

high quality and accurate assessment of those effects, and reach reasoned conclusions regarding the effects that are likely to occur.

**b. The effects analysis is arbitrarily biased to unrealistic scenarios that are unsupported by actual data**

The exposure modeling set forth in Appendix D makes many biased assumptions that substantially contribute to the inaccuracy of the DPEIS's effects analysis. Specifically, the modeling analysis in Appendix D contains multiple layers of precaution that aggregate in the annual and 10-year estimates. Attachment A to this letter provides a more detailed assessment of the overly conservative (*i.e.*, unrealistic) assumptions used in the modeling. These assumptions contribute anywhere from 10% to multiple orders of magnitude above the mean or most likely exposures outcome (*i.e.*, 100 to 1,000 times the "most likely" number of exposures). In aggregate, these compounding highly conservative assumptions produce a predicted number of exposures that is thousands to millions of times greater than the average or most likely outcome.

For example, the Phase II model assumes a source array of 8,000 cubic inches. This is at, or very near, the upper limit of the largest source arrays used in the GOM. *See* DPEIS at 3-18, Appx. D at D-25. The actual distribution of array sizes in the GOM ranges from 8,400 cubic inches to less than 2,000 cubic inches, with a mean value of 5,600 cubic inches. The scaling differences in the range to threshold criteria produced by an overestimated array size of 8,000 cubic inches cascade down through the calculations, so that when a threshold range four times larger than produced by a typical survey source is established using hearing injury thresholds 10 or a hundred times lower than actual measured thresholds, and applied to numbers of animals (using the Duke model) that are 10 times higher than any previous estimates, the outcome is a prediction that 10,000 to 100,000 times more exposures might occur than use of the "best available data" values might otherwise have calculated. *See Attachment A*. Instead of this overly precautionary and unrealistic approach, BOEM could have used the data for all array sizes used in the GOM in the past 10 or 20 years, plotted them on a typical bell-shaped curve, and calculated the mean or median and variance or mode.

Another example of excess precaution built into BOEM's effects analysis is found in the values entered into the transmission loss model. On pages D-100 through D-123 of Appendix D, the analysis acknowledges that (1) the "worst case" sound speed profile produces propagation at a given range that is 10 decibels ("dB") better than the average; (2) the actual-versus-modeled bathymetry and bottom properties probably add another 4 dB; and (3) using a smooth rather than wavy ocean surface might add another 1-2 dB over the actual transmission loss. In aggregate, an added 16 dB or so of "precautionary assumptions" translates to sound propagation that would travel more than 10 times farther than the result that would be produced by the "most likely" propagating environment (using a typical hybrid transmission loss value of  $15\log(R)$ ). Again, this single example is combined with other examples of precaution to predict exposure numbers that are thousands to millions of times higher than the most likely outcomes.

Yet another example occurs where the effects of running the animat exposure models for only 24 hours and then scaling those results up to longer survey periods (e.g., 30 days) are assessed in Section 6.5.1. Using this method, the total exposure estimates based on the rms SPL criteria are found to vastly “overestimate the number of animats exposed to levels exceeding threshold...” DPEIS, Appx. D at D-69. Nonetheless, this method is used in Phase II (App. D at D-180) to produce the final exposure estimates (App. D Section 7.3.4).

Section 6.5.2 analyzes potential contributions to uncertainty from the sound source characterization modeling, and from sound speed profiles, geoacoustic parameters, bathymetric data, and sea state inputs to the acoustic propagation modeling. This analysis concludes that the various uncertainties in the acoustic field represent a “multi-dimensional envelope” and that these different dimensions “cannot be summed to yield a ‘total’ uncertainty as this would be a meaningless quantity.” However, this conclusion is incorrect. There are ways to quantify the uncertainty in a meaningful way despite challenges to directly calculating the total uncertainty (or statistical variance). For example, the combined uncertainty contributed by environmental and model parameters could be further evaluated by comparing the outputs from multiple runs of the entire modeling process (both acoustic propagation modeling and exposure modeling) in which one or more of the parameters are adjusted across reasonable levels in each competing model run. The parameter-specific uncertainty analyses presented in Phase I of Appendix D are useful for identifying which parameters to adjust within the competing full modeling runs, but alone they only reinforce the fact that significant uncertainty is present at many steps within the modeling process. Multiple runs of the full modeling process using alternative parameter estimates should be conducted to improve the understanding of the total uncertainty surrounding the final results.

In addition, the analyses set forth in Section 6.5.2 of Appendix D use various methods to assess uncertainty around the parameters used in acoustic propagation modeling. However, in all examples only the “typical” (average or median) and “worst case” values are evaluated. As a result, uncertainties are only characterized in one direction from the typical or expected result, and that direction results in longer-range propagation of sounds. When characterizing uncertainty around estimates, it is common practice to not only report the upper confidence limits (“worst case” results in this example), but to also report the lower confidence limits. Without an understanding of the lower confidence limit values, it is not possible to properly bound and assess the range of outcomes from the modeling and interpret the likelihood of potential impacts. The failure to characterize the lower confidence limits results in a flawed and arbitrary analysis that is significantly biased. BOEM summarizes the significant biases of the modeling as follows:

The existing modeling largely does not account for uncertainty in the data inputs and also selects highly conservative data inputs. This bias often produces unrealistically high exposure numbers and “takes” that exponentially increase uncertainty throughout each step of the modeling. The modeling does not incorporate