

MONA OFFSHORE WIND PROJECTS

Preliminary Environmental Information Report

Volume 7, annex 22.1: Baseline sound survey



April 2023
FINAL

Image of an offshore wind farm

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Rev01	Draft for client comment	RPS	bpEnBW		29/12/2022
Rev02	Author Updates	RPS	bpEnBW		30/01/2023
Rev03	Final	RPS	bpEnBW	bpEnBW	15/03/2023

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Prepared for:

Mona Offshore Wind Ltd.

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Glossary

Term	Meaning
A-weighting	A frequency weighting devised to attempt to account for the fact that human response to sound is not equally sensitive to all frequencies. It consists of an electronic filter in a sound level meter which attempts to build this variability into the indicative sound level reading so that it will correlate, approximately, with the human response.
Ambient Sound Level, $L_{Aeq,T}$	The steady sound level which, over a period of time T, contains the same amount of A-weighted sound energy as the time varying sound over the same period. Also known as the equivalent continuous sound pressure level.
Background Sound Level, $L_{A90,T}$	The A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using fast time-weighting, F, and quoted to the nearest whole number of decibels.
Decibel (dB)	A unit used to measure or compare the intensity of a sound by comparing it with a given reference level on a logarithmic scale.
Free-field	A situation in which the radiation from a sound source is entirely unaffected by the presence of any reflective boundaries.
Logarithmic averaging	A method by which sound levels in decibels (dB) can be averaged. This allows us to account for the fact that higher levels of sound will always dominate in the presence of lower sound levels.
Noise	An unwanted or unexpected sound.
Residual Sound Level	The ambient sound level at a receptor in the absence of influence from the sound source under assessment.
Sound	Fluctuations of pressure within a medium (gas, solid or fluid) within the audible range of loudness and frequencies which excite the sensation of hearing.
Temporal averaging	Averaging a dataset over a given time period.

Acronyms

Acronym	Description
BS	British Standard
CCBC	Conwy County Borough Council
DCC	Denbighshire County Council
LT	Long-term
ST	Short-term

Units

Unit	Description
dB	Decibel

Unit	Description
h	Hour
m	Metre
m/s	Meters per second
ms	Milliseconds
km	Kilometres

1 BASELINE SOUND SURVEY

1.1 Introduction

- 1.1.1.1 This baseline sound survey technical report provides the methodology and results of the baseline sound survey undertaken for the Mona Offshore Wind Project. The report will inform the assessment of noise and vibration impacts reported in volume 3, chapter 22: Noise and vibration of the Preliminary Environmental Information Report (PEIR)
- 1.1.1.2 The purpose of the baseline sound survey is to quantify the existing sound climate at noise-sensitive receptors within the noise and vibration study area. The measured levels inform the derivation of noise criteria against which operational and construction noise impacts arising from the Mona Offshore Wind Project may be assessed in accordance with BS 4142:2014+A1:2019 and BS 5228-1:2009+A1:2014, respectively.
- 1.1.1.3 There are no significant existing sources of vibration impacting the nearest noise-sensitive receptors which require consideration. As such, no vibration survey is deemed necessary and this annex only contains details of the baseline sound survey. This is in line with the approach set out in the Environmental Impact Assessment (EIA) Scoping Report (Mona Offshore Wind Ltd, 2022). No comments on this approach were raised by The Planning Inspectorate in their scoping opinion.
- 1.1.1.4 The survey comprises a combination of short-term and long-term sound monitoring at 12 locations within the Mona Proposed Onshore Development Area. The proposed monitoring locations were discussed with Conwy County Borough Council (CCBC) and Denbighshire County Council (DCC) (see Table 1.1) and follows the approach set out in the Mona Offshore Wind Farm Environmental Impact Assessment Scoping Report (Mona Offshore Wind Ltd, 2022).

1.2 Study area

- 1.2.1.1 The Mona noise and vibration study area will focus on receptors (landward of Mean High Water Springs (MHWS)) where potential impacts are most likely to occur on receptors sensitive to noise and vibration.
- 1.2.1.2 The noise and vibration study area relevant to this technical report is defined as:
- The area of land to be temporarily or permanently occupied during the construction, operation and maintenance and decommissioning of the Mona Offshore Wind project (hereafter referred to as the Mona Proposed Onshore Development Area)
 - Noise sensitive receptors located within 1 km of the Mona Landfall and Onshore Substation
 - Noise sensitive receptors located within 250m of the Mona Proposed Onshore Development Area (excluding the Mona Landfall and Onshore Substation options).
- 1.2.1.3 The above descriptors are presented graphically in Figure 1.1 below. The number of receptors and their location in relation to the noise and vibration study area are identified in annex 22.2: Construction noise of the PEIR.

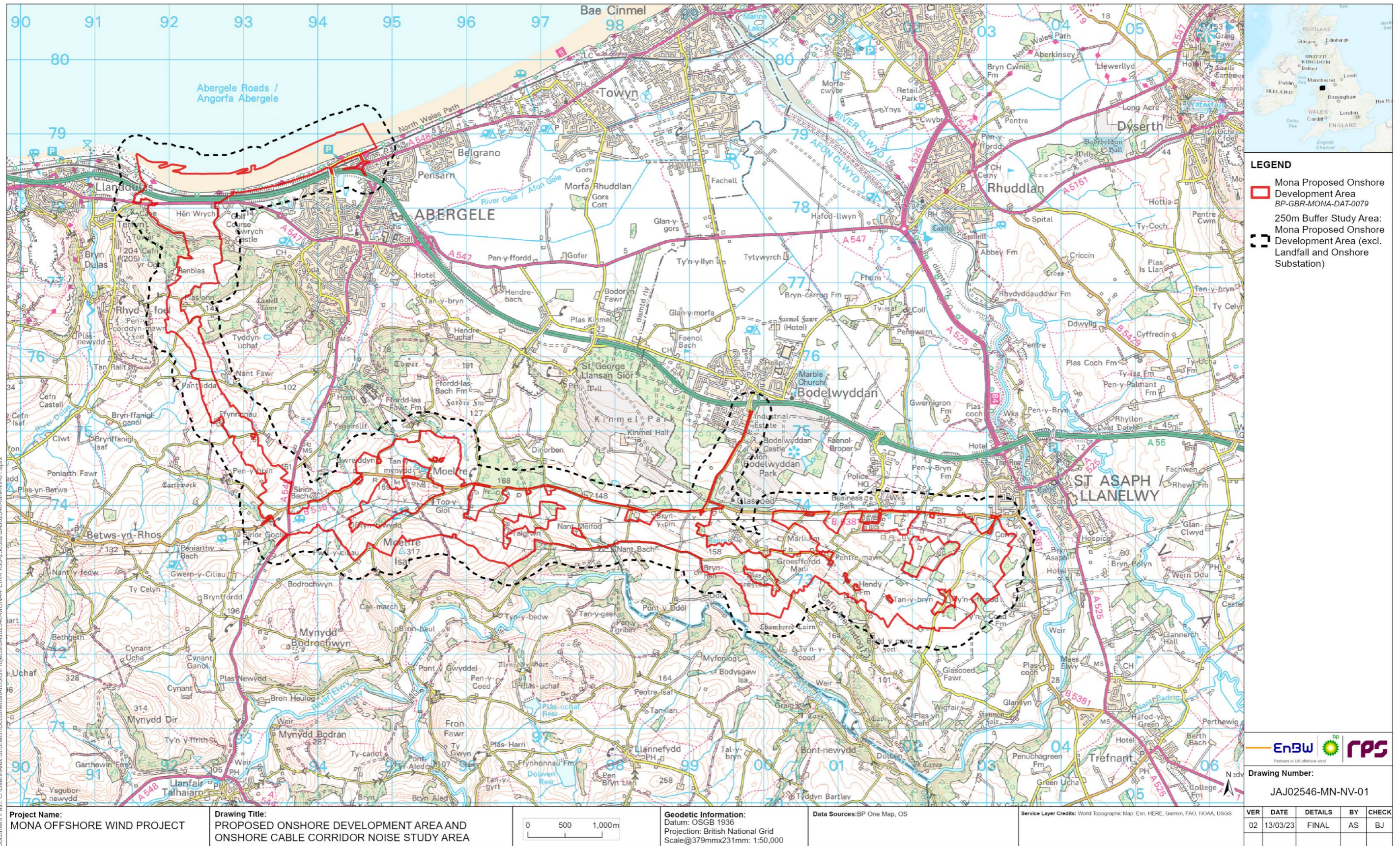


Figure 1.1: Noise and vibration study area – Mona Onshore Development Area.

