APPENDIX 12-2

Operational Wind Farm Noise Assessment

tnei

A specialist energy consultancy

Appendix 12.2

Operational Wind Farm Noise Report

Killoshulan Wind Farm

Atlantic Infrastructure Renewables Ltd

IE00061-011-R1
09 October 2026

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Executive Summary

TNEI Ireland Ltd was commissioned by MKO on behalf of Killoshulan Renewable Energy Ltd, subsidiary of Atlantic Infrastructure Renewables Ltd. (AIR) ('the Applicant') to undertake predictions of the wind turbine noise that would be emitted by the operation of the Killoshulan Wind Farm (hereinafter referred to as 'the Proposed Wind Farm'). The noise predictions were used to assess the potential impact of operational noise from the Proposed Wind Farm on the nearest noise sensitive receptors.

The Irish Governments '*Wind Energy Development Guidelines, 2006*' produced by the Department of Environment Heritage and Local Government (DoEHLG) (the Guidelines (DoEHLG, 2006)) are the current guidelines for setting noise limits for wind energy developments. The information relating to noise in the Guidelines (DoEHLG, 2006), in parts, is very limited and it is widely agreed that the limits proposed in the Guidelines (DoEHLG, 2006) were drafted to broadly align with the UK guidance ETSU-R-97 *'The Assessment and Rating of Noise from Wind Farms'*. In 2013, the UK guidance was supplemented by a document produced by the Institute of Acoustics *'A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise'* (IOA GPG). A new guidance which supersedes ETSU-R-97 was released in June 2026 named '*Assessment and Rating of Wind Turbine Noise*' (ARWTN); the assessment principles are generally the same as ETSU-R-97, but does introduce new terminology and clarifications to previous. It is specified in ARWTN that the IOA GPG is endorsed and should continue to be used.

Given the Guidelines (DoEHLG, 2006)were drafted to broadly align with ETSU-R-97 and given the assessment principles in ARWTN are broadly aligned with ETSU-R-97, the Guidelines (DoEHLG, 2006)are also considered to align with ARWTN core principles. Reference has been made to guidance contained in ARWTN and the IOA GPG to supplement the Guidelines (DoEHLG, 2006).

The operational noise assessment has been undertaken in three stages:

- Stage 1 – establish the Total Guidelines (DoEHLG, 2006) Noise Limits for nearby receptors based on measured background noise levels;
- Stage 2 – undertake a cumulative assessment based on likely predictions for all relevant turbines in the area (existing and proposed (in planning)) and compare the cumulative noise predictions against the Total Guidelines (DoEHLG, 2006) Noise Limits; and,
- Stage 3 – establish Site Specific Noise Limits for the Proposed Project (at levels below the Total Guidelines (DoEHLG, 2006) Noise Limits, where limit apportionment is required) and compare the noise predictions from the Proposed Wind Farm on its own against the proposed Site Specific Noise Limits.

Background noise monitoring was undertaken at six Noise Monitoring Locations (NMLs) considered to be representative of the noise sensitive receptors located closest to the Proposed Wind Farm.

There are 184 residential Noise Sensitive Receptors (NSRs) within 2 km of the Proposed Turbines. Of the 184 identified NSRs a total of thirteen NSRs were chosen as Noise Assessment Locations (NALs). Eleven of the NALs were chosen to represent the noise sensitive receptors located closest to the Proposed Wind Farm and two were additional receptors included to consider cumulative noise impacts near Lisdowney Wind Farm. For the assessment locations where no background noise measurements were undertaken, noise data collected at proxy locations deemed representative of the expected background noise environment was used to assess the wind turbine noise impact at those receptors.

Wind speed and direction data were measured using a LiDAR device located within the Proposed Wind Farm site. The wind data measured at 109 m and 99 m height was used to calculate hub height wind

speeds (at 103.5 m). These hub height wind speeds were then standardised to a height of 10 m in accordance with current good practice. Analysis of the measured data has been undertaken in accordance with the Guidelines (DoEHLG, 2006), ARWTN and current good practice to determine the pre-existing background noise environment and to establish the daytime and night-time noise limits at each of the NALs.

Two sets of noise limits have been derived; the Total Guidelines (DoEHLG, 2006) Noise Limits apply to the cumulative noise level of all turbines operating in the area including the Proposed Wind Farm, whilst the Site Specific Noise Limits apply to operational noise from the Proposed Wind Farm only.

Based on the guidance in the Guidelines (DoEHLG, 2006), the daytime Total Guidelines (DoEHLG, 2006) Noise Limit was set at 40 dB(A) where background noise levels were <30 dB and 45 dB(A) or background plus 5 dB whichever is the greater where background noise levels were >30 dB. The night-time Total Guidelines (DoEHLG, 2006) Noise Limit has been set at 43 dB(A) or background plus 5 dB whichever is the greater. Whilst it is understood that An Coimisiún Pleanála (ACP) currently condition night-time noise limits based on a fixed limit of 43 dB(A), the Association of Acoustic Consultants of Ireland produced a document, 'Environmental Noise Guidance for Local Authority Planning & Enforcement Departments', detailing advice for local authority officers 'involved in enforcement, assessment of noise reports, & drafting of noise conditions for planning permissions & permits'. The advice therein is to set night-time limits based on 43 dB(A) or background noise plus 5 dB, which is the approach that TNEI have taken for this assessment.

These limits were applied to eleven of the thirteen NALs. For the two NALs located proximate to Lisdowney Wind Farm, the Total Noise Limits were set as per the conditioned noise limits found in the planning conditions of Lisdowney Wind Farm.

Predictions of wind turbine noise for the Proposed Wind Farm were made, based upon the sound power level data for a candidate wind turbine, the Nordex N163 6.X MW with serrated trailing edges and a hub height of 103.5 m.

Modelling was undertaken using the ISO 9613: 1996 *'Acoustics – Attenuation of sound during propagation outdoors Part 2: General method of calculation'* noise prediction model which accords with current good practice and is considered to provide a realistic impact assessment. For nearby other wind farm / turbine schemes, predictions have been undertaken using sound power level data for the installed turbines or a suitable candidate. The model of turbine was either identified through an online search, or through the use of the Council's Planning Application Portal.

The assessment of likely cumulative noise levels undertaken at the NALs shows that the Proposed Wind Farm can operate concurrently with the other wind farm developments in the area, whilst meeting the Total Guidelines (DoEHLG, 2006) Noise Limit, at all NALs.

Site Specific Noise Limits have also been derived to take account (where required) of the other wind farm developments. Where wind turbine immissions from the other wind turbines at a given receptor were found to be at least 10 dB below the Total Guidelines (DoEHLG, 2006) Noise Limit, it is considered that they will be using a negligible proportion of the limit, as such it was considered appropriate to allocate the entire noise limit to the Proposed Wind Farm. For the receptors where turbine predictions were found to be within 10 dB of the Total Guidelines (DoEHLG, 2006) Noise Limit, apportionment of the Total Guidelines (DoEHLG, 2006) Noise Limits was undertaken in accordance with the IOA GPG.

Predicted noise levels indicate that at for all noise assessment locations, wind turbine noise immissions were below the Site Specific Noise Limits when considering the Nordex N163 6.X MW as a candidate turbine.

The use of Site Specific Noise Limits would ensure that the Proposed Wind Farm could operate concurrently with other proposed, consented or operational wind turbines in the area and would also

ensure that the Proposed Wind Farm's individual contribution could be measured and enforced if required.

Should planning permission be granted for the Proposed Wind Farm it would be appropriate to include a set of noise related planning conditions, which detail the noise limits applicable to the Proposed Wind Farm.

There are a number of wind turbine makes and models that may be suitable for the Proposed Wind Farm. Should the Proposed Wind Farm receive planning permission the final choice of turbine would be subject to a competitive tendering process. As such, predictions of wind turbine noise are for information only. The final choice of turbine would, however, need to meet the noise limits determined and contained within any condition imposed.

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1 Introduction

1.1 Brief

1.1.1 TNEI Ireland Ltd was commissioned by MKO on behalf of Killoshulan Renewable Energy Ltd, subsidiary of Atlantic Infrastructure Renewables Ltd. (AIR)('the Applicant') to undertake an operational noise assessment for the Killoshulan Wind Farm (hereinafter referred to as 'the Proposed Wind Farm'). The following steps summarise the noise assessment process:

- Measure and analyse existing background noise levels and present the measured noise data with reference to existing Government Guidance and the recommendations of the Department of Environment Heritage and Local Government (DoEHLG) which are contained in the '*Wind Energy Development Guidelines, 2006*' (1) (Guidelines (DoEHLG, 2006)) in conjunction with the guidance produced by the United Kingdom's Department of Energy Security and Net Zero which are contained within 'Assessment and Rating of Wind Turbine Noise' (ARWTN) (2) and the Institute of Acoustics *'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'* (3) (IOA GPG) which represents current good practice in the UK, and is frequently used to supplement the Guidelines (DoEHLG, 2006) and further inform wind farm noise assessments in Ireland[1] (see Section 2.7);
- Determine the Total Guidelines (DoEHLG, 2006) Noise Limits applicable to all wind farms in the area;
- Assess and undertake a cumulative noise assessment, where required, to take account of other proposed, consented or operational schemes near to the Proposed Wind Farm;
- Derive Site Specific Noise Limits for the Proposed Wind Farm, suitable for inclusion in a noise related planning condition should An Coimisiúin Pleanála grant planning permission for the Proposed Wind Farm;
- Undertake predictions of the operational wind turbine noise immissions from the Proposed Wind Farm that will be incident at neighbouring noise sensitive receptors;
- Compare the predictions of the operational wind turbine noise immissions from the Proposed Wind Farm against the Site Specific Noise Limits; and,
- Assess the impact of noise from the Proposed Wind Farm with reference to the Guidelines (DoEHLG, 2006), ARWTN and current good practice (IOA GPG).

1.2 Background

1.2.1 The Proposed Wind Farm is located approximately 2.4 km east of the village of Johnstown, 3.7 km northeast of the town of Urlingford and 4km west of the village of Freshford, Co. Kilkenny. The approximate Irish Transverse Mercator (ITM) reference for the centre if the

[1] Note ARWTN superseded the guidance produced by the United Kingdom's Department of Trade and Industry Noise Working Group, named ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms' (3) in June 2026; whilst this is a new piece of guidance, the assessment principles are generally the same as detailed in ETSU-R-97 and reference is made to the IOA GPG. ARWTN and the IOA GPG are therefore considered appropriate to use to continue to inform the Guidelines (DoEHLG, 2006). Further information is detailed in Section 2.9.

site is 634613, 666097 and the proposed layout considered in this assessment is for 10 no. wind turbines, as shown on Figure A1.1 in Annex 1.

1.2.2 This noise assessment models a candidate turbine, the Nordex N163, 6.X MW with serrated trailing edge blades and a hub height of 103.5 m.

1.2.3 The noise assessment has considered schemes that are operational, consented and proposed (planning application submitted). Schemes that are in pre-application are not considered. The schemes considered in the assessment are summarised in Table 1.1.

Table 1.1 Cumulative Wind Farm Developments

Wind Farm/ Wind Turbine	No. of Turbines	Status	Turbine Installed/Candidate Considered	Distance to nearest Proposed Project Turbine (km)
Bruckana	14	Operational	Siemens SWT-3.0-101	10.5
Lisdowney	4	Operational	Enercon E82/2300	4.5
Lisheen 1	18	Operational	Vestas V90/2000	11.7
Lisheen 2	12	Operational	Vestas V90/2000	13.7
Lisheen 3	8	Operational	Vestas V136/3450	9.8
An Cnoc	5	Operational	Enercon E70/2300	10.0
Ballybeagh	6	Operational	Enercon E82/2300	8.4
Seskin	8	In Planning	Vestas V150 6.0 MW	8.9
Gathabawn	12	In Planning	Vestas V136 4.5 MW	2.4

1.2.4 Figure A1.2 in Annex 1 shows the location of the above developments relative to the Proposed Wind Farm. The turbine type modelled for each of the schemes detailed in Table 1.1 was chosen using information contained within the Environmental Impacts Statements for the schemes or using information detailed on the specific project websites.

1.2.5 For the purposes of assessing the above schemes in conjunction with the Proposed Wind Farm the following terms have been referred to throughout the assessment;

- 'Total Guidelines (DoEHLG, 2006) Noise Limits'; defined as being the limit that should not be exceeded from the cumulative operation of all wind farm developments, including the Proposed Wind Farm; and
- 'Site Specific Noise Limits'; defined as being the limit that is specific to the Proposed Wind Farm only, and derived through the apportionment (where required), of the 'Total Guidelines (DoEHLG, 2006) Noise Limits' in accordance with current good practice (IOA GPG).

1.2.6 Note that the term 'noise emission' relates to the sound power level emitted from each wind turbine, whereas the term 'noise immission' relates to the sound pressure level received at any receptor location, due to the operation of the wind turbines. All references to dB are dB(A), unless otherwise stated. Wind speeds are standardised to 10 m height, and grid

coordinates are in ITM unless otherwise stated. A full glossary of terms is provided in Section 8.

2 Noise Planning Policy and Guidance

2.1 Overview of Noise Planning Policy and Guidance

2.1.1 In assessing the potential noise impacts of the Proposed Wind Farm, the following guidance and policy documents have been considered:

- National Planning Policy;
- Regional Planning Policy;
- Local Policy;
- Department of Environment Heritage and Local Government (DoEHLG) '*Wind Energy Development Guidelines,'* 2006;
- ETSU-R-97 *'The Assessment and Rating of Noise from Wind Farms'*; and
- Institute of Acoustics *'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'* (IOA GPG) May 2013.

2.2 National Planning Policy

2.2.1 National Planning Framework (NPF) is the primary material consideration for all planning decisions in Ireland. It is a long term, 20-year strategy for strategic planning and sustainable development of urban and rural areas to 2040, with the core objectives of securing balanced regional development and a sustainable growth.

2.2.2 The NPF was first introduced in 2018, the NPF serves as an overarching spatial planning and development strategy for the country. Subsequently, the revised NPF was approved by the Oireachtas in April 2025.

2.2.3 Within the NPF, there is an emphasis on the provision of renewable energy in helping to work towards a low carbon economy and climate resilience. Section 1.3 of the NPF outlines Ireland's shared goals.

2.2.4 One of these goals relates to the transition to a low-carbon society, promoting the need for renewable energy and associated infrastructure, emphasised below:

"This objective will shape investment choices over the coming decades in line with the National Mitigation Plan and the National Adaptation Framework. New energy systems and transmission grids will be necessary for a more distributed, renewables-focussed energy generation system, harnessing both the considerable on-shore and off-shore potential from energy sources such as wind…"

2.2.5 Moreover, development policies have also been introduced in the NPF which are to be applied country wide. Such as Policy Objective 55, which states that:

"Promote renewable energy use at appropriate locations within the built and natural environment to meet national objectives towards achieving a low-carbon economy by 2050."

2.3 Local Policy

2.3.1 The current renewable energy strategy for County Kilkenny is contained within the Kilkenny County Development Plan (2021-2027). This was adopted on the 3rd of September 2021. Section 11.5.3 – *'Development Management Guidance'* of Chapter 11 – *'Renewable Energy'* of Volume 1 states:

'All planning applications for wind energy developments shall be assessed against the DEHLG's Wind Energy Development Guidelines, 2006, (and any subsequent update of these guidelines) and the County Council's Wind Strategy

2.3.2 Section 11.5.3 goes on to state that when considering an application for wind energy development, the planning authority may consider:

'*local environmental impacts including noise, shadow flicker, electromagnetic interference etc…'*

2.3.3 Section 11.5.3.4 of Chapter 11 'Renewable Energy' states that:

… there will be a requirement for noise modelling as part of any wind energy development. Noise modelling carried out by the applicant in advance of and submitted with the planning application must test and demonstrate compliance with the required noise limits specified in the draft Ministerial Guidance.'

2.3.4 The Kilkenny County Council Noise Action Plan (2024-2028) has been prepared for the primary purpose of managing noise issues and their effects. The Plan has been prepared in accordance with the requirements of the EU Directive 2002/49/EC. The aim of the Directive is to establish a European-wide system for identifying sources of environmental noise, informing the public about relevant noise data, and taking the necessary steps to avoid, prevent or reduce noise exposure.

2.4 Wind Energy Development Guidelines, 2006

2.4.1 The current guidelines for setting noise limits are detailed in the Department of Environment Heritage and Local Government (DoEHLG), *'Wind Energy Development Guidelines, 2006'* (Guidelines (DoEHLG, 2006)).

2.4.2 The information relating to noise in the Guidelines (DoEHLG, 2006) is very limited (for example there is no guidance on where or how to measure background noise levels and how to correlate these with wind speed on the proposed wind farm site. There is also no mention of how to consider cumulative effects). The Guidelines (DoEHLG, 2006)do, however, include guidance on how to derive limits for daytime and night-time periods.

2.4.3 The daytime limits take account of existing background noise levels and include a fixed limit of 45 dB or background + 5 dB, whichever is the greater, except in low background noise environments where a fixed minimum limit in the range 35-40 dB should be considered. TNEIs interpretation of these limits based on the most recent wind farm noise conditions seen across wind farm projects in Ireland is that turbine noise should not exceed:

- 45 dB $L_{A90,\ 10\ min}$ or background noise + 5 dB, whichever is the greater, for daytime hours (applicable where background noise levels are greater than 30 dB L_{A90}); or,

- 40 dB $L_{A90,\ 10\ min}$ where background noise is less than 30 dB L_{A90};

2.4.4 The Guidelines (DoEHLG, 2006) states that a 'fixed limit of 43dB(A) will protect sleep inside properties during the night', however, whilst it is not explicit within the Guidelines (DoEHLG, 2006) guidance, the addition of a night-time 'background noise +5 dB' parameter is commonly applied in wind turbine noise assessments. This is as recommended in the Association of Acoustic Consultants of Ireland document 'Environmental Noise Guidance for Local Authority Planning & Enforcement Departments' (4). This details advice for local planning authorities on how to draft noise related conditions for a variety of sectors, including renewable energy developments. With relation to guidance on night-time noise limits for wind farms, the document recommends a limit of 5 dB above background, subject to a lower fixed limit of 43 dB, and notes that the Guidelines (DoEHLG, 2006)wording is particularly vague.

2.4.5 On that basis, the night-time noise limits used in this assessment have been based on 43 dB or background noise + 5 dB, whichever is the greater.

2.4.6 It is widely agreed that the limits proposed in the Guidelines (DoEHLG, 2006) were drafted to broadly align with the former UK guidance ETSU-R-97 *'The Assessment and Rating of Noise from Wind Farms'*. In 2013 this former UK guidance was supplemented by a document produced by the Institute of Acoustics' (IOA) 'A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise' (IOA GPG). A new guidance which supersedes ETSU-R-97 was released in June 2026 named 'Assessment and Rating of Wind Turbine Noise' (ARWTN); the assessment principles are generally the same as ETSU-R-97 but does introduce new terminology and clarifications to previous. It is specified in this update that the IOA GPG is endorsed and should continue to be used.

2.4.7 Given the Guidelines (DoEHLG, 2006) were drafted to broadly align with ETSU-R-97 and given the assessment principles in ARWTN are generally the same as ETSU-R-97, the Guidelines (DoEHLG, 2006) are also considered to align with ARWTN core principles. Reference has been made to guidance contained in ARWTN and the IOA GPG to supplement the less detailed Guidelines (DoEHLG, 2006).

2.5 Draft 2019 Guidelines

2.5.1 It is noted that the Guidelines (DoEHLG, 2006)are currently under review and a set of 'Draft 2019 Guidelines (DoHPLG, 2019)' were issued for consultation in December 2019. Significant concerns were raised during the public consultation process on the Draft 2019 Guidelines (DoHPLG, 2019), including concerns raised by acousticians (5) with significant experience in wind farm noise, and how the authors had misinterpreted existing guidance and had incorporated a number of errors within the technical approaches proposed. In light of these concerns, and the fact that significant changes would need to be made before they could be adopted, an assessment using the Draft 2019 Guidelines (DoHPLG, 2019)is not, in the professional opinion of TNEI, technically feasible or appropriate and has not therefore been undertaken.

2.5.2 Timelines for the conclusion of the Draft 2019 Guidelines (DoHPLG, 2019)review are still unclear however the Government of Ireland's Climate Action Plan 2024 (6) includes a 2024 Action (EL/24/5) to 'Publish the Revised Wind Energy Development Guidelines for onshore wind.' No timescales for completion are provided.

2.5.3 Therefore, at time of writing this Operational Noise Report, the Guidelines (DoEHLG, 2006)remain the relevant statutory guidelines and, as a result, they have been used for this assessment, appropriately supplemented by the guidance in ARWTN and the IOA GPG, which are considered by TNEI to represent current best practice. This report has been prepared by suitably qualified Acousticians, affiliated with the IOA. Based on the experience of TNEI of undertaking wind farms noise assessment projects with a combined rated capacity of >5 GW, it is considered that the use of these documents represents best available evidence and is the most robust approach.

2.6 Assessment and Rating of Wind Turbine Noise (ARWTN)

2.6.1 On June 19th, 2026, the UK Government Department of Energy Security and Net Zero released refreshed guidance which supersedes ETSU-R-97 titled *'Assessment and Rating of Wind Turbines'* (ARWTN).

2.6.2 The basic aim of ARWTN is to provide:

"guidelines for the control of wind turbine noise, such that wind farm neighbours receive a reasonable degree of protection without placing unreasonable restrictions on wind farm development."

2.6.3 ARWTN follows ETSU-R-97's prior aim of trying to balance any environmental impact with the need for renewable energy stating:

'ETSU-R-97 recognised the specific nature and operation of wind turbines and the noise they produce, and how this differs to many other sources of noise. The ETSU-R-97 guidance also identified the need to balance the environmental impacts from a wind farm with the benefits that arise through the development of renewable energy sources. These same principles remain relevant for these guidelines. The guidance recognises that achieving this balance may result in operational wind turbine noise being audible at nearby properties where such levels are considered acceptable.'

2.6.4 The guidance states that noise assessment criteria (previously known as noise limits in ETSU-R-97) should reflect the variation in both turbine source noise and background noise with wind speed. Lower Limiting Values (LLVs), which are different for the daytime and night-time periods, are applied where low levels of background sound are measured. The wind speed range that should be considered ranges between the cut-in wind speed for the turbines (usually about 2 to 3 ms-1) and up to 10 ms-1, where all wind speeds are referenced to a 10-metre measurement height.

2.6.5 Separate LLVs apply for daytime and for night-time. Daytime LLVs are chosen to protect a property's external amenity, and night-time LLVs are chosen to protect a properties indoor environment (with windows either open or closed).

2.6.6 The daytime noise assessment criteria is derived from background sound data measured during so-called 'quiet day' periods (considered to be the periods of the day when background sound levels are lower than at other times of the day); these comprise weekday evenings (18:00 to 23:00), Saturday afternoons and evenings (13:00 to 23:00) and all day and evening on Sundays (07:00 to 23:00). Multiple samples of 10-minute background noise levels using the $L_{A90,10min}$ measurement index are logged continuously over a range of wind speed conditions. These measured noise levels are then plotted against concurrent wind speed

data and a 'best fit' curve is fitted to the data to establish the background noise level as a function of wind speed. The daytime noise assessment criteria is then set at a level 5 dB(A) above the best fit curve, subject to a LLV within the range 35-40.

2.6.7 The night-time noise assessment criteria limit is derived from background sound data measured during the night-time periods (23:00 to 07:00), with no differentiation being made between weekdays and weekends. The 10-minute L_{A90} noise levels measured over the night-time periods are plotted against concurrent wind speed data and a 'best fit' correlation is established. The night-time noise limit is also based on a level 5 dB(A) above the best fit curve, subject to a LLV of 43 dB L_{A90}.

2.6.8 The exception to the setting of both the daytime and night-time LLVs occurs where a property occupier has a financial involvement in the wind farm development. Paragraph 2.29 of ARWTN states:

'The LLV used to define the noise assessment criteria can be increased to 45 dB for both day and night periods where the occupier (whether owner-occupiers or tenants) of the property has a financial involvement in the wind farm. Detailed guidance on appropriate arrangements for financial involvement is beyond the scope of this technical guide, however case law suggests this should be where the occupier receives a profitable (not merely compensatory) financial benefit associated with the wind farm over the life of that scheme.'

2.6.9 Additional reference is also made in ARWTN to aspects that can be scoped out of the requirement to be assessed. These include Infrasound, Ground-borne Vibration, and Low Frequency Sound – these are further detailed in Section 3.2 below.

2.6.10 Whilst there are differences with relation to terminology and clarifications, overall the document represents an evolution of ETSU-R-97 rather than a fundamental change to the underlying assessment approach. However, like ETSU-R-97, ARWTN provides a robust basis for determining the noise limits for wind turbine(s) and is the accepted standard for such developments across the UK. It also continues to consider previous good practice documentation released with relation to ETSU-R-97, as detailed below.

2.6.11 This assessment adopts core principles of ARWTN, especially for the background survey and analysis. However, the final criteria used follows the Guidelines (DoEHLG, 2006), for example the fixed minimum (or LLV) in this assessment are specific to the Guidelines (DoEHLG, 2006) and wind speeds are still considered up to 12m/s.

2.7 Current Good Practice

A Good Practice Guide on the Application of ETSU-R-97

2.7.1 In May 2013, the Institute of Acoustics issued *'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'* (IOA GPG). The document provides guidance on background noise data collection, data analysis and limit derivation, noise predictions, cumulative issues, reporting requirements and other matters such as noise related planning conditions.

2.7.2 The Authors of the IOA GPG sets out the scope of the document in Section 1.2:

'This guide presents current good practice in the application of the ETSU-R-97 assessment methodology for all wind turbine developments above 50 kW, reflecting the original principles within ETSU-R-97, and the results of research carried out and experience gained since ETSU-R-97 was published. The noise limits in ETSU-R-97 have not been examined as these are a matter for Government.'

2.7.3 With relation to the release of the ARWTN guidance, the IOA published a statement on the 22nd of June, 2026 (7) indicating that the IOA GPG and Supplementary Guidance Notes should continue to be used;

'A replacement for ETSU-R-97 for the assessment and rating of wind turbine noise, has been published by the Government. The Assessment and Rating of Wind Turbine Noise (ARWTN), endorses good practice guidance produced by the Institute of Acoustics. In this refreshed guidance, noise limits have not changed, and assessment principles are generally the same as before. The ARWTN does introduce new terminology and clarifications.

For the assessment of wind turbine noise IOA have set out a statement advising on good practice, and practitioners should continue to use the IOA Good Practice Guide published in 2013, alongside the six 2014 Supplementary Guidance Notes.'

2.7.4 Therefore, where any direct reference is made to ETSU-R-97 in quoted text from the IOA GPG, this is intended to relate to ARWTN.

2.7.5 The IOA GPG guidance document was endorsed by all Governments within the UK. For this assessment the recommendations included in the IOA GPG have been used to supplement the guidance provided within the Guidelines (DoEHLG, 2006).

2.7.6 The IOA GPG refers to six Supplementary Guidance Notes and where applicable these have also been considered in this report.

2.7.7 To summarise, the assessment of operational noise from the Proposed Wind Farm has been undertaken in accordance with Guidelines (DoEHLG, 2006), supplemented by the guidance presented in ARWTN and the IOA GPG where appropriate.

3 Potential Impacts

3.1 Operational Noise Sources

3.1.1 Wind turbines may emit two types of noise. Firstly, aerodynamic noise is a more natural sounding 'broadband' noise, albeit with a characteristic modulation, or 'swish', which is produced by the movement of the rotating blades through the air. Secondly, mechanical noise may emanate from components within the nacelle of a wind turbine. Potential sources of mechanical noise include gearboxes or generators.

3.1.2 Aerodynamic noise is usually perceived when the wind speeds are generally low although at very low wind speeds the blades either do not rotate, or rotate very slowly, and so negligible aerodynamic noise is generated. In higher winds aerodynamic noise may be masked by the normal sound of wind blowing through the trees and around buildings. The level of this natural 'masking' noise relative to the level of wind turbine noise is one of the several factors that determine the subjective audibility of the wind turbines (8).

3.1.3 The potential impact assessed in this report considers the overall noise levels of wind farms inclusive of expected Normal Amplitude Modulation (NAM), as originally described in ETSU-R-97. Other topics relating to operational wind farm noise characteristics, such as Low Frequency Noise (LFN) and Other Amplitude Modulation (OAM) are discussed below.

3.2 Infrasound, Low Frequency Noise and Vibration

3.2.1 The term infrasound can be defined as the frequency range below 20 Hz, while low frequency noise (LFN) is typically in the frequency range 20 – 200 Hz (9). An average young healthy adult has an audible range from 20 Hz to 20,000 Hz, although the sensitivity of the ear varies with frequency and is most sensitive to sounds with frequencies between 500 Hz and 4,000 Hz. Wind turbines do produce low frequency sounds (10), but our threshold of hearing at such low frequencies is relatively high and they often therefore go unnoticed. Infrasound from wind turbines is often at levels below that of the noise generated by wind around buildings and other obstacles.

3.2.2 In 2004, the former DTI commissioned The Hayes McKenzie Partnership to report on claims that infrasound or LFN emitted by wind turbine generators (WTGs) were causing health effects. Of the 126 wind farms operating in the UK, five had reported LFN problems, therefore, such complaints are an exception, rather than a general problem that exists for all wind farms. Hayes McKenzie investigated the effects of infrasound and LFN at three wind farms for which complaints had been received and the results were reported in May 2006 (11). The report concluded that:

- *'infrasound associated with modern wind turbines is not a source which will result in noise levels which may be injurious to the health of a wind farm neighbour;*
- *low frequency noise was measurable on a few occasions but below the existing permitted Night Time Noise Criterion. Wind turbine noise may result in internal noise levels within a dwelling that is just above the threshold of audibility, however at all sites it was always lower than that of local road traffic noise;*
- *that the common cause of complaint was not associated with LFN, but the occasional audible modulation of aerodynamic noise especially at night. Data collected showed that*

the internal noise levels were insufficient to wake up residents at these three sites. However once awoken, this noise can result in difficulties in returning to sleep.'

3.2.3 The Applied and Environmental Geophysics Research Group at Keele University was commissioned by the Ministry of Defence (MOD), the DTI and the British Wind Energy Association (BWEA) to undertake microseismic and infrasound monitoring of LFN and vibrations from wind farms for the purposes of siting wind farms in the vicinity of Eskdalemuir in Scotland. Whilst the testing showed that vibration can be detected several kilometres away from wind turbines, the levels of vibration from wind turbines were so small that only the most sophisticated instrumentation can reveal their presence and they are almost impossible to detect. Nevertheless, the Renewable Energy Foundation alleged potential adverse health effects and when that story was picked up in the popular press, notably the Scotsman, the report's authors expressed concern over the way in which their work had been misinterpreted and issued a rebuttal statement (12) in August 2005:

'Vibrations at this level and in this frequency range will be available from all kinds of sources such as traffic and background noise – they are not confined to wind turbines. To put the level of vibration into context, they are ground vibrations with amplitudes of about one millionth of a millimetre. There is no possibility of humans sensing the vibration and absolutely no risk to human health.'

3.2.4 In response to concerns that wind turbines emit infrasound and cause associated health problems, Dr Geoff Leventhall, Consultant in Noise Vibration and Acoustics and author of the Defra Report on Low Frequency Noise and its Effects, said in the article in the Scotsman ('Wind farm noise rules 'dated'- James Reynolds, 5 August 2005'):

'I can state quite categorically that there is no significant infrasound from current designs of wind turbines.'

3.2.5 An article (13) published in the IOA Bulletin (March/April 2009) concluded that there is no robust evidence that either low frequency noise (including 'infrasound') or ground-borne vibration from wind farms, has an adverse effect on wind farm neighbours.

3.2.6 Work (14) by Dr Leventhall looked at infrasound levels within the ear compared to external sources and concluded:

'The conclusion is that the continuous inner ear infrasound levels due to internal sources, which are in the same frequency range as wind turbine rotational frequencies, are higher than the levels produced in the inner ear by wind turbines, making it unlikely that the wind turbine noise will affect the vestibular systems, contrary to suggestions made following the measurements at Shirley. The masking effect is similar to that in the abdomen (Leventhall 2009). The body, and vestibular systems, appear to be built to avoid disturbance from the high levels of infrasound which are produced internally from the heartbeat and other processes. In fact, the hearing mechanisms and the balance mechanisms, although in close proximity, have developed to minimise interaction (Carey and Amin 2006).'

3.2.7 More recently during a planning Appeal (PPA-310-2028, Clydeport Hunterston Terminal Facility, approximately 2.5 km south-west of Fairlie, 9 Jan 2018), the health impacts related to LFN associated with wind turbines were considered at length by the appointed Reporter (Mr M Croft). The Reporter considered evidence from Health Protection Scotland and the National Health Service. In addition, he also considered LFN surveys undertaken by the

Appellant and the Local Authority, both of which demonstrated compliance with planning conditions and did not identify any problems attributable to the turbine operations; some periods with highest levels of low frequency noise were in fact recorded when the turbines were not operating.

3.2.8 The Reporter concluded that:

- The literature reviews by bodies with very significant responsibilities for the health of local people found insufficient evidence to confirm a causal relationship between wind turbine noise and the type of health complaints cited by some local residents;
- The NHS's assessment is that concerns about health impact are not supported by good quality research; and
- Although given the opportunity, the Community Council failed to provide evidence that can properly be set against the general tenor of the scientific evidence.

3.2.9 The WSP BEIS report notes on page 113 that:

'Several studies have investigated the claimed links between adverse health symptoms and infrasound emissions from wind turbines. Although some experimental studies have linked infrasonic signals with activation of physiological sensory processing, these have tended to be based on signals that are not representative of wind turbine infrasound. There remains no compelling evidence of adverse health effects associated with wind turbine infrasound exposure at sound frequencies and levels expected to be present at noise-sensitive receptor locations in the vicinity of wind farms.'

3.2.10 The WSP BEIS report goes on to note on page 114 that:

'Overall, the findings from the existing evidence base indicate that infrasound from wind turbines at typical exposure levels has no direct adverse effects on physical or mental health, and reported symptoms of ill-health are more likely to be psychogenic in origin.'

3.2.11 It is noted that research into infrasound is ongoing but the WSP BEIS report concluded that:

'It is expected that further evidence from ongoing studies into wind turbine infrasound effects will emerge soon, in particular from the NHMRC studies in Australia. However, based on the existing scientific evidence, it does appear probable that the above findings will not be contradicted by newer evidence.'

3.2.12 Since the publication of the WSP BEIS report, the study that was granted funding by NHMRC (the National Health and Medical Research Council of Australia) was published in the Environmental Health Perspectives (EHP) journal which is published by the United States National Institute of Environmental Health. The study (17) aimed to test the effect of exposure to 72 hours of infrasound (designed to simulate a wind turbine infrasound signature) exposure on human physiology, particularly sleep. The study concluded that:

'Our findings did not support the idea that infrasound causes WTS . High level, but inaudible, infrasound did not appear to perturb any physiological or psychological measure tested in these study participants.'

3.2.13 The UK based ARWTN guidelines specifically state with relation to existing evidence to infrasound and ground-borne vibration that;

'Infrasound from wind turbines at typical exposure levels has no direct adverse effects on physical or mental health.', and;

'Levels of ground-borne vibration from modern upwind turbines are very low and, although ground-borne vibration from wind turbines can be measured at large distances using sensitive equipment, these levels are significantly below the human perception threshold and therefore do not result in adverse effects on human receptors.'

3.2.14 With relation to LFN, ARWTN states that should the proposed noise criteria be followed then noise sensitive receptors will be considered suitably protected from LFN, as the criteria are based on A-weighted noise levels.

3.2.15 It is therefore not considered necessary to carry out specific assessments of infrasound, ground-borne vibration, or LFN, and it has not been considered further in the noise assessment.

3.3 Amplitude Modulation of Aerodynamic Noise (AM)

3.3.1 In the context of wind turbine noise amplitude modulation describes a variation in noise level over time; for example, observers may describe a 'whoosh whoosh' sound, which can be heard close to a wind turbine as the blades sweep past. Amplitude Modulation of aerodynamic noise is an inherent characteristic of wind turbine noise and was noted in ETSU-R-97, on page 68:

'The modulation or rhythmic swish emitted by wind turbines has been considered by some to have a characteristic that is irregular enough to attract attention. The level and depth of modulation of the blade noise is, to a degree, turbine-dependent and is dependent upon the position of the observer. Some wind turbines emit a greater level of modulation of the blade noise than others. Therefore, although some wind turbines might be considered to have a character that may attract one's attention, others have noise characteristics which are considerably less intrusive and unlikely to attract one's attention and be subject to any penalty.

This modulation of blade noise may result in a variation of the overall A-weighted noise level by as much as 3dBA (peak to trough) when measured close to a wind turbine. As distance from the wind turbine [or] wind farm increases, this depth of modulation would be expected to decrease as atmospheric absorption attenuates the high frequency energy radiated by the blade.'

3.3.2 The Acoustics community has sought to make a distinction between the AM discussed within ETSU-R-97, which is expected at most wind farms and as such may be considered as 'Normal Amplitude Modulation' (NAM), compared to the unusual AM that has sometimes been heard at some wind farms, hereinafter referred to as 'Other Amplitude Modulation' (OAM). The term OAM is used to describe an unusual feature of aerodynamic noise from wind turbines, where a greater than normal degree of regular fluctuation in sound level occurs at blade passing frequency, typically once per second. In some appeal decisions it may also be referred to as 'Excess Amplitude Modulation' (EAM). It should be noted that the noise assessment and rating procedure detailed in ETSU-R-97 fully takes into account the presence of the intrinsic level of NAM when setting acceptable noise limits for wind farms.

3.3.3 On 16 December 2013, RenewableUK (RUK) released six technical papers (15) on AM, which reflected the outcomes of research commissioned over the previous three years, together with a template planning condition. Whilst this research undoubtedly improved understanding of Other Amplitude Modulation (OAM) and its effects, it should be noted that at the time of writing it has not been endorsed by any relevant body such as the Institute of Acoustics (IOA).

3.3.4 On 22 January 2014, the IOA released a statement regarding the RUK research and the proposed planning condition to deal with the issue of amplitude modulation from a wind turbine and stated:

'This research is a significant step forward in understanding what causes amplitude modulation from a wind turbine, and how people react to it. The proposed planning condition, though, needs a period of testing and validation before it can be considered to be good practice. The IOA understands that RenewableUK will shortly be making the analysis tool publicly available on their website so that all interested parties can test the proposed condition, and the IOA will review the results later in the year. Until that time, the IOA cautions the use of the proposed planning condition.'

3.3.5 In April 2015, an Amplitude Modulation Working Group (AMWG) formed by the IOA issued a discussion document entitled 'Methods for Rating Amplitude Modulation in Wind Turbine Noise'. The document presented three methods that can be used to quantify the level of AM at a given measurement location. After extensive consultation a preferred method of measuring OAM was recommended by the IOA in a report called 'Final Report - A Method for Rating Amplitude Modulation in Wind Turbine Noise' dated 9th August 2016, which details a preferred method for practitioners to measure and rate AM near operational wind farms. The method calculates an amplitude modulation depth value in decibel (dB) for any given 10-minute period, and the executive summary states:

'The AMWG has not addressed the question of what level of AM in wind turbine noise (when measured by a specific metric) is likely to result in adverse community response or how that response should be evaluated. The psycho-acoustic aspects of AM are not within the scope of this study, but the proposed metric is intended to assist with such further research.'

3.3.6 On 3 August 2015, the Department for Energy and Climate Change (DECC), now the Department for Business, Energy and Industrial Strategy (BEIS), commissioned independent consultants WSP Parsons Brinkerhoff to carry out a literature review on OAM (which they refer to simply as AM). The stated aims were as follows:

- *To review the available evidence on Amplitude Modulation (AM) in relation to wind turbines, including but not limited to the research commissioned and published by RenewableUK in December 2013;*
- *To work closely with the Institute of Acoustics' AM working group, who are expected to recommend a preferred metric and methodology for quantifying and assessing the level of AM in a sample of wind turbine noise data;*
- *To review the robustness of relevant dose response relationships, including the one developed by the University of Salford as part of the RenewableUK study, on which the correction (or penalty) for amplitude modulation proposed as part of its template planning condition is based;*

- *To consider how, in a policy context, the level(s) of AM in a sample of noise data should be interpreted, in particular determining at what point it causes a significant adverse impact;*
- *To recommend how excessive AM might be controlled through the use of an appropriate planning condition; and*
- *To consider the engineering/cost trade-offs of possible mitigation measures.*

3.3.7 Their report (16), 'Wind Turbine AM Review – Phase 2 Report' was published in August 2016 at the same time as the release of the IOA AMWG Final Report, and concluded that there is sufficient robust evidence that excessive AM leads to increased annoyance from wind turbine noise and recommended that excessive AM is controlled through a suitably worded planning condition, which will control it during periods of complaint. Those periods should be identified by measurement using the metric proposed by the IOA, and enforcement action would rely upon professional judgement by Local Authority Environmental Health Officers, based on the duration and frequency of occurrence. It is not clear within the body of the report what evidence the authors relied upon to arrive at their conclusions, although the Executive Summary states (page 4):

'It is noted that none of the Category 1 or 2 papers have been designed to answer the main aim of the current review in its entirety. The Category 1 studies have limited representativeness due to sample constraints and the artificiality of laboratory environments, whereas the Category 2 studies generally do not directly address the issue of AM WTN exposure-response. A meta - analysis of the identified studies was not possible due to the incompatibility of the various methodologies employed. Notwithstanding the limitations in the evidence, it was agreed with DECC that the factors to be included in a planning condition should be recommended based on the available evidence, and supplemented with professional experience'.

3.3.8 The report (16) states that any planning condition must accord with existing planning guidance and should be subject to legal advice on a case-by-case basis. Existing guidance would include compliance with the six tests of a planning condition embodied in Circular 4/98. The report's authors did not dictate a particular condition to be used but did suggest that any condition should include the following elements (p5):

- *"The AM condition should cover periods of complaints (due to unacceptable AM);*
- *The IoA-recommended metric should be used to quantify AM (being the most robust available objective metric);*
- *Analysis should be made using individual 10-minute periods, applying the appropriate decibel 'penalty' to each period, with subsequent analysis;*
- *The AM decibel penalty should be additional to any decibel penalty for tonality;* [tonality means mechanical sound already covered by ETSU noise limits]*; and*
- *An additional decibel penalty is proposed during the night time period to account for the current difference between the night and day limits on many sites to ensure the control method works during the most sensitive period of the day."*

3.3.9 The recommendation to impose a planning condition and the associated penalty scheme were at odds with the advice from the IOA GPG 2013 which states (paragraph 7.2.10):

'7.2.1 The evidence in relation to "Excess" or "Other" Amplitude Modulation (AM) is still developing. At the time of writing, current practice is not to assign a planning condition to deal with AM.'

3.3.10 In 2017, a potential noise related planning condition which included consideration of OAM was published in the Acoustics Bulletin magazine (by the IOA) written by a number of acousticians working in the field of wind farm noise in the UK. The approach outlined in the document was not subject to any wider consultation nor has it been endorsed by the IOA, the UK Government or Scottish Government. The lack of robust information regarding the second element is highlighted in the article itself which notes:

'Whilst local authorities and developers have waited for a planning condition that could be applied to newly consented wind farms, or to those already consented but with a suspensive condition, the report Wind Turbine AM Review (WTAMR) by WSP/Parsons Brinckerhoff for DECC arguably did not provide that. In addition there have been a number of comments on WTAMR that we consider should be addressed. The introductory sections and the conditions text represent the broad consensus view of those whose names appear below, following a period of discussion, compromise and agreement. This approach is proposed based on the current state of understanding, but may be subject to modification in light of new research and further robust information.'

'As various people before us have discovered, the derivation of a penalty is not easy. There is not sufficient reliable research to be confident that a penalty system would always provide a fair indication of the impact of AM.'

3.3.11 The article goes on to note that:

'However, to do nothing would be unfair on those wind farm neighbours adversely affected by AM and, in any case, there seems to be general agreement amongst many stakeholders on all sides of the debate that a robust condition including AM is required.'

3.3.12 The topic of AM from wind turbine noise was considered again in the UK in 2022, with a review of evidence commissioned by the UK Government published in the WSP BEIS report 'A review of Noise Guidance for Onshore Wind Turbines,' (October 2022). The report notes that the IOA preferred metric provides a suitable approach to measure and quantify AM near operational wind farms (whilst noting that work is ongoing to refine the approach) but also highlights that further work is required to develop a robust mechanism for controlling AM that can be incorporated into a planning condition. In relation to the potential for a penalty scheme to control AM, the WSP BEIS report notes on page 208 that:

'In practice, the details of applying such a penalty scheme are complicated by the complexities of wind turbine sound measurements. These often involve a considerable amount of data filtering and data aggregation to address the practical difficulties of measuring a highly variable source, which is often also at a level that is relatively low compared with other, fluctuating residual sounds present in the acoustic environment. Such details will need to be carefully considered in further study, and the example planning condition proposed by a group of IOA members in 2017 should be considered as a starting point.'

3.3.13 To note, In March 2024, the International Electrotechnical Commission (IEC) published International Standard 'IEC TS 61400-11-2 Wind energy generation systems – Part 11-2:

Acoustic Noise measurement techniques – Measurement of wind turbine sound characteristics in receptor position' was published, which also details an AM measurement method. The method closely resembles that of the IOA AM working groups, though differs in respect to output requirements, and use of worst-case results per wind speed bin.

3.3.14 The ARWTN guidelines released in June 2026 state with relation to AM that;

'All wind turbines generate AM (or blade swish, to a limited extent), but the occurrence of elevated levels of AM is a complex phenomenon that is likely to be related to a combination of turbine and site characteristics; the current consensus is that AM cannot be predicted.'

And goes on to note that it is *'best controlled through enforcement of planning conditions which include the application of character corrections'.*

3.3.15 As a summary, a significant amount of research has been undertaken in relation to OAM and key outcomes of the research are that:

- It is clear that OAM, if it occurs frequently and for sustained periods, it has the potential to result in adverse impacts for wind farm neighbours;
- It is not currently possible to predict if and when OAM will occur at a proposed wind farm site. On sites where OAM has been identified it occurs intermittently and varies in terms of severity;
- There are methodologies available that can be used to measure and quantify OAM through measurements near operational wind farms, in particular the method produced by the Amplitude Modulation Working Group (AMWG), which was formed by the Institute of Acoustics and published in 2015 in a report 'Methods for Rating Amplitude Modulation in Wind Turbine Noise';
- It would be possible to measure and quantify OAM using the AMWG methodology (which provides an AM rating for each 10-minute period) and ARWTN penalty scheme only during field measurements as part of a noise compliance assessment (required by a condition or complaint); and
- There are measures available which have been shown to mitigate OAM should it occur. Measures can include:
    - Changes to the operation of the relevant wind turbine(s) by changing parameters such as blade pitch;
    - Addition of blade furniture (such has vortex generators) to alter the flow of air over the wind turbine blades; and, in extreme cases,
    - Targeted wind turbine shutdowns in specific conditions where OAM is found to occur.

3.3.16 Where mitigation is required, it needs to be designed on a site-specific basis.

4 Methodology

4.1 Assessing Operational Noise Impact

4.1.1 To undertake an assessment of the operational noise impact in accordance with the requirements of the Guidelines (DoEHLG, 2006), the following steps are required:

- Specify the location of the wind turbines for the Proposed Wind Farm;
- Measure the background noise levels as a function of on-site wind speed at a selection of representative Noise Monitoring Locations (NML);
- Establish for each NML the 'Total Guidelines (DoEHLG, 2006) Noise Limits' on analysis of the measured background noise levels;
- Identify the locations of all nearby noise sensitive receptors and select a sample of relevant Noise Assessment Locations (NAL). For each NAL, identify the most representative measured background noise data;
- Specify the likely noise emission characteristics of the wind turbines for the Proposed Wind Farm and all nearby cumulative wind turbines;
- Calculate the likely noise immission levels due to the cumulative operation of all relevant wind turbines and compare it to the Total Guidelines (DoEHLG, 2006) Noise Limits;
- Determine the 'Site Specific Noise Limits,' which take account of the noise limit already allocated to, or could theoretically be used by other schemes in the area; and
- Calculate the likely noise immission levels due to the operation of the Proposed Wind Farm on its own and compare it to the Proposed Wind Farm's 'Site Specific Noise Limits'.

4.1.2 In order to consider the steps outlined above the assessment has been split into three separate stages:

- Stage 1 – determine existing Total Guidelines (DoEHLG, 2006) Noise Limits, which are already set for other wind farms within the vicinity of the Proposed Wind Farm at each NAL or establish the Total Guidelines (DoEHLG, 2006) Noise Limits for each NAL (where noise limits are not already set) based on the measured background noise levels;
- Stage 2 – undertake a cumulative assessment, comparing cumulative predictions against the Total Guidelines (DoEHLG, 2006) Noise Limits; and
- Stage 3 – establish the Proposed Wind Farm's Site Specific Noise Limits (at levels below the Total Guidelines (DoEHLG, 2006) Noise Limits, where limit apportionment is required) and compare the noise predictions from the Proposed Wind Farm on its own against the proposed 'Site Specific Noise Limits'.

4.1.3 There are a range of turbine makes and models that may be appropriate for the Proposed Wind Farm. This noise assessment models the Nordex N163, 6.X MW candidate turbine with serrated trailing edge blades and a hub height of 103.5 m.

4.2 Consultation

4.2.1 Comments regarding noise and vibration in relation to operational wind farm noise were included in the EIAR Scoping from two consultees, namely the response from Kilkenny County Council (19/06/2026) and the Health Service Executive.

4.2.2 The HSE Environmental Health response sets out a number of requirements for the consideration of noise, including the need to identify all noise sensitive locations, include proposed mitigation measures, and the requirement for a baseline survey to be conducted. All of the HSE requirements are covered within this EIAR except for the following point which is addressed below.

4.2.3 The HSE response states:

'The applicant should consider the findings of the High court judgement issued in the judicial review of the Derryadd Wind Farm and with regard to general noise considerations of noise and wind farms, the judgement in Margaret Webster and Keith Rollo and Meenacloghspar (Wind) Ltd.'

4.2.4 The findings of the judicial review of the Derryadd Wind Farm found that the open-ended design envelope of the turbine dimensions was beyond acceptable limits. This decision does not influence this Proposed Wind Farm noise assessment as there is only a single set of design envelope specifications (hub/tip height) considered in this assessment.

4.2.5 The second case mentioned in 4.2.3 is in referenced the Ballyduff Wind Farm noise nuisance case. The central issue in relation to noise submitted by the plaintiffs was Amplitude Modulation (AM) caused by the turbines. It is not currently possible to predict AM at receptors. As mentioned, current guidance suggests that AM should be controlled through a suitable planning condition. If AM were to occur, an AM assessment can be undertaken using the methodology outlined in Section 3.3.5. This would determine the degree of AM being experienced and would suggest the mitigation required to reduce the impact at the receptor.

4.2.6 The Kilkenny County Council (KCC) Scoping document also sets out a number of requirements for the consideration noise and vibration. Most are covered within this EIAR, however, the points relevant to operational wind farm noise are:

The anticipated noise impact levels on noise sensitive receptors to include AM noise, which will be proximate to the proposed site boundaries shall be clearly detailed in an easy-to-understand measurable form;

Impact of proposed development in terms of noise and vibration during construction, operation and decommissioning (potential impacts on residential amenity and structural damage to buildings) resultant of heavy excavation and drilling; this shall include cumulative impacts with proposed and permitted windfarms and associated grid connections in the wider area;

Additional mitigation measures such as methods of detection and software technology to rapidly switch off relevant turbines when too noisy at nearby receptors and also noise barriers shall also be discussed;

4.2.7 As discussed in Section 3.2, ground-borne vibration from the operation of the Proposed Wind Farm does not need to be addressed in this assessment.

4.2.8 Live monitoring of noise levels from Wind Farms to directly control switch-off may be possible but it is not common practice. This is deemed unnecessary given that the Proposed Wind Farm will be designed to meet the Total Guidelines (DoEHLG, 2006)limits. Therefore, live shutdowns of turbines should not be required as noise levels are designed to be within the guideline levels.

4.2.9 The use of barriers for wind farm noise will provide no mitigation or very limited mitigation given the size and height above ground of wind turbines relative to receptors. In general, noise barriers are only effective if placed very close to either the receptor or the source and block the line of sight. It is not feasible to place a noise barrier adjacent to a wind turbine, and a barrier placed next to receptor would have to cover a large area such that line of sight to the nearest turbines is covered. The only relevant noise barrier considered for wind farm noise are those arising due to topography (this is discussed in Section 4.4.16). These topographical barrier effects are duly accounted for in the predictions.

4.3 Setting the Total Guidelines (DoEHLG, 2006) Noise Limits (Stage 1)

Wind Shear

4.3.1 Wind shear can be defined as *'the change in the relationship between wind speed at different heights'.* Due to wind shear, wind speeds recorded on one meteorological mast at different heights are usually different, generally the higher the anemometer the higher the wind speed recorded. For example, if a wind speed of 4 ms^{-1} is recorded at 80 m height, 3.5 ms^{-1} may be recorded at 40 m and 2.5 ms^{-1} may be recorded at 10 m.

4.3.2 Hub height wind speed is the key wind speed for a wind farm noise assessment, as it is the wind speed at hub height which will determine the noise emitted by the wind turbines and informs the turbine control system. Ideally, both wind turbine noise predictions and background noise level measurements should refer to hub height wind speed (or a representation thereof), ensuring that there is no discrepancy between the wind speed at which the noise is emitted and the wind speed at which the corresponding background noise is measured.

4.3.3 The IOA GPG states that one of three methods of wind speed measurement may be adopted. For this assessment, wind speeds were recorded by a LiDAR at two measurement heights (109 m, 99 m) closest to the modelled hub height (103.5 m). These were then used to calculate hub height wind speeds in line with 'Method A' of Section 2.6.3 of the IOA GPG to fully take account of wind shear.

Noise Impact Criteria in the Guidelines (DoEHLG, 2006)

4.3.4 Analysis of the measured data has been undertaken in accordance with the Guidelines (DoEHLG, 2006) and current good practice to determine the pre-existing background noise environment.

4.3.5 The Guidelines (DoEHLG, 2006) has been used to establish the daytime and night-time Total Guidelines (DoEHLG, 2006) Noise Limits for each NAL.

4.3.6 The Total Guidelines (DoEHLG, 2006) Noise Limits for the daytime have been set at;

- 40 dB(A) where background noise levels are below 30 dB(A); and,
- 45 dB(A) or background noise plus 5 dB, whichever is the greater, where background noise levels are greater than 30 dB(A).

4.3.7 Total Guidelines (DoEHLG, 2006) Noise Limits at night time has been set at;

- 43 dB(A) or background plus 5 dB, whichever is the greater.

4.3.8 This 'Total' limit relates to noise from all wind farm developments in the area. The limit was chosen with due regard to the guidance in the Guidelines (DoEHLG, 2006) and following a review of the predicted levels from existing wind turbines in the area.

4.3.9 The acceptable limits for wind turbine operational noise are clearly defined for all time periods by the application of the Guidelines (DoEHLG, 2006) methodology. Consequently, the test applied to operational noise is whether or not the predicted wind turbine noise immission levels at nearby noise sensitive properties lie below the Guidelines (DoEHLG, 2006) Noise Limits. Depending on the levels of background noise, the satisfaction of the Guidelines (DoEHLG, 2006) derived limits can lead to a situation whereby, at some locations under some wind conditions and for a certain proportion of the time, the wind turbine noise would be audible.

4.4 Assessment of likely effects and the requirement for a cumulative assessment (Stage 2)

4.4.1 The Guidelines (DoEHLG, 2006)do not include an information on assessment cumulative noise impacts therefore the guidance provided within the IOA GPG (2013) has been adopted. The IOA GPG contains a detailed section on cumulative noise and provides guidance on where a cumulative assessment is required. Section 5.1.4 and 5.1.5 of the GPG state:

'During scoping of a new wind farm development consideration should be given to cumulative noise impacts from any other wind farms in the locality. If the proposed wind farm produces noise levels within 10 dB of any existing wind farm/s at the same receptor location, then a cumulative noise impact assessment is necessary.

Equally, in such cases where noise from the proposed wind farm is predicted to be 10 dB greater than that from the existing wind farm (but compliant with ETSU-R-97 in its own right), then a cumulative noise impact assessment would not be necessary.'

4.4.2 A cumulative assessment was undertaken at each of the Noise Sensitive Receptors (NSRs) proximate to the Proposed Wind Farm and other nearby operational and proposed wind farm developments.

Noise Prediction / Propagation Model

4.4.3 The ISO 9613-2: 1996 *'Acoustics – Attenuation of sound during propagation outdoors Part 2: General method of calculation'* (17) model algorithm provides a robust prediction method for calculating the noise immission levels at the nearest receptors.

4.4.4 It should be noted that the IOA GPG references the 1996 version of the 9613 standard, which was updated in 2024, however, use of either version when adopting the IOA GPG amendments to the noise model, results in negligible differences in predicted noise levels.

4.4.5 The ISO 9613-2 noise model is intended for the modelling of many noise source types and was not written specifically for the modelling of wind turbine noise, however, a number of studies have been undertaken to determine the standard's accuracy for wind turbine noise predictions and some amendments to the propagation model have been widely adopted for the modelling of wind turbine noise in the UK, primarily through the incorporation of recommendations in the IOA GPG.

4.4.6 In 1998, a European Commission (EC) research project into wind farm noise propagation over large distances, published as 'Development of a Wind Farm Noise Prediction Model,' JOULE project JOR3-CT95-0051, identified a simplified version of ISO 9613-2 as the most suitable at that time, but the full method has been used for this assessment.

4.4.7 The ISO 9613-2 model can take account of the following factors that influence sound propagation outdoors:

- Geometric divergence;
- Atmospheric absorption;
- Reflecting obstacles;
- Screening;
- Vegetation; and
- Ground attenuation.

4.4.8 The model uses as its acoustic input data the octave band sound power output of the turbine and calculates, on an octave band basis, attenuation due to the factors above, as appropriate.

4.4.9 Guidance on noise prediction and propagation modelling is not provided within the Guidelines (DoEHLG, 2006), however the use of ISO 9613-2 is discussed within the IOA GPG which states, in Section 4.1.4:

'ISO 9613-2 standard in particular, which is widely used in the UK, can be applied to obtain realistic predictions of noise from on-shore wind turbines during worst case propagation conditions (i.e. sound speed gradients due to downwind conditions or temperature inversions), but only provided that the appropriate choice of input parameters and correction factors are made.'

4.4.10 There is currently no standard approach to specifying error bands on noise predictions, however, Table 5 of ISO 9613-2 suggests, at best, an estimated of accuracy of ± 3 dB(A). The work undertaken as part of the EC research study concluded that the ISO 9613-2 algorithm reliably predicted noise levels that would generally occur under downwind propagation conditions. The error bands referenced in the ISO standard itself relate to the general application of the standard. Additional, wind farm specific studies, have also been undertaken to validate the use of the standard to predict wind farm noise and these are referenced in Section 4 of the IOA GPG which goes on to conclude that:

"The outcome of this research has demonstrated that the ISO 9613-2 standard in particular, which is widely used in the UK, can be applied to obtain realistic predictions of noise from on-

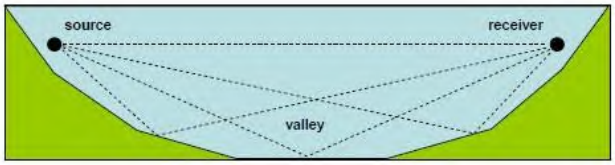
shore wind turbines during worst case propagation conditions (i.e. sound speed gradients due to downwind conditions or temperature inversions), but only provided that the appropriate choice of input parameters and correction factors are made."

4.4.11 TNEI's experience of undertaking compliance monitoring for operational wind farms indicates that the predictions undertaken using the guidance in the IOA GPG show a good correlation with measured levels, with predicted levels usually slightly higher than measured levels.

