

Hornsea 4



Hornsea Project Four: Preliminary Environmental Information Report (PEIR)

Volume 6, Annex 8.1: Baseline Noise Survey Report

Prepared Royal HaskoningDHV, 18 April 2019
Checked Anisha Lakhani, Ørsted, 19 April 2019
Accepted Thomas Watts, Ørsted, 29 May 2019
Approved Julian Carolan, Ørsted, 29 May 2019

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Glossary

Term	Definition
L_{Aeq}	The equivalent continuous sound pressure level over the measurement period.
L_{Amax}	The maximum sound pressure level occurring within the defined measurement period.
L_{A90}	The sound pressure level exceeded for 90% of the measurement period.
L_{A10}	The sound pressure level exceeded for 10% of the measurement period.

Acronyms

Acronym	Definition
BS	British Standard
CRTN	Calculation of Road Traffic Noise
EBI	Energy Balancing Infrastructure
ECC	Export Cable Corridor
ERYC	East Riding of Yorkshire Council
OnSS	Onshore Substation
PEIR	Preliminary Environmental Information Report

Units

Unit	Definition
dB(A)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level the reference quantity is 20 μ Pa. Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people’s assessment of loudness.

1 Introduction

1.1 Project background

1.1.1.1 Ørsted Hornsea Project Four Limited (hereafter the 'Applicant') is proposing to develop Hornsea Project Four Wind Farm (hereafter Hornsea Four). Hornsea Four will be located approximately 65 km offshore the East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone. Hornsea Four will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall and on to an onshore substation with electrical balancing infrastructure, and connection to the electricity transmission network.

1.1.1.2 Royal HaskoningDHV was commissioned to undertake a baseline noise survey at locations within the onshore search area (i.e. including areas identified for the identified location of the landfall, onshore export cable corridor (ECC), the onshore substation (OnSS) and energy balancing infrastructure (EBI). The location of the baseline noise survey monitoring locations is illustrated on [Figure 1](#) and [Figure 2](#).

1.1.1.3 All identified baseline noise survey monitoring locations and the survey methodology was agreed with East Riding of Yorkshire Council (ERYC) prior to the surveys commencing in April 2019. Agreement was achieved via email correspondence between 21st January 2019 and 24th February 2019, following the first Human Environment technical panel meeting held with on the 7th January 2019.

1.2 Aims and objectives

1.2.1.1 Baseline noise survey monitoring measurements were collected to characterise the existing noise climate within the Hornsea Four onshore search area to provide a baseline against which to assess impacts and identify if any additional mitigation may be required for both construction and operational phases of the project.

1.2.1.2 This technical report provides details of the methodology used in undertaking the baseline noise survey and presents the results of the survey.

2 Methodology

2.1 General Survey Practice

2.1.1.1 Baseline noise survey monitoring measurements were undertaken in accordance with current industry best practice, specifically British Standard (BS) 4142:2014 Method for Rating and Assessing Industrial and Commercial Sound, and BS 7445-2:1991 Description and Measurement of Environmental Noise.

2.1.1.2 Traceable calibrated Class 1 Sound Level Meters were used for all measurements during the survey. For all baseline measurement locations, measurements captured the following noise criteria:

- L_{Aeq} – the equivalent continuous sound pressure level over the measurement period. This parameter was standardised as pertinent for land use within BS 7445-2:1991;
- L_{Amax} – the maximum sound pressure level occurring within the defined measurement period;
- L_{A90} – the sound pressure level exceeded for 90% of the measurement period and is indicative of the background noise level; and
- L_{A10} – the sound pressure level exceeded for 10% of the measurement period. The L_{A10} index is used within the Calculation of Road Traffic Noise (CRTN) as an appropriate descriptor of traffic noise.

2.1.1.3 The equivalent continuous sound pressure level (L_{Aeq}) is the conventional descriptor of environmental noise and is defined as:

$$L_{eq,T} = 10 \times \log \left[\frac{1}{T} \int \frac{\rho^2(t) \partial t}{\rho_0^2} \right] dB$$

2.1.1.4 Noise measurements are normally taken with an A-weighting (denoted by a subscript 'A') to approximate the frequency response of the human ear and in free-field conditions (i.e. away from any reflecting surfaces other than the ground).