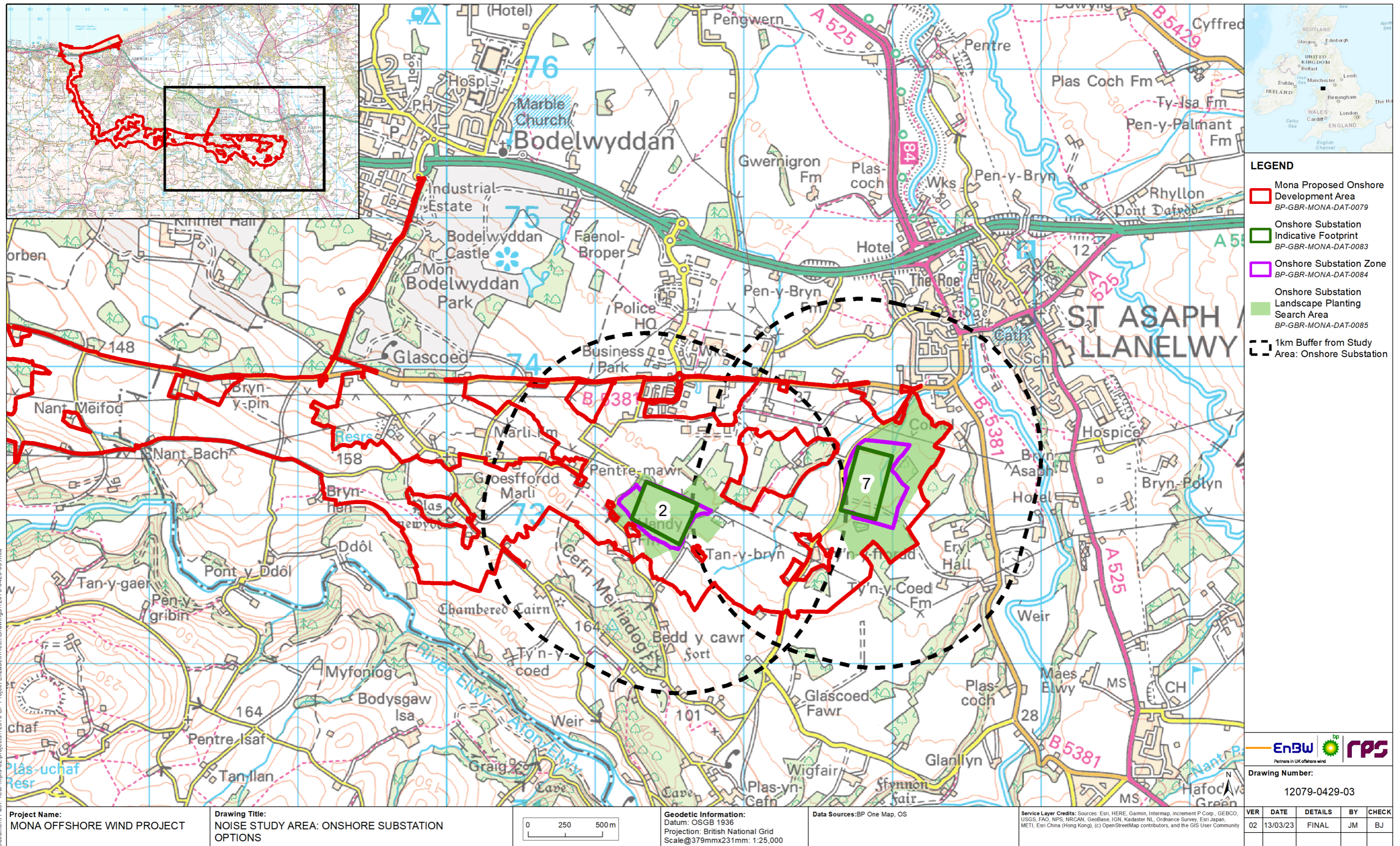


Figure 1.2: Noise and vibration study area – Mona Onshore Substation footprints.

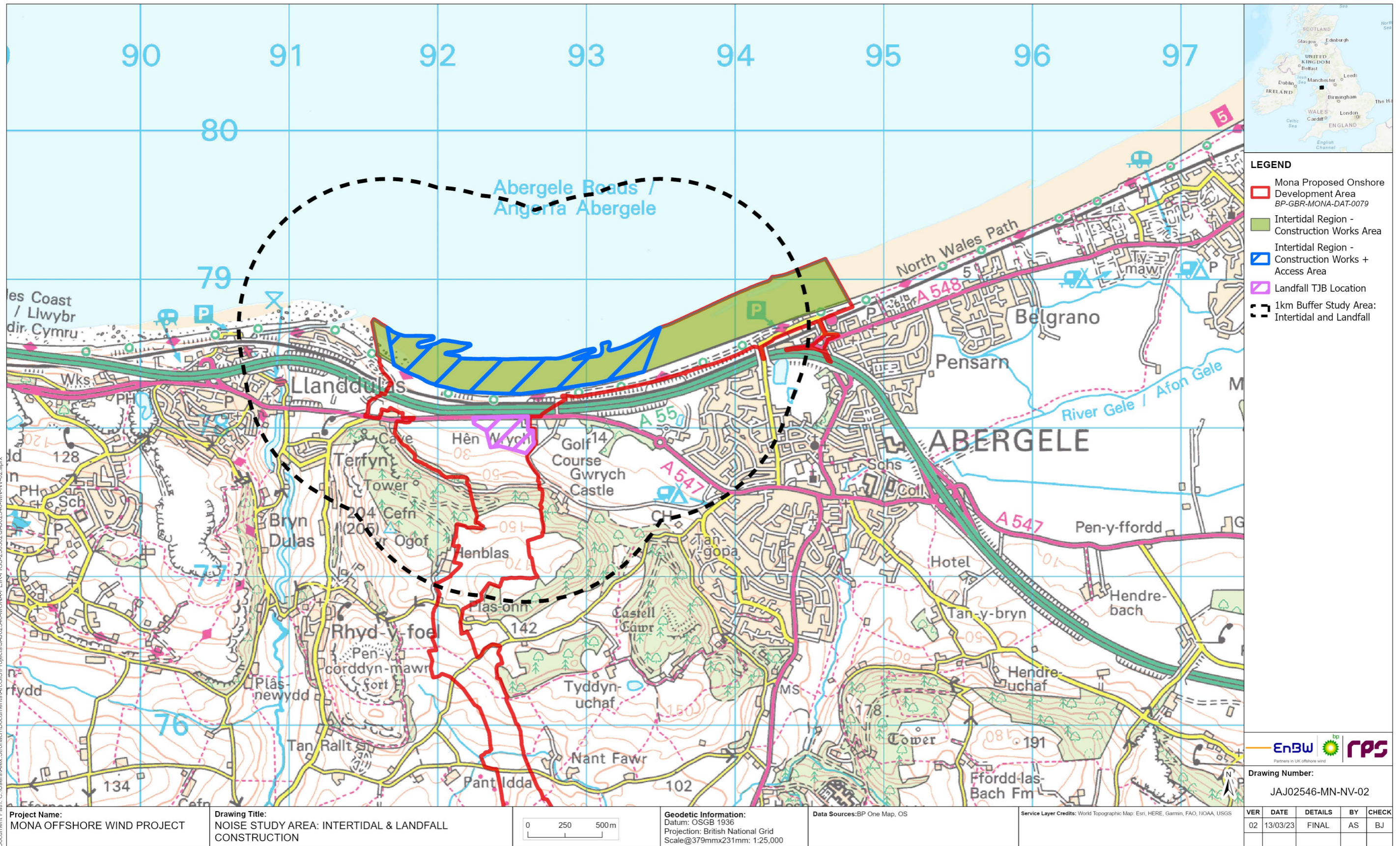


Figure 1.3: Noise and vibration study area – Mona Intertidal Region.

1.3 Consultation

1.3.1.1 A summary of the key issues raised during consultation activities undertaken to date specific to noise and vibration are presented in Table 1.1 below. Consultation has focused on the proposed locations of the baseline sound survey.

Table 1.1: Summary of key consultation topics raised during consultation activities undertaken for the Mona Offshore Wind Project relevant to noise and vibration.

Date	Consultee and type of response	Topics
06 September 2022	Environmental Health Department, Conwy Borough County Council (CBBC) – Email	Consultation to agree the proposed noise survey locations at landfall.
28 September 2022	Environmental Health Department, Denbighshire County Council (DCC)– Email	Consultation to agree the proposed noise survey methodology for receptors around the proposed substation locations. DCC agreed with the proposal but requested that a long-term location be added to the receptor at Plas yr Esgob.

1.4 Site-specific surveys

1.4.1.1 A summary of the surveys undertaken to inform the baseline noise environment is outlined in Table 1.2 below.

1.4.1.2 No baseline vibration surveys were undertaken since vibration impacts are assessed against absolute criteria as opposed to criteria derived based on the existing environment which is the case for noise impacts. The vibration impact criteria are defined in volume 7, annex 22.2: Construction noise and vibration technical report of the PEIR.

1.4.1.3 The surveys were undertaken by Dr Alex Stronach who is a qualified senior acoustic consultant with RPS. Alex has a Ph.D. in environmental acoustics, a postgraduate diploma in acoustics and noise control, and over 3 years’ experience in acoustic consultancy. He is highly experienced in the measurement and assessment of noise and vibration having managed both large- and small-scale projects ranging from energy infrastructure, residential developments, and educational facilities.

Table 1.2: Summary of surveys undertaken to inform baseline sound environment.

Title	Extent of survey	Overview of survey	Survey contractor	Date
Baseline sound survey	Mona Landfall.	Baseline sound survey at locations representative of the nearest noise-sensitive receptors to Onshore Cable Corridor at landfall.	RPS	November 2022
	Onshore Substation option locations	Baseline sound survey at locations representative of the nearest noise-sensitive receptors to the proposed Onshore Substation options.	RPS	November 2022

1.4.1.4 Monitoring was undertaken at the Mona Landfall and Onshore Substation option locations to characterise the baseline sound environment where permanent structures are proposed. Monitoring was not undertaken within other areas of the Mona Proposed Onshore Development Area as the location of the Onshore Cable Corridor and 400kV Grid Connection Corridor has not been confirmed. Further targeted baseline sound surveys may be undertaken once the Onshore Cable Corridor and 400kV Grid Connection Corridor have been refined.

