

WESTERN GRAY WHALE ADVISORY PANEL
5th Meeting

WGWAP 5/20
December 2008
ENGLISH

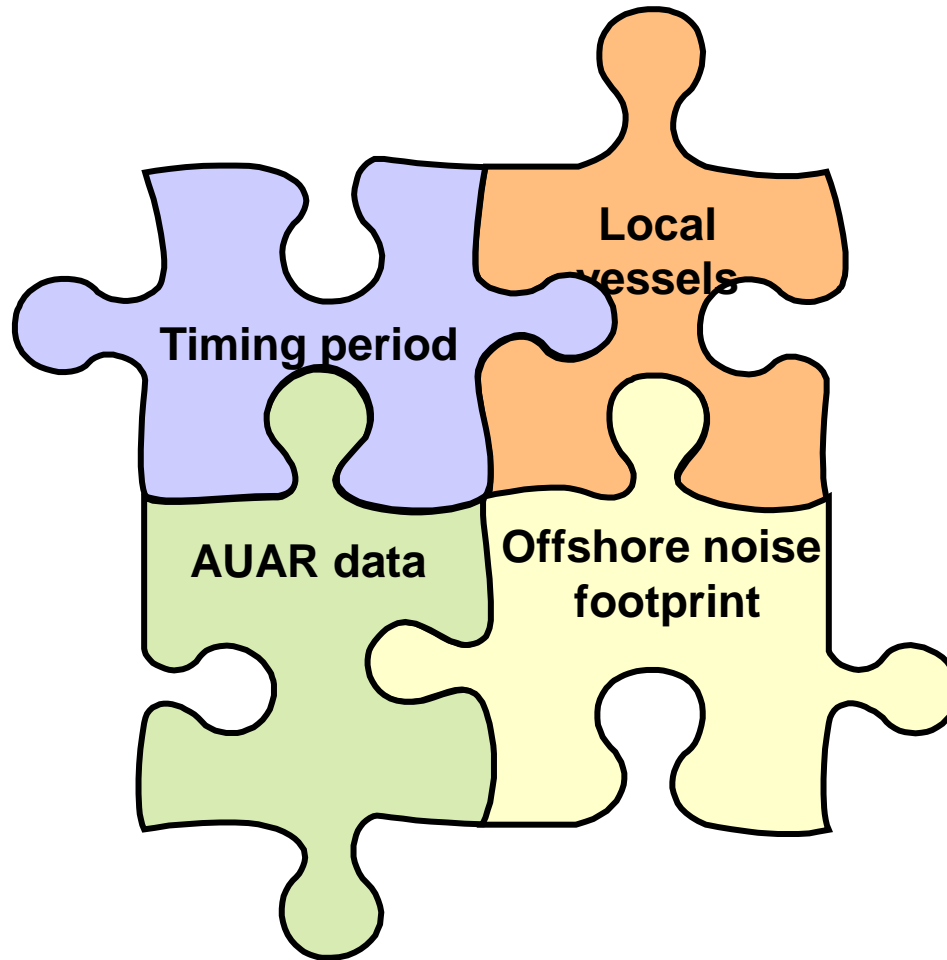
**Estimation of acoustic levels and sound energy exposure at locations of WGW sightings
for input to the 2006 MVA study
Jasco Applied Science
Submitted by SEIC**



Estimation of acoustic levels
and sound energy exposure
at locations of WGW sightings
for input to the 2006 MVA study



Inputs to estimation process



Offshore noise footprint estimation by PE modelling

- Used 10 offshore noise sources scenarios originally defined for pre-season modelling of 2006 operations acoustic footprint
 - Start and end dates as well as some details of vessel spreads composition adjusted post-season to be more representative of actual operations
 - CDPE modelling of scenarios performed for every WGW observation site (at standard depth of 10m) and all AUAR locations (at bottom depth)
-

Local vessels noise level estimation at receiver points

- Precise tracking data for Oparin, Bogorov and photo-ID zodiac from shipboard GPS records
 - Noise level contribution from each vessel in area estimated using empirical $k \cdot \log(r)$ transmission loss law at every WGW sighting site and AUAR location (approach is justifiable because local vessels only dominate noise footprint at relatively close ranges)
 - Contribution from multiple local vessels added to yield local component of noise at every receiver
-

Audio level data from AUAR bottom mounted recorders

- Acoustic levels provided by POI from internal disk based recordings in AUAR devices, at one minute resolution (60-second averages)
 - Used broadband levels computed over frequency range 20Hz-15kHz, thus excluding most of wave and current induced low frequency noise
 - Preprocessed AUAR based data to flag anomalies like “deaf” periods of several minutes every few hours due to internal disk transfers (marked as missing)
-

Time indexed selection of various data inputs

- **For each one-minute interval within time period of interest derive:**
 - Estimated offshore noise level at desired observation site, selected from model results for 10 available source scenarios based on current sample time
 - Estimated aggregate sound level at desired observation site from local vessels for which GPS track data are available, computed through empirical formulae based on distance of vessels and nominal Source Level values
 - Same noise level estimates as above for nearest valid AUAR location to observation site, up to nth nearest AUAR
 - Corresponding received level measured at that AUAR
-

Estimation of received levels at desired observation site

- **As per previous slide we have:**
 - Offshore Level at site (OL_s) – from model
 - Offshore Level at AUAR (OL_a) – from model
 - Vessels Level at site (VL_s) – from transmission formulae
 - Vessels Level at AUAR (VL_a) – from transmission formulae
 - Measured Level at AUAR (ML_a) – from data recordings
 - **Correction factor CF is obtained as:**
 - $CF = ML_a - \text{Sum}(OL_a, VL_a)$
 - **Estimated offshore and local vessel levels at site are:**
 - $EOL_s = OL_s + CF$
 - $EVL_s = VL_s + CF$
-

Computation of time averaged noise level or total energy metric

- For focal follows or tracks, one-minute levels are averaged over bin length of observation (e.g. about 10 minutes for focal follows)
 - For scans, mean acoustic energy in each one-minute interval is summed over a range of periods of interest preceding the observation (2hrs, 8hrs, 1day, 3days)
 - Data availability threshold for cumulative energy: accept up to 20% missing data (e.g. AUAR disk write gaps) and compensate by proportional scaling
-