3 March 2016

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the National Marine Fisheries Service's (NMFS) 26 February 2016 notice (81 Fed. Reg. 9950) and the letter of authorization (LOA) application[1] submitted by the U.S. Department of the Navy seeking issuance of regulations under section 101(a)(5)(A) of the Marine Mammal Protection Act (the MMPA). The regulations would authorize the taking of marine mammals incidental to training activities to be conducted from 2016 to 2021 within the Temporary Maritime Activities Area (TMAA) in the Gulf of Alaska (GOA). The Commission previously commented in its 15 September 2014 letters on NMFS's advance notice of proposed rulemaking and the Navy's Draft Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement (DSEIS) regarding the proposed activities. The Commission also has commented on other draft environmental impact statements and previously proposed regulations for similar activities in other Navy training and testing study area—the most recent of which was from 17 June 2015 on the proposed rule for training and testing activities in the Northwest Training and Testing study area (NWTT).

Background

The Navy proposes to conduct training activities in the waters off Kodiak, Alaska. The activities would involve the use of mid- and high-frequency sonar, weapons systems, explosive and non-explosive munitions and ordnance, high-explosive underwater detonations, expended materials, electromagnetic devices, vessels, and aircraft. Activities would occur in summer, defined as April–October.

Timing of activities and acoustic modeling

The LOA application indicated that the Navy would conduct the proposed activities from April–October. However, given that training activities likely would occur only during the month of July, the Navy selected July as the seasonal representative for its analyses (Department of the Navy 2014a). Because the GOA environment (i.e., sound speed profiles and wind speed) varies markedly by season, modeling for July would provide an appropriate basis for estimating takes during the

[1] Which was revised last in January 2015.

April–October timeframe only if the environmental parameters in July are considered the worst-case scenario. Conversely, the Navy could have averaged the environmental data for each season[2], as it had for NWTT and the other Navy study areas. In either case, the time frame during which modeling was conducted should be consistent with environmental conditions in the months when the proposed activities would be authorized to occur. Otherwise, if the Navy modeled only during July but the activities actually occur in April, the estimated numbers of takes could be underestimated due to colder temperatures and greater wind speeds causing surface ducting conditions in GOA in the cold season[3]. The Commission made similar recommendations regarding this issue in its 18 November 2010 letter on the LOA for the same activities under the original GOA Draft EIS and its more recent 15 September 2014 letters regarding the proposed activities. Therefore, the Commission again recommends that, if the Navy requests authorization to conduct training activities from April–October, then NMFS require the Navy to include the appropriate environmental parameters in its acoustic modeling based on those months[4] rather than assuming the activities would occur only during July. If it is indeed the case that activities will occur only during July, then NMFS should not be including a 7-month timeframe for the Navy to conduct its activities in the final rule.

Uncertainty in density estimates

Uncertainty in general—The Navy estimated marine mammal densities in GOA based on (1) models that use direct survey sighting data and distance sampling theory, (2) models that use known or inferred habitat associations to predict densities (e.g., relative environmental suitability (RES) models), typically in areas where survey data are limited or non-existent, or (3) extrapolation from neighboring regional density estimates or population/stock assessments based on expert opinion (Department of the Navy 2014e). The Navy acknowledged that estimates from both RES models and extrapolated densities include a high degree of uncertainty (Department of the Navy 2014e), but it does not appear that the Navy included measures of uncertainty (e.g., standard deviation, coefficient of variation (CV), etc.) in those estimates.

For GOA, the Navy based some of its densities on stratified design-based estimates from Rone et al. (2014), which is a more preferred approach than RES models and extrapolated estimates. However, the CVs were quite large in some instances. For example, the densities for killer whales were 0.005 (CV=0.60) for the inshore stratum, 0.002 (CV=0.77) for the offshore stratum, 0.002 (CV=0.77) for the seamount stratum, and 0.020 (CV=1.93) for the slope stratum. Using only the mean densities would likely result in an underestimation of takes due to the CVs being so much greater than the mean point estimates. The abundance estimates for unidentified large whales also were prorated among blue, fin, and humpback whales within each stratum and incorporated proportionally into each species' density estimate. A high level of uncertainty and variability is inherent in using such prorated methods. In addition, the Rone et al. (2014) data were collected in summer (23 June–18 July 2013) but were considered representative of year-round densities, which may be relevant if the Navy would be conducting the activities only in July but likely would not be

[2] Although those generally are defined as either two (cold and warm) or four (winter, spring, summer, and fall) seasons, the Navy also could have averaged the environmental data for the timeframe of activities (April–October) since it did not include seasonality in its density estimates.
[3] Defined as December–May.
[4] Based either on the worst-case scenario or on averaging of the relevant months.

representative of other seasons, especially during the cold season. Further, some density estimates were based on data from Waite (2003) that included (1) a single sighting, for which the Navy noted that confidence in the density value was low and/or (2) f(0) and g(0) values derived from other surveys in the North Pacific[5] (Department of the Navy 2009).