1.4.2 Methodology and Instrumentation

1.4.2.1 The baseline sound survey comprised a combination of unattended long-term and short-term attended surveys. The long-term surveys involved the installation of monitors for between one and two weeks in secure locations. Meteorological equipment including a rain gauge and a mast for monitoring wind.

1.4.2.2 Short-term monitoring would be carried out over four 15-minute periods during the daytime between 07:00 hrs and 23:00 hrs, and two 15-minute periods during the night-time between 23:00 and 07:00 hrs. At the start of each measurement, the wind speed and direction were measured using a hand-held anemometer to ensure that the direction and magnitude are acceptable for sound monitoring. No short-term attended monitoring surveys was carried out during periods of significant rainfall

1.4.2.3 The locations for the long-term sound survey were selected to be representative of the nearest noise-sensitive human receptors to the construction works at landfall and the Mona Onshore Substation locations. The short-term sound survey locations were selected to supplement the long-term survey data and obtain a more detailed understanding of the spatial variation in the local sound climate These locations are described in Table 1.3 and Table 1.4 for locations at the Mona Landfall and around the Mona Onshore Substation locations, respectively and are shown in Appendix A.

1.4.2.4 Measurements were only undertaken at locations representative of the nearest human receptors at this stage since information on the location of ecological receptors was not available at the time the baseline sound survey was undertaken. Additional

baseline sound measurements will be undertaken once information on the locations of ecological receptors is available.

1.4.2.5 At all locations, measurements were undertaken in the free-field at approximately 1.5 m above local ground level.

Table 1.3: Descriptions of long term (LT) and short-term (ST) sound monitoring locations at landfall.

Position	Location			Representative receptor
	x-coordinate	y-coordinate	Description	
LT1	293627.00	37768.70	Northern boundary of Abergele Golf Course	Residential receptors on Troon Way and surrounding residential area.
LT2	292797.6044	377923.1622	Western boundary of Abergele Golf Course	Residential receptor at Gwyrch House and neighbouring properties.
ST1	293347.9658	378273.0002	Northern boundary of Castle Cove Caravan Park.	Static caravans at Castle Cove Caravan Park.
ST2	291678.0794	378122.6140	Southern boundary of land at Tan yr Ogof Farm.	Residential receptors at Tan yr Ogof Farm and Tan yr Ogof Caravan Park.

Table 1.4: Descriptions of long term (LT) and short-term (ST) sound monitoring locations near the proposed onshore substation.

Position	Location			Representative receptor
	x-coordinate	y-coordinate	Description	
LT3	301047.9307	373606.8890	Southwestern boundary of the land west of Waen Meredydd	Residential receptor at Waen Meredydd
LT4	301011.0525	373286.6453	Eastern boundary of the land west of Tyddyn Meredydd	Residential receptor at Tyddyn Meredydd
LT5	302877.8515	373770.7900	Rear garden of the property at Cae yr Haul, Lon Coed Esgob.	Residential receptors on Lon Coed Esgob and Glascoed Road.
LT6	302261.4401	373716.6587	Western boundary of the land east of Plas yr Esgob.	Residential receptors at Plas yr Esgob and Coed yr Esgob.
LT7	302950.6347	372502.3279	Eastern boundary of the land east of Tyn y Ffordd Fawr.	Residential receptors near Cefnmeiriadog and caravans at Lyons Eryl Hall Caravan Park & Country Club.

Position	Location			Representative receptor
	x-coordinate	y-coordinate	Description	
LT8	302079.7281	372365.2572	Southeastern boundary of the land at Tyn y Ffordd Newydd.	Residential receptors at Tyn y Ffordd Newydd, Rhos Aber, and Isfryn.
ST3	302341.0767	373353.8919	Southern boundary of the land north of Coed yr Esgob.	Residential receptor at Coed yr Esgob.
ST4	302466.1157	372552.6271	Western boundary of the land east of Tyn y Ffordd Fawr	Residential receptors near Cefnmeiriadog.

1.4.2.6 The long-term survey equipment was deployed between 12:45 hours on Wednesday 9 November and 14:15 hours on Thursday 10 November 2022 and was collected between 14:15 hours on Tuesday 22 November and 10:00 hours on Wednesday 23 November 2022.

1.4.2.7 Short-term measurements at ST1 and ST2 were undertaken whilst deploying the long-term monitoring equipment on Wednesday 9 November, with ST3 and ST4 being undertaken upon collection on Wednesday 23 November.

1.4.2.8 Measurements of the L_{Aeq} , L_{Amax} , and L_{A90} were undertaken at 100ms intervals and temporally averaged over 15-minute periods for the duration of the survey period. The equipment listed in Table 1.5 below was used to undertake the survey.

Table 1.5 Equipment used during the baseline sound survey.

A The calibration level of 94.0 dB was recorded at all positions upon completion of the short-term measurements.

Position	Make/model	Serial number	Calibration at start (dB) (Ref: 94.0 dB)	Calibration at end (dB) (Ref: 94.0 dB)	Last manufacturers' calibration date
Calibrator	Rion NC-74	110118	N/A	N/A	17/10/2022
LT1	Rion NL-52	01087404	94.0	94.0	14/07/2022
LT2	Rion NL-52	01143556	94.0	94.0	10/05/2022
LT3	Rion NL-52	00231668	94.0	94.0	11/02/2022
LT4	Rion NL-52	00220558	94.0	94.0	16/06/2022
LT5	Rion NL-52	00620870	94.0	94.0	20/05/2022
LT6	Rion NL-52	00620864	94.0	94.0	22/09/2022
LT7	Rion NL-52	00164424	94.0	93.8	16/06/2021
LT8	Rion NL-52	00943367	94.0	94.0	19/04/2021
ST1	Rion NL-52	386735	94.0	93.9	19/11/2020
ST2-ST4	Rion NL-52	164423	94.0	94.0a	19/04/2021

1.4.2.9 The equipment was installed within weatherproof enclosures which includes a Rion WS-15 windshield on the microphone. The equipment was calibrated upon commencement and conclusion of the noise survey to confirm an acceptable degree of accuracy. As shown in Table 1.5 above, no significant drift (± 0.5 dB) was noted to have occurred.

1.4.2.10 Measurements undertaken in accordance with British Standard 7445-2:1991 – ‘Description and measurement of environmental noise – Part 2: Guide to the acquisition of data. All sound level meters used meet the ‘Class 1’ criteria defined within BS EN 61672-2:2013+A1:2017 – ‘Electroacoustics. Sound level meters – Pattern evaluation tests’. All calibrators used meet the ‘Class 1’ criteria defined within BS EN IEC 60942 – ‘Electroacoustics. Sound Calibrators’.

1.4.3 Meteorological conditions

1.4.3.1 A weather station was deployed alongside the survey equipment to monitor the variation in meteorological conditions throughout the survey period.

1.4.3.2 A Davies Instruments Vantage Vue 6250 weather station was deployed at LT2, adjacent to Gwyrch House, to monitor the conditions at the landfall. An additional Lufft WS600-UMB weather station was deployed at position LT3, Waen Meredydd, to monitor the conditions further in-land at positions around the onshore substation location.

1.4.3.3 Both weather stations were temporally synchronised with the sound survey equipment and any periods, where precipitation events or wind speeds greater than 5 m/s occurred, were omitted during the analysis of the measured data.

1.4.4 Existing sound climate

1.4.4.1 A subjective description of the existing sound climate at each position is presented in Table 1.6 below.

Table 1.6 Subjective description of noise climate at baseline sound survey positions.

Position	Subjective description of noise climate
LT1	Dominant noise source noted to be road traffic on the A547 to the north of the survey position.
LT2	Primarily dominated by road traffic noise on the A547 and A55. Further influence was noted from activity on the golf course such as speech and golf karts although their influence is less significant.
LT3	This location was noted to be rural and thus quiet overall. Distant traffic from the A55 was noted to be audible and there will be influence from traffic on country lane adjacent to survey position. Upon collection, farming machinery was noted to be audible on land to the north.
LT4	A similarly rural location, distant road traffic on local roads was noted to be audible but otherwise the sound climate was noted to be quiet. It was noted whilst deploying the equipment that a generator was audible on the property at Y Bwthyn to the east. The meter was installed sufficiently far away so as not to be influenced by this source. The data shows no influence on the measured levels and the generator was not running upon collection.
LT5	Glascoed Road runs from east to west to the north of this position. The noise climate was noted to be dominated by local traffic on this road and others in the area.
LT6	Distant traffic noise on Glascoed Road and the A55 was dominant at this position. Farming machinery was in operation at Plas yr Esgob Farm upon deployment.
LT7	The sound climate at this position was noted to be quiet with only distant traffic noise audible whilst on-site.
LT8	Similar to LT7, the sound climate was noted to be quiet with very distant traffic noise being audible on local roads. Upon collection, the landowner informed us that on Saturday 19 th November, hunters were active on the land during the daytime and thus noise levels were likely to be higher. This has been accounted for in our analysis of the data.
ST1	This position was in relatively close proximity to the A55 and thus traffic noise dominated. A railway line separates the caravan park from the A55 and pass-bys were noted to be influential upon the measured levels.
ST2	Traffic noise on the A55 to the north and A547 to the south dominated the noise climate.
ST3	The sound climate was noted to be quiet with distant traffic noise the primary source of noise.
ST4	The sound climate at this position was noted to be quiet with only distant traffic noise audible whilst on-site.