4.4.12 The IOA GPG quotes a comparative study undertaken in Australia that indicated ISO 9613-2 can, in some conditions, under-predict ground attenuation effects and the potential for additional reflection paths 'across a valley', whilst slightly over-predicting on flat terrain. It should be noted, however, that the wind farm layouts studied were untypical for the UK, with rows of turbines spreading over 10 km on an elevated ridge. It also should be noted that no correction for background contribution was undertaken, and the monitoring locations were located as far as 1.7 km from the nearest turbine, where turbine noise may be at similar levels to background noise and therefore difficult to differentiate. For the study's modelling work topographic height data was included as an input, which is consistent with ISO 9613-2 methodology generally, but not with the requirements of the IOA GPG.

4.4.13 The IOA GPG states that a *'further correction of +3 dB should be added to the calculated overall A-weighted level for propagation 'across a valley', i.e. a concave ground profile or where the ground falls away significantly between a turbine and the receiver location.'* The potential reflection paths are illustrated in Schematic 4.1 below.

Schematic 4.1: Multiple reflection paths for sound propagation across concave ground



Source: IOA GPG, page 21, Figure 5

4.4.14 A formula from the JOULE Project JOR3-CT95-0051 (1998) is suggested for determining whether a correction is required.

$$h_m \geq 1.5 \times (abs\ (h_s - h_r) / 2)$$

where h_m is the mean height above the ground of the direct line of sight from the receiver to the source (as defined in ISO 9613-2, Figure 3), and h_s and h_r are the heights above local ground level of the source and receiver respectively).

4.4.15 The calculation of h_m requires consideration of the digital terrain model and needs to be performed for each path between every turbine and every receiver. Interpretation of the results of the calculation above and the subsequent inclusion of a concave ground profile correction requires careful consideration with any topographical variation considered in the context of a site.

4.4.16 The IOA GPG also discusses the potential for topographical screening effects of the terrain surrounding a wind farm and the nearby noise sensitive receptors. Although barrier screening effects in ISO 9613-2 can make corrections of up to 15 dB, the IOA GPG states that

where there is no line of sight between the highest point on the rotor and the receiver location a reduction of no more than 2 dB may be applied.

4.4.17 The modelling parameters used in this assessment are detailed in Section 6.3 below.

4.5 Setting the Site Specific Noise Limits (Stage 3)

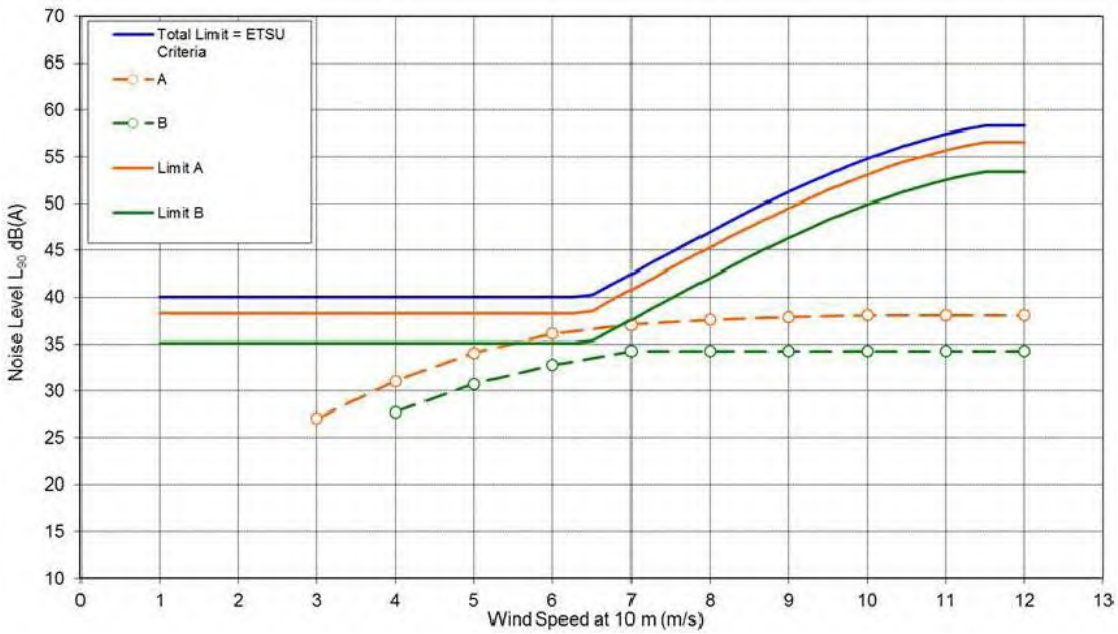
4.5.1 Summary Box 21 of the IOA GPG states:

'Whenever a cumulative situation is encountered, the noise limits for an individual wind farm should be determined in such a way that no cumulative excess of the total ETSU-R-97 noise limit would occur.'

4.5.2 In order to determine Site Specific Noise Limits at receptors in proximity to the Proposed Wind Farm (where required) limit apportionment has been undertaken. The limit apportionment has considered the noise limit already allocated to other wind farms in the area.

4.5.3 The limit apportionment approach is demonstrated in Graph 4.1 below. In this example the total limit (shown in blue) is shared between a consented wind farm (A) and a proposed development (B). The two noise limits for a given receptor (the solid orange and green lines) when added together equate to the Total Guidelines (DoEHLG, 2006) noise limit, and the predicted levels for each wind farm (the dashed lines) meet the specific limits established for consented wind farm and the Proposed Wind Farm.

Graph 4.1: Limit Apportionment Example



4.5.4 The limit derivation can also be undertaken with consideration to the amount of headroom between another schemes(s) predictions and the Total Noise Limit. With regard to this Section 5.4.11 of the IOA GPG states:

'In cases where there is significant headroom (e.g. 5 to 10 dB) between the predicted noise levels from the existing wind farm and the Total Noise Limits, where there would be no

realistic prospect of the existing wind farm producing noise levels up to the Total Noise Limits, agreement could be sought with the LPA as to a suitable predicted noise level (including an appropriate margin to cover factors such as potential increases in noise) from the existing wind farm to be used to inform the available headroom for the cumulative assessment without the need for negotiation or cumulative conditioning. This may be the case particularly at low wind speeds.'

4.5.5 With this in mind, where appropriate, an additional 2 dB buffer has been added to the other schemes' turbine noise predictions. This is considered to be a suitable buffer in accordance with Section 5.4.11 of the IOA GPG and would represent a 60% increase in emitted noise levels from the other schemes.

4.5.6 Where predicted wind turbine noise levels from the individual wind farm/ turbine schemes are found to be >10 dB below the Total Guidelines (DoEHLG, 2006) Noise Limits then it has been deemed appropriate to allocate the entire noise limit to the Proposed Wind Farm. Further information on the approach to apportionment is provided in Section 6.6 below.

5 Baseline

5.1 Identification of Potential Noise Receptors

5.1.1 The Guidelines (DoEHLG, 2006)state that *'a noise sensitive location includes any occupied dwelling house, hostel, health building or place of worship and may include areas of particular scenic quality or special recreational amenity importance.'* Following a review of NSRs surrounding the Proposed Wind Farm, the closest receptors were found all to be residential properties.

5.1.2 During the initial search to identify the closest receptors, a dwelling immediately to the east within 300 m of T2, named NSR335, was identified as vacant as well as being involved with the project so it has not been considered further. NSRs 357 (squash Club), 366 (restaurant), 367 (yard), 370 (boarded-up building) were all either unoccupied or non-residential, therefore have not been considered.

5.1.3 A total of six Noise Monitoring Locations (NMLs) were selected as being appropriate locations to determine a representative baseline for all of the identified NSRs. The locations of the NMLs relative to the Proposed Wind Farm site are shown on Figure A1.1 in Annex 1.

5.1.4 The NMLs were selected following a detailed review of the area using aerial photography and on-site checks. Where possible, locations were selected that were subject to minimal influence from other noise sources, such as local watercourses and vegetation.

5.2 Background Noise Survey

5.2.1 Background noise monitoring was undertaken for the purposes of setting the Total Guidelines (DoEHLG, 2006) Noise Limits. Data were recorded over the period, 7th December 2022 to the 31st of January 2023.

5.2.2 Details of the exact monitoring periods, the rationale behind the exact kit location and the dominant noise sources observed at each of the NMLs are detailed in the Field Data Sheets (FDS) and installation report included in Annex 2.

5.2.3 The NML precise location is the physical position that the sound level meter was sited at each property, as shown on Figure A1.1 (Annex 1) and summarised in Table 5.1 below.

Table 5.1 Noise Monitoring Locations

NML	NSR	X (ITM)	Y (ITM)
NML1	N/A	631910	664977
NML2	202	632533	666566
NML3	287	634614	668001
NML4	404	636812	667441
NML5	384	636332	666030

NML	NSR	X (ITM)	Y (ITM)
NML6	509	633907	664410

5.3 Noise Monitoring Equipment

5.3.1 Section 2.4 of the IOA GPG includes information on the type and specification of noise monitoring equipment that should be used for background noise surveys and states:

'Noise measurement equipment and calibrators used on site should comply with Class 1/Type 1 of the relevant standard(s). Enhanced microphone windscreens should be used. Standard windshields of a diameter of less than 100 mm cannot be relied upon to provide sufficient reduction of wind noise in most circumstances.'

5.3.2 The noise monitoring equipment used for the background noise survey meets with the requirements of the IOA GPG. Details of the noise monitoring equipment used, the calibration drift recorded and photographs at each NML are detailed in the FDS included in Annex 2. The IOA GPG states that for calibration drift greater than 1 dB the measurements should be discarded. The maximum calibration drift recorded during the noise survey was -0.3 dB as detailed in the FDS, therefore no correction has been applied to the noise data.

5.3.3 Copies of the calibration/conformance certificates for the sound level meters and sound level calibrator used for the noise survey are included in Annex 3. All sound level meters conform to Class 1/Type 1, and were laboratory calibrated within 2 years of any measurements, as per the recommendations of the IOA GPG. The sound level meter calibrator was also laboratory calibrated within 1 year of any measurements, as per the recommendations of the IOA GPG.

5.3.4 The microphones were all mounted between 1.2 m and 1.5 m above local ground level, situated between 3.5 m and 20 m from the dwelling and were located *'in an area frequently used for rest and relaxation'* (Section 2.5.1 of IOA GPG), and away from obvious local sources of noise such as boiler flues, fans and running water. The sound level meters were situated as far away from hard reflective surfaces such as fences and walls as practicable.

5.3.5 All measurement systems were set to log the L_{A90} and L_{Aeq} noise levels in ten-minute intervals continuously over the deployment period.

5.4 Meteorological Data

5.4.1 The Guidelines (DoEHLG, 2006) state on Page 29 that:

'Noise limits should be applied to external locations, and should reflect the variation in both turbine source noise and background noise with wind speed.'

5.4.2 ARWTN states on Page 13 that:

5.4.3 *'Background sound levels for the day (derived from the "quiet day" periods) and night, are related to standardised wind speeds determined from hub height wind speeds on the proposed wind farm site being assessed'*

5.4.4 This allows comparison of actual operating noise levels from the turbines with the noise levels that would otherwise be experienced at a dwelling.

5.4.5 The preferred methodologies for measuring or calculating wind shear are detailed in Section 4.3.1.

5.4.6 For the Proposed Wind Farm, concurrent wind speed and direction were recorded using a LiDAR device which was located within the Proposed Wind Farm site (ITM location 634846, 665189). The meteorological data was collected and provided by the Applicant. The wind data measured at 109 m and 99 m height was used to calculate hub height wind speeds (at 103.5 m). These hub height wind speeds were then standardised to a height of 10 m in accordance with current good practice. Wind speed and direction data were collected over the same time-scale and averaged over the same ten-minute periods as the noise data to provide the analysis of the measured background noise as a function of wind speed and direction.

5.4.7 The installation report and calibration information for the LIDAR can be provided upon request.

5.4.8 A tipping bucket rain gauge was installed by TNEI at NML1 and NML3 for the duration of the noise survey to record periods of rainfall, time synchronised to the sound measurements. As per the recommendations in Section 3.1.9 of the IOA GPG, the rain data were analysed by TNEI and the 10-minute periods that contained a registered rainfall event was excluded as well as the preceding and following 10-minute periods. All excluded rainfall periods are shown on Figures A1.3a-A1.3f (Annex 1) as blue crosses.

5.5 Influence of Existing Turbines on Background Measurements

5.5.1 The Guidelines (DoEHLG, 2006) state that background noise levels should be determined such that they are not influenced by existing turbine noise, whilst the IOA GPG details that, in situations where measurement locations are potentially influenced by existing turbine noise, the following approaches can be adopted:

1. The existing wind turbines can be switched off (assuming the applicant has control of those turbines and noting that there would be associated cost implications);
2. The contribution of the wind turbines can be accounted for by filtering the measured data by direction (only including background data when a receptor is upwind of the wind turbines) or by subtracting predicted turbine noise from the measured levels;
3. Limits can be set using ‘proxy’ datasets measured at location(s) outside of the influence of the wind turbines; or
4. Limits can be set using data collected as part of previous background noise assessments undertaken before the wind turbines were operational, providing the equipment and both noise and meteorological data obtained are appropriate.

5.5.2 The closest operational wind farm to the NMLs is Lisdowney Wind Farm which is 3.2 km away at its closest point to the NMLs (NML3 and NML4). Based on the data analysis of gathered noise data, the contribution to overall background noise levels from Lisdowney Wind Farm at the NMLs used for this assessment was found to be negligible and therefore this has not been considered further.

5.6 Directional Filtering of Background Noise

5.6.1 In Section 3.1.22 of the IOA GPG the need to directionally filter background noise data is discussed. Where a receiver is located upwind of a dominant local noise source whilst also being systematically downwind of the turbines then it may be necessary to filter background noise data particularly when this corresponds to the prevailing wind direction.

5.6.2 For this site there are no dominant local noise sources (other than those discussed in Section 5.5 above) so no directional filtering was undertaken.

5.7 Analysis of Measured Data

5.7.1 Analysis of the measured data has been undertaken in accordance with the recommendations in Guidelines (DoEHLG, 2006), ARWTN and the IOA GPG.

5.7.2 Meteorological data was screened upon receipt by TNEI and where rainfall occurred, the noise and wind speed data has been excluded from the assessment as detailed in Section 5.4 above.

5.7.3 Time series graphs are provided in Annex 4, which show the variation in measured wind speed/direction and noise level over the monitoring period. These graphs also show where data was excluded, either due to rainfall, birdsong (dawn chorus) or manual exclusions due to atypical data.

5.8 Prevailing Background Noise Level

5.8.1 Table 5.2 and Table 5.3 summarise the derived prevailing background noise levels from the baseline survey.

Table 5.2 Summary of Prevailing Background Noise Levels during Quiet Day Periods (dB(A))

NML	Prevailing Background Noise Level $L_{A90,10\ min}$											
	1	2	3	4	5	6	7	8	9	10	11	12
NML1	27.9	29.5	30.7	31.4	32.0	32.6	33.3	34.3	35.7	37.8	40.7	44.5
NML2	30.1	32.3	33.7	34.6	35.2	35.6	36.2	37.1	38.6	40.9	44.2	48.8
NML3	24.5	26.0	27.8	29.9	32.2	34.8	37.5	40.5	43.6	46.8	50.2	53.6
NML4	25.3	26.0	26.7	27.5	28.4	29.6	31.1	32.9	35.3	38.2	41.7	45.9
NML5	28.7*	28.7	28.8	29.5	30.7	32.3	34.4	36.8	39.6	42.6	45.8	49.3
NML6	29.1*	29.1*	29.1	29.4	30.3	31.6	33.3	35.5	38.2	41.3	44.8	48.8

**restricted values where the derived minimum occurs at a higher wind speed, see Section 5.8.4.*

Table 5.3 Summary of Prevailing Background Noise Levels during Night-time Periods (dB(A))

NML	Prevailing Background Noise Level $L_{A90,10\ min}$											
	1	2	3	4	5	6	7	8	9	10	11	12
NML1	23.5*	23.5	23.6	24.0	24.7	25.9	27.6	29.7	32.5	35.8	39.9	44.6
NML2	24.4*	24.4	24.7	25.6	27.0	28.8	31.0	33.6	36.5	39.6	42.9	46.3
NML3	23.5	24.5	26.1	28.2	30.7	33.5	36.5	39.6	42.8	45.9	48.8	51.5
NML4	23.9*	23.9*	23.9	24.5	25.8	27.7	30.1	32.8	35.7	38.9	42.1	45.3
NML5	25.4*	25.4*	25.4	26.0	27.4	29.5	32.1	35.2	38.6	42.2	45.9	49.7
NML6	23.6*	23.6*	23.6	24.3	25.7	27.8	30.4	33.4	36.7	40.2	43.9	47.6

**restricted values where the derived minimum occurs at a higher wind speed, see Section 5.8.4.*

5.8.2 A series of graphs are presented for each of the NMLs to illustrate the data collected, these are included as Figures A1.3a - A1.4f (Annex 1). There is a set of graphs for each NML, which show the range of wind speeds and directions recorded during the survey, the 10-minute average wind speed plotted against the recorded $L_{A90,\ 10min}$ noise level, and a calculated 'best fit' polynomial regression line for both quiet day and night-time periods. Each Figure also includes a table with the number of measured data points per integer wind speed bin and the prevailing measured background noise level. An additional set of graphs showing the excluded data have been included within Annex 4.

5.8.3 The background noise levels have been calculated using a best fit polynomial regression line of no more than a fourth order through the measured $L_{A90,\ 10min}$ noise data, as required by ARWTN and the IOA GPG.

5.8.4 In line with the recommendations included in Section 3.1.21 of the IOA GPG, where relevant, the polynomial background curve for the low-speed conditions has been flatlined or restricted at the wind speeds which are lower than where the derived minimum occurs. The wind speeds and values that this occurs for have been highlighted in Table 5.2 and Table 5.3 as asterisked values. This is also presented on the Figures, the final regression analysis curve is shown as a continuous black line.

5.8.5 Section 2.9.5 of the IOA GPG recommends that no fewer than 200 valid data points should be recorded in each of the quiet daytime and night-time periods, with no fewer than 5 valid data points in any 1 ms^{-1} wind speed bin. Where the background noise data has been filtered by wind direction the IOA GPG (Section 2.9.6) recommends that 100 data points and 3 per wind speed bin may be appropriate. Where the minimum number of data points in a wind speed bin was not achieved, data in that bin has been manually excluded from the assessment.

6 Noise Assessment Results

6.1 Noise Sensitive Receptors and Noise Assessment Locations

6.1.1 As part of the initial noise modelling work all noise sensitive receptors (NSR) in proximity to the Proposed Wind Farm were identified. A total of thirteen NSRs were chosen as representative Noise Assessment Locations (NALs). Eleven of these NALs were chosen to represent the noise sensitive receptors located closest to the Proposed Wind Farm, and two additional receptors were included to consider cumulative noise impacts near Lisdowney Wind Farm and Gathabawn Wind Farm. The modelling results for the NALs have been presented within the main body of this report whilst an assessment for all other NSRs has been included within Annex 5 of this report for completeness. Each NAL and NSR are shown on Figure A1.1.

6.1.2 Predictions of noise at the NALs ensures that the assessment reports the worst case (loudest) noise immission level expected at each group of NSRs. Table 6.1 details which NML has been used to set noise limits for each NAL and a similar table detailing which NML has been used to set limits at each NSR has also been included within Annex 5.

6.1.3 NAL12 and NAL13 did not use the noise monitoring data gathered at the NMLs above to determine their noise limits as they are closer to the existing Lisdowney Wind Farm. Lisdowney Wind Farm has existing conditioned limits (18) (decision notice issued on 23/07/2012, KCC case reference 12/172) which would already apply to NAL12 and NAL13.

Table 6.1 Noise Assessment Locations

Noise Assessment Location (NAL)	Easting (m)	Northing (m)	Elevation (m AOD)	Approximate Distance to Nearest Turbine* (m)	Background Noise Data Used
NAL01	636290	666025	222	743 (T2)	NML5
NAL02	636333	664308	130	850 (T1)	NML5
NAL03	634725	665192	229	975 (T4)	NML6
NAL04	633960	664440	186	1,710 (T5)	NML6
NAL05	631934	665528	185	2,018 (T5)	NML1
NAL06	632840	666845	246	747 (T7)	NML2
NAL07	633664	667809	288	748 (T7)	NML3
NAL08	634342	667852	280	779 (T8)	NML3
NAL09	635120	667785	231	894 (T9)	NML3

Noise Assessment Location (NAL)	Easting (m)	Northing (m)	Elevation (m AOD)	Approximate Distance to Nearest Turbine* (m)	Background Noise Data Used
NAL10	636075	668002	173	1,376 (T10)	NML4
NAL11	636865	667255	180	1,399 (T10)	NML4
NAL12	637775	669204	178	3,415 (T10)	N/A-Using limits from Lisdowney Wind Farm
NAL13	638525	669902	222	4,429 (T10)	

** Please note the distances to nearest turbines quoted above may differ from those reported elsewhere. Distances for the noise assessment are taken from the nearest turbine to the closest edge of the amenity area (usually the garden) and not the house. Elevation has not been accounted for.*

6.2 Noise Emission Characteristics of the Wind Turbines

6.2.1 This assessment considers the Nordex N163 6.X MW candidate turbine with serrated trailing edge blades and a hub height of 103.5 m.

6.2.2 For the cumulative assessment the turbines considered are summarised in Annex 6 and the noise immission levels from the cumulative schemes are included within Annex 7. The data for some turbines has not been included due to data confidentiality. The detailed noise data can be made available to the relevant decision makers (ACP/KCC) upon request, subject to the signing of the appropriate Non-Disclosure Agreement.

6.2.3 Due to the differences in the way in which levels are provided by the different manufacturers, TNEI has accounted for uncertainty using the guidance contained within Section 4.2 of the IOA GPG (2013). Details of the sound power level, octave data and measurement uncertainty used for each of the turbine types considered in this assessment are included in Annex 7.

6.2.4 The source data provided for each turbine does not indicate a tonal component and as such no tonal penalty (as envisaged in ARWTN) was applicable. This is consistent with the guidance provided in the IOA GPG which states, in Section 4.2.7:

'It is highly unlikely that any specific information on tonality at representative receptor separation distances in accordance with the ETSU-R-97 methodology will be available at the planning application stage. When such information is available, it should be appropriately applied. It is standard to control the potential presence of tones in practice through the use of suitable planning conditions.'

6.2.5 Manufacturer noise level data is usually supplied based on a turbine of a specific hub height although the noise levels are presented as standardised to 10 m height. Accordingly, the noise data used in this assessment corrects the published turbine noise data following the guidance detailed in Section 4.3 of IOA GPG Supplementary Guidance Note 4, where

applicable. The hub heights considered for the cumulative wind farm/turbine developments are summarised in Annex 7.

6.2.6 The location of the wind turbines are shown on Figure A1.1 and grid references are included in Annex 6.

6.3 Noise Propagation Parameters

6.3.1 The noise immission levels have been calculated using the full IOS 9613-2 model with a receiver height of 4.0 m above local ground level, mixed ground (G=0.5) and air absorption based on a temperature of 10 °C and 70 % relative humidity. The modelling parameters reflect current good practice as detailed within the IOA GPG.

6.3.2 The wind turbine noise immission levels are based on the $L_{A90,10\ minute}$ noise indicator in accordance with the recommendations in the Guidelines (DoEHLG, 2006), which were obtained by subtracting 2dB(A) from the turbine sound power level data (L_{Aeq} indicator).

6.3.3 A topographical assessment has been undertaken between each NSR and wind turbine location to determine whether any concave ground profiles exist between the source and receiver (noise sensitive receptor). Analysis undertaken using a combination of CadnaA (19) and an Excel model found that if the formula in the IOA GPG is applied directly a +3 dB correction is required for some turbines at a number of receptors.

6.3.4 In addition, an assessment has been undertaken to determine whether any topographical screening effects of the terrain occur where there is no direct line of sight between the highest point on the turbine rotor and the receiver location. Upon analysis of each NSR it was found that a barrier correction of -2 dB could be applied for some turbines at a number of receptors. All topographical corrections applied for each turbine and NAL are included in Annex 6. In reality, there is significant screening at some of the locations so more attenuation may occur in practice. The use of a 2 dB value is therefore considered to be conservative as it results in the highest predicted levels. All corrections have been applied, where necessary, in all of the tables and graphs in this report.

6.3.5 The need to include a concave ground/screening correction may change depending on the final location of the turbines (following micrositing) and the final turbine hub height. Nevertheless, turbine noise levels will have to meet the noise limits detailed in planning conditions regardless of any difference in noise propagation caused by topography. Should planning permission be granted for the Proposed Wind Farm, the need to apply a concave slope correction will need to be considered by the Applicant prior to the final selection of a turbine model for the Proposed Wind Farm.

6.3.6 The cumulative assessment has taken into account directivity effects in line with good practice. The directivity of wind turbines has been recognised for some time. Building on earlier work by NASA, in 1988 Wyle Laboratories studied sound propagation using an omnidirectional loudspeaker source elevated 80 ft above ground, in upwind, downwind and cross wind situations, and in both flat and hilly terrain, then compared those measurements to measured data from actual wind turbines. Their study quantified directivity factors for a limited frequency range, but was unable to conclusively demonstrate the anticipated directivity effects on real wind turbines. It also highlighted, but was unable to explain, measured differences observed between flat and hilly terrain.

6.3.7 Hubbard (1990) (IOA GPG Section 4.4.3) described a number of factors believed to influence propagation and directivity, notably refraction caused by vertical wind and temperature gradients. In the downwind direction the wind gradient causes the sound rays to bend toward the ground, whereas in the upwind direction the rays curve upward away from the ground. Upwind of the turbine this results in a region of increased attenuation termed the 'shadow zone'. The excess attenuation is frequency dependent, with lowest frequencies least attenuated. Relating this to the earlier NASA studies, Hubbard noted that the distance from the source to the edge of the shadow zone is related to the wind speed gradient and the elevation of the source, which for a typical turbine source was calculated to be approximately 5 times the source height.

6.3.8 This observation was adopted in the IOA GPG, which states (Section 4.4.2) 'Such reductions (due to "shadow zone" refraction effects) will in practice only progressively come into play at distances of between 5 and 10 turbine tip heights', while Section 4.4.3 provides graphical examples of increasing broadband directivity with increasing tip height scaling in both flat and hilly terrain, without qualifying either of those designations.

6.3.9 The IOA GPG recommends (Section 4.4.1) that directivity attenuation factors adopted in any assessment should be clearly stated. The TNEI noise model can consider the effect of directivity and in line with current good practice the attenuation values used are in detailed in Table 6.2. These are based upon the examples given in the IOA GPG (Section 4.4.2), using interpolation based on the three primary values: 0 dB just before crosswind, 2 dB in crosswind and 10 dB upwind. A single directivity function is used for any path between a wind turbine and a receptor where the distance between the two is greater than 5 turbine tip heights.

Table 6.2 Wind Directivity Attenuation Factors used in Modelling

Direction (º)	0	15	30	45	60	75	90	105	120	135	150	165
Attenuation dB(A))	-10	-9.9	-9.3	-8.3	-6.7	-4.6	-2	0	0	0	0	0
Direction (º)	180	195	210	225	240	255	270	285	300	315	330	345
Attenuation (dB(A))	0	0	0	0	0	0	-2	-4.6	-6.7	-8.3	-9.3	-9.9

6.4 Total Guidelines (DoEHLG, 2006) Noise Limits (Stage 1)

6.4.1 The Total Guidelines (DoEHLG, 2006) Noise Limits have been established for NALs 1-11 as detailed in Table 6.3 and Table 6.4 below, based on a fixed minimum level of 40dB(A) (daytime) and 43 dB(A) (night-time)

6.4.2 NAL12 and NAL13 have been assessed based on fixed conditioned limits which apply to the existing Lisdowney Wind Farm. The Lisdowney Wind Farm decision notice states that at the existing nearest receptors, the wind farm noise levels should be kept below a fixed absolute limit of 45dB(A) LA90 daytime and 43dB(A) LA90 night-time.

Table 6.3 Total Guidelines (DoEHLG, 2006) Noise Limits Daytime

Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL01	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
NAL02	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
NAL03	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
NAL04	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
NAL05	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7	49.5
NAL06	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
NAL07	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
NAL08	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
NAL09	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
NAL10	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
NAL11	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
NAL12	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
NAL13	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

Table 6.4 Total Guidelines (DoEHLG, 2006) Noise Limits Night-Time

Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL01	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
NAL02	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
NAL03	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
NAL04	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6

Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL05	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9	49.6
NAL06	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
NAL07	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
NAL08	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
NAL09	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
NAL10	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
NAL11	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
NAL12	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
NAL13	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0

6.5 Predicting the requirement for a cumulative assessment and the likely effects (Stage 2)

6.5.1 A likely cumulative noise assessment was undertaken for all NALs tabular results are summarised in Table 6.5 and Table 6.6. The results show that the predicted cumulative wind turbine noise immission levels meet the 'Total Guidelines (DoEHLG, 2006) Noise limits' under all conditions, with a small exception of NAL13 in night-time 8-12m/s where there is a marginal +0.1 dB exceedance. However, this is not due to the Proposed Wind Farm which is not contributing to the cumulative levels, and has arising most likely due to cautious predictions in this report for both Gathabawn and Lisdowney Wind Farms which are the primary contributing wind farms at NAL13.

6.5.2 The predicted 'likely' cumulative levels are the actual levels expected at an NAL and include the addition of an appropriate level of uncertainty to the turbine data as per Section 4.2 of the IOA GPG. The uncertainty level added is generally +2 dB but this can vary depending on the turbine manufacturer data available for each turbine.

6.5.1 A set of predictions have also been undertaken at all other NSRs located in proximity to the site. The results are presented in tabular form in Annex 5, indicating that the predicted cumulative wind turbine noise immission levels meet the Total Noise Limits under all conditions and at all NSRs for both daytime and night-time periods.

6.5.2 Figures A1.4a-m (Annex 1) show predictions at each NAL from the Proposed Wind Farm and 'cumulative (including Proposed Wind Farm)' against the 'Total Guidelines (DoEHLG, 2006) Noise Limits'. The individual contribution of the cumulative schemes is also shown. It should be noted that at most NALs the contribution of the Proposed Wind Farm is dominant meaning that the predicted cumulative levels including the Proposed Wind Farm are very similar to the predictions for the Proposed Wind Farm on its own. In these cases, the lines are plotted on top of each other so can be hard to distinguish. For this reason, the predicted levels from the Proposed Wind Farm are plotted with triangular markers.

6.5.3 The locations where the Proposed Wind Farm is not dominant are NALs 10-13. For NALs 10-11, the Proposed Wind Farms's contribution is slightly above that of Gathabawn Wind Farm. For the further locations NAL12 and NAL13 which are nearer to Lisdowney Wind Farm, the Proposed Wind Farms's contribution is relatively low (30dB maximum is predicted) and both the Lisdowney Wind Farm and Gathabawn Wind Farm noise are dominant.

6.5.4 Note that for the cumulative noise predictions, the noise model considers the range of noise data available for each turbine type modelled. For some turbines noise data was not available for wind speeds less than 5 $ms^{-1,}$ therefore no cumulative predictions are included for wind speeds less than 5 ms^{-1}.

Table 6.5 Guidelines (DoEHLG, 2006) Compliance Table – Likely Cumulative Noise - Daytime

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL01	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.1	40.6	41.7	41.7	41.7	41.7	41.7	41.7
	Exceedance Level	-	-	-	-	-8.9	-4.4	-3.3	-3.3	-3.3	-5.9	-9.1	-12.6
NAL02	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	32.7	37.2	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-	-	-12.3	-7.8	-6.7	-6.7	-6.7	-9.3	-12.5	-16.0
NAL03	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-	-	-9.2	-4.7	-3.6	-3.6	-3.6	-4.9	-8.4	-12.4
NAL04	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	29.1	33.5	34.6	34.6	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-	-	-15.9	-11.5	-10.4	-10.4	-10.4	-11.7	-15.2	-19.2
NAL05	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7	49.5
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	26.3	30.6	31.7	31.7	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-	-	-18.7	-14.4	-13.3	-13.3	-13.3	-13.3	-14.0	-17.8
NAL06	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-	-	-10.4	-5.9	-4.8	-4.8	-4.8	-5.7	-9.0	-13.6
NAL07	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.0	39.4	40.4	40.4	40.4	40.4	40.4	40.4
	Exceedance Level	-	-	-	-	-10.0	-5.6	-4.6	-5.1	-8.2	-11.4	-14.8	-18.2
NAL08	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.3	39.8	40.9	40.9	40.9	40.9	40.9	40.9
	Exceedance Level	-	-	-	-	-9.7	-5.2	-4.1	-4.6	-7.7	-10.9	-14.3	-17.7
NAL09	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.1	39.5	40.5	40.5	40.5	40.5	40.5	40.5
	Exceedance Level	-	-	-	-	-9.9	-5.5	-4.5	-5.0	-8.1	-11.3	-14.7	-18.1
NAL10	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	31.3	35.5	36.4	36.5	36.5	36.5	36.5	36.5
	Exceedance Level	-	-	-	-	-8.7	-4.5	-8.6	-8.5	-8.5	-8.5	-10.2	-14.4
NAL11	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	30.8	34.8	35.8	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-	-	-9.2	-5.2	-9.2	-9.1	-9.1	-9.1	-10.8	-15.0
NAL12	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.0	39.5	40.5	40.7	40.7	40.7	40.7	40.7
	Exceedance Level	-	-	-	-	-8.9	-4.4	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
NAL13	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.9	41.0	42.6	43.2	43.3	43.3	43.3	43.3
	Exceedance Level	-	-	-	-	-8.1	-4.0	-2.4	-1.8	-1.7	-1.7	-1.7	-1.7

Table 6.6 Guidelines (DoEHLG, 2006) Compliance Table – Likely Cumulative Noise – Night-time

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL01	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.1	40.6	41.7	41.7	41.7	41.7	41.7	41.7
	Exceedance Level	-	-	-	-	-6.9	-2.4	-1.3	-1.3	-1.9	-5.5	-9.2	-13.0
NAL02	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	32.7	37.2	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-	-	-10.3	-5.8	-4.7	-4.7	-5.3	-8.9	-12.6	-16.4
NAL03	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-	-	-7.2	-2.7	-1.6	-1.6	-1.6	-3.8	-7.5	-11.2
NAL04	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	29.1	33.5	34.6	34.6	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-	-	-13.9	-9.5	-8.4	-8.4	-8.4	-10.6	-14.3	-18.0
NAL05	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9	49.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	26.3	30.6	31.7	31.7	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-	-	-16.7	-12.4	-11.3	-11.3	-11.3	-11.3	-13.2	-17.9
NAL06	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-	-	-8.4	-3.9	-2.8	-2.8	-2.8	-4.4	-7.7	-11.1
NAL07	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.0	39.4	40.4	40.4	40.4	40.4	40.4	40.4
	Exceedance Level	-	-	-	-	-8.0	-3.6	-2.6	-4.2	-7.4	-10.5	-13.4	-16.1
NAL08	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.3	39.8	40.9	40.9	40.9	40.9	40.9	40.9
	Exceedance Level	-	-	-	-	-7.7	-3.2	-2.1	-3.7	-6.9	-10.0	-12.9	-15.6
NAL09	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.1	39.5	40.5	40.5	40.5	40.5	40.5	40.5
	Exceedance Level	-	-	-	-	-7.9	-3.5	-2.5	-4.1	-7.3	-10.4	-13.3	-16.0
NAL10	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	31.3	35.5	36.4	36.5	36.5	36.5	36.5	36.5
	Exceedance Level	-	-	-	-	-11.7	-7.5	-6.6	-6.5	-6.5	-7.4	-10.6	-13.8
NAL11	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	30.8	34.8	35.8	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-	-	-12.2	-8.2	-7.2	-7.1	-7.1	-8.0	-11.2	-14.4
NAL12	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.0	39.5	40.5	40.7	40.7	40.7	40.7	40.7
	Exceedance Level	-	-	-	-	-6.9	-2.4	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3
NAL13	Total Noise Limit: Guidelines (DOEHLG, 2006) L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.9	41.0	42.6	43.2	43.3	43.3	43.3	43.3
	Exceedance Level	-	-	-	-	-6.1	-2.0	-0.4	0.2	0.3	0.3	0.3	0.3

6.6 Derivation of Site Specific Noise Limits (Stage 3)

6.6.1 In order to protect residential amenity, the IOA GPG (2013) recommendations are that cumulatively, all schemes operate within the Total Guidelines (DoEHLG, 2006) Noise Limits. This can be found in summary box SB21 of the IOA GPG (2013) which states:

'Whenever a cumulative situation is encountered, the noise limits for an individual wind farm should be determined in such a way that no cumulative excess of the total ETSU-R-97 noise limit would occur.'

6.6.2 The Site Specific Noise Limits have been derived to take account of the proportion of the noise limit that has been allocated to, or could theoretically be used by, other wind farm developments in proximity to the Proposed Wind Farm.

6.6.3 Table 6.7 summarises the approach adopted at each NAL in order to derive the Site Specific Noise Limits for the Proposed Wind Farm.

Table 6.7 Limit Derivation Strategy

NAL	Limit Derivation Strategy
NALs 1-6	The likely predicted levels from other schemes were found to be more than 10 dB below the Total Guidelines (DoEHLG, 2006) Noise Limits and as such the entire noise limits has been allocated to the Proposed Wind Farm. This result in Site Specific Noise Limit being equal to the Total Guidelines (DoEHLG, 2006) Noise Limit.
NALs 7-11	The likely predicted levels from other schemes (mostly Gathabawn) were found to be within 10 dB of the Total Guidelines (DoEHLG, 2006) Noise Limits by a small margin, as such the Site Specific Noise Limit has been set to the logarithmic subtraction of predicted cumulative levels (inclusive of a cautious +2 dB) from other schemes from the Total Guidelines (DoEHLG, 2006) Noise Limit. This result in Site Specific Noise Limit being nearly equals to the entire Total Guidelines (DoEHLG, 2006) Noise Limit.
NALs 12 - 13	The predicted levels for the Proposed Wind Farm only were found to be more than 10 dB below the conditioned noise limits for Lisdowney Wind Farm and as such, the Site Specific Noise Limit has been set to 10 dB below the Total Guidelines (DoEHLG, 2006) Noise Limit.

6.6.4 As summarised in Table 6.7 above, it is proposed that the full Guidelines (DoEHLG, 2006) Noise Limits be allocated to the Proposed Wind Farm at a number of noise assessment locations, as the other schemes do not need a portion of the limit. For the remaining noise assessment locations, apportionment was required in order to allow the Proposed Wind Farm and the other wind farm developments to co-exist to within the Total Guidelines (DoEHLG, 2006) Noise Limits.

6.6.5 Table 6.8 and Table 6.9 show the daytime and night-time Site Specific Noise Limits, noise predictions for the Proposed Wind Farm (Nordex N163 candidate turbine) and the exceedance level. A negative exceedance demonstrates compliance with the Site Specific Noise Limits.

6.6.6 The Stage 3 assessment shows that the predicted wind turbine noise immission levels meet the Site Specific Noise Limits under all conditions and at all NALs for both daytime and night time periods.

6.6.7 A series of graphs to show the predicted wind turbine noise from the Proposed Wind Farm compared to the Site Specific Noise Limits are included as Figures A1.5a - A1.5m (Annex 1). There is a set of graphs for each of the NALs, which show the Total Guidelines (DoEHLG, 2006) Noise Limit (solid red line), the prevailing background noise level (black line), the Site Specific Noise Limit (dashed red line with triangles) and the predicted wind turbine noise (Nordex N163) from the Proposed Wind Farm (solid blue line with triangular markers).

6.6.8 In the event that planning permission is granted for the Proposed Wind Farm it would be appropriate to set noise limits equal to the Site Specific Noise Limits contained in Table 6.8 and Table 6.9.

Table 6.8 Site Specific Noise Limits Compliance Table – Daytime

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL01	Site Specific Noise Limit L_{A90}	40.0	40.0	40.0	40.0	45.0	44.9	44.9	44.9	44.9	47.5	50.8	54.3
	Predicted Wind Turbine Noise L_{A90}	-	-	-	31.5	36.0	40.5	41.6	41.6	41.6	41.6	41.6	41.6
	Exceedance Level	-	-	-	-8.5	-9.0	-4.4	-3.3	-3.3	-3.3	-6.0	-9.2	-12.7
NAL02	Site Specific Noise Limit L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Predicted Wind Turbine Noise L_{A90}	-	-	-	28.0	32.5	37.0	38.1	38.1	38.1	38.1	38.1	38.1
	Exceedance Level	-	-	-	-12.0	-12.5	-8.0	-6.9	-6.9	-6.9	-9.5	-12.7	-16.2
NAL03	Site Specific Noise Limit L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Predicted Wind Turbine Noise L_{A90}	-	-	-	31.3	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-	-8.7	-9.2	-4.7	-3.6	-3.6	-3.6	-4.9	-8.4	-12.4
NAL04	Site Specific Noise Limit L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.4	28.9	33.4	34.5	34.5	34.5	34.5	34.5	34.5
	Exceedance Level	-	-	-	-15.6	-16.1	-11.6	-10.5	-10.5	-10.5	-11.8	-15.3	-19.3
NAL05	Site Specific Noise Limit L_{A90}	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7	49.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	21.0	25.5	30.0	31.1	31.1	31.1	31.1	31.1	31.1
	Exceedance Level	-	-	-	-24.0	-19.5	-15.0	-13.9	-13.9	-13.9	-13.9	-14.6	-18.4
NAL06	Site Specific Noise Limit L_{A90}	45.0	45.0	45.0	45.0	45.0	45.0	45.0	44.9	44.9	45.9	49.2	53.8
	Predicted Wind Turbine Noise L_{A90}	-	-	-	30.0	34.5	39.0	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level	-	-	-	-15.0	-10.5	-6.0	-4.9	-4.9	-4.9	-5.8	-9.1	-13.7
NAL07	Site Specific Noise Limit L_{A90}	40.0	40.0	40.0	40.0	44.9	44.8	44.8	45.3	48.5	51.7	55.2	58.6

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Predicted Wind Turbine Noise L_{A90}	-	-	-	29.9	34.4	38.9	40.0	40.0	40.0	40.0	40.0	40.0
	Exceedance Level	-	-	-	-10.1	-10.5	-5.9	-4.8	-5.3	-8.5	-11.8	-15.2	-18.6
NAL08	Site Specific Noise Limit L_{A90}	40.0	40.0	40.0	40.0	44.9	44.7	44.7	45.2	48.5	51.7	55.2	58.6
	Predicted Wind Turbine Noise L_{A90}	-	-	-	30.5	35.0	39.5	40.6	40.6	40.6	40.6	40.6	40.6
	Exceedance Level	-	-	-	-9.5	-9.8	-5.2	-4.0	-4.6	-7.8	-11.1	-14.5	-17.9
NAL09	Site Specific Noise Limit L_{A90}	40.0	40.0	40.0	40.0	44.9	44.7	44.7	45.2	48.5	51.7	55.2	58.6
	Predicted Wind Turbine Noise L_{A90}	-	-	-	30.1	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2
	Exceedance Level	-	-	-	-9.9	-10.3	-5.7	-4.5	-5.0	-8.3	-11.6	-15.0	-18.4
NAL10	Site Specific Noise Limit L_{A90}	39.6	39.6	39.6	39.6	39.6	39.0	44.6	44.6	44.6	44.6	46.4	50.8
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.7	29.2	33.7	34.8	34.8	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-	-14.9	-10.4	-5.2	-9.8	-9.8	-9.8	-9.8	-11.6	-16.0
NAL11	Site Specific Noise Limit L_{A90}	39.6	39.6	39.6	39.6	39.6	39.1	44.7	44.7	44.7	44.7	46.5	50.8
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.1	28.6	33.1	34.2	34.2	34.2	34.2	34.2	34.2
	Exceedance Level	-	-	-	-15.6	-11.1	-6.1	-10.5	-10.5	-10.5	-10.5	-12.3	-16.7
NAL12	Site Specific Noise Limit L_{A90}	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
	Predicted Wind Turbine Noise L_{A90}	-	-	-	19.1	23.6	28.1	29.2	29.2	29.2	29.2	29.2	29.2
	Exceedance Level	-	-	-	-15.9	-11.4	-6.9	-5.8	-5.8	-5.8	-5.8	-5.8	-5.8
NAL13	Site Specific Noise Limit L_{A90}	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Predicted Wind Turbine Noise L_{A90}	-	-	-	16.9	21.4	25.9	27.0	27.0	27.0	27.0	27.0	27.0
	Exceedance Level	-	-	-	-18.1	-13.6	-9.1	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0

Table 6.9 Site Specific Noise Limits Compliance Table – Night-time

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL01	Site Specific Noise Limit L_{A90}	42.9	42.9	42.9	42.9	42.9	42.9	42.8	42.8	43.4	47.1	50.9	54.7
	Predicted Wind Turbine Noise L_{A90}	-	-	-	31.5	36.0	40.5	41.6	41.6	41.6	41.6	41.6	41.6
	Exceedance Level	-	-	-	-11.5	-7.0	-2.4	-1.3	-1.2	-1.9	-5.6	-9.3	-13.1
NAL02	Site Specific Noise Limit L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	42.9	42.9	43.5	47.2	50.9	54.7
	Predicted Wind Turbine Noise L_{A90}	-	-	-	28.0	32.5	37.0	38.1	38.1	38.1	38.1	38.1	38.1
	Exceedance Level	-	-	-	-15.0	-10.5	-5.9	-4.8	-4.8	-5.4	-9.1	-12.8	-16.6
NAL03	Site Specific Noise Limit L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Predicted Wind Turbine Noise L_{A90}	-	-	-	31.3	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-	-11.7	-7.2	-2.7	-1.6	-1.6	-1.6	-3.8	-7.5	-11.2
NAL04	Site Specific Noise Limit L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.4	28.9	33.4	34.5	34.5	34.5	34.5	34.5	34.5
	Exceedance Level	-	-	-	-18.6	-14.1	-9.6	-8.5	-8.5	-8.5	-10.7	-14.4	-18.1
NAL05	Site Specific Noise Limit L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	42.9	42.9	42.9	42.9	44.9	49.6
	Predicted Wind Turbine Noise L_{A90}	-	-	-	21.0	25.5	30.0	31.1	31.1	31.1	31.1	31.1	31.1
	Exceedance Level	-	-	-	-22.0	-17.5	-13.0	-11.8	-11.8	-11.8	-11.8	-13.8	-18.5
NAL06	Site Specific Noise Limit L_{A90}	43.0	43.0	43.0	43.0	43.0	42.9	42.9	42.9	42.9	44.5	47.9	51.3
	Predicted Wind Turbine Noise L_{A90}	-	-	-	30.0	34.5	39.0	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level	-	-	-	-13.0	-8.5	-4.0	-2.9	-2.8	-2.8	-4.5	-7.8	-11.2
NAL07	Site Specific Noise Limit L_{A90}	42.9	42.9	42.9	42.9	42.9	42.7	42.6	44.3	47.7	50.8	53.8	56.5

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Predicted Wind Turbine Noise L_{A90}	-	-	-	29.9	34.4	38.9	40.0	40.0	40.0	40.0	40.0	40.0
	Exceedance Level	-	-	-	-13.0	-8.5	-3.8	-2.6	-4.4	-7.7	-10.9	-13.8	-16.5
NAL08	Site Specific Noise Limit L_{A90}	42.8	42.8	42.8	42.8	42.8	42.6	42.5	44.2	47.6	50.8	53.8	56.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	30.5	35.0	39.5	40.6	40.6	40.6	40.6	40.6	40.6
	Exceedance Level	-	-	-	-12.3	-7.8	-3.0	-1.8	-3.6	-7.0	-10.2	-13.1	-15.8
NAL09	Site Specific Noise Limit L_{A90}	42.8	42.8	42.8	42.8	42.8	42.6	42.5	44.2	47.6	50.8	53.8	56.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	30.1	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2
	Exceedance Level	-	-	-	-12.7	-8.2	-3.5	-2.3	-4.1	-7.5	-10.6	-13.6	-16.3
NAL10	Site Specific Noise Limit L_{A90}	42.8	42.8	42.8	42.8	42.8	42.5	42.4	42.4	42.4	43.4	46.9	50.2
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.7	29.2	33.7	34.8	34.8	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-	-18.1	-13.6	-8.8	-7.6	-7.5	-7.5	-8.6	-12.0	-15.4
NAL11	Site Specific Noise Limit L_{A90}	42.8	42.8	42.8	42.8	42.8	42.6	42.5	42.5	42.5	43.5	46.9	50.2
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.1	28.6	33.1	34.2	34.2	34.2	34.2	34.2	34.2
	Exceedance Level	-	-	-	-18.8	-14.3	-9.5	-8.3	-8.3	-8.3	-9.3	-12.7	-16.0
NAL12	Site Specific Noise Limit L_{A90}	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
	Predicted Wind Turbine Noise L_{A90}	-	-	-	19.1	23.6	28.1	29.2	29.2	29.2	29.2	29.2	29.2
	Exceedance Level	-	-	-	-13.9	-9.4	-4.9	-3.8	-3.8	-3.8	-3.8	-3.8	-3.8
NAL13	Site Specific Noise Limit L_{A90}	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Predicted Wind Turbine Noise L_{A90}	-	-	-	16.9	21.4	25.9	27.0	27.0	27.0	27.0	27.0	27.0
	Exceedance Level	-	-	-	-16.1	-11.6	-7.1	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0

7 Summary and Conclusions

7.1.1 This report has assessed the potential impact of operational noise from the Proposed Wind Farm on the residents of nearby Noise Sensitive Receptors (NSRs) using guidance contained within the Guidelines (DoEHLG, 2006). Reference was also made to the guidance in ARWTN and the IOA GPG to supplement the Guidelines (DoEHLG, 2006).

7.1.2 Background noise monitoring was undertaken by TNEI at six NSRs neighbouring the Proposed Wind Farm. A total of 184 residential NSRs were identified within 2 km of the Proposed Turbines, thirteen of which were chosen as Noise Assessment Locations (NALs). The assessment locations were chosen to represent the noise sensitive receptors located closest to the Proposed Wind Farm and other nearby relevant wind farms. For the assessment locations where no background noise measurements were undertaken, noise data collected at proxy locations considered representative of the expected background noise environment was used to assess the noise impact at those receptors.

7.1.3 Concurrent wind speed data was collected using a LIDAR unit located within the Proposed Wind Farm site. The data collected at 109 m and 99 m height which were used to calculate hub height wind speeds (103.5 m) which were then standardised to 10 m height, in accordance with current good practice.

7.1.4 Analysis of the measured data was undertaken to determine the pre-existing background noise environment and to establish the daytime and night-time noise limits for eleven of the thirteen assessment locations. A 'Total Guidelines (DoEHLG, 2006) Noise Limit' of 40 dB(A), where background noise levels are below 30 dB, and 45 dB or background noise plus 5 dB, whichever is the greater, where background noise levels are above 30 dB was set for the daytime. A limit of 43 dB(A) or background noise plus 5 dB, whichever is the greater, was used for the night-time period.

7.1.5 For the remaining two assessment locations, existing cumulative limits are in effect due to the proximity of Lisdowney Wind Farm, therefore existing limits have been adopted at these two assessment locations.

7.1.6 Given the number of operational, consented and proposed wind farms in proximity to the Proposed Wind Farm. A cumulative assessment was undertaken, and the results show that the predicted cumulative wind farm noise immission levels would meet the Total Guidelines (DoEHLG, 2006) Noise Limits at all NALs (and all identified NSRs) during both the daytime and night-time periods.

7.1.7 Site Specific Noise Limits have been derived taking into account (where required) the other consented wind farms in the area. Compliance with the Site Specific Noise Limit ensures that the 'Total Guidelines (DoEHLG, 2006) Noise Limit' would not be exceeded by the total cumulative immissions from all wind farms.

7.1.8 For NALs 1-6, immissions from other wind farms were found to be at least 10 dB below the 'Total Guidelines (DoEHLG, 2006) Noise Limit', then these other wind farms would be using a negligible proportion of the limit. As such it is considered appropriate to allocate the entire noise limit to the Proposed Wind Farm.

7.1.9 For NALs 7-11, the immissions from other wind farms were found to be within 10 dB of the 'Total Guidelines (DoEHLG, 2006) Noise Limit' by a small margin. Therefore the Site Specific Noise Limits were set as the logarithmic subtraction of the predicted immissions from other schemes from the 'Total Guidelines (DoEHLG, 2006) Noise Limit'.

7.1.10 For NAL12 and NAL13, turbine predictions for the Proposed Wind Farm were found to be greater than 10 dB below the conditioned noise limits, therefore the Site Specific Noise Limits were set at 10 dB below the existing noise limits such that the Proposed Wind Farm does not contribute to the noise levels at these receptors.

7.1.11 An assessment was undertaken to determine whether the Proposed Wind Farm could operate within the Site Specific Noise Limits and it was found that for at all receptors, wind turbine noise immissions were below the Site Specific Noise Limits when considering the Nordex N163, 6.X MW, with serrated trailing edge blades.

7.1.12 There are a number of wind turbine makes and models that may be suitable for the Proposed Wind Farm. Should the proposal receive planning permission, the final choice of turbine would be subject to a competitive tendering process. The final choice of turbine would, however, have to meet the noise limits determined and contained within any condition imposed.

8 Glossary of Terms

AOD: Above Ordnance Datum is the height above sea level.

Amplitude Modulation: a variation in noise level over time; for example observers may describe a 'whoosh whoosh' sound, which can be heard close to a wind turbine as the blades sweep past.

Attenuation: the reduction in level of a sound between the source and a receiver due to any combination of effects including: distance, atmospheric absorption, acoustic screening, the presence of a building façade, etc.

Background Noise: the noise level rarely fallen below in any given location over any given time period, often classed according to daytime, evening or night time periods. The L_{A90} indices (see below) is often used to represent the background noise level.

Bin: subset or group into which data can be sorted; in the case of wind speeds, bins are often centred on integer wind speeds with a width of 1 m/s. For example the 4 m/s bin would include all data with wind speeds of 3.5 to 4.5 m/s.

Dawn Chorus: noise due to birds which can occur at sunrise.

Broadband Noise: noise with components over a wide range of frequencies.

Decibel (dB): the ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. A logarithmic scale is used in noise level measurements because of this wide range. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound level.

dB(A): the ear has the ability to recognise a particular sound depending on its pitch or frequency. Microphones cannot differentiate noise in the same way as the ear, and to counter this weakness the noise measuring instrument applies a correction to correspond more closely to the frequency response of the human ear. The correction factor is called 'A Weighting' and the resulting measurements are written as dB(A). The dB(A) is internationally accepted and has been found to correspond well with people's subjective reaction to noise. Some typical subjective changes in noise levels are:

- a change of 3 dB(A) is just perceptible;
- a change of 5 dB(A) is clearly perceptible;
- a change of 10 dB(A) is twice (or half) as loud.

Directivity: the property of a sound source that causes more sound to be radiated in one direction than another.

Frequency: the pitch of a sound in Hz or kHz. See Hertz.

Ground Effects: the modification of sound at a receiver location due to the interaction of the sound wave with the ground along its propagation path from source to receiver. Described using the term 'G', and ranges between 0 (hard), 0.5 (mixed) and 1 (soft).

Hertz (Hz): sound frequency refers to how quickly the air vibrates, or how close the sound waves are to each other (in cycles per second, or Hertz (Hz)).

L_w: is the sound power level. It is a measure of the total noise energy radiated by a source of noise, and is used to calculate noise levels at a distant location. The L_{WA} is the A-weighted sound power level.

L_{eq}: is the equivalent continuous sound level, and is the sound level of a steady sound with the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. The $LA_{eq,T}$ is the A-weighted equivalent continuous sound level over a given time period (T).

L_{90}: index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is often used to measure the background noise level. The $L_{A90,10min}$ is the A-weighted background noise level over a ten minute measurement sample.

Noise emission: the noise energy emitted by a source (e.g. a wind turbine).

Noise immission: the sound pressure level detected at a given location (e.g. the nearest dwelling).

Night Time Hours: ETSU-R-97 defines the night time hours as 23.00 to 07.00 every day.

Quiet Daytime Hours: ETSU-R-97 defines the amenity hours as 18.00 to 23.00 Monday to Friday, 13.00 to 23.00 on Saturdays and 07.00 to 23.00 on Sundays.

Sound Level Meter: an instrument for measuring sound pressure level.

Sound Power Level: the total sound power radiated by a source, in decibels.

Sound Pressure Level: a measure of the sound pressure at a point, in decibels**.**

Standardised Wind Speed: a wind speed measured at a height different than 10 m (generally measured at the turbine hub height) which is expressed to a reference height of 10 m using a roughness length of 0.05 for standardisation purpose (in accordance with the IEC 61400-11 standard).

Tonal Noise: noise which covers a very restricted range of frequencies (e.g. a range of ≤20 Hz). This noise can be more annoying than broadband noise.

Wind Shear: the increase of wind speed with height above the ground.