The Commission understands that density data are not available for all areas where, or times when, activities may occur and that even when such data are available the densities could be underestimated if associated CVs are large. However, the Commission continues to believe that action proponents, including the Navy, should use the best available density estimate plus some measure of uncertainty (e.g., mean plus two standard deviations, mean plus the coefficient of variation, the upper limit of the confidence interval) in those instances. NMFS indicated in the preamble to the NWTT final rule that adjusting the mean density estimates would result in unreasonable take estimates, particularly given the high CVs associated with most marine mammal density estimates. However, it is that high level of uncertainty that the Commission believes should have been incorporated to better estimate the numbers of animals that could be taken. While NMFS surmised that interannual variability was the cause for the large CVs for NWTT, Rone et al. (2014) indicated that it is actually the small sample sizes that typically result in large uncertainty around the density estimates. Furthermore, Rone et al. (2014) did not correct the density (or abundance) estimates for the proportion of animals missed on the transect line (g(0)), which also results in an underestimation of densities. Therefore, the Commission recommends that NMFS require the Navy to (1) account for uncertainty in its density estimates for all species by using the upper limit of the 95% confidence interval or the arithmetic mean plus two standard deviations and (2) then re-estimate the numbers of takes accordingly.

Pinniped densities—Similar to estimating cetacean densities, the Navy used data from Rone et al. (2014) to estimate densities of northern fur seals. Those data likely under-represent densities for the summer timeframe[6] in which activities were proposed to occur. Adult males usually are on shore at the Pribilof Islands from May–August (some remain until November), while most adult females are on or near the Islands from June–November (Roppel 1984). Adult males may move south into GOA or the North Pacific Ocean or north into the Bering Sea in fall, while adult females, pups, and juveniles[7] move south and remain at sea until at least the next breeding season. Because the Rone et al. (2014) study occurred from late June through July, most of the spring/summer migration of fur seals through the Gulf of Alaska to the Pribilof Islands was likely missed. Even if the Navy incorporated the available CVs from the Rone et al. (2014) data, the Commission believes that the densities would be underestimated, especially given that g(0) values also were not incorporated into northern fur seal density estimates.

The Commission indicated in its 2014 letters regarding the proposed activities in GOA, and various letters regarding activities in NWTT, that movements of northern fur seals have been investigated using satellite-linked telemetry from adult females (Ream et al. 2005, Melin et al. 2012, Pelland et al. 2014, Sterling et al. 2014), adult males (Sterling et al. 2014), and pups (Lea et al. 2009).

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[5] Waite (2003) did not provide survey-specific f(0) and g(0) values; therefore, those values originated from other surveys that occurred in the North Pacific. Waite (2003) data also were collected in summer (June and July) but were applied to other seasons.

[6] Defined as April–October in the DSEIS.

[7] Young animals typically begin returning to breeding islands when 1 to 3 years old.

The Commission further suggested that those telemetry and dispersion data, in addition to unpublished data from the National Marine Mammal Laboratory (NMML), could be scaled to the population for a better approximation of density. Accordingly, the Commission recommends that NMFS require the Navy to consult with scientists at NMML to revise its northern fur seal density estimates by using movement and dispersion data from tagged fur seals specific to the study area and the timeframe of the activities and scaling those data to the population.

For estimating Steller sea lion and elephant seal densities, the Navy used abundance data from stock assessment reports divided by an area[8]. The Navy cited Angliss and Allen (2009) for the combined Steller sea lion abundance estimate. However, those abundance estimates have increased (see Allen and Angliss (2015) for the most current abundance estimates) since the 2008 stock assessment report[9]. For elephant seals, the Navy indicated that only male elephant seals migrate as far north as GOA during foraging trips based on information collected from extensive satellite tagging studies (LeBoeuf et al. 2000) and, thus, included only males in its density estimate. The Navy apparently misinterpreted LeBoeuf et al. (2000), as Figures 1 and 12 depict female elephant seals in GOA. In addition, to account for males at rookeries that were not counted and an increase in the population since 2005, the Navy doubled the number of males and juveniles reported in the stock assessment report (3,815; Angliss and Allen 2009) to 7,630. Although the Navy included such a correction, it still has underestimated the abundance of elephant seals by not including females and using an outdated abundance estimate.

Due to similar issues with pinniped densities for NWTT, the Commission suggested that the Navy update its Steller sea lion abundance estimate and contact NMML regarding unpublished satellite telemetry data[10] that could be used to better determine the area of Steller sea lion occurrence. For elephant seals, the Commission suggested the Navy use Robinson et al. (2012), which provided more recent satellite-linked telemetry data on dispersion and movements of female northern elephant seals similar to those of LeBoeuf et al. (2000) but more extensive in nature. Those suggestions, and ultimately recommendations, were made for GOA in 2014 as well. Accordingly, the Commission again recommends that NMFS require the Navy to (1) revise its Steller sea lion abundance estimate to include updated abundance data from Allen and Angliss (2015) and consult with scientists at NMML[11] regarding unpublished data to revise its Steller sea lion densities and (2) revise its northern elephant seal abundance estimate to include both updated abundance data from Allen and Angliss (2015) and data for female elephant seals and incorporate data from Robinson et al. (2012) into its estimates of northern elephant seal densities—a similar method as suggested for northern fur seals of scaling movement and dispersion data from tagged animals to the population

[8] The area of the TMAA is approximately 87,250 km^2, which represents 6.25% of the entire GOA Large Marine Ecosystem as defined by the National Oceanic and Atmospheric Administration (approximately 1,396,800 km^2, not including inland passages). That scaled area was used in combination with abundance estimates to derive the various density estimates.