1.4.5 Results

1.4.5.1 The results of the baseline sound survey at the long-term monitoring positions are presented graphically in Appendix B. A tabulated schedule of the results obtained at the short-term monitoring positions is presented in Appendix C.

1.4.5.2 The range of measured sound levels is presented in Table 1.7 below.

Table 1.7 Range of measured sound levels at long-term monitoring positions.

Location	Measured Sound Level, (dB)					
	Day			Evening	Night	
	$L_{Aeq,16h}$ (0700-2300)	$L_{Aeq,12h}$ (0700-1900)	$L_{A90,1h}$ (0700-2300)	$L_{Aeq,4h}$ (1900-2300)	$L_{Aeq,8h}$ (2300-0700)	$L_{A90,15min}$ (2300-0700)
LT1	50 – 56	51 – 57	30 – 55	44 – 54	41 – 53	25 – 51
LT2	47 – 58	48 – 58	35 – 58	41 – 55	45 – 51	29 – 56
LT3	42 – 60	43 – 60	26 – 56	36 – 59	35 – 60	25 – 54
LT4	42 – 61	43 – 62	26 – 57	35 – 59	38 – 61	27 – 55
LT5	44 – 54	45 – 55	32 – 53	38 – 54	37 – 57	27 – 55
LT6	43 – 57	44 – 56	30 – 55	39 – 57	36 – 59	27 – 55
LT7	40 – 58	41 – 58	27 – 58	35 – 58	34 – 62	25 – 59
LT8	37 – 52	38 – 53	25 – 53	27 – 53	28 – 55	25 – 54

1.5 Next Steps

1.5.1.1 Additional baseline sound measurements will be undertaken to quantify the noise climate at human receptors along the Mona Onshore Development Area to derive construction threshold limits and inform mitigation strategies to be adopted.

1.5.1.2 Measurements will also be undertaken at locations containing noise sensitive ecological receptors based on the results of ecological surveys undertaken on-site.

1.6 References

British Standards Institution (1991), 'British Standard 7445-2:1991 Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'.

British Standards Institution (2003), 'British Standard 7445-1:2003. Description and measurement of environmental noise – Part 1: Guide to environmental quantities and procedures'

British Standards Institution (2017), 'BS EN 61672-2:2013+A1:2017 – 'Electroacoustics. Sound level meters – Pattern evaluation tests'

British Standards Institution (2018), 'BS EN IEC 60942 – 'Electroacoustics. Sound Calibrators'

Mona Offshore Wind Ltd. (2022) Mona Offshore Wind Farm Environmental Impact Assessment Scoping Report