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Annex 1 – Figures

- Figure A1.1 – Noise Monitoring and Assessment Locations
- Figure A1.2 – Cumulative Wind Farms
- Figure A1.3a-A1.3f – Background Noise Analysis Graphs
- Figure A1.4a-A1.4m – Cumulative Noise Predictions with Total Noise Limit
- Figure A1.5a-A1.5m – Site Specific Noise Limit

N

Ballylehaun Hill

Cullahill to Cashel Motorway

M8

Dublin Road

R639

Kilkenny Road

Clomantagh Hill 349 m

Kilkenny Road

R435

The Loughans

R693

L1815

Kyle Hill

Bán na Campa

Kilrush Road

Nuenna River

R693

Nore River

Brown's Wood

0 1 2 3 Kilometre

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LEGEND

- EIAR Site Boundary
- Noise Monitoring Locations (NMLs)
- Noise Assessment Locations (NALs)
- Killoshulan Wind Farm

Cumulative Wind Farms (within 10 km)

- Lisdowney
- Gathabawn

Noise Sensitive Receptors (NSRs) Represented By:

- NML1
- NML2
- NML3
- NML4
- NML5
- NML6
- Non-Residential

Rev.	Date	Amendment Details	Drawn	Approved
0	07/10/2026	FIRST ISSUE	FL	MC



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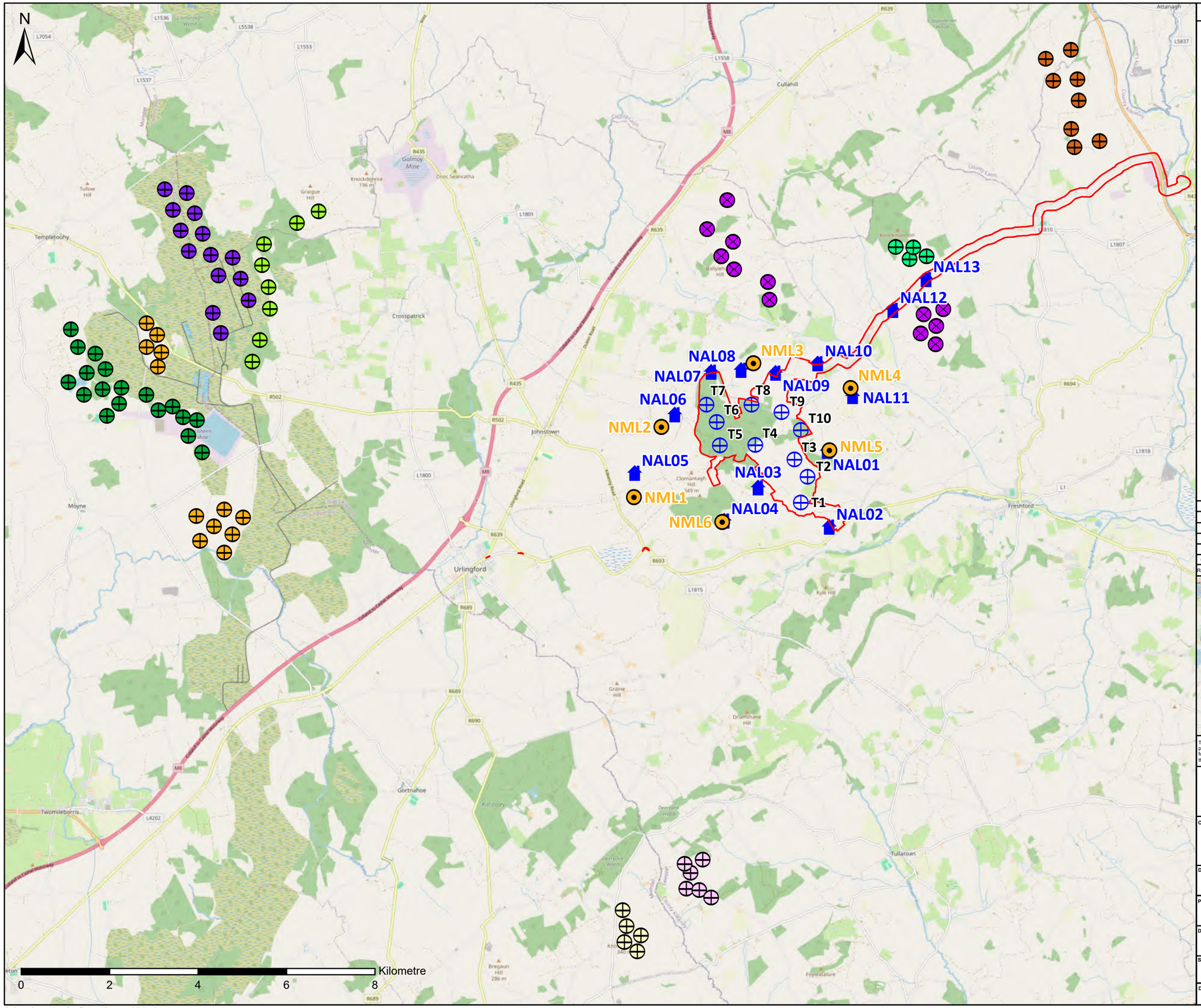
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Drawing Title: FIGURE A1.1 - NOISE MONITORING LOCATIONS

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Drawing Number: IE00061-012



LEGEND

- EIAR Site Boundary
- Noise Monitoring Locations (NMLs)
- Noise Assessment Locations (NALs)
- Killoshulan Wind Farm

Cumulative Wind Farms (within 10 km)

- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn

Rev.	Date	Amendment Details	Drawn	Approved
0	07/10/2026	FIRST ISSUE	FL	MC



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Drawing Title: FIGURE A1.2 - CUMULATIVE WIND FARMS

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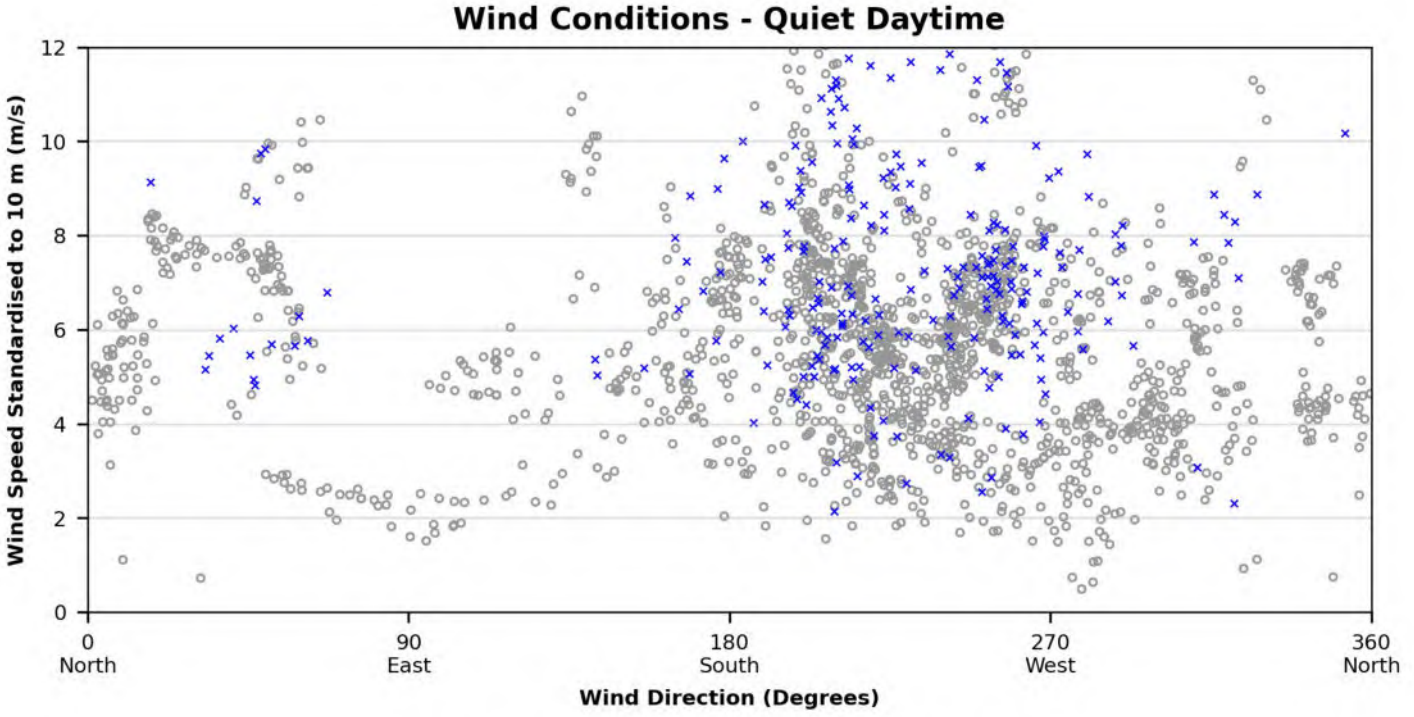
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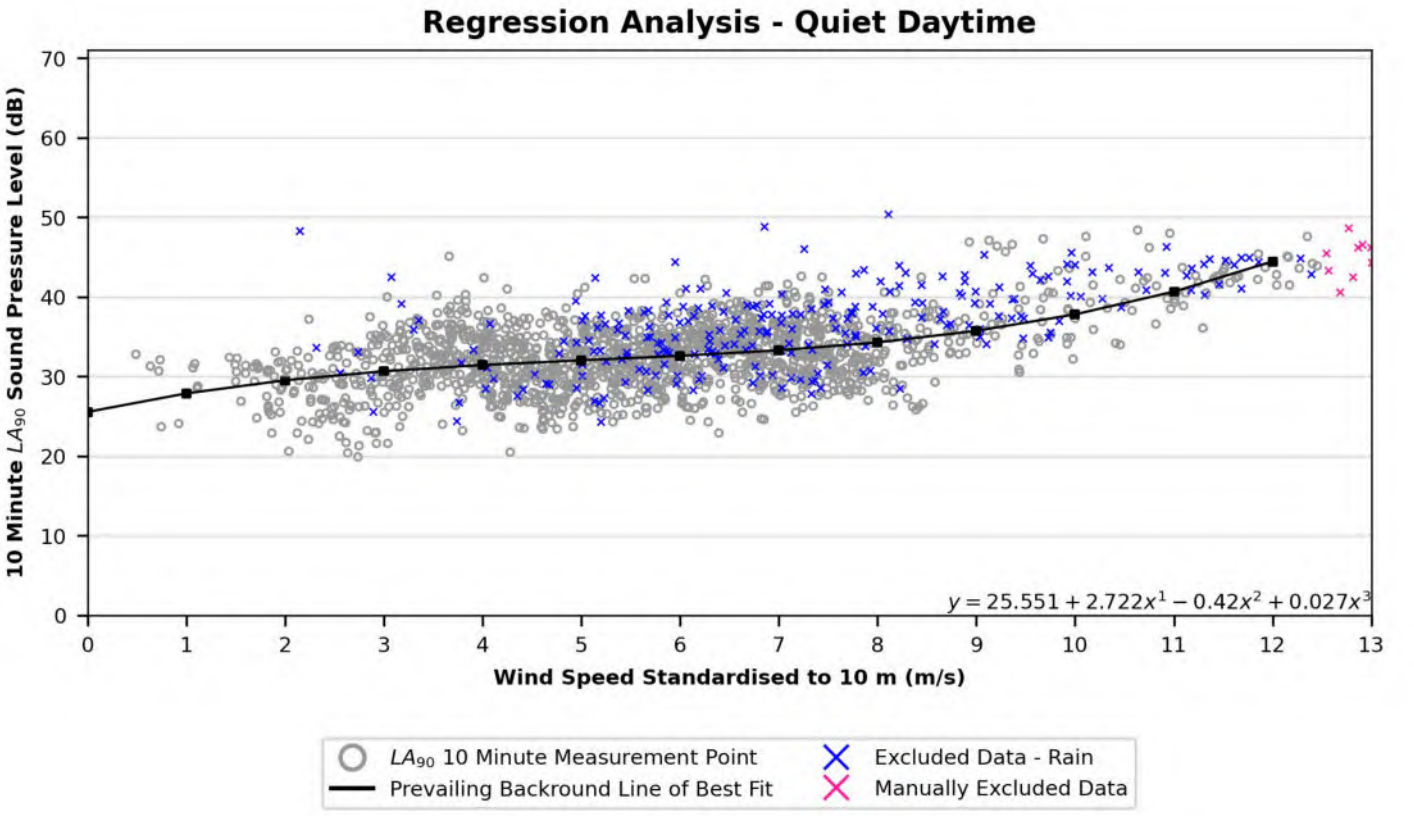
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IE00061 - Killoshulan Wind Farm

Figure A1.3a

Receptor Name: NML1





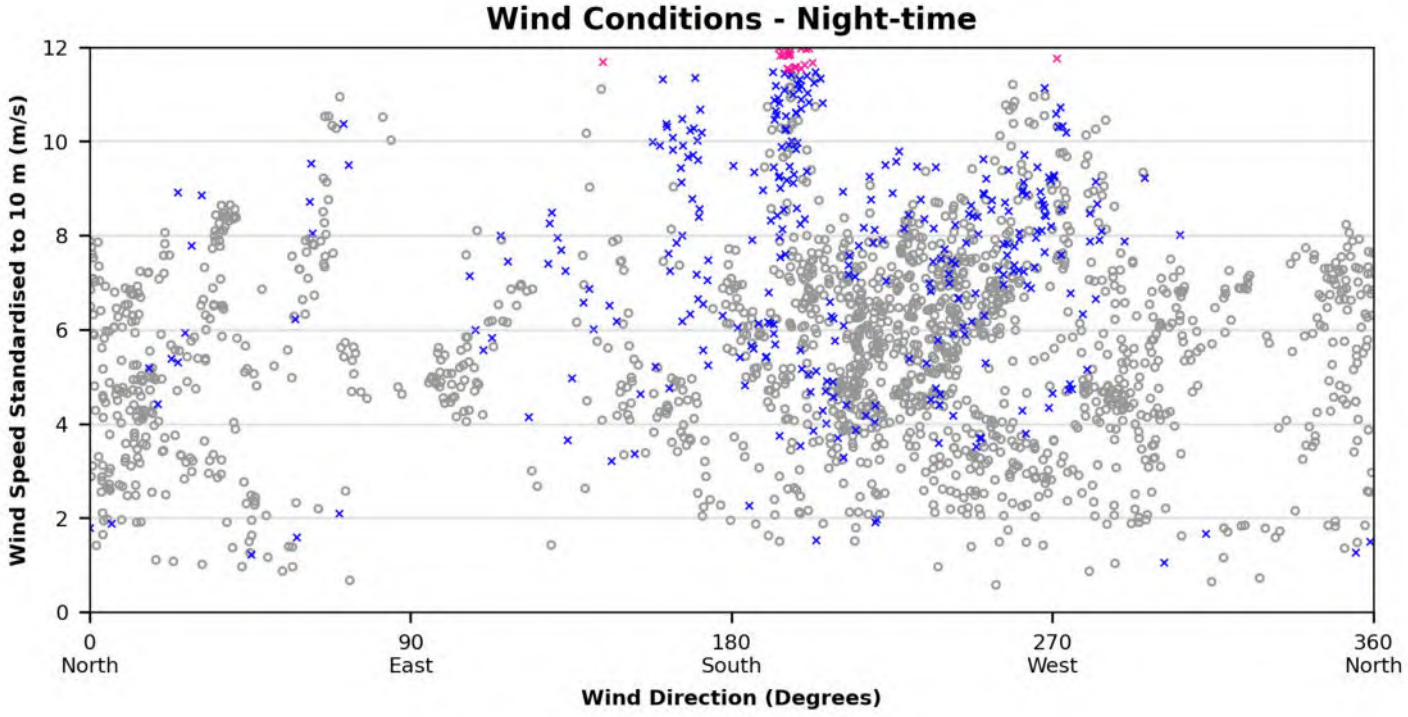
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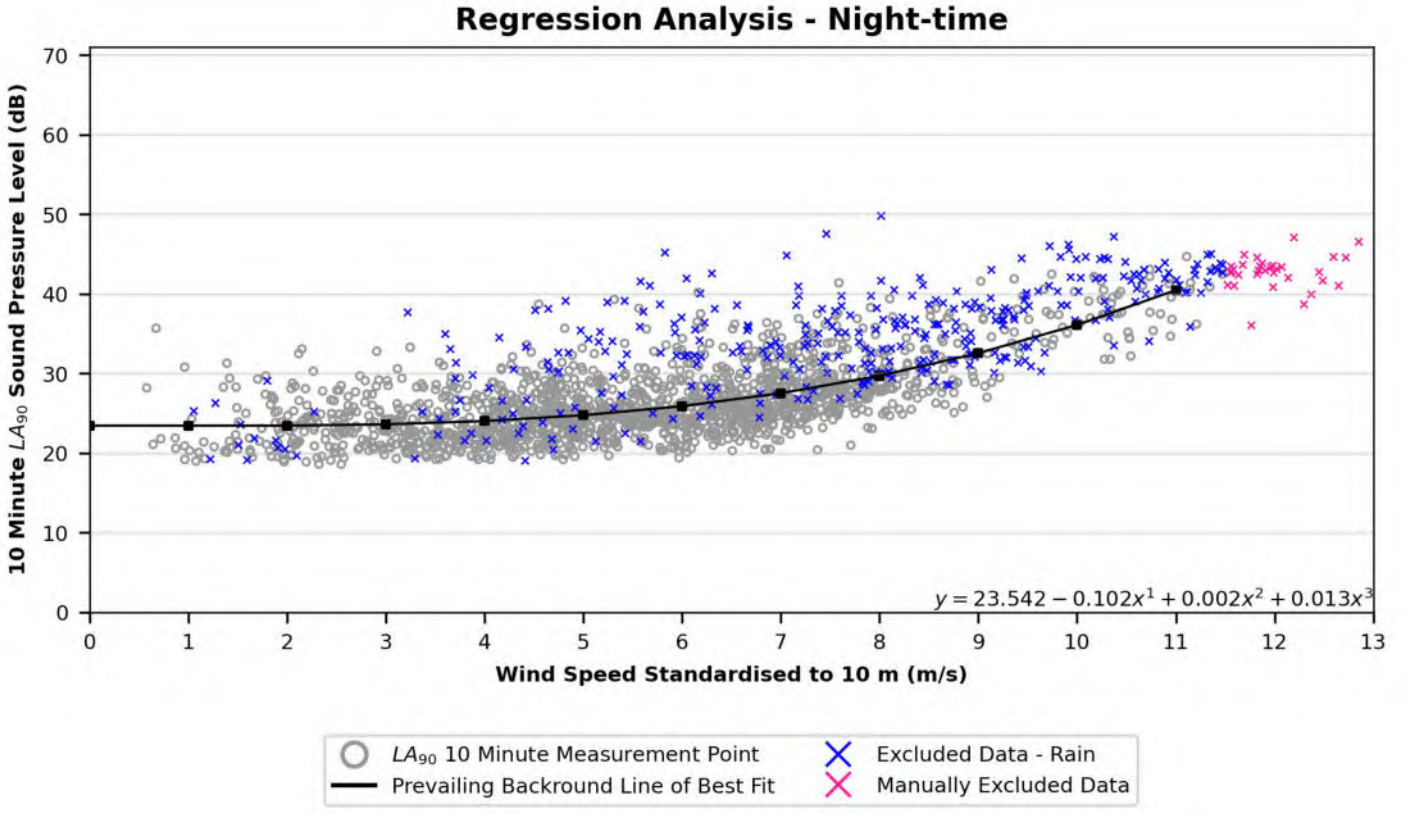
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No. Data Points	1	11	75	140	242	249	259	274	141	48	29	27	17
Prevailing Backround	25.6	27.9	29.5	30.7	31.4	32.0	32.6	33.3	34.3	35.7	37.8	40.7	44.5

IE00061 - Killoshulan Wind Farm

Figure A1.3a

Receptor Name: NML1





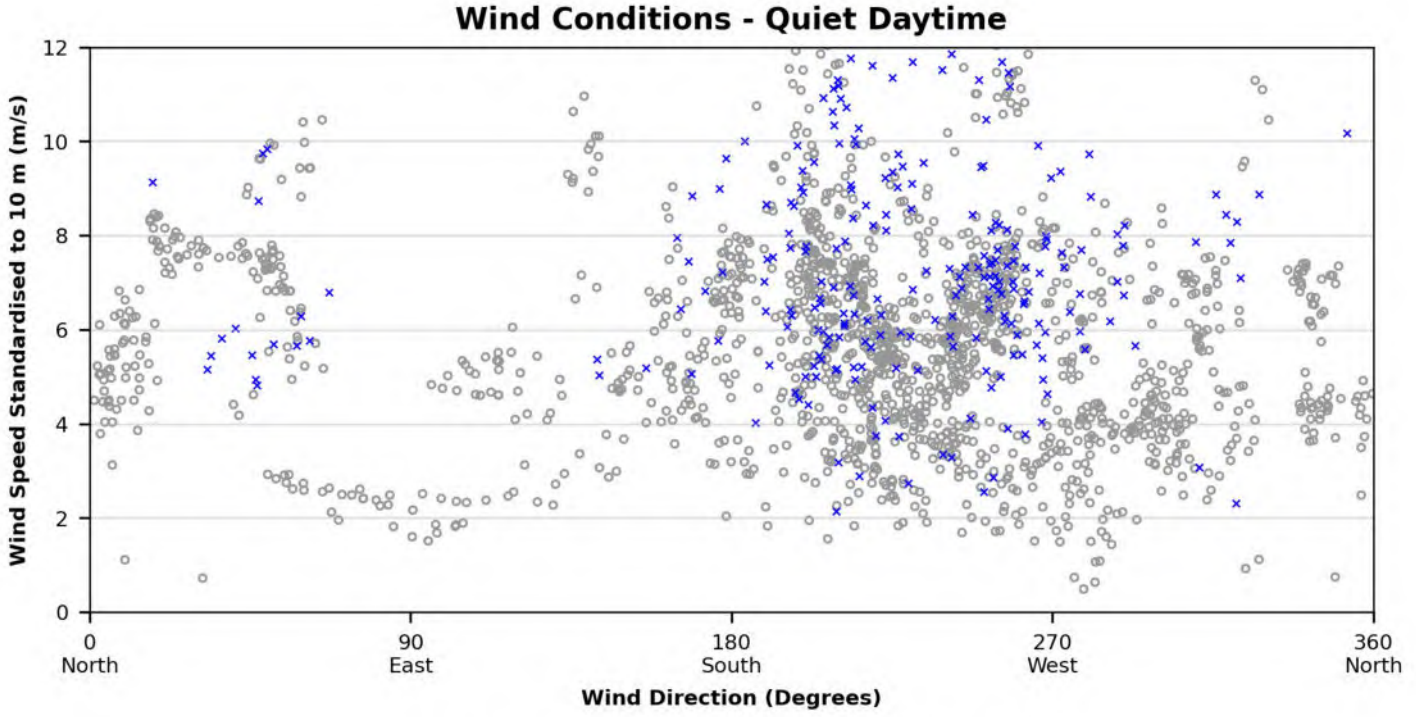
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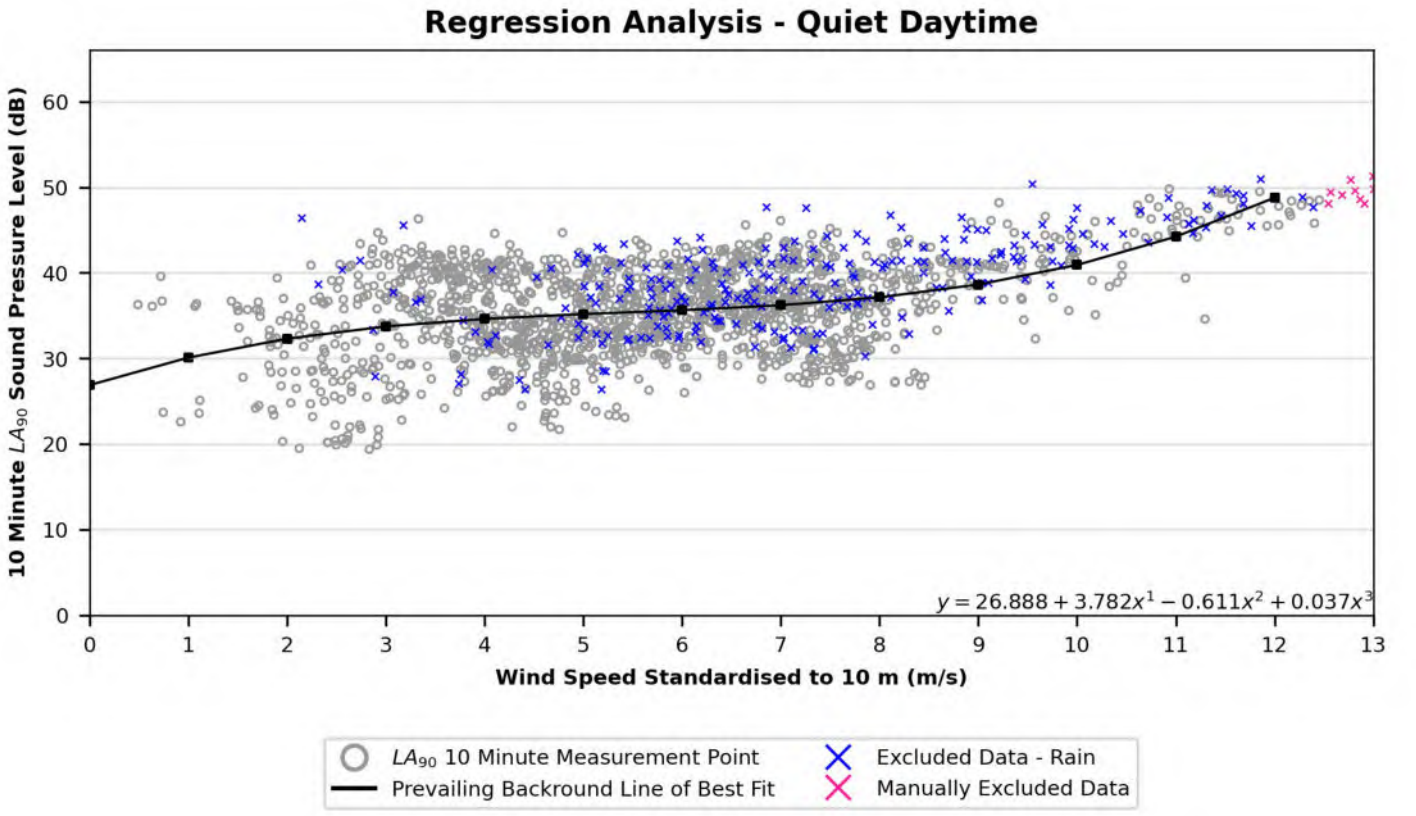
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Prevailing Backround	23.5	23.5	23.5	23.6	24.0	24.8	25.9	27.5	29.7	32.6	36.1	40.5	

IE00061 - Killoshulan Wind Farm

Figure A1.3b

Receptor Name: NML2





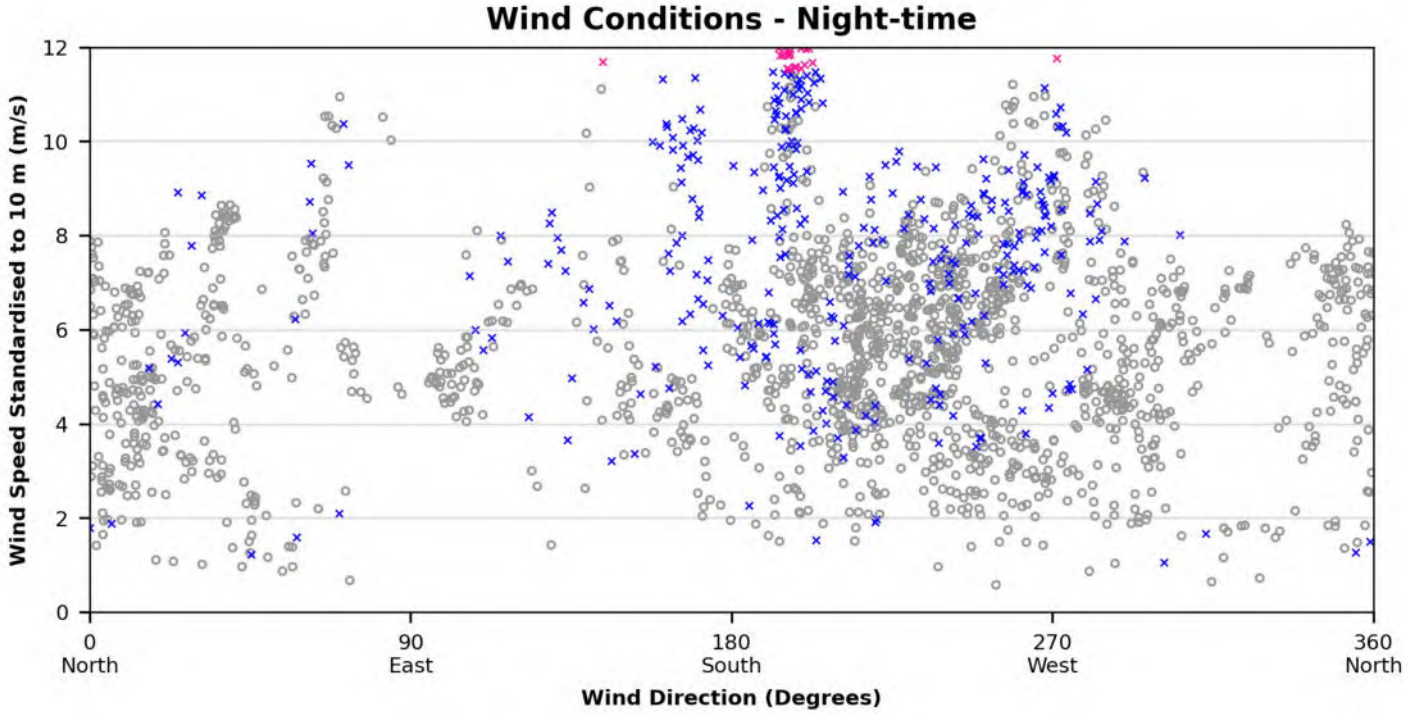
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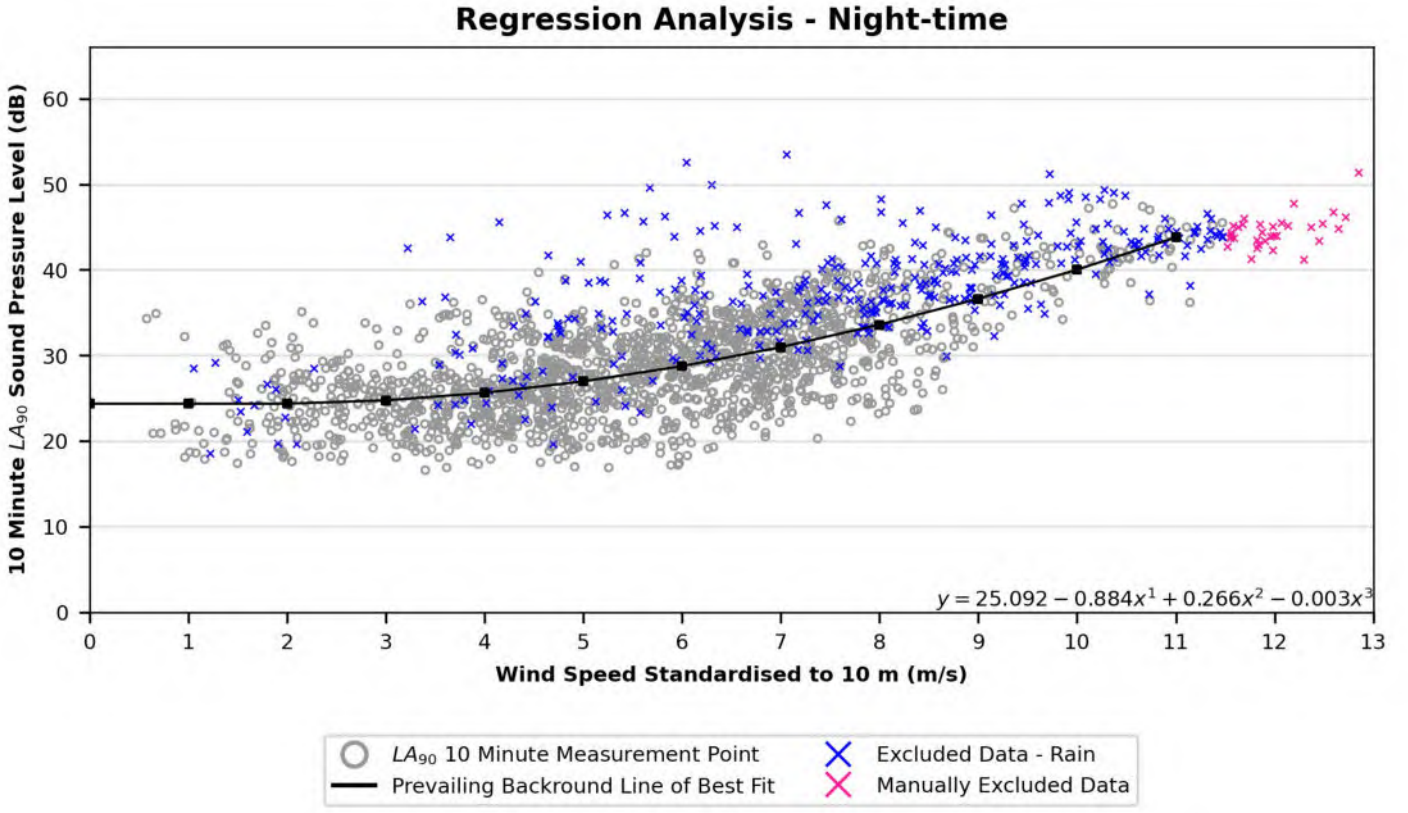
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Prevailing Backround	26.9	30.1	32.3	33.7	34.6	35.2	35.6	36.2	37.1	38.6	40.9	44.2	48.8

IE00061 - Killoshulan Wind Farm

Figure A1.3b

Receptor Name: NML2





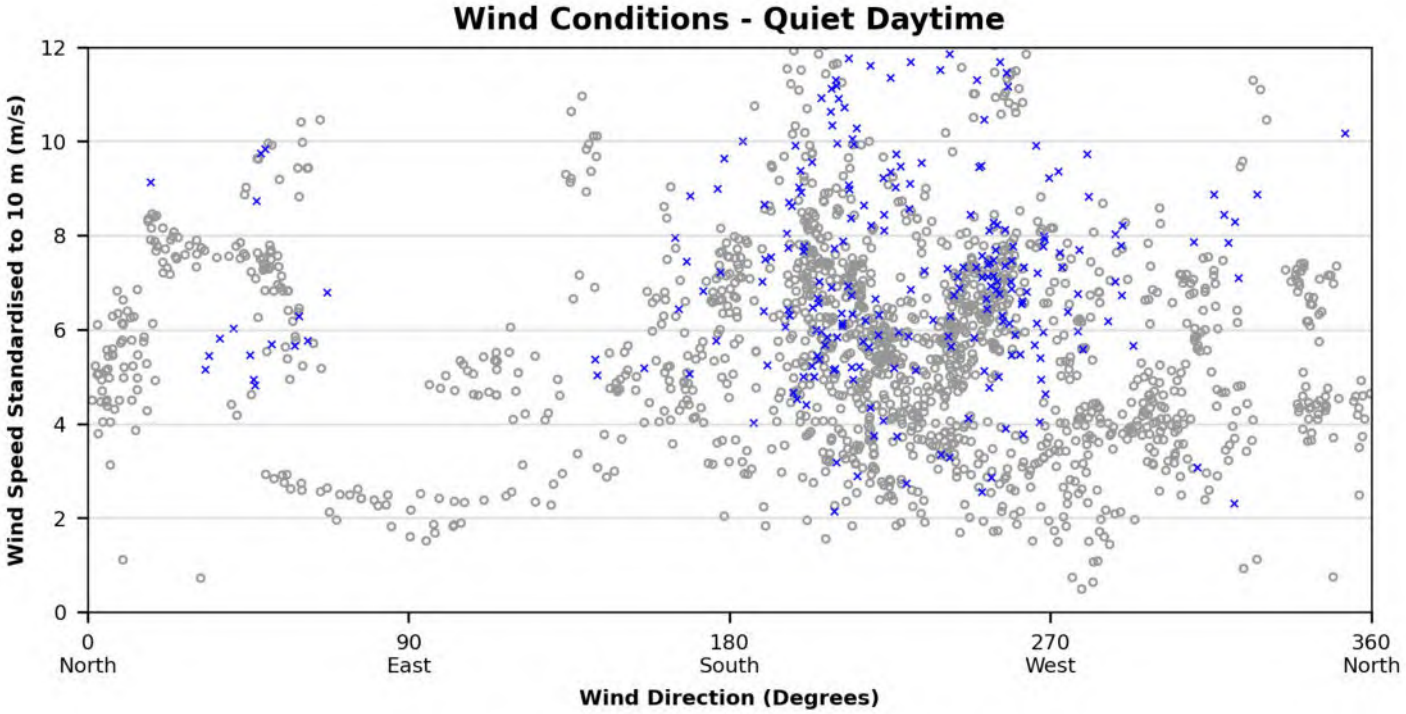
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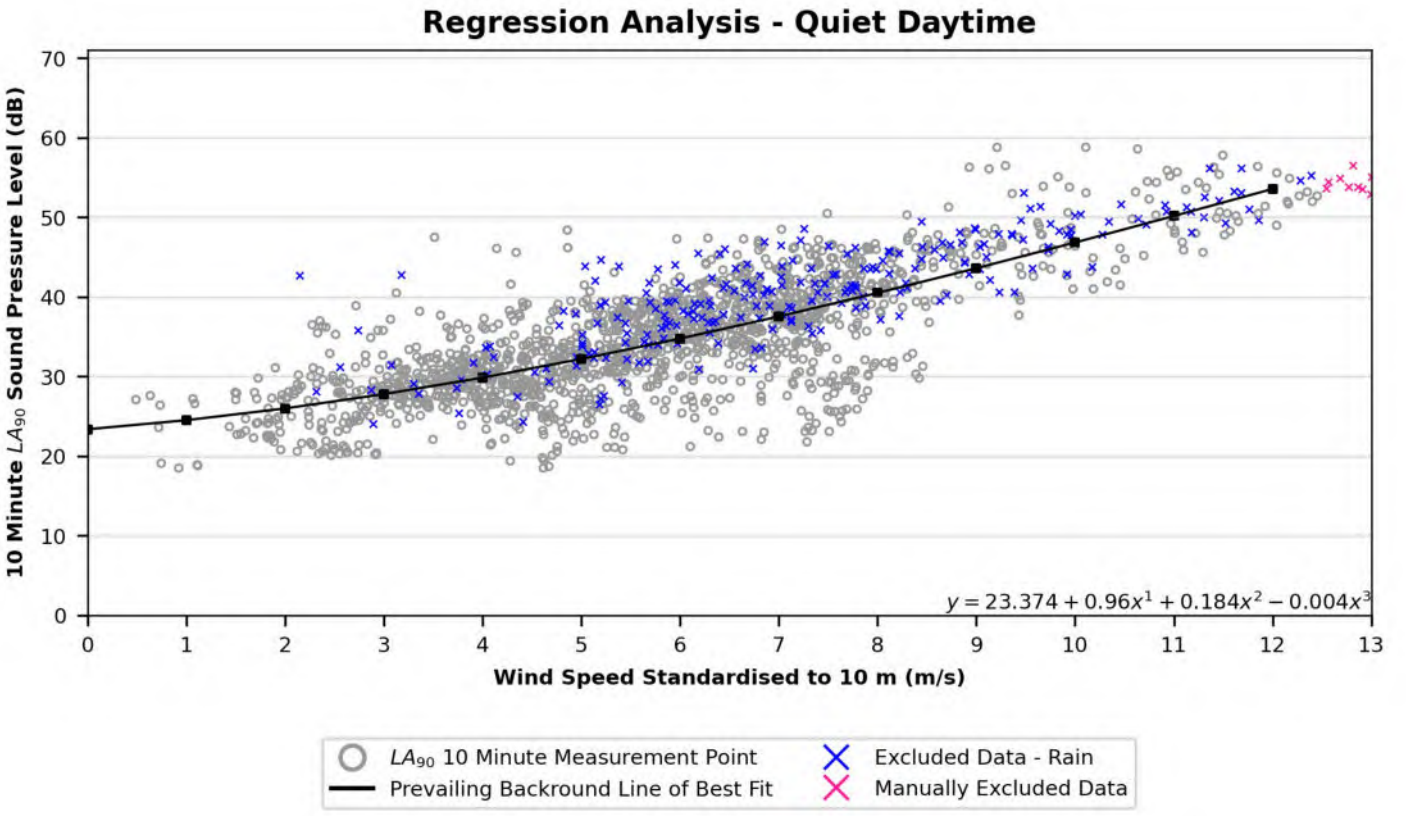
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Prevailing Backround	24.4	24.4	24.4	24.8	25.6	27.0	28.8	31.0	33.6	36.6	40.0	43.8	

IE00061 - Killoshulan Wind Farm

Figure A1.3c

Receptor Name: NML3





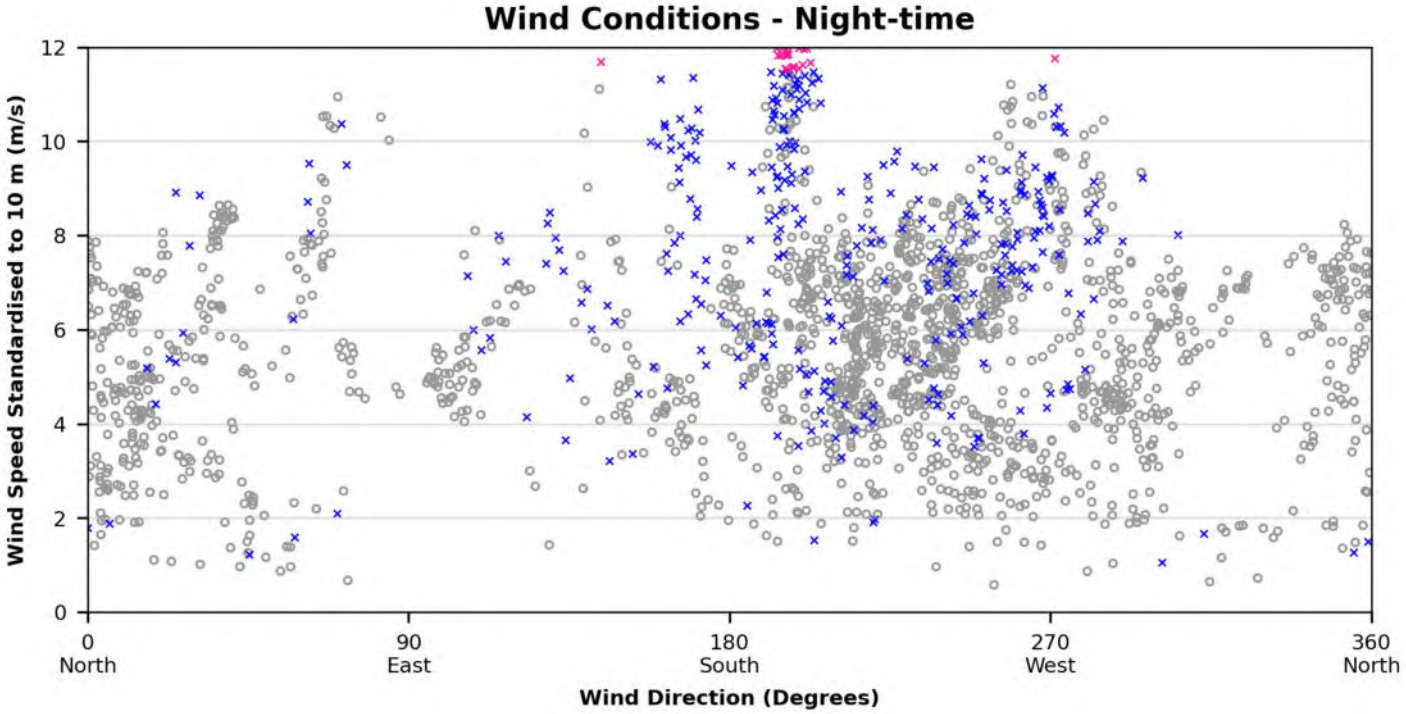
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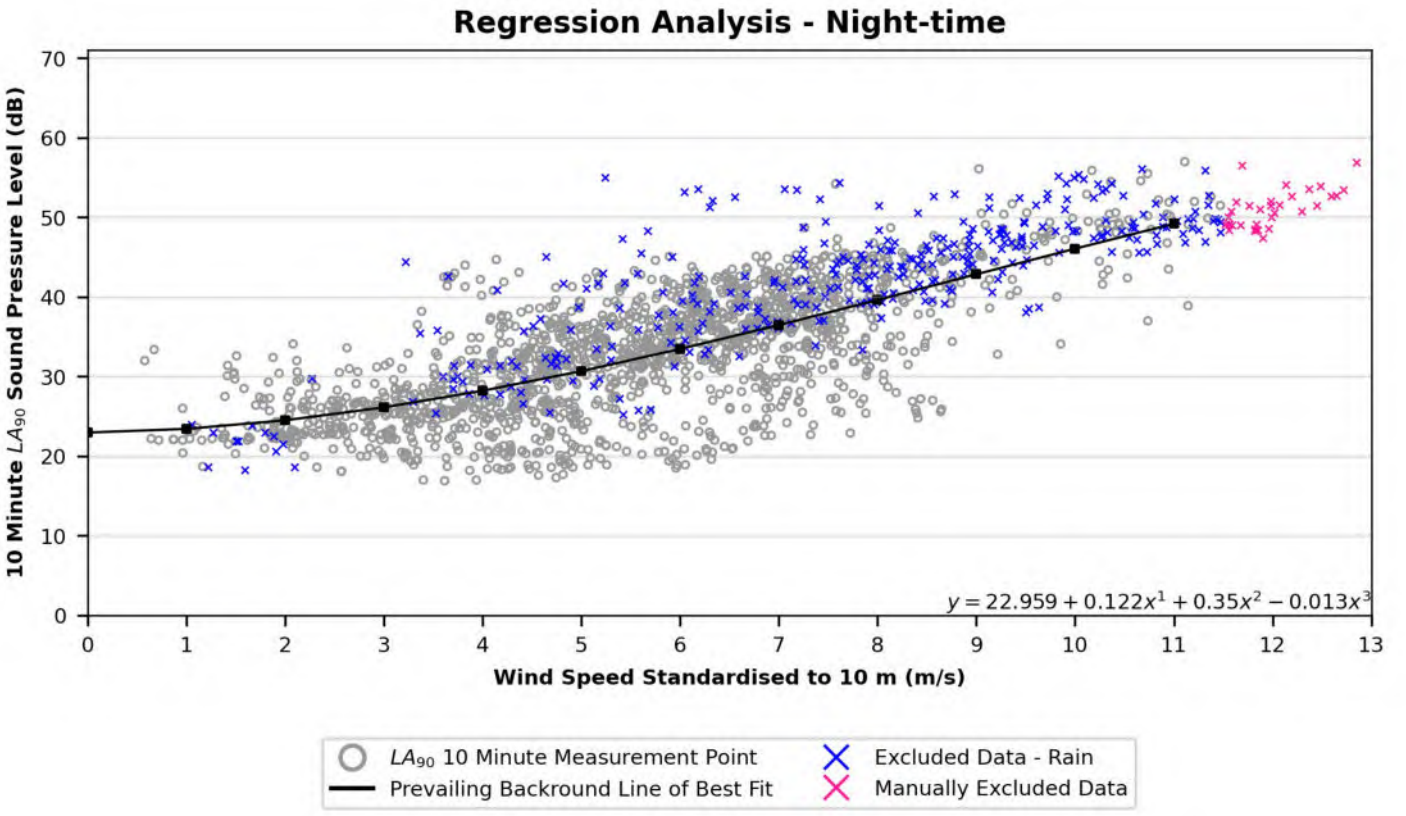
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Prevailing Backround	23.4	24.5	26.0	27.8	29.9	32.2	34.8	37.5	40.5	43.6	46.8	50.2	53.6

IE00061 - Killoshulan Wind Farm

Figure A1.3c

Receptor Name: NML3





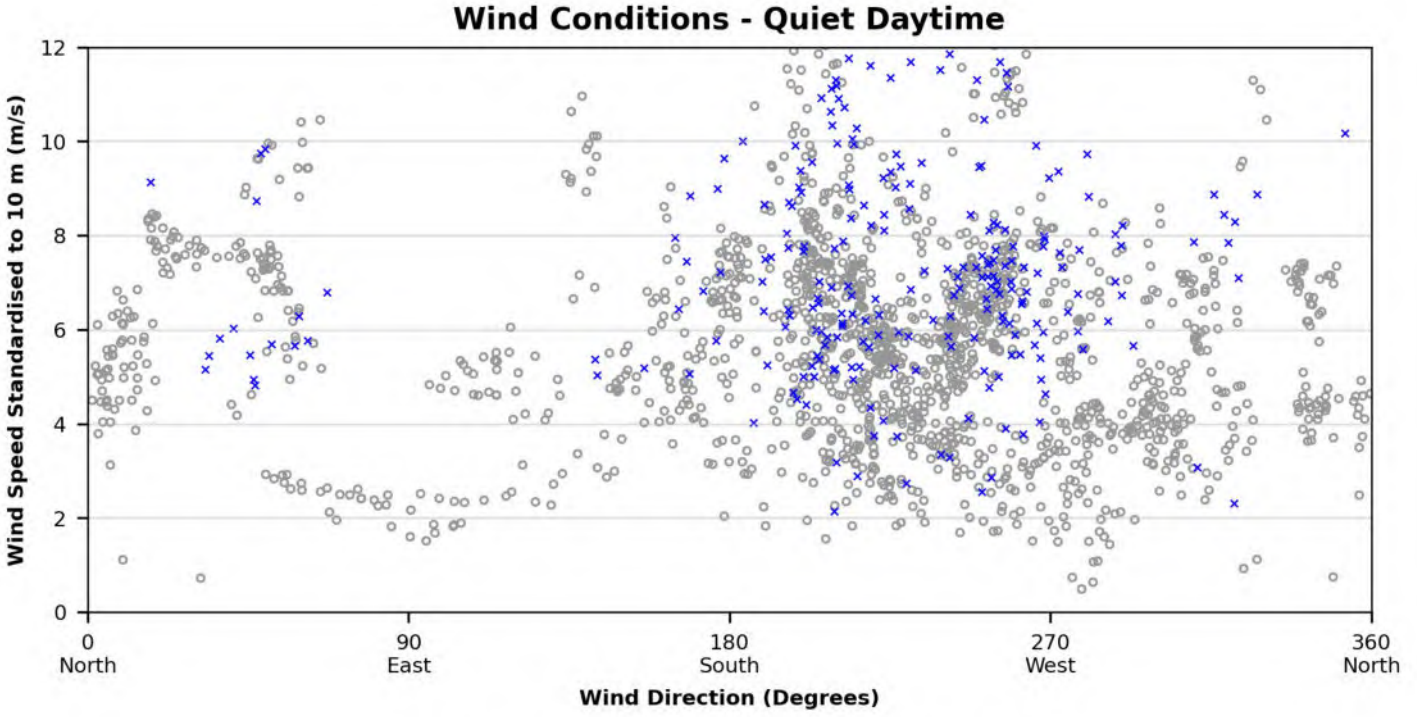
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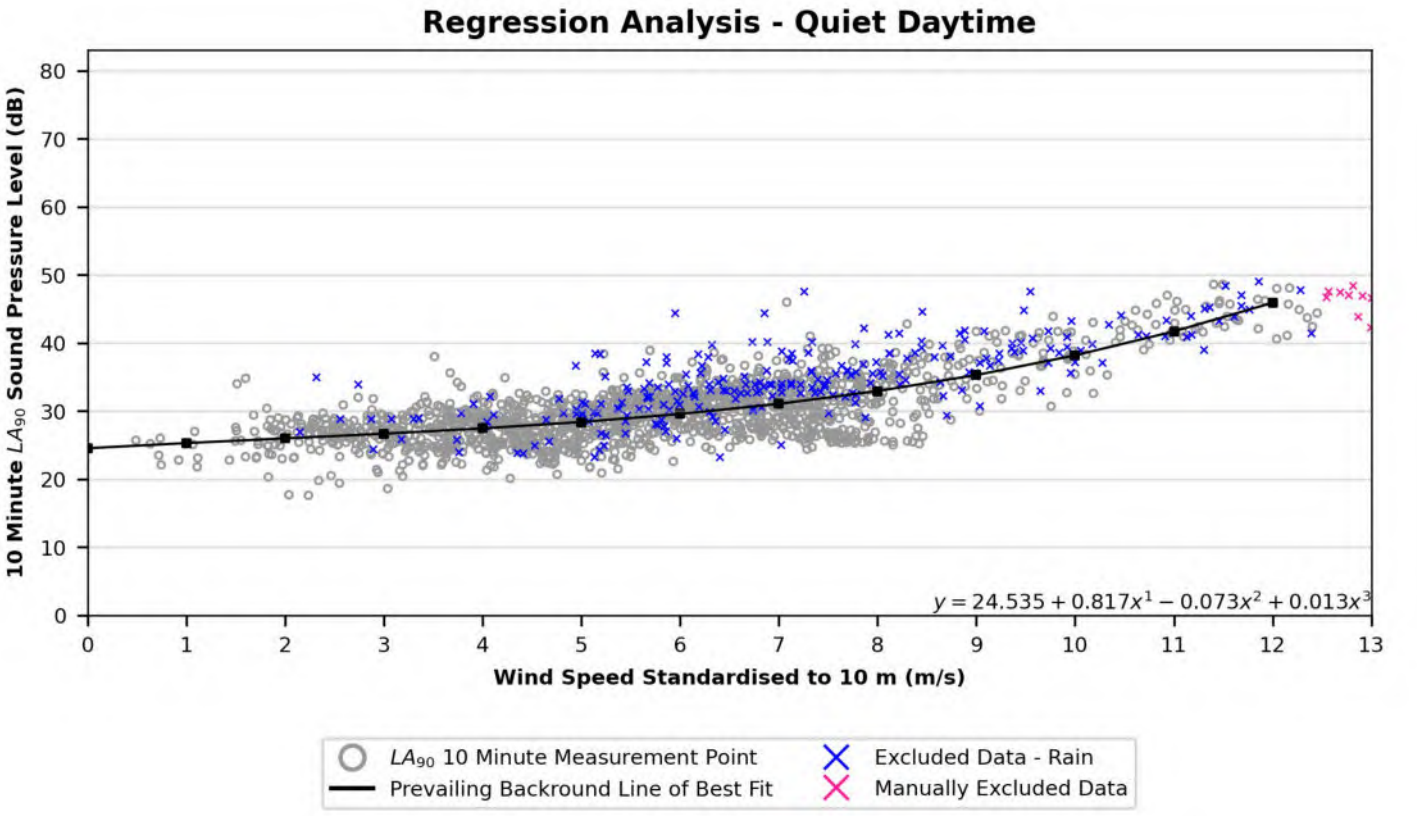
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Prevailing Backround	23.0	23.4	24.5	26.1	28.2	30.7	33.5	36.5	39.6	42.9	46.1	49.2	

IE00061 - Killoshulan Wind Farm

Figure A1.3d

Receptor Name: NML4





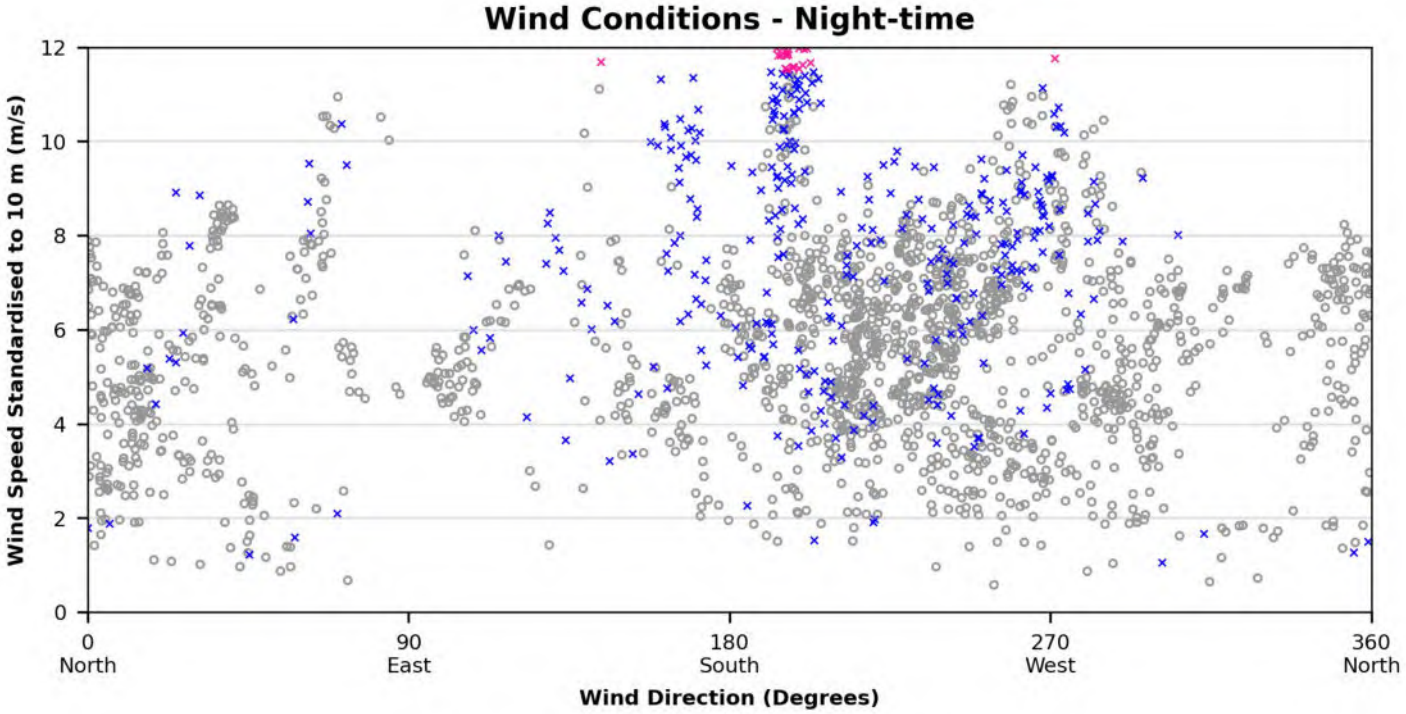
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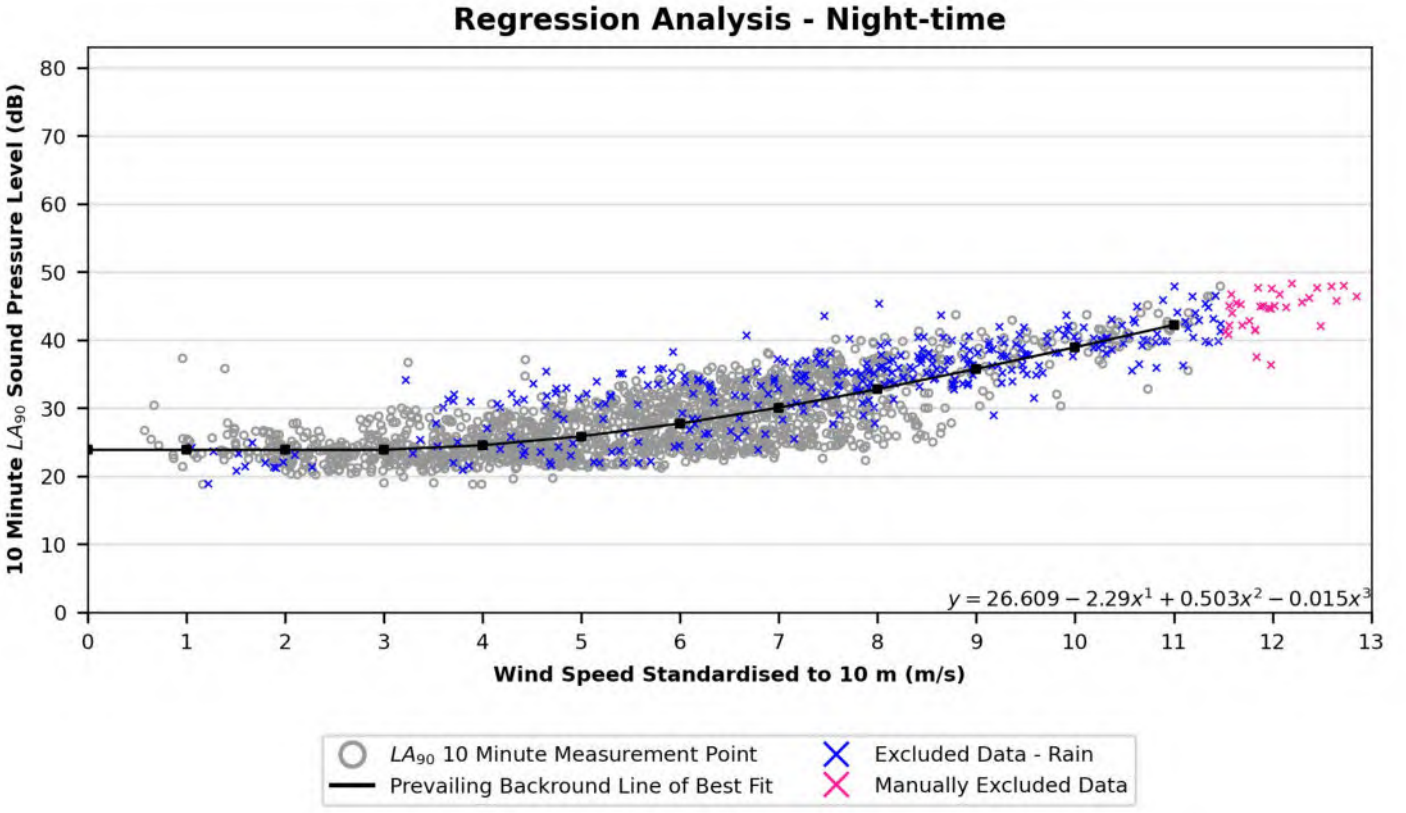
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No. Data Points	1	11	75	140	242	249	259	274	141	48	29	27	17
Prevailing Backround	24.5	25.3	26.0	26.7	27.5	28.4	29.6	31.1	32.9	35.3	38.2	41.7	45.9