2.1.1.5 A record of the meteorological conditions during the baseline monitoring survey was made using a portable weather station installed at monitoring location SMP1 and cross referenced with the recorded baseline noise data. Baseline noise measurements taken during periods of rain or when average wind speeds exceeded 5 ms^{-1} were excluded from the data.

2.2 Data Acquisition

2.2.1 Landfall

2.2.1.1 Baseline noise measurements were undertaken at three receptor locations identified as the closest noise sensitive receptors to the proposed works at landfall ([Table:1](#)). Short-term attended measurements were taken during the daytime (30 minutes) and night time (15 minutes) reference periods.

Table 1: Baseline Noise Survey Monitoring Locations – Landfall Search Area.

Description	Measurement Location	Baseline Noise Receptor Identifier*	X	Y	Nearest Postcode
Tenant James Ltd, Manor House Farm, Bridlington	LMP1	LFR1	515508	461771	YO15 3QU
Jackson R T & Sons Caravan Park, Auburn Farm, Fraisthorpe, Bridlington	LMP2	LFR2	516347	459686	YO15 3QU
CN Warkup & Sons, Hamilton Hill Road, Driffield	LMP3	LFR3	516622	462633	YO25 8PW

* Note: receptor identifiers relate to the locations originally identified during scoping and consultation for the baseline noise survey.

2.2.2 Onshore ECC

2.2.2.1 Baseline noise measurements were undertaken at three receptor locations (**Table 2**). Short-term attended measurements were taken during the daytime (30-60 minutes) and night time (15 minutes) reference periods.

Table 2: Baseline Noise Monitoring Locations – Onshore ECC.

Description	Measurement Location	Baseline Noise Receptor Identifier*	X	Y	Nearest Postcode
Killingwold Cottage, Bishop Burton, Beverley	CMP1	CCR1	500141	439641	HU17 8QX
Broadgate Farm Holiday Cottages, Walkington	CMP2	CCR2	501223	437767	HU17 8RP
Sharry Gangs, Dunswell Road, Cottingham	CMP3	CCR3	504701	435077	HU16 4JS

* Note: receptor identifiers relate to the locations originally identified during scoping and consultation for the baseline noise survey.

2.2.3 OnSS

2.2.3.1 Since the baseline noise methodology was agreed with ERYC, amendments to the survey approach within the OnSS search area was necessary due to landowner access agreements not being possible for all proposed noise monitoring locations. The proposed measurement locations at baseline noise receptor identifier locations SSR2, SSR5, SSR7 and SSR8 were moved due to issues with landowner access agreement. These are shown in bold in **Table 3**.

2.2.3.2 Baseline noise survey monitoring measurements were undertaken at six receptor locations that had been identified as being the closest noise sensitive receptors to the OnSS (**Table 3**).

Long term unattended measurements were taken continuously over a period of one week. The baseline noise survey monitoring locations are shown on [Figure 1](#) and [Figure 2](#).

Table 3: Baseline Noise Monitoring Locations – OnSS.

Description	Measurement Location	Baseline noise Receptor Identifier*	X	Y	Nearest Postcode
Woodmansey G & Son Ltd, Manor Farm, Beverley	SMP1	SSR1	502093	435895	HU17 8PP
Lazaat, Wood Hill Way, Cottingham /	SMP2	SSR2	503418	434636	HU16 5SX
Welbourn farm, Plattwood Farm / Beverley Road, Cottingham	SMP3	SSR3	502483	434991	HU16 5FF
Residential Property, Skidby, Cottingham	SMP4	SSR4	503464	434811	HU16 5RZ
A Taylor & Son, Burn Park Farm, Park Lane, Cottingham	SMP2	SSR5	503418	434636	HU16 5RZ
Farm on Park Lane, Cottingham	SMP5	SSR6	503644	435681	HU16 5SA
Residential property south east of A1079, Beverley	SMP6	SSR7	502977	502977	HU17 8PP
Residential property West off A164 Road, Beverley	SMP6	SSR8	502977	502977	HU17 8PP

* Note: receptor identifiers relate to the locations originally identified during scoping and consultation for the baseline noise survey.