Appendix A: Baseline Sound Survey Locations

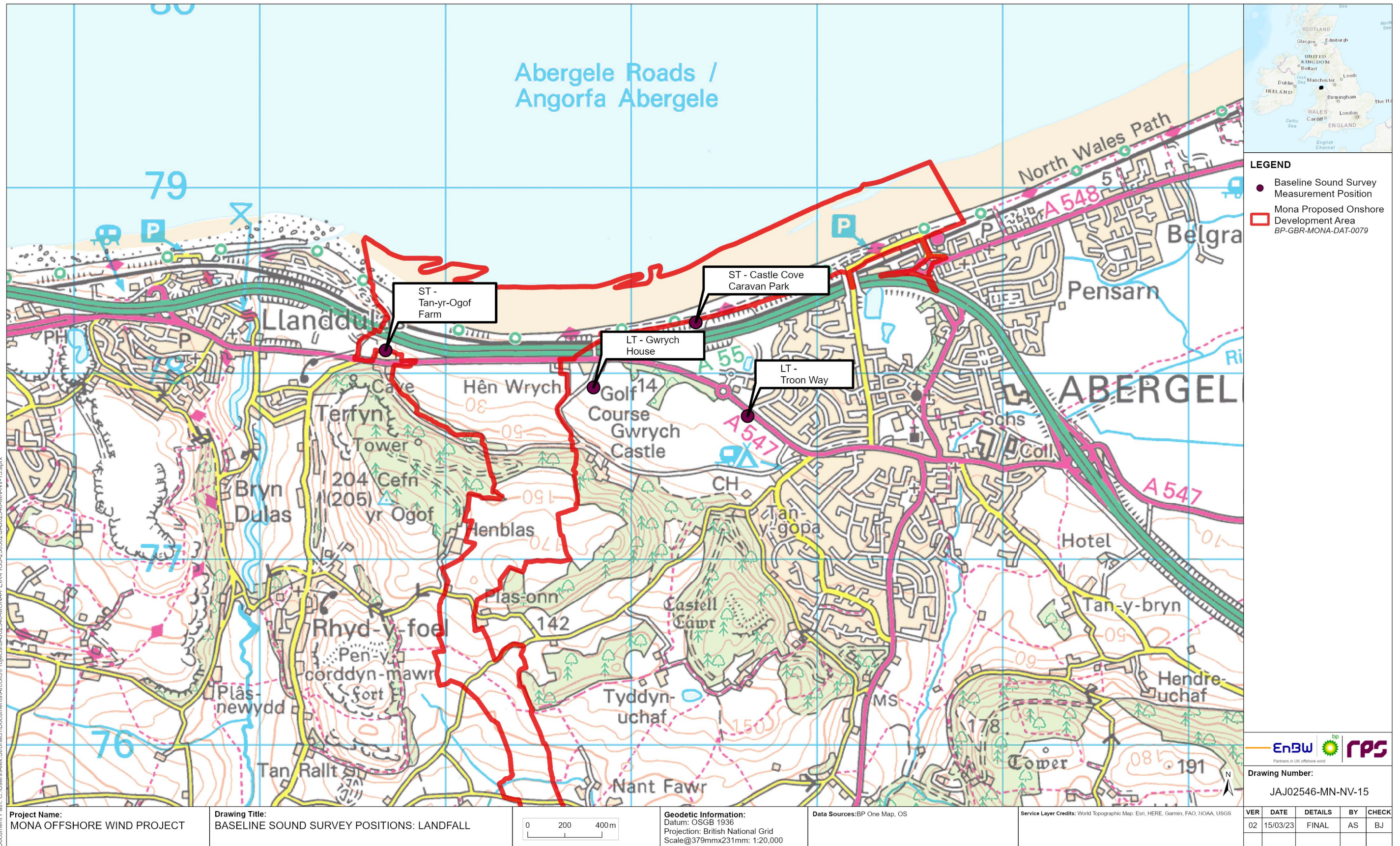


Figure 1.4: Baseline sound survey locations - landfall

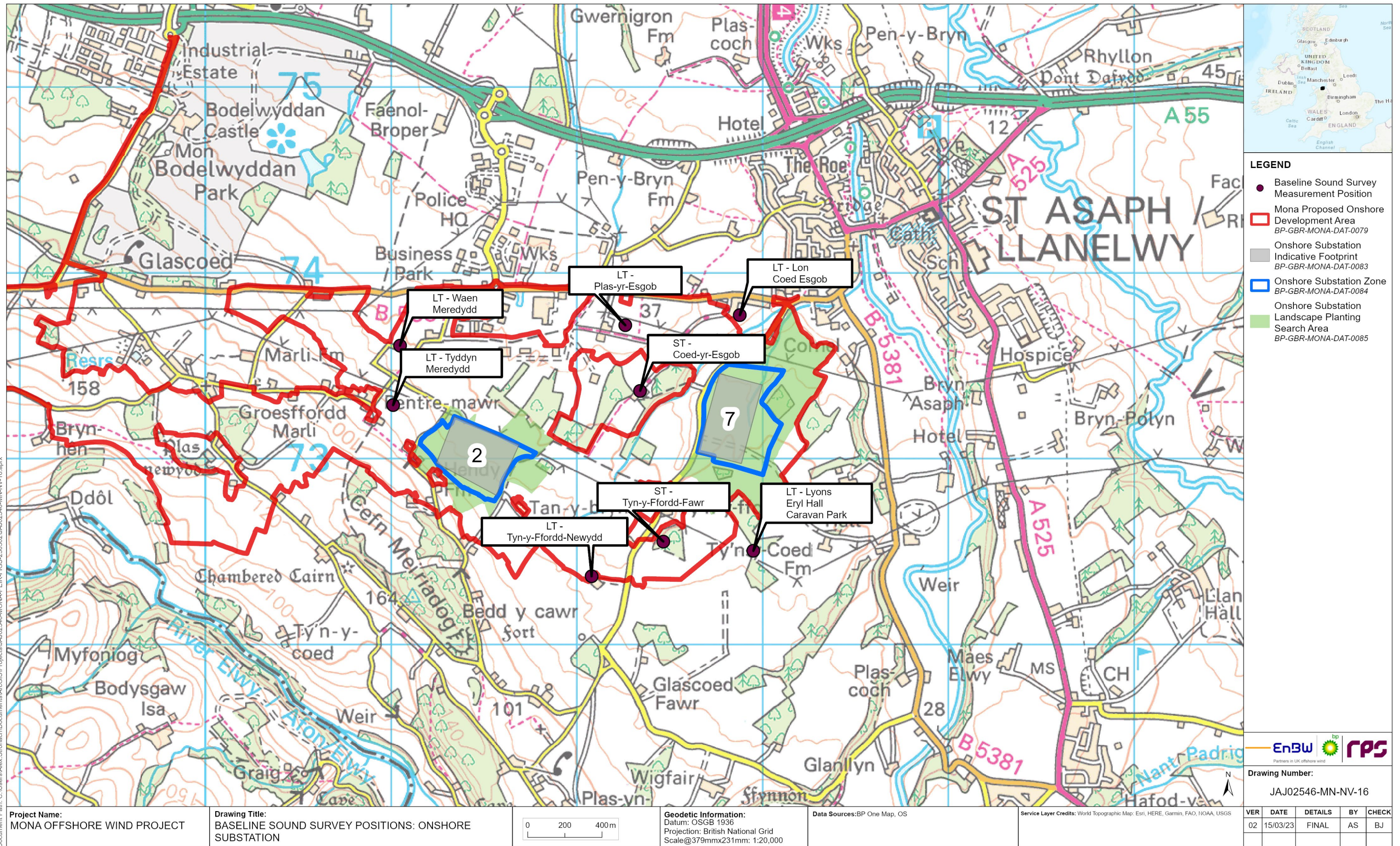


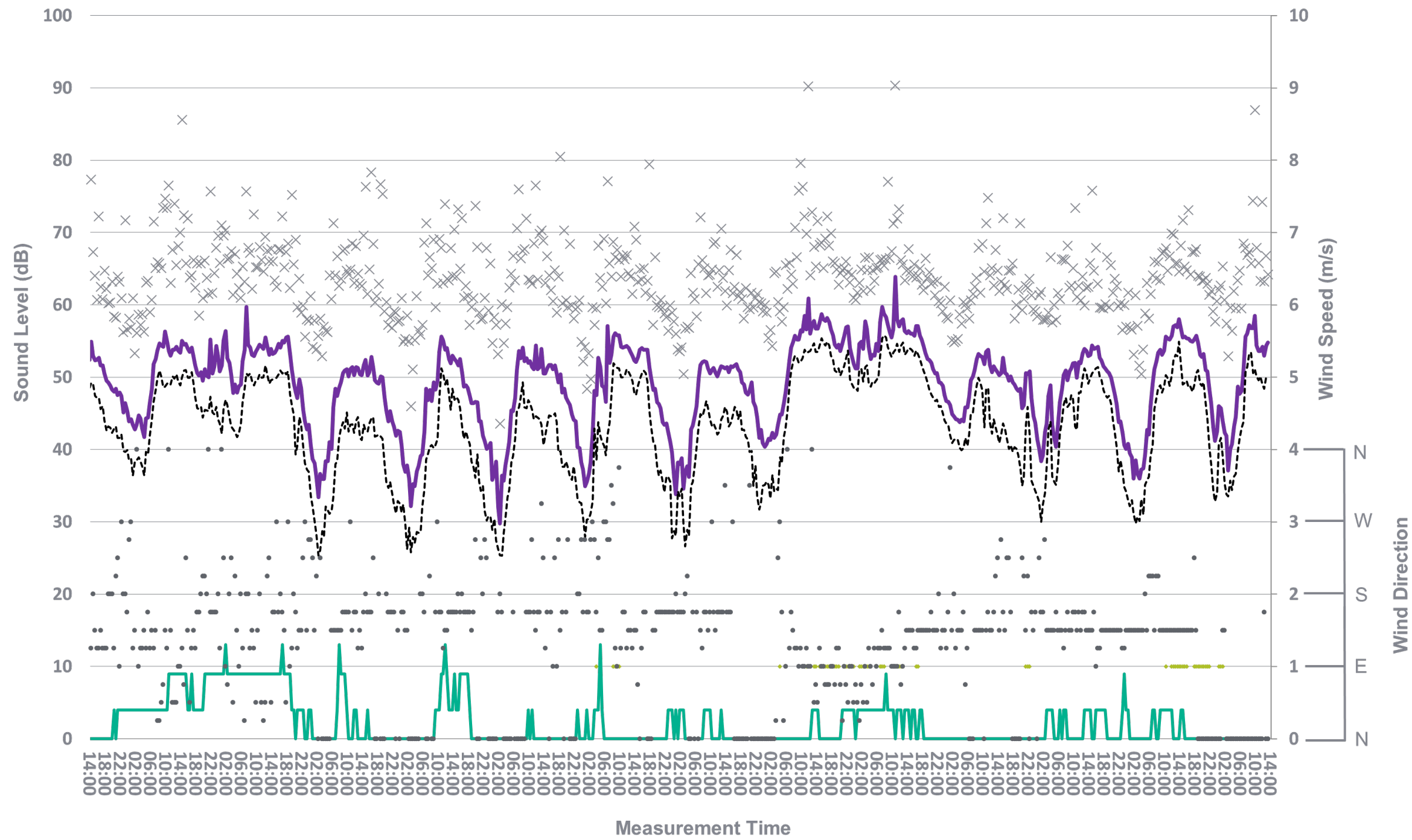
Figure 1.5: Baseline sound survey locations – onshore substations

Appendix B:

Time-History Graphs

Appendix B1

Measured Noise Levels at LT1, 9 to 22 November 2022

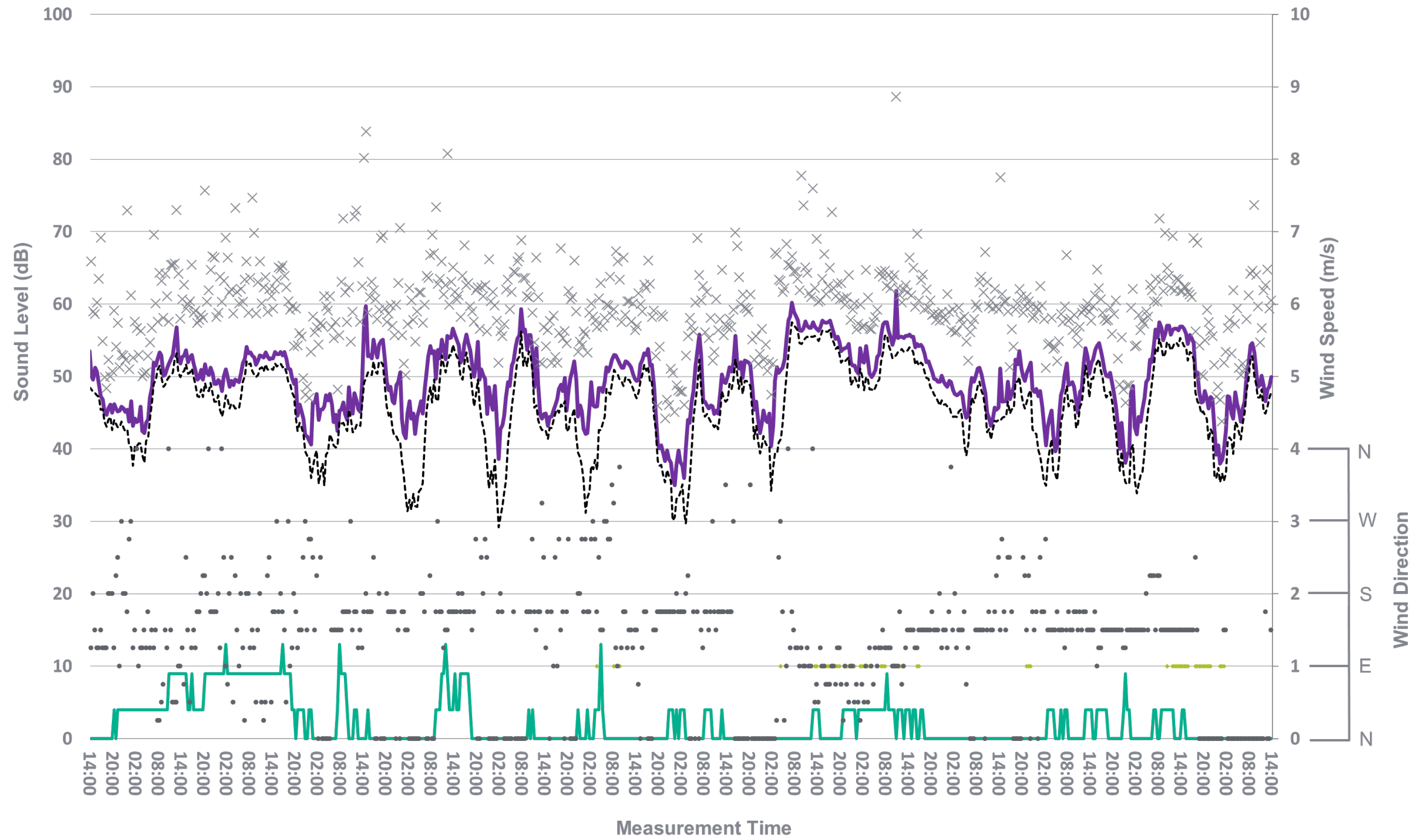


Mona Offshore Wind Farm

— LAeq × LAmax - - - - LA90 • Rain — Wind • Direction

Appendix B2

Measured Noise Levels at LT2, 9 to 22 November 2022



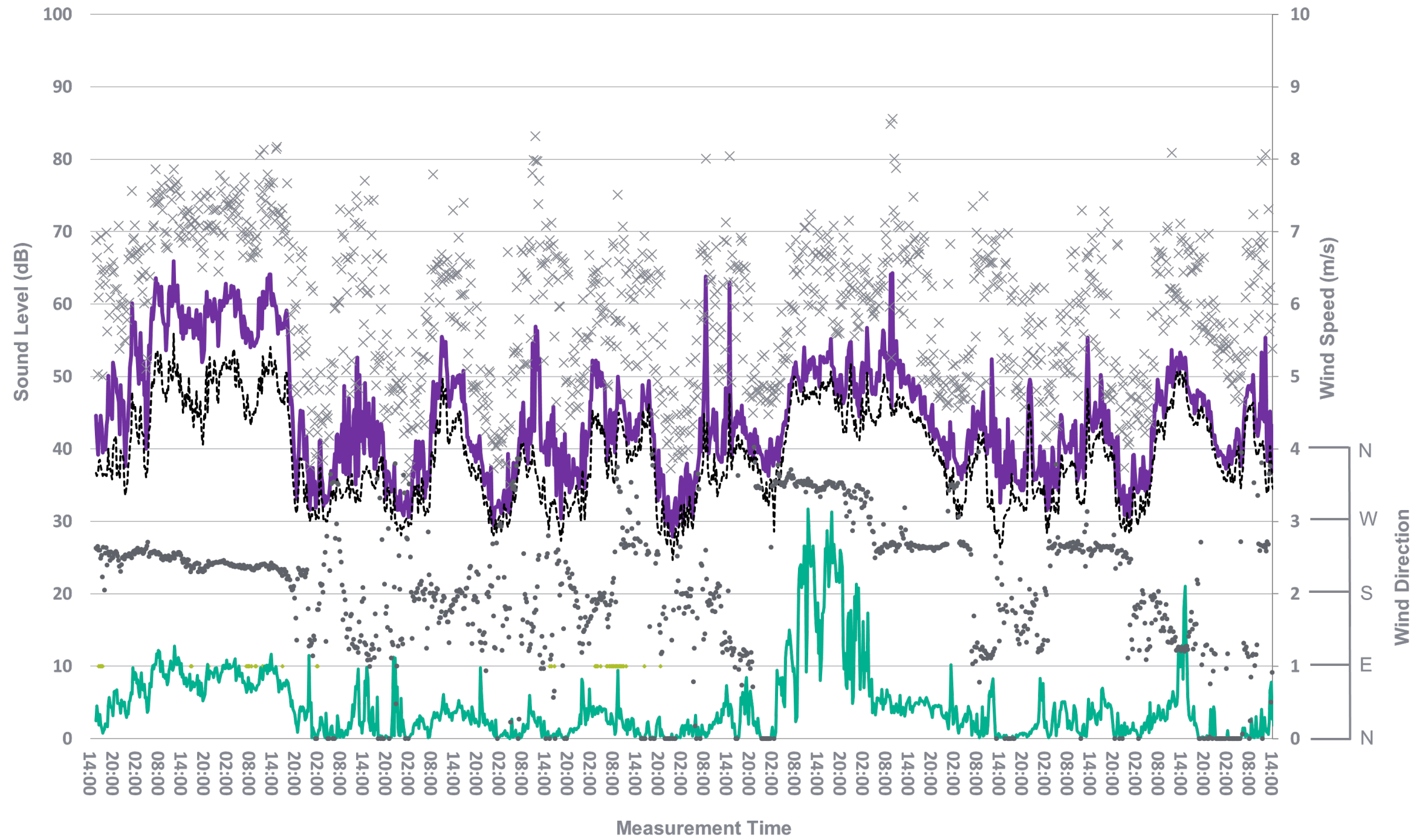
Mona Offshore Wind Farm

— LAeq × LAmax - - - - LA90 • Rain — Wind • Direction



Appendix B3

Measured Noise Levels at LT3, 9 to 22 November 2022



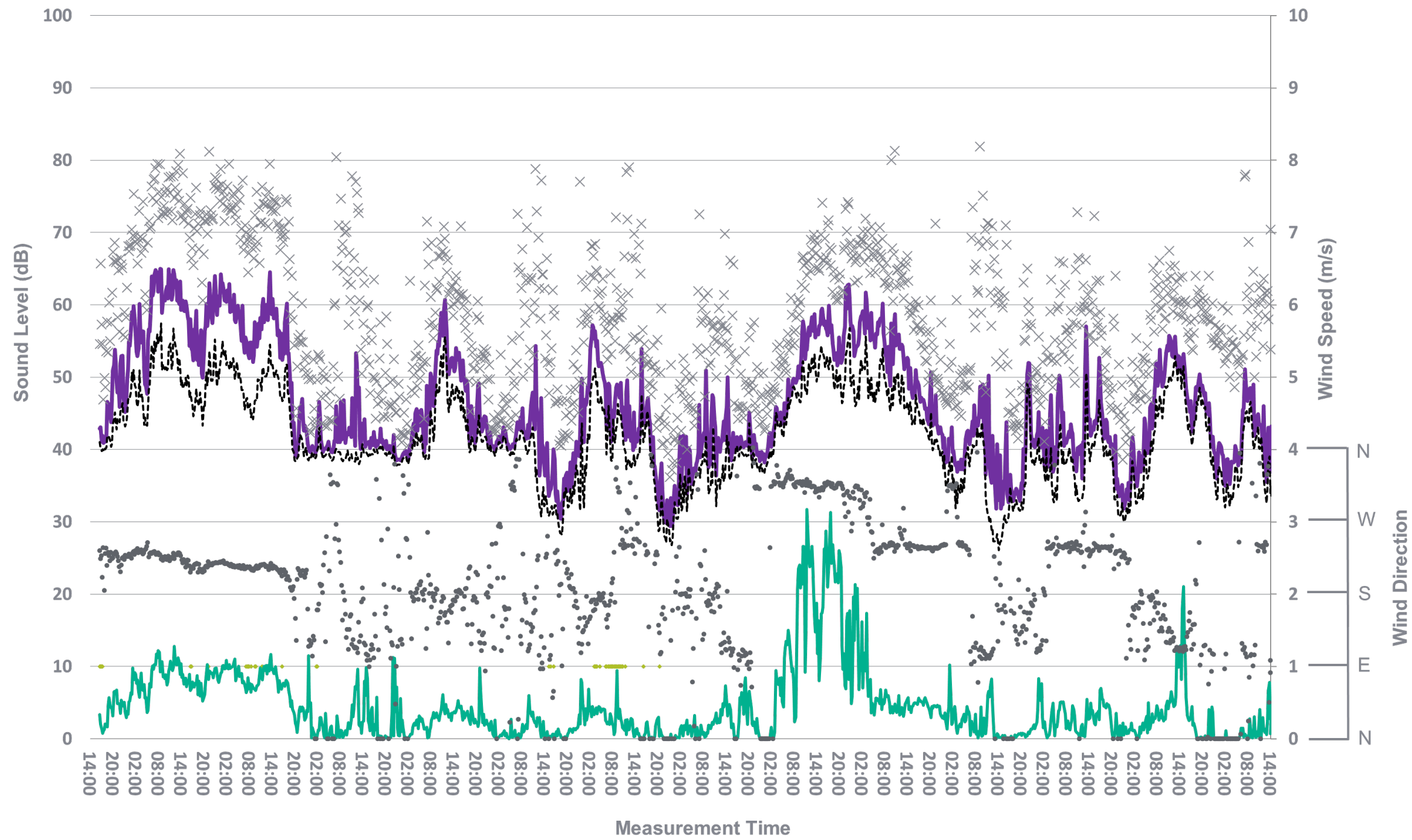
Mona Offshore Wind Farm

— LAeq × LAmax - - - - LA90 • Rain — Wind • Direction



Appendix B4

Measured Noise Levels at LT4, 9 to 22 November 2022



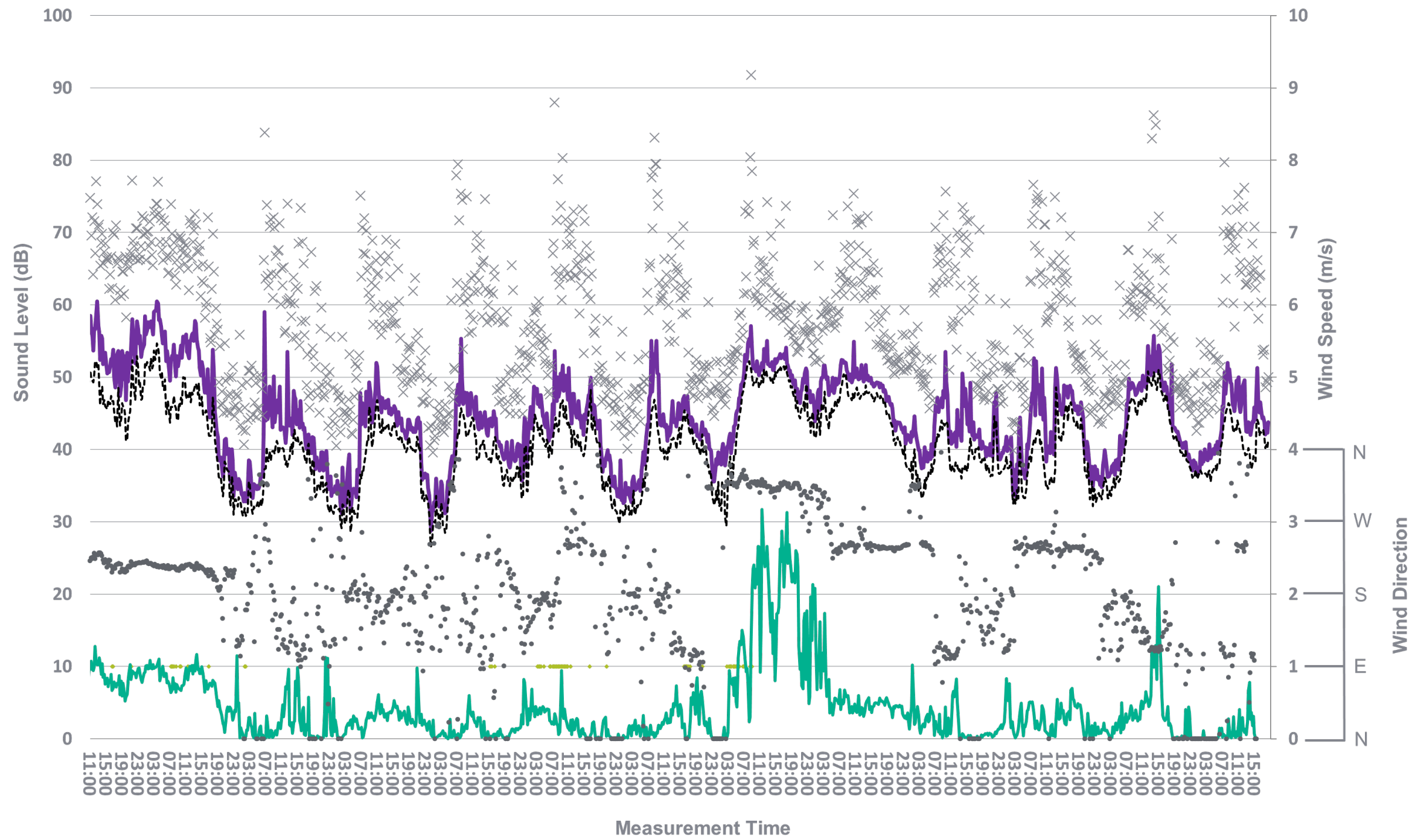
Mona Offshore Wind Farm

— LAeq × LAmax - - - - LA90 • Rain — Wind • Direction



Appendix B5

Measured Noise Levels at LT5, 10 to 22 November 2022



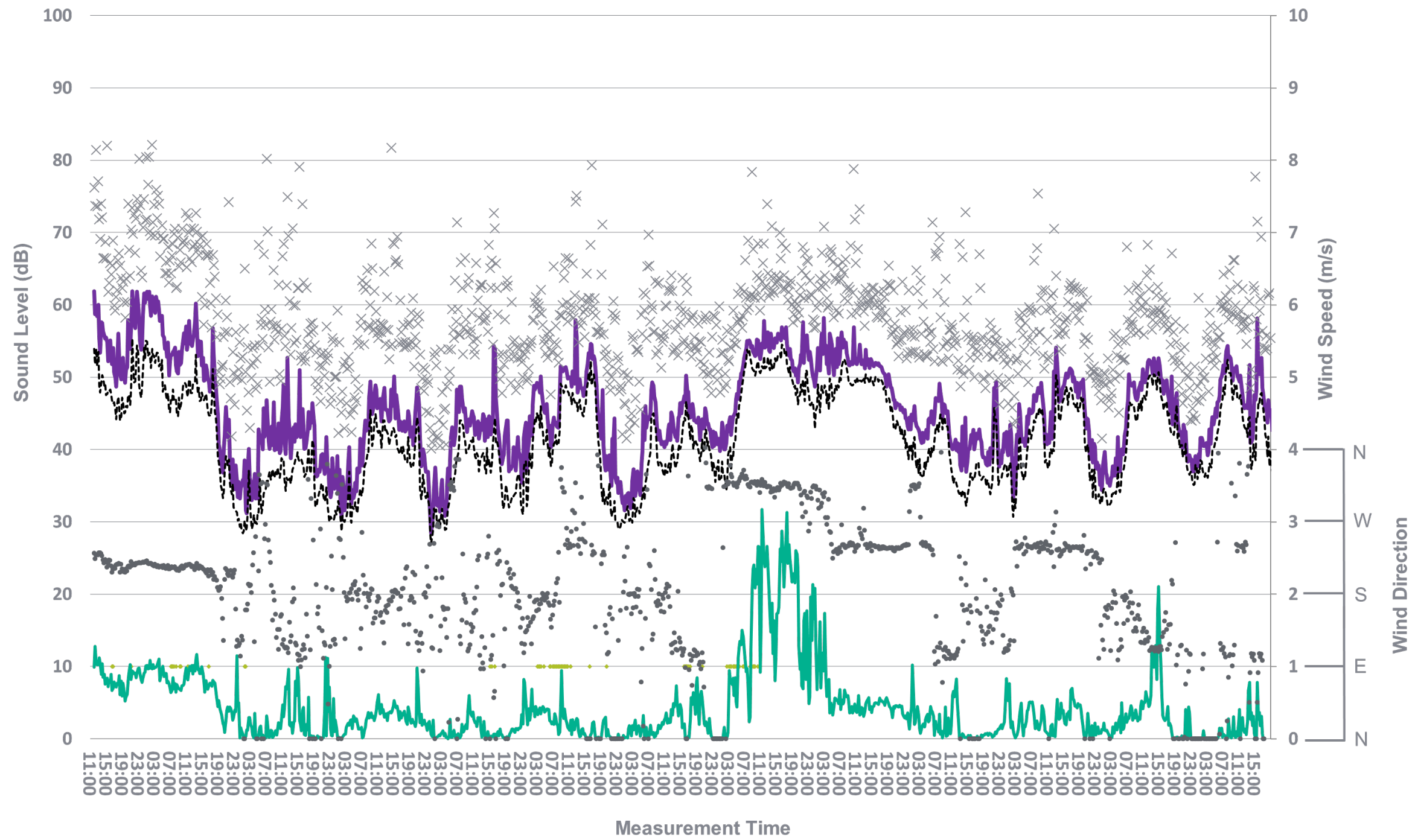
Mona Offshore Wind Farm

— LAeq × LAmax - - - - LA90 • Rain — Wind • Direction



Appendix B6

Measured Noise Levels at LT6, 10 to 22 November 2022



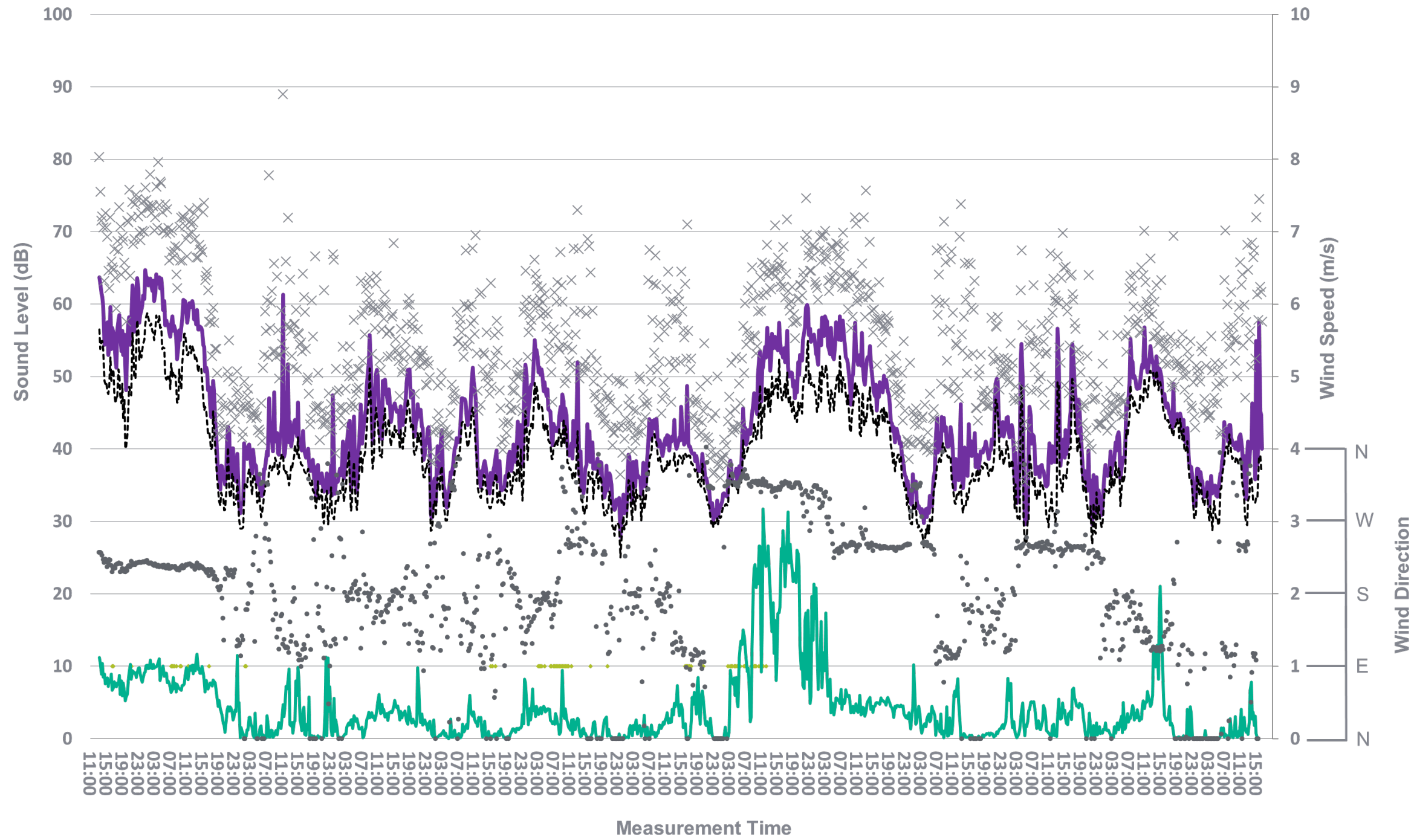
Mona Offshore Wind Farm

— LAeq × LAmax - - - - LA90 • Rain — Wind • Direction



Appendix B7

Measured Noise Levels at LT7, 10 to 22 November 2022



