CALEDONIA
Offshore Wind Farm

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Volume 7E Proposed Development (Onshore) Appendices

Appendix 8-3 Baseline Survey Method and Results

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Acronyms and Abbreviations

BS	British Standard
BSI	British Standards Institute
dB	Decibels
EIAR	Environmental Impact Assessment Report
km	Kilometre
m	Metre
NMP	Noise Monitoring Position
NSR	Noise Sensitive Receptor
ONEC	Onshore Export Cable Corridor
SLM	Sound Level Meters

1 Introduction

1.1.1.1 This technical appendix supports Volume 5, Chapter 8: Airborne Noise and Vibration of the Environmental Impact Assessment Report (EIAR).

1.1.1.2 This technical appendix describes the baseline noise survey undertaken for the Proposed Development (Onshore), the locations chosen and provides a summary of observations and measurements. The purpose of the noise survey was to characterise baseline noise levels at representative Noise Sensitive Receptors (NSR).

2 Survey Method

2.1 Study area

2.1.1.1 The baseline survey methodology was agreed with Aberdeenshire Council Environmental Health Department; refer to Volume 7E, Appendix 8-2: Summary of Noise Consultation.

2.1.1.2 Long-term noise monitoring was conducted at four Noise Monitoring Positions (NMP), representative of the closest NSRs, between 11 and 13 December 2023. The study area and NMPs are shown within Volume 5, Chapter 8: Airbourne Noise and Vibration, Figure 8-2 and Figure 8-3. The monitoring locations are described in Sections 3.2.2 to 3.2.5.

2.1.1.3 The siting of the NMPs sought to characterise the noise environment at locations where noise from anthropogenic sources, e.g. wind turbines and existing electrical infrastructure, was minimised. This is a robust approach, as the difference between the prevailing background and the predicted rating level of the Proposed Development (Onshore) would therefore be greatest, potentially resulting in the identification of more significant impacts.

2.1.1.4 It was not proposed to undertake baseline monitoring along the entire Onshore Export Cable Corridor (ONEC) given the stage of the Proposed Development (Onshore) design with no identification of the Onshore Export Cable Route location. It was therefore proposed that noise monitoring was undertaken for up to 24 hours at a location representative of the closest receptors to the Landfall Site (NMP4) and in addition to record subjective observations of the prevailing noise environment at selected locations along the ONEC.

2.1.1.5 In regards the Onshore Substation Site it was noted that a previous baseline noise survey was undertaken in 2014 as part of the planning application for the adjacent (operational) Moray East and New Deer substations.

2.1.1.6 Supplementary monitoring was therefore proposed at three additional locations in vicinity to the Onshore Substation Site (NMP1, NMP2 and NMP3).

2.1.1.7 Each measurement undertaken at NMPs was continuous for the duration shown in Table 2-1.

2.1.2 NMP1 (Burnside)

2.1.2.1 NMP1 was sited in open fields, >40 metres (m) east of the nearest buildings at Burnside. Installations at New Deer Substation were clearly visible approximately 840m to the south.

2.1.3 NMP2 (East Swanford)

2.1.3.1 NMP2 was sited behind an outhouse building (>4m from building) at East Swanford, with open fields to the west, and the garden of the residence to the south. Buildings within the East Swanford property provided screening such that the New Deer Substation approximately 420m to the south-east was not visible at the NMP.

2.1.4 NMP3 (Mains of Asleid)

2.1.4.1 NMP3 was sited in a residential steading, immediately adjacent to the garden and driveway, approximately 15m west of the nearest building at Mains of Asleid. NMP3 is positioned so that the house blocks almost all hum of unknown machinery heard to north-west of house (estimated around 1 kilometre (km) distance). The gradual rise in ground level hides the view of New Deer Substation approximately 330m to the west.

2.1.5 NMP4 (Landfall Site)

2.1.5.1 NMP4 was sited beside a farm access road in open fields, approximately 200m from the nearest buildings at Lower Warylip to the east-south-east; approximately 230m from nearest buildings at Dallachy Cottages to the west; and approximately 520m from the nearest part of coastline, to the north-north-east between Craig Neen and Stake Ness, west of Whitehills. No traffic passed on the access road, and 1-2 vehicles on the nearby rural road, during attendance.

