							Document Reference LF500013-CST-RHD-MEM-0003 / LF600013-CST-RHD-MEM-0002	
Responses to Non- Material Change comments on underwater noise for fish							Page 1 of 3	
Prepared by		Checked by		Approved by		Project Review by		Date of Issue
Fiona Mueller	07.03.2022	Melisa Vural	07.03.2022	Helen Craven	07.03.2022	Rachel Hall	08.03.2022	08.03.2022

Dear Ms Crowhurst,

Dogger Bank Wind Farm ('the applicant') received consultee responses to the Dogger Bank A and B (DBA and DBB) Non-Material Change (NMC) application, for which consultation closed on 11th February 2022. Responses were received from the Marine Management Organisation (MMO), Natural England, The Crown Estate and Trinity House. The latter three did not have any specific comments or objections to the NMC, as such no response to these is provided by the applicant.

Comments from the MMO mostly confirm the approach or provide reference to the relevant guidance. There were, however, two main comments that require clarification which relate to the data used for the density of fish spawning, and the threshold for underwater noise impacts to fish species.

The purpose of this letter is to provide responses to these main queries raised by the MMO.

In addition, the applicant acknowledges that an addendum to the DBA Marine Mammal Mitigation Protocol (MMMP) will be provided to the MMO, should the NMC be granted, to ensure that the mitigation measures account for the latest consented hammer energies. No increase in hammer energies will be utilised at the site until an updated MMMP reflecting the increase in hammer energy has been approved by the MMO. Tables 4-1 and 4-2 of the Site Integrity Plan will also be updated for information purposes. The MMO has endorsed this approach as appropriate.

Stakeholder comments and responses

Point 2 in MMO's response relates to clarifying the data used to determine the distance of the sites from high density spawning grounds and the need to present this in a figure, and states the following:

"The Applicant has stated that the Projects are located 'approximately 80km from the high-density spawning grounds' for Herring, however, it is unclear what data or maps have been used to support a distance of 80km and no supporting information has been provided to contextualise the definition of 'high-density'. Herring do not exhibit spawning site fidelity and the locations of Herring spawning activity are known to vary year on year (see Annex 1 for ICES plots which demonstrate this point), therefore the distance between the Banks Herring spawning ground and the project will also vary inter-annually. The MMO would have expected the Applicant to have used International Herring Larval Survey (IHLS) data to support their assessment, for example, by providing a visual representation of Herring larval densities for the Banks Herring stock over a 10-year period, typically the data are presented in the form of a 'heat map'. The heatmap can then be overlaid with the piling noise contours from the modelling, to show the range of effect from noise in relation to larval densities. IHLS data can be downloaded from Eggs and larvae (ices.dk)."

The applicant has reviewed the IHLS data and mapped these in relation to the Projects, which is provided in **Figure 1**. This shows the predicted noise contours and impact ranges for fleeing and stationary fish at

	Document Reference LF500013-CST-RHD-MEM-0003 / LF600013-CST-RHD-MEM-0002
Responses to Non- Material Change comments on underwater noise for fish	Page 2 of 3

DBA and DBB. The figure demonstrates that based on the underwater noise modelling for both fleeing and stationary fish, there is only a small overlap with areas of very low larval densities. There is no overlap with any of the high larvae density areas therefore confirming the statement in the NMC application that the Projects are located 80km from high-density spawning grounds.

Point 3 in MMO’s response relates to the use of a higher noise threshold level to consider behavioural responses, and states the following:

“The MMO considers that the Applicant should also undertake noise modelling for the received levels of the Single Strike Sound exposure levels (SELs) at the Herring spawning grounds based on 135dB. The use of the 135dB is based on startle responses observed in sprat by Hawkins et al. (2014). Sprat is considered a suitable proxy species for Herring for the purpose of modelling likely behavioural responses in gravid Herring at the spawning ground. It would be useful if the 135dB noise contour was presented in mapped form, i.e., as an additional contour (additional to the 186dB, 203dB and 207dB that have already been modelled.”