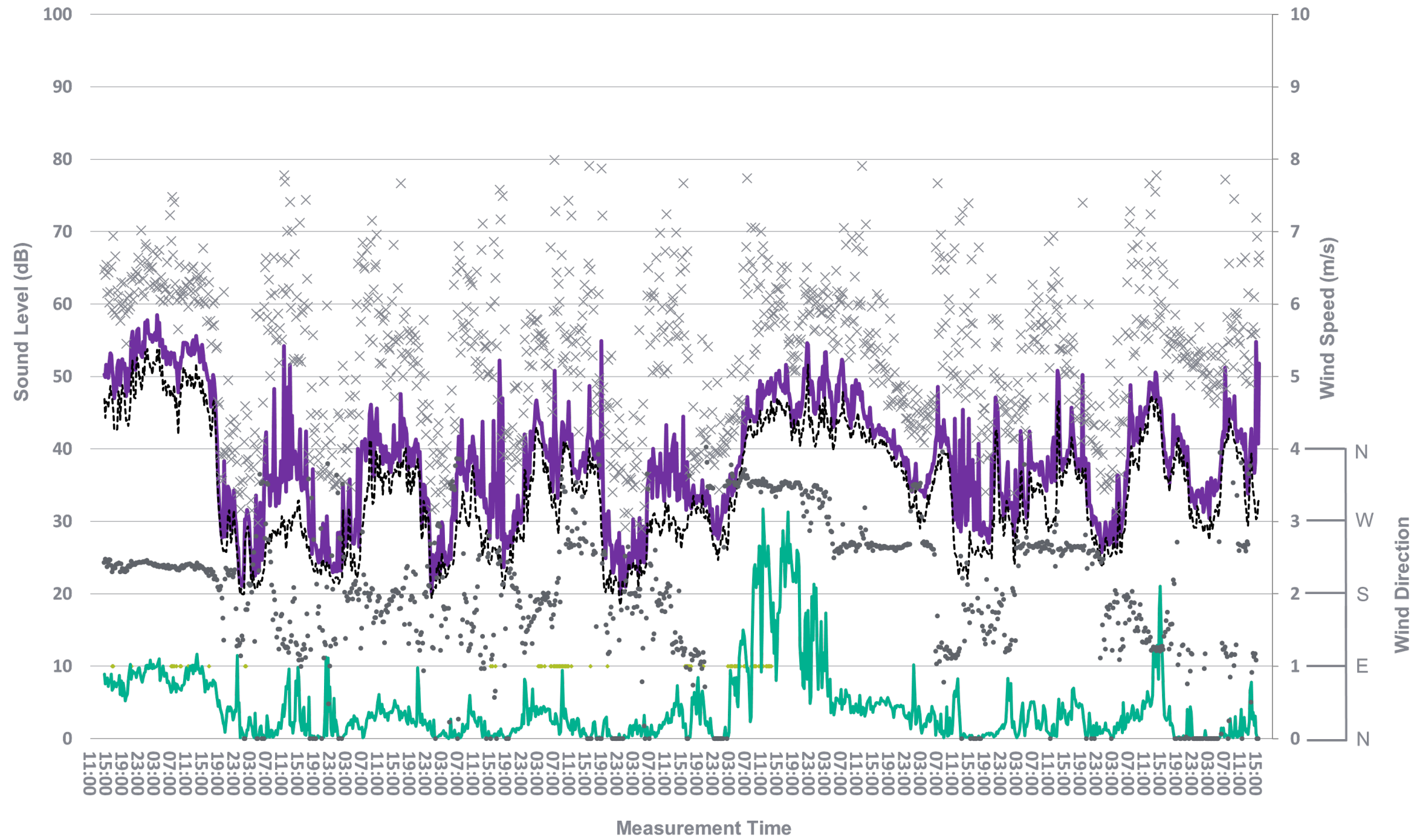
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— LAeq × LAmax - - - - LA90 • Rain — Wind • Direction



Appendix B8

Measured Noise Levels at LT8, 10 to 22 November 2022



Mona Offshore Wind Farm

— LAeq × LAmax - - - - LA90 • Rain — Wind • Direction

Appendix C: Short-Term Survey Results

ST1 – Castle Cove Caravan Park
Measured Sound Level (dB)

Start Time	L _{Aeq}	L _{AF,max}	L _{A90}
09/11/2022 11:00	63	92.2	81
09/11/2022 11:15	62	91.8	71
09/11/2022 11:30	64	93.4	94
09/11/2022 11:45	62	92	78
09/11/2022 12:00	63	92.8	77
09/11/2022 12:15	63	93	85
09/11/2022 12:30	64	93.3	83
09/11/2022 12:45	62	91.9	80
09/11/2022 13:00	64	93.2	83
09/11/2022 13:15	62	91.8	70
09/11/2022 13:30	63	92.4	86
09/11/2022 13:45	64	93.6	91
09/11/2022 14:00	64	93.1	93
09/11/2022 14:15	67	96.1	94
09/11/2022 14:30	64	93.6	90
09/11/2022 14:45	62	91.5	91
09/11/2022 15:00	62	91.7	74
09/11/2022 15:15	62	91.5	80
09/11/2022 15:30	61	90.3	87
09/11/2022 15:45	61	90.2	74
09/11/2022 16:00	62	91.9	79
09/11/2022 16:15	62	92	89

ST2 – Tan yr Ogof Caravan Park
Measured Sound Level (dB)

Start Time	<i>L</i> _{Aeq}	<i>L</i> _{AF,max}	<i>L</i> _{A90}
09/11/2022 11:45	63	92.2	81
09/11/2022 12:00	62	91.8	71
09/11/2022 12:15	64	93.4	94
09/11/2022 12:30	62	92	78
