mammals.

A. Acoustic Impacts on Marine Mammals

NEPA requires agencies to ensure the "professional integrity, including scientific integrity," of the discussions and analyses that appear in EISs. 40 C.F.R. § 1502.24. To that end, they must make every attempt to obtain and disclose data necessary to their analysis. *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, 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.

B. Other Impacts on Marine Mammals

The activities proposed for the NWTT Study Area 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.[9] DEIS at 3.4-75 to 77. 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."[10] 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.[11] Because physiological stress responses are

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

[10] 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).

[11] 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,

highly conservative across species, it is reasonable to assume that marine mammals would be subject to the same effects and recent research is bearing this out. A study of North Atlantic right whales produced evidence showing that exposures to low-frequency ship noise may be associated with chronic stress in whales.[12] For the Navy, such studies should be particularly relevant when assessing impacts on those marine mammal populations that are subjected to stress inducing impacts from training and testing activities on a regular basis. The Navy cannot simply rely on its characterization of sonar exposure as being "brief and intermittent" to conclude—without scientific support—that it is unlikely that individual animals would be exposed to sonar long enough for stress or injury to occur. The scale of harassment incidence suggests otherwise and belies the claim that impacts are "transitory." With scientific literature suggesting the opposite, associated stress responses cannot simply be dismissed as short in duration and less than biologically significant. Nonetheless, 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.

Second, 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 marine mammals over the life of the range. For example, under its preferred alternative, the Navy plans to abandon approximately 28,000 pounds of potentially toxic metals in NWTT Study Area waters. DEIS at 3.1-50. Nonetheless, the DEIS fails to adequately consider the cumulative impacts of these toxins on marine mammals from past, current, and proposed training exercises. 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 expended materials and toxics would dissipate or become buried in sediment leads to a blithe conclusion that releases of hazardous material would have no adverse effects. Given the amount of both hazardous and nonhazardous materials, this discussion is inadequate under NEPA. In addition, the Navy also plans to abandon cables, wires, and other items that could entangle marine wildlife, including more than 9,500 parachutes. DEIS at 3.3-29; 3.3-32. Acknowledging that entanglement is a serious issue for marine mammals (*e.g.*, "[F]rom 1982 to February 2012 in the California, Oregon, Washington areas inhabited by stocks of large whales there were 279 reported whale entanglements." DEIS at 3.4-249), the DEIS nonetheless dismisses the threat posed by abandoning more than 9,500 parachutes by claiming without support that bottom-feeding is not likely to occur in the deep-water areas where parachutes are deployed. DEIS at 256. Again, this discussion and analysis is inadequate under NEPA.

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).

[12] R. M. Rolland, S. E. Parks, K. E. Hunt, M. Castellote, P. J. Corkeron, D. P. Nowacek, S. K. Wasser, and S. D. Krauss. 2012. "Evidence That Ship Noise Increases Stress in Right Whales." *Proceedings of the Royal Society of Biology*. 10. 1098/rspb.2011.2429.

Third, the Navy fails to adequately consider the risk of ship collisions with large cetaceans, as exacerbated by the use of active acoustics. 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.[13] It should be assumed that other large whales (which, as the DEIS repeatedly notes, are already highly susceptible to vessel collisions) are subject to the same hazard. In addition, the Navy's own post-model acoustic effects quantification process assumes that animals would move away from the sound source (DEIS 3.4-119 to 127) and its analysis of responses to sonar discuses many cases in which animals have rapidly fled from acoustic sources, including sonar (DEIS at 3.4-79 to 82). Such responses could lead to a greater risk of being struck by other Navy vessels or commercial vessels. As the Navy notes, "[v]essel strikes from commercial, recreational, and Navy vessels are known to affect large whales and have resulted in serious injury and occasional fatalities to cetaceans." DEIS at 3.4-236. While the Navy discusses the threat of ship strikes generally (DEIS at 3.4-234 to 245), it fails to utilize any probability calculation, let alone the kind of modeling for take that it uses for other impacts (*e.g.*, acoustic sources), which can underestimate the impact from ship strikes.

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 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).[14] 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). NEPA is not satisfied when an applicant rests on its alleged laurels. The Navy can no longer simply claim that decades of activities in the Pacific Northwest have not resulted in population-level impacts as research is increasingly suggesting a link between Navy sonar and population-level impacts.[15]

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

---

[13] Nowacek et al., North Atlantic Right Whales, 271 Proceedings of the Royal Society of London, Part B: Biological Sciences at 227.

[14] "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.

[15] D.E. Claridge, Population ecology of Blainville's beaked whales, dissertation, University of Aberdeen, Scotland (2013); J.A. Goldbogen et al., Blue whales respond to simulated mid-frequency military sonar, Proceedings of the Royal Society B 280: 20130657 (2013).

C. Marine Mammal Descriptions

The Navy identifies data deficiencies for several stocks of marine mammals that occur in the action area and will be affected by the proposed action, but it fails to obtain the information necessary for evaluating the environmental impacts of its action. The DEIS states:

> For the 13 stocks involving nine marine mammal species in the Study Area (killer whale, harbor porpoise, Northern fur seal, Pygmy sperm whales and dwarf sperm whales, Cuvier's beaked whales and Mesoplodon beaked whales, Gray whales, and Guadalupe fur seals), there is insufficient data for a species or stock-specific density to be derived. Some of these species/stocks were represented in the modeling by a single density. Therefore, as detailed in the following paragraphs, to quantify the likely number of effects to these stocks/species, the modeling based on a common species density was prorated to the stocks. In the case of Guadalupe fur seal a surrogate species was assumed to provide an appropriate conservative estimate of effects as described in the subsection below.[16]

This is insufficient to meet the requirements of 40 C.F.R. § 1502.22(a). As described below, some of these species are extremely sensitive to sound such as Cuvier's beaked whales. The Navy must correct this problem.

1. North Pacific Right Whale

The North Pacific right whale is the most endangered whale in the world. Due to their rarity, the DEIS discounts potential impacts of the Navy's activities.[17] This conclusion is in error because effects on even one whale could threaten the entire population. Behavioral changes that interfere with essential life functions like feeding or breeding could have negative impacts on conservation of the right whale. "[T]he continued anthropogenic threats and other factors . . . demonstrate a high risk of extinction" and "at present, no protective or conservation measures are in place that substantially mitigate the factors affecting the future viability of this species."[18] New science that shows that at least some baleen whales are susceptible to behavioral disturbance from sonar must be taken into account.[19] Additionally, the proposed action is inconsistent

[16] DEIS 3.4-113.

[17] DEIS 3.4-112, 3.4-152.

[18] National Marine Fisheries Service, North Pacific Right Whale, 73 Fed. Reg. 12024, 12027-28 (Mar. 6, 2008).

[19] Jeremy Goldbogen, et al. Blue whale respond to simulated mid-frequency military sonar, Proceedings of the Royal Society B 280: 20130657 (2013).

with criteria for the North Pacific right whale recovery plan, including reducing the potential for ship strikes and reducing anthropogenic noise impacts on right whales.[20]

2. Humpback Whales

The DEIS should take into account how important vocalization is for key behavior and communication of humpback whales, and recent science demonstrates that baleen whales are susceptible to behavioral disturbance from sonar.[21]

The DEIS' conclusion that rapid recovery from a threshold shift and avoidance means that the proposed action will not have any long-term consequences for individual animals or the population is flawed. First, recovery time lengths often exceed 24 hours,[22] and permanent injuries including nerve damage can occur at sound levels only inducing temporary threshold shift.[23] Second, the assumption that behavioral responses will not amount to those that affect feeding, reproduction or other activities that could have individual or population effects is flawed.

Additionally, humpbacks have already lost communication space, which means that the proposed action's impacts are layered over unfavorable background acoustic conditions. Humpback whales are losing up to 52 percent and 94 percent, respectively, of their communication space in the busiest areas of the ocean off the British Columbia coast, according to a new study.[24] A study of humpback whales found that they reduced their vocalizations in the presence of wind and background noise and shifted instead to using surface-generated sounds such as breaching to communicate.[25] While this shift shows behavior modification to address changes in the acoustic environment, it also reduces the information contained with the communication.[26]

---

[20] National Marine Fisheries Service, Recovery Plan for the North Pacific Right Whale III-4&5 (2013).

[21] *See generally*, Goldbogen (2013).

[22] National Marine Fisheries Service, Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals (2013).

[23] Kujawa, S.G., and Liberman, M.C. (2009). Adding insult to injury: Cochlear nerve degeneration

after "temporary" noise-induced hearing loss. *Journal of Neuroscience* 29:14077-14085; Lin, H.W., Furman, A.C., Kujawa, S.G., and Liberman, M.C. (2011). Primary neural

degeneration in the guinea pig cochlea after reversible noise-induced threshold shift.

Journal of the Association for Research in Otolaryngology 12: 605-616.

[24] Williams, R., Clark, C. W., Ponirakis, D. and Ashe, E. (2013), Acoustic quality of critical habitats for three threatened whale populations. Animal Conservation. doi: 10.1111/acv.12076

[25] Dunlop, R. a, Cato, D.H. & Noad, M.J., 2010. Your attention please: increasing ambient noise levels elicits a change in communication behaviour in humpback whales (Megaptera novaeangliae). *Proceedings. Biological sciences / The Royal Society*, 277(1693), pp.2521–9.

[26] Id.

Humpback whales should also be reclassified as sensitive to mid-frequency sounds. Humpback whales are the notable exception within the mysticetes, with some calls exceeding 10 kHz.[27] Sensitivities to sonar are among the key habitat concerns for humpback whales.[28]

Humpbacks will be impacted by the Navy training and testing activities both in the project area and from the Hawaii Southern California Training and Testing ranges. The North Pacific stock migrates between Hawaii and Alaska. For Navy testing and training activities from 2014-2019 in the Southern California and Hawaii Training Ranges, the Fisheries Service anticipates more than 50,000 Level B takes of humpback whales with an average of 10,000 per year.[29]

3. Blue Whales

There are only about 2,000 blue whales in the affected population. Notably, unlike other baleen whale populations, the endangered blue whale populations have not shown signs of recovery off the western coast of North America in the last 20 years.[30] Alternative 1 anticipates two TTS and three behavioral reactions annually. Contrary to the conclusion in the DEIS, this could be a significant impact on the population. The Fisheries Service estimates that the removal of more than 3 blue whales would impede its conservation, and the takes anticipated by this action in addition to vessel strikes and other impacts threaten to exceed this level.

