



## **Supplementary Environmental Information**

### *Supporting Information on Harbour Porpoises in the Humber Estuary*

#### *Supplementary Report EX 10.5*

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## **SUPPORTING INFORMATION ON HARBOUR PORPOISES IN THE HUMBER ESTUARY**

### **1.1 THE ENVIRONMENTAL STATEMENT**

1.1.1 The Environmental Statement (*Section 10.5.59*) states that:

*“The area around Spurn Head and the outer Humber Estuary is considered to be an important coastal site in England for harbour porpoise. Rare sightings have been reported in the Humber Estuary including in the vicinity of the development site and further upstream.”*

1.1.2 For the purposes of the assessment porpoises have been assumed to occur in the Humber Estuary but that the middle estuary is not their main or a particularly important habitat given:

- their range over the North Sea;
- their diet is not limited to species found only within the Humber Estuary; and
- their rare reported occurrence.

1.1.3 The assessment of the impact of noise on marine mammals depends not only on the characteristics of the source, but also on the characteristics of the surrounding environment, how these affect the sound field and on the species-specific response and sensitivity. Species specific thresholds for damage and behavioural responses have been proposed that are based on an ever increasing body of scientific literature.

1.1.4 *Table 0.1* presents the criteria used in the assessment of noise on harbour porpoise. With two impact piling rigs in operation it is conceivable that the distances at which the criterion for peak noise would be met would be larger. However, this would only occur in the unexpected event that two blows occurred at exactly the same time so that the peak noise would still be within the same order of magnitude. The predictions for the accumulation of energy take into account two rigs. It is noted that, for Harbour porpoise the calculated distances exceed the width of the estuary at the location of AMEP. The area affected outside of the estuary is likely to be limited by the screening effects of estuarine morphological features such as the headland at Spurn Head. The accumulated energy assumes that an animal stays in one place and is subject to noise from a high number of hammer blows per day and so even though it is further away from the noise source than for behavioural effects to occur damage may result; this represents a worst case scenario. An animal that is moving might experience fewer noise events, which would reduce the energy that it experiences.

**Table 0.1**      **Threshold Values Used in the Assessment – Harbour Porpoise**

	Criterion	Distance at Which Criterion Will be Met or Exceeded
Distances at which auditory damage due to the peak noise level is predicted	200 dB re 1 $\mu$ Pa (Peak) *	0-116 m (exceeded)
Distances at which auditory damage due to the accumulation of energy is predicted	179 dB re 1 $\mu$ Pa <sup>2</sup> s (SEL) *	criterion met at up to 25.0 km (for 20,000 pile strikes per day) to 38.6 km (for 40,000 pile strikes per day)
Distances at which behavioural changes are predicted	160 dB re 1 $\mu$ Pa (rms) **	1.7 km (predicted)
* Criterion for permanent threshold shift based on Lucke <i>et al</i> (2009) (1)		
** Criterion for significant behavioural response based on Southall <i>et al</i> (2007) (2) and rms levels derived from Lucke <i>et al</i> (2009) and US NMFS criterion.		

1.1.5      It should be noted that there have been a range of findings regarding avoidance reactions in harbour porpoise and this uncertainty is described in Lucke *et al* (2009). It is noted by the authors that their resulting data may be used as a first indication of a threshold range for behavioural reactions of harbour porpoises, and it has been adopted here since it agrees well with the well-established US NMFS criterion, and represents the best available data. The range of studies that have been referenced by Lucke *et al* also show that observations during wind farm construction showed movements directed away from the construction noise source occurred at up to 15 km, and to the contrary that no reaction to seismic airguns was observed in another study at similar noise levels to those adopted as criteria in this study.

1.1.6      The approach taken for the calculation of the 38.6 km zone (in Table 1.1), in which auditory damage due to the accumulation of energy may occur, is consistent with the framework approach developed by Southall *et al*, and takes a conservative view that the same criterion should apply to a single pulse event as when exposure is the result of