IE00061 - Killoshulan Wind Farm

Figure A1.3d

Receptor Name: NML4





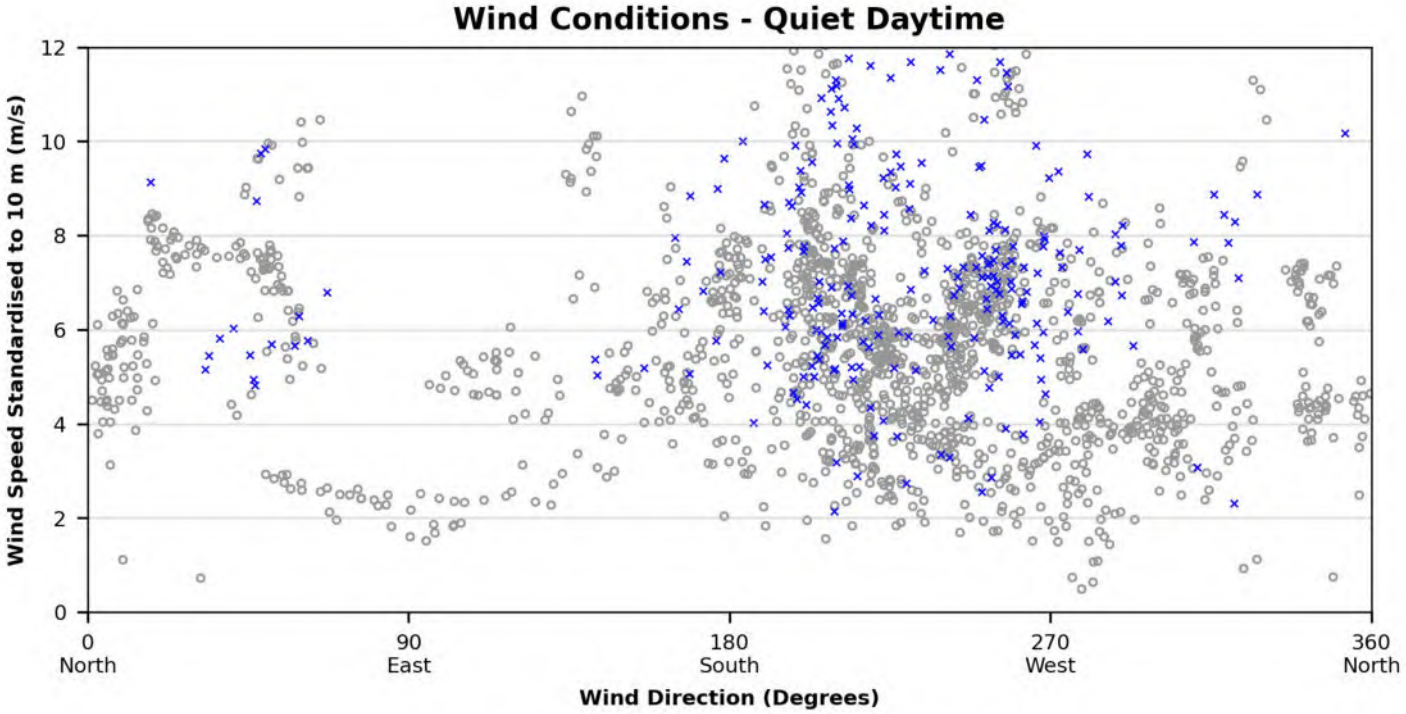
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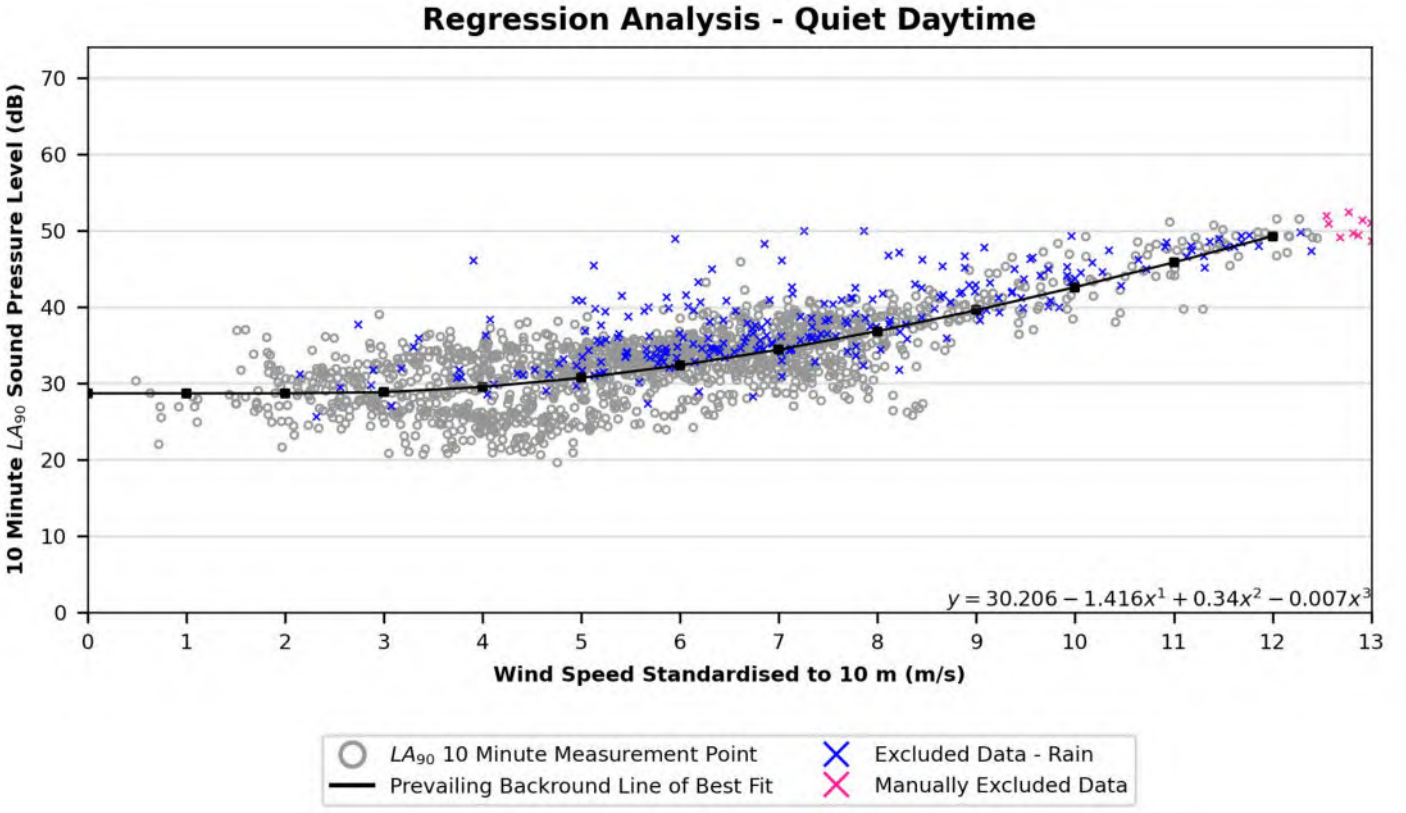
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No. Data Points	0	28	89	145	232	269	290	305	151	52	33	22	0
Prevailing Backround	23.9	23.9	23.9	23.9	24.5	25.9	27.7	30.1	32.8	35.7	38.9	42.2	

IE00061 - Killoshulan Wind Farm

Figure A1.3e

Receptor Name: NML5





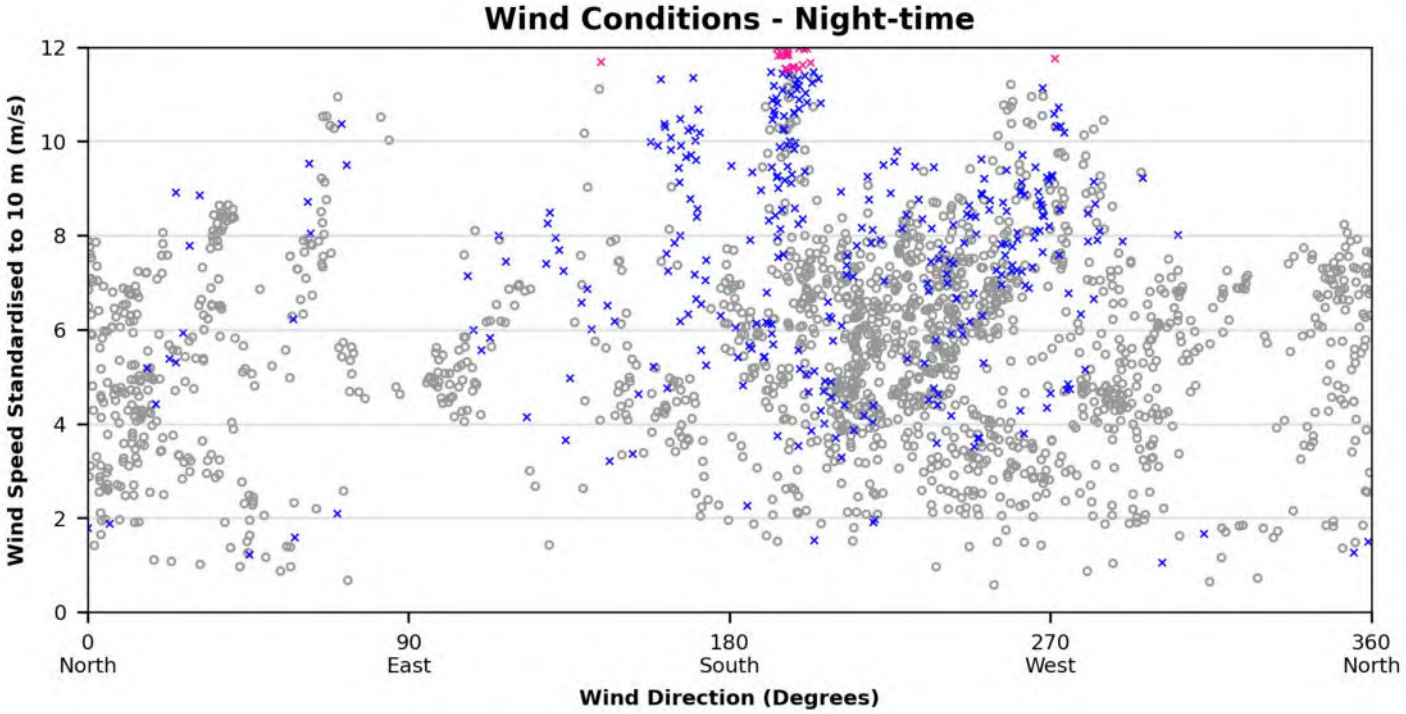
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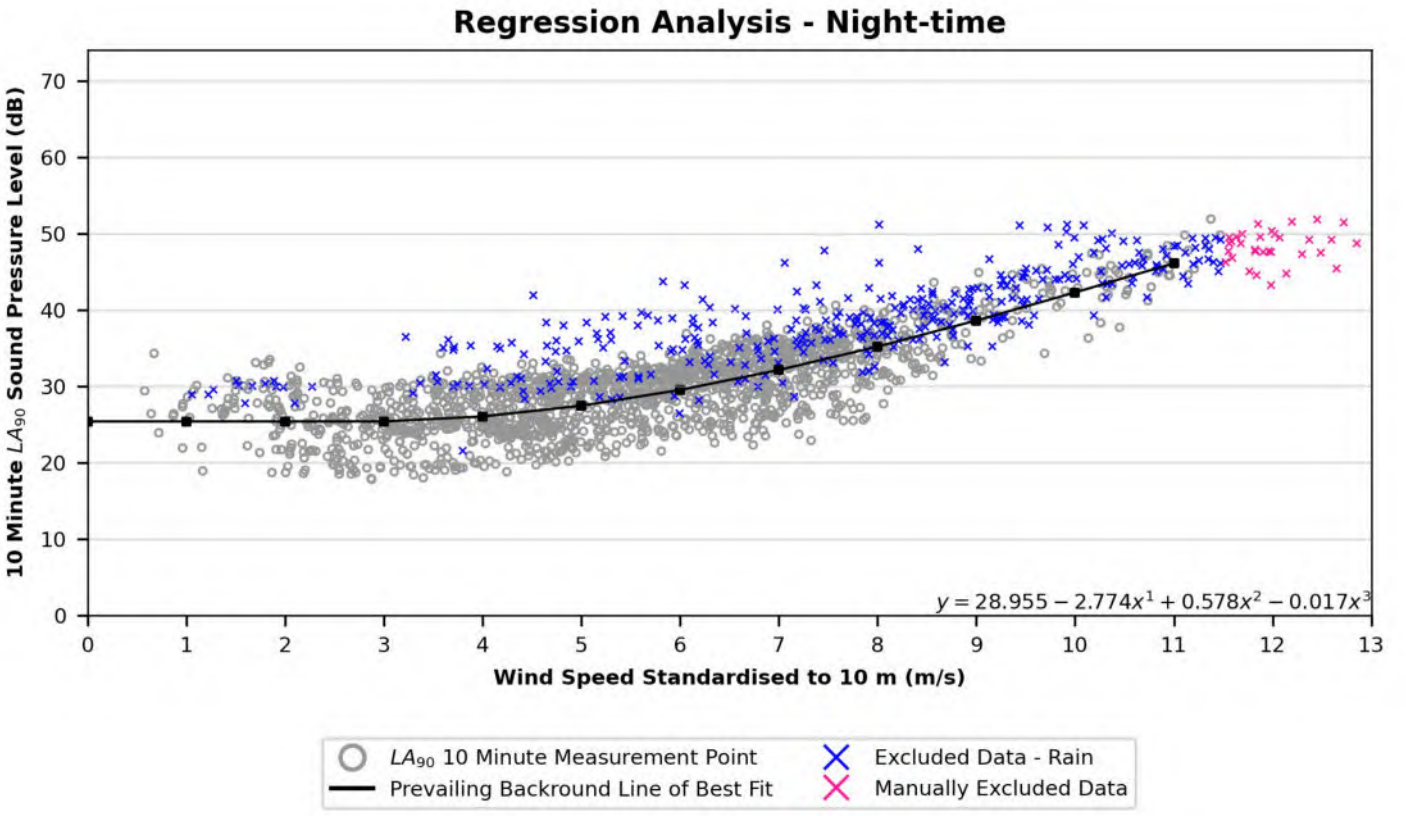
Windspeed (m/s)	0	1	2	3	4	5	6	7	8	9	10	11	12
No. Data Points	1	11	75	140	242	249	259	274	141	48	29	27	17
Prevailing Backround	28.7	28.7	28.7	28.8	29.5	30.7	32.3	34.4	36.8	39.6	42.6	45.8	49.3

IE00061 - Killoshulan Wind Farm

Figure A1.3e

Receptor Name: NML5





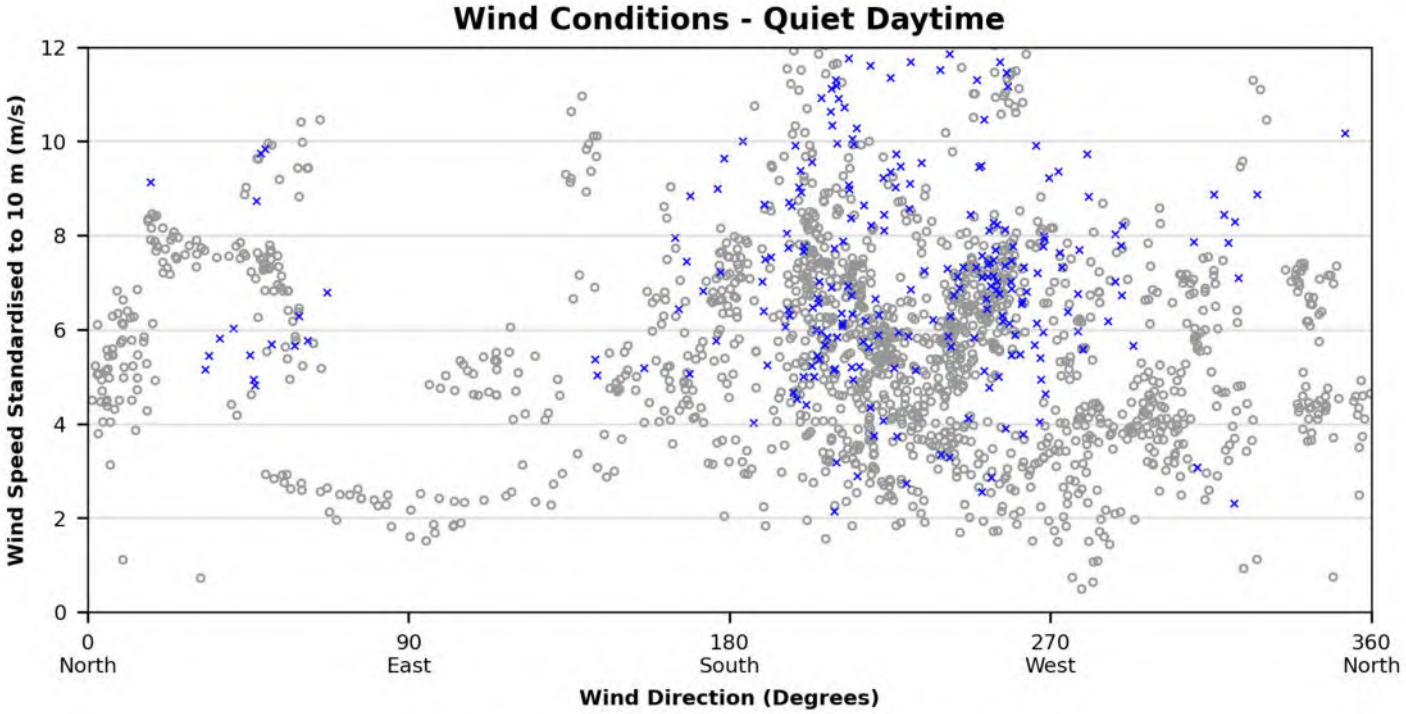
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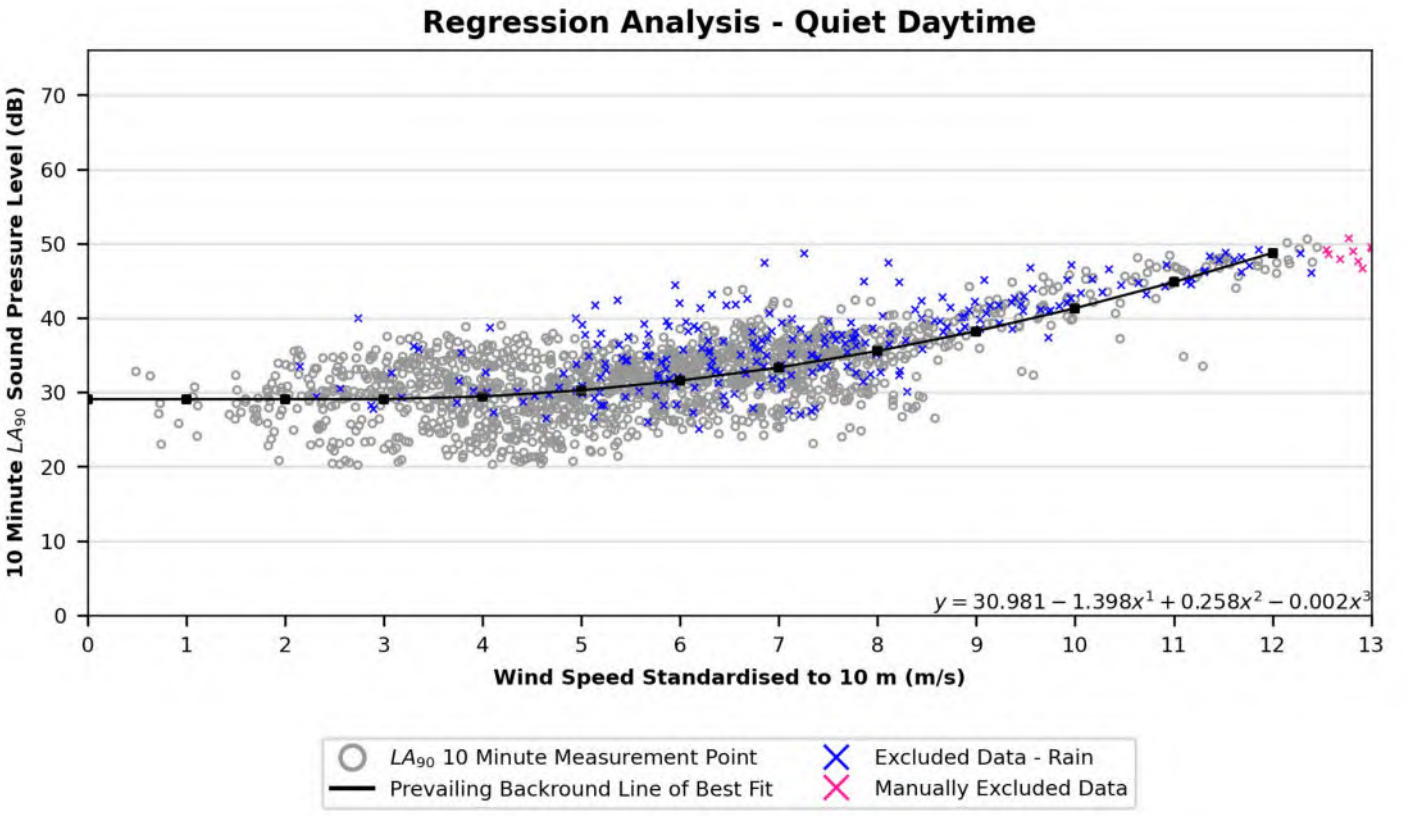
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No. Data Points	0	28	89	145	232	269	290	305	151	52	33	22	0
Prevailing Backround	25.4	25.4	25.4	25.4	26.0	27.4	29.5	32.1	35.2	38.6	42.3	46.1	

IE00061 - Killoshulan Wind Farm

Figure A1.3f

Receptor Name: NML6





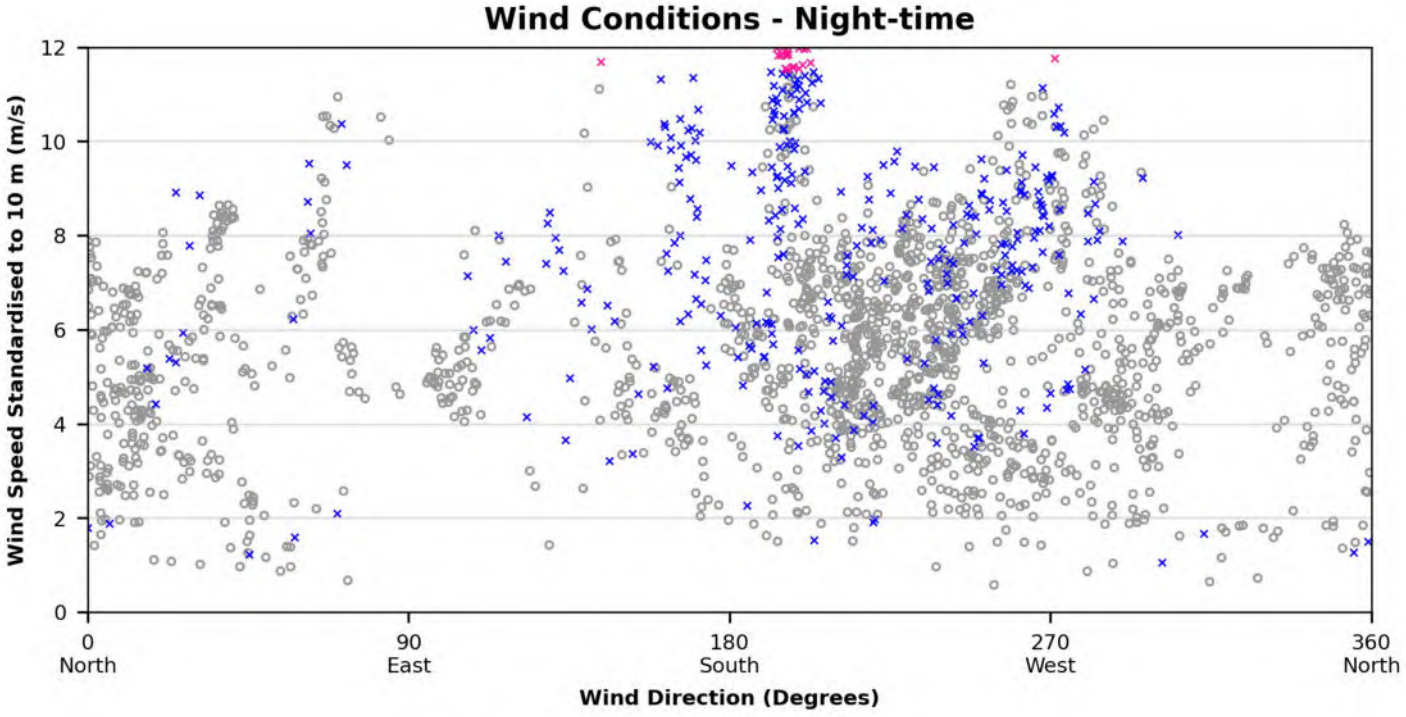
Summary - Quiet Daytime

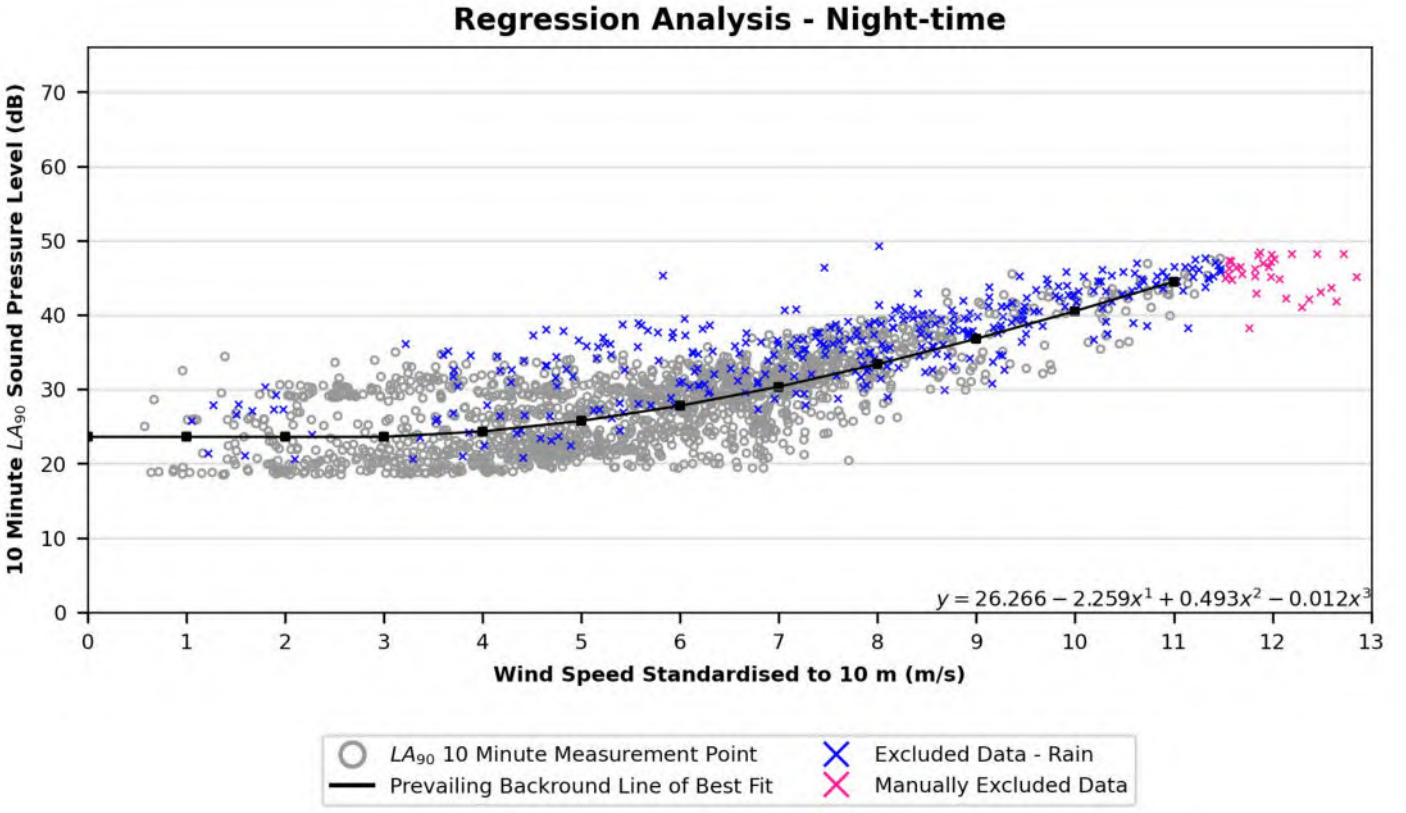
Windspeed (m/s)	0	1	2	3	4	5	6	7	8	9	10	11	12
No. Data Points	1	11	75	140	242	249	259	274	141	48	29	27	17
Prevailing Backround	29.1	29.1	29.1	29.1	29.4	30.3	31.6	33.3	35.5	38.2	41.3	44.8	48.8

IE00061 - Killoshulan Wind Farm

Figure A1.3f

Receptor Name: NML6

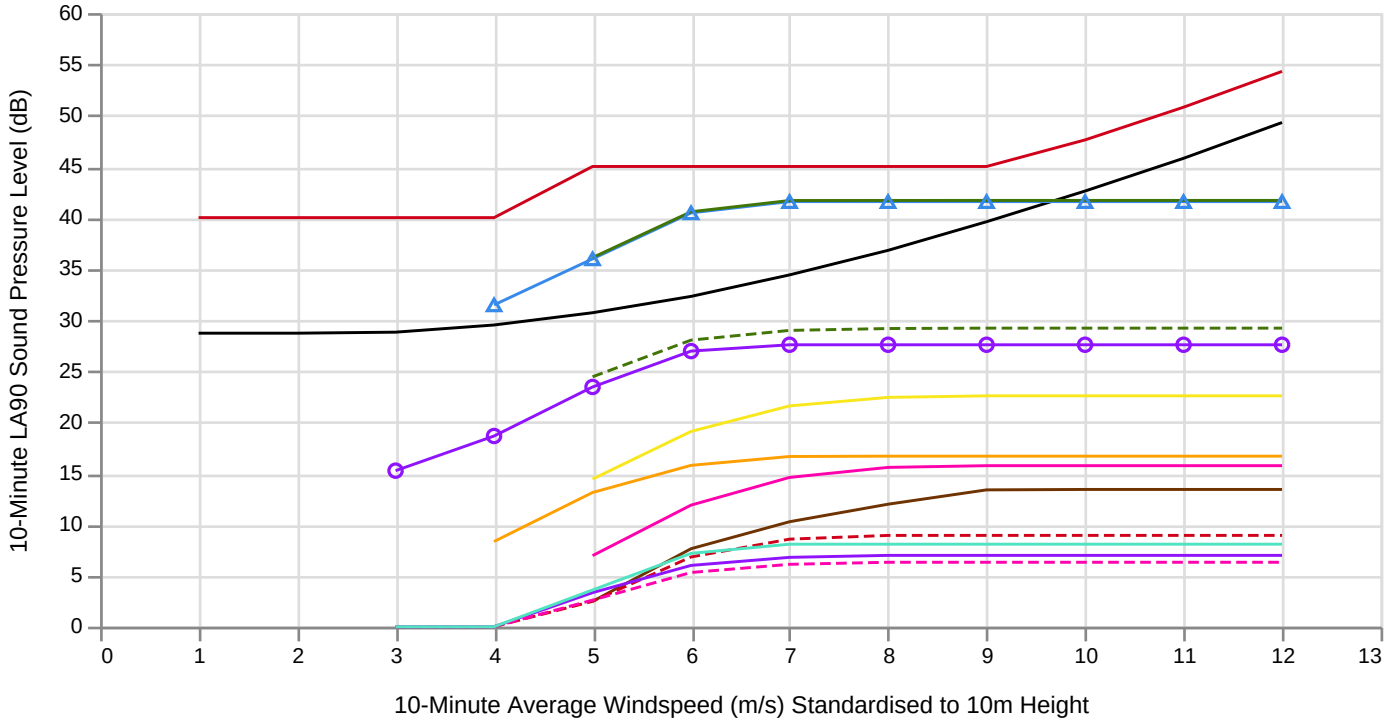




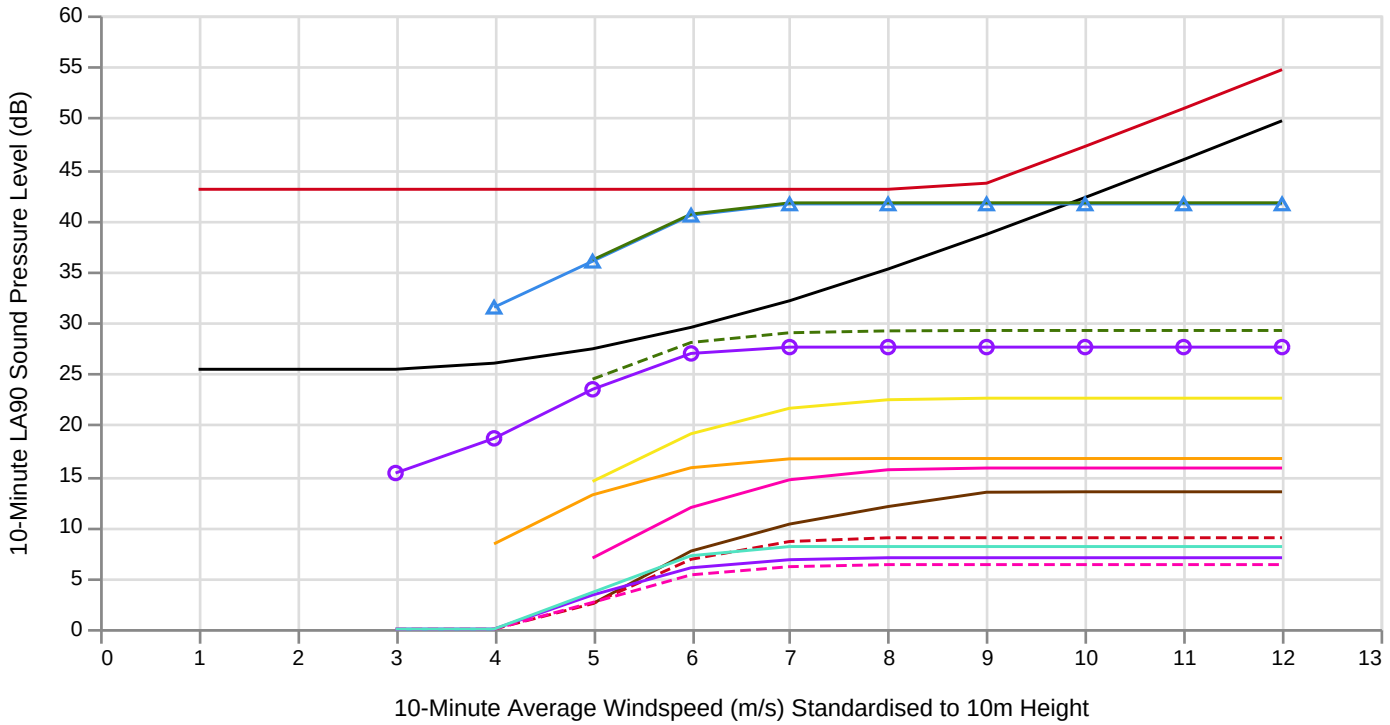
Summary - Night-time

Windspeed (m/s)	0	1	2	3	4	5	6	7	8	9	10	11	12
No. Data Points	0	28	89	145	232	269	290	305	151	52	33	22	0
Prevailing Backround	23.6	23.6	23.6	23.6	24.3	25.7	27.8	30.3	33.4	36.8	40.5	44.5	

Daytime - NAL01



Night time - NAL01

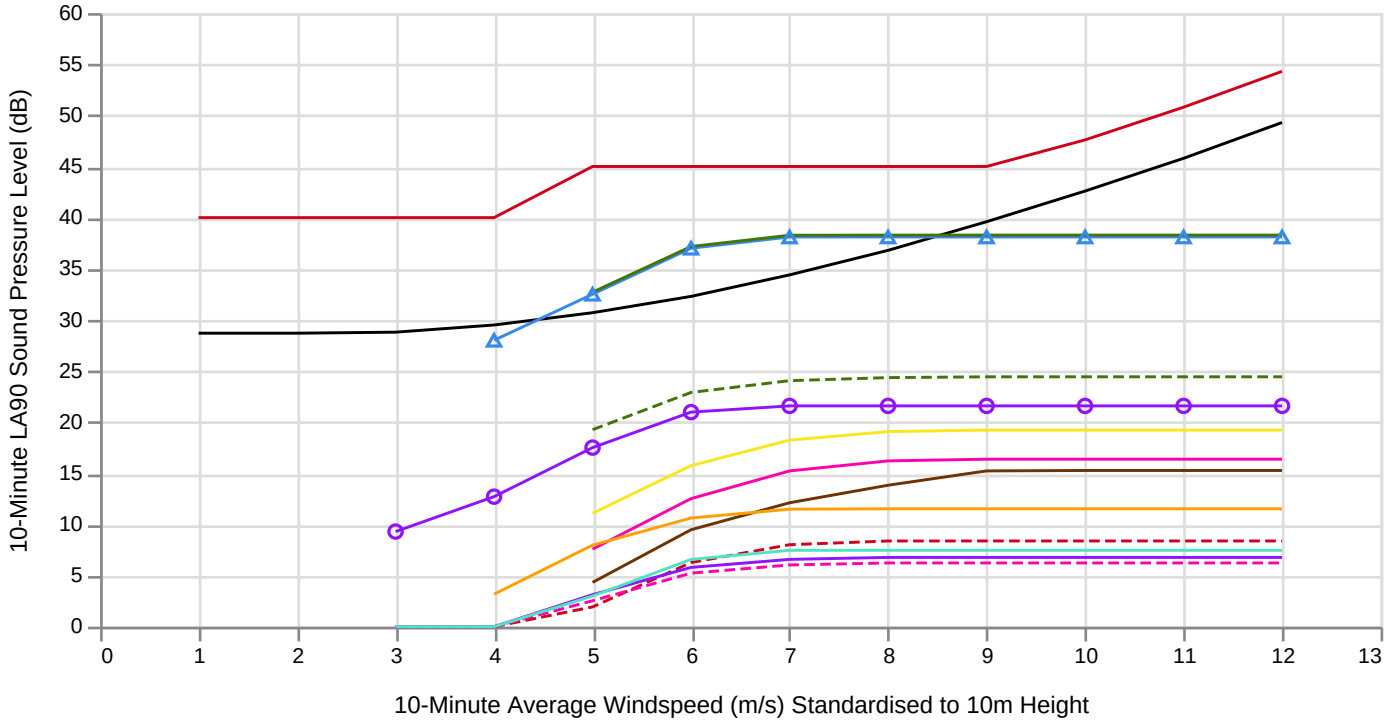


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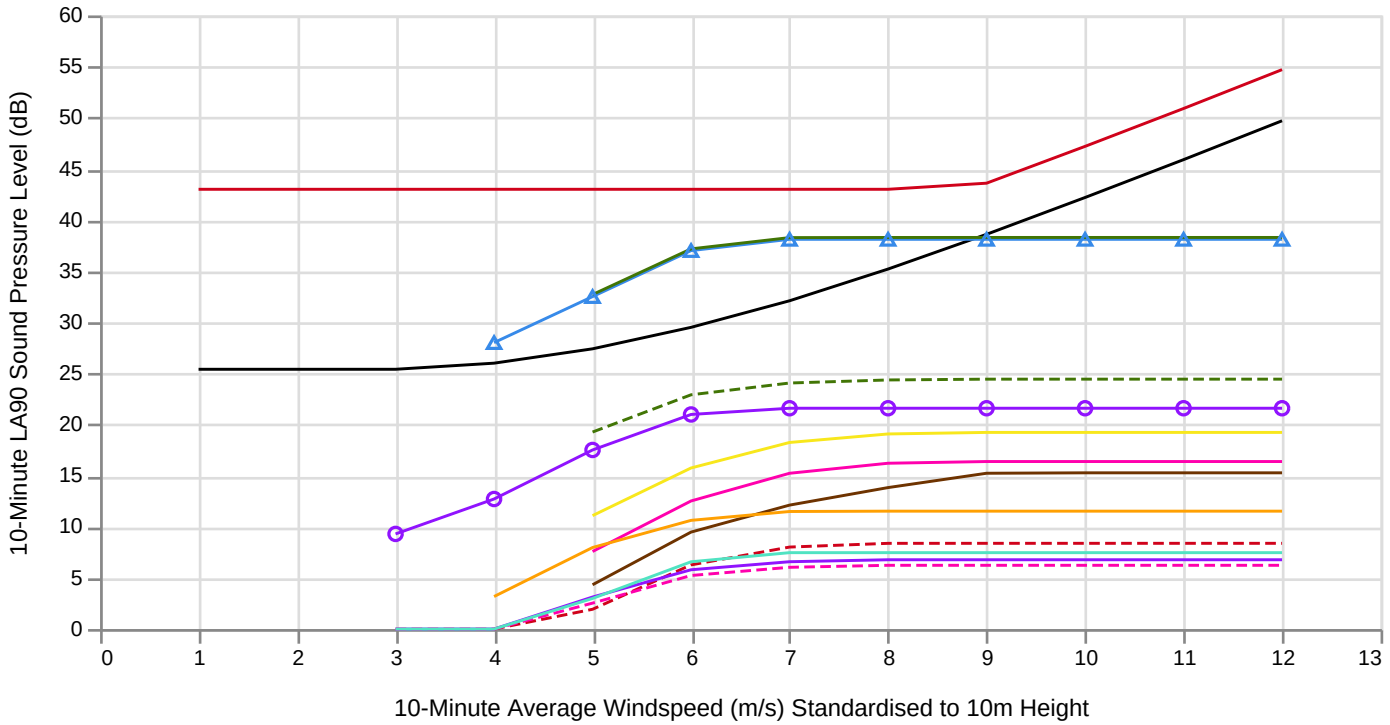
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL02



Night time - NAL02

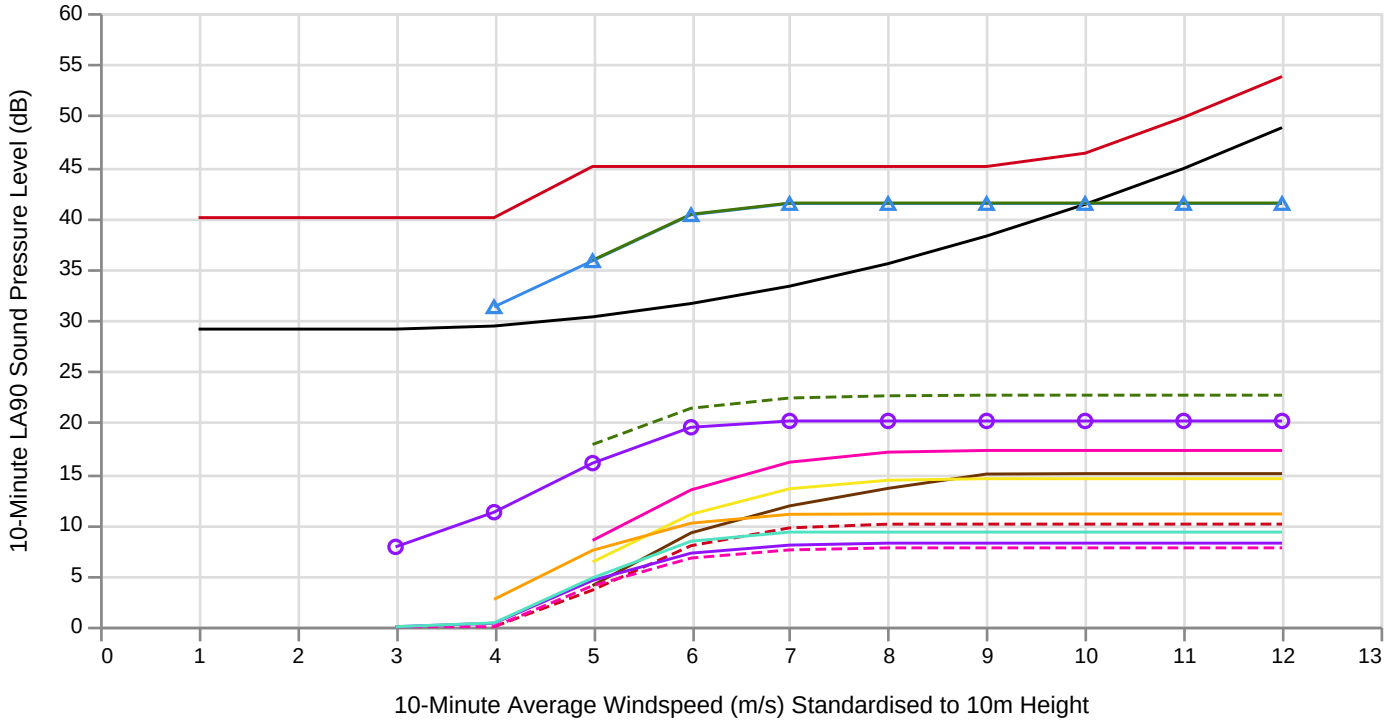


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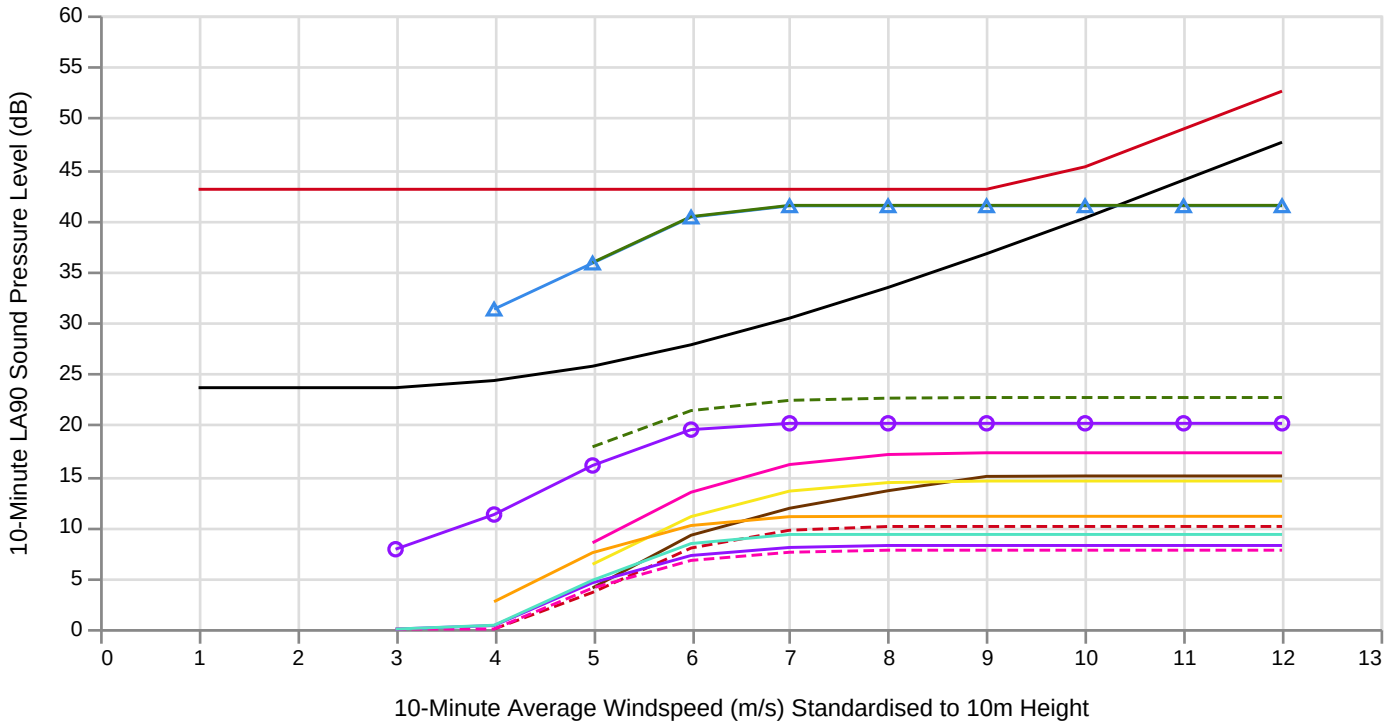
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL03



Night time - NAL03

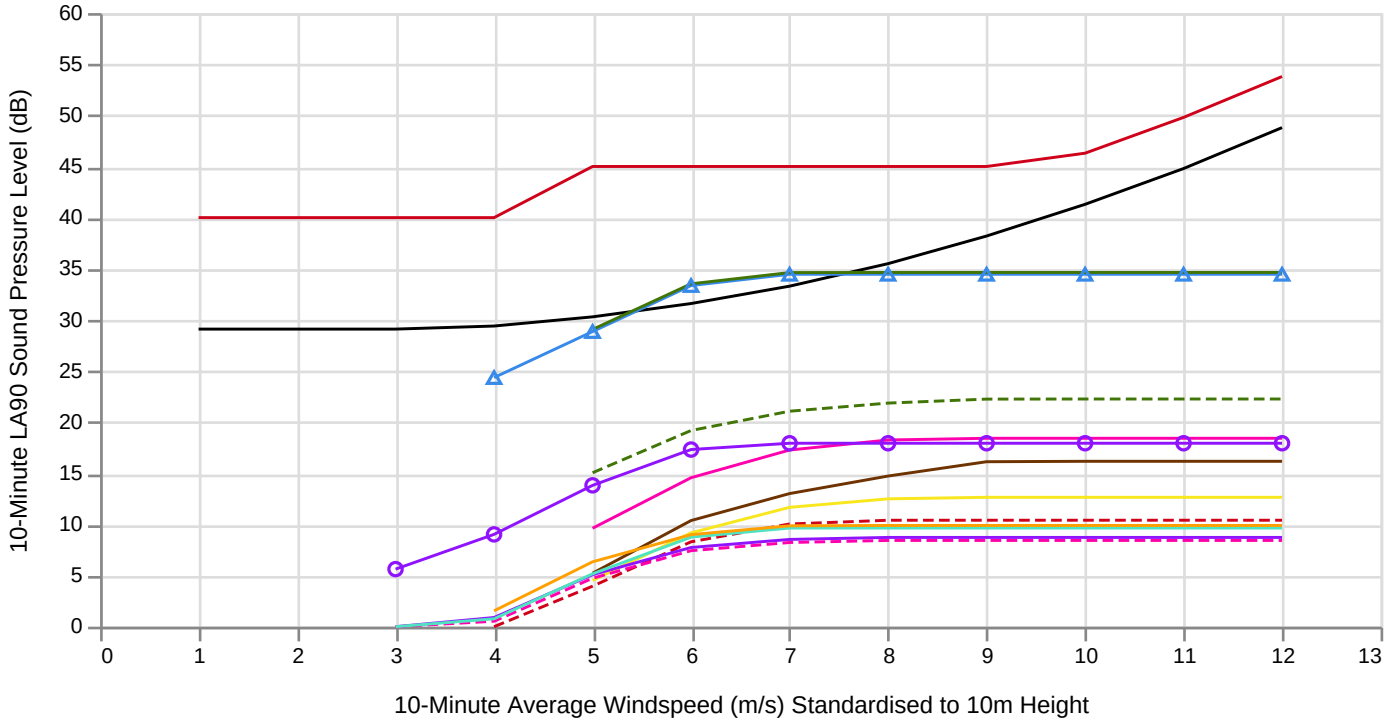


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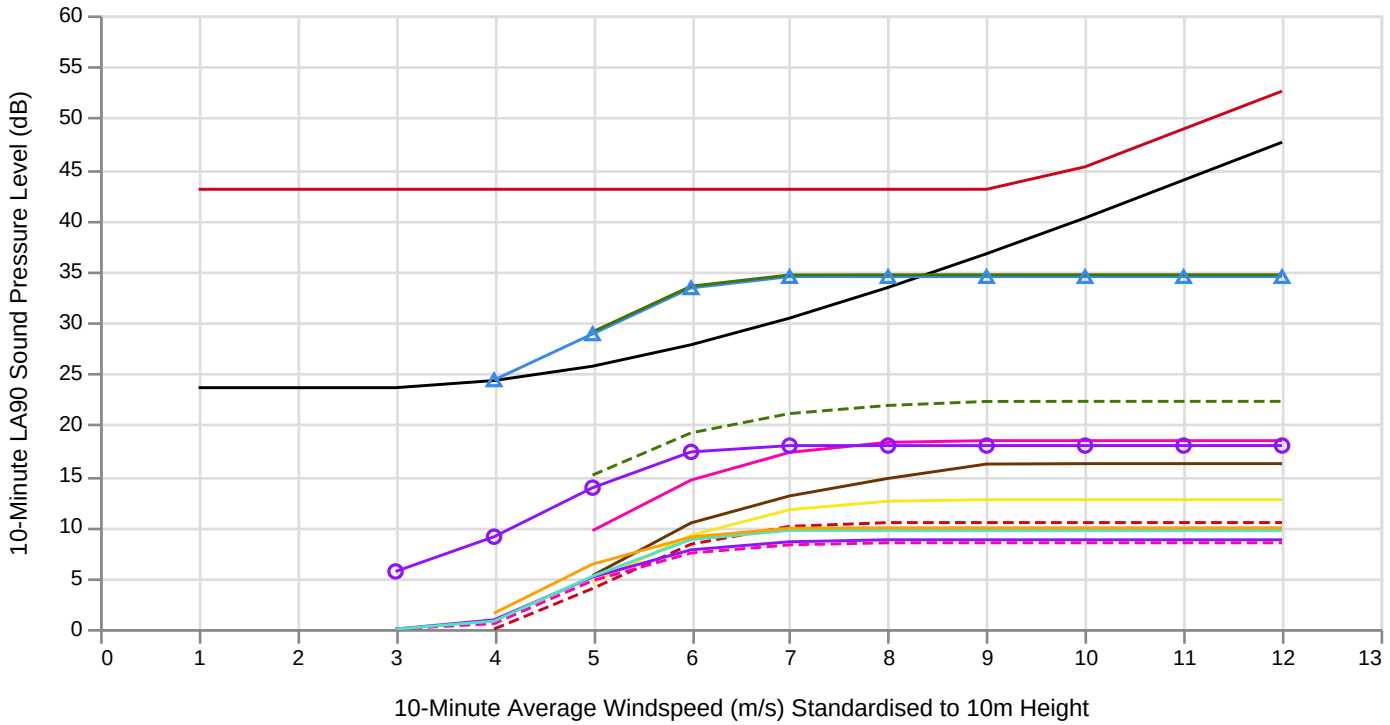
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL04



Night time - NAL04

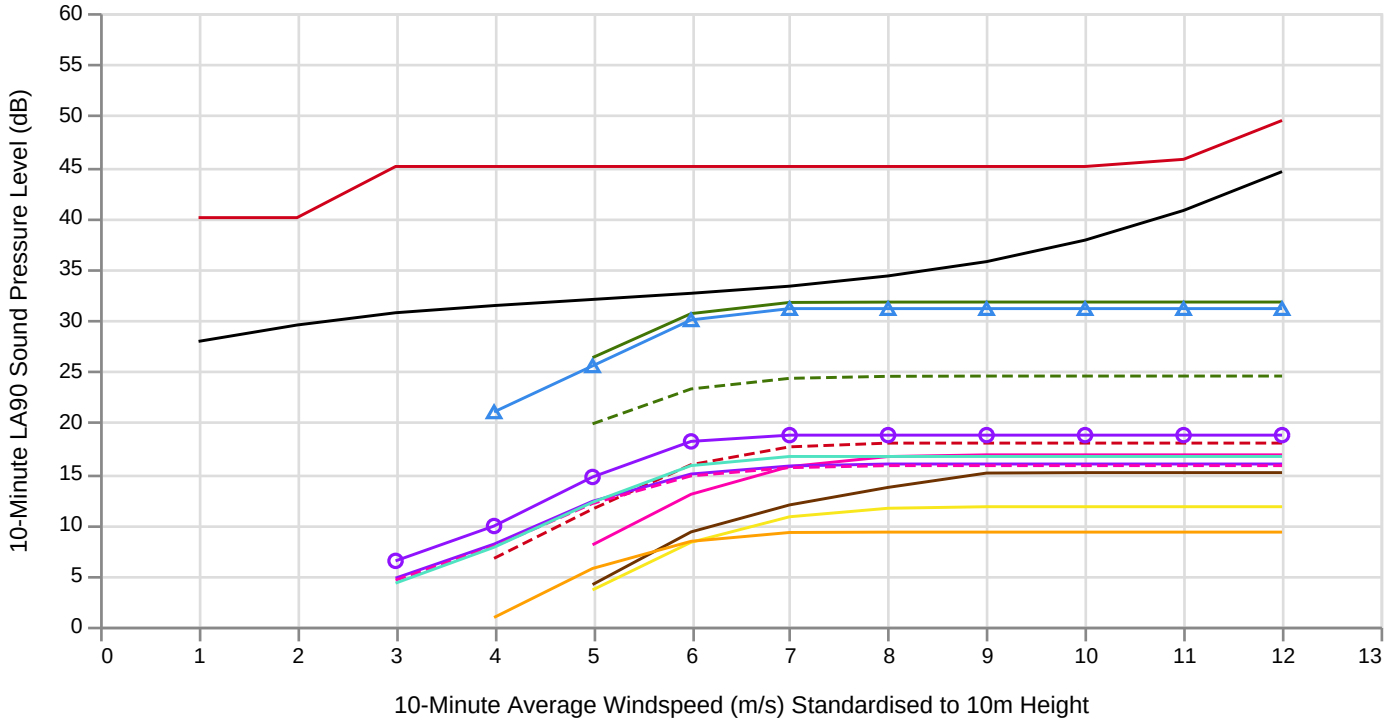


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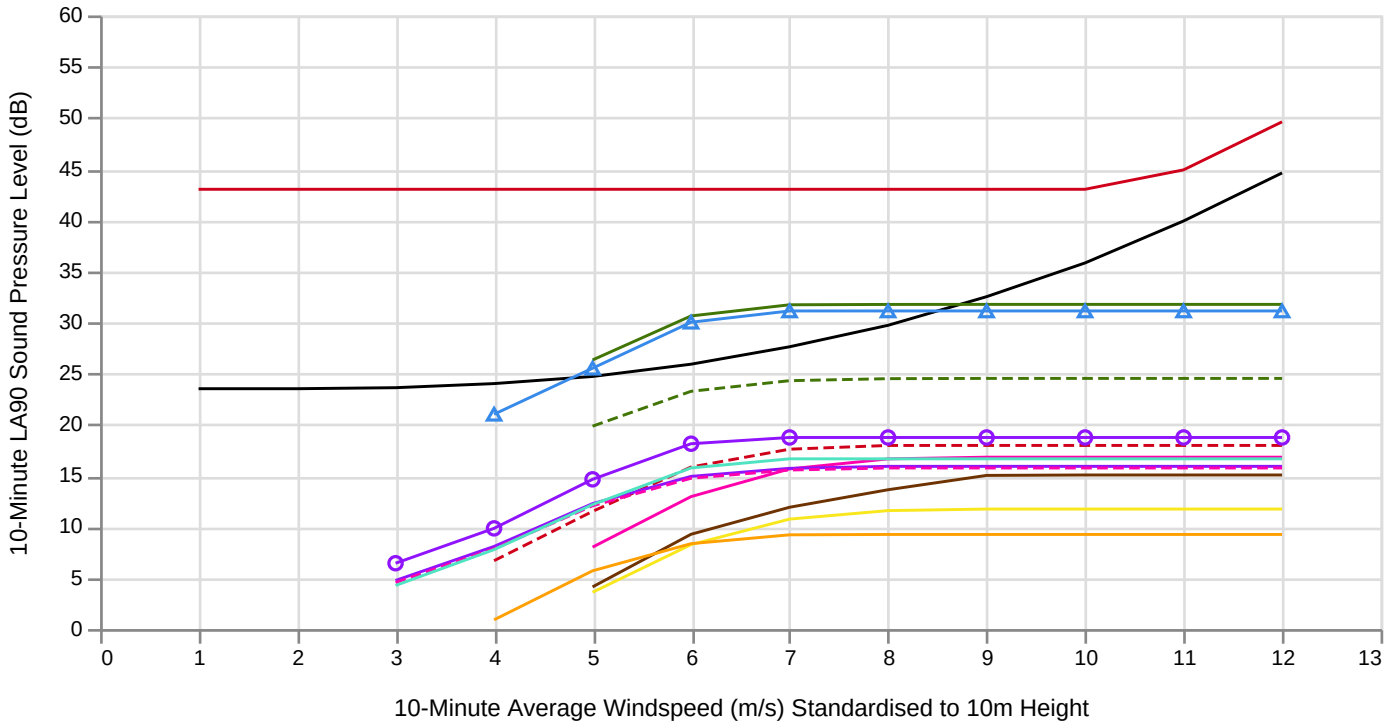
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL05