The endangered blue whale is adversely affected by military sonar and other mid-frequency and low-frequency anthropogenic noise. The Goldbogen et al. study is extremely concerning because of the potential impacts of sonar on the essential life functions of blue whales. It found that mid-frequency sonar can disrupt feeding and displace blue whales from high-quality prey patches, significantly impacting their foraging ecology, individual fitness and population health.[31] Even fairly low-received levels can have an adverse impact.[32] Mid-frequency sonar has been associated with several cases of blue whale stranding events.[33] Additionally, low-frequency anthropogenic noise can mask calling behavior, reduce communication range, and damage hearing.[34] These impacts from sonar on blue whales suggest that the action's impacts would have long-term impacts on the blue whale population.

---

[27] DEIS 3.4-15

[28] National Marine Fisheries Service, Stock Assessment Report Humpback Whale 189 (2011).

[29] 78 Fed. Reg. 78106 (Dec. 24, 2013).

[30] Jeremy A. Goldbogen et al., *Blue Whales Respond to Simulated Mid-Frequency Military Sonar*, PROCEEDINGS OF THE ROYAL SOCIETY 280: 20130657 1, 6 (2013).

[31] Id. at 6.

[32] Id. at 1,6.

[33] Id. at 2.

[34] Id. at 1.

The DEIS should also consider that blue whales may have a greater tendency to be injured or killed by ship strikes. From 2004-2008 five blue whales were killed by ship strikes.[35] The four deaths that occurred in 2007 marked the highest number recorded for any year and prompted a mitigation plan and ship strike response plan.[36] Additionally, several blue whales have been sited with large wounds that appear to have been caused by ship strikes.[37]

Finally, the blue whales affected by this action are also subject to sonar exposure from the Southern California training and testing activities. The Navy must take a hard look at cumulative impacts of both of these Navy actions on this migratory species.

4. Fin Whales

Fin whales are sensitive to noise. In response to a seismic survey, 250 fin whales stopped singing for several weeks to months.[38] And, as noted by the DEIS, "vocalizing fin whales in the Mediterranean left the area where a seismic survey was being conducted and that their displacement persisted beyond the completion of the survey."[39] Similar disturbance can be expected from the proposed action.[40] While the DEIS anticipates both TTS and behavioral reactions, it appears that these instances are underestimates. Fin whales were the most commonly detected baleen whale in surveys from 2004-2013, and they were present in 90 percent of the days in surveys from October through February.[41] Thus, the DEIS needs to better quantify the anticipated impacts to fin whales of its activities or it must provide a better rationale. Fin whales are also subject to vessel strikes. As noted in the DEIS nine known fin whales having stranded in Washington after being struck by vessels in the last decade.[42] In 2010, a fin whale was struck by a ship at Ocean Beach, San Francisco and another arrived on a ship bow at Port of Oakland.[43] Their vulnerability to vessel collisions must be taken into account when determining the impact of Navy vessel movements and cumulative impacts.

---

[35] National Marine Fisheries Service, Blue Whale: Eastern North Pacific Stock Assessment Report 177, 180 (2010).

[36] Id.

[37] Id.

[38] Weilgart, *The impacts of anthropogenic ocean noise on cetaceans and implications for management*, Can. J. Zool. Vol. 85: 1091 (2007).

[39] DEIS 3.4-75.

[40] *See e.g.*, Goldbogen (2013).

[41] DEIS 3.4-28.

[42] DEIS 3.4-237.

[43] National Marine Fisheries Service. Southwest Regional Office, California Marine Mammal Stranding Network Database (2010); Kuruvila, Matthai. 2010. Dead whale on bow of ship docking in Oakland. *San Francisco Chronicle* (September 17, 2010).

5. Sei whales

There are approximately 126, with a minimum population of 83, sei whales in the eastern North Pacific stock, and the anthropogenic removal of even one animal could interfere with the sei whale's ability to maintain a sustainable population. There is missing information about the status and trends of this population, and shipstrikes are a known threat but are likely underestimated because of the lack of reporting.

6. Minke whales

The DEIS acknowledges that there will be 17 instances of TTS and 1 behavioral effect from Alternative 1. This is likely an underestimate. Minke whales are commonly present in the action area and will be impacted. In the Bahamas in 2000, minke whales stranded in response to mid-frequency active sonar.[44] The DEIS jumps to the conclusion that there will be no long term effects on individuals or the population based on the same flawed rationale used for humpback whales.

7. Gray whales

The DEIS acknowledges that there may be a discrete Pacific Coast Feeding Group of gray whales. "[T]he PCFG is relatively small in number and utilizes a largely different ecosystem from that of the main ENP stock."[45] A smaller stock could mean that the proposed action is more likely to have population level impacts on this smaller stock of gray whales. While the DEIS concludes that Eastern North Pacific gray whales could be exposed to sound that would exceed the current impact thresholds, it should also evaluate the potential impact to the Pacific Coast Feeding Group. Impacts on this group would be expected to be more severe because of its smaller population. Moreover, gray whales are susceptible to ship strikes and are reportedly difficult to spot, there was a confirmed juvenile struck in Southern California 2009.[46]

8. Sperm Whales

Sperm whales use echolocation to hunt for prey. The Fisheries Service's stock assessment report also notes anthropogenic sound as a habitat concern for sperm whales that feed in the ocean's "sound channel."[47] They are deep diving and difficult to observe, thus mitigation using observers will be insufficient to avoid impacts of sonar to

---

[44] Weilgart (2007).

[45] Weller, D.W., Bettridge, S., Brownell, R.L., Jr., Laake, J.L., Moore, J.E., Rosel, P.E., Taylor, B.L and

Wade, P.R. 2013. Report of the National Marine Fisheries Service gray whale stock identification workshop. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-507

[46] National Marine Fisheries Service. Southwest Regional Office, California Marine Mammal Stranding Network Database (2010).

[47] Carretta et al. 2013.

sperm whales. The DEIS' conclusion that sonar will only result in sperm whales alerting, ignoring the stimulus, changing their behaviors or vocalizations, or avoiding the area by swimming away or diving fails to account for the fact that ensonification of the sperm whale habitat can interfere with hunting.

The DEIS must consider that sperm whales migrate up and down the coast, and will be subjected to Navy activities in the Southern California training range including more than 2,000 level B instances of harassment annually.[48] This population is also under pressure from entanglement in fishing gear. In December 2010, two endangered sperm whales were observed entangled in a net. One whale died and the other whale was seriously injured and released with trailing gear. These two were among 16 sperm whales that NMFS estimated were taken by the California drift gillnet fishery in 2010. Sperm whales have been observed entangled 10 times in observed drift gillnet sets since 1990 with average estimate of 3.8 sperm whale deaths per year.[49]

9. Pygmy Sperm Whale & Dwarf Sperm Whale

The DEIS should explain its rationale for estimating pygmy and dwarf sperm whale interactions while concurrently noting a lack of data about dwarf sperm whales. It must explain whether the model is only anticipating impacts for pygmy sperm whales based on the estimates of that population or whether it also has added the effects on dwarf sperm whales. The Navy has a duty to obtain that information or use scientifically accepted methods to nonetheless evaluate those impacts.[50]

10. Killer Whales

The analysis of the proposed action's impacts on southern resident killer whales is inadequate. There are only about 80 individual animals remaining in this population, and therefore effects on even one animal's essential behavior can result in population level impacts. The DEIS' conclusion that the range of responses of killer whales to sonar includes only ignoring, alerting, altering movement, and avoidance is without basis. Killer whales depend on their acoustic sensory system for communications, navigating, and locating prey.[51] Southern resident killer whales use echolocation to detect salmon in the water column, and even vessel noise can reduce the range of which they can effectively locate prey.[52] The Navy has not taken a hard look at the direct, indirect or cumulative impacts to the southern resident killer whale.

Background conditions for the southern resident killer whale are unfavorable, which must be considered when evaluating the impact of the proposed action on this small

---

[48] 78 Fed. Reg. 78106, 78143 (December 24, 2013).

[49] Carretta et al. 2013.

[50] 40 C.F.R. § 1502.22(a).

[51] National Marine Fisheries Service. Southern Resident Killer Whale Recovery Plan (2008).

[52] Id.

population. The 80-animal southern resident killer whale population may actually be declining. Scientists have recommended that, in evaluating southern resident killer whale population trends, only years 1987-2011 should be evaluated and in this timeframe the southern resident killer whale population may be declining by 0.91 each year.[53]

Limited prey availability is already threatening the survival of these killer whales. Southern Resident killer whales are dietary specialists, who depend on adequate populations of Chinook salmon for their survival, social cohesion and reproductive success.[54] During the past century and a half, human activities, including overfishing, artificial propagation and habitat degradation, have profoundly reduced the regional abundance of these prey species, thereby contributing to Southern Resident population declines.[55] In the northeastern Pacific region, most Chinook salmon stocks are at a fraction of their historical levels.[56]

Additionally, the DEIS must better reflect and analyze the proposed action's impacts on the use of offshore areas by southern resident killer whales. Areas off the coast of Washington, Oregon, and California provide essential habitat for southern resident killer whales. A team of scientists recently tracked a group of southern residents from late December 2012 to March 2013, collecting nearly daily location data as the whales traveled through more than 23,580 square kilometers of marine habitat between Point Reyes, California, and Cape Flattery, Washington.[57] Acoustic recordings further demonstrate that the population consistently occurs in this region between January and June.[58] Researchers have also observed whales engaging in foraging-like behavior at the mouth of the Columbia River in late March, coincident with the arrival of Chinook

---

[53] Velez-Espino.