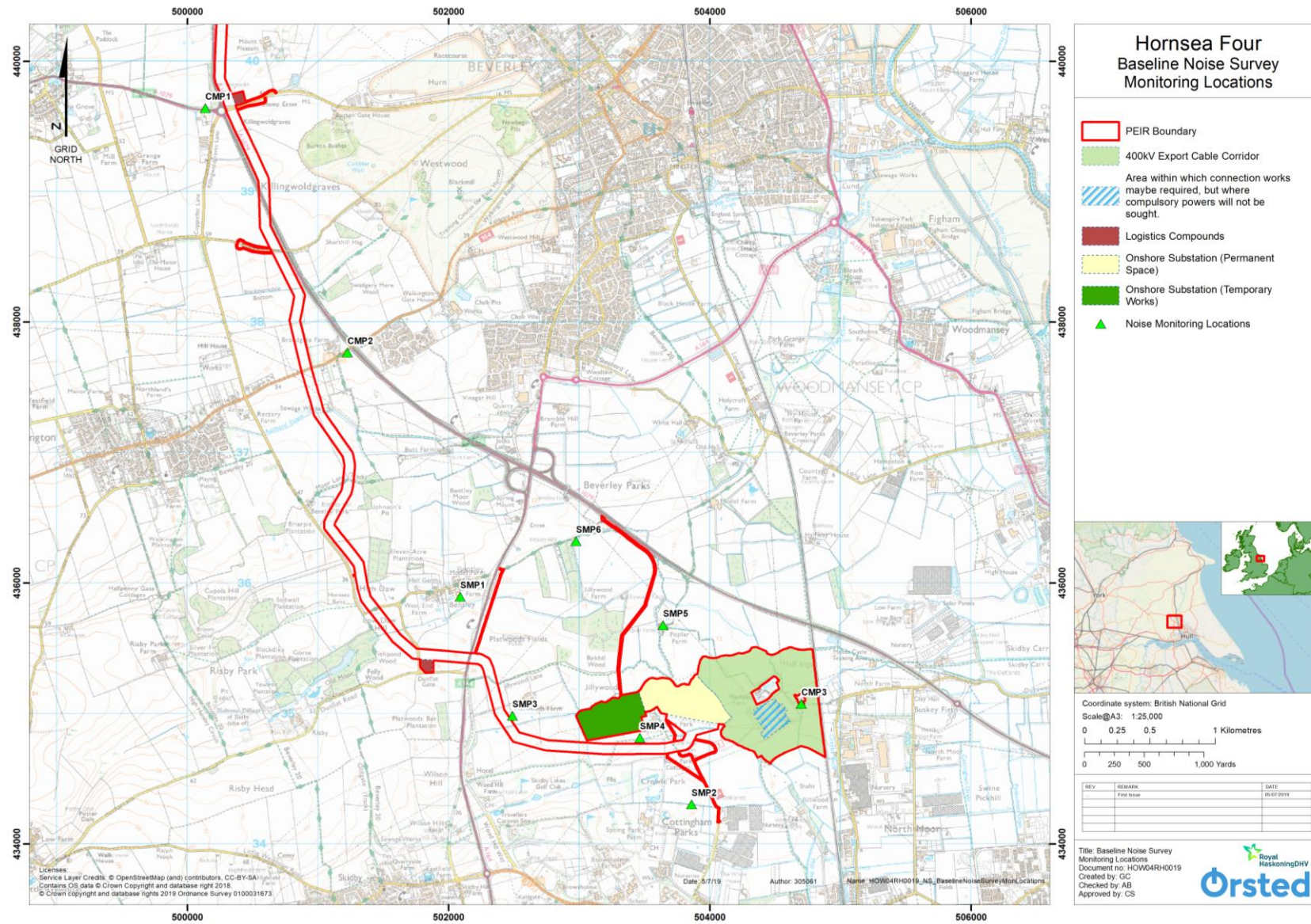


Figure 1: Baseline Noise Survey Monitoring Locations (not to scale).