Night time - NAL05

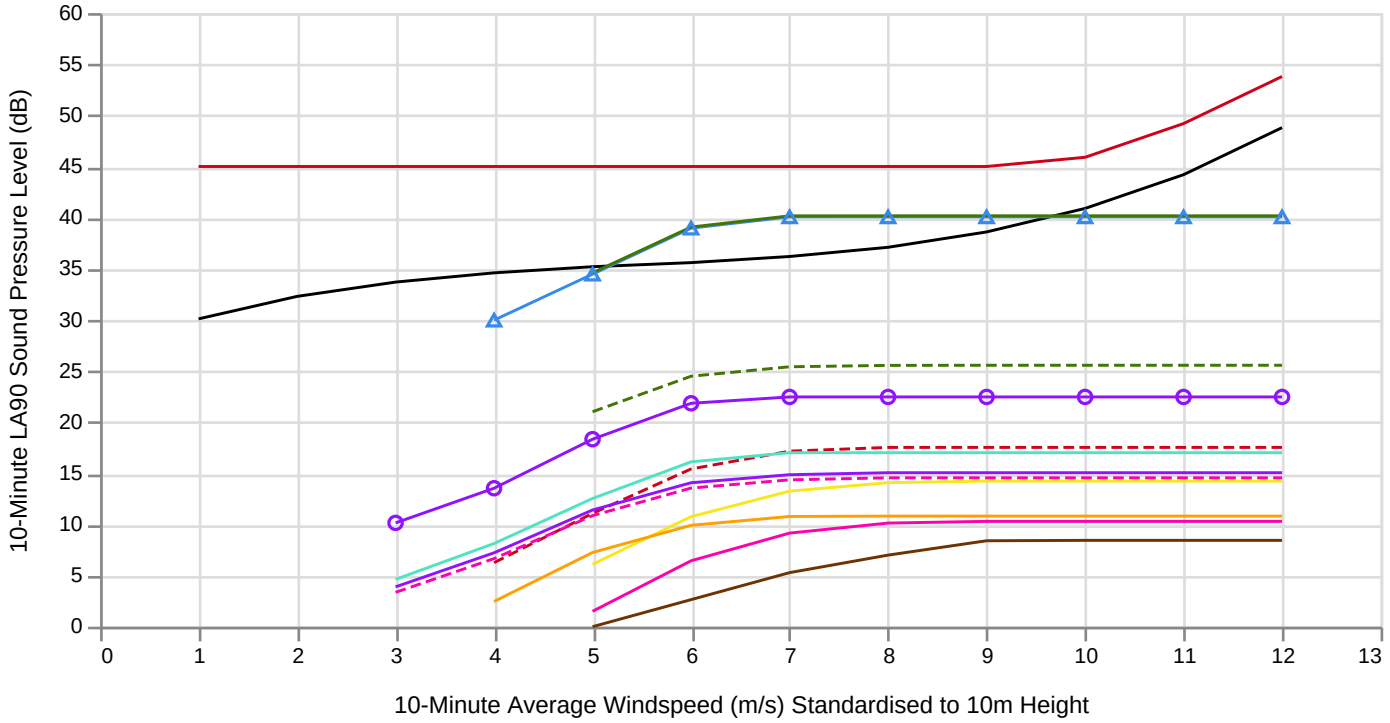


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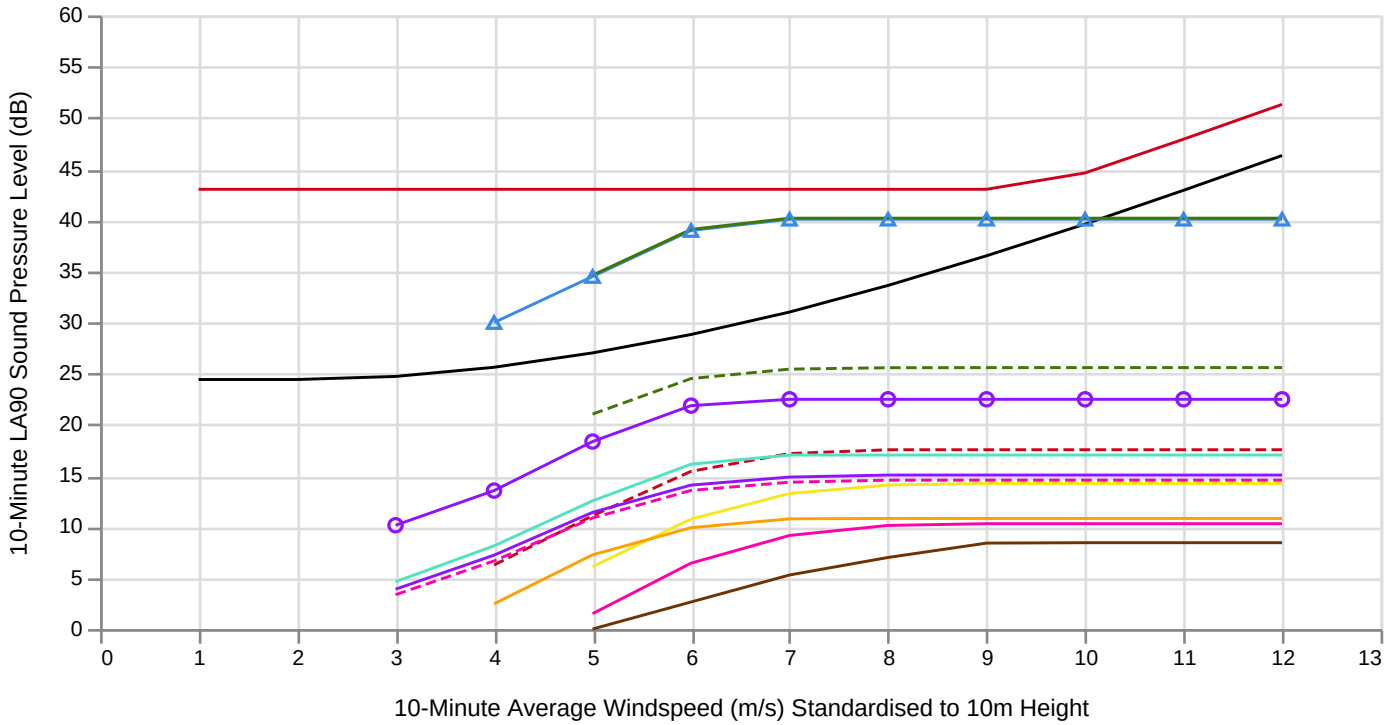
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL06



Night time - NAL06

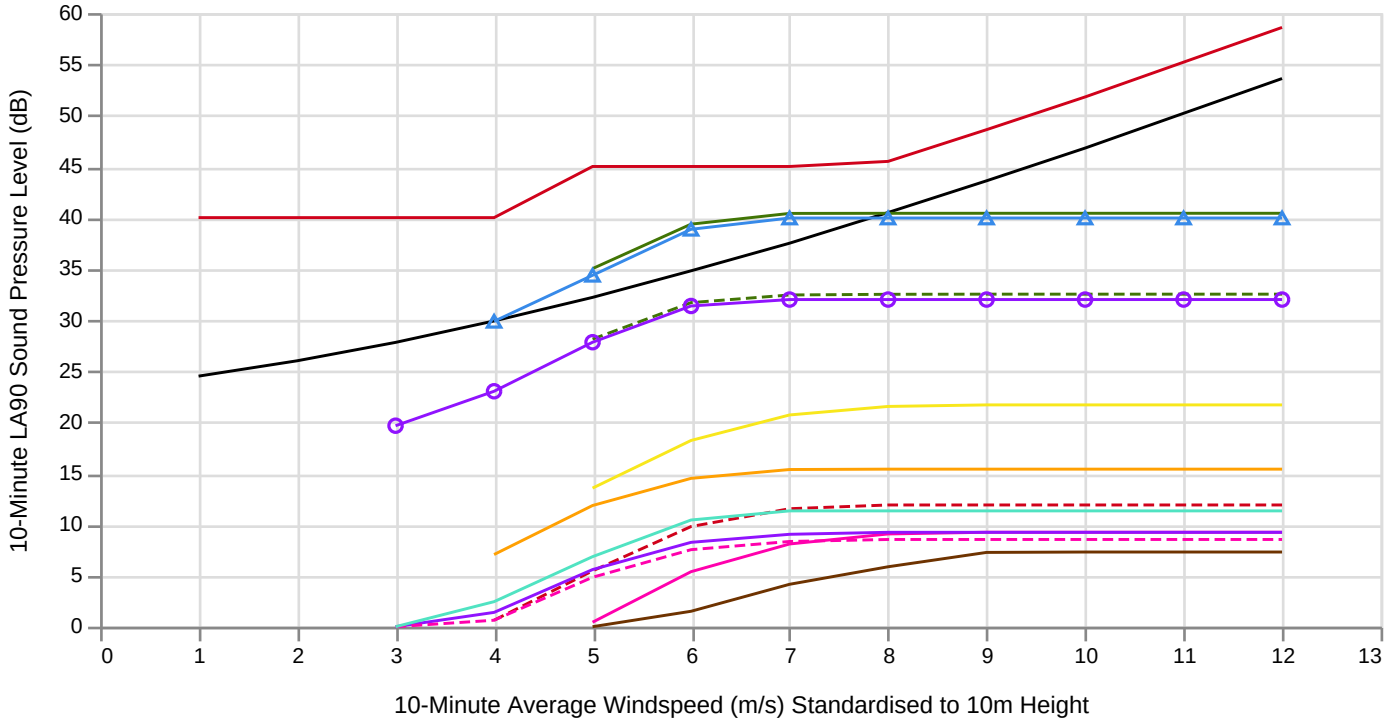


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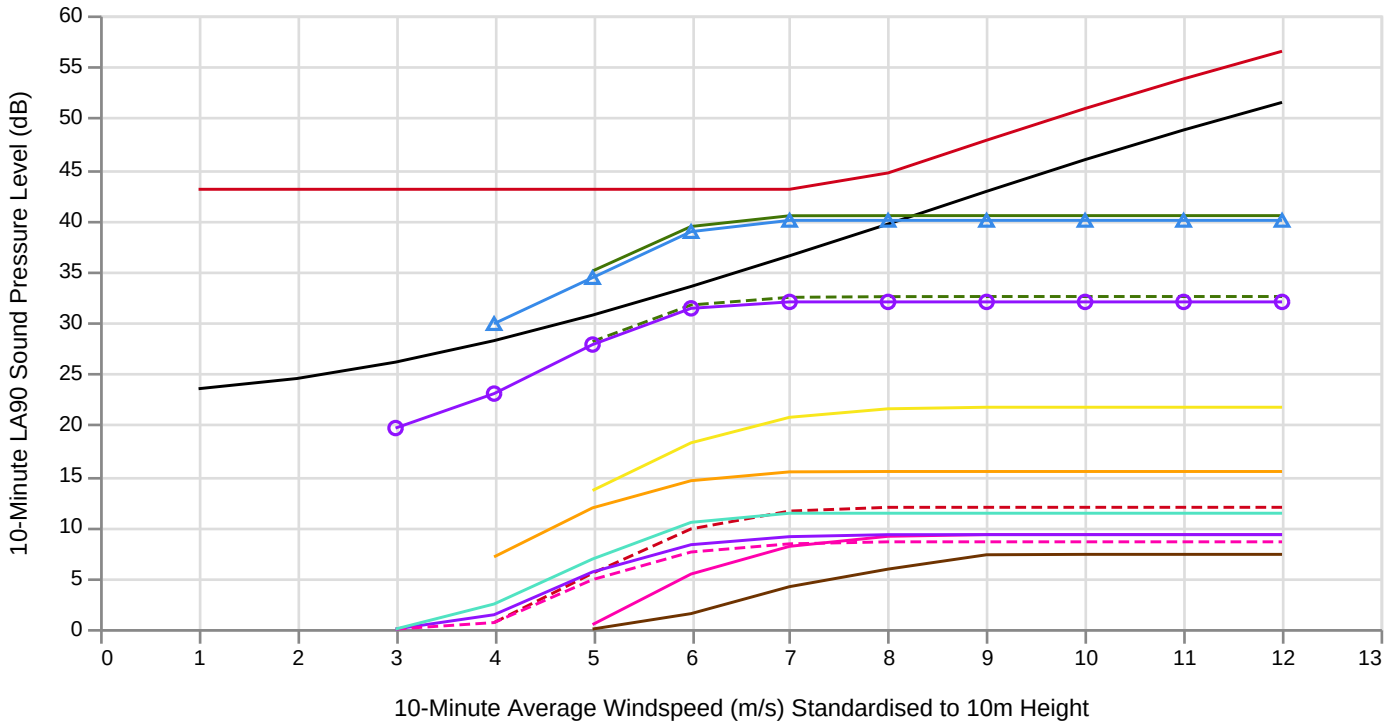
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL07



Night time - NAL07

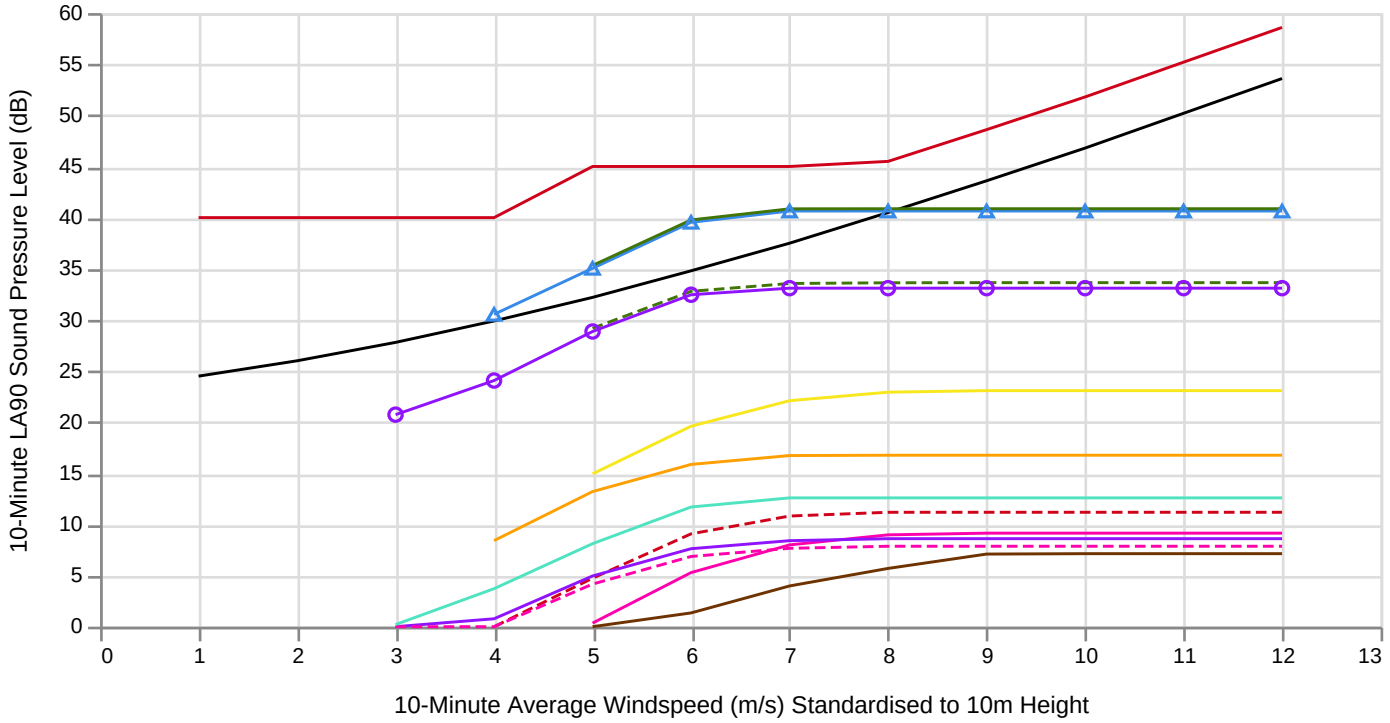


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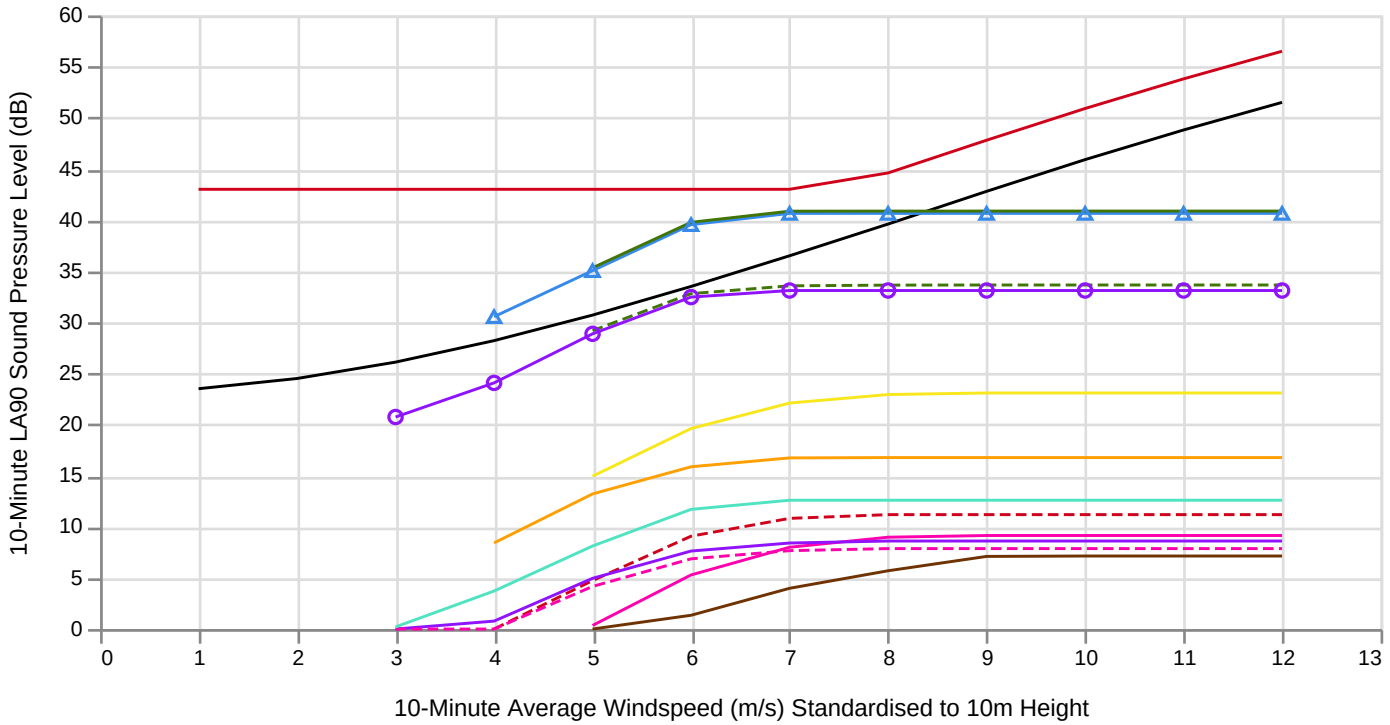
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL08



Night time - NAL08

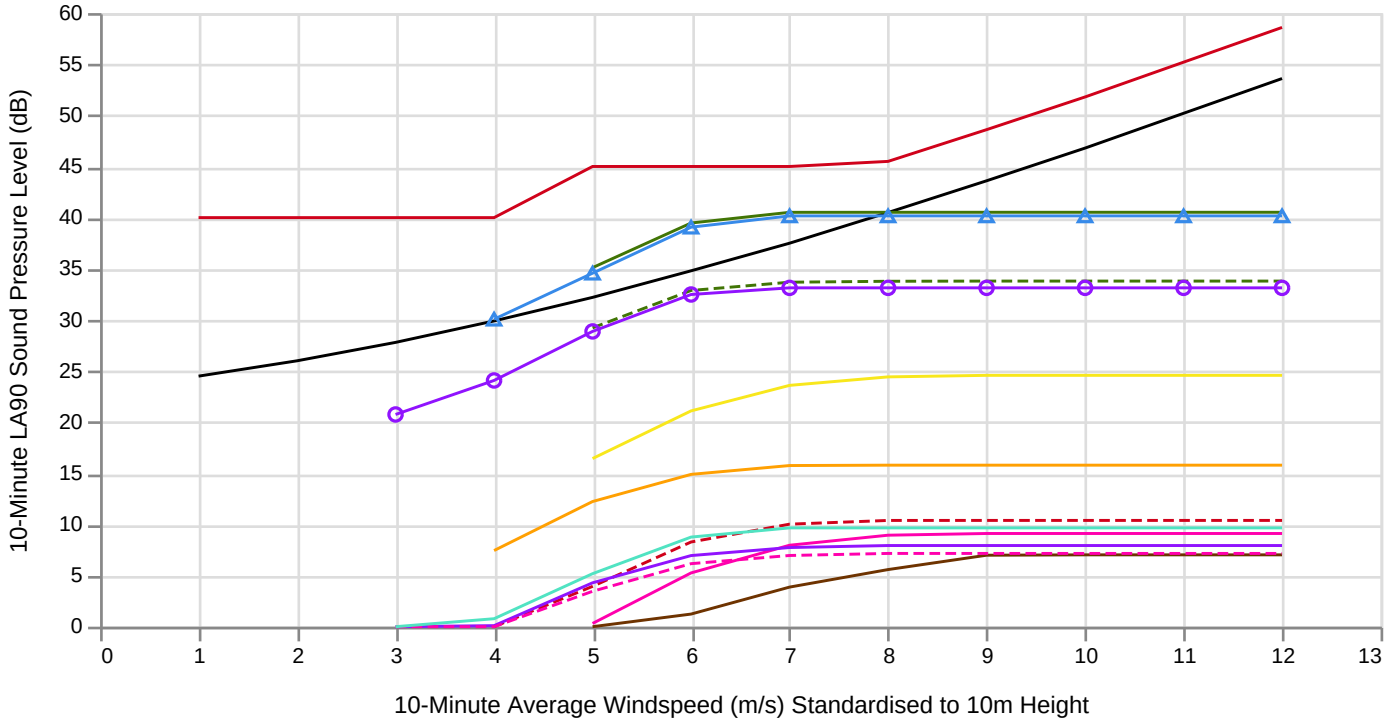


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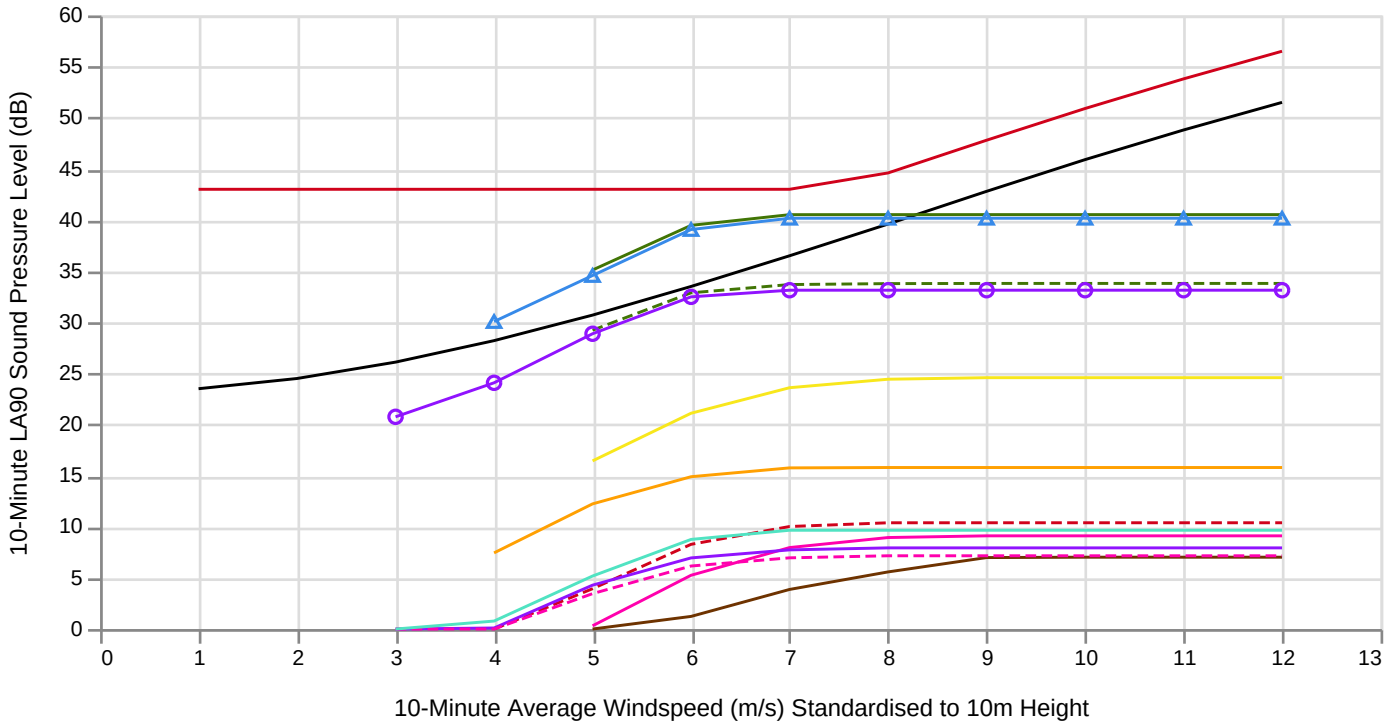
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL09



Night time - NAL09

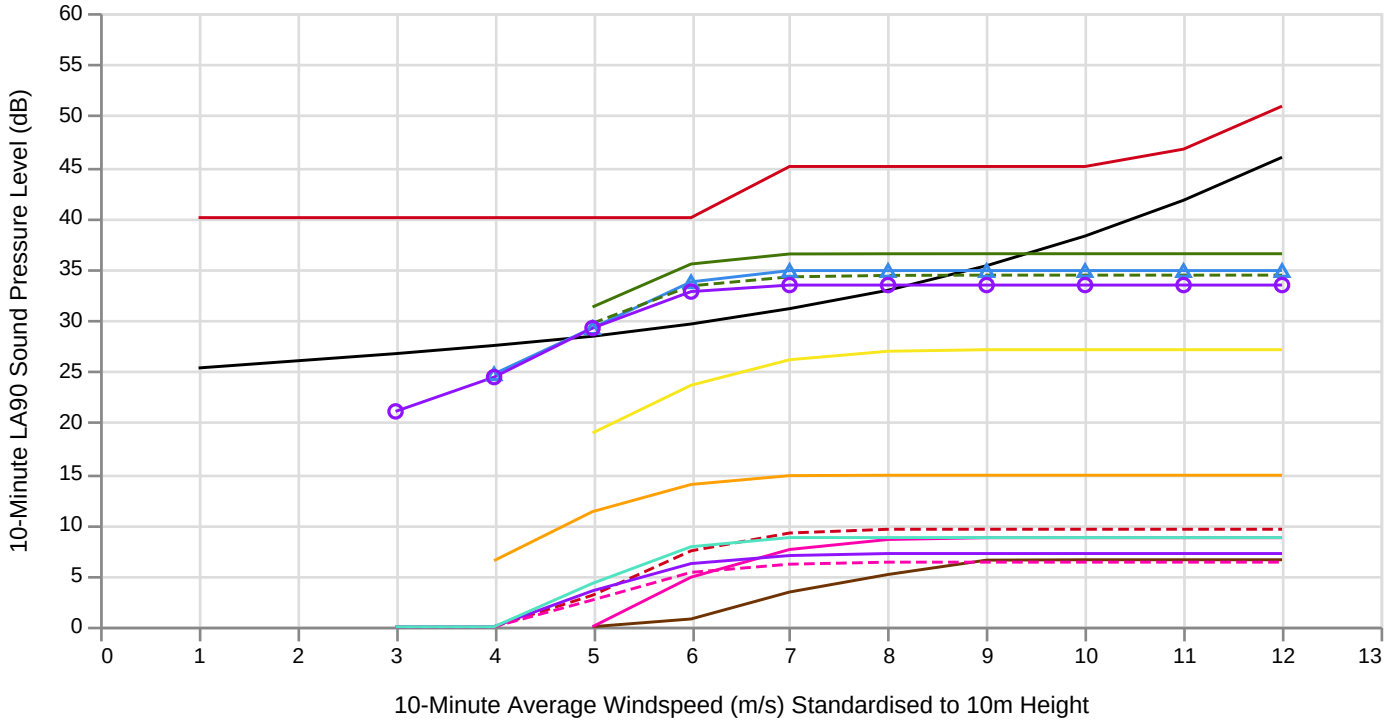


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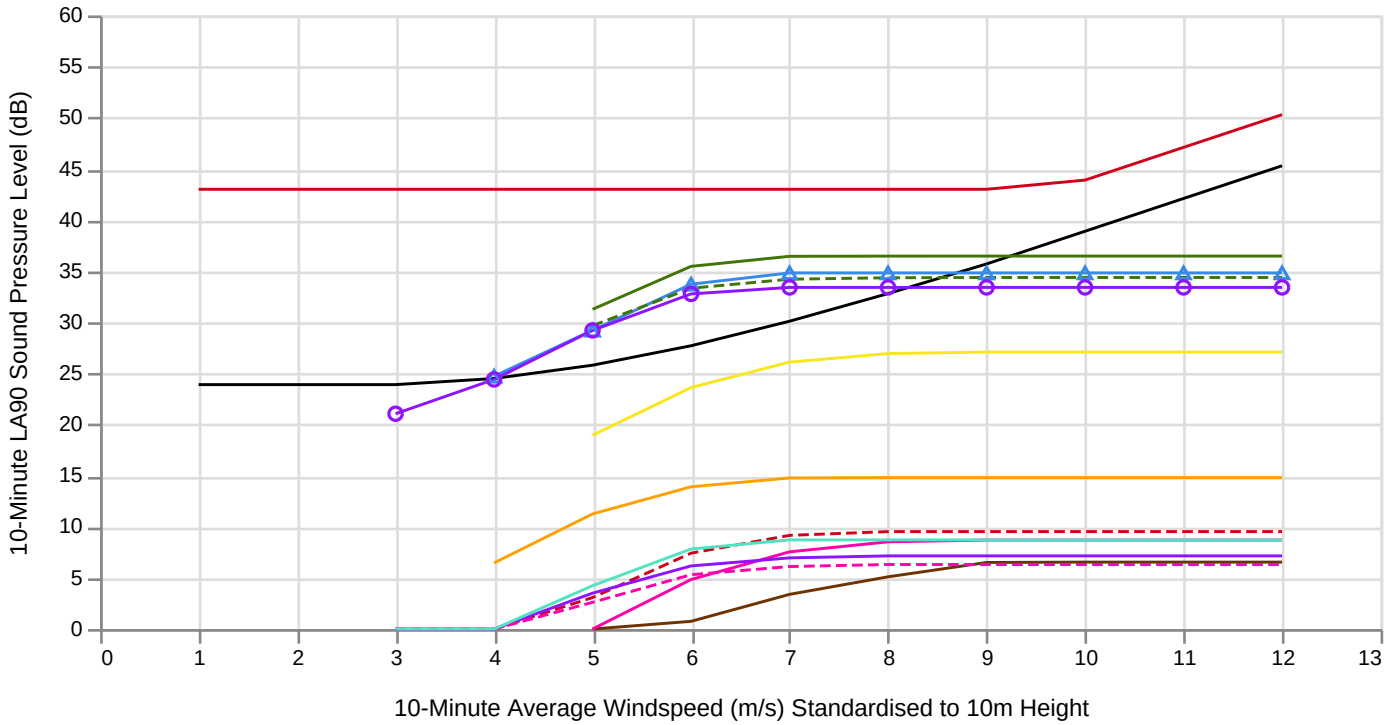
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL10



Night time - NAL10

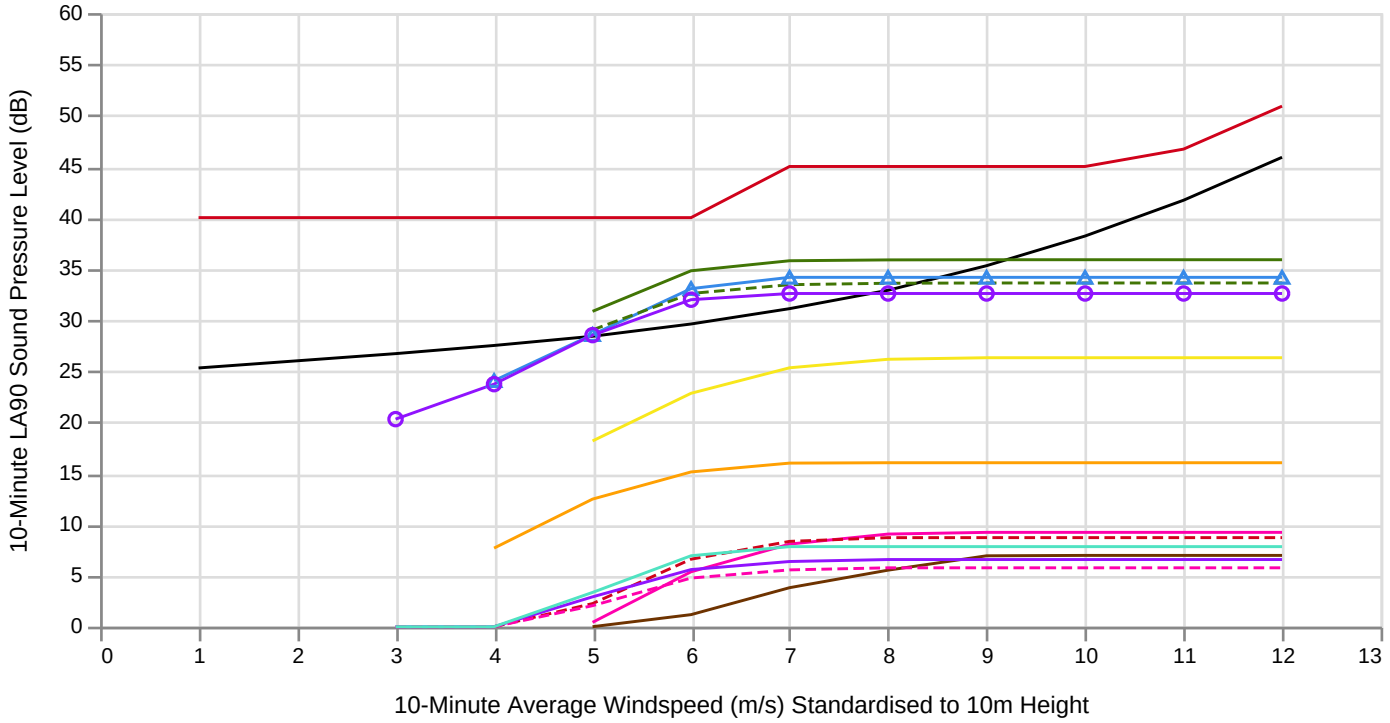


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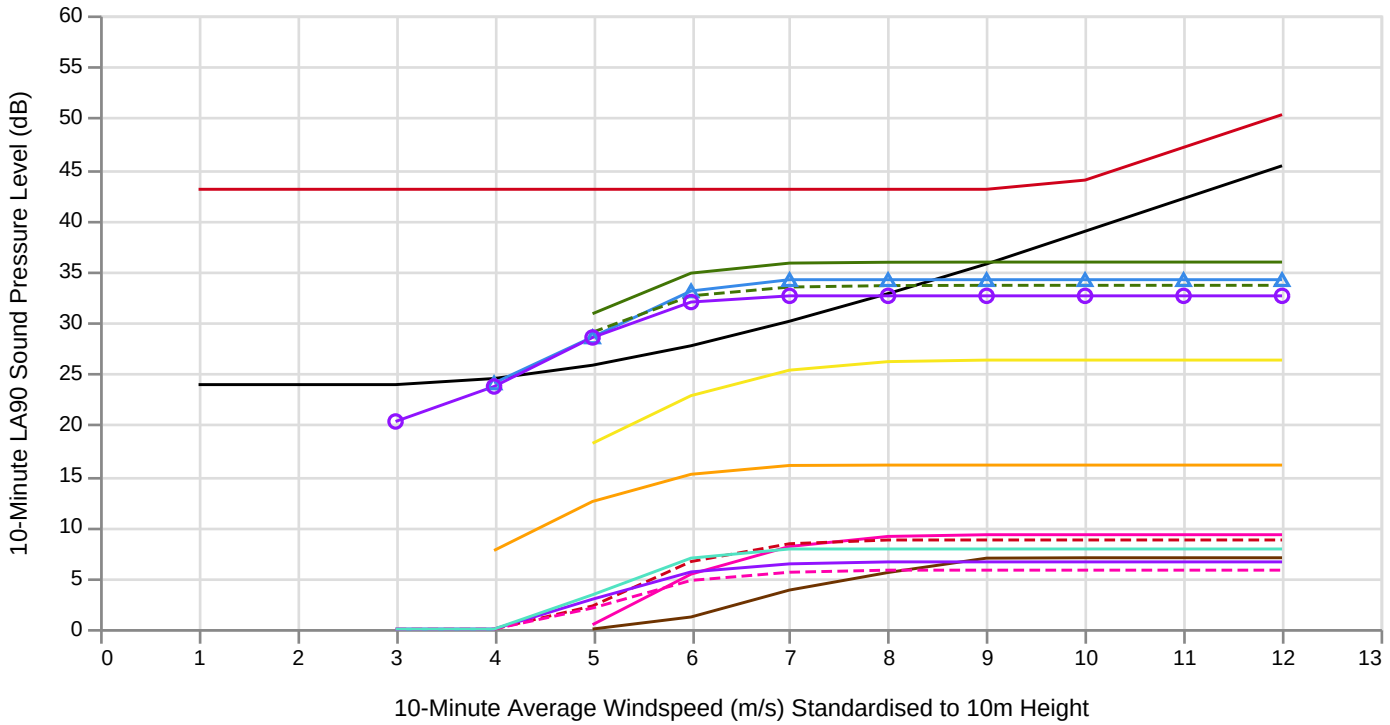
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL11



Night time - NAL11

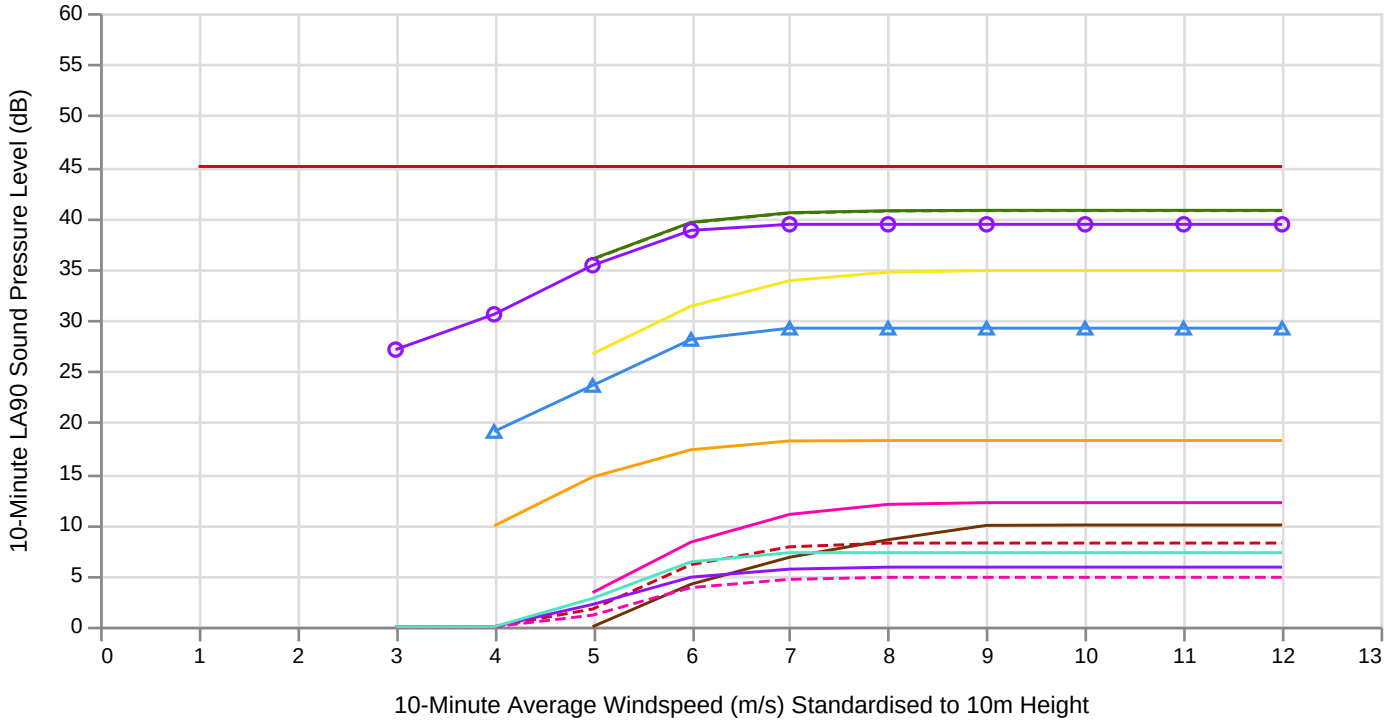


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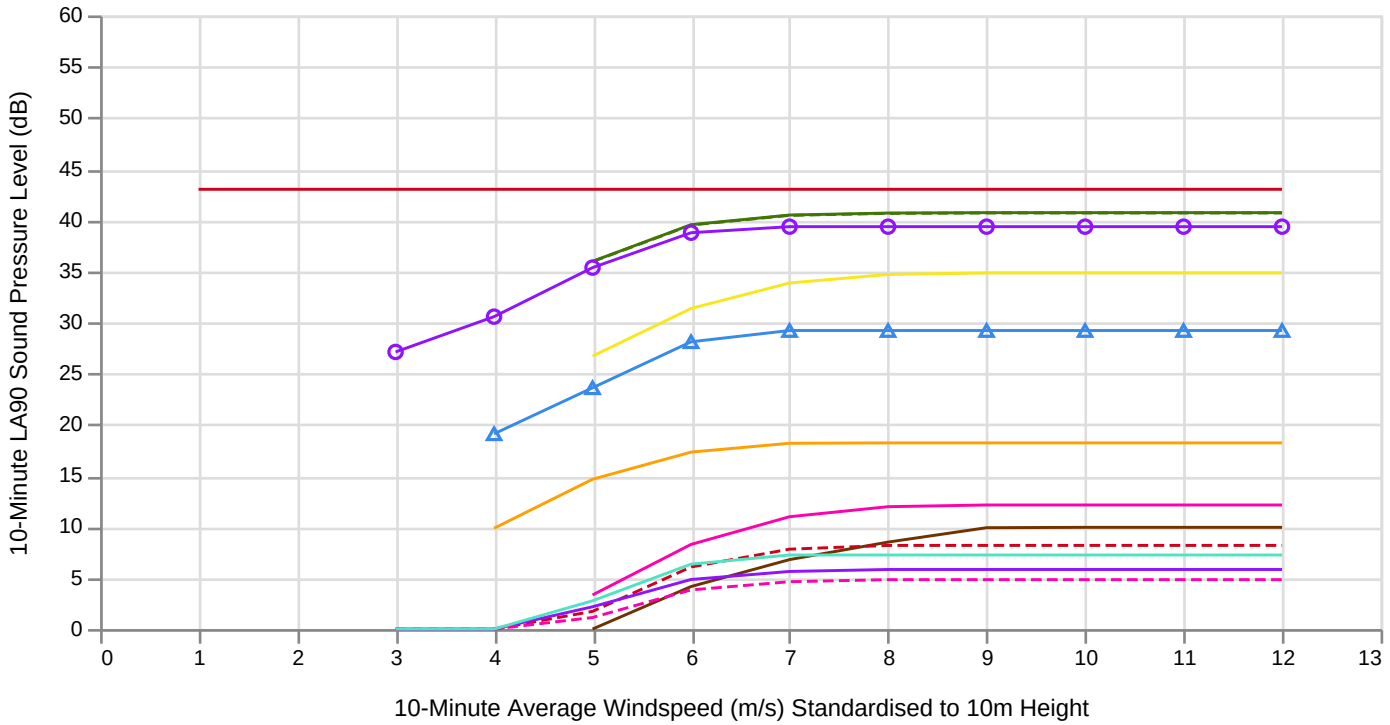
- Background Noise Trendline
- Total WEDG Noise Limit
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL12



Night time - NAL12

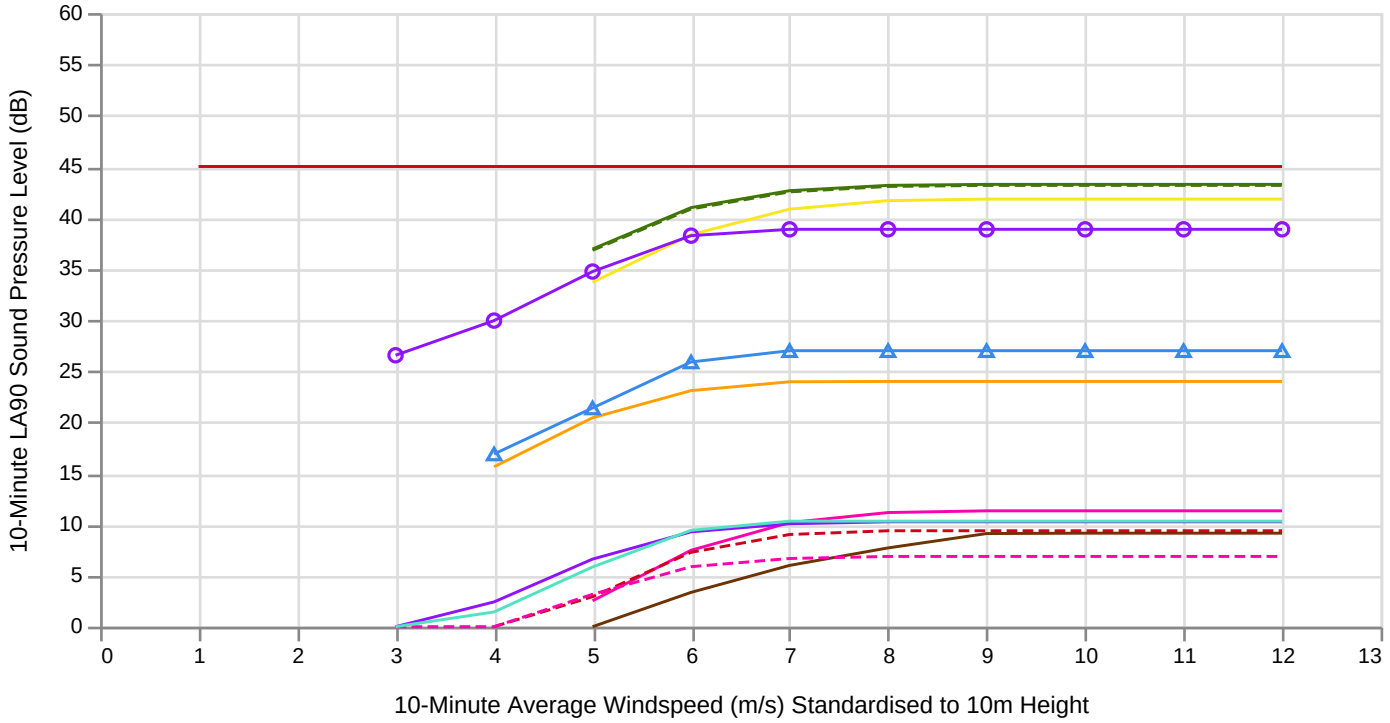


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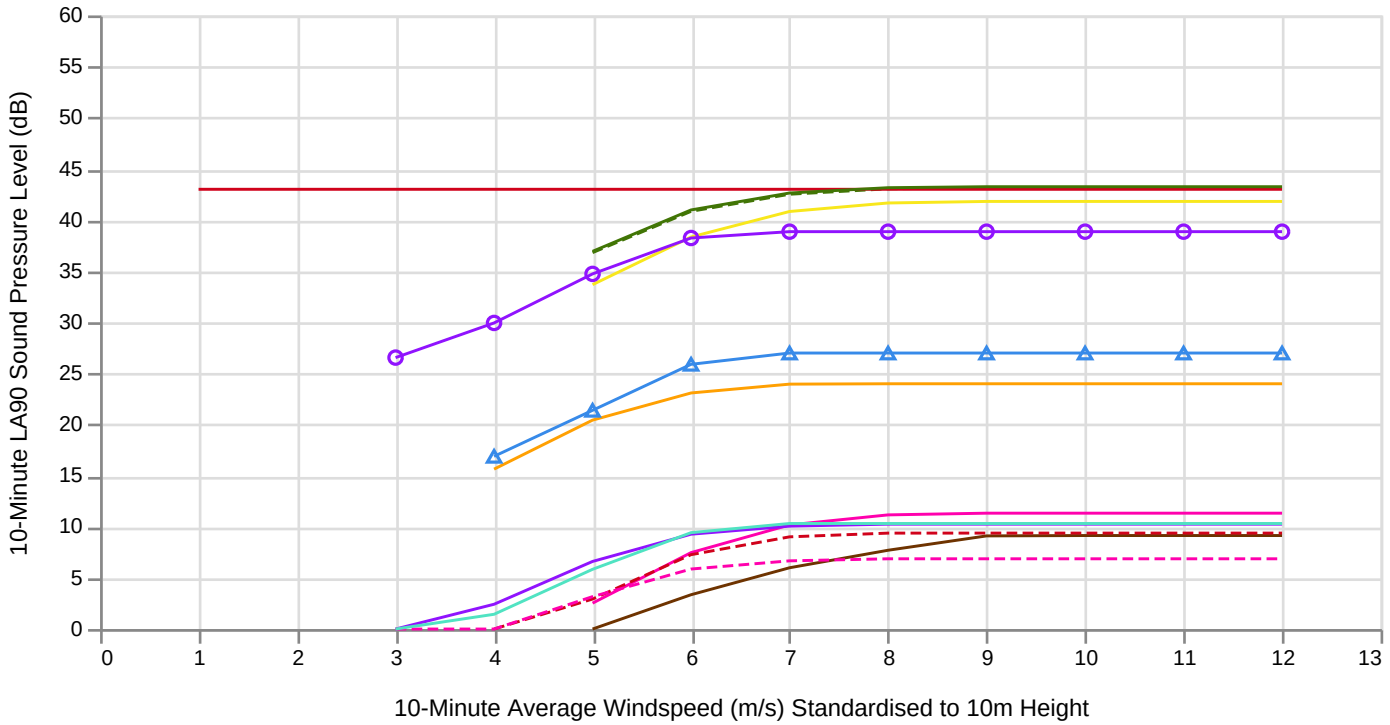
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)
- Total WEDG Noise Limit

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL13



Night time - NAL13

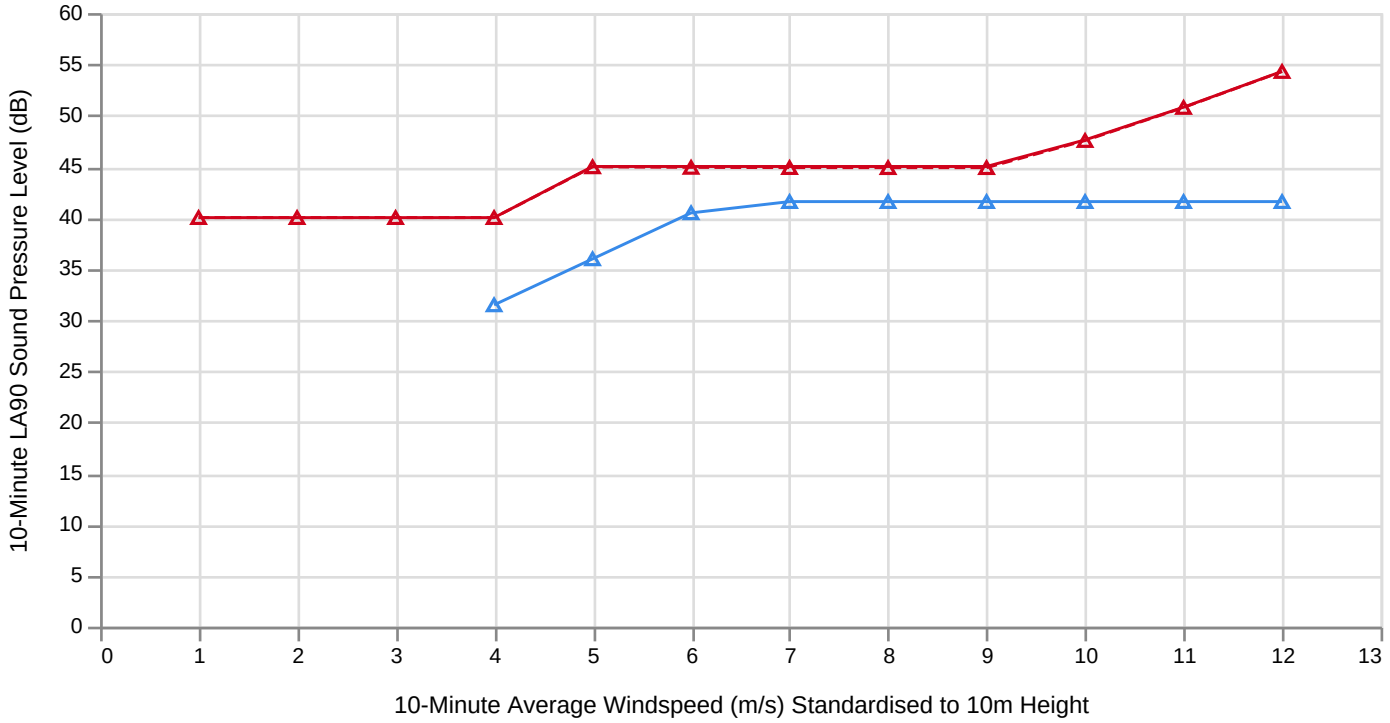


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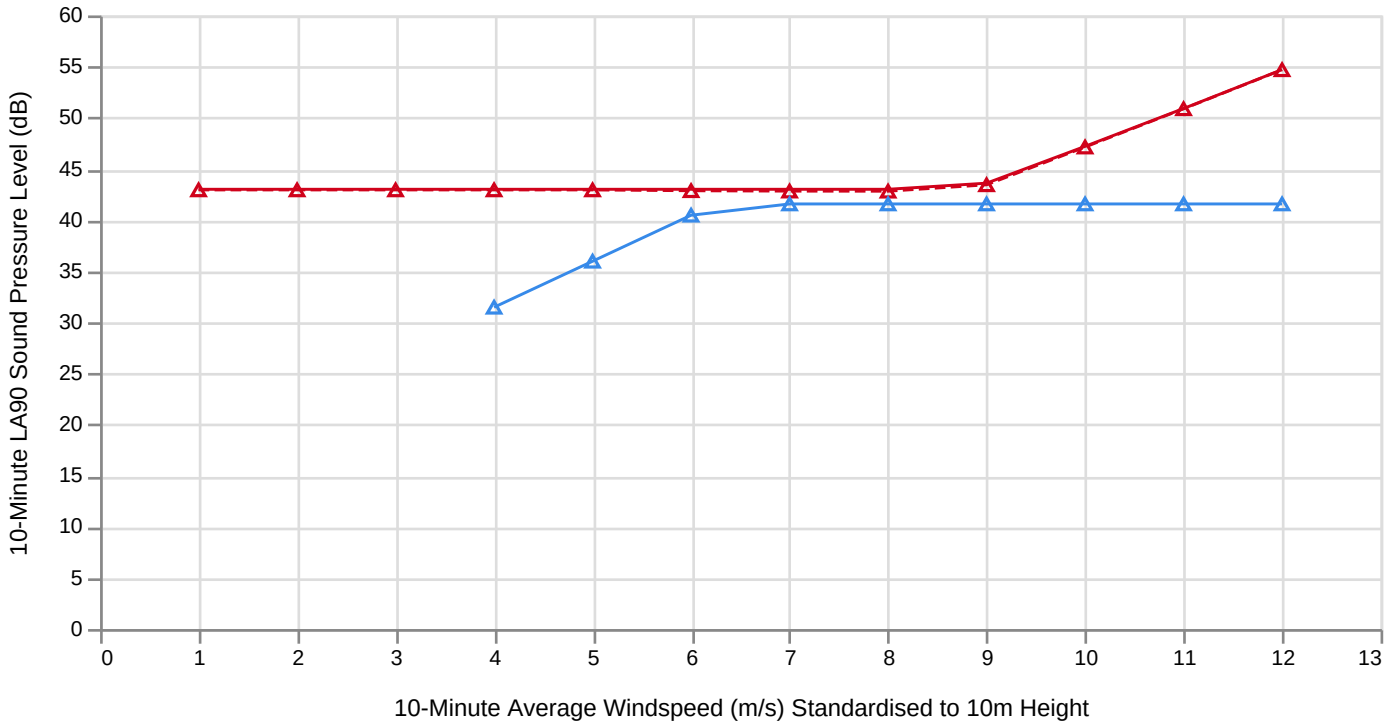
- Proposed Development
- Cumulative (excl. Killoshulan)
- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn
- Cumulative (incl.)
- Total WEDG Noise Limit