[54] Ayres et al., *supra* note 40, at *2. *See also Recovery Plan*, *supra* note 41, at II-75 ("Reductions in prey availability may force whales to spend more time foraging and might lead to reduced reproductive rates and higher mortality.").

[55] Nat'l Marine Fisheries Serv., *Recovery Plan for Southern Resident Killer Whales (Orcinus* orca*)* II-1-2, at II-86 (2008); *see also* Nat'l Marine Fisheries Serv., *Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation: F/NWR/2010/06051* 143 (2011) [hereinafter, *Biological Opinion*] (finding that decreased Chinook abundance resulting from proposed fishing operations would "reduce the whale population by -0.5 to -1.3 whales").

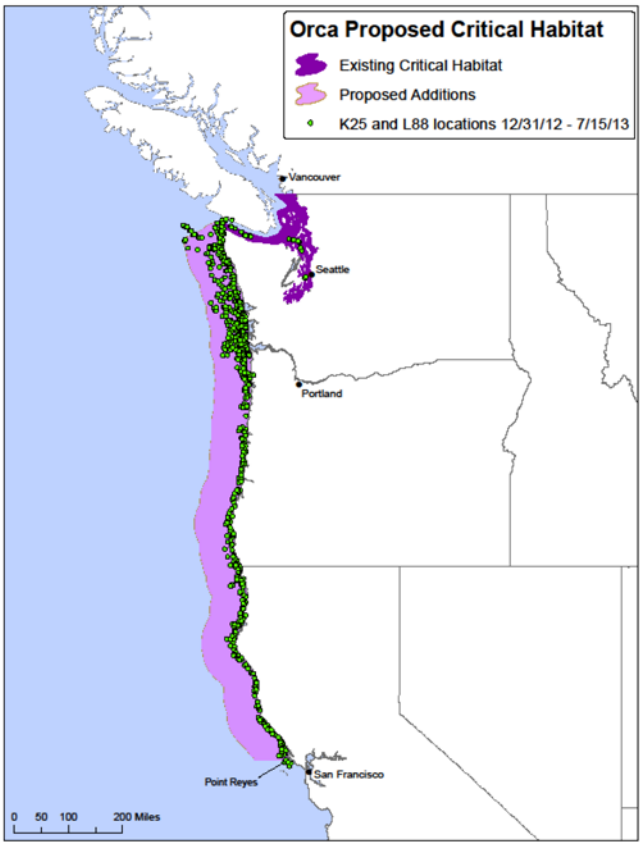
[56] Katherine L. Ayres et al., *Distinguishing the Impacts of Inadequate Prey and Vessel Traffic on an Endangered Killer Whale (*Orcinus orca*) Population*, 7 PLOS ONE e36842 (2012).

[57] Bradley M. Hanson et al., Abstract, *Informing Southern Resident Killer Whales Critical Habitat Designation in Their Winter Range along the U.S. West Coast* (forthcoming).

[58] M. Bradley Hanson, et al., Assessing the Coastal Occurrence of Endangered Killer Whales Using Autonomous Passive Acoustic Recorders, 134 J. OF THE ACOUSTICAL SOC'Y OF AMERICA 3486, 3486 (2013) (explaining that "on average the whales occur in inland waters less than half of the days each year"); see also Christopher Dunagan, Researchers launch winter tracking of killer whales, Kitsap Sun's Watching Our Water Ways, February 22, 2012 at http://pugetsoundblogs.com/waterways/2012/02/22/researchers-launch-winter-tracking-of-killer-whales/#axzz2yzvaCfaj.

salmon,[59] and determined that portions of the population exhibit contaminant concentrations consistent with the consumption of Columbia River and California Chinook.[60] A petition to revise the southern resident killer whale's critical habitat to include offshore areas is pending with the National Marine Fisheries Service.

Figure 1. Area proposed for protection in petition to revise southern resident killer whale critical habitat



Each of these circumstances must be considered to make an informed decision as to the true extent of the impacts on the southern resident killer whale from the Navy's proposed action.

---

[59] Jeannette E. Zamon et al., Winter Observations of Southern Resident Killer Whales (Orcinus orca) Near the Columbia River Plume during 2005 Spring Chinook Salmon (Oncorhynchus tshawtscha) Spawning Migration, 88 NW. NATURALIST 193, 196 (2007).

[60] Margaret M. Krahn et al., *Persistent Organic Pollutants and Stable Isotopes in Biopsy Samples (2004/2006) from Southern Resident Killer Whales*, 54 MARINE POLLUTION BULLETIN 1903, 1909 (2007) [hereinafter *Persistent Organic Pollutants*]; *see also* Margaret M. Krahn et al., *Effects of Age, Sex and Reproductive Status on Persistent Organic Pollutant Concentrations in "Southern Resident" Killer Whales*, 58 MARINE POLLUTION BULLETIN 1522, 1527 (2009) [hereinafter *Age, Sex and Reproductive Status*] (concluding, on the basis of blubber biopsy samples, that certain Southern Resident killer whales "travel to California to forage, where high levels of DDT are found in prey," and noting that "[t]hese results have been substantiated by multiple sightings of [Southern Residents] in waters off the coast of central California").

11. Harbor Porpoises

The DEIS should consider that the takes for harbor porpoises may be higher than estimated.[61] Harbor porpoises are acutely sensitive to a range of anthropogenic sounds. They have engaged in avoidance responses 50 miles from a seismic airgun array, a consistent result with other studies showing harbor porpoises abandoning habitat when exposed to pulsed sounds at received levels well below 120 dB.[62] Another study using seismic sounds founds that a harbor porpoise experienced temporary threshold shift (TTS) when exposed to airgun noise at 164 dB.[63] Further, harbor porpoise are vulnerable to physical modification of nearshore habitats and activities because they are found in shallow waters and near-shore areas, bays, tidal areas, and river mouths.[64] Additionally, it is unknown whether the kill rate is insignificant because there is no reliable estimate of the mortality rate due to commercial fisheries because there are no observer placements in Southeast Alaska fisheries.[65] In light of these vulnerabilities, harbor porpoises are likely to suffer more casualties than the Navy estimated.

We also ask the Navy to explain the discrepancy in the estimated annual training effects for sonar and other active acoustic sources between the No Action Alternative and Alternative 1 and 2 for harbor porpoise, as reflected in Table 3.4-17 of the DEIS.[66] The modeling shows an increase in take for every population affected by sonar and other active acoustic sources, except behavioral impacts to harbor porpoises. Given the sensitivity of harbor porpoise to sonar—the behavioral impact threshold is set at any received sound level above 120 db—and the increase in surface ship sonar activity, we would expect the take of harbor porpoises to increase from the No Action Alternative to Alternatives 1 and 2. While the discrepancy could be attributed in part to moving activities away from harbor porpoise habitat, that is something the Navy professed previously that it was unable to do while also maintaining fidelity to training needs.

---

[61] In NWTT-TR, the model-estimated takes harbor porpoises for TTS was 768.59, and 5920.38 for behavior for exposed to non-impulsive sources during training events under Alternative 1.

[62] Bain, D.E. and R. Williams, Long-range Effects of Airgun Noise on Marine Mammals: Responses as a Function of Received Sound Level and Distance (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E35).

[63] Lucke, K., Siebert, U., Lepper, P.A. & Blanchet, M.-A. 2009. Temporary Shift in Masked Hearing Thresholds in a Harbour Porpoise (Phocoena phocoena) After Exposure to Seismic Airgun Stimuli. The Journal of the Acoustical Society of America 125:4060-4070.

[64] National Marine Fisheries Service, Harbor Porpoise: Alaska Stock Assessment Report 136, 139 (2012).

[65] National Marine Fisheries Service, Harbor Porpoise: Southeast Alaska Stock Assessment Report 131, 133 (2012).

[66] DEIS 3.4-151.

12. Cuvier's Beaked Whale (ziphius cavirostris)

As noted in the DEIS, Cuvier's beaked whales are the most common beaked whale off the west coast. Beaked whales are extremely sensitive to sound, as evidenced by the recent mass stranding of up to 11 Cuvier's beaked whales (at least four animals have died) in Crete, Greece, from April 1 to 6 while naval operations took place off shore.[67] Despite this known concern, the DEIS has failed to obtain sufficient data on Cuvier's beaked whales for its analysis.[68] It instead estimates from Mesoplodon beaked whales. The DEIS should further consider that the majority of strandings coincident with naval sonar exercises have involved Cuvier's beaked whales.[69] This is especially important, because as the DEIS observes, the abundance along the U.S. west coast, including in the California Current, [70] is declining.[71] A recent study found that the beaked whales respond to sonar by vigorously swimming.[72] Rapid, directed swimming can increase stranding risks.[73] Notably, the study points out that current U.S. management practices usually do not consider that such significant behavior disruption occurs at exposure levels as low as used in the study.[74] In addition to increasing strandings, sonar also reduces individual fitness because it causes beaked whales to cease echolocation-based foraging, experience orientation changes, and demonstrate strong and sustained avoidance even beyond the end of the exposure.[75] Accordingly, impacts on Cuvier's beaked whales could include interference with essential behaviors that will have more than a negligible impact on this species.

13. Steller sea lion

The status of Steller sea lion populations in California and Washington is of particular cause for concern. In California, the present size of the statewide population is about one-fifth to one-third of that recorded the first half of the 20th century, and declines may be even more severe since the population is thought to have been larger yet in the 19th

---

[67] Giuseppe Notarbartolo di Sciara's Marine Conservation Blog and Website, Wave Action, http://www.disciara.net/?p=1010.

[68] DEIS 3.4-114.