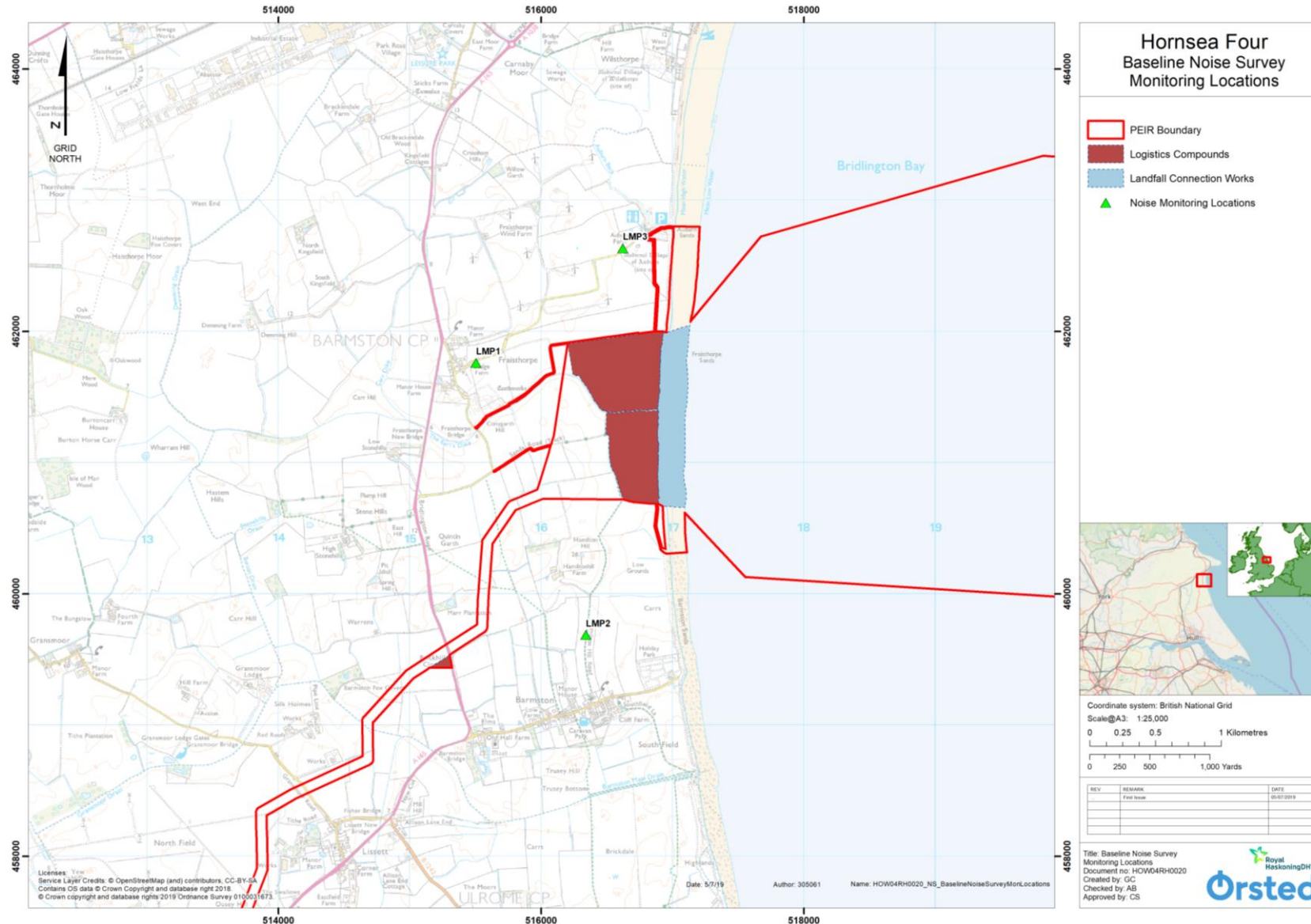


Figure 2: Baseline Noise Survey Monitoring Locations (not to scale).