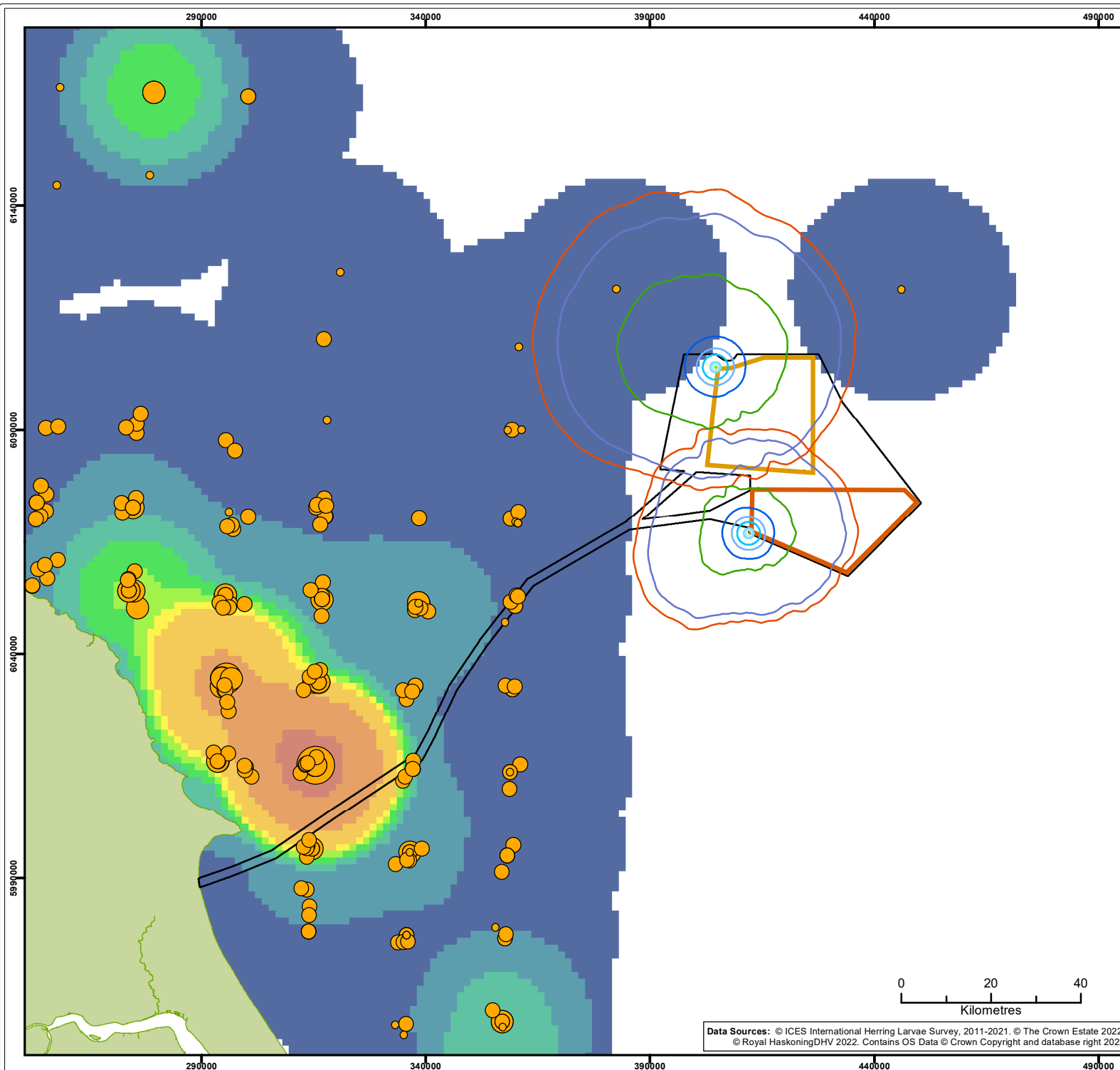
The use of the 135 dB SELs threshold for open water situations is not recommended and reference to the Hawkins et al (2014) study is not considered appropriate in these circumstances. Hawkins et al (2014) acknowledge that “these data cannot yet be used to define the sound exposure criteria” due to the limited nature of the study, clearly implying that their research represents results of one study in specific conditions, which they cannot say is representative of all. They go on to state that “More detailed studies of the behaviour of these species (sprat and mackerel) are required to establish whether the responses observed are likely to result in adverse effects upon the survival of individuals. Examination of the effects of repeated exposure of the same fish to sound is also important.”