[69] Stacy L. DeRuiter et at., *First Direct Measurements of Behavioural Responses by Cuvier's Beaked Whales to Mid-Frequency Active Sonar* BIOLOGY LETTERS 9: 20130223 1 (2013).

[70] Jeffrey E. Moore & Jay P. Barlow, *Declining Abundance of Beaked Whales (FamilyZiphiidae) in the California Current Large Marine Ecosystem* 8 PLOS ONE e52779 8 (Jan. 2013).

[71] DEIS 3.4-50.

[72] DeRuiter et al. 2013.

[73] Id.

[74] Id.

[75] Id.

century.[76] Non-pup numbers have not increased during the past 13 to 19 years (1996-2009 and 1990-2009 datasets for 4 rookeries). The San Miguel Island and Seal Rocks rookeries remain abandoned; the Farallon Islands and Año Nuevo Island rookeries, once the largest and most important in California, declined in abundance by ~80% since the early-to-mid 1900s; and during the past 19 years (1990-2009) pup numbers have continued to decline at Año Nuevo and have remained at very low levels at the Farallones.[77] In Washington, current Steller sea lion abundance remains well-below historic population levels of several thousand animals, and there are no active rookeries, creating a large gap of more than 600 miles between rookeries in British Columbia and Oregon.[78] These concerning population trends in Washington and California should be taken into account in the DEIS.

14. California sea lion

In 2013, there was an unusual mortality event for California sea lions with more than 1,000 reported strandings of emaciated sea lions in Southern California. The cause of the strandings has not yet been reported.[79] These sea lions are also impacted by the Southern California testing and training activities that occur near their rookeries.

15. Northern sea otter

The DEIS discounts impacts on the northern sea otter because of a lack of data. This is improper under NEPA.[80] The DEIS concludes that:

> There is no density data available for sea otters in the Study Area. In addition, sea otters inhabit an acoustically complex shallow water environment that is beyond the predictive capability of current acoustic modeling programs. Therefore, even if there were density data for sea otters in the Study Area, attempting to acoustically model underwater sound propagation and sound levels would not be justified.[81]

Sea otters in Washington occupy only a small portion of the pre-exploitation range, and they are limited in a way that makes them vulnerable to a stochastic event, such as an

---

[76] Carretta et al. 2013; NMFS 2008. National Marine Fisheries Service. 2008. Recovery Plan for the Steller Sea Lion (*Eumetopias jubatus*). Revision. National Marine Fisheries Service, Silver Spring, MD.

[77] NMML. 2012. Memo on Regional and Overall Trends and Trend Analysis of the Eastern Regional Distinct Population Segment (DPS) of Steller Sea Lion. 10 April 2012

[78] Carretta et al. 2013.

[79] National Marine Fisheries Service. http://www.nmfs.noaa.gov/pr/health/mmume/californiasealions2013.htm

[80] 40 C.F.R. § 1502.22(a).

[81] DEIS 3.4-113.

oil spill. The Navy must obtain more information on northern sea otters and describe the impacts of the proposed action on the stocks of sea otters that occur in the action area.

III. Other Impacts on Wildlife

The same concerns that apply to marine mammals – such as injury or death from mid-frequency active sonar, collisions with ships, bioaccumulation of toxins, and stress – apply to sea turtles, birds and other biota as well. The Navy must adequately evaluate impacts and propose mitigation for each category of harm. 40 C.F.R. §§ 1502.14, 1502.16.

The Navy limits its analysis of the effects of mid-frequency active sonar on sea turtles on the grounds that their best hearing range appears to occur below 1 kHz. DEIS at 3.5-4 to 5; 3.5-27. Given the endangered status of sea turtles, there is little room for error in assessing impacts. While acknowledging a lack of density data for the species in open ocean conditions and a lack of data on Washington and Oregon densities, the Navy nonetheless concludes that "potential impacts are not expected to result in substantial changes to behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment, and are not expected to result in population-level impacts." DEIS at 3.5-28. Given the paucity of research looking at sonar impacts on sea turtles and the lack of density data, the Navy's conclusions are hardly supported by sufficient evidence. Speculation must be supported by rigorous analysis and wholes in data must be filled prior to concluding that no population-level impacts are expected.

Nor is the Navy's reasoning with regard to seabirds any more sound. Although the Navy acknowledges that "[t]here is little published literature on the hearing abilities of birds underwater…[and] no measurements of the underwater hearing ability of any diving birds" (DEIS at 3.6-17), it then inexplicably concludes that "any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population." DEIS at 3.6-35. Such reasoning does not bear up to any serious scrutiny. *See, e.g.*, the entirely unsupported assertion that "[s]eabirds would avoid any additional exposures during a foraging dive when they surface." DEIS at 3.6-35. Nor is it consistent with its determination that sonar and other active acoustic sources, explosive detonations, and weapons firing, launch, and impact noise is likely to adversely affect the ESA-listed marbled murrelet. DEIS at 3.6-78. Seabirds occur in the NWTT Study Area, dive underwater (in some cases to depths of hundreds of feet), and are sensitive to the frequencies used by the Navy's acoustic sources. They must receive further analysis in the DEIS, both for the direct impacts they may suffer on exposure to the Navy's acoustic sources and for the impacts they may incur indirectly through depletion of prey species and hard bottom habitat. 40 C.F.R. § 1502.16(a), (b).

Without further consideration of these species, the Navy's review is incomplete.

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

The NWTT Study Area is a highly productive region for fish and invertebrate populations. It supports some of the most productive and commercially important fisheries in the United States (including flounder, tuna, anchovy, mackerel, and salmon). The NWTT Study Area supports hundreds of other species, many with federally designated essential fish habitat in the Study Area.

In its DEIS, the Navy discusses many of the unknowns regarding impacts from training and testing on fish (*e.g.*, "While statistically significant losses were documented in the two groups impacted, the researchers only tested that particular sound level once, so it is not known if this increased mortality was due to the level of the test signal or to other unknown factors." DEIS at 3.9-61), while also acknowledging that "potential impacts on fish from acoustic and explosive stressors can range from no impact, brief acoustic effects, tactile perception, and physical discomfort; to slight injury to internal organs and the auditory system; do death of the animal." DEIS at 3.9-87. Nonetheless, the DEIS concludes that its training activities—including both the use of mid-frequency active sonar and underwater detonations—would have no significant impact on fish, fisheries, and essential fish habitat. The Navy's conclusion not only contradicts the available scientific literature on noise but also ignores the valid concerns of fishermen. For example, fisherman concerned with declining catch rates wrote letters opposing the Navy's proposal to build an Undersea Warfare Training Range off the coast of North Carolina in 2005. Those fishermen reported sharp declines in catch rates in the vicinity of Navy exercises.

A. Decline in Catch Rates

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.[82] 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 in the vicinity of an airgun survey across a 1600-square-mile area. In another experiment, catch rates of rockfish were similarly shown to decline.[83] Drops in catch rates in these experiments range from 40 to

[82] 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 July 10, 2012) (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).

[83] 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

80 percent.[84] A variety of other species, herring, zebrafish, pink snapper, and juvenile Atlantic salmon, have been observed to react to various noise sources with acute alarm.[85]

In their comments on the Navy's Draft Environmental Impact Statement for the proposed Undersea Warfare Training Range off the coast of 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.[86] These reports are also indicative of behavioral changes—such as a spatial redistribution of fish within the water column—that could similarly affect the fisheries in the NWTT Study Area.

B. Permanent Injury and Mortality

The Navy's conclusion that underwater noise "is unlikely to impact fish species" ignores the scientific literature. 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.[87] Significant mortality for fish eggs has been shown to 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.[88] 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."[89] Also, larvae

---

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).

[84] Id.

[85] 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.

[86] 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).

[87] 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, 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).

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

[89] Navy, Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the Southern California Range Complex 3.7-66 to 3.7-67 (2008). In the NWTT Study Area, the Navy would operate sonar at higher levels than those used in the Norwegian studies.

in at least some species are known to use sound in selecting and orienting toward settlement sites.[90] Acoustic disruption at that stage of development could have significant consequences.[91] Although the Navy acknowledges studies showing that eggs and larvae are more susceptible to sound, it tries to distinguish them by stating that they "were laboratory studies, however, and have not been verified in the field." DEIS at 3.9-63. Federal law does not allow the Navy to ignore the valid scientific studies that have already been conducted simply because they are contrary to its interest.

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. There are a variety of exercises, some of which involve underwater explosions that will take place in the NWTT Study Area. Given the variety of fish and fisheries inhabiting these waters, the Navy's failure to analyze these effects in significant detail is stunning.

C. Hearing Loss

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."[92] 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.[93] 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.[94] The Navy contradicts this study by claiming that "permanent hearing loss has not been demonstrated in fish as they have been shown to regenerate lost sensory hair cells." DEIS at 3.9-70. As with marine mammals, 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 of a number of other species, including sunfish and tilapia.[95] For

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

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

[92] 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).

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

[94] Id.

[95] 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.

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.[96] The Navy's conclusion "that exposure of fish to transient, non-impulse sources is unlikely to result in any hearing loss" (DEIS at 3.9-70) is simply unsupported, even by its own discussion of the research, which documents temporary hearing loss in goldfish, catfish, rainbow trout, and channel catfish (DEIS at 3.9-63 to 65). Again, federal law does not allow the Navy to ignore the valid scientific studies that have already been conducted simply because they are contrary to its interest.

D. Breeding Behavior

NMFS has observed that 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.[97] The repetitive use of sonar and other active acoustics could thus have significant adverse behavioral effects on some species of fish and those who depend on them.

In sum, the Navy arbitrarily dismisses the potential for adverse impacts on fish. The Navy also capriciously dismisses the notion that fisheries in the area would suffer economic loss, even though—judging by the comments from North Carolina fishermen in 2005—its training activities appear to have disrupted fishing in the past. Just like the training proposed in North Carolina, the available evidence here underscores the need for a more serious and informed analysis than the Navy currently provides. To comply with the requirements of NEPA, the Navy should 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. The Navy must also meaningfully assess the economic consequences of reduced catch rates on commercial and recreational fisheries (as well as on marine mammal foraging) in the NWTT Study Area. It should also consider avoiding essential fish habitat, spawning grounds and other areas of important habitat for fish species, especially hearing specialists. Notably, as with marine mammals, the Navy does not consider exclusion of important fish habitat or fisheries in the NWTT Study Area.