09/11/2022 12:45	63	92.8	77
09/11/2022 13:00	63	93	85
09/11/2022 13:15	64	93.3	83
09/11/2022 13:30	62	91.9	80
09/11/2022 13:45	64	93.2	83
09/11/2022 14:00	62	91.8	70
09/11/2022 14:15	63	92.4	86
09/11/2022 14:30	64	93.6	91
09/11/2022 14:45	64	93.1	93
09/11/2022 15:00	67	96.1	94
09/11/2022 15:15	64	93.6	90
09/11/2022 15:30	62	91.5	91
09/11/2022 15:45	62	91.7	74
09/11/2022 16:00	62	91.5	80
09/11/2022 16:15	61	90.3	87
09/11/2022 16:30	61	90.2	74
09/11/2022 16:45	62	91.9	79

ST3 – Coed yr Esgob Measured Sound Level (dB)			
Start Time	L _{Aeq}	L _{AF,max}	L _{A90}
22/11/2022 10:15	50	81	46
22/11/2022 10:30	49	69	46
22/11/2022 10:45	48	59	46
22/11/2022 11:00	49	68	46
22/11/2022 11:15	48	58	45
22/11/2022 11:30	48	58	46
22/11/2022 11:45	46	59	44
22/11/2022 12:00	45	53	43
22/11/2022 12:15	45	78	42
22/11/2022 12:30	43	59	40

ST4 – Coed yr Esgob Measured Sound Level (dB)			
Start Time	L _{Aeq}	L _{AF,max}	L _{A90}
22/11/2022 13:15	38	46	36
22/11/2022 13:30	42	50	40
22/11/2022 13:45	45	56	42
22/11/2022 14:00	39	46	36
22/11/2022 14:15	38	50	35
22/11/2022 14:30	37	57	35
22/11/2022 14:45	37	56	33
22/11/2022 15:00	58	78	33
22/11/2022 15:15	55	76	32
22/11/2022 15:30	36	49	33
22/11/2022 15:45	53	67	37
22/11/2022 16:00	39	48	37
22/11/2022 16:15	40	67	37