3 Baseline noise survey monitoring results

3.1.1.1 **Table 4** and **Table 5** provide a summary of the measured baseline noise data at the landfall during both the daytime and night-time surveys respectively.

Table 4: Baseline Noise Monitoring Data – Landfall, Daytime Free Field, dB.

Noise Monitoring Location	Date	Start time	End time	LA _{eq}	LA _{max}	LA ₁₀	LA ₉₀
LMP1	11 April 2019	16:14:34	16:44:34	52.1	79.2	47.9	34.3
LMP2	11 April 2019	14:48:58	15:18:58	49.5	78.7	40.9	35.7
LMP3	11 April 2019	15:37:55	16:07:55	51.0	73.3	49.4	39.2

Table 5: Baseline Noise Monitoring Data – Landfall, Night-time Free Field, dB.

Noise Monitoring Location	Date	Start time	End time	LA _{eq}	LA _{max}	LA ₁₀	LA ₉₀
LMP1	12 April 2019	00:54:00	01:10:00	37.1	63.3	33.8	30.2
LMP2	12 April 2019	00:12:16	00:27:16	34.4	56.0	34.4	29.7
LMP3	12 April 2019	00:34:09	00:50:09	42.2	65.7	37.3	31.0

3.1.1.2 **Table 6** and **Table 7** summarise the measured baseline noise data along the onshore ECC during both the daytime and night-time respectively. Result data at CMP1, CMP2 and CMP3 includes a distance correction accounting for the monitoring positions being closer to the road than the respective receptors at those locations.

Table 6: Baseline Noise Monitoring Data – Onshore ECC, Daytime Free Field, dB.

Noise Monitoring Location	Date	Start time	End time	LA _{eq}	LA _{max}	LA ₁₀	LA ₉₀
CMP1	11 April 2019	12:16:11	12:46:11	56.1	73.2	59.2	48.1
CMP2	11 April 2019	12:54:32	13:27:32	58.6	71.2	62.8	47.4
CMP3	12 April 2019	13:02:47	14:02:47	50.8	73.1	50.4	46.2

Table 7: Baseline Noise Monitoring Data – Onshore ECC, Night-time Free Field, dB.

Noise Monitoring Location	Date	Start time	End time	LA _{eq}	LA _{max}	LA ₁₀	LA ₉₀
CMP1	12 April 2019	23:02:02	23:17:02	50.1	69.0	51.3	39.3
CMP2	12 April 2019	23:24:35	23:39:35	54.2	74.8	53.9	36.0

* Note: no night time noise monitoring was undertaken at CMP3.

3.1.1.3 **Table 8** and **Table 9** provides a summary of the measured baseline noise data at the OnSS during both daytime and night-time respectively.

Table 8: Baseline Noise Monitoring Data – OnSS, Daytime Free Field, dB.

Noise Monitoring Location	Date	Start time	End time	LA _{eq}	LA _{max}	LA ₁₀	LA ₉₀
SMP1	3– 11 April 2019	12:15:00	11:45:00	56.8	100.7	55.5	50.4
SMP2	3– 11 April 2019	14:50:23	10:45:23	45.0	86.3	44.0	37.6
SMP3	3– 11 April 2019	13:00:00	10:10:00	45.1	85.4	44.2	39.2
SMP4	3– 11 April 2019	15:10:07	10:50:07	44.2	86.2	41.4	36.5
SMP5	3– 11 April 2019	13:30:02	10:30:02	51.7	89.0	50.3	43.0
SMP6	3– 11 April 2019	16:10:03	12:00:03	53.9	84.0	55.4	48.4

Table 9: Baseline Noise Monitoring Data – OnSS, Night-time Free Field, dB.