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.

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

[97] 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).

V. The Navy's 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[98]—and by the Navy 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 or sea turtle is detected within 200 yards. DEIS at 5-28.

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.[99] Many other whales are also hard to detect, especially depending on seasonality, geography, and behaviors. For example, the visual and acoustic detection rates of blue whales, which are susceptible to ship strikes in the Pacific Northwest, differ seasonally and geographically, suggesting that a single detection mode (*e.g.*, visual) may be insufficient to detect blue whales in all seasons and regions.[100] The Navy's own assessment of detection probabilities fails to adequately account for gaps in accurate perception and availability bias information, leading to an overestimation of assessment probability. Further, while purportedly basing its assessment on the "best available science," the Navy admittedly refused to incorporate data from the proof of concept phase of the lookout effectiveness study it initiated in 2010. While the data may be preliminary or incomplete, the Navy may not ignore it if it is the best available

---

[98] 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).

[99] 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).

[100] E.M. Oleson, J. Calambokidis, J. Barlow and J.A. Hildebrand, Blue Whale Visual and Acoustic Encounter Rates in the Southern California Bight, 23(3) Marine Mammal Science 574-597 (2007).

information on the effectiveness of its lookout regime. 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.[101]

In this light, the Navy's claims that it cannot implement more protective mitigation measures ring false. DEIS at 5-49 to 60. Although the Navy goes to some pain to describe "mitigation measures considered but eliminated" —primarily because of "unacceptable impacts on readiness"—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 NWTT activities. It can, and must, do more to mitigate the harm on marine wildlife.

A. Protection Zones

As discussed above, there is scientific consensus that geographic mitigation represents the most effective means currently available to reduce the impacts of mid-frequency sonar on marine mammals.[102] It was with that understanding that NOAA launched a multi-year effort to improve the tools available to agencies, including the Navy, for evaluating and mitigating the impacts of anthropogenic noise on marine mammals. One of NOAA's Working Groups, CetMap, is identifying marine mammal "hot spots" along our coasts—important habitat for marine mammals as evidenced by high density of animals, by information on specific habitat use such as foraging or calving, or by association of areas with range-limited populations. CetMap's identification of these areas should form a basis for creating protection zones where training activities could be barred or limited. For the Pacific Northwest, CetMap has produced density and distribution maps for marine mammal populations occurring in the region, many of which overlap with the Study Area.

The Navy should have identified important areas utilizing these maps, designing and discussing mitigation for these and similar areas. By failing to do so, the Navy failed to comply with NEPA. See 40 C.F.R. § 1502.14(f). The Navy must revise and reissue its

[101] 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.

[102] Supra, note 3.

DEIS after fully analyzing the information produced by CetMap and identifying reasonable mitigation that the public can review and submit comments on.

B. Mitigation of Navy Debris and Expended Material

The DEIS fails to set forth any mitigation measures concerning the massive amount of discarded debris and expended materials associated with its proposed activities in the NWTT Study Area. The Navy claims that ocean currents will rapidly disperse the expended materials and thus no mitigation is required. "In NEPA's demand that an agency prepare a detailed statement on 'any adverse environmental effects which cannot be avoided should the proposal be implemented,' is an understanding that the EIS will discuss the extent to which adverse effects can be avoided." *Robertson*, 490 U.S. at 352-53. The Navy's "all-or-nothing approach" is not a sufficient discussion of how the adverse impacts of expended material can be avoided. By failing to explore mitigation measures for expended materials, the Navy does not even attempt to avoid, minimize, rectify, reduce, or compensate for its dumping of debris – all of which are options included in the CEQ regulation's definition of "mitigation." 40 C.F.R. § 1508.20.

C. Other Mitigation Measures

In addition to considering protection zones and mitigation for expended materials, 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, marine protected areas;

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 areas with marked differentials in sea surface temperatures, which have the potential to attract offshore concentration of animals, including beaked whales;[103]

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

[103] 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.").

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 for similar activities in Southern California;[104]

9) Suspension of relocation of exercises when beaked whales or significant aggregations of other species 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;

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;

[104] 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).

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) 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;

23) 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;

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

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

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

27) 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

28) 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.

While the Navy considers, and summarily dismisses, many of these measures in its DEIS, it fails to do so in a manner permitted by NEPA and we note that similar or additional measures may be required under the Marine Mammal Protection Act, Endangered Species Act, and other statutes.

VI. 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 has failed to meet the statutory requirements of NEPA and its regulations because it improperly limited the scope of the DEIS and failed to include sufficient information on the cumulative impacts of the project on marine mammals, including ocean acidification and noise pollution. Furthermore, the overall cumulative impact analysis omitted stressors or activities found to have a negligible impact on an individual marine mammal species. The Navy's omission is contrary to the purpose of a cumulative impact assessment. CEQ's regulations for implementing the National Environmental Policy Act point out that "[c]umulative impacts can result from individually minor but collectively significant actions taking place over a period of time."[105]

A. Ocean acidification

The DEIS should consider the cumulative impacts of its action in light of ocean acidification in the Pacific Northwest. Ocean acidification results from the ocean's absorption of carbon dioxide from the atmosphere, which causes seawater to become more acidic. Ocean acidification increases the impacts of sonar and other noise pollution on the acoustic environment, with corresponding impacts on marine mammals. Ocean acidification decreases the sound absorption of seawater causing sounds to travel further.[106] Already sound travels 10-15 percent further with only a

[105] 40 CFR § 1508.7.

[106] Keith C. Hester et al., *Unanticipated Consequences of Ocean Acidification: A Noisier Ocean at Lower pH* 35 GEOPHYSICAL RES. LETTERS L19601, L19604 (Oct. 2008).

change of 0.1 pH that has occurred on average in the global oceans due to anthropogenic carbon dioxide.[107]

Ocean acidification is especially pronounced in the Pacific Northwest because of the upwelling in the California Current system. Adding carbon dioxide to the region's upwelling waters, in which carbon-dioxide-rich waters from the deep ocean are drawn up to the surface, results in a sort of hyper-acidification.[108] Surveys of coastal waters show carbon dioxide levels that were not expected until the end of the century.[109]

Accordingly, noise pollution in the action area is increasing in intensity and range due to ocean acidification. Ocean acidification and its effect of decreasing sound absorption within frequency ranges, thus increasing ambient noise levels, are well established phenomena.[110] In addition, rising global temperatures contribute to decreased sound absorption in the lower frequency range, amplifying the effects of increased acidification.[111]A recent study shows that ocean acidification and reduced ventilation will significantly decrease sound absorption in the ocean for frequencies lower than about 10 kHz.[112] Changes in the low frequency range have already exceeded ten percent and even greater changes in the future are inevitable.[113] Shallow waters are of particular concern because they are the first area affected by atmospheric changes and greatly impact marine mammals.[114]

Ocean acidification increases the distance the noise travels. Specifically, increasingly acidic seawater reduces the occurrence of certain charged molecules, such as borate ions, which absorb energy from passing sound waves.[115] Thus, as pH levels decrease, ocean noise encounters fewer impediments and, ultimately, travels farther.[116] The change is significant. Researchers predict that ocean acidification will reduce the intrinsic ability of surface seawater to absorb sound at frequencies important to marine mammals by 40 percent before 2050.[117] These levels of ocean acidification predicted

---

[107] Id.

[108] Feely, Richard A., Christopher L Sabine, J Martin Hernandez-Ayon, Debby Ianson, and Burke Hales. 2008. *Evidence for Upwelling of Corrosive 'Acidified' Water onto the Continental Shelf.* Science 320: 1490–2 (2008).

[109] Id.

[110] Keith C. Hester et al., *Unanticipated Consequences of Ocean Acidification: A Noisier Ocean at Lower pH* 35 GEOPHYSICAL RES. LETTERS L19601, L19604 (Oct. 2008).

[111] Id.

[112] Id.

[113] Id.

[114] Id.

[115] Peter G. Brewer & Keith Hester, *Ocean Acidification and the Increasing Transparency of the Ocean to Low-Frequency Sound*, 22 OCEANOGRAPHY 86, 87 (Dec. 2009).

[116] Id.

[117] Id.

for 2050, however, have already been surpassed in the action area. The pCO2 values in the upwelled waters off the Washington coast range from 850 to 950 μatm (microatmospheres) near the continental shelf, with higher CO_2 closer to shore.[118] This corresponds with about 850-950 ppm at surface, which is nearly double the 560 ppm CO_2 predicted for mid-century. Thus, the problem of ocean acidification amplifying the ensonifcation of the environment is already present in the action area and not merely a future concern.

Marine mammals are significantly impacted by increases noise pollution resulting from ocean acidification. The significant increase in ambient noise in the ocean is within the auditory range critical to marine life. [119] Most marine mammals depend primary on their sense of hearing to interact with their environment, including detecting signals from prey and predators.[120] Anthropogenic noise introduced into the ocean can interfere with these important interactions and also harm the animals' auditory systems.[121] Concerns from the increased noise pollution from a variety of maritime activities are well established.[122] For example, one study found that severe (.70–90 dB loss) to profound (.90 dB loss) hearing loss was found in fifty seven percent of stranded bottlenose dolphins and thirty six percent of rough-toothed dolphins tested in the study.[123] The study attributed some of the hearing loss to chronic noise from boating and shipping activities.[124]

The EIS must discuss ocean acidification and take a hard look at the impacts of sonar in light of noise travelling greater distances due to acidification, which is accelerating as carbon dioxide emissions continue unabated.