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL01



Night time - NAL01

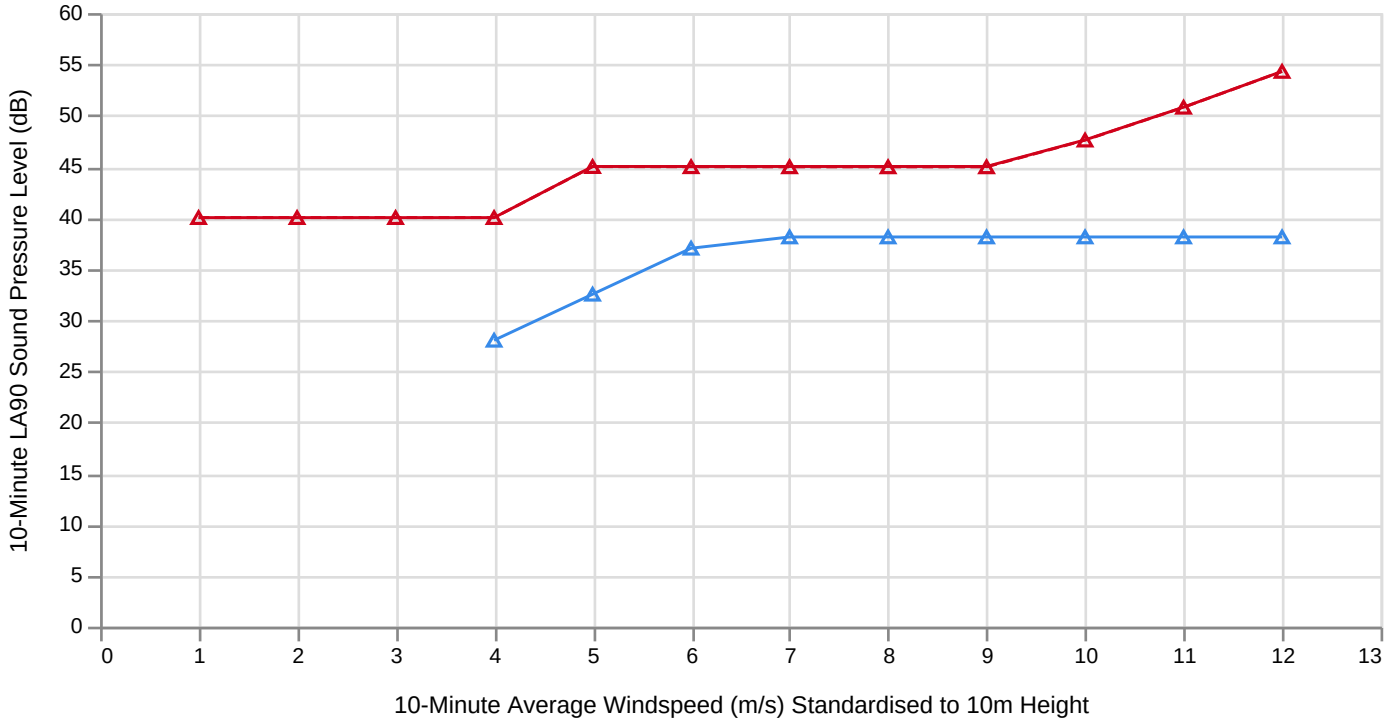


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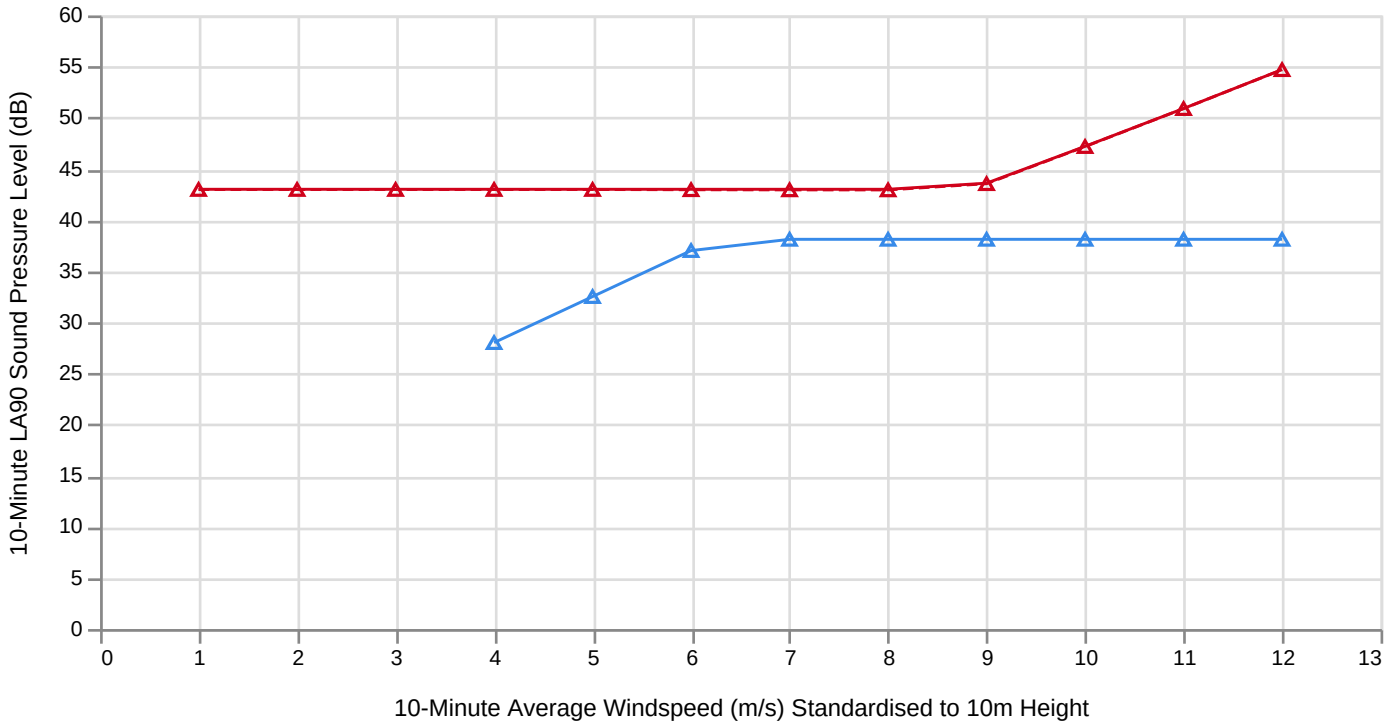
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL02



Night time - NAL02

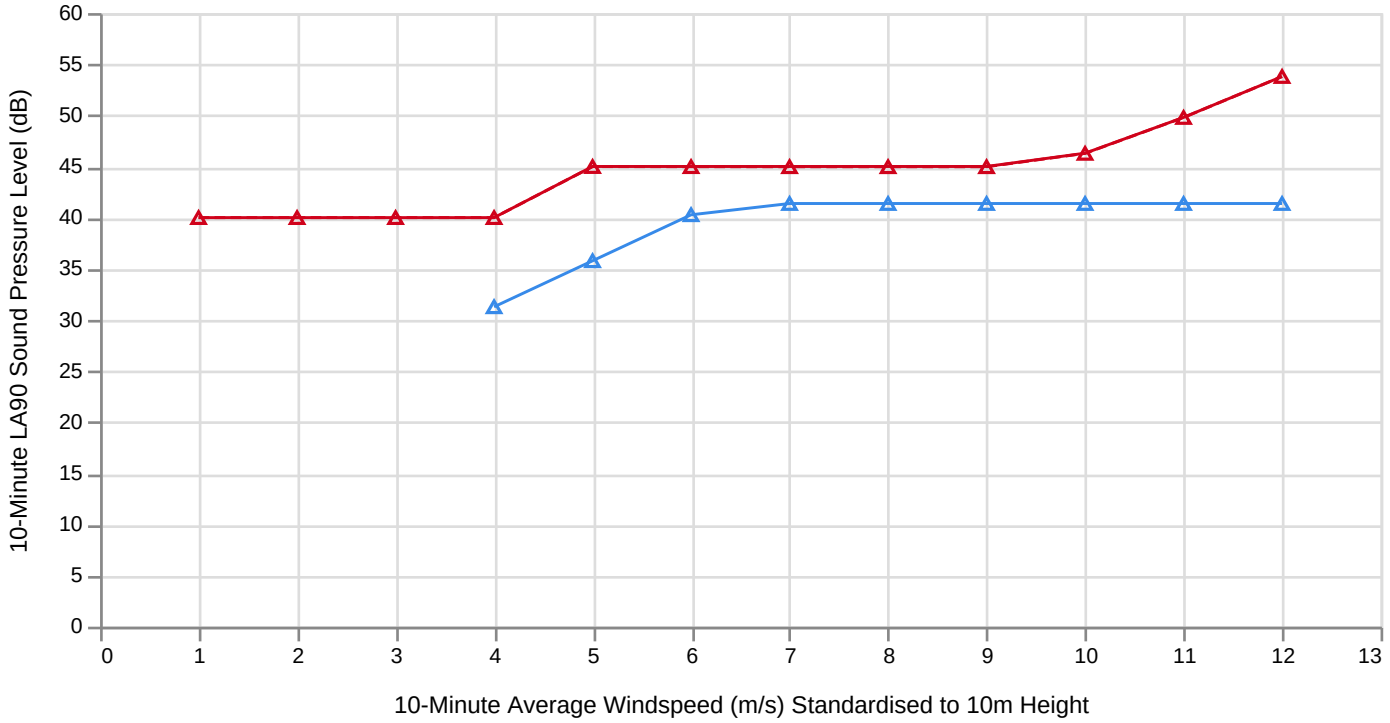


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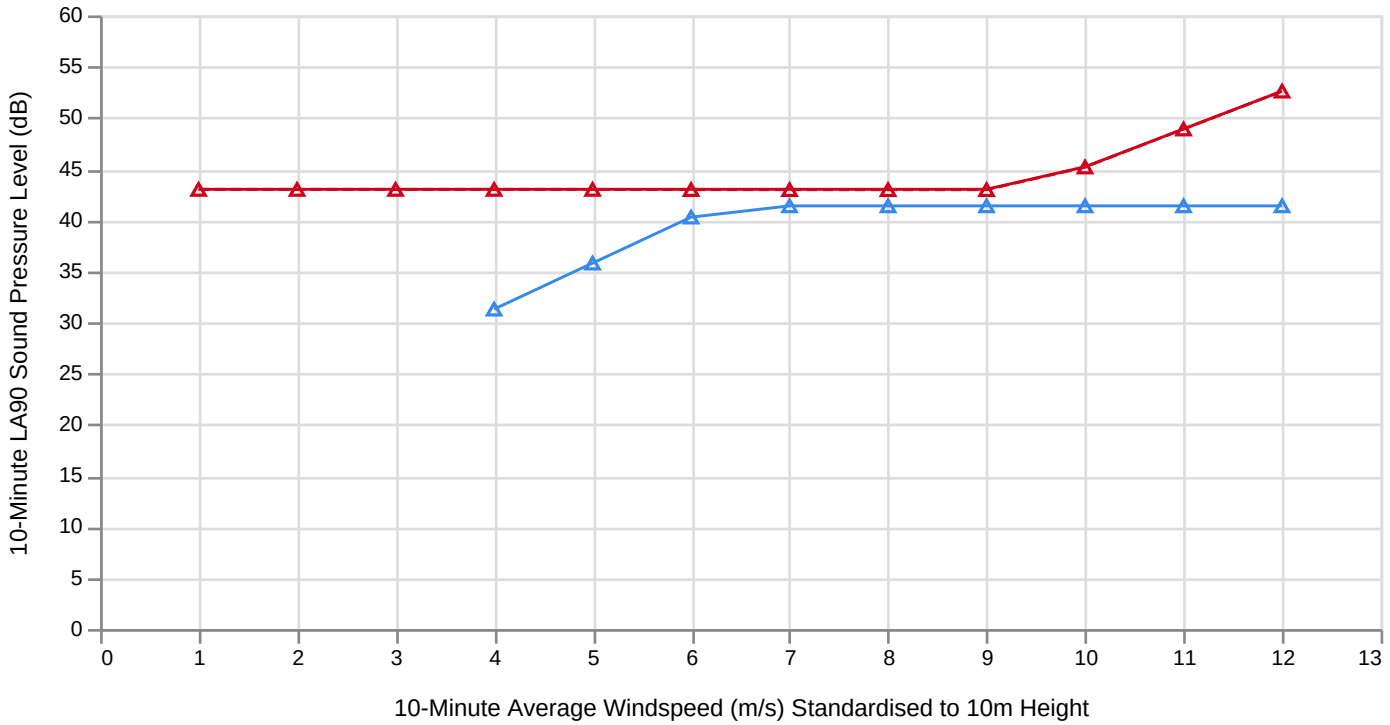
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL03



Night time - NAL03

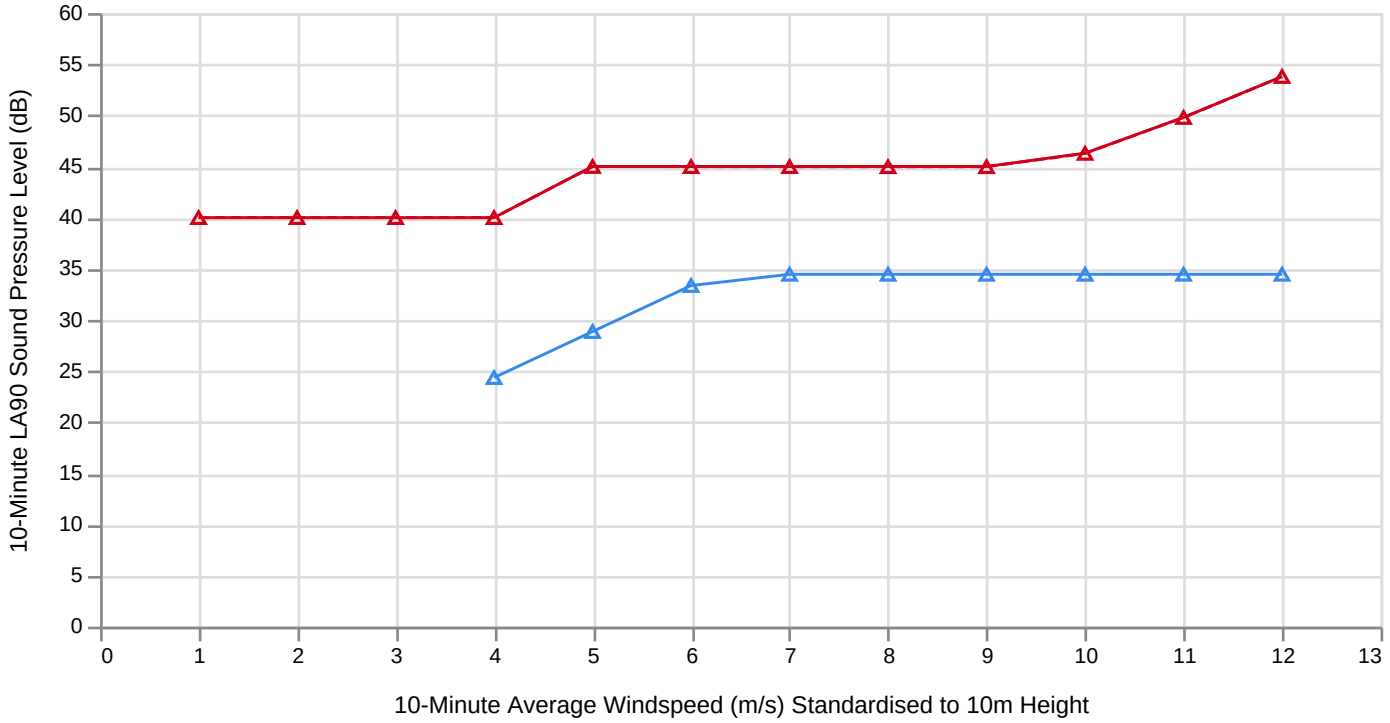


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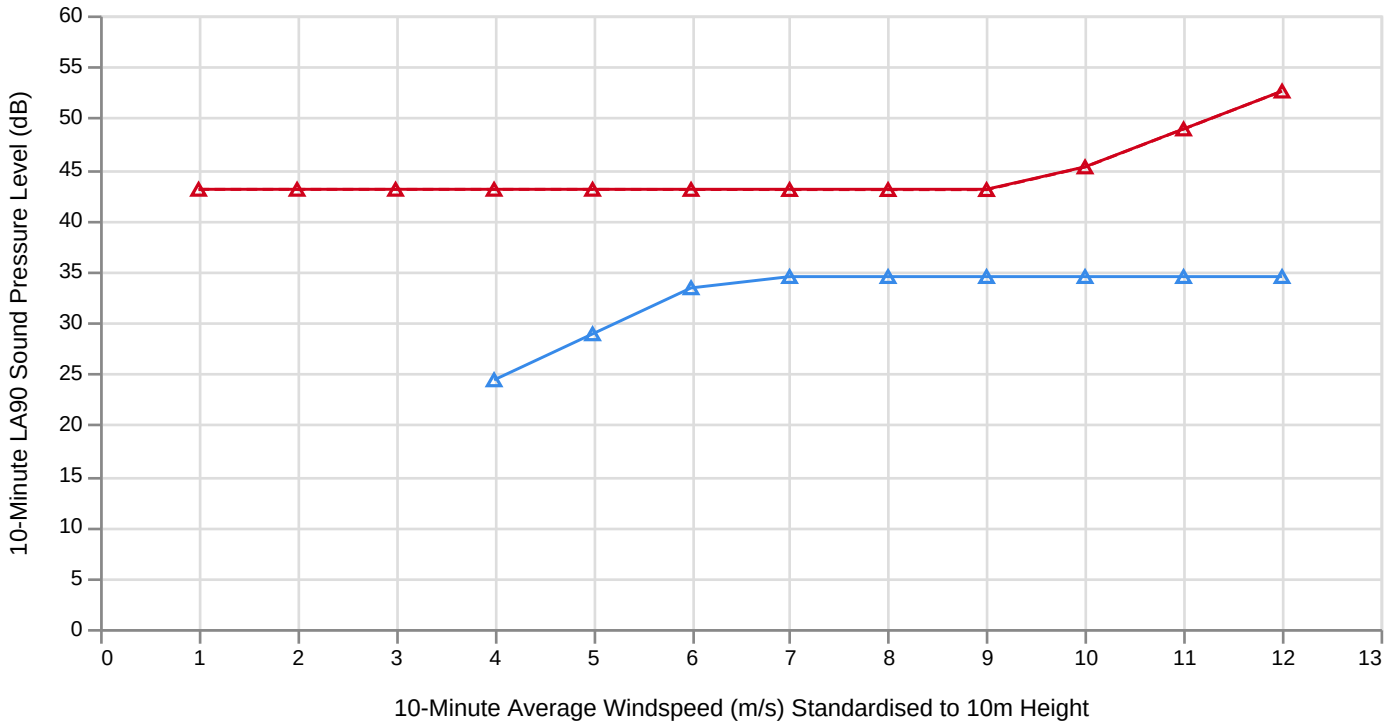
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL04



Night time - NAL04

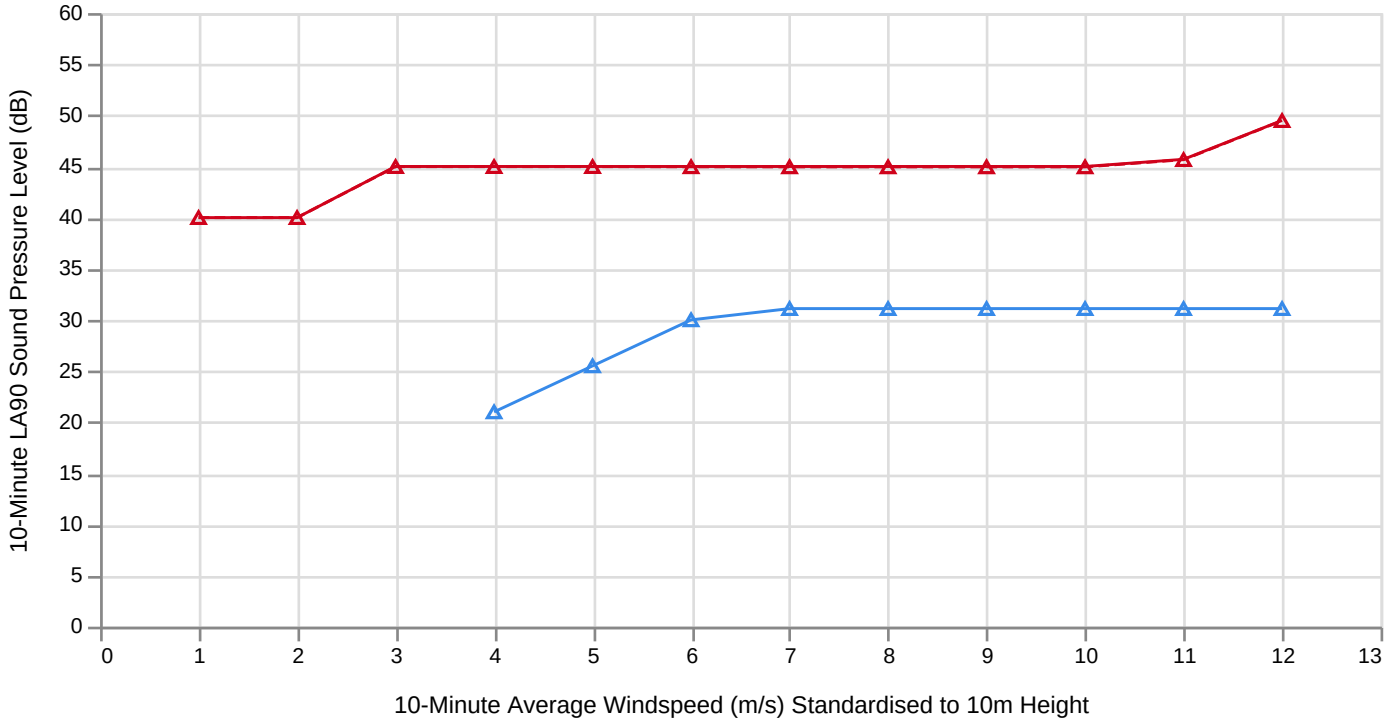


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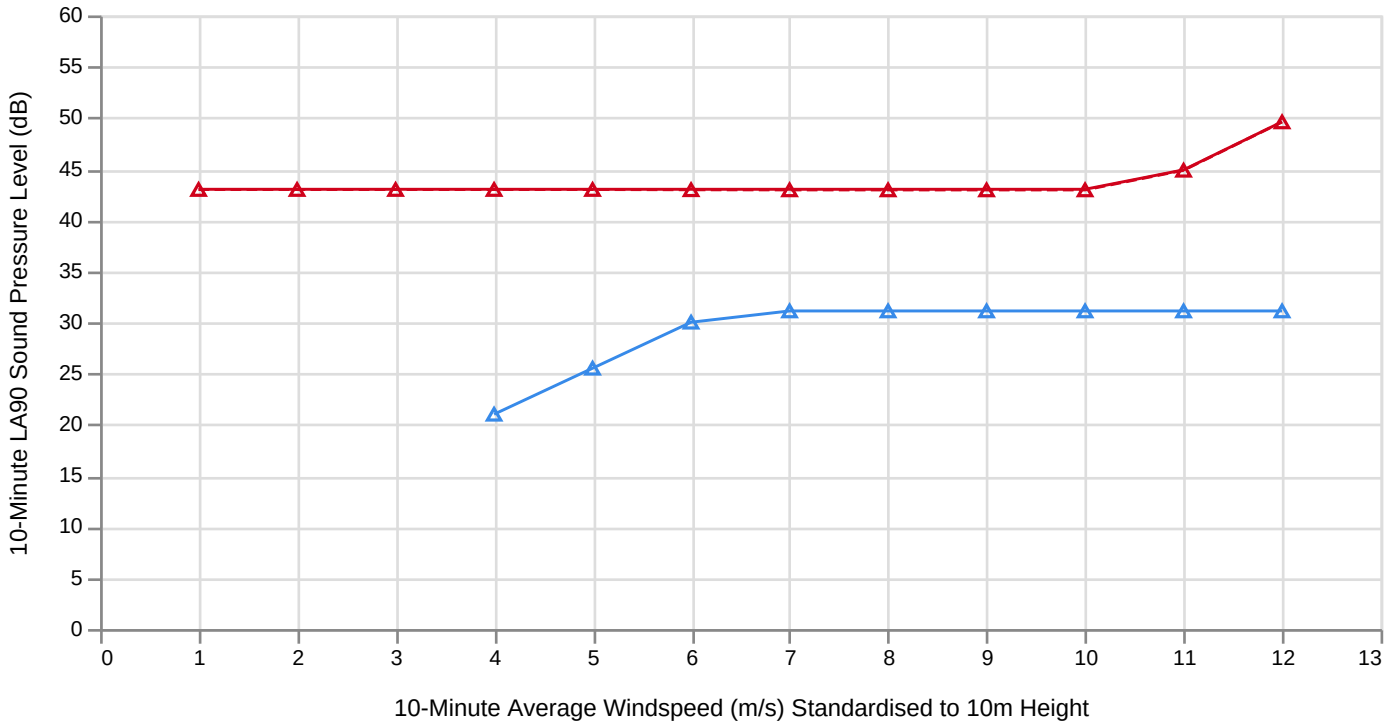
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL05



Night time - NAL05

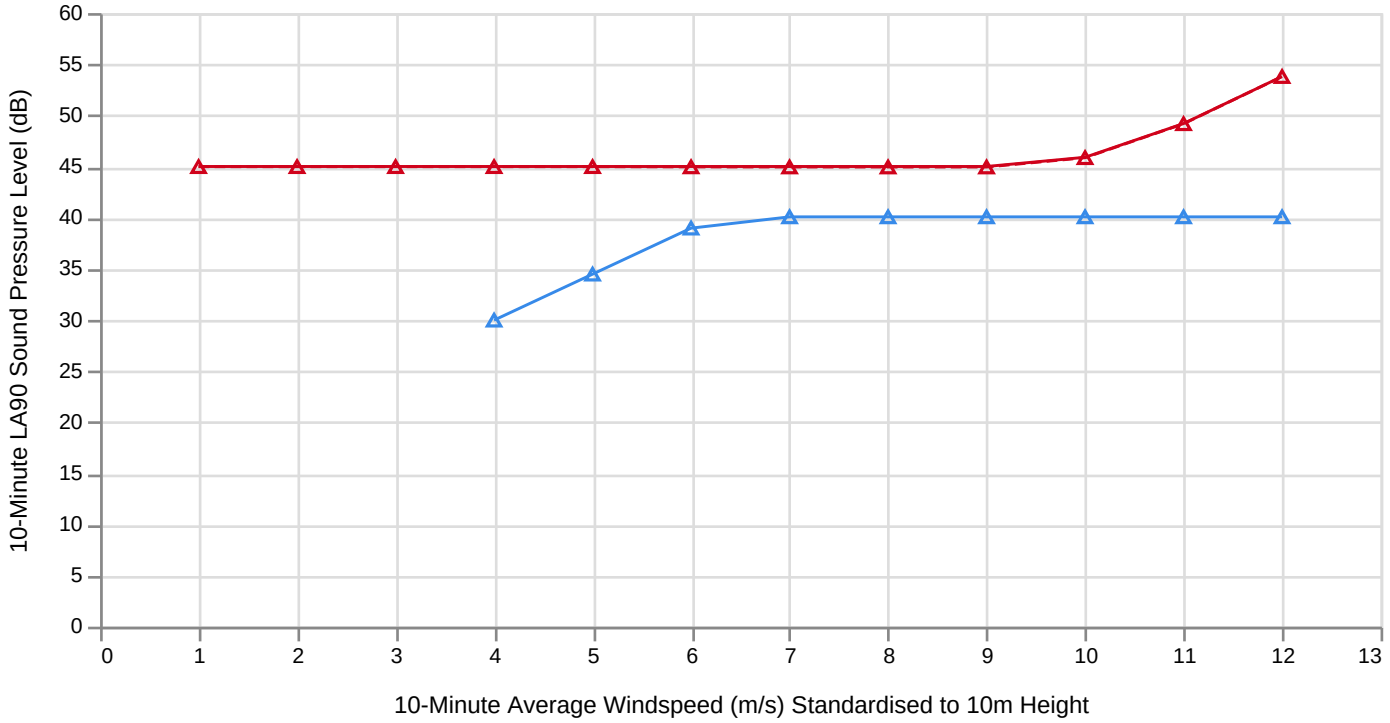


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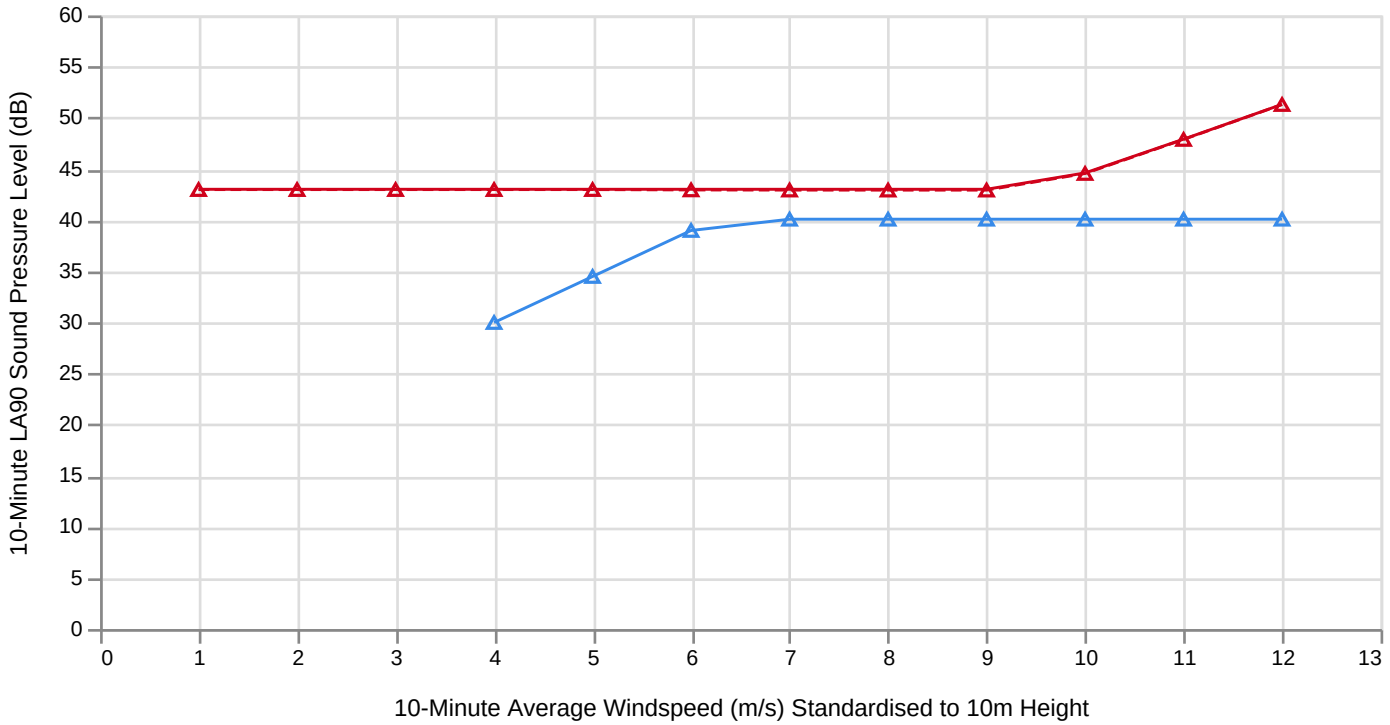
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL06



Night time - NAL06

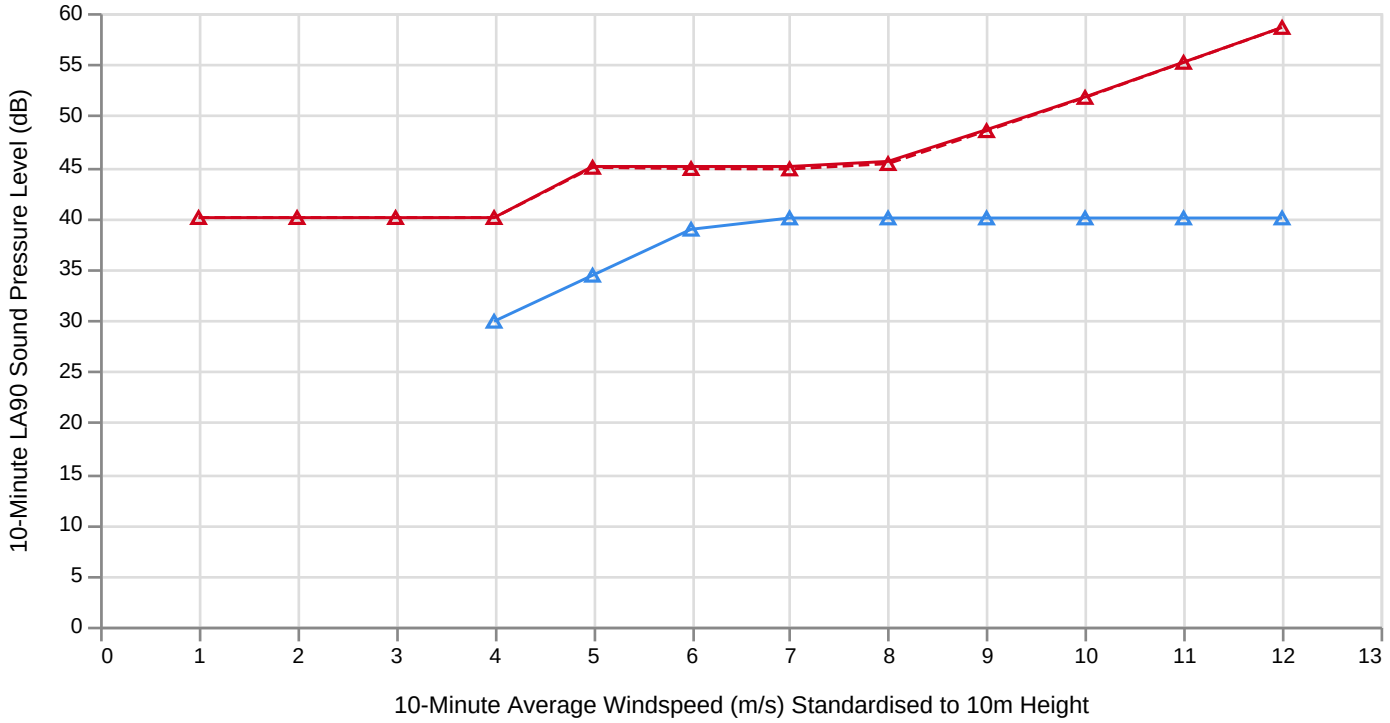


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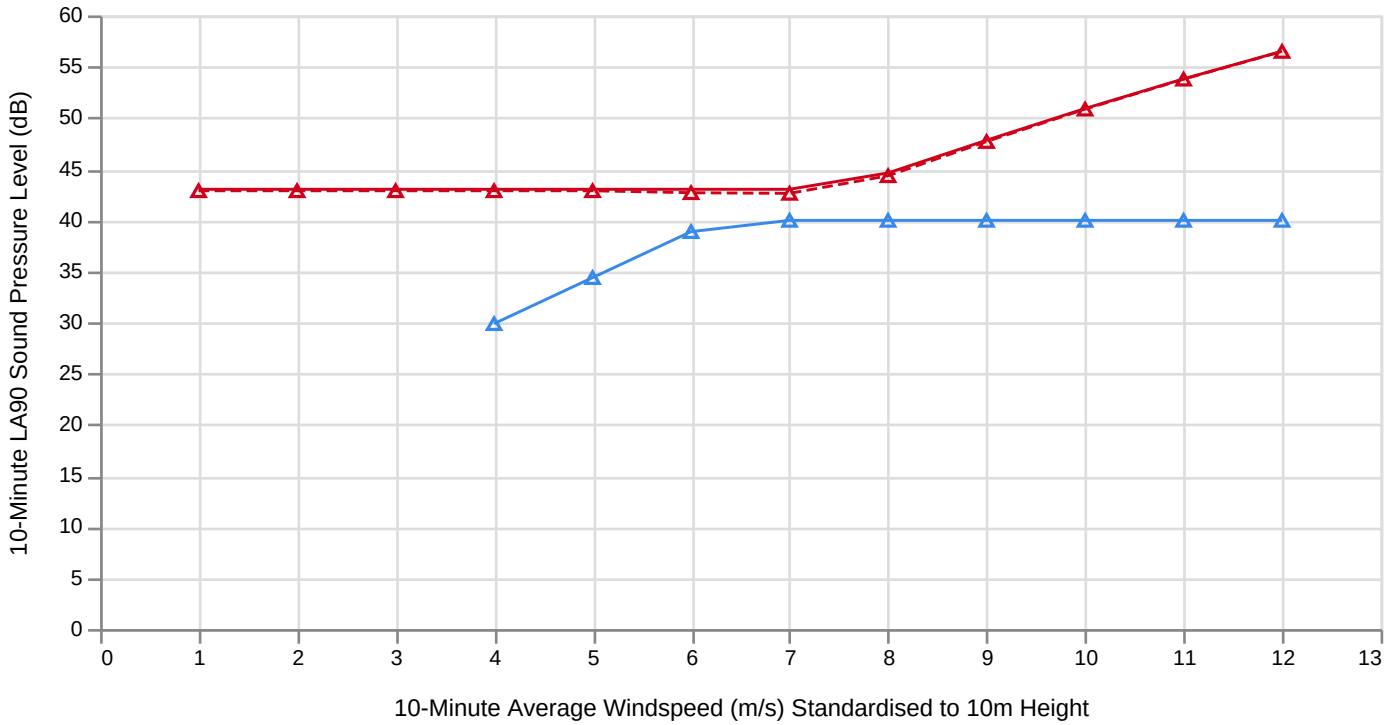
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL07



Night time - NAL07

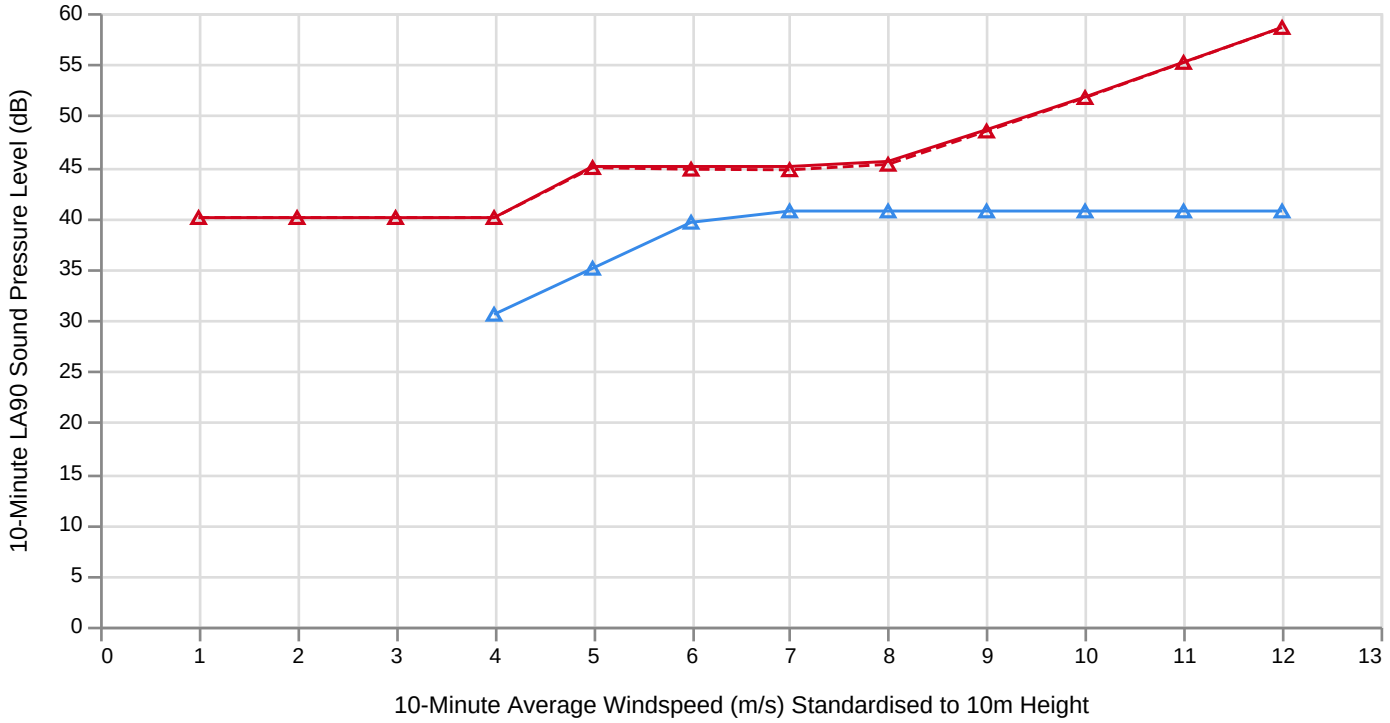


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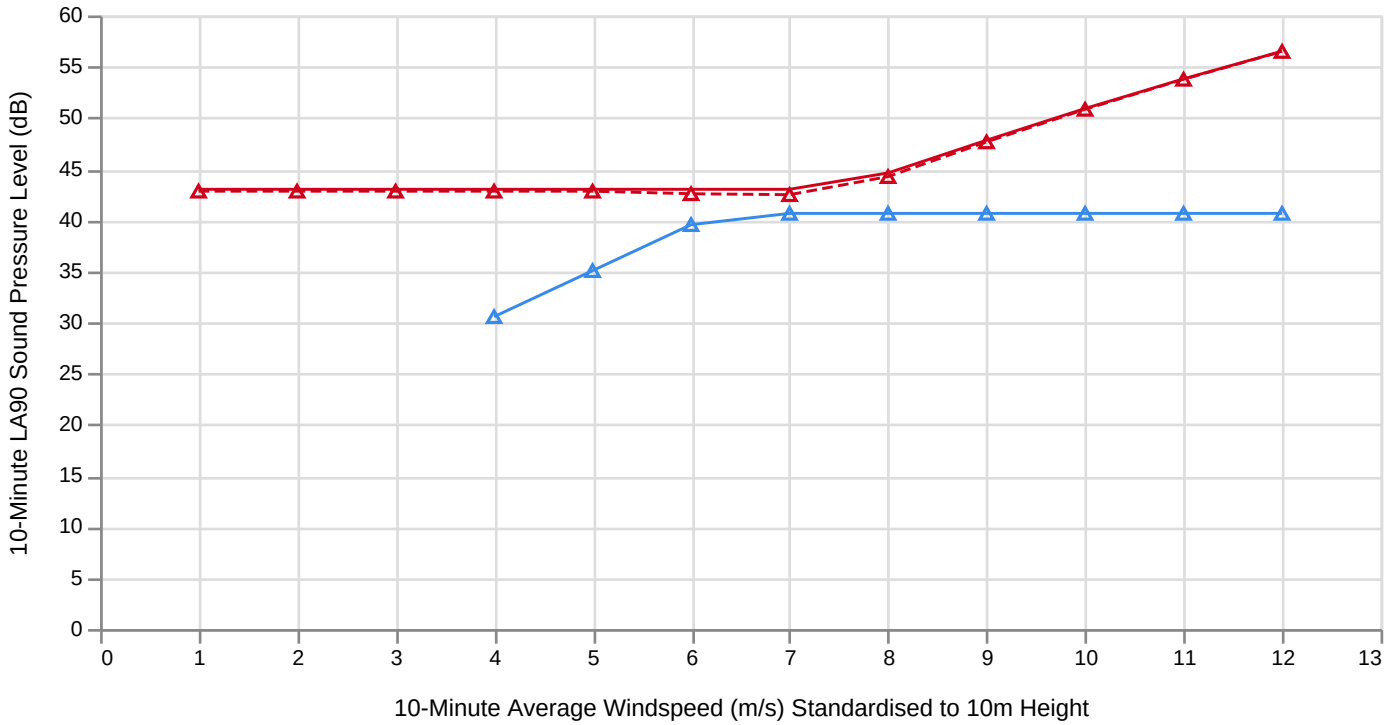
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL08



Night time - NAL08

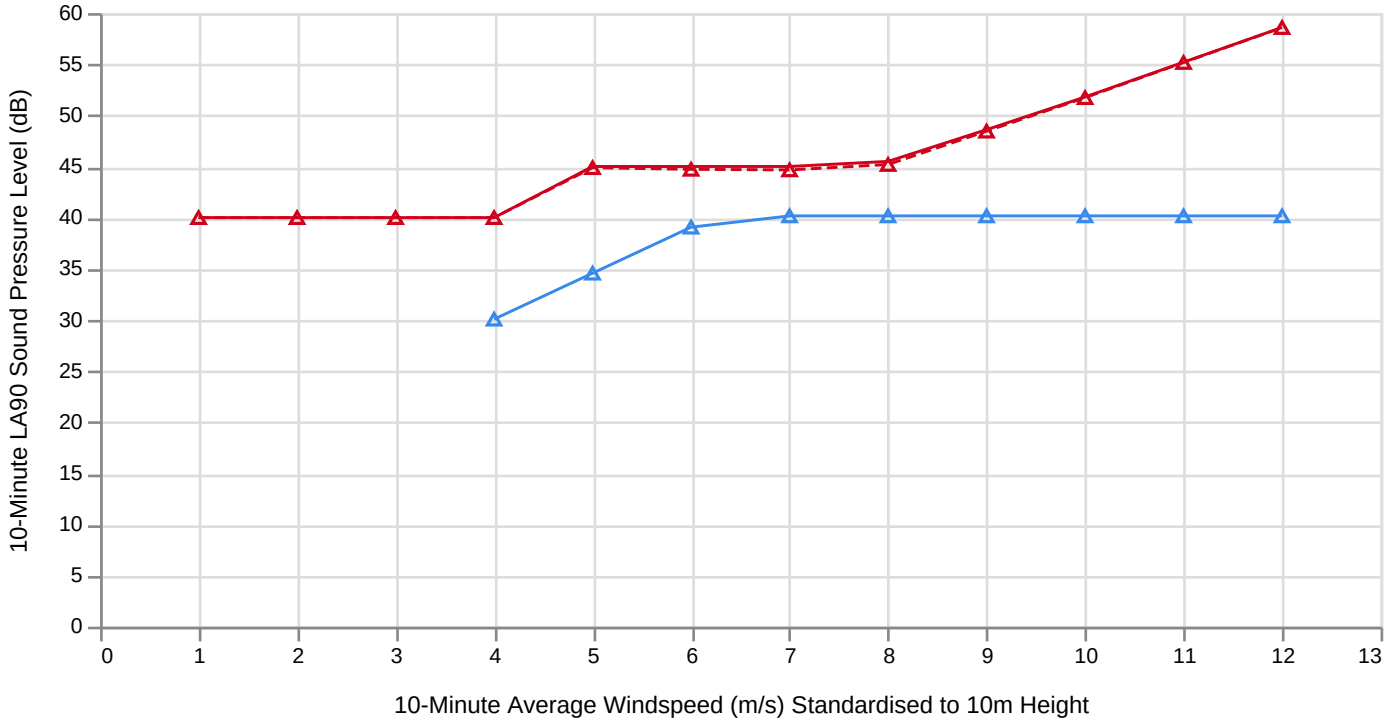


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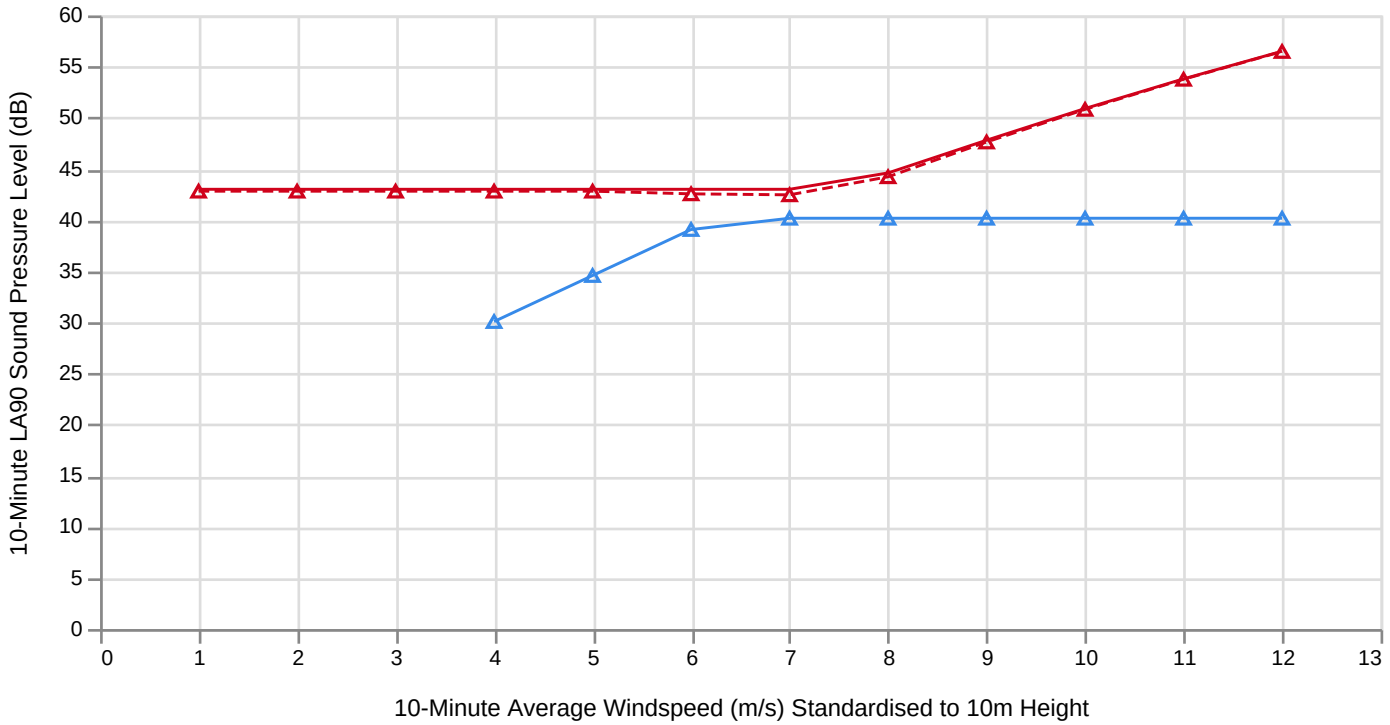
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL09



Night time - NAL09

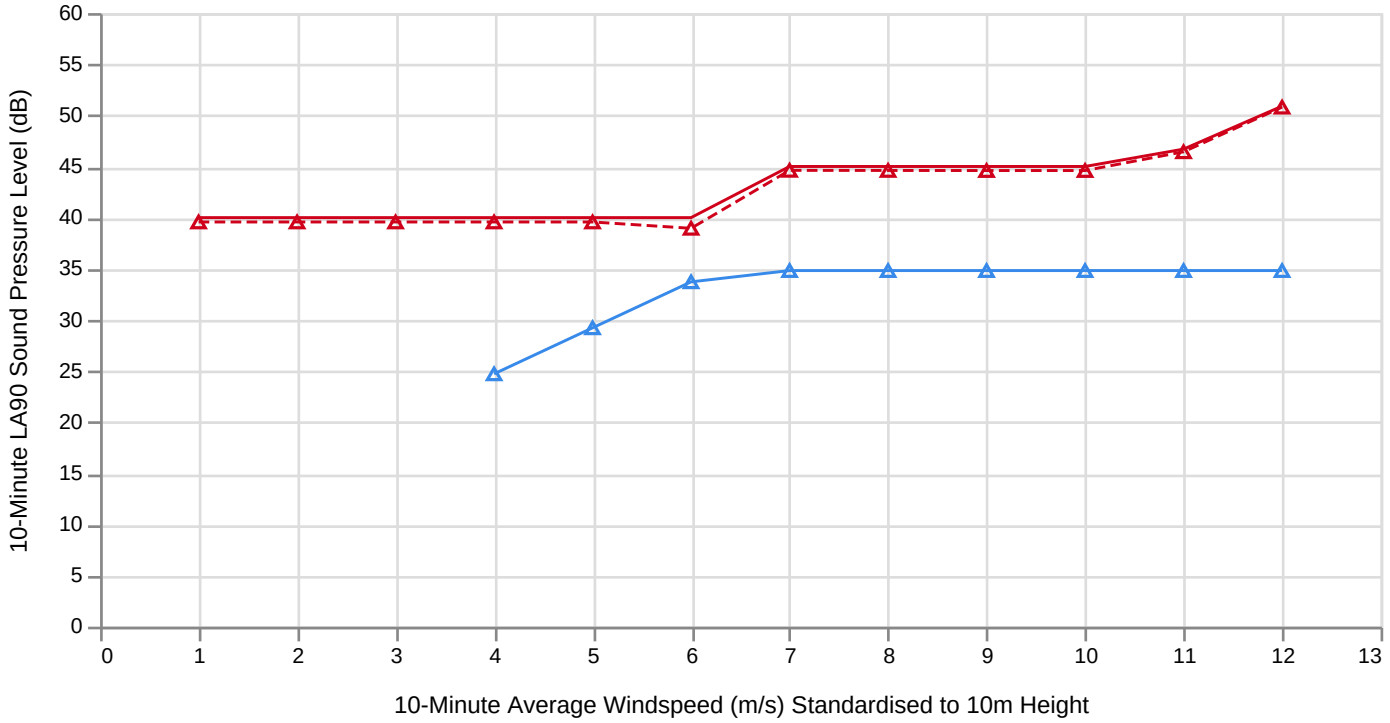


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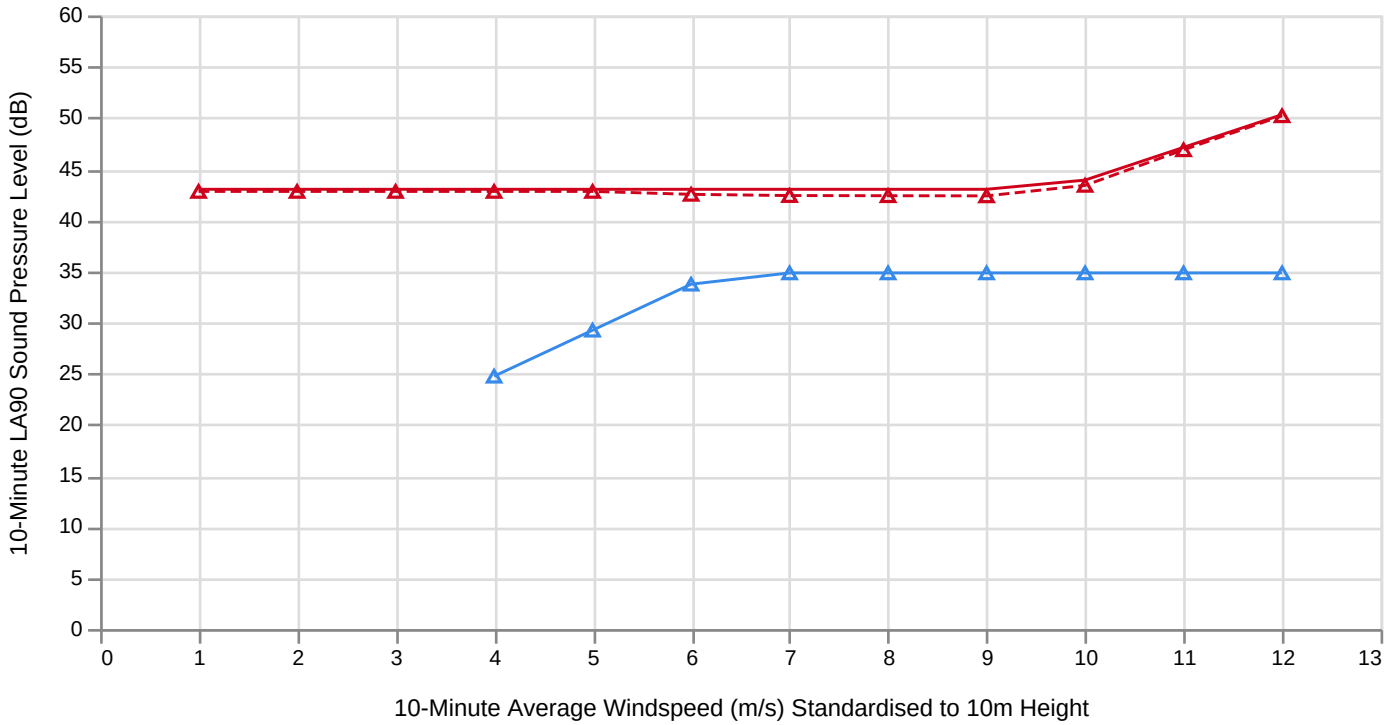
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL10



Night time - NAL10

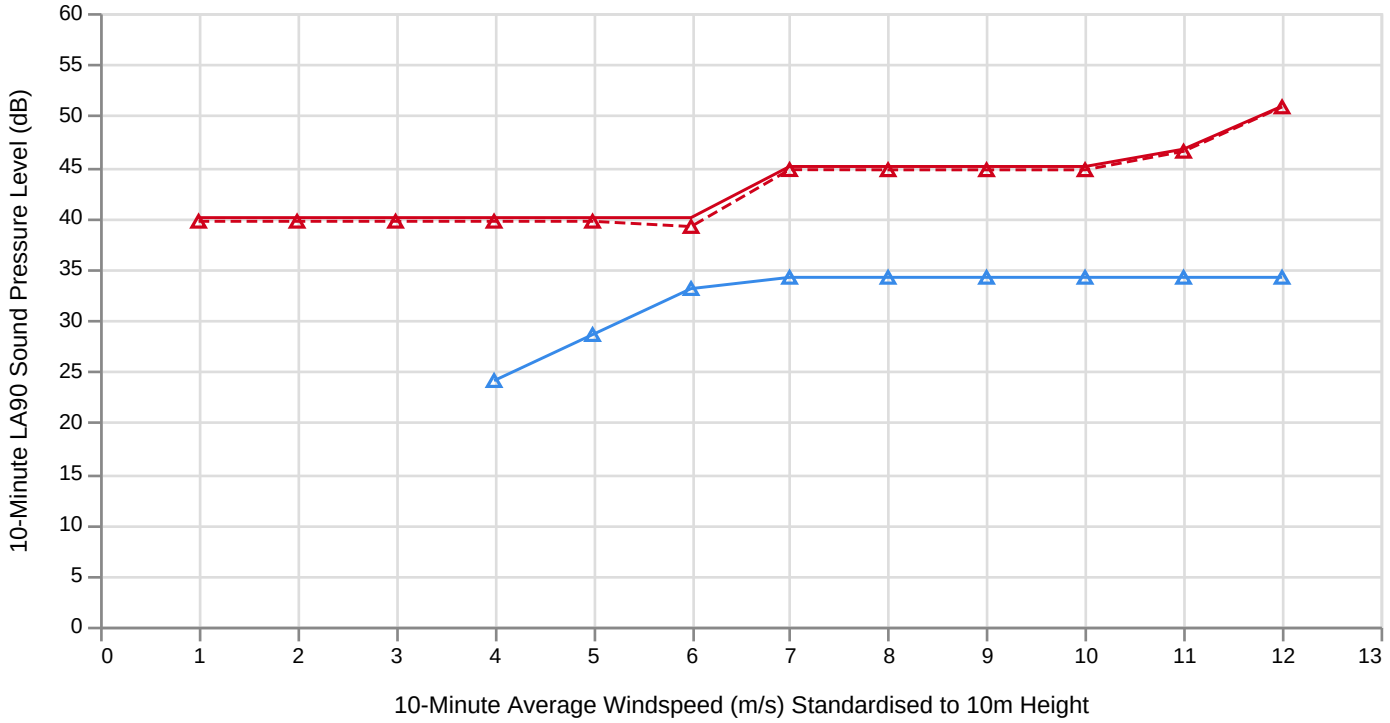


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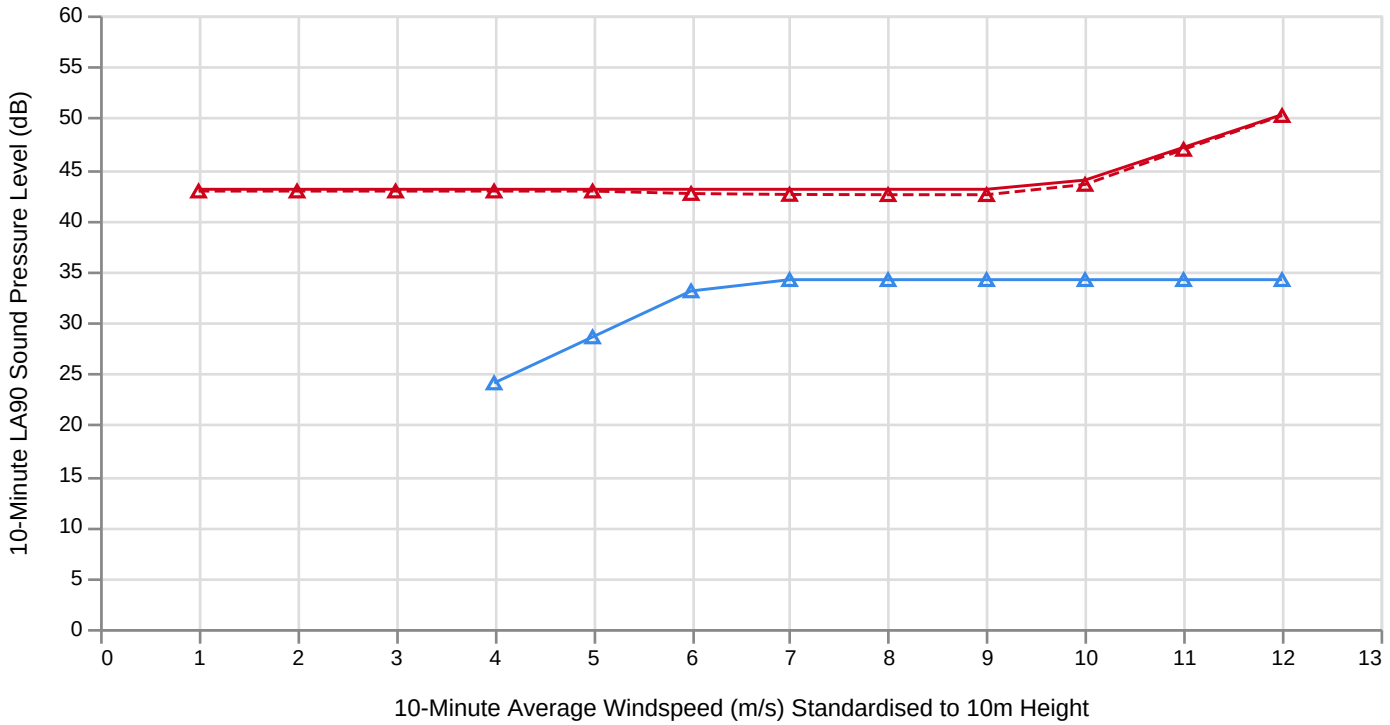
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL11