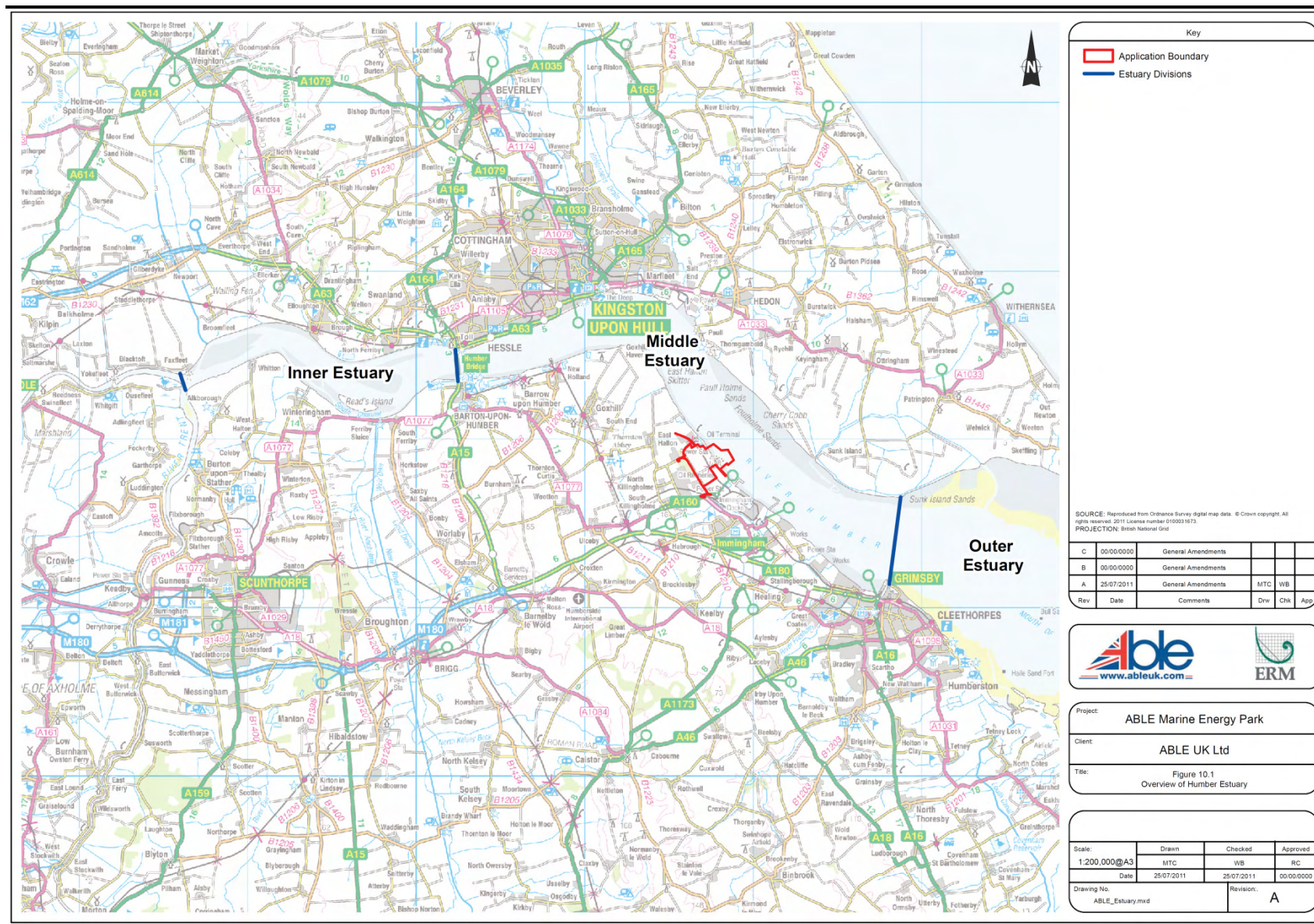
(1) Lucke, Siebert, Lepper, Blanchet (2009) Temporary shift in masked hearing Thresholds in a Harbor Porpoise (*Phocoena phocoena*) After Exposure to Seismic Airgun Stimuli. Acoustical Society of America.

(2) Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas and P.L. Tyack. (2007) Marine mammal noise exposure criteria: initial scientific recommendations. *Aquatic Mammals* 33(4):411-522.

an accumulation of multiple pulses. (This ignores any potential for recovery of hearing between pulses and may over-estimate the ranges generated for auditory damage.)

- 1.1.7 Although auditory damage can potentially occur within a distance of up to 38.6 km from the source, porpoises only change their behaviour at approximately 1.7 km from the noise source. Porpoises may occupy the space between 1.7 km to 38.6 km from noise sources and not be deterred, but yet suffer some physiological damage in the form of permanent hearing damage, especially when the piling noise source is continuous, and individual animals spend a long time within this zone.

*Figure 0.1 Project Location*





## 1.2 *HARBOUR PORPOISE OCCURRENCE IN THE MIDDLE ESTUARY*

1.2.8 There are several sources of distribution data for the harbour porpoise that support the conclusions of the ES. These include:

- Small Cetaceans in the European Atlantic and North Sea (SCANS) I in 1994 and II in 2005;
- Atlas of Cetacean Distribution in northwest European Waters (Reid et al., 2003);
- Sea Watch Foundation ([www.seawatchfoundation.org.uk](http://www.seawatchfoundation.org.uk)); and
- Other internet sources eg news articles.

1.2.9 In general data sources on the harbour porpoise indicate that it is a wide ranging species with year-round distribution in coastal and offshore areas in the North Sea. Although the harbour porpoise is often described as a coastal species in UK waters it is widely distributed over the continental shelf and not particularly concentrated close to the shore <sup>(1)</sup>. Harbour porpoises are a highly mobile species, with individuals moving on a wide scale over a short time as well as large scale population movements over longer (eg decadal) time scales.

1.2.10 The main evidence for only rare sightings in the middle Humber estuary, where the Project is located, is the general low level of recorded sightings and lack of published journal articles on the harbour porpoise in this location. Sightings in the outer estuary (near Spurn Head) and the North Sea, however, are common. For example Marine Life has reported sightings of the harbour porpoise between Immingham in the middle Humber estuary and Cuxhaven in Germany <sup>(2)</sup>. Several harbour porpoises were observed during the trip, including one 20 minutes after leaving Immingham but while still in the estuary. All other sightings between Immingham and Cuxhaven were at Spurn Point, further into the North Sea and towards Europe.