B. Cumulative Noise Pollution

The Navy must consider the cumulative impacts of its action combined with other noise pollution in the action area. The Navy erred in concluding that there are no harmful additive impacts from the co-occurrence of its activities and other ocean noise. This must be corrected.

---

[118] Richard A. Feely, et al. Scientific Summary of Ocean Acidification in Washington State (2012).

[119] Id.

[120] John Andrew Wright, *How Harbour Porpoises Utilise Their Natural Environment and Respond to Noise*, Ph.D. Thesis. Aarhus University, Dep't of Bioscience, Denmark at 176 (2013).

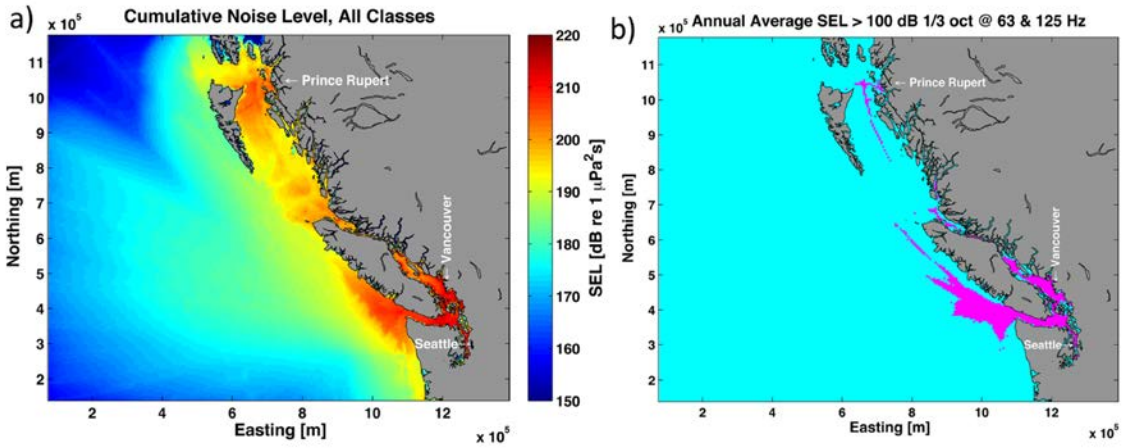
[121] Id.

[122] Keith C. Hester et al., *Unanticipated Consequences of Ocean Acidification: A Noisier Ocean at Lower pH* 35 GEOPHYSICAL RES. LETTERS L19601, L19602 (Oct. 2008).

[123] David Mann et al., *Hearing Loss in Stranded Odontocete Dolphins and Whales* 5 PLOS ONE 1 (Nov. 2010).

[124] Id.

The Puget Sound and Georgia Basin are among the busiest waterways in the world. Recent studies of the Puget Sound demonstrate that the waters are chronically noisy. At least 90 percent of the time at least one extremely noisy vessel is traveling through the shipping lanes in the Puget Sound.[125] The study found that all vessels (cargo vessels, passenger ferries and tugs, recreational watercrafts) generate noise at frequencies relevant to all marine mammal functional hearing groups. [126] The researchers found that noise in the area from these vessels averaged about 120 decibels, and regularly exceed 120 dB, the current acoustic criterion for behavioral harassment of marine mammals for continuous sound types in the United States.[127]



Figures a and b. (a) Cumulative sound exposure level from vessel traffic from Jan to Dec 2008. (b) Areas where the estimated annual average sound pressure level (SPLrms) exceeded the EU Marine Strategy Framework Directive of 100 dB (SPLrms) in 1/3-octave bands centered on 63 or 125 Hz. Source: Erbe 2012

Erbe et al. modeled vessel traffic noise in the Pacific Northwest and developed useful maps to identify the sound exposure levels.[128] Notably, the model shows that the annual average shipping noise in the region already exceeds thresholds recommended for acoustically sensitive species.[129]

If acoustic thresholds for marine mammals are already being exceeded in the action area, then the additive impact of sonar, vessel noise, explosions are all contributing further to the exceedences. Moreover, this also undermines the Navy's reliance on avoidance behavior to mitigate the impact of its activities on marine mammals. Animals may be displaced into other areas that already exceed acoustic thresholds.

---

[125] Christopher Bassett et al., *A Vessel Noise Budget for Admiralty Inlet, Puget Sound, Washington (USA)* 132 J. ACOUSTICAL SOC. OF AM. 3706 (Dec. 2012).

[126] Id.

[127] Id.

[128] Erbe, C., MacGillivray, A., and Williams, R. 2012. *Mapping cumulative noise from shipping to inform marine spatial planning.* J. Acoust. Soc. Am. 132 (5), November 2012. 423-428.

[129] Id.

The EIS must quantify and evaluate the impacts that its action contributes to the overall noise pollution in the action area, which most importantly includes ensonification of the marine environment from vessel traffic.

C. Cumulative Impacts on Migratory Species

NEPA requires a cumulative impacts analysis to: (1) catalogue past and present projects in the area; (2) assess the cumulative environmental impacts of those projects with the proposed project; and (3) analyze the additive cumulative impact of all reasonably foreseeable Federal and non-Federal actions, whether or not they have actually been proposed. *See City of Carmel-By-The-Sea v. United States Dep't of Transp*., 123 F.3d 1142, 1160 (9th Cir. 1997) (rejecting cumulative impacts analysis that referred generally to other past "development projects" and did not discuss the additive impacts of foreseeable future projects); *Fritiofson v. Alexander*, 772 F.2d 1225, 1243 (5th Cir. 1985) (agency must consider reasonably foreseeable actions regardless of whether they have yet formally been proposed). A cumulative impacts analysis must provide "some quantified or detailed information" because "[w]ithout such information, neither courts nor the public . . . can be assured that …[an agency] provided the hard look that it is required to provide." *Cuddy Mountain*, 137 F.3d at 1379; *Carmel-By-The-Sea*, 123 F.3d at 1160 (faulting EIS for describing other projects in inadequate detail to permit review of their cumulative impacts).

Although the Navy states that it considers "activities outside the study area that might impact migratory marine mammals and sea turtles," DEIS at 4-2, its analysis falls far short of this statement and the requirements of NEPA. Rather, the DEIS's discussion of cumulative impacts does not consider in any appropriate detail the host of other past, present, and reasonably foreseeable future impacts that will interact with – and affect many of the same populations of marine species – as the Navy's training exercises. For example, the DEIS's discussion of cumulative impacts to marine mammals from fishing is limited to the mere recognition that whales can become entangled in nets or be caught as bycatch. There is no attempt to quantify these impacts, or to evaluate what they might mean in tandem with other impacts such as vessel strikes, pollution, habitat disturbance, or the Navy's activities proposed in the DEIS. Indeed, the conclusion of this truncated discussion of cumulative impacts is simply to recognize that cumulative impacts are significant overall, but the Navy's additions to those impacts would be small by comparison to the harm already occurring, and so can be dismissed. DEIS at 4-35 to 4-36, 4-48. This misses the entire point of analyzing cumulative impacts – to evaluate alternatives and mitigation that would reduce the cumulative impacts from the activity when it occurs alongside other harmful impacts.

While the DEIS is deficient in this regard overall, the most significant omission is any mention of the cumulative impacts to migratory marine mammals from the Navy's activities in other training ranges. There can be no dispute that many of the marine mammals purportedly considered in this DEIS are the same populations and individuals impacted by the Navy's training in other ranges, including the Gulf of Alaska, Southern California, and Hawai'i. But, while acknowledging that actions outside the study area can have cumulative effects on these migratory species, the Navy's discussion of these

impacts is limited to the effects of maritime traffic and commercial fishing. DEIS at 4-2, 4-19 to 4-20. The DEIS omits any discussion of the Navy's impacts to these same species outside the Northwest.[130] The cumulative effects analysis must acknowledge, quantify, and evaluate the significance of past, present, and reasonably foreseeable future takes and other harm to these same populations and individuals from the Navy's own activities outside this specific training range.

The Navy's training in these other ranges will result in hundreds of thousands of instances of take and other harm to marine mammals over at least the next five years under permits that the Navy recently received. For example, the Eastern North Pacific population of gray whales will be subject to more than 3,000 incidences of take by harassment and more the 6,000 instances of temporary hearing loss from the Navy's sonar and acoustic training activities in Southern California every year. *See* HSTT at 3.4-167. Many of other species, including blue, humpback, fin, sperm, and sei whales migrate north-to-south along the coastline and from Hawai'i to the Northwest coast (in the case of humpback whales). *See* HSTT EIS at 3.4-167 and DEIS at 3.4-150 (the same California/Oregon/Washington population of fin whales subjected to more than 629 annual instances of behavioral harassments and 898 annual instances of temporary hearing loss in Southern California and then another 14 annual instances of behavioral harassment and 10 instances of temporary hearing loss in the Northwest). The DEIS does not mention the large numbers of takes and harm occurring to these species in other training ranges, nor does it quantify, or even attempt to analyze the combined or cumulative effects from training exercises throughout the migratory range of these species. These impacts range from physical injury to harassment and other stressors that affect feeding, breeding, and migration. While the DEIS attempts to dismiss many of these impacts as temporary, they can and do accumulate over time both in terms of repeated stress and injury to individual animals. Moreover, repeated and prolonged exposure to stressors such as sound can cause habitat avoidance and other harms.

VII. The Navy Fails to Properly Analyze Reasonable Alternatives

To comply with NEPA, an EIS must "inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. The regulation itself describes the requirement as "the heart of the environmental impact statement." *Id.*at § 1502.14. Courts similarly portray the alternatives requirement 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

[130] As just one example, the Navy goes so far as to ignore known past impacts of its own training exercises on these species in other training ranges: While it emphasizes that "[t]here has never been a Navy vessel strike to a marine mammal in the Study Area," DEIS at 4-32, a Navy vessel struck and killed a fin whale in Southern California in 2009 and, in the twenty year period from 1991 to 2010, Navy ships struck at least 16 whales (with 7 of these being fatal) in Southern California. *See* HSTT EIS at 3.4-268. Most of these strikes and fatalities were to the same populations that also migrate through the NWTT Study Area.

discuss the reasons for their having been eliminated." 40 C.F.R. § 1502.14(a). The agency must also state how the alternatives considered in the DEIS and decisions based on the DEIS will or will not achieve the requirements of sections 101 and 102(1) of NEPA and other environmental laws and policies. *See* 40 C.F.R. § 1502.2(d). 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.