Night time - NAL11

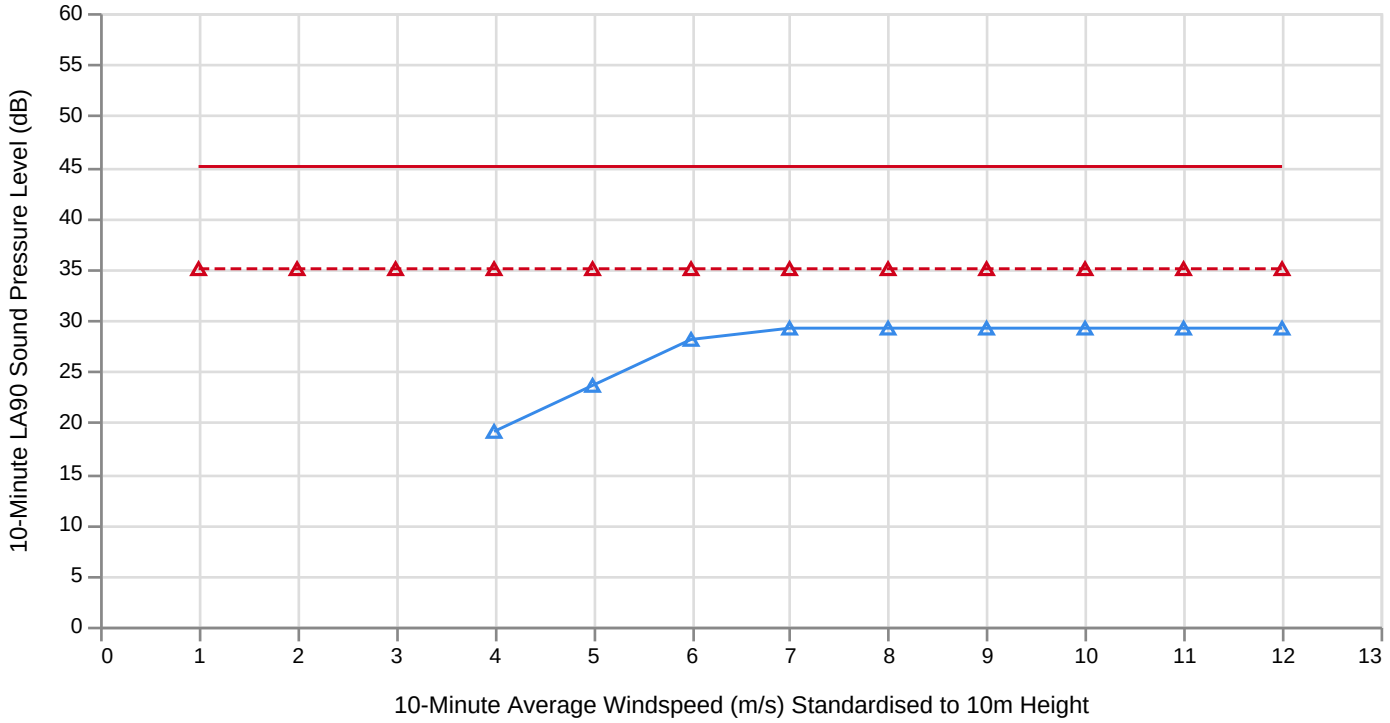


Legend

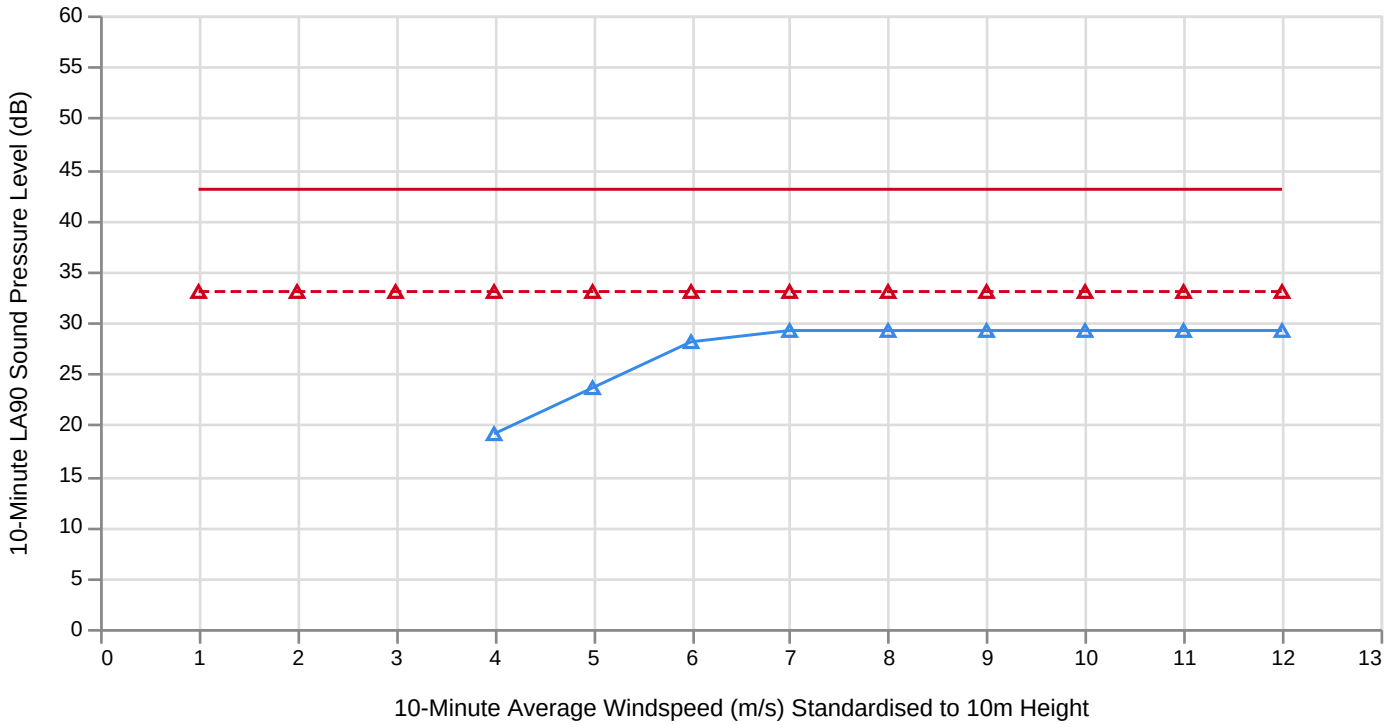
- Total WEDG Noise Limit
- Site-Specific Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL12



Night time - NAL12

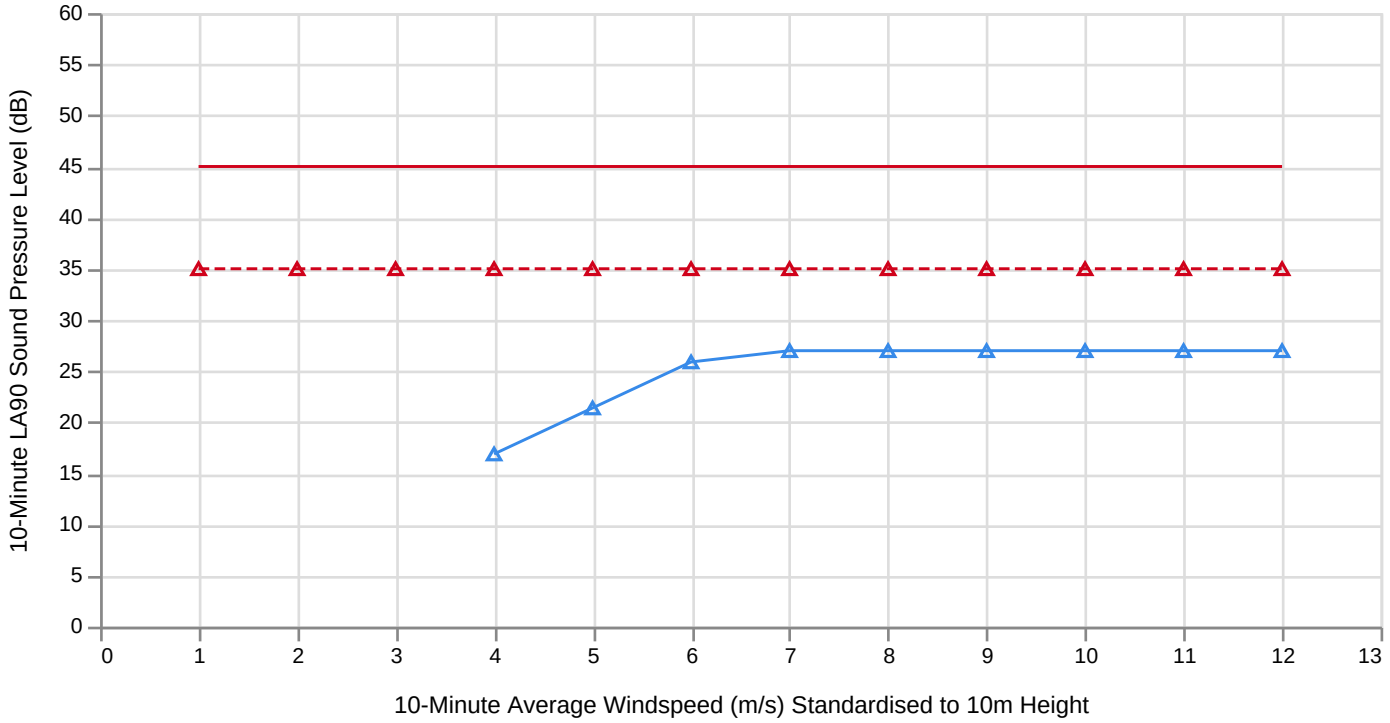


Legend

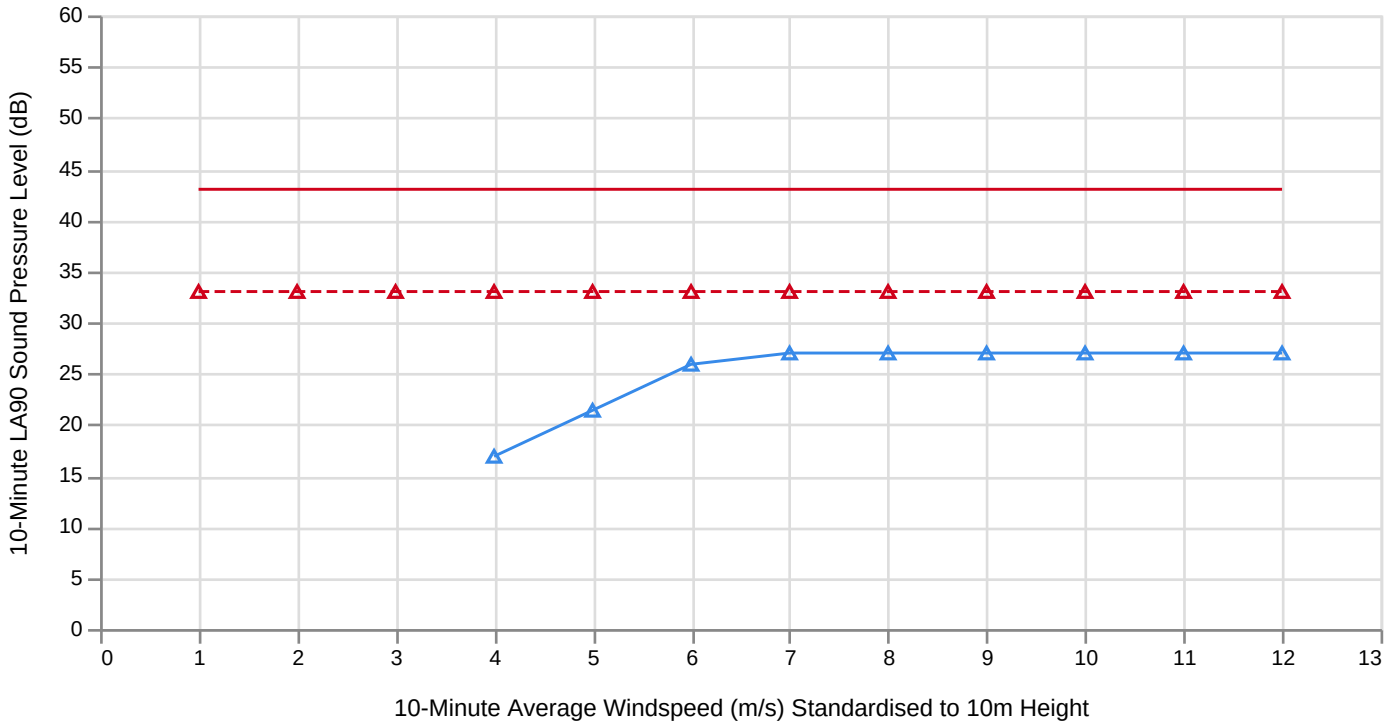
- Site-Specific Noise Limit
- Total WEDG Noise Limit
- Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Daytime - NAL13



Night time - NAL13



Legend

Site-Specific Noise Limit

Total WEDG Noise Limit

Proposed Development

Client	MKO
Project Name	Killoshulan Wind Farm
Project Number	IE00061
Drawn By	FL
Checked By	MC
Date	2026-10-07

Annex 2 – Field Data Sheets (FDS)/Installation Report

- Kit Installation Report
- Field Data Sheets (Noise Monitoring Record)

Killoshulan Wind Farm Noise Survey - Installed Noise Monitoring Locations



Present during the course of the installation:

- Colum Breslin, TNEI Ireland Ltd

Unless specified, all noise meters were installed at least 3.5 m from any hard-reflecting surface except the ground and less than 20 m from the dwelling and away from obvious noise sources, such as boiler flues.

Detailed information and pictures for each of the installed locations are provided below. The original full-size pictures are available on request.

Noise Monitoring Location (NML) - Latitude/ Longitudes

NML	Lat Long	ITM
NML1	52.734935”N, -7.527501”W	631910, 664977
NML2	52.753659”N, -7.521505”W	632301, 667063
NML3	52.761954”N, -7.487148”W	634614, 668001
NML4	52.756776”N, -7.454635”W	636812, 667441
NML5	52.744119”N, -7.461916”W	636332, 666029
NML6	52.729718”N, -7.497993”W	633907, 664409

NML1



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North



South



East



West



Description
The noise monitoring equipment was installed at a proxy location to the east of the derelict property. The location was chosen due to its proximity to the west of the proposed development. The kit was positioned in what was considered to be the area where contamination was least likely on the more sheltered side of the farm next to the trees. The location was seen to be representative of the other properties in the area to the west. The predominant sounds that were audible during the installation were from the adjacent farm yard, noise from cattle in the nearby barns, and birdsong. The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground. A rain gauge was installed at this location.

NML2



North



South



East



Description
The noise monitoring equipment was installed in front of the property which was south of the house. The location was chosen due to its proximity to the north-west of the proposed development, and was seen to be representative of surrounding properties. The predominant sounds that were audible during the installation were from the birdsong and noise from the trees. Secondary noises were from the occasional car passing and multiple dogs constantly barking while staff were present. Further north to this property is a large cattle farm with agricultural machinery. The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

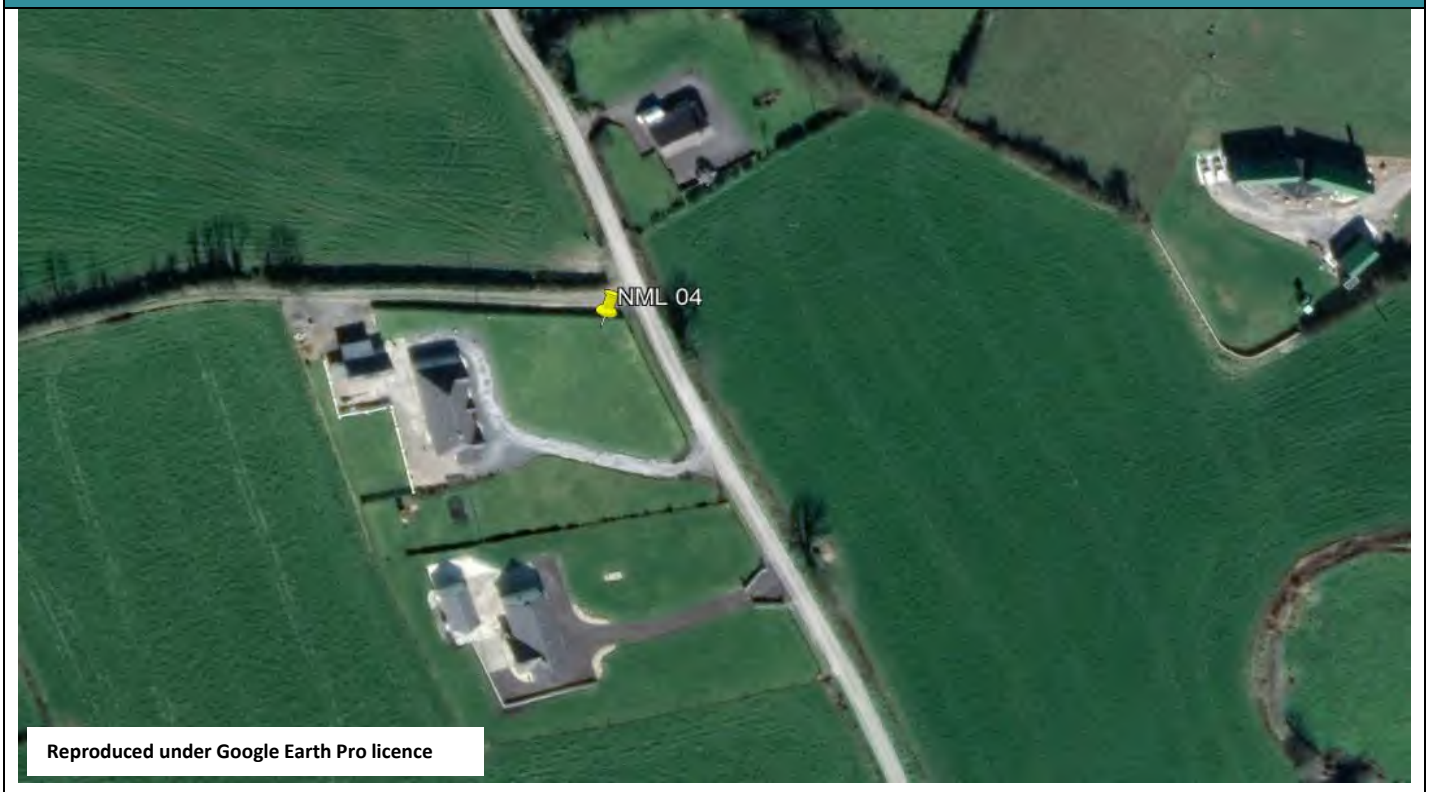
NML3



North	South
	
East	**West**
	

Description
The noise monitoring equipment was within the amenity area. This location was chosen to maximise the distance from potential noise sources at the dwelling that could contaminate the noise data, e.g. the rear boiler. The location was chosen due to its proximity to the north-east of the proposed development and was also seen to be representative of the other properties in the area to the north and east. The predominant sounds that were audible during the installation were from the distant motorway and birdsong. There were 4 turbines visible to the north of this property but not audible. The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground. A rain gauge was installed at this location.

NML4



North	South
	
East	**West**
	

Description
The noise monitoring equipment was installed in the amenity area to the north-east of the property and away from sources that could contaminate the noise data i.e. boiler flue, clothesline, shed workstation. The amenity area did have a small play area for children, however the kit was placed a reasonable distance away from this area. The location was chosen due to its proximity to the east of the proposed development and was also seen to be representative of the other properties in the area to the east. The predominant sounds that were audible during the installation were from the birdsong, distant traffic and some construction noise could also be heard. In general, this location was quiet and rural. The noise meter was located on a grass patch area adjacent to the property, greater than 3.5m from any hard reflecting surface except the ground.

NML5



Reproduced under Google Earth Pro licence

North	South
	
East	**West**
	

Description
The noise monitoring equipment was installed in a location considered to provide representative data for the dwelling to the west of the equipment. The location was chosen due to its proximity to the east of the proposed development and was also seen to be representative of the other properties in the area to the south-east. The predominant sounds that were audible during the installation were from the birdsong, multiple dogs barking, cattle lowing and construction to the north of the property. Wind induced noise from the nearby woodland was not audible. The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

NML6



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North



South



East



West



Description
The location was chosen due to its proximity to the east of the proposed development, and was also seen to be representative of the other properties in the area to the south. The predominant sounds that were audible during the installation were from the birdsong. Secondary noise came from distant engine and beeping noises, which sounded like construction taking place to the south. This property seems to have construction still taking place with a new dwelling being constructed to the west of the property. The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

Noise Monitoring Field Data Sheet

MONITORING LOCATION

Project Title (Project Number)	Killoshulan Wind Farm (IE00061)
Client	MKO
Location Name	NML1
Surveyor(s)	CB
Description	The noise monitoring equipment was installed at a location to the east of the property. The location was chosen due to its proximity to the west of the proposed development. The kit was positioned in what was considered to be a representative external amenity area, away from potential noise contamination from the household.
Comments	The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.
Approximate National Grid Reference	631910, 664977

NOISE MONITORING EQUIPMENT DETAILS

Survey	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM 029	NL52	00932360	16/11/2021
Calibrator	Cal 003	NC-74	35173441	01/04/2022

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	$L_{A9010min}$, $L_{Aeq10min}$	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0101	12:10 07/12/22	10:20 06/01/23	94.0	94.2	0.2	SV1 • Adjacent is a farmyard – tractor & barn noise • Birdsong is strong • Frosty conditions
0102	10:40 06/01/23	11:40 31/01/23	94.0	94.3	0.3	SV2 • Birdsong • Road traffic clearly audible • Cows lowing in adjacent farm SV3 • Birdsong constant but otherwise quiet

PHOTOGRAPHS

North	South
	
East	**West**
	

Noise Monitoring Field Data Sheet

MONITORING LOCATION

Project Title (Project Number)	Killoshulan Wind Farm (IE00061)
Client	MKO
Location Name	NML2
Surveyor(s)	CB
Description	The noise monitoring equipment was installed at a location to the south of the property. The location was chosen due to its proximity to the west of the proposed development. The kit was positioned in what was considered to be a representative area away from potential noise contamination from the household.
Comments	The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.
Approximate National Grid Reference	632301, 667063

NOISE MONITORING EQUIPMENT DETAILS

Survey	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM 049	NL52	00809388	02/07/2022
Calibrator	Cal 003	NC-74	35173441	01/04/2022

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	$L_{A9010min}$, $L_{Aeq10min}$	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0201	15:40 07/12/22	13:00 06/01/23	94.0	94.0	0	SV1 • Birdsong constant • Cattle lowing • Distant traffic
0202	13:10 06/01/23	12:10 31/01/23	94.0	94.0	0	SV2 • Adjacent farm putting down silage • Tractor noise • Birdsong and crows • Windy SV3 • Birdsong constant • Distant traffic • Calm and quiet conditions

PHOTOGRAPHS

North	South
	

East


Noise Monitoring Field Data Sheet

MONITORING LOCATION

Project Title (Project Number)	Killoshulan Wind Farm (IE00061)
Client	MKO
Location Name	NML3
Surveyor(s)	CB
Description	The noise monitoring equipment was installed at a location to the west of the property. The location was chosen due to its proximity to the north of the proposed development. The kit was positioned in what was considered to be a representative area away from potential noise contamination from the household.
Comments	The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.
Approximate National Grid Reference	634614, 668001

NOISE MONITORING EQUIPMENT DETAILS

Survey	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM 040	NL52	01176428	22/11/2021
Calibrator	Cal 003	NC-74	35173441	01/04/2022

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	$L_{A9010min}$, $L_{Aeq10min}$	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0301	15:00 07/12/22	12:30 06/01/23	94.0	94.2	0.2	SV1 • Distant traffic noise from motorway constant • Quiet other than motorway • Birdsong present • Four turbines to the north visible but inaudible
0302	12:50 06/01/23	11:50 31/01/23	94.0	94.1	0.1	SV2 • Noise from vegetation and trees prominent • Windy • Motorway is inaudible SV3 • Wind induced noise from foliage • Windy conditions • Birdsong present

PHOTOGRAPHS

North	South
	
East	**West**
	

Noise Monitoring Field Data Sheet

MONITORING LOCATION

Project Title (Project Number)	Killoshulan Wind Farm (IE00061)
Client	MKO
Location Name	NML4
Surveyor(s)	CB
Description	The noise monitoring equipment was installed at a location to the west of the property. The location was chosen due to its proximity to the north of the proposed development. The kit was positioned in what was considered to be a representative area away from potential noise contamination from the household.
Comments	The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.
Approximate National Grid Reference	636812, 667441

NOISE MONITORING EQUIPMENT DETAILS

Survey	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM 030	NL52	01176428	22/11/2021
Calibrator	Cal 003	NC-74	35173441	01/04/2022

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	$L_{A9010min}$, $L_{Aeq10min}$	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0501	14:30 07/12/22	12:20 06/01/23	94.0	94.0	0	SV1 • Quiet overall • Birdsong present • Distant construction noise to the south-west • Distant road traffic noise
0502	12:30 06/01/23	11:40 31/01/23	94.0	94.0	0	SV2 • Birdsong present • Distant road traffic noise • Distant engine hum SV3 • Wind induced noise in foliage • Windy conditions • Birdsong present

PHOTOGRAPHS

North	South
	
East	**West**
	

Noise Monitoring Field Data Sheet

MONITORING LOCATION

Project Title (Project Number)	Killoshulan Wind Farm (IE00061)
Client	MKO
Location Name	NML5
Surveyor(s)	CB
Description	The noise monitoring equipment was installed at a location to the east of the property. The location was chosen due to its proximity to the east of the proposed development. The kit was positioned in what was considered to be a representative area away from potential noise contamination from the household.
Comments	The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.
Approximate National Grid Reference	636332, 666029

NOISE MONITORING EQUIPMENT DETAILS

Survey	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM 035	NL52	01165339	03/06/2021
Calibrator	Cal 003	NC-74	35173441	01/04/2022

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	$L_{A9010min}$, $L_{Aeq10min}$	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0401	14:00 07/12/22	11:30 06/01/23	94.0	94.0	0	SV1 • Birdsong present • Cattle farm is adjacent to kit • Noise generated from tractor • Multiple dogs barking • Cement blocks being moved to uphill location
0402	11:50 06/01/23	11:20 31/01/23	94.0	94.0	0	SV2 • Quiet in general • Distant road traffic audible • Birdsong present SV3 • Birdsong present • Dogs barking • Quiet otherwise

PHOTOGRAPHS

North	South
	
East	**West**
	

Noise Monitoring Field Data Sheet

MONITORING LOCATION

Project Title (Project Number)	Killoshulan Wind Farm (IE00061)
Client	MKO
Location Name	NML6
Surveyor(s)	CB
Description	The noise monitoring equipment was installed at a location to the west of the property. The location was chosen due to its proximity to the south of the proposed development. The kit was positioned in what was considered to be a representative area away from potential noise contamination from the household.
Comments	The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.
Approximate National Grid Reference	633907, 664409

NOISE MONITORING EQUIPMENT DETAILS

Survey	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM 044	NL52	01165339	03/06/2021
Calibrator	Cal 003	NC-74	35173441	01/04/2022

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	$L_{A9010min}$, $L_{Aeq10min}$	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0601	12:40 07/12/22	11:00 06/01/23	94.0	94.0	0	SV1 • Engine noise in the distance • Distant beeping noise (intermittent) • Birdsong • Area surrounding property is under construction
0602	11:20 06/01/23	11:00 31/01/23	94.0	94.1	0.1	SV2 • Digger activity close to noise monitoring kit . This was only for one day. • Birdsong • Trees noisy SV3 • Birdsong present • Quiet otherwise

PHOTOGRAPHS

North	South
	
East	**West**
	

Annex 3 – Calibration/Conformance Certificates for Sound Level Meters and Calibrator

- Sound Level Meter/Calibrator Calibration Certificates

NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to	TNEI Group Floor 7 West One Forth Banks Newcastle Upon Tyne England
Attention of	Ewan Watson

Certificate Number	**212123**
Item Calibrated	Rion NL-52 Sound Level Meter, complete with Rion UC59 Microphone
Serial Numbers	01165339 (Sound Level Meter) and 10558 (Microphone)
ID Number	SLM035
Order Number	1685
Date Received	01 Jun 2021
NML Procedure Number	AP-NM-09
Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 11 Jun 2021] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 11 Jun 2021] B&K 4134 Measuring Microphone, No. 0743 [Cal Due Date: 27 May 2022] B&K 4228 Pistonphone, No. 0741 [Cal Due Date: 26 May 2022] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 02 Sep 2021]

Calibrated by	David Fleming	**Approved by**	Paul Hetherington
Date of Calibration	03 Jun 2021	**Date of Issue**	03 Jun 2021

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

Standard Terms & Conditions for Calibration, Testing and Consultancy Assignments

1. Reports issued by the National Metrology Laboratory Division of NSAI are copyright to NSAI and shall not be used, either in whole or in part, for the purposes of advertising, publicity or litigation without the written consent of the Chief Executive or his nominee.
2. No action or legal proceeding shall be taken (except in the case of wilful neglect or default) against NSAI or the Board or any member of the Board or any committee appointed by the Board or any officer or servant of NSAI, by reason of or arising out of the carrying out of any research, investigation, test or analysis or the publication of the results thereof in the name of NSAI.
3. NSAI will not release any information received from or provided to the client in relation to this report except as may be required by law, including the Freedom of Information Act 1997, or as specified by the client.
4. This certificate relates only to the item(s) described on the front page and shall not be reproduced, except in full.
5. This contract is governed by the laws of Ireland whose courts shall have exclusive jurisdiction.

Decision Rule and Compliance Statement

The rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement is known as a decision rule. The rule used by NSAI NML follows the guidelines set out in the document ILAC-G8:09/2019 published by the International Laboratory Accreditation Co-operation. Further information on the decision rule is available on the NSAI website:
(https://www.nsai.ie/images/uploads/metrology/Decision_Rule.pdf).

The symbols used to indicate the state of compliance of the instrument calibration and their meanings are given in the following table.

Statement of compliance and associated symbol	Description
PASS	The absence of a symbol indicates that the measurement result is inside the specification limit by a margin greater than its associated expanded uncertainty; the instrument meets its accuracy specification.
Conditional PASS Symbol: **£**	The measurement result is inside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state compliance. There is a risk that the instrument fails to meet its specification.
Conditional FAIL Symbol: **&**	The measurement result is on the specification limit or is outside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state non-compliance.
FAIL Symbol: **$**	The measurement result is outside the specification limit by a margin greater than its associated measurement uncertainty; the instrument fails to meet its accuracy specification.
Unc. > Spec Symbol: **#**	The expanded measurement uncertainty is greater than the instrument's accuracy specification. It is not possible to determine compliance or otherwise with the specification. The user should expand the in-use accuracy specification to make allowance for the calibration uncertainty.
Outside CIPM MRA Symbol: **¢**	Indicates that the calibration result is traceable to SI units but is not currently included in the table of NSAI NML's calibration and measurement capabilities approved under the CIPM MRA.

Where no specification exists, and none is prescribed by the client, the Decision Rule policy of the NSAI NML does not apply and results are provided without a statement of compliance.

Ambient laboratory conditions:

Barometric Pressure:	101.0 kPa ± 0.5 kPa
Temperature:	22.6 °C ± 1 °C
Relative Humidity:	45 %RH ± 5%RH

Summary of Results:

The following table summarises the results of the verification tests. The detailed results are given in the subsequent tables.

IEC 61672 Test	Test Title	Status
10	Self-generated Noise (Electrical)	/
11	Acoustical Signal	PASS
12	Frequency Weighting	PASS
13	Frequency and Time Weighting @ 1 kHz	PASS
14	Level Linearity Test on Reference Level Range	PASS
15	Level Linearity including Range Control	n/a
16	Toneburst Response	PASS
17	Peak C	PASS
18	Overload Indication	PASS

Detailed Results.

Prior to carrying out the verification tests the sound level meter was adjusted to read correctly for pressure response through application of a reference acoustical calibrator.

Self-generated Noise Test (Electrical Input) (Test #10) [1]

Range: Single Range Instrument
Mode: Leq

SLM Configuration	Freq. Weighting Network	SLM Reading[2]
Microphone installed	A	17.8 dB
Microphone replaced by electrical signal device and Fitted with a short-circuit	A	16.2 (U/R)[3]
	C	23.9
	Z (Linear)	30.4

Acoustical signal test of a frequency weighting (Test #11) [1]

Range: Single Range Instrument
Frequency Weighting setting: C
Time Weighting response: Slow

Input Level[4]	Input Freq.	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
94.0 dB	1000 Hz	0.0 dB (Ref)	1.1 dB	0.3 dB
	125	+0.1	1.5	0.3
	4000[7]	+0.2	1.6	0.5

Electrical signal tests of frequency weightings (Test #12)[1]

Range: Single Range Instrument

Freq. (nominal)	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
A-Weighting					
63 Hz	93 dB	93.0 dB	0.0 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	91.8	-1.2	3.5, -17	0.20
C-Weighting					
63 Hz	93 dB	93.0 dB	0.0 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.1	+0.1	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	93.3	+0.3	3.5, -17	0.20
LIN Weighting					
63 Hz	93 dB	93.0 dB	0.0 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.0	0.0	2.1, -3.1	0.20
16000	93	93.0	0.0	3.5, -17	0.20

Frequency and time weightings at 1 kHz (Test #13)[1]

Range: Single Range Instrument

Time Weighting Setting	Frequency Weighting Setting	Input Level[4]	Deviation from Reference	Tolerance[6] (±)	Uncertainty. of Measurement (±)
Fast	A	94.0 dB	0.0 dB	0.4 dB	0.20 dB
	C		0.0	0.4	0.20
	Z		0.0	0.4	0.20
Slow	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
Leq.	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
SEL	A	114.0 dB	0.0 dB	0.3 dB	0.20 dB

Linearity level on the reference range (Test #14)[1]

Range: Single Range Instrument
Input Frequency: 1 kHz
SLM Measuring Mode: SPL

Range	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
130 dB	94 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	99	99.0	0.0	1.1	0.20
	104	104.0	0.0	1.1	0.20
	109	109.0	0.0	1.1	0.20
	114	114.0	0.0	1.1	0.20
	119	119.0	0.0	1.1	0.20
	124	124.0	0.0	1.1	0.20
	129	129.0	0.0	1.1	0.20
	132	132.0	0.0	1.1	0.20
	133	133.0	0.0	1.1	0.20
	134	134.1	+0.1	1.1	0.20
	135	135.1	+0.1	1.1	0.20
	136	136.1	+0.1	1.1	0.20
	94	94.0	0.0	1.1	0.20
	89	89.0	0.0	1.1	0.20
	84	84.0	0.0	1.1	0.21
	79	79.0	0.0	1.1	0.21
	74	74.0	0.0	1.1	0.21
	69	69.0	0.0	1.1	0.21
	64	64.0	0.0	1.1	0.21
	59	59.0	0.0	1.1	0.21
	54	54.0	0.0	1.1	0.21
	49	49.0	0.0	1.1	0.21
	44	44.0	0.0	1.1	0.21
	39	39.0	0.0	1.1	0.21
	34	34.1	+0.1	1.1	0.21
	30	30.0	0.0	1.1	0.21
	29	29.1	+0.1	1.1	0.21
	28	28.0	0.0	1.1	0.21
	27	27.1	+0.1	1.1	0.21
	26	26.1	+0.1	1.1	0.21

Toneburst response (Test #16)[1]

Range: Single Range Instrument

Burst Type	SLM Mode	Input Level[4]	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
200 ms	LAF	116.0 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAF	99.0	0.0	1.3	0.3
0.25 msec	LAF	90.0	-0.1	1.3, -3.3	0.3
200 ms	LAS	109.6 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAS	90.0	0.0	1.3, -1.8	0.3
200 ms	SEL	110.0 dB	0.0 dB	0.8 dB	0.3 dB
2 .0 ms	SEL	90.3	0.0	1.3	0.3
0.25 ms	SEL	81.0	-0.1	1.3, -3.3	0.3

Peak C sound level (Test #17)[1]

Range: Single Range Instrument

Pulse Type	Pulse Frequency	Input Level[4] (peak value)	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
1 cycle	8 kHz	133.4 dB	-0.1 dB	2.4 dB	0.35 dB
Pos. ½ cycle	500 Hz	132.4 dB	-0.2 dB	1.4 dB	0.35 dB
Neg. ½ cycle	500 Hz	132.4 dB	-0.2 dB	1.4 dB	0.35 dB

Overload indication (Test #18)[1]

Range: Single Range Instrument
SLM Measuring Mode: LAEq

Test description	Overload occurred at (±)	Meas. Diff. (Pos – Neg)	Tolerance[6] (±)	Uncertainty of Measurement (±)
Positive ½ cycle at 4 kHz	139.6 dB	-	-	-
Negative ½ cycle at 4 kHz	139.3 dB	-	-	-
Level difference of positive & negative pulses	-	0.3 dB	1.8 dB	0.30 dB

Notes:

(1) The test number, given in parentheses after the section heading, refers to the relevant clause in IEC 61672-3 (2006).

(2) SLM denotes Sound Level Meter

(3) U/R denotes Under Range

(4) All input levels are given in dB relative to a 20 µPa reference level.

(5) The SLM Error of Indication is defined as follows:
SLM Error of Indication = SLM Reading - Input Level

(6) The figures in the column labelled 'Tolerance' are the acceptance limits given in IEC 61672-1(2003). These tolerance limits include an allowance for the maximum expanded uncertainty of the test laboratory. The criteria for compliance with the tolerance is that the measurement result, extended by its associated uncertainty, lies within the specified limits.

(7) Microphone response at 4 kHz was measured using an electrostatic actuator. A Free Field correction of +1.2 dB was applied to the measured actuator response.
This measurement is not included in NML's tables of Calibration and Measurement Capabilities, approved under the CIPM MRA.
For information, the measured sensitivity and frequency response of the microphone is given in an addendum to this certificate.

Comments:

Where used in the results table, further information on the meaning of symbols is given in the table on page 2 of this certificate.

The instrument was found to meet the requirements of IEC 61672-1 (2003) in accordance with the verification procedures set out in IEC 61672-3 (2006) at the time of calibration.

The reported measurement results are traceable, via national standards maintained by NSAI National Metrology Laboratory (NML) or by other national metrology institutes, to internationally accepted realisations of the SI units.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%. It has been determined in accordance with the "Guide to the Expression of Uncertainty in Measurement (GUM)". These uncertainties apply only to the measured values and do not carry any implication regarding the long-term stability of the instrument.

NSAI
National Metrology Laboratory

Addendum to Certificate 212123

Rion
Type: UC59

Serial no: 10558

Sensitivity: 49.3 mV/Pa
-26.1 ±0.10 dB re. 1 V/Pa

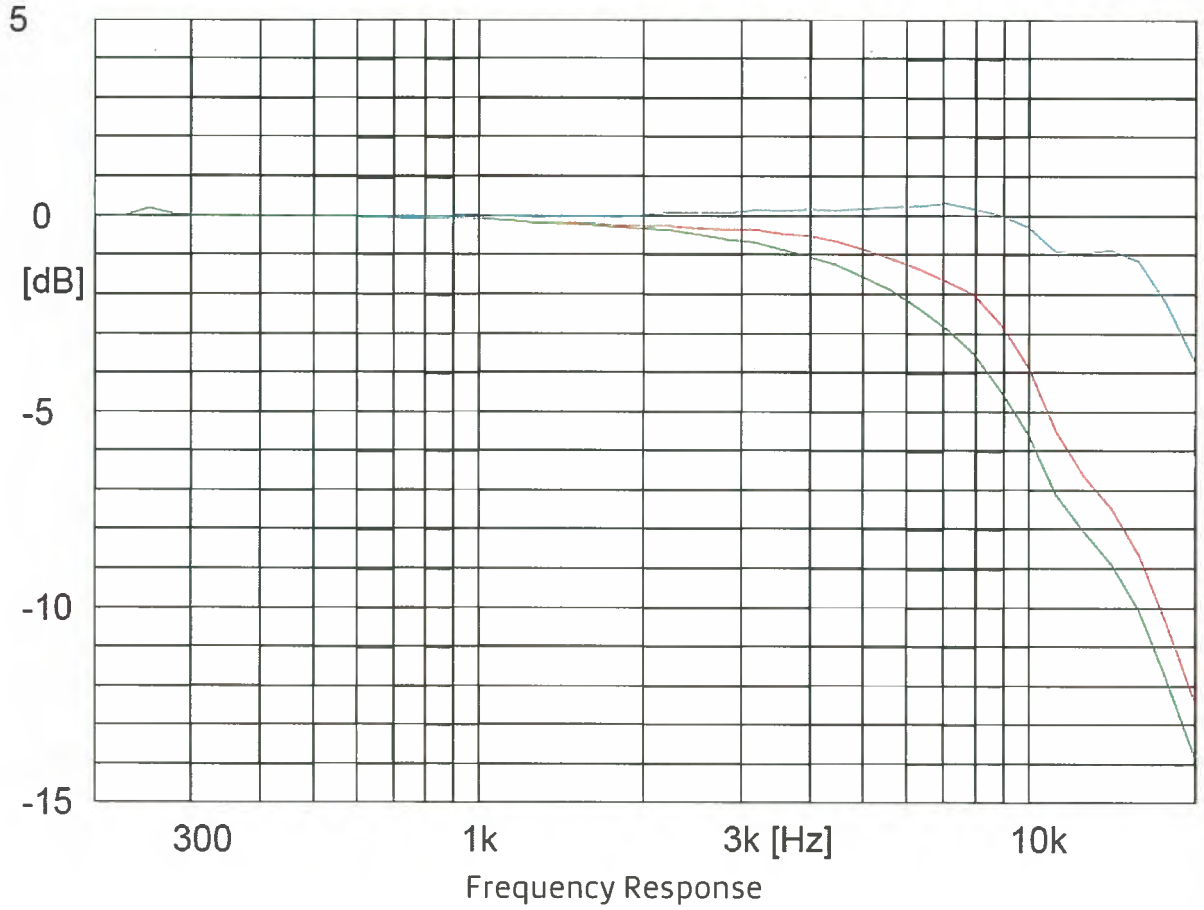
Date: 03/06/2021

Measurement conditions:

Polarisation voltage:	0.0 V
Pressure:	100.94 ±0.03 kPa
Temperature:	22.2 ±1.2 °C
Relative humidity:	51.1 ±2.7 %RH

Results are normalized to the reference conditions.

Free field response
Diffuse field response
Pressure (Actuator) response



Frequency Response

NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to	TNEI Ireland Limited Unit S12 Synergy Centre Technological University Dublin Campus Tallaght Dublin D24 A386
Attention of	Ewan Watson

Certificate Number	**214286**
Item Calibrated	Rion NL-52 Sound Level Meter, complete with Rion UC59 Microphone
Serial Numbers	00643022 (Sound Level Meter) and 06802 (Microphone)
ID Number	SLM030
Order Number	3
Date Received	18 Oct 2021
NML Procedure Number	AP-NM-09
Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 10 Jun 2022] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 10 Jun 2022] B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023] B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 07 Oct 2022]

Calibrated by	David Fleming	**Approved by**	Paul Hetherington
Date of Calibration	17 Nov 2021	**Date of Issue**	18 Nov 2021

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

Standard Terms & Conditions for Calibration, Testing and Consultancy Assignments

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5. This contract is governed by the laws of Ireland whose courts shall have exclusive jurisdiction.

Decision Rule and Compliance Statement

The rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement is known as a decision rule. The rule used by NSAI NML follows the guidelines set out in the document ILAC-G8:09/2019 published by the International Laboratory Accreditation Co-operation. Further information on the decision rule is available on the NSAI website:
(https://www.nsai.ie/images/uploads/metrology/Decision_Rule.pdf).

The symbols used to indicate the state of compliance of the instrument calibration and their meanings are given in the following table.

Statement of compliance and associated symbol	Description
PASS	The absence of a symbol indicates that the measurement result is inside the specification limit by a margin greater than its associated expanded uncertainty; the instrument meets its accuracy specification.
Conditional PASS Symbol: **£**	The measurement result is inside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state compliance. There is a risk that the instrument fails to meet its specification.
Conditional FAIL Symbol: **&**	The measurement result is on the specification limit or is outside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state non-compliance.
FAIL Symbol: **$**	The measurement result is outside the specification limit by a margin greater than its associated measurement uncertainty; the instrument fails to meet its accuracy specification.
Unc. > Spec Symbol: **#**	The expanded measurement uncertainty is greater than the instrument's accuracy specification. It is not possible to determine compliance or otherwise with the specification. The user should expand the in-use accuracy specification to make allowance for the calibration uncertainty.
Outside CIPM MRA Symbol: **¢**	Indicates that the calibration result is traceable to SI units but is not currently included in the table of NSAI NML's calibration and measurement capabilities approved under the CIPM MRA.

Where no specification exists, and none is prescribed by the client, the Decision Rule policy of the NSAI NML does not apply and results are provided without a statement of compliance.

Ambient laboratory conditions:

Barometric Pressure:	102.0 kPa ± 0.5 kPa
Temperature:	20.8 °C ± 1 °C
Relative Humidity:	39 %RH ± 5%RH

Summary of Results:

The following table summarises the results of the verification tests. The detailed results are given in the subsequent tables.

IEC 61672 Test	Test Title	Status
10	Self-generated Noise (Electrical)	/
11	Acoustical Signal	PASS
12	Frequency Weighting	PASS
13	Frequency and Time Weighting @ 1 kHz	PASS
14	Level Linearity Test on Reference Level Range	PASS
15	Level Linearity including Range Control	n/a
16	Toneburst Response	PASS
17	Peak C	PASS
18	Overload Indication	PASS

Detailed Results.

Prior to carrying out the verification tests the sound level meter was adjusted to read correctly for pressure response through application of a reference acoustical calibrator.

Self-generated Noise Test (Electrical Input) (Test #10) (1)

Range: Single Range Instrument
Mode: Leq

SLM Configuration	Freq. Weighting Network	SLM Reading(2)
Microphone installed	A	18.9 dB (U/R)(3)
Microphone replaced by electrical signal device and Fitted with a short-circuit	A	19.4 (U/R)(3)
	C	25.9
	Z (Linear)	26.4

Acoustical signal test of a frequency weighting (Test #11) (1)

Range: Single Range Instrument
Frequency Weighting setting: C
Time Weighting response: Slow

Input Level(4)	Input Freq.	SLM Error of Indication(5)	Tolerance(6) (±)	Uncertainty of Measurement (±)
94.0 dB	1000 Hz	0.0 dB (Ref)	1.1 dB	0.3 dB
	125	+0.2	1.5	0.3
	4000(7)	+0.5	1.6	0.5

Electrical signal tests of frequency weightings (Test #12)[1]

Range: Single Range Instrument

Freq. (nominal)	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
A-Weighting					
63 Hz	93 dB	92.9 dB	-0.1 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	91.8	-1.2	3.5, -17	0.20
C-Weighting					
63 Hz	93 dB	92.7 dB	-0.3 dB	1.5 dB	0.20 dB
125	93	93.1	+0.1	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.1	+0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	92.9	-0.1	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	92.0	-1.0	3.5, -17	0.20
LIN Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.0	0.0	2.1, -3.1	0.20
16000	93	93.0	0.0	3.5, -17	0.20

Frequency and time weightings at 1 kHz (Test #13)[1]

Range: Single Range Instrument

Time Weighting Setting	Frequency Weighting Setting	Input Level[4]	Deviation from Reference	Tolerance[6] (±)	Uncertainty. of Measurement (±)
Fast	A	94.0 dB	0.0 dB	0.4 dB	0.20 dB
	C		+0.1	0.4	0.20
	Z		+0.1	0.4	0.20
Slow	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
Leq.	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
SEL	A	114.0 dB	0.0 dB	0.3 dB	0.20 dB

Linearity level on the reference range (Test #14)[1]

Range: Single Range Instrument
Input Frequency: 1 kHz
SLM Measuring Mode: SPL

Range	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
130 dB	94 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	99	99.0	0.0	1.1	0.20
	104	104.0	0.0	1.1	0.20
	109	109.0	0.0	1.1	0.20
	114	114.0	0.0	1.1	0.20
	119	119.0	0.0	1.1	0.20
	124	124.0	0.0	1.1	0.20
	129	129.0	0.0	1.1	0.20
	132	132.0	0.0	1.1	0.20
	133	133.0	0.0	1.1	0.20
	134	134.0	0.0	1.1	0.20
	135	135.0	0.0	1.1	0.20
	136	136.0	0.0	1.1	0.20
	94	94.0	0.0	1.1	0.20
	89	89.0	0.0	1.1	0.20
	84	84.0	0.0	1.1	0.21
	79	79.0	0.0	1.1	0.21
	74	74.0	0.0	1.1	0.21
	69	69.0	0.0	1.1	0.21
	64	64.0	0.0	1.1	0.21
	59	59.0	0.0	1.1	0.21
	54	53.9	-0.1	1.1	0.21
	49	49.0	0.0	1.1	0.21
	44	44.0	0.0	1.1	0.21
	39	39.0	0.0	1.1	0.21
	34	34.1	+0.1	1.1	0.21
	30	30.2	+0.2	1.1	0.21
	29	29.3	+0.3	1.1	0.21
	28	28.3	+0.3	1.1	0.21
	27	27.4	+0.4	1.1	0.21
	26	26.5	+0.5	1.1	0.21
	25	25.6	+0.6	1.1	0.21

Toneburst response (Test #16)[1]

Range: Single Range Instrument

Burst Type	SLM Mode	Input Level[4]	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
200 ms	LAF	135.0 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAF	118.0	-0.1	1.3	0.3
0.25 msec	LAF	109.0	-0.1	1.3, -3.3	0.3
200 ms	LAS	128.6 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAS	109.0	0.0	1.3, -1.8	0.3
200 ms	SEL	129.0 dB	0.0 dB	0.8 dB	0.3 dB
2 .0 ms	SEL	109.3	-0.1	1.3	0.3
0.25 ms	SEL	100.0	-0.2	1.3, -3.3	0.3

Peak C sound level (Test #17)[1]

Range: Single Range Instrument

Pulse Type	Pulse Frequency	Input Level[4] (peak value)	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
1 cycle	8 kHz	130.4 dB	-0.5 dB	2.4 dB	0.35 dB
Pos. ½ cycle	500 Hz	132.4 dB	-0.4 dB	1.4 dB	0.35 dB
Neg. ½ cycle	500 Hz	132.4 dB	-0.3 dB	1.4 dB	0.35 dB

Overload indication (Test #18)[1]

Range: Single Range Instrument
SLM Measuring Mode: LAEq

Test description	Overload occurred at (±)	Meas. Diff. (Pos – Neg)	Tolerance[6] (±)	Uncertainty of Measurement (±)
Positive ½ cycle at 4 kHz	139.6 dB	-	-	-
Negative ½ cycle at 4 kHz	139.4 dB	-	-	-
Level difference of positive & negative pulses	-	0.2 dB	1.8 dB	0.30 dB

Notes:

(1) The test number, given in parentheses after the section heading, refers to the relevant clause in IEC 61672-3 (2006).

(2) SLM denotes Sound Level Meter

(3) U/R denotes Under Range

(4) All input levels are given in dB relative to a 20 µPa reference level.

(5) The SLM Error of Indication is defined as follows:
SLM Error of Indication = SLM Reading - Input Level

(6) The figures in the column labelled 'Tolerance' are the acceptance limits given in IEC 61672-1(2003). These tolerance limits include an allowance for the maximum expanded uncertainty of the test laboratory. The criteria for compliance with the tolerance is that the measurement result, extended by its associated uncertainty, lies within the specified limits.

(7) Microphone response at 4 kHz was measured using an electrostatic actuator. A Free Field correction of +1.2 dB was applied to the measured actuator response.
This measurement is not included in NML's tables of Calibration and Measurement Capabilities, approved under the CIPM MRA.
For information, the measured sensitivity and frequency response of the microphone is given in an addendum to this certificate.

Comments:

Where used in the results table, further information on the meaning of symbols is given in the table on page 2 of this certificate.

The instrument was found to meet the requirements of IEC 61672-1 (2003) in accordance with the verification procedures set out in IEC 61672-3 (2006) at the time of calibration.

The reported measurement results are traceable, via national standards maintained by NSAI National Metrology Laboratory (NML) or by other national metrology institutes, to internationally accepted realisations of the SI units.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%. It has been determined in accordance with the "Guide to the Expression of Uncertainty in Measurement (GUM)". These uncertainties apply only to the measured values and do not carry any implication regarding the long-term stability of the instrument.

NSAI
National Metrology Laboratory

Addendum to Certificate 214286

Rion
Type: UC59

Serial no: 06802

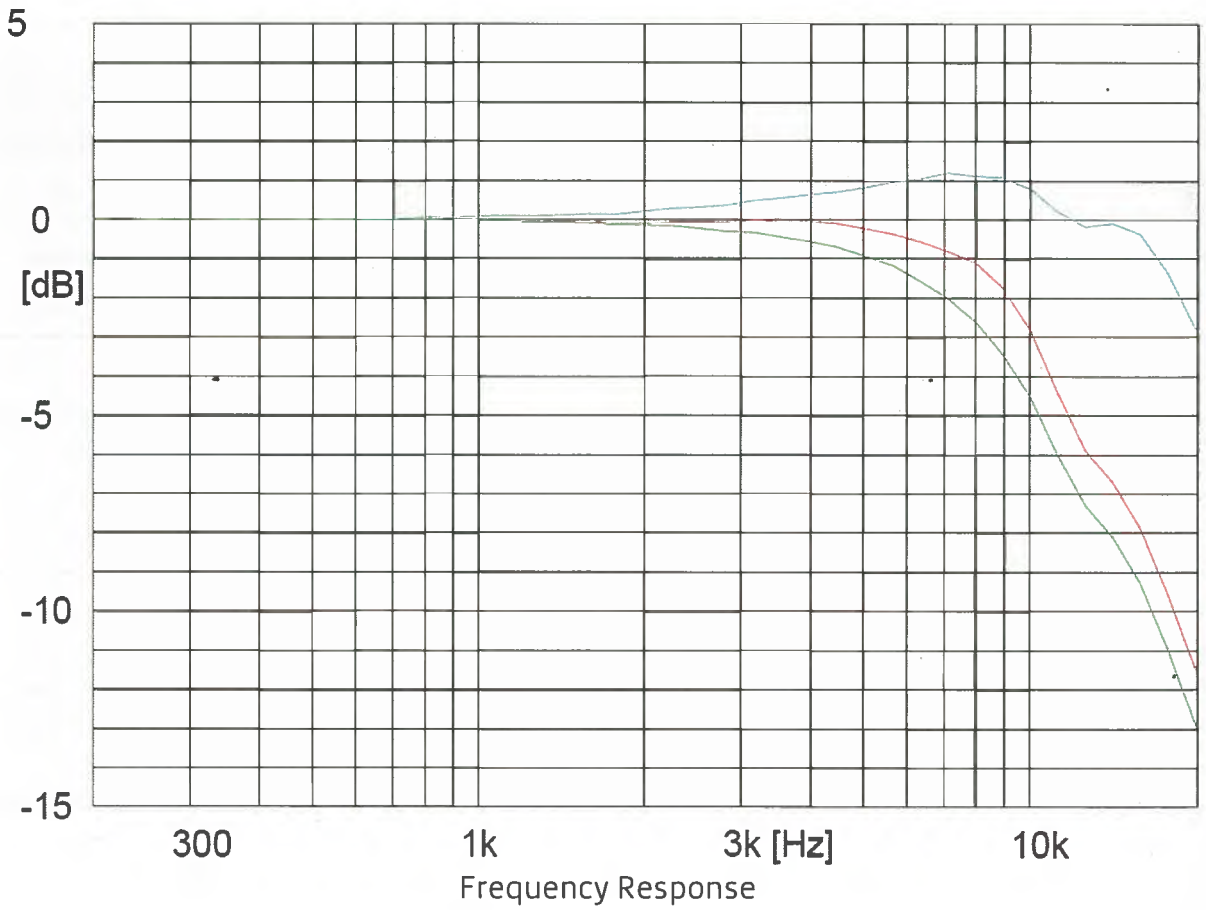
Sensitivity: 39.3 mV/Pa
-28.1 ±0.01 dB re. 1 V/Pa

Date: 17/11/2021

Measurement conditions:	
Polarisation voltage:	0.0 V
Pressure:	101.94 ±0.00 kPa
Temperature:	20.7 ±1.1 °C
Relative humidity:	39.3 ±2.1 %RH

Results are normalized to the reference conditions.

Free field response
Diffuse field response
Pressure (Actuator) response



Frequency Response

NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to	TNEI Ireland Limited Unit S12 Synergy Centre Technological University Dublin Campus Tallaght Dublin D24 A386
Attention of	Ewan Watson

Certificate Number	**214285**
Item Calibrated	Rion NL-52 Sound Level Meter, complete with Rion UC59 Microphone
Serial Numbers	01176428 (Sound Level Meter) and 12471 (Microphone)
ID Number	SLM040
Order Number	3
Date Received	18 Oct 2021
NML Procedure Number	AP-NM-09
Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 10 Jun 2022] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 10 Jun 2022] B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023] B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 07 Oct 2022]

Calibrated by	David Fleming	**Approved by**	Paul Hetherington
Date of Calibration	22 Nov 2021	**Date of Issue**	22 Nov 2021

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

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Decision Rule and Compliance Statement

The rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement is known as a decision rule. The rule used by NSAI NML follows the guidelines set out in the document ILAC-G8:09/2019 published by the International Laboratory Accreditation Co-operation. Further information on the decision rule is available on the NSAI website:
(https://www.nsai.ie/images/uploads/metrology/Decision_Rule.pdf).

The symbols used to indicate the state of compliance of the instrument calibration and their meanings are given in the following table.

Statement of compliance and associated symbol	Description
PASS	The absence of a symbol indicates that the measurement result is inside the specification limit by a margin greater than its associated expanded uncertainty; the instrument meets its accuracy specification.
Conditional PASS Symbol: **£**	The measurement result is inside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state compliance. There is a risk that the instrument fails to meet its specification.
Conditional FAIL Symbol: **&**	The measurement result is on the specification limit or is outside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state non-compliance.
FAIL Symbol: **$**	The measurement result is outside the specification limit by a margin greater than its associated measurement uncertainty; the instrument fails to meet its accuracy specification.
Unc. > Spec Symbol: **#**	The expanded measurement uncertainty is greater than the instrument's accuracy specification. It is not possible to determine compliance or otherwise with the specification. The user should expand the in-use accuracy specification to make allowance for the calibration uncertainty.
Outside CIPM MRA Symbol: **¢**	Indicates that the calibration result is traceable to SI units but is not currently included in the table of NSAI NML's calibration and measurement capabilities approved under the CIPM MRA.