[9] Although the Navy did correctly include animals from the Gulf of Alaska, southeast Alaska, and British Columbia rookeries in it density estimates, it indicated in the Steller sea lion introduction in Department of the Navy (2014e) that only individuals from the eastern stock were expected to occur in the study area. The Commission notes that individuals from the Gulf of Alaska rookeries are part of the western, not the eastern stock.

[10] The Commission understands it is difficult to determine densities when the best available data are not published. Accordingly, the Commission recommended in its 3 April 2014 letter regarding the 2013 stock assessment reports that NMFS, including NMML, make every effort to ensure that data collected on at-sea distribution and movements of pinnipeds are made available in a timely manner and to a broad audience.

[11] The Commission has provided contact information for the appropriate scientists at NMML.

could be used for Steller sea lions and elephant seals as well. NMFS did indicate in the preamble to the NWTT final rule that the Commission's recommended scaling method may be investigated in the future as the science and methodology evolve and that NMFS, along with the Navy, will continue to work with researchers and scientists at NMML in the development of future at-sea analyses. The Commission would welcome a meeting to discuss the Navy's density estimates prior to the publication of the Navy's Phase III draft EISs and rulemakings.

Criteria and thresholds

The Navy proposed to estimate the numbers of takes resulting from its activities by adjusting received sound levels at different frequencies based on the hearing sensitivity of various groups of marine mammals at those frequencies. The adjustments were based on "weighting" functions derived by Southall et al. (2007) and Finneran and Jenkins (2012; Type I and Type II weighting functions, respectively). Type I weighting functions (see Figure 1 in Southall et al. 2007) are flat over a wide range of frequencies and then decline at the extremes of the animal's hearing range. Type II weighting functions (Finneran and Jenkins 2012) are used only for cetaceans and combine the precautionary Type I curves developed by Southall et al. (2007) with equal loudness weighting functions derived from empirical studies of bottlenose dolphins (Finneran and Schlundt 2011).

The Commission considers the theory behind those weighting functions to be reasonable. Essentially, Type II weighting functions lead to an increase in sensitivity at certain frequencies, effectively lowering the sound exposure level (SEL) thresholds by 16–20 dB compared to the Type I weighting functions (see Figures 2 and 6 of Finneran and Jenkins (2012)). For sonar-related activities, Finneran and Jenkins (2012) reduced the TTS thresholds for acoustic sources for low- and mid-frequency cetaceans by 17 dB[12]. Because data are lacking for TTS thresholds for high-frequency cetaceans exposed to acoustic (i.e., tonal) sources, Finneran and Jenkins (2012) added a 6-dB correction factor to the TTS threshold derived from exposure to non-explosive impulsive sources (i.e., from airguns). Finneran and Jenkins (2012) ascribed the 6-dB difference to the method outlined in Southall et al. (2007). However, as the Commission previously has noted, Southall et al. (2007) did not use a 6-dB correction factor to extrapolate from impulsive to acoustic thresholds[13], but rather to estimate PTS thresholds from TTS thresholds based on peak pressure levels.

The Commission assumes that Finneran and Jenkins (2012) incorrectly provided Southall et al. (2007) as the justification for the 6-dB correction factor[14] that actually originated from the same beluga whale that participated in the Schlundt et al. (2000) and Finneran et al. (2002) experiments. If that is the case and the explosive threshold of 164.3 dB re 1 μPa^2-sec (based on Lucke et al. (2009) and used in Finneran and Jenkins (2012)) was thereby increased by 6 dB, the resulting unadjusted TTS threshold would be 170.3 dB re 1 μPa^2-sec for acoustic sources. That threshold then should have been adjusted by 19.4 dB to yield a TTS threshold[15] of 151 rather than 152 dB re 1 μPa^2-sec.

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[12] Assuming they rounded up from 16.5 dB.
[13] Southall et al. (2007) indicated that the TTS threshold for non-pulse (acoustic) sources was 12 dB greater than for pulse (explosive) sources based on SELs (195 dB re 1 μPa^2-sec based on mean data from Schlundt et al. (2000) vs 183 dB re 1 μPa^2-sec based on a single beluga data point from Finneran et al. (2002) and a 3-dB Type I weighting adjustment, respectively).
[14] Which also was used for pinnipeds.
[15] Which served as the basis for the PTS threshold.

Similar adjustments should have been made to the explosive threshold as well, which also served as the basis for the PTS and behavioral thresholds.

Based on the preamble to the NWTT final rule, it appears that NMFS misunderstood the Commission's previous recommendations, specifically those directed at revising the thresholds by 1 dB. NMFS indicated that a simple 19.4-dB adjustment to the thresholds presented in Southall et al. (2007) was not appropriate. However, the Commission never indicated that any adjustment to thresholds from Southall et al. (2007) were to be made. Further, NMFS stated that it was confident that the thresholds and criteria used in the NWTT analysis have already incorporated the correct balance of conservative assumptions that tend towards overestimation in the face of uncertainty. The Commission never questioned the conservative nature of the thresholds, it questioned the accuracy of the thresholds based on the purported derivation method in Finneran and Jenkins (2012). Thus, the Commission recommends that NMFS require the Navy to (1) include the appropriate justification for its use of the 6-dB extrapolation factor between explosive and acoustic sources rather than Southall et al. (2007), (2) use 151 rather than 152 dB re 1 μPa^2-sec as the TTS threshold for high-frequency cetaceans exposed to acoustic sources, (3) use 145 rather than 146 dB re 1 μPa^2-sec as the TTS threshold for high-frequency cetaceans for explosive sources, and (4)(a) based on these changes to the TTS thresholds, adjust the PTS thresholds for high-frequency cetaceans by increasing the amended TTS threshold by 20 dB for acoustic sources and 15 dB for explosive sources and (b) adjust the behavioral thresholds by decreasing the amended TTS thresholds by 5 dB for explosive sources.