2.2 Monitoring Equipment and Approach

2.2.1.1 The following section details the how equipment was calibrated.

2.2.1.2 The sound level meters (SLM) used were compliant with Class 1 specification as described in BS EN 61672-1 (BSI 2003[1]).

2.2.1.3 The equipment used was within the accredited laboratory calibration period of one year (calibrator) or two years (SLMs) respectively. Calibration certificates are held on file. The serial number for the calibrator is 35024421 with the serial numbers for SLMs detailed within Table 2-1.

2.2.1.4 The calibration of the SLMs was checked in the field before and after each measurement. Any drift in calibration was found to be within acceptable limits (≤0.1 decibels (dB)) as detailed in Table 2-1.

2.2.1.5 Sound metrics were recorded as follows:

- Noise indices L_{eq}, L_{10}, L_{90} and L_{max} were recorded, with time fast-weighted, in all measurements. Frequency was A-weighted for broadband measurements and Z-weighted (that is, unweighted) for 1/3-octave frequency band measurements;

- Broadband measurements were taken at all NMPs. Additionally, 1/3-octave band measurements were taken (from 12.5 Hertz to 20 kilohertz, inclusive) at NMP2, to allow investigation of potential tonal contributions from the existing electrical infrastructure; and
- The averaging period was set to 5 minutes at most NMPs; except at NMP1 where the averaging period was set to 1 minute, in order to distinguish passing vehicles at the nearby low-volume road junction.

Table 2-1: Noise measurement details

NMP ID	Short descriptor	Duration (hours)	Frequency bands measured	Averaging period (minutes)	Serial number of sound level meter	Calibration drift (dB)
NMP1	Burnside	45	broadband	1	00264486	0.1
NMP2	East Swanford	44	broadband, 1/3 octave	5	00721019	0.0
NMP3	Mains of Asleid	46	broadband	5	00732094	0.0
NMP4	Landfall Site	24	broadband	5	00620867	0.0

2.2.1.6 Microphones were positioned at a height of approximately 1.5m above ground in a free-field location: that is, at least 3.5m from any vertical sound reflective surfaces. Double-skin outdoor wind shields were fitted to microphones throughout monitoring.

2.2.1.7 Weather was monitored simultaneously with the majority of the noise monitoring period. A weather station was installed for 46 hours at NMP3 and measured rainfall, wind speed and wind direction. Subjective weather observations were also taken during the course of the survey, summarised in Table 2-2.

Table 2-2: Weather conditions during attendance at NMPs

Location	Wind speed	Cloud	Precipitation
In the vicinity of the Onshore Substation Site (NMP1, NMP2, NMP3)	very low	overcast to clear	no rain; wet ground
Landfall Site (NMP4)	low to very low	overcast	no rain; wet ground to very wet ground

2.2.1.8 Periods of adverse weather (specifically, wind speed >5 metres per second, or precipitation) were later screened from noise data at the analysis stage. Distance of each respective NMP from the weather monitoring position was taken into account. The interpretation of remaining noise data was also informed by the weather data as appropriate.

3 Baseline Survey Results

3.1.1.1 The following section provides a summary of observations and measurements undertaken during the baseline noise survey.

3.2 Subjective Observations of Noise

3.2.1.1 Subjective observations were recorded in accordance with the requirements of BS4142 during installation and decommissioning of the monitoring equipment.

3.2.2 NMP1 (Burnside)

3.2.2.1 In the absence of nearby traffic, the dominant noise was from distant traffic, and birds within hundreds of metres. Occasional vehicles could be heard distinctly when passing the minor road junction 240m away. The New Deer substation seemed to be perceptible as a low hum or buzz. Aeroplanes occasionally passed overhead. Distant machinery could be heard.

3.2.3 NMP2 (East Swanford)

3.2.3.1 The noise environment was very quiet, with faint sounds of what seemed to be distant machinery or aeroplanes. Birds and dogs were occasionally heard within hundreds of metres. Aeroplanes occasionally passed overhead. The New Deer substation was not perceived; however, it was slightly audible as a buzz during a spot measurement on the access road to the property, where there was direct line of sight to the existing New Deer substation.