Three alternatives are given in the DEIS: a No Action Alternative (maintaining baseline training and testing activities that historically occur in the Study Area), the preferred Alternative 1 (increasing training and testing activities, expanding activities to new areas, and force structure changes), and Alternative 2 (Alternative 1 with more training and testing activities). These alternatives do not provide decision makers with a range of genuine choices. While the purpose of the alternatives analysis is to "consider the likely environmental impacts of the preferred course of action as well as reasonable alternatives," which "facilitates informed decisionmaking by agencies and allows the political process to check those decisions," *New Mexico ex rel. Richardson v. BLM*, 565 F.3d 683, 703-704 (10th Cir. 2009), the DEIS falls short of this goal. The Navy's alternatives amount to a presentation of only one true course of action: potential training and testing in all areas at all times.

A. Failure to Identify Environmental Impact-Based Alternatives

The Navy claims it prepared the DEIS to "assess the potential environmental impacts" and to execute 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.

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 options 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 showing what is and is not known and what species and habitats would be most at risk from each alternative.

The two alternatives that purportedly meet the Navy's purpose and needs present no options for a decisionmaker wishing to reduce harms to the environment or for the public to hold decisionmakers accountable for their choices based on environmental impacts. For example, a decisionmaker wishing to choose the alternative that does less

harm to marine mammals from training with sonar has nowhere to turn; both of the Navy's alternatives result in the exact same impact to marine mammals from training with sonar—nearly 25,000 takes per year. Violating NEPA's regulations, there is no presentation of an alternative that details a way forward that "avoid[s] or minimize[s] adverse impacts or enhance[s] the quality of the human environment." *Id*.

B. The Navy Improperly Dismissed Alternatives Necessary to Provide a Well Reasoned Choice of Alternatives

Several alternatives were recommended to the Navy during the scoping process that addressed this absence of environmental impact-based alternatives. However, the DEIS improperly dismisses all of these suggestions. "While NEPA 'does not require agencies to analyze the environmental consequences of alternatives it has in good faith rejected as too remote, speculative, or impractical or ineffective,' it does require the development of 'information sufficient to permit a reasoned choice of alternatives as far as environmental aspects are concerned.'" *New Mexico ex rel. Richardson v. BLM*, 565 F.3d 683, 708-709 (10th Cir. 2009) quoting *Colorado Envtl. Coalition v. Dombeck*, 185 F.3d 1162, 1174 (10th Cir. 1999).

Dismissing the suggestions, the Navy fails to show how any of the alternatives are "too remote, speculative, or impractical or ineffective." For instance, while proximity to home ports and complexes might prove to be more convenient and even more cost effective, neither expense nor ease equates to the level of being too remote, speculative, or impractical or ineffective. *See* DEIS § 2.5.1.1 at 2-42. These factors alone cannot dictate an agency's choice of alternatives to evaluate in an EIS.

"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 and the alternatives analysis loses its purpose entirely.

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 expedient. 40 C.F.R. § 1502.14. By improperly disregarding many alternatives, the Navy has failed to discuss all reasonable alternatives.

C. The Navy Must Identify Alternative Sites and Seasonal Restrictions

The Navy's analysis is devoid of geographic alternatives and even minor seasonal restrictions. This omission is inappropriate in light of the strong consensus—at NOAA and in the scientific community—that spatial-temporal avoidance of high-value habitat

represents the best available means to reduce the impacts of mid-frequency active sonar and certain other types of ocean noise on marine life.[131]

Protected areas should ordinarily be identified during the planning stage based on biological and oceanographic factors, rather than merely on the confirmed presence of marine animals in real time; and, indeed, the Naval Facilities Engineering Command, Atlantic undertook just such an analysis in the Navy's EIS for Atlantic Fleet Active Sonar Training covering the period 2009-2013. The Navy's detailed planning for certain training and testing exercises, particularly major exercises, such as RIMPAC, JTFEXs, COMPTUEXs, and USWEXs, provide an ideal opportunity to develop reasonable alternatives for the timing and siting of such activities based on biological and oceanographic factors.

Further spatial-temporal alternatives do not require large shifts in location, but rather can be very effective by simply carving out small areas of known biological importance. For instance, the Navy has conceded in other analyses the importance designating "cautionary areas" that requires higher administrative approval for activities in the areas See, e.g., the cautionary area for humpback whales in the Final EIS for Hawaii-Southern California Training and Testing. Despite these recognitions, the Navy fails here to identify areas and develop an alternative based on avoiding a handful of biologically important areas. Instead, all of the alternatives propose year-round, unrestricted 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 and the identification of biologically important areas. In fact, moving in the wrong direction on these matters, the Navy has proposed withdrawing spatial-temporal protections for the ESA-listed marbled murrelet.

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. However, because the Navy has failed to undertake an alternatives analysis that allows it to make an informed siting choice, the DEIS is inadequate and must be revised.

D. Other Reasonable Alternatives

The DEIS should also consider other reasonable alternatives which could fulfill the Navy's purpose while reducing harm to marine life and coastal resources. For example:

(1) 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 discussion inadequate. For instance, while

[131] Supra, note 3.

safety zones are no substitute for geographic mitigation (which, as noted above, is the most effective means of reducing impacts on marine mammals), they do provide a form of last-recourse protection for any animals that are spotted near the array. The Navy must analyze safety zone enhancements outside critical points of its training and consider modifications in the safety zone provisions.

We have noted several reasons in the past why expanding the safety zone would reduce the risk of near-array exposures: for example, (1) marine mammal groups are often spread out over a wide area, and animals may go undetected within the safety zone even if group members are only spotted outside; and (2) uncertainty remains over the thresholds and distances needed to cause hearing loss in some species. Given the Navy's *de facto* use of a wider safety zone in past exercises, it should consider how to provide for safety zone enhancements outside critical points of its training. In addition, the Marine Mammal Commission has repeatedly called for modifications in the safety zone provisions to allow sufficient time for animals to move out of the sound field.[132]

(2) While we appreciate the Navy's plan to use range sensors and other passive acoustic platforms in limited instances, such efforts must be expanded. The Navy has failed to set forth an action plan and timeline in its EIS to bring these sensors and platforms on line for purposes of more meaningful mitigation. Passive acoustic monitoring is one of the most effective available means of monitoring marine mammals in the vicinity of MFA sonar exercises and other sources of undersea noise.[133] Under the right conditions, it can significantly improve detectability of certain cryptic or deep-diving species. For example, while beaked whales are theoretically sightable only during the 8% of time that they are on the surface (and even then are unlikely to be spotted visually), some species vocalize over roughly 25% of their deep foraging dives.[134] NMFS, in its rulemakings, has repeatedly noted the mitigation potential of passive acoustic monitoring and the commitment of the Navy to technological development in support of this measure. 74 Fed. Reg. 3895.

---

[132] MMC, Letter from Rebecca Lent, Executive Director, Marine Mammal Commission, to Kimberly Kler, NWTT EIS/OEIS Project Manager, Naval Facilities Engineering Command Northwest. Formal comments on draft EIS, submitted Feb. 20, 2014 (2014).

[133] ECS Working Group: S. Dolman et al., Technical report on effective mitigation for active sonar and beaked whales, Working group convened by European Cetacean Society. 10pp. (2009); E.A. Falcone, Sighting characteristics and photo-identification of Cuvier's beaked whales (*Ziphius cavirostris*) near San Clemente Island, California: a key area for beaked whales and the military?, Marine Biology 156: 2631-2640 (2009); L. Hatch et al., Characterizing the relative contributions of large vessels to total ocean noise fields: a case study using the Gerry E. Studds Stellwagen Bank National Marine Sanctuary, Environmental Management 42: 735-752 (2008).

[134] N. Aguilar Soto, Acoustic and foraging behavior of short-finned pilot whales (Globicephala macrorhynchus) and Blainville's beaked whales (Mesoplodon densirostris) in the Canary Islands; implications on the effects of man-made noise and boat collisions, Ph.D. dissertation, La Laguna University, Canary Islands, Spain (2006); ECS Working Group (2009).

(3) 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.

VIII. 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 increased training in the NWTT Study Area on the region's marine mammals and other fish and wildlife, the DEIS does not adequately consider the 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 (*e.g.*, whale watching, cruise ships, etc.), particularly those areas centered on observing whales and other marine mammals in their natural habitats.

One of NEPA's explicit purposes is to "assure esthetically and culturally pleasing surroundings," 42 U.S.C. 4331(b)(2), and courts have made 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).

IX. 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]").

For meaningful public input, 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. 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.

In addition, the Navy has also ignored repeated Freedom of Information Act requests regarding information and reports cited in the DEIS (see, e.g., the Navy's failure to produce documents in response to case file number 200600587. NRDC renewed the request on January 28, 2009).

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.

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. Prejudging the results of this NEPA process, the Navy has already applied for an incidental take permit. As we explained in comments on that permit application (which we incorporate by reference), the Navy's pursuit of an MMPA permit tiered to an as-yet-unfinished NEPA process demonstrates that the Navy has predetermined the result of its NEPA process. NMFS and the Navy should abandon any intent to undertake any activities tiered to the EIS until after the NEPA process has been completed. Nonetheless, we will submit comments on NMFS' rulemaking for the Navy's activities 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 Service over the numerous endangered and threatened species that will be harmed from its activities.

(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 Alaska, California, Oregon, and Washington 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 NWTT Study Area 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, many migratory birds occur within the NWTT Study Area. 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.