Mitigation and monitoring measures

Ranges to impact criteria—Many of the proposed activities involve mitigation measures that currently are being implemented in accordance with previous environmental planning documents, regulations, or consultations. Most of the mitigation zones for activities involving acoustic (e.g., mid- and high-frequency active sonar) or explosive sources (e.g., underwater detonations, explosive sonobuoys, surface detonations) were designed originally to reduce the potential for onset of TTS. For its LOA application, the Navy revised its acoustic propagation models by updating hearing criteria and thresholds and marine mammal density and depth data. Based on the updated information, the models now predict that for certain activities the ranges to onset of TTS are much larger than those estimated previously. Due to the ineffectiveness and unacceptable operational impacts associated with mitigating those large areas, the Navy indicated it is unable to mitigate for onset of TTS for every activity. For that reason, it proposes to base its mitigation zones for each activity on avoiding or reducing PTS out to the predicted maximum range of effects.

Table 11-1 in the LOA application lists the Navy's predicted distances or ranges over which PTS and TTS might occur and the recommended mitigation zones. Rather than include all sources, the table categorizes sound sources by a representative source type within a source bin (e.g., Bin MF1: SQS-53 antisubmarine warfare hull-mounted sonar) and provides average and maximum distances from the sound source at which PTS could be expected to occur and the average range at which TTS could be expected to occur. Chapter 6 of the LOA application also includes tables listing various ranges. However, the tables in Chapter 6 include (1) only a subset of the proposed activities (5 of the 8 explosive activities analyzed, Table 6-14), some of which are not relevant to GOA (Bin E3), (2) the average rather than maximum ranges (Table 6-14), (3) nominal values for deep water offshore areas, not specific to GOA (Table 6-14), and (4) values that are not consistent with Table

11-1. Specifically, the average ranges to PTS and TTS for Bin E12 in Table 6.14 were listed as 485 and 1,760 m, respectively, but in Table 11-1 they were 906 m and 2,300 m, respectively. Of greater concern, is that the average ranges to the various thresholds in Table 6.14 of the LOA application and Table 3.8-18 of the DSEIS do not comport but are both apparently based on the average approximate range to effects. In addition, the LOA application does not provide the ranges to PTS for acoustic sources for more than 1 ping (Table 6-9), as it does for TTS (i.e., 1, 5, and 10 pings; Table 6-10). Instead, the Navy assumed that it was unlikely that marine mammals could maintain a speed of 10 knots parallel to the ship and receive adequate energy over successive pings that would result in PTS. Further, the Navy indicated in Table 6-9 that the ranges to PTS for acoustic sources were "within representative ocean acoustic environments" and in Table 6-10 that the ranges to TTS for acoustic sources were "over a representative range of ocean environments", which the Commission assumes as not specific to GOA[16].

Absent GOA-specific information, the LOA application process is not fully transparent and the Commission and public cannot comment on the appropriateness of the proposed mitigation zones. Although NMFS indicated in its preamble to the NWTT final rule that it believes that the representative sources provide adequate information to analyze potential effects on marine mammals, NMFS still did not address the appropriateness of the actual mitigation zones based on those ranges to effects. Essentially, it is unclear if the Navy's effects analysis, which estimated the numbers of takes and accounted for environmental conditions in GOA, reflects the ranges to those effects as stipulated in the various tables in the LOA application. Those tables appear to be based on generalized ranges not specific to GOA. Thus, the take estimates appear to be site-specific but the ranges to effects and mitigation zones are not. To address these ongoing issues, the Commission recommends that NMFS require the Navy to provide the predicted average and maximum ranges for all impact criteria (i.e., behavioral response, TTS, PTS, onset slight lung injury, onset slight gastrointestinal injury, and onset mortality), for all activities (i.e., based on the activity category and representative source bins and including ranges for more than 1 ping), and for all functional hearing groups of marine mammals within GOA.

Passive and active acoustic monitoring—The Navy indicated in its LOA application that the use of lookouts (i.e., observers) is expected to increase the overall likelihood that certain marine mammal species will be detected at the surface of the water, when compared to the likelihood that those same species would be detected if lookouts are not used. It also noted that lookouts would not always be entirely effective at avoiding impacts on all species due to the various detection probabilities, levels of experience, and dependence on sighting conditions. The Commission agrees and has made numerous recommendations to the Navy in previous letters related to the effectiveness of visual monitoring.

