

## Applicability of NOAA Acoustic Guidelines

|                      | <u>Exposure</u> | <u>Takes</u> |
|----------------------|-----------------|--------------|
| Level A (injury)     | yes             | no           |
| Level B (behavioral) | no              | no           |

Please note that the NOAA Acoustic Guidance only addresses 25% of the datasets inherent in the regulation of seismic operations and at that, the least consequential of the said datasets.

Following From BOEM Application

[http://www.nmfs.noaa.gov/pr/permits/incidental/oilgas/boem\\_2016rule\\_app.pdf](http://www.nmfs.noaa.gov/pr/permits/incidental/oilgas/boem_2016rule_app.pdf)

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There are currently no available robust, quantitative models that fully translate exposures to takes at the broader programmatic and aggregate scale that is the subject of this petition. Notably, BOEM and NMFS are co-funding a research project to develop a model to quantify takes at these aggregate scales, but this model is not available in time for this petition. Refer to the discussion within this section on the “Risk Assessment Framework.”

BOEM believes “exposures” represent the number of times animals may be exposed to sound levels at or above NMFS’ established acoustic criteria, including repeated exposures of the same animal. A “take” represents incidences where these exposures may lead to temporary or

permanent injury to hearing (i.e., Level A Harassment) and/or behavioral disruption (i.e., Level B Harassment). The task of interpreting which ‘exposures’ equate to “takes” is difficult at best, especially for Level B Harassment where there is variability in reactions among species and even individuals within the same species.

Regardless of this challenge, the MMPA requires the identification of the number of individuals that may be taken from an action. To help achieve this end, BOEM (along with NMFS) have used a best available modeling approach to estimate potential “exposures” of marine mammals from the acoustic sources under the proposed action and also applied some newer approaches to modeling to help better predict where “exposures” may equate to “takes.”

It is, however, important to note that modeling results are meant to be precautionary and likely overestimate “exposures” and therefore “takes.” This is partly due to uncertainty and variability with the data inputs and assumptions used in the model, such as

- future technologies and source levels;
- number and exact description of the surveys to be conducted (i.e., current CY 2016 survey activity levels are significantly lower than annual levels predicted in this petition);
- exact location of survey efforts;
- abundance and density information for marine mammals in the GOM; and
- species- and individual-specific behavioral responses to sound.

Additionally, the model is not able to consider the effect of reduction of exposures from any of the 19 mitigation measures analyzed in the associated Draft Gulf of Mexico G&G Programmatic EIS. Nonetheless, BOEM believes this modeling approach to be the best currently available methodology in which to estimate exposures and then interpret potential taking. We do reinforce, however, that modeling inputs and

results are purposely precautionary in order to avoid underestimating potential impacts to marine mammals

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### **Risk Assessment Framework**

As noted previously, there are currently no available robust, quantitative models that fully translate exposures to takes at the broader programmatic and aggregate scale that is the subject of this petition. BOEM and NMFS are co-funding a research project to develop a model to quantify takes at these aggregate scales, but this model is not available in time for this petition. This research project seeks to expand a recently developed Risk Assessment Framework (RAF) from the individual project level to analyses of aggregate and chronic effects. The RAF was developed through a research collaboration of world-leading scientists in underwater sound, marine mammal hearing and marine mammal behavior to provide a novel analytical method to evaluate the effects of human induced noise on marine mammal hearing and behavior. In broad terms, the acoustic RAF considers the results of conventional assessments (e.g., exposure estimates) and through a rigorous analytical methodology, interprets what these estimates mean within the context of key biological and population parameters (e.g., population size, life history factors, compensatory ability of the species, animal behavioral state, source-animal proximity, relative motion, variation in density estimates, and aversion) and other biological, environmental and anthropogenic factors. The end result provides not just the number of exposures, which is what conventional models provide, but instead what these numbers mean biologically for each affected marine mammal stock/population (i.e., severity of impact, and vulnerability of stock/population) as well as the likelihood of any such impact. More information on the existing RAF can be found online at <http://sea->

[inc.net/2016/01/02/b-southall-and-expert-working-group-present-a-risk-assessment-framework-to-assess-the-biological-significance-of-noise-exposure-on-marine-mammals/](http://inc.net/2016/01/02/b-southall-and-expert-working-group-present-a-risk-assessment-framework-to-assess-the-biological-significance-of-noise-exposure-on-marine-mammals/).

BOEM highlights this forthcoming methodology in this petition to both underscore the precautionary nature of the current model and resulting take estimates as well to point to a future methodology that may help to provide a more meaningful biological interpretation of exposures and ultimately more realistic predictions of takes