Noise Monitoring Location	Date	Start time	End time	LA _{eq}	LA _{max}	LA ₁₀	LA ₉₀
SMP1	3– 11 April 2019	23:00:00	07:00:00	53.5	99.6	49.9	37.3
SMP2	3– 11 April 2019	23:00:23	07:00:23	42.4	76.3	39.1	33.4
SMP3	3– 11 April 2019	23:00:00	07:00:00	43.5	88.0	39.3	32.7
SMP4	3– 11 April 2019	23:00:07	23:00:07	41.8	86.8	37.2	32.4
SMP5	3– 11 April 2019	23:00:02	07:00:02	49.4	79.1	43.8	32.7
SMP6	3– 11 April 2019	23:00:03	07:00:03	52.6	85.3	49.7	38.0

3.1.1.4 **Table 10** and **Table 11** contain statistical analysis of the measured background noise levels, LA₉₀, at the OnSS during both daytime and night-time respectively. The mean, mode and mean +/- one standard deviation are presented to show the variability of background noise at each location. Statistical analysis is undertaken to ascertain a representative background sound level.

Table 10: LA₉₀ Statistical Analysis – OnSS, Daytime Free Field, dB.

Noise Monitoring Location	Date	Start time	End time	Average LA ₉₀	Mode	Average – 1 standard deviation	Average + 1 standard deviation
SMP1	3– 11 April 2019	12:15:00	11:45:00	50.4	50.0	46.4	54.4
SMP2	3– 11 April 2019	14:50:23	10:45:23	37.6	37.0	34.4	40.8
SMP3	3– 11 April 2019	13:00:00	10:10:00	39.2	37.0	35.9	42.4
SMP4	3– 11 April 2019	15:10:07	10:50:07	36.5	37.0	33.9	39.2
SMP5	3 April – 11 April 2019	13:30:02	10:30:02	43.0	45.0	38.5	47.5
SMP6	3– 11 April 2019	16:10:03	12:00:03	48.4	50.0	44.6	52.2

Table 11: LA₉₀ Statistical Analysis – OnSS, Night-time Free Field, dB.

Noise Monitoring Location	Date	Start time	End time	Average LA ₉₀	Mode	Average – 1 standard deviation	Average + 1 standard deviation
SMP1	3– 11 April 2019	12:15:00	11:45:00	37.3	30.0	28.4	46.3
SMP2	3– 11 April 2019	14:50:23	10:45:23	33.4	34.0	29.7	37.1
SMP3	3– 11 April 2019	13:00:00	10:10:00	32.7	30.0	27.2	38.1
SMP4	3– 11 April 2019	15:10:07	10:50:07	32.4	31.0	28.7	36.2
SMP5	3– 11 April 2019	13:30:02	10:30:02	32.7	29.0	24.5	40.9
SMP6	3– 11 April 2019	16:10:03	12:00:03	38.0	34.0	30.1	45.8

4 Conclusion and Discussion

- 4.1.1.1 To characterise the baseline noise environment and conditions within Hornsea Four’s study area a baseline noise survey was undertaken at agreed sensitive receptor/measurement locations (with ERYC) between 3 April and 11 April 2019.
- 4.1.1.2 Amendments to the agreed methodology (moving/combining baseline monitoring locations) were made at the onshore project substation due to access restrictions. These amendments i.e. baseline noise monitoring locations that form the basis of this report do not materially impact the baseline identification compared to the locations identified originally.
- 4.1.1.3 Baseline noise data was collated for each monitoring location with L_{Aeq}, LA₉₀, LA₁₀, L_{AFmax} levels determined from each specific measurement period. Background noise levels were obtained from the baseline measurements. The background noise levels for the unattended measurement periods were assessed using statistical analysis of the measured LA₉₀ values.
- 4.1.1.4 Assessment values for receptor locations at the OnSS have been derived from long term and short-term measurements.
- 4.1.1.5 The baseline noise monitoring surveys are considered representative (and generally consistent with similar rural locations) of Hornsea Four’s study area and were undertaken at the landfall, along the onshore ECC and within the OnSS.

5 References

BSI Standards Publication (2014) BS4142:2014 Methods for rating and assessing industrial and commercial sound.

BSI Standards Publication (1991) BS7445-2:1991 Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use.