For a number of years, the Navy has been working with collaborators at the University of St. Andrews to study observer effectiveness. The Navy has noted in the DSEIS that while data were collected as part of a proof-of-concept phase, those data are not fairly comparable as protocols were being changed and assessed, nor are those data statistically significant. The Commission understands those points but believes the basic information the studies provide is useful. In one instance, the marine mammal observers (MMOs) sighted at least three marine mammals at distances of less than 914 m (i.e., within the mitigation zone for mid-frequency active sonar for cetaceans), which were not

[16] Unlike Table 3.8-18 in which the Navy indicated the ranges to effects were for marine mammals within the study area.

sighted by Navy lookouts (Department of the Navy 2012). In other instances, MMOs sighted a group of approximately 3 dolphins at a distance of 732 m (Department of the Navy 2014b), a group of approximately 20 dolphins at a distance of 759 m (Department of the Navy 2014d), and a group of approximately 9 pilot whales at a distance of 383 m (Department of the Navy 2014c)—none of which were documented as having been sighted by the Navy lookouts. Further, MMOs have reported marine mammal sightings not observed by Navy lookouts to the Officer of the Deck, presumably to implement mitigation measures (Department of the Navy 2010). Neither details regarding those reports nor raw sightings data were provided to confirm this. The Commission believes that the study will be very informative once completed and that those preliminary data provide an adequate basis for taking a precautionary approach in the interim.

Accordingly, the Commission continues to believe that rather than simply reducing the size of the zones it plans to monitor the Navy should supplement its visual monitoring efforts with other monitoring measures. The Navy did propose to supplement visual monitoring with passive acoustic monitoring during activities that generate impulsive sounds (primarily explosives) but not during mid- and high-frequency active sonar. The Navy also uses visual, passive acoustic, and active acoustic monitoring during Surveillance Towed Array Sensor System Low Frequency Active[17] sonar activities to augment its mitigation efforts over large areas. It is not clear why the Navy would not use those same monitoring methods as part of its mitigation measures for the other activities described in its LOA application. NMFS indicated in the preamble to the NWTT final rule that the Navy does not have the resources to construct and maintain passive acoustic monitoring systems for each training and testing activity but did not address the use of active acoustics. The Commission would like to clarify that in its previous letters it did not intend to indicate that passive acoustic monitoring should be used for each training and testing activity but rather for those activities that could cause PTS, injury, or mortality beyond those in which passive acoustic monitoring is already proposed for use. Therefore, the Commission again recommends that NMFS require the Navy to use passive and active acoustic monitoring, whenever practicable, to supplement visual monitoring during the implementation of its mitigation measures for all activities that could cause PTS, injury, or mortality beyond those explosive activities for which passive acoustic monitoring already was proposed.

Request for Level A harassment and mortality takes

The Navy proposed an additional post-model analysis of acoustic and explosive effects to include (1) animal avoidance of repeated sound exposures, (2) sensitive species avoidance of areas of activity before a sound source or explosive is used, and (3) effective implementation of mitigation measures. That analysis reduced the model-estimated numbers of Level A harassment (i.e., PTS and injury) and mortality takes.

The Navy assumed that marine mammals likely would avoid repeated high-level exposures to a sound source that could result in injuries (i.e., PTS). It therefore adjusted its estimated numbers of takes to account for marine mammals swimming away from a sonar or other active source and away from multiple explosions to avoid repeated high-level sound exposures. The Navy also assumed that harbor porpoises and beaked whales would avoid certain training activity areas because of high levels of vessel or aircraft traffic occurring before those activities. For those types of

[17] SURTASS LFA.

activities, the Navy appears to have reduced the model-estimated takes from Level A harassment (i.e., PTS) to Level B harassment (i.e., TTS) during use of sonar and other active acoustic sources and from mortality to Level A harassment (i.e., injury) during use of explosive sources. The Commission recognizes that, depending on conditions, marine mammals may avoid areas of excessive sound or activity, but knows of no scientifically established basis for predicting the extent to which marine mammals will abandon their habitat based on the presence of vessels or aircraft. That would be essential for adjusting the estimated numbers of takes. Furthermore, McCarthy et al. (2011; Figure 3) did not show that beaked whales left the area prior to initiation of sonar use and while vessels and aircraft were mobilizing for the activities[18], rather the whales were assumed to move away[19] from the source after the sound source had been turned on.

The Navy also indicated that its post-model analysis considered the potential for mitigation to reduce PTS from exposure to sonar and other active acoustic sources and injuries (presumably including PTS as well) and mortality from exposure to explosive sources. Clearly, the purpose of mitigation measures is to reduce the number and severity of takes. However, the effectiveness of the Navy's mitigation measures has not been demonstrated and remains uncertain. This is an issue that the Commission has raised many times in the past, and the Navy has recognized the need to assess the effectiveness of its mitigation measures in its Integrated Comprehensive Monitoring Program, DSEIS, and LOA application. That application stated that although the use of lookouts was expected to increase the likelihood that marine species would be detected at the water's surface, it was unlikely that using those lookouts would help avoid impacts on all species because of the inherent limitations of visual monitoring.

According to data in the monitoring reports mentioned previously (Department of the Navy 2010, 2012, 2014b, 2014c, 2014d), the effectiveness of the lookouts has yet to be determined. However, the Navy proposed to adjust its take estimates based on both mitigation effectiveness scores and g(0)—the probability that an animal on a vessel's or aircraft's track line will be detected. According to its proposed approach, for each species the Navy would multiply a mitigation effectiveness score and a g(0) to estimate the percentage of the subject species that would be observed by lookouts and for which mitigation would be implemented, thus reducing the estimated numbers of marine mammal takes for Level A harassment and mortality (explosive sources only). The Commission understands the Navy would reduce the estimated numbers of Level A harassment (i.e., PTS and injury) and mortality takes for that species to Level B (i.e., TTS) takes.