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.[135] 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.[136] 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:[137]

> (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*.[138] Thirteen beaked whales of two species were killed in the

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

[136] Id.

[137] 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).

[138] 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.[139] An additional stranding of Cuvier's beaked whales, also coinciding with a naval exercise, occurred in 1991.[140] It was reported that mass live strandings occurred each time exercises took place in the area.[141]

(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.[142] 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.[143] The following year saw nine additional Cuvier's beaked whales strand off Greece, again coinciding with naval activity.[144]

(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."[145] 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.[146] In January 1998, according to a NMFS biologist, a beaked whale "stranded suspiciously" at Vieques as naval exercises were set to commence offshore.[147]

---

[139] Id.

[140] 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).

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

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

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

[144] 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).

[145] 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).

[146] 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).

[147] 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."[148]

(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.[149] 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.[150] 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.[151]

(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.[152] 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.[153] Eleven harbor porpoises—an abnormally high number

---

[148] 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).

[149] 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.

[150] 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.

[151] 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.

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

[153] 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.[154]

(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.[155]

(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.[156] The probability that the whales died at sea is extremely high.[157]

(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, being the

---

[154] 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.

[155] 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).

[156] 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).

[157] Id.

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.[158]

(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.[159] A NATO response force was performing exercises within 50 miles at the time of the strandings.

(12) Ionian Sea 2011 – At least ten and possibly dozens of additional Cuvier's beaked whales stranded or washed ashore dead on the Island of Corfu in Greece and across the Ionian Sea on the Italian coast of Calabria in December 2011. The stranding event coincided in time and space with a major Italian Navy exercise known as "Mare Aperto" in the central-southern Tyrrhenian, Ionian, and southern Adriatic. At least one of the participating ships in the exercises was equipped with active sonar identical to systems used by the U.S. Navy.

(13) Greece 2014 – At least eleven Cuvier's beaked whales stranded or washed ashore dead on the island of Crete in Greece from April 1 to April 6, 2014. The stranding event coincided in time and space with a major multinational naval exercise known as "Noble Dina" in the Mediterranean Sea just south of Crete. As part of "Noble Dina," U.S., Greek, and Israeli naval forces conducted anti-submarine warfare exercises, which require the use of high-powered military sonar.

Some 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.[160] Indeed, it is not even certain that some beaked whale species naturally strand in numbers.

---

[158] 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).

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

[160] 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

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.[161] 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 marine species are concerned.[162] 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.[163]

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."[164] 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.[165] In any case, the evidence is considered

---

§ 13.8 (2000) (report of the IWC Scientific Committee, Standing Working Group on Environmental Concerns).

[161] 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).

[162] 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).

[163] 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).

[164] 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.

[165] 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.

"compelling" that acoustic trauma, or injuries resulting from behavioral responses, has in some way led to the deaths of these animals.[166]

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 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.[167]

---

[166] 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).

[167] 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).

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.

APPENDIX C

CRITIQUE OF THE NAVY'S ACOUSTICS ANALYSIS

We urge the Navy to substantially alter the approach it has taken thus far. The Navy must revise its acoustic impact analysis to reflect the evidence of mid-frequency sonar's effects on marine life. Unfortunately, the Navy's current 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. In issuing a revised DEIS the Navy should (1) reduce its thresholds or risk function for marine mammal injury, hearing loss, and significant behavioral change, in accordance with the available science; (2) address the considerable scientific record that has developed around sonar and whale injury and mortality; and (3) revise its impact assessment model to take account of complex sound fields, synergistic effects from multiple sound sources, and the presence of vulnerable populations in the NWTT Study Area.

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 significant problems with the Navy's thresholds, as discussed below.

1. Injury

The Navy sets the threshold for onset permanent threshold shift ("PTS"), which is the highest threshold for direct physical injury, at 198 dB re 1 $\mu Pa^{2\bullet}s$ for all mysticetes, dolphins, beaked whales, and medium- and large-toothed whales; 172 dB re 1 $\mu Pa^{2\bullet}s$ for porpoises and *Kogia* spp.; 197 dB re 1 $\mu Pa^{2\bullet}s$ for northern elephant and harbor seals; and 220 dB re 1 $\mu Pa^{2\bullet}s$ for sea lions, fur seals, and sea otters. DEIS at 3.4-100. 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.[168] 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

[168] 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.

lower than 140 dB re 1 μPa.[169] 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 μPa^{2}•s, at least for beaked whales. Indeed, to pay at least some deference to the literature, the Navy—under pressure from NMFS—has previously assumed that non-lethal injury would occur in beaked whales exposed above 173 dB re 1 μPa^{2}•s.[170]

In addition, the DEIS goes to great pains to create uncertainty about 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 3.4-69 to 71. 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;[171] 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.[172] Nonetheless, the Navy fails to evaluate the impacts from this potential avenue of injury and entirely disregards key literature.[173] NEPA requires agencies to evaluate all "reasonably

---

[169] 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).

[170] 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).

[171] 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).

[172] 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).

[173] A. Fahlman, P.L. Tyack, P.J.O. Miller, and P.H. Kvadsheim, How man-made interference might cause gas bubble emboli in deep diving whales, 5 Frontiers in Physiology 13 (2014).M.J. Moore and G.A. Early, Cumulative sperm whale bone damage and the bends, 306 Science 2215 (2004); R. Williams, S. Gero, L. Bejder, J. Calambokidis, S.D. Kraus, D. Lusseau, A.J. Read, and J. Robbins, Underestimating the damage: interpreting cetacean carcass recoveries in the context of the Deepwater Horizon/BP incident; P.D. Jepson, R. Deaville, I.A.P. Patterson, A.M. Pocknell, H.M. Ross, J.R. Baker, F.E. Howie, R.J. Reid, A. Colloff, and A.A. Cunningham, Acute and chronic gas bubble lesions in cetaceans stranded in the United Kingdom, 42 Veterinary Pathology 291-305 (2005); and Y. Bernaldo de Quiros, O. Gonzalez-Diaz, A. Mollerlokken, A.O. Brubakk, A. Hjelde, P. Saavedra, and A. Fernandez, Differentiation at autopsy between in vivo gas embolism and putrefaction using gas composition analysis, 127 Int. J. Legal Med. 2:437-45 (2013).

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.

2. Temporary Threshold Shift

The DEIS sets its threshold for temporary hearing loss and behavioral effects, or "temporary threshold shift" ("TTS"), at 178 dB re 1 $\mu Pa^{2\bullet}s$ for all mysticetes, dolphins, beaked whales, and medium- and large-toothed whales; 152 dB re 1 $\mu Pa^{2\bullet}s$ for porpoises and *Kogia* spp.; 183 dB re 1 $\mu Pa^{2\bullet}s$ for northern elephant and harbor seals; and 206 dB re 1 $\mu Pa^{2\bullet}s$ for sea lions, fur seals, and sea otters. DEIS at 3.4-100. 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. *Id*.

Notably, the Navy's extrapolation of data from bottlenose dolphins and belugas to all cetaceans other than harbor porpoises and *Kogia* 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, killer whales are more sensitive over part of the mid-frequency range than are the two species in the SPAWAR and Hawaii studies.[174] Furthermore, it is likely that the animals in the studies do 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.[175]

Also, relevant to both calculations for TTS and PTS, it should be noted that low-frequency cetaceans have good low-frequency sensitivity out to 10 kilohertz, thus the Southall weighting function is not the best approach to capture functional hearing ranges, as the low-frequency curve should not be modified until reaching the 10 kilohertz frequency and it should be flatter out to about 30 kilohertz.

3. "Risk Function" for Behavioral Effects and Thresholds

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.

---

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

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

Once again, the Navy relies on studies of temporary threshold shift in captive animals for its primary source of data. DEIS 3.4-104. Marine mammal scientists have long recognized the deficiencies of using captive subjects in behavioral experiments, and to 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.[176] 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.[177] 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.[178]

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 3.4-81; 3.4-104. 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.[179] 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, again, that the Navy provide the public with its propagation analysis for the Haro Strait event.

---

[176] 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).

[177] 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).

[178] 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).

[179] 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.[180] 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.[181] The Navy's failure to incorporate these numbers into its methodology as another data set is unjustifiable.

The Navy also fails to incorporate data on harbor porpoises and beaked whales when setting its thresholds. For both harbor porpoises and beaked whales, the Navy uses lower thresholds to determine behavioral impacts (120 dB and 140 dB, respectively) but fails to also incorporate that data when determining thresholds for other species. While these animals may reflect a particular sensitivity to noise, the DEIS fails to explain why this data cannot be incorporated in some way when determining thresholds for other species. By failing to incorporate this data into its modeling, the Navy unjustifiably ignores relevant information.

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").

---

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

[181] 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).

In addition, 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.[182]

We are also concerned with the weighting of behavioral thresholds for marine mammals. This approach is not as conservative as it should be in the low frequencies given the apparently strong reaction that have been documented in odontocetes in response to predominantly low-frequency sources (e.g., seismic). Thus, we believe there should be no weighting applied to behavioral thresholds.

Finally, while the Navy has set a specific threshold for beaked whales (140 dB) based on the Tyack et al. study, it fails to incorporate additional data on beaked whales indicating that the threshold should be even lower.[183]

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;

---

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

[183] P.L. Tyack et al., Beaked Whales Respond to Simulated and Actual Navy Sonar, PLoS ONE 6(3): e17009. Doi:10.1371/jounal.pone.0017009 (2011); B. Southall et al., Biological and behavioral response studies of marine mammals in Southern California, 2010 ("SOCAL-10"), Project Report, 26 February 2011 (2011); B. Southall et al., Biological and behavioral response studies of marine mammals in Southern California, 2011 ("SOCAL-11"), Final Project Report, 8 March 2012 (2012).

(2) The Navy does not properly account for reasonably foreseeable reverberation effects (as in the Haro Strait stranding incident),[184] 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;[185]

(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;[186] 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.

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

[184] 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).

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

[186] 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.