1.2.11 The Atlas of Cetacean Distribution in North-West European Waters <sup>(3)</sup> depicts snapshots of the distribution of the cetaceans that have been recorded in these waters from the latter half of the 20th century. Although care should be taken with interpretation of the monthly

(1)Pinn, E. (2009) Threshold for Designation Of Special Areas of Conservation for Harbour Porpoise and Other Highly Mobile, Wide Ranging Marine Species (Annex 1 to JNCC Committee paper P10Sept08, amended 13 February 2009).

[http://jncc.defra.gov.uk/pdf/JNCC\\_P10Sept08Annex1\\_amendedFeb09.pdf](http://jncc.defra.gov.uk/pdf/JNCC_P10Sept08Annex1_amendedFeb09.pdf)

(2) <http://www.marine-life.org.uk/immingham-cuxhaven>

(3) Reid, J.B., Evans, P.G.H., & Northridge, S.P., (2003), The Atlas of Cetacean Distribution in north-west European Waters. Joint Nature Conservation Committee, Peterborough.

maps <sup>(1)</sup> they show, at a coarse scale, presence of harbour porpoise in the Humber and the North Sea. The only recording of the harbour porpoise in the middle estuary is during the month of September, although it is present in the outer estuary year round.

- 1.2.12 Many of the sightings of the harbour porpoise recorded both in the middle and outer estuary are by the general public. The Sea Watch Foundation collates information provided by the public but has few recordings of the harbour porpoise occurring in the middle estuary <sup>(2)</sup>. They also highlight that sightings this far into the estuary are rare <sup>(3)</sup>. Other occasional sightings of harbour porpoise in the middle estuary are reported on various internet sites, especially news websites, which highlights the rarity of observations in these locations. For example, the BBC reported a sighting of a harbour porpoise in the Middle Estuary in 2008 and noted that it was nearly 200 years ago that the mammals were last seen in the estuary, but that they have been increasingly spotted in the past three years <sup>(4)</sup>. In addition a cetacean, believed to be a harbour porpoise, was spotted in the River Trent at Bole in February 2012 <sup>(5)</sup>. Harbour porpoises are occasionally sighted in tidal parts of the River Trent, which branches into the Humber Estuary a few miles north of Gainsborough.
- 1.2.13 Harbour porpoise are opportunistic feeders that hunt over wide ranges for fish, cephalopods and crustaceans, related to their local availability <sup>(6)</sup>. In European waters, herring, mackerel, sand-eel, gobies and a wide range of gadoid fish such as cod and whiting are all known to form prey of porpoises.
- 1.2.14 Harbour porpoises are one of the smallest cetaceans and as such they cannot store much energy. Their habitat in cold waters also imposes very high energy demands, which together with their small size makes them dependent on all-year-round proximity to food sources. Consequently, harbour porpoise distribution reflects the distribution and energy density of its prey <sup>(7)</sup>, as suggested by porpoise satellite

(1) [http://jncc.defra.gov.uk/pdf/\\_\\_\\_HP\\_all\\_months.pdf](http://jncc.defra.gov.uk/pdf/___HP_all_months.pdf)

(2) <http://www.seawatchfoundation.org.uk>

(3) <http://www.seawatchfoundation.org.uk/newsarchive.php?uid=122>

(4) <http://news.bbc.co.uk/1/hi/england/humber/7741611.stm>

(5) <http://www.trentvale.co.uk/news/article/harbour-porpoise-spotted-in-trent-near-gainsborough/>

(6) [http://www.seawatchfoundation.org.uk/docs/Harbour\\_Porpoise.pdf](http://www.seawatchfoundation.org.uk/docs/Harbour_Porpoise.pdf)

(7) Santos *et al.*, (2004) Variability in the Diet of Harbor Porpoises (*Phocoena phocoena*) in Scottish waters 1992–2003. Marine Mammal Science, 20(1):1–27.

tracking <sup>(1)</sup>. The harbour porpoise is also thought to be following herring in the North Sea as their stocks are recovering <sup>(2)</sup>. As such the Humber estuary will be part of their range for some individuals, especially as the water quality and ecological status of the Humber continues to improve, but is unlikely to be of great value to them in comparison with their normal range in shelf waters (ie virtually the whole of the North Sea).

(1) Fontaine, MC., Tolley, KA., Siebert, U., Gobert, S., Lepoint, G., Bouquegneau, J. and Das, K. (2007) Long-term feeding ecology and habitat use in harbour porpoises *Phocoena phocoena* from Scandinavian waters inferred from trace elements and stable isotopes. *BMC Ecology* 2007, 7:1.

(2) Vergeer, C., 2006. Harbour Porpoise (*Phocoena phocoena*) and Herring (*Clupea harengus*) in Southern North Sea. North, Master of (November), p.58