To implement that approach, the Navy assigned mitigation effectiveness scores of—

1 mitigation is considered fully effective if the entire mitigation zone can be observed visually on a continuous basis based on the surveillance platform(s), number of lookouts, and size of the range to effects zone;

0.5 mitigation is considered mostly effective if (1) over half of the mitigation zone can be observed visually on a continuous basis or (2) there is one or more of the scenarios within the activity for which the mitigation zone cannot be observed visually on a continuous basis (but the range to effects zone can be observed visually for the majority of the scenarios); or

[18] Specifically for a Submarine Commanders Course exercise.
[19] Based on the absence of vocalizations heard on a bottom-mounted hydrophone array.

N/A mitigation is not considered as an adjustment factor if (1) less than half of the mitigation zone can be observed visually on a continuous basis or (2) the mitigation zone cannot be observed visually on a continuous basis during most of the scenarios within the activity due to the type of surveillance platform(s), number of lookouts, and size of the mitigation zone.

The difficulty with this approach is in determining the appropriate adjustment factors. Again, the information needed to judge effectiveness has not been made available. The Navy also has not provided the criteria (i.e., the numbers and types of surveillance platforms, numbers of lookouts, and sizes of the respective zones) needed to elicit the three mitigation effectiveness scores. Moreover, measures of effort (i.e., numbers and types of surveillance platforms, numbers of lookouts, and sizes of mitigation zones) are not necessarily measures of, or even linked to, effectiveness. As previously discussed, the Navy also has not demonstrated the effectiveness of the visual monitoring measures. The Navy further reinforced that point in its DSEIS through statements that it is improper to use the proof-of-concept data to draw any conclusions on the effectiveness of Navy lookouts.

The information that the Navy provided in Chapter 11 of its LOA application and Chapter 5 of its DSEIS regarding the effectiveness of various mitigation measures does not necessarily comport with its determination of mitigation effectiveness scores. For example, the Navy indicated that bombing exercises involve the aircraft firing munitions at a target and that it is highly unlikely that anything but a whale blow or large pod of dolphins would be seen at distances closer to 2.3 km[20] near the perimeter of the mitigation zone. Therefore, the Commission is unsure why the Navy would reduce any take estimates based on mitigation measures that are, as the Navy itself states, likely not fully effective and how, given the unlikelihood of sighting them, the Navy would implement a shut down or delay for small groups of odontocetes or for pinnipeds in general. Nevertheless, in this example, the Navy assigned a mitigation effectiveness score of 1, apparently assuming that the mitigation would be fully effective (Table 3.8-19 in the DSEIS). Those effectiveness scores again are measures of effort rather than true effectiveness.

In addition, the Navy appears to be inconsistent in its use of the terms "range to effects zone" and "mitigation zone," which are not the same (see Table 11-1 of the LOA application). More importantly, some of the mitigation zones may be smaller than the estimated range to effects zones. For example, the Navy proposed a mitigation zone of 183 m after a 10 dB reduction in power for its most powerful active acoustic sources (e.g., Bin MF1) and assumed that marine mammals would leave the area near the sound source after the first few pings. However, the Navy did not present data on the range to onset PTS for more than 1 ping and only provided data for "representative ocean acoustic environments", which may or may not be representative of GOA. It also is unclear how the Navy evaluated sources that have a typical duty cycle of several pings per minute (i.e., dipping sonar), as the range to onset PTS for those sources appears to be based on 1 ping as well (compare Tables 6-9 and 11-1). Without the relevant information, mitigation based on those zones cannot be evaluated fully or deemed effective, and therefore assigning mitigation effectiveness scores is inappropriate.

[20] Similarly, the Navy indicated it was unlikely to see anything but a whale blow or large pod of dolphins at distances closer to 1.9 km near the perimeter of the mitigation zone during sinking exercises.

The Navy used numerous references to estimate species-specific g(0) values based on both vessel- and aircraft-based scientific surveys of marine mammals (Table 6-7)—the Commission notes that g(0) values for various species have been updated by Barlow (2015). The Navy indicated that various factors are involved in estimating g(0), including sightability and detectability of the animal (e.g., behavior and appearance, group size, blow characteristics), viewing conditions (e.g., sea state, wind speed, wind direction, wave height, and glare), the observer's ability to detect animals (e.g., experience, fatigue, and concentration), and platform characteristics (e.g., pitch, roll, speed, and height above water). In its LOA application, the Navy noted that due to the various detection probabilities, levels of experience, and dependence on sighting conditions, lookouts would not always be effective at avoiding impacts on all species. Yet it based its g(0) estimates on data from experienced researchers conducting scientific surveys, not on data from Navy lookouts whose effectiveness as observers has yet to be determined. The Commission recommended earlier in this letter that the Navy supplement its mitigation and monitoring measures because the observer effectiveness study has yet to be completed or reviewed. It therefore would be inappropriate for the Navy to reduce the numbers of takes based on the proposed post-analysis approach because, as described, it does not address the issue of observer effectiveness in development of mitigation effectiveness scores or g(0) values. Further, since the Navy believes that it also would be improper to use the proof-of-concept data, the applicable data do not exist at the current time to fulfill the Navy's post-analysis objective.