3.2.4 NMP3 (Mains of Asleid)

3.2.4.1 The noise environment was very quiet, with faint sounds of distant traffic, and birds (rooks) congregating in trees within hundreds of metres. Occasional vehicles were clearly heard when present on the nearest public road passing New Deer substation. Agricultural machinery and construction activity were perceptible in the distance.

3.2.5 NMP4 (Landfall Site)

3.2.5.1 The dominant noise sources were the sea or the main road to the east, dependent on the weather conditions. A few birds were heard in surrounding fields.

3.2.6 Noise Survey Record Sheet

3.2.6.1 Surveyor's notes and photographs are summarised in Volume 7E, Appendix 8-3, Annex 1: Noise Survey Record Sheet.

3.3 Measured Noise Levels

3.3.1 Statistical Summaries

3.3.1.1 Table 3-1 summarises the day and night levels during the measurements, excluding periods of wind at or exceeding 5 metres per second and/or rainfall at or exceeding 0.1 millimetres per hour.

3.3.1.2 In Table 3-1 levels are rounded to the nearest integer, and standard deviations are rounded to 1 decimal place.

Table 3-1 Statistical summary of measured noise data

Period	Noise Index	NMP1	NMP2	NMP3	NMP4
Day	$dBL_{Aeq,\ day}$ log mean	42	33	38	42
	$dBL_{Amax,\ day}$ maximum	66	63	69	69
	$dBL_{A90,\ day}$ mean	34	26	31	40
	$dBL_{A90,\ day}$ standard deviation	5.9	3.9	5.1	1.4
	$dBL_{A90,\ day}$ mode	37	28	24	39
Night	$dBL_{Aeq,\ night}$ log mean	37	31	36	44
	$dBL_{Amax,\ night}$ maximum	66	63	68	56
	$dBL_{A90,\ night}$ mean	31	25	33	41
	$dBL_{A90,\ night}$ standard deviation	5.1	3.9	4.2	2.2
	$dBL_{A90,\ night}$ mode	32	28	36	41

3.3.2 Derived Representative Levels

3.3.2.1 Representative levels were derived from measurements taken, excluding periods affected by wind, rainfall and rain runoff. The representative levels are shown in Table 3-2.

3.3.2.2 Levels near the Onshore Substation Site (NMP1, NMP2 and NMP3) are objectively low.

Table 3-2 Representative Noise Levels

Noise Index	NMP1	NMP2	NMP3	NMP4
$dBL_{Aeq, day}$	42	33	38	42
$dBL_{A90, day}$	34	26	24	39
$dBL_{Aeq, night}$	37	31	36	44
$dBL_{A90, night}$	31	25	33	41

3.3.3 Graphs of Measured Data

3.3.3.1 The figures within Volume 7E, Appendix 8-3, Annex 2: Measured Data Graphs, show measured noise, rain rate and wind speed at each NMP. Horizontal lines indicate the screening thresholds for wind speed and rainfall; when either of these levels was exceeded, the simultaneous noise data was excluded from the statistical summaries.

3.3.3.2 NMP2 and NMP3 noise levels show ongoing effects of rain runoff for several hours after rainfall stopped, which may be due to watercourses in the vicinity. This was taken into account in the derivation of representative levels.

3.3.3.3 NMP4 noise levels may show the effects of rainfall after around 01:00 on 13 December 2023; measured weather data is less informative for this NMP, which was on the coast at a distance of approximately 27km from the weather station near New Deer substation. Derived representative levels for both day and night are objectively low and so it has not been necessary to determine the effects of weather more exactly.

3.3.3.4 NMP1 was measured with 1-minute averaging; the graph is broken into 6-hour periods. NMP2, NMP3 and NMP4 were measured with 5-minute averaging; the graphs are broken into 24-hour periods.

4 References

[1] BSI (2003) 'BS EN 61672-1:2003 Electroacoustics. Sound level meters'. BSI, London

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