Importantly, the study was conducted in a quiet lough. In such a quiet environment, the background noise levels are low. Any reaction by marine wildlife to increased noise generation is relative to and influenced by the existing base noise levels present. The background noise generated in a calm lough environment is far quieter than that generated in the open-water North Sea, and wildlife is much more likely to respond to low dB noise increase because the noise generated is more starkly apparent than in the louder location. It is therefore not appropriate to attempt to translate reaction patterns from one distinct environment to the other distinct environment. This is highlighted by the fact that 135 dB SEL is likely to be only slightly above the background noise level at Dogger Bank, based on measurements at the Hornsea Project Two Offshore Wind Farm. Based on the distance from high larval density areas for these Projects, it is therefore not considered necessary to model the additional contour.

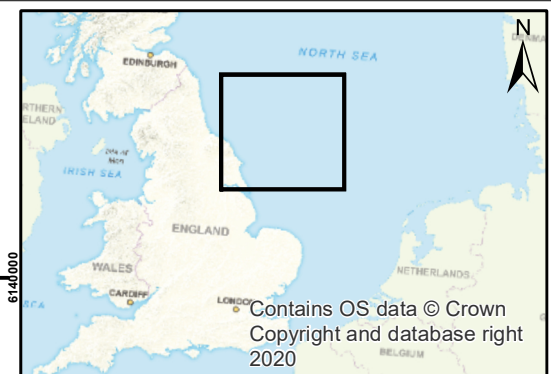
The applicant’s responses above were discussed with the MMO in the last Project update meeting on 24th February 2022. Based on these discussions and the applicant’s responses on these comments, as set out above, they were considered appropriate. As such it is the applicant’s view that no updates to the NMC assessments are needed. Therefore, the NMC application documents and conclusions remain valid.

If you have any questions or require clarifications on the above, please do not hesitate to contact me.

Kind regards,
David Scott



Data Sources: © ICES International Herring Larvae Survey, 2011-2021. © The Crown Estate 2022. © Royal HaskoningDHV 2022. Contains OS Data © Crown Copyright and database right 2022



Contains OS data © Crown Copyright and database right 2020

Legend:

- Dogger Bank - Creyke Beck A
- Dogger Bank - Creyke Beck B
- DCO Order limits
- Average Small Herring Larvae Abundance <11mm - ICES 2011 - 2021
- Density per km²
- Creyke Beck A & B Single Strike SEL at 4000 kJ Unwtd SPLpeak
- Creyke Beck A & B 4000 kJ Unwtd SPLpeak (Fleeting)
- Creyke Beck A & B 4000 kJ Unwtd SPLpeak (Stationary)
- Small Herring Larvae Abundance (n/m²)

Client: Doggerbank Offshore Wind Farm Project 1 Projco Ltd. and Doggerbank Offshore Wind Farm Project 2 Projco Ltd.
 Project: Dogger Bank A & B

Title: Predicted Noise Contours and Impact Ranges for Fleeting and Stationary Fish at the Dogger Bank A & B Wind Farms, Location ID6

Figure: 1 Drawing No:

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	23/02/2022	GC	HC	A4	1:1,200,000

Co-ordinate system: WGS84 UTM31N