The Navy did indicate that, although distinct differences between marine mammal surveys and the proposed training activities exist, the use of g(0) as an approximate sightability factor for quantitatively adjusting model-estimated takes based on implementation of mitigation (mitigation effectiveness multiplied by g(0)) is an appropriate use of the best available science based on the way it has been applied. Consistent with its impact assessment processes, the Navy applied g(0) values in a conservative manner (erring on the side of overestimating the number of impacts) to adjust model-estimated takes within the applicable mitigation zones during training activities. That reasoning is unsupported by facts stated within the DSEIS itself. For example, the mitigation zone for sinking exercises is 4.6 km with one lookout stationed on a vessel and one in an aircraft. The range to observe a whale blow or large pod of dolphins as stated by the Navy is 1.9 km, and the mortality zone is less than 260 m[21], yet the Navy assigned a mitigation effectiveness score of 1—fully effective. The Commission is concerned that the Navy not only is applying g(0) values based on experienced scientists and not lookouts—who according to the Navy have less experience detecting marine mammals than marine mammal observers used for line-transect surveys—but also believes that mitigation can be implemented at ranges beyond its stated visual limits.

In responding to the Commission's concerns in the preamble of the NWTT final rule, NMFS directed the Commission to NWTT's post-model quantitative analysis of animal avoidance behavior and mitigation effectiveness technical report (TR; Department of the Navy 2014f) that provided additional details regarding how the avoidance and mitigation factors were used and scientific support from peer-reviewed research. A similar report was prepared for GOA. Although the TRs provided examples of how the mortality, injury, and PTS takes were reduced numerically, they did not provide additional scientific support for those reductions and contained much of the same information (albeit slightly amended) as the associated LOA applications and EISs. NMFS indicated in its response that it believes that the post-modeling analysis is an effective method for

[21] Based on Table 6-14 of the LOA application.

quantifying the implementation of mitigation measures to reduce impacts on marine mammals and the science regarding the avoidance of sound sources by marine mammals which cannot be captured within the modeling process itself, and that the resulting exposure estimates are, nevertheless, a conservative estimate of impacts on marine mammals from the Navy's proposed activities. The Commission finds no scientific basis for NMFS's supposition that the resulting take estimates are a conservative estimate given that the estimated mortality, injury, and PTS takes have been greatly reduced based on unsubstantiated factors. Given that the Commission's concerns have yet to be assuaged, the Commission again recommends that NMFS authorize the total numbers of model-estimated Level A harassment[22] and mortality takes rather than allowing the Navy to reduce the estimated numbers of Level A harassment and mortality takes based on its proposed post-model analysis.

Possible errors in the take tables

The Commission observed some possible errors in the take tables provided in the Navy's LOA application, DSEIS, and GOA-TR that includes the actual modeled data (Department of the Navy 2014a). The takes in those tables inform NMFS's negligible impact determination analyses. For example, in the GOA-TR, the model-estimated takes for TTS exceed those for behavior for Dall's porpoises (13,532 and 2,198, respectively) exposed to non-impulsive sources (acoustic sources) during training events under Alternative 2[23] (Table 13 in Department of the Navy 2014a), but not for harbor porpoises (0 and 7,411, respectively). The Commission is unsure how the takes would be so much greater for the TTS threshold when it is higher than the behavioral threshold. The Commission is acutely aware that the densities and thresholds do differ for these two species and the thresholds are based on two different metrics, one that accumulates energy over time and one that is based on a maximum sound pressure level. However, the vast difference in the trends for TTS and behavior between Dall's porpoises (six times more TTS than behavioral takes) and harbor porpoises (more than 7,000 behavioral takes and 0 TTS) likely is not based on those factors alone.

One possible explanation is that the Navy used the behavioral response functions (BRF_1 and BRF_2)[24] from Finneran and Jenkins (2012) without updating them with the new weighted TTS thresholds. BRF_1 and BRF_2 were based on the assumption that 50 percent of the exposed animals would exhibit a behavioral response at 165 dB re 1 μPa (based on a basement parameter of 120 dB re 1 μPa and *K* parameter of 45 dB re 1 μPa, see Finneran and Jenkins (2012) for details on the BRF parameters). Because the weighted TTS threshold can be as low as 152[25] dB re 1 μPa^2-sec for high-frequency cetaceans, it is illogical that the behavioral threshold that equates to a 50 percent response would be higher than the TTS threshold. Thus, the current BRFs appear to underestimate the numbers of behavioral takes. BRF_1 and BRF_2 should have been adjusted with more representative values for *K* (and, in turn, the *A* parameter that informs the shape of the curve), and the behavioral takes recalculated accordingly. It also is unclear how there are 0 model-estimated TTS takes for harbor porpoises when the threshold is 152 dB re 1 μPa^2-sec, yet there are 7,000 behavioral takes

[22] PTS and injury, if the latter was reduced as well.
[23] Alternative 1 in the DSEIS and NWTT-TR is the Preferred Alternative, as discussed in the LOA application.
[24] BRF_1 is used for low-frequency cetaceans; while BRF_2 is used for all mid- and high-frequency cetaceans (except beaked whales and harbor porpoises) and pinnipeds.
[25] Which the Commission believes should be 151 dB re 1 μPa^2-sec.

based on the 120-dB re 1 μPa threshold—given that the latter does not accumulate energy over time or up to a 24-hour period.

