

SYNOPSIS OF PRECAUTIONARY ASSUMPTIONS

GULF OF MEXICO DPEIS

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BACKGROUND

The BOEM Gulf of Mexico DPEIS is structurally very similar to most recent NEPA analyses for environmental risk from manmade sound in the marine environment. The interaction of the source, the propagation of the sound from source to animals, and the resulting sound exposures interact to produce a calculated estimate of effect, usually stated as MMPA Level A and Level B “takes”, since the MMPA requires that the impact of an activity be quantified in those terms (NEPA and ESA do not have such strictly numerical requirements for estimating impact).

Historically and in this EIS, each element of the model is assessed relative to the available information and a value is selected that is considered sufficiently conservative or precautionary, given uncertainties about the scientific data or about natural variability in factors such as animal distribution, location and movement of the sound source or the sound propagating properties of the water column. Selection of conservative values in multiple steps of the model leads to an outcome that is not an average of the precautionary assumptions, or even an addition of uncertainty, but multiplication of each uncertainty by the uncertainty in the other steps. Simply put, doubling the expected value for four different parts of the model does not double the outcome, nor does it result in a $2+2+2+2 = 8$ -fold increase in the predicted outcome. Instead the effect of multiple precautions is multiplicative, and the outcome is $2 \times 2 \times 2 \times 2 = 16$ -fold more than if the model was run with ‘most likely’ values like averages. Doubling all values out of precaution therefore does not predict an outcome of 200 takes when 100 was the most likely expected outcome, but instead produces an outcome of 1,600 takes.

As we will see from the following quick-look at the GOM DPEIS, there are many more variables in the model than the simple four variable example described above. And the levels of precaution are not simple doubling of expected values, but multiples that may range from addition of some percentage (less than doubling) to increases that are orders of magnitude greater than the “most reasonable” value (orders of magnitude are multiples of ten, such as 10, 100, 1000, etc.). The downstream consequences are also more complicated than the simple two times two example above, with some variables interacting in other than simple multiplicative ways.

For example, use of an 8000 cubic inch sound source rather than the mean or median of sizes actually used (5,600-5,100 cubic inches) would appear to only create a difference of about 30-37%, but that

difference in size produces a difference in source sound level of 3-6 decibels, depending also on the number of elements in the source array. The difference in source level needs to get translated into a difference in the area covered by the sound from the two different sources, because that will change how many animals are within the two respective areas, all other factors being equal. The 33-37% difference in the size of the two arrays translates into an increase of some 45-50% (roughly) in the area exposed and therefore the number of animals taken. That is, if one uses an 8000 cubic inch array as the precautionary standard and that results in a take estimate of 150 individuals, then use of the more likely mean value of 5,600 cubic inches will result in a take of 100 individuals. Needless to say, this is a pretty large downstream consequence from alteration of a single value by what might superficially look like a pretty small amount. As we will see, factoring in the other parts of the model where similar conservative assumptions are exercised results in a prediction of takes that is millions, possibly billions, of times greater than the outcome predicted by using most likely outcomes only.

[for ease of locating information, references to the DPEIS are to the .paf file page number, not the page numbers on the document itseif]

SUMMARY OF PRECAUTIONARY ASSUMPTIONS IN THE BOEM DPEIS

This list includes only the most obvious and clearly unsupported precautionary assumptions of the model:

- Source
 - Extreme array size and number of elements increases exposures by 1.5 to 2 times.
 - Six additional precautionary assumptions were not analyzed.
- Propagation
 - Conservative or simplifying assumptions about the propagating environment add 10-16 dB minimum to the propagated sound.
 - Combined with the precautionary source assumptions, this results in a 90-120 time increase in estimated takes, all other variables being equal.
 - Six additional precautionary assumptions were not analyzed.
- Animal Abundance, Density and Movements
 - NMFS's Stock Assessment Reports ("SARs") and Duke Model differ on average by a factor of 2. A minimum compromise for uncertainty would be to reduce abundance and density estimates by 25% to 1.5 times SAR.
 - Three specific groups showed even more extreme differences, but were not separated in this simple analysis: expansion of Bryde's whale habitat leading to more takes; large increases in numbers of deep divers (beaked whales, sperm whales, Kogia); extremely large increases in pelagic dolphin numbers (over 80 times for two species)
 - Five additional precautionary assumptions were not analyzed.
- Threshold Criteria
 - Level A calculations from SPLrms and SEL used precautionary assumptions that overestimated take by 10-1,000 times. SPLpeak takes were overestimated at least twofold by using 6 dB instead of 15 dB to derive PTS from TTS.