In addition, there is a fundamental problem in converting between cumulative SEL thresholds for TTS and sound pressure level thresholds for behavior. The Commission believes that the Navy likely assumed the pings emitted from the sound sources were 1 sec in length, thus the sound pressure level and sound exposure level were equivalent. The assumption of a 1-sec ping may be appropriate for some sound sources but likely is not appropriate for all. The Commission had recommended most recently in its 31 March 2014 letter on the proposed rule for the Mariana Islands Training and Testing study area (MITT) that NMFS require the Navy to describe the upper limit of BRF_1 and BRF_2, including whether it assumed a 1-sec ping for all sources. Rather than provide the requested information, NMFS indicated in the preamble to the MITT final rule that the BRFs have been used by the Navy to assess behavioral reactions in marine mammals for several years and are described in greater detail in the Atlantic Fleet Active Sonar Training, the Southern California Range Complex, and the Hawaii Range Complex EISs[26]. Unfortunately, none of those documents provide the requested information nor are they relevant since the TTS thresholds have been amended and weighted based on Finneran and Jenkins (2012). None of the requested information has been provided in Finneran or Jenkins (2012) either. For these reasons, the Commission recommends that NMFS require the Navy to (1) describe the upper limit of BRF_1 and BRF_2, including whether it assumed a 1-sec ping for all sources, (2) explain how 0 TTS and up to 7,000 behavioral takes were model-estimated for harbor porpoises, (3) adjust BRF_1 and BRF_2 with appropriate *K* and *A* parameters based on the basement parameter and the weighted TTS thresholds, and (4) recalculate its behavioral take estimates for all marine mammals exposed to acoustic sources based on those revised BRFs.

The Navy also appears to be rounding down all take numbers from the GOA-TR in its DSEIS and LOA application rather than rounding to the nearest whole number, which the Commission believes was the Navy's policy[27] for species listed under the Marine Mammal Protection Act (MMPA) in its environmental compliance documents for its TAP Program. When determining the population within a modeling area in its GOA-TR, the Navy indicated the total true population is (1) rounded to 1 if the total true population is equal to or greater than 0.05 but less than 1.0 and (2) rounded to the nearest whole number if the total true population is equal to or greater than 1.0. For example, the model-estimated non-TTS (behavioral) takes for Stejneger's beaked whales exposed to non-impulsive sources during training events under Alternative 2 in the GOA-TR was 1,153.95 (Table 13 in Department of the Navy 2014a) but was rounded down to 1,153 in the LOA application (Table 5.2[28]), *Federal Register* notice (Table 13), and DSEIS (Table 3.8-17). Similarly, the model-estimated TTS takes for Stejneger's beaked whales was 0.94 in the GOA-TR (Table 13 in Department of the Navy 2014a) but 0 in the LOA application, *Federal Register* notice, and DSEIS (Tables 5.2, 13, and 3.8-17, respectively).

In response to the Commission's rounding concerns for NWTT, NMFS indicated in the preamble to the final rule that all fractional post-processed exposures for a species across all events

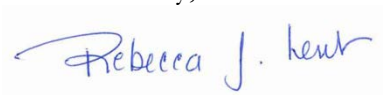
[26] Under its Tactical Training Theater Assessment and Planning (TAP) Program.
[27] And NMFS's policy for other incidental take authorizations.
[28] The Commission understands that Table 5-2 includes takes for exposure to both non-impulsive and impulsive sources, but the model-estimated takes for non-TTS (behavior) and TTS for impulsive sources were both 0.

within each category were summed to provide an annual total predicted number of effects. The final exposure numbers presented in the LOA application and the NWTT final EIS also incorporated post-processed exposure numbers that had been rounded down to the nearest integer so that subtotals correctly sum to total annual effects rather than exceed the already conservative total exposure numbers. The Commission questions that explanation for various reasons.

First, non-TTS (behavioral) takes are not adjusted due to post-processing based on the Navy's post-model analysis method. Second, the meaning of 'correctly sum to total annual effects' is unclear—the Commission is unaware of a total annual effects level that the Navy is trying to meet. However, if the Navy assumes that the total annual effects level for Stejneger's beaked whales was in fact based on the summation of all the estimated takes, the total annual effects would be 1,154.89[29]. Yet only 1,153 takes of Stejneger's beaked whales were included in Table 5.2 of the LOA application[30], hence at least 1 take is missing from the total of 1,154[31]. Thus, it appears that the Navy is rounding down in all cases rather than only to "correctly sum to total annual effects". Third, fractions of animals (essentially, fractions of takes) should not be added to one another across all events (or activities) or be the result of the post-model analysis (Department of the Navy 2014f), because fractions of animals cannot be taken. Given that NMFS uses a 24-hour reset, all take estimates should be based on the numbers of whole animals that can be taken in a given day by each activity. Lastly, it is unclear why a take estimate such as 1,153.95 or 0.94 would ever be rounded down. Accordingly, the Commission recommends that NMFS require the Navy to round its takes based on the model-estimated takes to the nearest whole number or zero for each activity on a given day prior to summing them in all of its take tables.

The Commission hopes you find its letter helpful. Please contact me if you have questions concerning the Commission's recommendations or rationale.

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

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[29] Based on takes of 1,153.95 for behavior and 0.94 for TTS, all other takes were 0.
[30] And Table 13 of the *Federal Register* notice.
[31] Assuming the Navy rounded down from 1,154.89.

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