Where no specification exists, and none is prescribed by the client, the Decision Rule policy of the NSAI NML does not apply and results are provided without a statement of compliance.

Ambient laboratory conditions:

Barometric Pressure:	103.1 kPa ± 0.5 kPa
Temperature:	22.1 °C ± 1 °C
Relative Humidity:	30 %RH ± 5%RH

Summary of Results:

The following table summarises the results of the verification tests. The detailed results are given in the subsequent tables.

IEC 61672 Test	Test Title	Status
10	Self-generated Noise (Electrical)	/
11	Acoustical Signal	PASS
12	Frequency Weighting	PASS
13	Frequency and Time Weighting @ 1 kHz	PASS
14	Level Linearity Test on Reference Level Range	PASS
15	Level Linearity including Range Control	n/a
16	Toneburst Response	PASS
17	Peak C	PASS
18	Overload Indication	PASS

Detailed Results.

Prior to carrying out the verification tests the sound level meter was adjusted to read correctly for pressure response through application of a reference acoustical calibrator.

Self-generated Noise Test (Electrical Input) (Test #10) (1)

Range: Single Range Instrument
Mode: Leq

SLM Configuration	Freq. Weighting Network	SLM Reading(2)
Microphone installed	A	19.4 dB (U/R)(3)
Microphone replaced by electrical signal device and Fitted with a short-circuit	A	18.9 (U/R)(3)
	C	24.4
	Z (Linear)	25.9

Acoustical signal test of a frequency weighting (Test #11) (1)

Range: Single Range Instrument
Frequency Weighting setting: C
Time Weighting response: Slow

Input Level(4)	Input Freq.	SLM Error of Indication(5)	Tolerance(6) (±)	Uncertainty of Measurement (±)
94.0 dB	1000 Hz	0.0 dB (Ref)	1.1 dB	0.3 dB
	125	+0.2	1.5	0.3
	4000(7)	+0.5	1.6	0.5

Electrical signal tests of frequency weightings (Test #12)[1]

Range: Single Range Instrument

Freq. (nominal)	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
A-Weighting					
63 Hz	93 dB	92.9 dB	-0.1 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	92.9	-0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	91.8	-1.2	3.5, -17	0.20
C-Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	92.9	-0.1	1.6	0.20
8000	93	93.0	0.0	2.1, -3.1	0.20
16000	93	91.9	-1.1	3.5, -17	0.20
LIN Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.1	+0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.1	+0.1	1.6	0.20
4000	93	93.1	+0.1	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	93.1	+0.1	3.5, -17	0.20

Frequency and time weightings at 1 kHz (Test #13)[1]

Range: Single Range Instrument

Time Weighting Setting	Frequency Weighting Setting	Input Level[4]	Deviation from Reference	Tolerance[6] (±)	Uncertainty. of Measurement (±)
Fast	A	94.0 dB	0.0 dB	0.4 dB	0.20 dB
	C		+0.1	0.4	0.20
	Z		+0.2	0.4	0.20
Slow	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
Leq.	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
SEL	A	114.0 dB	0.0 dB	0.3 dB	0.20 dB

Linearity level on the reference range (Test #14)[1]

Range: Single Range Instrument
Input Frequency: 1 kHz
SLM Measuring Mode: SPL

Range	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
130 dB	94 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	99	99.0	0.0	1.1	0.20
	104	104.0	0.0	1.1	0.20
	109	109.0	0.0	1.1	0.20
	114	114.0	0.0	1.1	0.20
	119	119.0	0.0	1.1	0.20
	124	124.0	0.0	1.1	0.20
	129	129.0	0.0	1.1	0.20
	132	132.0	0.0	1.1	0.20
	133	133.0	0.0	1.1	0.20
	134	134.0	0.0	1.1	0.20
	135	135.0	0.0	1.1	0.20
	136	136.0	0.0	1.1	0.20
	94	94.0	0.0	1.1	0.20
	89	89.0	0.0	1.1	0.20
	84	84.0	0.0	1.1	0.21
	79	79.0	0.0	1.1	0.21
	74	74.0	0.0	1.1	0.21
	69	69.0	0.0	1.1	0.21
	64	64.0	0.0	1.1	0.21
	59	59.0	0.0	1.1	0.21
	54	53.9	-0.1	1.1	0.21
	49	49.0	0.0	1.1	0.21
	44	44.0	0.0	1.1	0.21
	39	39.0	0.0	1.1	0.21
	34	34.1	+0.1	1.1	0.21
	30	30.2	+0.2	1.1	0.21
	29	29.2	+0.2	1.1	0.21
	28	28.3	+0.3	1.1	0.21
	27	27.4	+0.4	1.1	0.21
	26	26.5	+0.5	1.1	0.21
	25	25.6	+0.6	1.1	0.21

Toneburst response (Test #16)[1]

Range: Single Range Instrument

Burst Type	SLM Mode	Input Level[4]	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
200 ms	LAF	135.0 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAF	118.0	-0.1	1.3	0.3
0.25 msec	LAF	109.0	-0.2	1.3, -3.3	0.3
200 ms	LAS	128.6 dB	-0.1 dB	0.8 dB	0.3 dB
2.0 ms	LAS	109.0	-0.1	1.3, -1.8	0.3
200 ms	SEL	129.0 dB	0.0 dB	0.8 dB	0.3 dB
2 .0 ms	SEL	109.3	0.0	1.3	0.3
0.25 ms	SEL	100.0	-0.2	1.3, -3.3	0.3

Peak C sound level (Test #17)[1]

Range: Single Range Instrument

Pulse Type	Pulse Frequency	Input Level[4] (peak value)	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
1 cycle	8 kHz	130.4 dB	-0.1 dB	2.4 dB	0.35 dB
Pos. ½ cycle	500 Hz	132.4 dB	-0.4 dB	1.4 dB	0.35 dB
Neg. ½ cycle	500 Hz	132.4 dB	-0.3 dB	1.4 dB	0.35 dB

Overload indication (Test #18)[1]

Range: Single Range Instrument
SLM Measuring Mode: LAEq

Test description	Overload occurred at (±)	Meas. Diff. (Pos – Neg)	Tolerance[6] (±)	Uncertainty of Measurement (±)
Positive ½ cycle at 4 kHz	140.1 dB	-	-	-
Negative ½ cycle at 4 kHz	139.6 dB	-	-	-
Level difference of positive & negative pulses	-	0.5 dB	1.8 dB	0.30 dB

Notes:

(1) The test number, given in parentheses after the section heading, refers to the relevant clause in IEC 61672-3 (2006).

(2) SLM denotes Sound Level Meter

(3) U/R denotes Under Range

(4) All input levels are given in dB relative to a 20 µPa reference level.

(5) The SLM Error of Indication is defined as follows:
SLM Error of Indication = SLM Reading - Input Level

(6) The figures in the column labelled 'Tolerance' are the acceptance limits given in IEC 61672-1(2003). These tolerance limits include an allowance for the maximum expanded uncertainty of the test laboratory. The criteria for compliance with the tolerance is that the measurement result, extended by its associated uncertainty, lies within the specified limits.

(7) Microphone response at 4 kHz was measured using an electrostatic actuator. A Free Field correction of +1.2 dB was applied to the measured actuator response.
This measurement is not included in NML's tables of Calibration and Measurement Capabilities, approved under the CIPM MRA.
For information, the measured sensitivity and frequency response of the microphone is given in an addendum to this certificate.

Comments:

Where used in the results table, further information on the meaning of symbols is given in the table on page 2 of this certificate.

The instrument was found to meet the requirements of IEC 61672-1 (2003) in accordance with the verification procedures set out in IEC 61672-3 (2006) at the time of calibration.

The reported measurement results are traceable, via national standards maintained by NSAI National Metrology Laboratory (NML) or by other national metrology institutes, to internationally accepted realisations of the SI units.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%. It has been determined in accordance with the "Guide to the Expression of Uncertainty in Measurement (GUM)". These uncertainties apply only to the measured values and do not carry any implication regarding the long-term stability of the instrument.

NSAI
National Metrology Laboratory

Addendum to Certificate 214285

Rion
Type: UC59

Serial no: 12471

Sensitivity: 39.9 mV/Pa
-28.0 ±0.00 dB re. 1 V/Pa

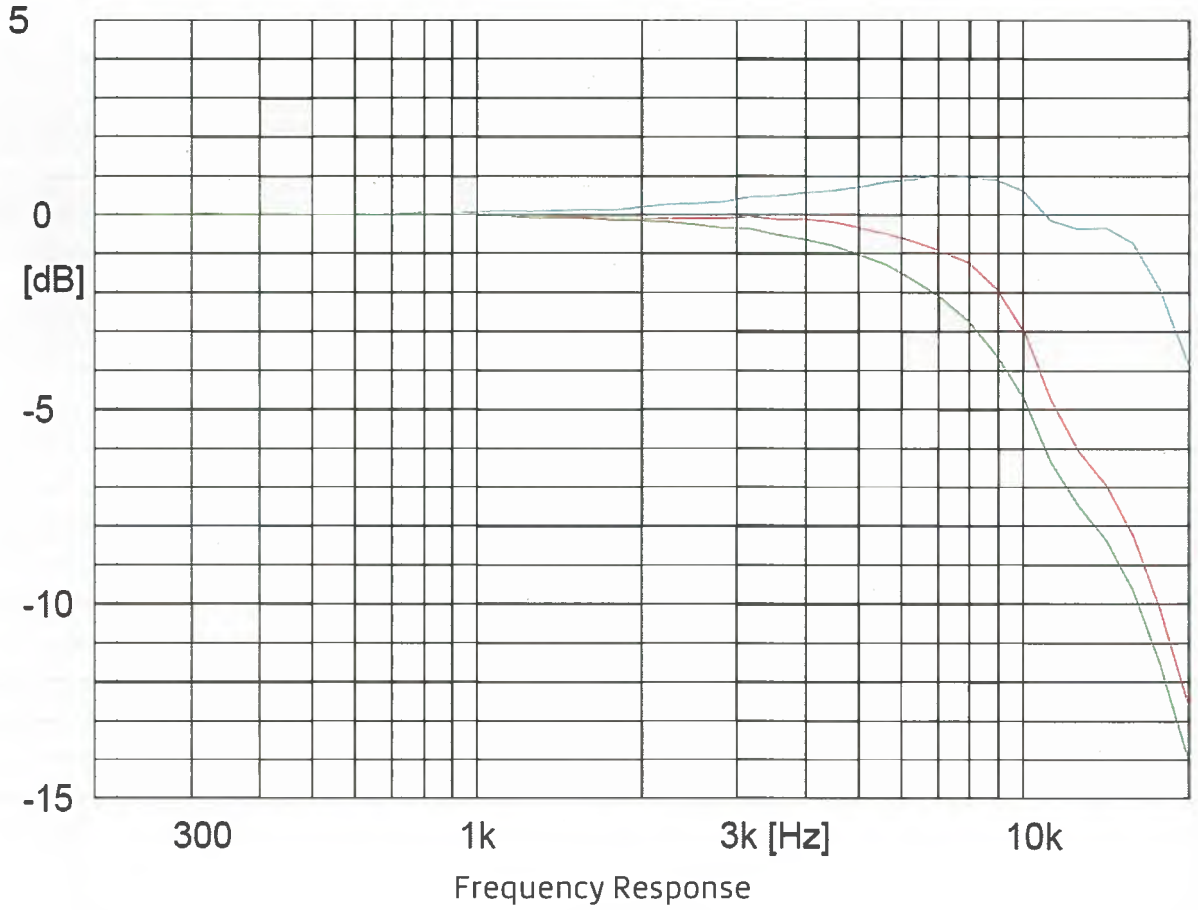
Date: 22/11/2021

Measurement conditions:

Polarisation voltage:	0.0 V
Pressure:	103.10 ±0.00 kPa
Temperature:	20.4 ±1.0 °C
Relative humidity:	31.8 ±2.2 %RH

Results are normalized to the reference conditions.

Free field response
Diffuse field response
Pressure (Actuator) response



Frequency Response

NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to	TNEI Ireland Limited Unit S12 Synergy Centre Technological University Dublin Campus Tallaght Dublin D24 A386
Attention of	Ewan Watson

Certificate Number	**214287**
Item Calibrated	Rion NL-52 Sound Level Meter, complete with Rion UC59 Microphone
Serial Numbers	00386739 (Sound Level Meter) and 12362 (Microphone)
ID Number	SLM044
Order Number	3
Date Received	18 Oct 2021
NML Procedure Number	AP-NM-09
Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 10 Jun 2022] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 10 Jun 2022] B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023] B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 07 Oct 2022]

Calibrated by	David Fleming	**Approved by**	Paul Hetherington
Date of Calibration	17 Nov 2021	**Date of Issue**	18 Nov 2021

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

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4. This certificate relates only to the item(s) described on the front page and shall not be reproduced, except in full.
5. This contract is governed by the laws of Ireland whose courts shall have exclusive jurisdiction.

Decision Rule and Compliance Statement

The rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement is known as a decision rule. The rule used by NSAI NML follows the guidelines set out in the document ILAC-G8:09/2019 published by the International Laboratory Accreditation Co-operation. Further information on the decision rule is available on the NSAI website:
(https://www.nsai.ie/images/uploads/metrology/Decision_Rule.pdf).

The symbols used to indicate the state of compliance of the instrument calibration and their meanings are given in the following table.

Statement of compliance and associated symbol	Description
PASS	The absence of a symbol indicates that the measurement result is inside the specification limit by a margin greater than its associated expanded uncertainty; the instrument meets its accuracy specification.
Conditional PASS Symbol: **£**	The measurement result is inside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state compliance. There is a risk that the instrument fails to meet its specification.
Conditional FAIL Symbol: **&**	The measurement result is on the specification limit or is outside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state non-compliance.
FAIL Symbol: **$**	The measurement result is outside the specification limit by a margin greater than its associated measurement uncertainty; the instrument fails to meet its accuracy specification.
Unc. > Spec Symbol: **#**	The expanded measurement uncertainty is greater than the instrument's accuracy specification. It is not possible to determine compliance or otherwise with the specification. The user should expand the in-use accuracy specification to make allowance for the calibration uncertainty.
Outside CIPM MRA Symbol: **¢**	Indicates that the calibration result is traceable to SI units but is not currently included in the table of NSAI NML's calibration and measurement capabilities approved under the CIPM MRA.

Where no specification exists, and none is prescribed by the client, the Decision Rule policy of the NSAI NML does not apply and results are provided without a statement of compliance.

Ambient laboratory conditions:

Barometric Pressure:	101.9 kPa ± 0.5 kPa
Temperature:	20.6 °C ± 1 °C
Relative Humidity:	39 %RH ± 5%RH

Summary of Results:

The following table summarises the results of the verification tests. The detailed results are given in the subsequent tables.

IEC 61672 Test	Test Title	Status
10	Self-generated Noise (Electrical)	/
11	Acoustical Signal	PASS
12	Frequency Weighting	PASS
13	Frequency and Time Weighting @ 1 kHz	PASS
14	Level Linearity Test on Reference Level Range	PASS
15	Level Linearity including Range Control	n/a
16	Toneburst Response	PASS
17	Peak C	PASS
18	Overload Indication	PASS

Detailed Results.

Prior to carrying out the verification tests the sound level meter was adjusted to read correctly for pressure response through application of a reference acoustical calibrator.

Self-generated Noise Test (Electrical Input) (Test #10) [1]

Range: Single Range Instrument
Mode: Leq

SLM Configuration	Freq. Weighting Network	SLM Reading[2]
Microphone installed	A	17.2 dB (U/R)[3]
Microphone replaced by electrical signal device and Fitted with a short-circuit	A	18.1 (U/R)[3]
	C	24.9
	Z (Linear)	25.9

Acoustical signal test of a frequency weighting (Test #11) [1]

Range: Single Range Instrument
Frequency Weighting setting: C
Time Weighting response: Slow

Input Level[4]	Input Freq.	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
94.0 dB	1000 Hz	0.0 dB (Ref)	1.1 dB	0.3 dB
	125	+0.2	1.5	0.3
	4000[7]	+0.3	1.6	0.5

Electrical signal tests of frequency weightings (Test #12)[1]

Range: Single Range Instrument

Freq. (nominal)	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
A-Weighting					
63 Hz	93 dB	92.9 dB	-0.1 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	92.9	-0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	91.8	-1.2	3.5, -17	0.20
C-Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.1	+0.1	1.4	0.20
1000	93	93.1	+0.1	1.1	0.20
2000	93	93.1	+0.1	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	91.9	-1.1	3.5, -17	0.20
LIN Weighting					
63 Hz	93 dB	93.0 dB	0.0 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	92.9	-0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.0	0.0	2.1, -3.1	0.20
16000	93	93.0	0.0	3.5, -17	0.20

Frequency and time weightings at 1 kHz (Test #13)[1]

Range: Single Range Instrument

Time Weighting Setting	Frequency Weighting Setting	Input Level[4]	Deviation from Reference	Tolerance[6] (±)	Uncertainty. of Measurement (±)
Fast	A	94.0 dB	0.0 dB	0.4 dB	0.20 dB
	C		+0.1	0.4	0.20
	Z		+0.1	0.4	0.20
Slow	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
Leq.	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
SEL	A	114.0 dB	0.0 dB	0.3 dB	0.20 dB

Linearity level on the reference range (Test #14)[1]

Range: Single Range Instrument
Input Frequency: 1 kHz
SLM Measuring Mode: SPL

Range	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
130 dB	94 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	99	99.0	0.0	1.1	0.20
	104	104.0	0.0	1.1	0.20
	109	109.0	0.0	1.1	0.20
	114	114.0	0.0	1.1	0.20
	119	119.0	0.0	1.1	0.20
	124	124.0	0.0	1.1	0.20
	129	129.0	0.0	1.1	0.20
	132	132.0	0.0	1.1	0.20
	133	133.0	0.0	1.1	0.20
	134	134.0	0.0	1.1	0.20
	135	135.0	0.0	1.1	0.20
	136	136.0	0.0	1.1	0.20
	94	94.0	0.0	1.1	0.20
	89	89.0	0.0	1.1	0.20
	84	84.0	0.0	1.1	0.21
	79	79.0	0.0	1.1	0.21
	74	74.0	0.0	1.1	0.21
	69	69.0	0.0	1.1	0.21
	64	64.0	0.0	1.1	0.21
	59	59.0	0.0	1.1	0.21
	54	53.9	-0.1	1.1	0.21
	49	49.0	0.0	1.1	0.21
	44	44.0	0.0	1.1	0.21
	39	39.0	0.0	1.1	0.21
	34	34.1	+0.1	1.1	0.21
	30	30.2	+0.2	1.1	0.21
	29	29.3	+0.3	1.1	0.21
	28	28.3	+0.3	1.1	0.21
	27	27.4	+0.4	1.1	0.21
	26	26.5	+0.5	1.1	0.21
	25	25.5	+0.5	1.1	0.21

Toneburst response (Test #16)[1]

Range: Single Range Instrument

Burst Type	SLM Mode	Input Level[4]	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
200 ms	LAF	135.0 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAF	118.0	-0.1	1.3	0.3
0.25 msec	LAF	109.0	-0.1	1.3, -3.3	0.3
200 ms	LAS	128.6 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAS	109.0	0.0	1.3, -1.8	0.3
200 ms	SEL	129.0 dB	0.0 dB	0.8 dB	0.3 dB
2 .0 ms	SEL	109.3	-0.1	1.3	0.3
0.25 ms	SEL	100.0	-0.2	1.3, -3.3	0.3

Peak C sound level (Test #17)[1]

Range: Single Range Instrument

Pulse Type	Pulse Frequency	Input Level[4] (peak value)	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
1 cycle	8 kHz	130.4 dB	-0.3 dB	2.4 dB	0.35 dB
Pos. ½ cycle	500 Hz	132.4 dB	-0.4 dB	1.4 dB	0.35 dB
Neg. ½ cycle	500 Hz	132.4 dB	-0.3 dB	1.4 dB	0.35 dB

Overload indication (Test #18)[1]

Range: Single Range Instrument
SLM Measuring Mode: LAEq

Test description	Overload occurred at (±)	Meas. Diff. (Pos – Neg)	Tolerance[6] (±)	Uncertainty of Measurement (±)
Positive ½ cycle at 4 kHz	139.6 dB	-	-	-
Negative ½ cycle at 4 kHz	139.6 dB	-	-	-
Level difference of positive & negative pulses	-	0.0 dB	1.8 dB	0.30 dB

Notes:

(1) The test number, given in parentheses after the section heading, refers to the relevant clause in IEC 61672-3 (2006).

(2) SLM denotes Sound Level Meter

(3) U/R denotes Under Range

(4) All input levels are given in dB relative to a 20 µPa reference level.

(5) The SLM Error of Indication is defined as follows:
SLM Error of Indication = SLM Reading - Input Level

(6) The figures in the column labelled 'Tolerance' are the acceptance limits given in IEC 61672-1(2003). These tolerance limits include an allowance for the maximum expanded uncertainty of the test laboratory. The criteria for compliance with the tolerance is that the measurement result, extended by its associated uncertainty, lies within the specified limits.

(7) Microphone response at 4 kHz was measured using an electrostatic actuator. A Free Field correction of +1.2 dB was applied to the measured actuator response.
This measurement is not included in NML's tables of Calibration and Measurement Capabilities, approved under the CIPM MRA.
For information, the measured sensitivity and frequency response of the microphone is given in an addendum to this certificate.

Comments:

Where used in the results table, further information on the meaning of symbols is given in the table on page 2 of this certificate.

The instrument was found to meet the requirements of IEC 61672-1 (2003) in accordance with the verification procedures set out in IEC 61672-3 (2006) at the time of calibration.

The reported measurement results are traceable, via national standards maintained by NSAI National Metrology Laboratory (NML) or by other national metrology institutes, to internationally accepted realisations of the SI units.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%. It has been determined in accordance with the "Guide to the Expression of Uncertainty in Measurement (GUM)". These uncertainties apply only to the measured values and do not carry any implication regarding the long-term stability of the instrument.

NSAI
National Metrology Laboratory

Addendum to Certificate 214287

Rion
Type: UC59

Serial no: 12362

Sensitivity: 46.2 mV/Pa
-26.7 ±0.00 dB re. 1 V/Pa

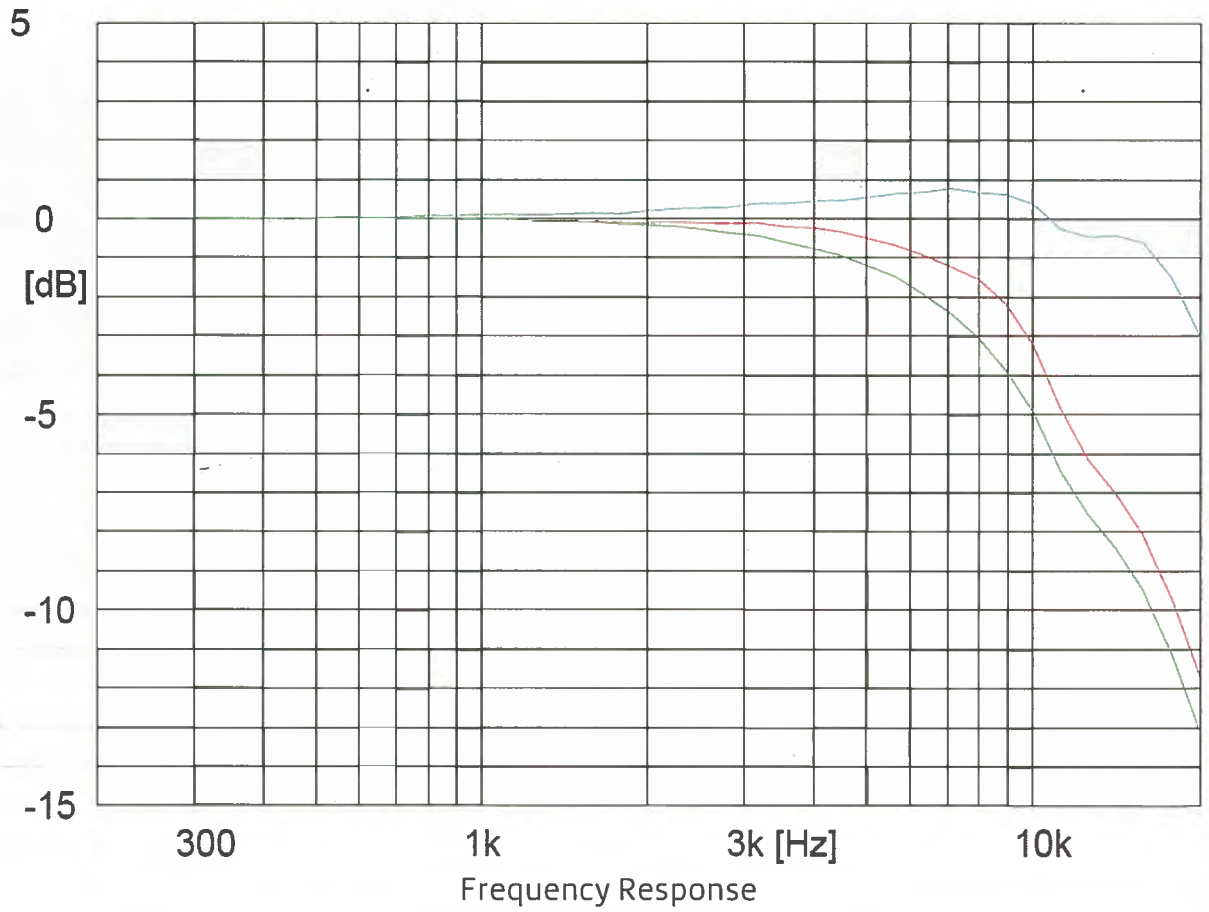
Date: 17/11/2021

Measurement conditions:

Polarisation voltage:	0.0 V
Pressure:	101.94 ±0.01 kPa
Temperature:	20.6 ±1.1 °C
Relative humidity:	39.5 ±2.1 %RH

Results are normalized to the reference conditions.

Free field response
Diffuse field response
Pressure (Actuator) response



Frequency Response

NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to	TNEI Ireland Limited Unit S12 Synergy Centre Technological University Campus Tallaght Dublin 24
Attention of	Ewan Watson

Certificate Number	221332
Item Calibrated	RION NC-74 Sound Level Calibrator
Serial Number	35173441
ID Number	None
Order Number	6
Date Received	24 Mar 2022
NML Procedure Number	AP-NM-13
Method	The above calibrator was allowed to stabilize for a suitable period in laboratory conditions. It was then calibrated by measuring the sound pressure level generated in its measuring cavity. The calibrator's operating frequency was also measured.
Calibration Standards	Norsonic 1504A Calibration System incorporating: Agilent 34401A Digital Multimeter, File No. 0736 [Cal Due: 10 Jun 2022] B & K 4134 Measuring Microphone, File No. 0744 [Cal Due: 03 Jun 2023] B & K 4228 Pistonphone, File No. 0740 [Cal Due: 04 Jun 2023]

Calibrated by David Fleming

Approved by Paul Hetherington

Date of Calibration 01 Apr 2022

Date of Issue 01 Apr 2022

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

Standard Terms & Conditions for Calibration, Testing and Consultancy Assignments

1. Reports issued by the National Metrology Laboratory Division of NSAI are copyright to NSAI and shall not be used, either in whole or in part, for the purposes of advertising, publicity or litigation without the written consent of the Chief Executive or his nominee.
2. No action or legal proceeding shall be taken (except in the case of wilful neglect or default) against NSAI or the Board or any member of the Board or any committee appointed by the Board or any officer or servant of NSAI, by reason of or arising out of the carrying out of any research, investigation, test or analysis or the publication of the results thereof in the name of NSAI.
3. NSAI will not release any information received from or provided to the client in relation to this report except as may be required by law, including the Freedom of Information Act 1997, or as specified by the client.
4. This certificate relates only to the item(s) described on the front page and shall not be reproduced, except in full.
5. This contract is governed by the laws of Ireland whose courts shall have exclusive jurisdiction.

Decision Rule and Compliance Statement

The rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement is known as a decision rule. The rule used by NSAI NML follows the guidelines set out in the document ILAC-G8:09/2019 published by the International Laboratory Accreditation Co-operation. Further information on the decision rule is available on the NSAI website:
(https://www.nsai.ie/images/uploads/metrology/Decision_Rule.pdf).

The symbols used to indicate the state of compliance of the instrument calibration and their meanings are given in the following table.

Statement of compliance and associated symbol	Description
PASS	The absence of a symbol indicates that the measurement result is inside the specification limit by a margin greater than its associated expanded uncertainty; the instrument meets its accuracy specification.
Conditional PASS Symbol: **£**	The measurement result is inside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state compliance. There is a risk that the instrument fails to meet its specification.
Conditional FAIL Symbol: **&**	The measurement result is on the specification limit or is outside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state non-compliance.
FAIL Symbol: **$**	The measurement result is outside the specification limit by a margin greater than its associated measurement uncertainty; the instrument fails to meet its accuracy specification.
Unc. > Spec Symbol: **#**	The expanded measurement uncertainty is greater than the instrument's accuracy specification. It is not possible to determine compliance or otherwise with the specification. The user should expand the in-use accuracy specification to make allowance for the calibration uncertainty.
Outside CIPM MRA Symbol: **¢**	Indicates that the calibration result is traceable to SI units but is not currently included in the table of NSAI NML's calibration and measurement capabilities approved under the CIPM MRA.

Where no specification exists, and none is prescribed by the client, the Decision Rule policy of the NSAI NML does not apply and results are provided without a statement of compliance.

Measuring Conditions:

Ambient Pressure:	(102.0 ± 0.5) kPa
Ambient Temperature:	(21.5 ± 1.0) °C
Ambient Rel. Humidity:	(32 ± 5) %RH

Results:

The measured sound pressure levels (SPL) reported below refer to the ambient laboratory conditions at the time of calibration.

Calibrator Setting	Measured Parameter	Measured Value (1)		Tolerance (3) (±)	Meas. Uncertainty (±)
		Before Adj.	After Adj.		
94 dB	Sound Pressure Level(2)	93.95 dB	*	0.40 dB	0.15 dB
	Frequency	1001.8 Hz	*	10 Hz	0.25 Hz

Notes: (1) * indicates that no calibration adjustment was made.
(2) The measured sound pressure level was that generated in the calibrator's cavity when loaded by the microphone specified on page 1 of this certificate (including protection grid).
(3) Tolerance limits set out in IEC 60942:2003, Sound Calibrators, Class 1.

Comments:

Where used in the results table, further information on the meaning of symbols is given in the table on page 2 of this certificate.

The instrument was found to comply with the requirements of IEC 60942 (2003), Class 1, for the sound pressure level and frequency outputs measured at the time of calibration.

Note that for acoustic calibrators which meet IEC 60942 (2003), the instrument is considered out of tolerance if the measured deviation from the set level, extended by it associated uncertainty, exceeds the specified tolerance limits.

Note that the measured values refer to the ambient conditions given above.

When using the calibrator with a sound level meter any manufacturer's guidelines regarding free-field corrections should be observed.

The reported measurement results are traceable, via national standards maintained by NSAI National Metrology Laboratory (NML) or by other national metrology institutes, to internationally accepted realisations of the SI units.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%. It has been determined in accordance with the "Guide to the Expression of Uncertainty in Measurement (GUM)". These uncertainties apply only to the measured values and do not carry any implication regarding the long-term stability of the instrument.

NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to	TNEI Ireland Limited Unit S12 Synergy Centre Technological University Dublin Campus Tallaght Dublin D24 A386
Attention of	Ewan Watson

Certificate Number	**214288**
Item Calibrated	Rion NL-52 Sound Level Meter, complete with Rion UC59 Microphone
Serial Numbers	00932360 (Sound Level Meter) and 05586 (Microphone)
ID Number	SLM029
Order Number	3
Date Received	18 Oct 2021
NML Procedure Number	AP-NM-09
Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 10 Jun 2022] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 10 Jun 2022] B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023] B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 07 Oct 2022]

Calibrated by	David Fleming	**Approved by**	Paul Hetherington
Date of Calibration	16 Nov 2021	**Date of Issue**	16 Nov 2021

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

Standard Terms & Conditions for Calibration, Testing and Consultancy Assignments

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2. No action or legal proceeding shall be taken (except in the case of wilful neglect or default) against NSAI or the Board or any member of the Board or any committee appointed by the Board or any officer or servant of NSAI, by reason of or arising out of the carrying out of any research, investigation, test or analysis or the publication of the results thereof in the name of NSAI.
3. NSAI will not release any information received from or provided to the client in relation to this report except as may be required by law, including the Freedom of Information Act 1997, or as specified by the client.
4. This certificate relates only to the item(s) described on the front page and shall not be reproduced, except in full.
5. This contract is governed by the laws of Ireland whose courts shall have exclusive jurisdiction.

Decision Rule and Compliance Statement

The rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement is known as a decision rule. The rule used by NSAI NML follows the guidelines set out in the document ILAC-G8:09/2019 published by the International Laboratory Accreditation Co-operation. Further information on the decision rule is available on the NSAI website:
(https://www.nsai.ie/images/uploads/metrology/Decision_Rule.pdf).

The symbols used to indicate the state of compliance of the instrument calibration and their meanings are given in the following table.

Statement of compliance and associated symbol	Description
PASS	The absence of a symbol indicates that the measurement result is inside the specification limit by a margin greater than its associated expanded uncertainty; the instrument meets its accuracy specification.
Conditional PASS Symbol: £	The measurement result is inside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state compliance. There is a risk that the instrument fails to meet its specification.
Conditional FAIL Symbol: &	The measurement result is on the specification limit or is outside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state non-compliance.
FAIL Symbol: $	The measurement result is outside the specification limit by a margin greater than its associated measurement uncertainty; the instrument fails to meet its accuracy specification.
Unc. > Spec Symbol: #	The expanded measurement uncertainty is greater than the instrument's accuracy specification. It is not possible to determine compliance or otherwise with the specification. The user should expand the in-use accuracy specification to make allowance for the calibration uncertainty.
Outside CIPM MRA Symbol: ¢	Indicates that the calibration result is traceable to SI units but is not currently included in the table of NSAI NML's calibration and measurement capabilities approved under the CIPM MRA.

Where no specification exists, and none is prescribed by the client, the Decision Rule policy of the NSAI NML does not apply and results are provided without a statement of compliance.

Ambient laboratory conditions:

Barometric Pressure:	101.5 kPa ± 0.5 kPa
Temperature:	20.7 °C ± 1 °C
Relative Humidity:	40 %RH ± 5%RH

Summary of Results:

The following table summarises the results of the verification tests. The detailed results are given in the subsequent tables.

IEC 61672 Test	Test Title	Status
10	Self-generated Noise (Electrical)	/
11	Acoustical Signal	PASS
12	Frequency Weighting	PASS
13	Frequency and Time Weighting @ 1 kHz	PASS
14	Level Linearity Test on Reference Level Range	PASS
15	Level Linearity including Range Control	n/a
16	Toneburst Response	PASS
17	Peak C	PASS
18	Overload Indication	PASS

Detailed Results.

Prior to carrying out the verification tests the sound level meter was adjusted to read correctly for pressure response through application of a reference acoustical calibrator.

Self-generated Noise Test (Electrical Input) (Test #10) [1]

Range: Single Range Instrument
Mode: Leq

SLM Configuration	Freq. Weighting Network	SLM Reading[2]
Microphone installed	A	16.9 dB (U/R)[3]
Microphone replaced by electrical signal device and Fitted with a short-circuit	A	17.4 (U/R)[3]
	C	25.1
	Z (Linear)	26.3

Acoustical signal test of a frequency weighting (Test #11) [1]

Range: Single Range Instrument
Frequency Weighting setting: C
Time Weighting response: Slow

Input Level[4]	Input Freq.	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
94.0 dB	1000 Hz	0.0 dB (Ref)	1.1 dB	0.3 dB
	125	+0.2	1.5	0.3
	4000[7]	+0.3	1.6	0.5

Electrical signal tests of frequency weightings (Test #12)[1]

Range: Single Range Instrument

Freq. (nominal)	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
A-Weighting					
63 Hz	93 dB	92.9 dB	-0.1 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	91.8	-1.2	3.5, -17	0.20
C-Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	91.8	-1.2	3.5, -17	0.20
LIN Weighting					
63 Hz	93 dB	92.9 dB	-0.1 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	92.9	-0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.0	0.0	2.1, -3.1	0.20
16000	93	93.0	0.0	3.5, -17	0.20

Frequency and time weightings at 1 kHz (Test #13)[1]

Range: Single Range Instrument

Time Weighting Setting	Frequency Weighting Setting	Input Level[4]	Deviation from Reference	Tolerance[6] (±)	Uncertainty. of Measurement (±)
Fast	A	94.0 dB	0.0 dB	0.4 dB	0.20 dB
	C		+0.1	0.4	0.20
	Z		+0.1	0.4	0.20
Slow	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
Leq.	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
SEL	A	114.0 dB	0.0 dB	0.3 dB	0.20 dB

Linearity level on the reference range (Test #14)[1]

Range: Single Range Instrument
Input Frequency: 1 kHz
SLM Measuring Mode: SPL

Range	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
130 dB	94 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	99	99.0	0.0	1.1	0.20
	104	104.0	0.0	1.1	0.20
	109	109.0	0.0	1.1	0.20
	114	114.0	0.0	1.1	0.20
	119	119.0	0.0	1.1	0.20
	124	124.0	0.0	1.1	0.20
	129	129.0	0.0	1.1	0.20
	132	132.0	0.0	1.1	0.20
	133	133.0	0.0	1.1	0.20
	134	134.0	0.0	1.1	0.20
	135	135.0	0.0	1.1	0.20
	136	136.0	0.0	1.1	0.20
	94	94.0	0.0	1.1	0.20
	89	89.0	0.0	1.1	0.20
	84	84.0	0.0	1.1	0.21
	79	79.0	0.0	1.1	0.21
	74	74.0	0.0	1.1	0.21
	69	69.0	0.0	1.1	0.21
	64	64.0	0.0	1.1	0.21
	59	59.0	0.0	1.1	0.21
	54	54.0	0.0	1.1	0.21
	49	49.0	0.0	1.1	0.21
	44	44.0	0.0	1.1	0.21
	39	39.0	0.0	1.1	0.21
	34	34.0	+0.1	1.1	0.21
	30	30.1	+0.1	1.1	0.21
	29	29.1	+0.1	1.1	0.21
	28	28.1	+0.1	1.1	0.21
	27	27.2	+0.1	1.1	0.21
	26	26.2	+0.2	1.1	0.21
	25	25.2	+0.2	1.1	0.21

Toneburst response (Test #16)[1]

Range: Single Range Instrument

Burst Type	SLM Mode	Input Level[4]	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
200 ms	LAF	135.0 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAF	118.0	0.0	1.3	0.3
0.25 msec	LAF	109.0	-0.1	1.3, -3.3	0.3
200 ms	LAS	128.6 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAS	109.0	0.0	1.3, -1.8	0.3
200 ms	SEL	129.0 dB	0.0 dB	0.8 dB	0.3 dB
2 .0 ms	SEL	109.3	0.0	1.3	0.3
0.25 ms	SEL	100.0	-0.1	1.3, -3.3	0.3

Peak C sound level (Test #17)[1]

Range: Single Range Instrument

Pulse Type	Pulse Frequency	Input Level[4] (peak value)	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
1 cycle	8 kHz	130.4 dB	-1.0 dB	2.4 dB	0.35 dB
Pos. ½ cycle	500 Hz	132.4 dB	-0.3 dB	1.4 dB	0.35 dB
Neg. ½ cycle	500 Hz	132.4 dB	-0.3 dB	1.4 dB	0.35 dB

Overload indication (Test #18)[1]

Range: Single Range Instrument
SLM Measuring Mode: LAEq

Test description	Overload occurred at (±)	Meas. Diff. (Pos – Neg)	Tolerance[6] (±)	Uncertainty of Measurement (±)
Positive ½ cycle at 4 kHz	140.1 dB	-	-	-
Negative ½ cycle at 4 kHz	139.5 dB	-	-	-
Level difference of positive & negative pulses	-	0.6 dB	1.8 dB	0.30 dB

Notes:

(1) The test number, given in parentheses after the section heading, refers to the relevant clause in IEC 61672-3 (2006).

(2) SLM denotes Sound Level Meter

(3) U/R denotes Under Range

(4) All input levels are given in dB relative to a 20 µPa reference level.

(5) The SLM Error of Indication is defined as follows:
SLM Error of Indication = SLM Reading - Input Level

(6) The figures in the column labelled 'Tolerance' are the acceptance limits given in IEC 61672-1(2003). These tolerance limits include an allowance for the maximum expanded uncertainty of the test laboratory. The criteria for compliance with the tolerance is that the measurement result, extended by its associated uncertainty, lies within the specified limits.

(7) Microphone response at 4 kHz was measured using an electrostatic actuator. A Free Field correction of +1.2 dB was applied to the measured actuator response.
This measurement is not included in NML's tables of Calibration and Measurement Capabilities, approved under the CIPM MRA.
For information, the measured sensitivity and frequency response of the microphone is given in an addendum to this certificate.

Comments:

Where used in the results table, further information on the meaning of symbols is given in the table on page 2 of this certificate.

The instrument was found to meet the requirements of IEC 61672-1 (2003) in accordance with the verification procedures set out in IEC 61672-3 (2006) at the time of calibration.

The reported measurement results are traceable, via national standards maintained by NSAI National Metrology Laboratory (NML) or by other national metrology institutes, to internationally accepted realisations of the SI units.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%. It has been determined in accordance with the "Guide to the Expression of Uncertainty in Measurement (GUM)". These uncertainties apply only to the measured values and do not carry any implication regarding the long-term stability of the instrument.

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National Metrology Laboratory

Addendum to Certificate 214288

Rion
Type: UC59

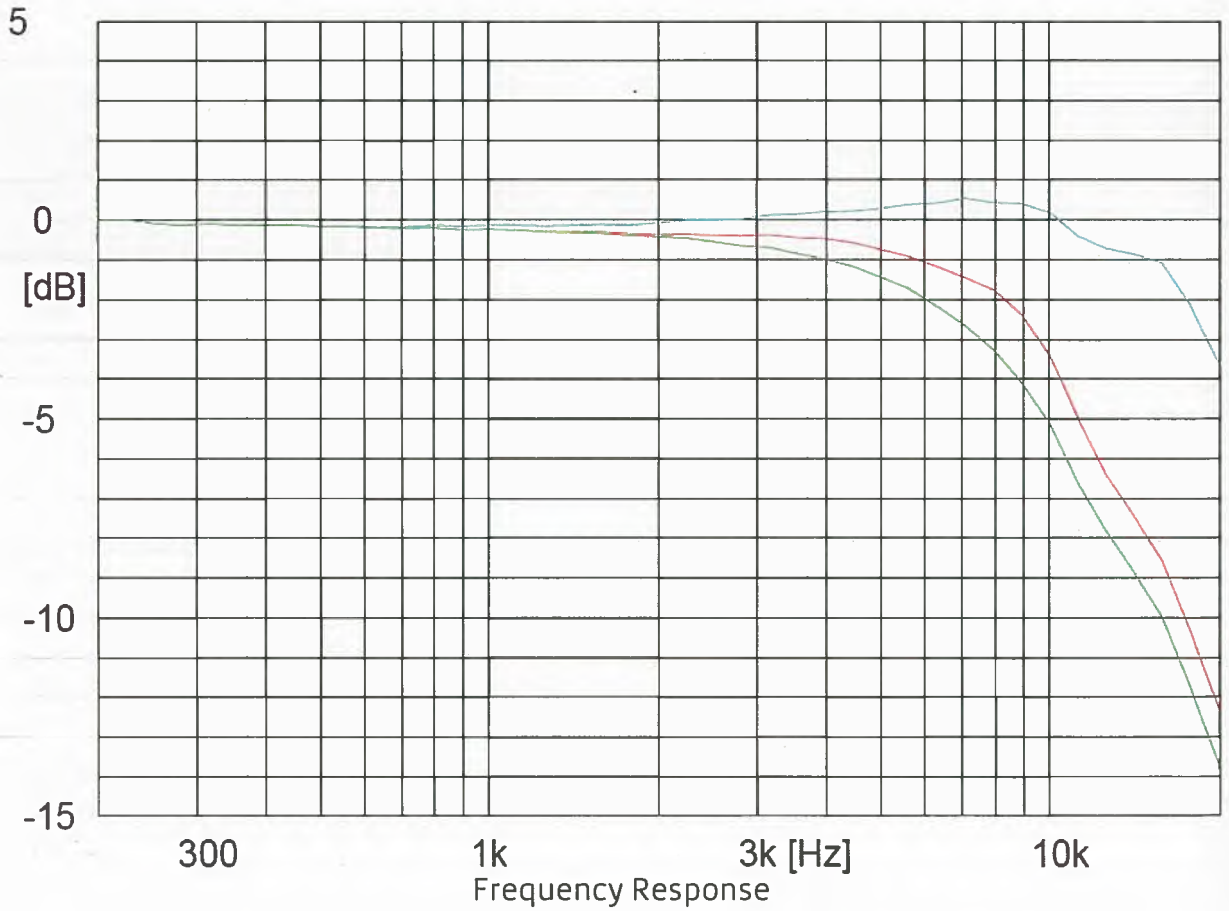
Serial no: 05586

Sensitivity: 38.0 mV/Pa
-28.4 ±0.01 dB re. 1 V/Pa

Date: 15/11/2021

Measurement conditions:	
Polarisation voltage:	0.0 V
Pressure:	102.32 ±0.00 kPa
Temperature:	21.5 ±1.1 °C
Relative humidity:	45.9 ±2.1 %RH
Results are normalized to the reference conditions.	

Free field response
Diffuse field response
Pressure (Actuator) response



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National Metrology Laboratory

Certificate of Calibration

Issued to

TNEI Ireland Limited
Unit S12 Synergy Centre
Technological University Dublin Campus
Tallaght
Dublin 24

Certificate Number	222721
Item Calibrated	Rion NL-52 Sound Level Meter, complete with Rion UC59 Microphone
Serial Numbers	00809388 (Sound Level Meter) and 17858 (Microphone)
ID Number	SLM49
Order Number	7
Date Received	22 Jun 2022
NML Procedure Number	AP-NM-09
Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 08 Jul 2022] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 08 Jul 2022] B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023] B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 07 Oct 2022]

Calibrated by	David Fleming	**Approved by**	Paul Hetherington
Date of Calibration	02 Jul 2022	**Date of Issue**	02 Jul 2022

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

Standard Terms & Conditions for Calibration, Testing and Consultancy Assignments

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Decision Rule and Compliance Statement

The rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement is known as a decision rule. The rule used by NSAI NML follows the guidelines set out in the document ILAC-G8:09/2019 published by the International Laboratory Accreditation Co-operation. Further information on the decision rule is available on the NSAI website:

(https://www.nsai.ie/images/uploads/metrology/Decision_Rule.pdf).

The symbols used to indicate the state of compliance of the instrument calibration and their meanings are given in the following table.

Statement of compliance and associated symbol	Description
PASS	The absence of a symbol indicates that the measurement result is inside the specification limit by a margin greater than its associated expanded uncertainty; the instrument meets its accuracy specification.
Conditional PASS Symbol: **£**	The measurement result is inside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state compliance. There is a risk that the instrument fails to meet its specification.
Conditional FAIL Symbol: **&**	The measurement result is on the specification limit or is outside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state non-compliance.
FAIL Symbol: **$**	The measurement result is outside the specification limit by a margin greater than its associated measurement uncertainty; the instrument fails to meet its accuracy specification.
Unc. > Spec Symbol: **#**	The expanded measurement uncertainty is greater than the instrument's accuracy specification. It is not possible to determine compliance or otherwise with the specification. The user should expand the in-use accuracy specification to make allowance for the calibration uncertainty.
Outside CIPM MRA Symbol: **¢**	Indicates that the calibration result is traceable to SI units but is not currently included in the table of NSAI NML's calibration and measurement capabilities approved under the CIPM MRA.

Where no specification exists, and none is prescribed by the client, the Decision Rule policy of the NSAI NML does not apply and results are provided without a statement of compliance.

Ambient laboratory conditions:

Barometric Pressure:	101.0 kPa ± 0.5 kPa
Temperature:	21.5 °C ± 1 °C
Relative Humidity:	48 %RH ± 5%RH

Summary of Results:

The following table summarises the results of the verification tests. The detailed results are given in the subsequent tables.

IEC 61672 Test	Test Title	Status
10	Self-generated Noise (Electrical)	/
11	Acoustical Signal	PASS
12	Frequency Weighting	PASS
13	Frequency and Time Weighting @ 1 kHz	PASS
14	Level Linearity Test on Reference Level Range	PASS
15	Level Linearity including Range Control	n/a
16	Toneburst Response	PASS
17	Peak C	PASS
18	Overload Indication	PASS

Detailed Results.

Prior to carrying out the verification tests the sound level meter confirmed to be reading correctly for pressure response through application of a reference acoustical calibrator.

Self-generated Noise Test (Electrical Input) (Test #10) [1]

Range: Single Range Instrument
Mode: Leq

SLM Configuration	Freq. Weighting Network	SLM Reading[2]
Microphone installed	A	18.9 dB (U/R)[3]
Microphone replaced by electrical signal device and Fitted with a short-circuit	A	18.5 (U/R)[3]
	C	24.1
	Z (Linear)	25.8

Acoustical signal test of a frequency weighting (Test #11) [1]

Range: Single Range Instrument
Frequency Weighting setting: C
Time Weighting response: Slow

Input Level[4]	Input Freq.	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
94.0 dB	1000 Hz	0.0 dB (Ref)	1.1 dB	0.3 dB
	125	+0.2	1.5	0.3
	4000[7]	+0.5	1.6	0.5

Electrical signal tests of frequency weightings (Test #12)[1]

Range: Single Range Instrument

Freq. (nominal)	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
A-Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	92.9	-0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	91.8	-1.2	3.5, -17	0.20
C-Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	93.0	0.0	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	91.9	-1.1	3.5, -17	0.20
LIN Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.0	0.0	2.1, -3.1	0.20
16000	93	93.0	0.0	3.5, -17	0.20

Frequency and time weightings at 1 kHz (Test #13)[1]

Range: Single Range Instrument

Time Weighting Setting	Frequency Weighting Setting	Input Level[4]	Deviation from Reference	Tolerance[6] (±)	Uncertainty of Measurement (±)
Fast	A	94.0 dB	0.0 dB	0.4 dB	0.20 dB
	C		+0.1	0.4	0.20
	Z		+0.1	0.4	0.20
Slow	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
Leq.	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
SEL	A	114.0 dB	0.0 dB	0.3 dB	0.20 dB

Linearity level on the reference range (Test #14)[1]

Range: Single Range Instrument
Input Frequency: 1 kHz
SLM Measuring Mode: SPL

Range	Input Level[4]	SLM Reading	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
130 dB	94 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	99	99.0	0.0	1.1	0.20
	104	104.1	+0.1	1.1	0.20
	109	109.0	0.0	1.1	0.20
	114	114.0	0.0	1.1	0.20
	119	119.0	0.0	1.1	0.20
	124	124.0	0.0	1.1	0.20
	129	129.0	0.0	1.1	0.20
	132	132.0	0.0	1.1	0.20
	133	133.0	0.0	1.1	0.20
	134	134.0	0.0	1.1	0.20
	135	135.0	0.0	1.1	0.20
	136	136.1	+0.1	1.1	0.20
	94	94.0	0.0	1.1	0.20
	89	89.0	0.0	1.1	0.20
	84	84.1	+0.1	1.1	0.21
	79	79.0	0.0	1.1	0.21
	74	74.0	0.0	1.1	0.21
	69	69.0	0.0	1.1	0.21
	64	64.0	0.0	1.1	0.21
	59	59.0	0.0	1.1	0.21
	54	54.0	0.0	1.1	0.21
	49	49.0	0.0	1.1	0.21
	44	44.0	0.0	1.1	0.21
	39	39.0	0.0	1.1	0.21
	34	34.1	+0.1	1.1	0.21
	30	30.2	+0.2	1.1	0.21
	29	29.2	+0.2	1.1	0.21
	28	28.3	+0.3	1.1	0.21
	27	27.5	+0.5	1.1	0.21
	26	26.5	+0.5	1.1	0.21
	25	25.6	+0.6	1.1	0.21

Toneburst response (Test #16)[1]

Range: Single Range Instrument

Burst Type	SLM Mode	Input Level[4]	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
200 ms	LAF	134.0 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAF	117.0	-0.1	1.3	0.3
0.25 msec	LAF	108.0	-0.2	1.3, -3.3	0.3
200 ms	LAS	127.6 dB	-0.1 dB	0.8 dB	0.3 dB
2.0 ms	LAS	108.0	-0.1	1.3, -1.8	0.3
200 ms	SEL	128.0 dB	-0.1 dB	0.8 dB	0.3 dB
2 .0 ms	SEL	108.3	-0.1	1.3	0.3
0.25 ms	SEL	99.0	-0.2	1.3, -3.3	0.3

Peak C sound level (Test #17)[1]

Range: Single Range Instrument

Pulse Type	Pulse Frequency	Input Level[4] (peak value)	SLM Error of Indication[5]	Tolerance[6] (±)	Uncertainty of Measurement (±)
1 cycle	8 kHz	133.4 dB	0.0 dB	2.4 dB	0.35 dB
Pos. ½ cycle	500 Hz	135.4 dB	-0.3 dB	1.4 dB	0.35 dB
Neg. ½ cycle	500 Hz	135.4 dB	-0.3 dB	1.4 dB	0.35 dB

Overload indication (Test #18)[1]

Range: Single Range Instrument
SLM Measuring Mode: LAEq

Test description	Overload occurred at (±)	Meas. Diff. (Pos – Neg)	Tolerance[6] (±)	Uncertainty of Measurement (±)
Positive ½ cycle at 4 kHz	139.2 dB	-	-	-
Negative ½ cycle at 4 kHz	139.4 dB	-	-	-
Level difference of positive & negative pulses	-	0.2 dB	1.8 dB	0.30 dB

Notes:

(1) The test number, given in parentheses after the section heading, refers to the relevant clause in IEC 61672-3 (2006).

(2) SLM denotes Sound Level Meter

(3) U/R denotes Under Range

(4) All input levels are given in dB relative to a 20 μPa reference level.

(5) The SLM Error of Indication is defined as follows:
SLM Error of Indication = SLM Reading - Input Level

(6) The figures in the column labelled 'Tolerance' are the acceptance limits given in IEC 61672-1(2003). These tolerance limits include an allowance for the maximum expanded uncertainty of the test laboratory. The criteria for compliance with the tolerance is that the measurement result, extended by its associated uncertainty, lies within the specified limits.

(7) Microphone response at 4 kHz was measured using an electrostatic actuator. A Free Field correction of +1.2 dB was applied to the measured actuator response.
This measurement is not included in NML's tables of Calibration and Measurement Capabilities, approved under the CIPM MRA.
For information, the measured sensitivity and frequency response of the microphone is given in an addendum to this certificate.

Comments:

Where used in the results table, further information on the meaning of symbols is given in the table on page 2 of this certificate.

The instrument was found to meet the requirements of IEC 61672-1 (2003) in accordance with the verification procedures set out in IEC 61672-3 (2006) at the time of calibration.

The reported measurement results are traceable, via national standards maintained by NSAI National Metrology Laboratory (NML) or by other national metrology institutes, to internationally accepted realisations of the SI units.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%. It has been determined in accordance with the "Guide to the Expression of Uncertainty in Measurement (GUM)". These uncertainties apply only to the measured values and do not carry any implication regarding the long-term stability of the instrument.

NSAI
National Metrology Laboratory

Addendum to Certificate 222721

Rion
Type: UC59

Serial no: 17858

Sensitivity: 46.2 mV/Pa
-26.7 ±0.08 dB re. 1 V/Pa

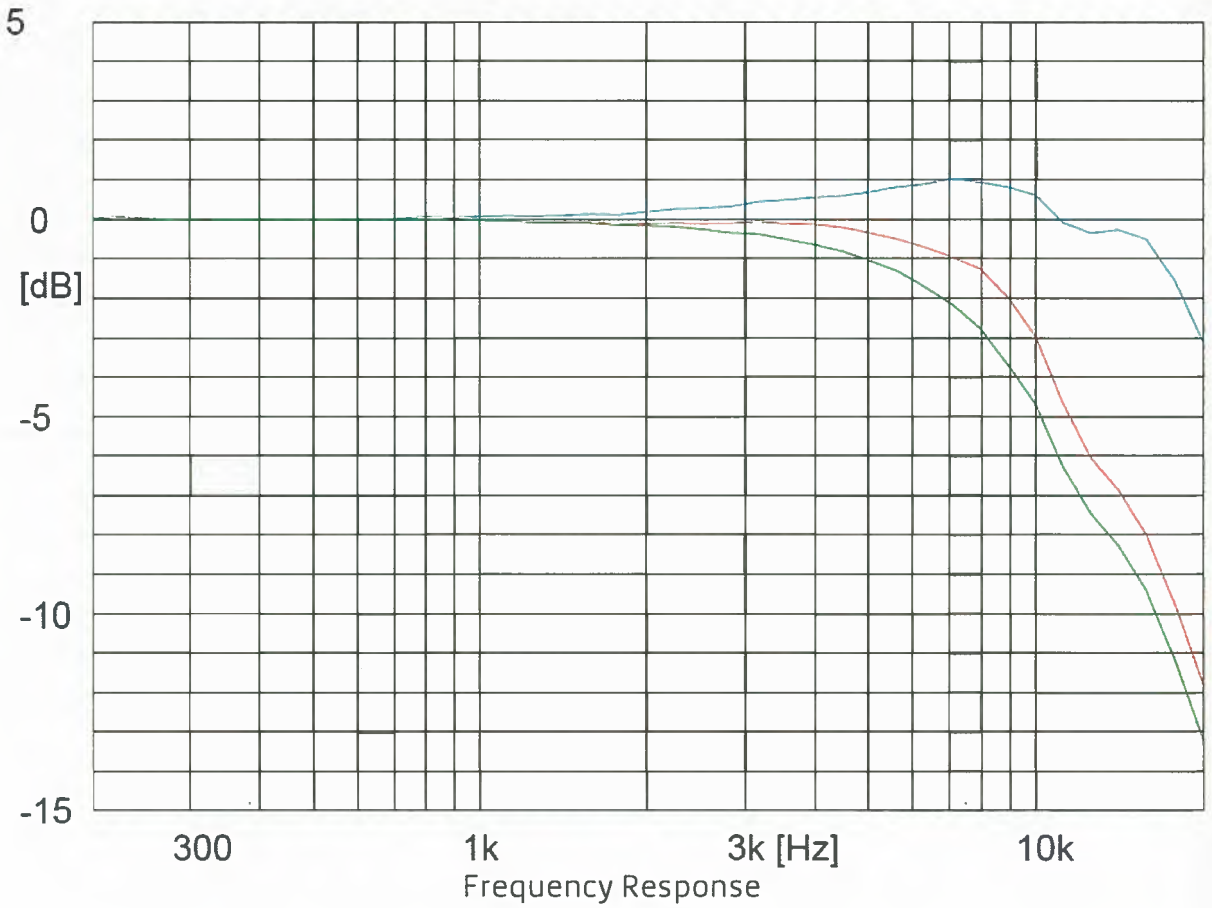
Date: 02/07/2022

Measurement conditions:

Polarisation voltage:	0.0 V
Pressure:	100.95 ±0.00 kPa
Temperature:	21.4 ±1.0 °C
Relative humidity:	48.1 ±2.2 %RH

Results are normalized to the reference conditions.

Free field response
Diffuse field response
Pressure (Actuator) response



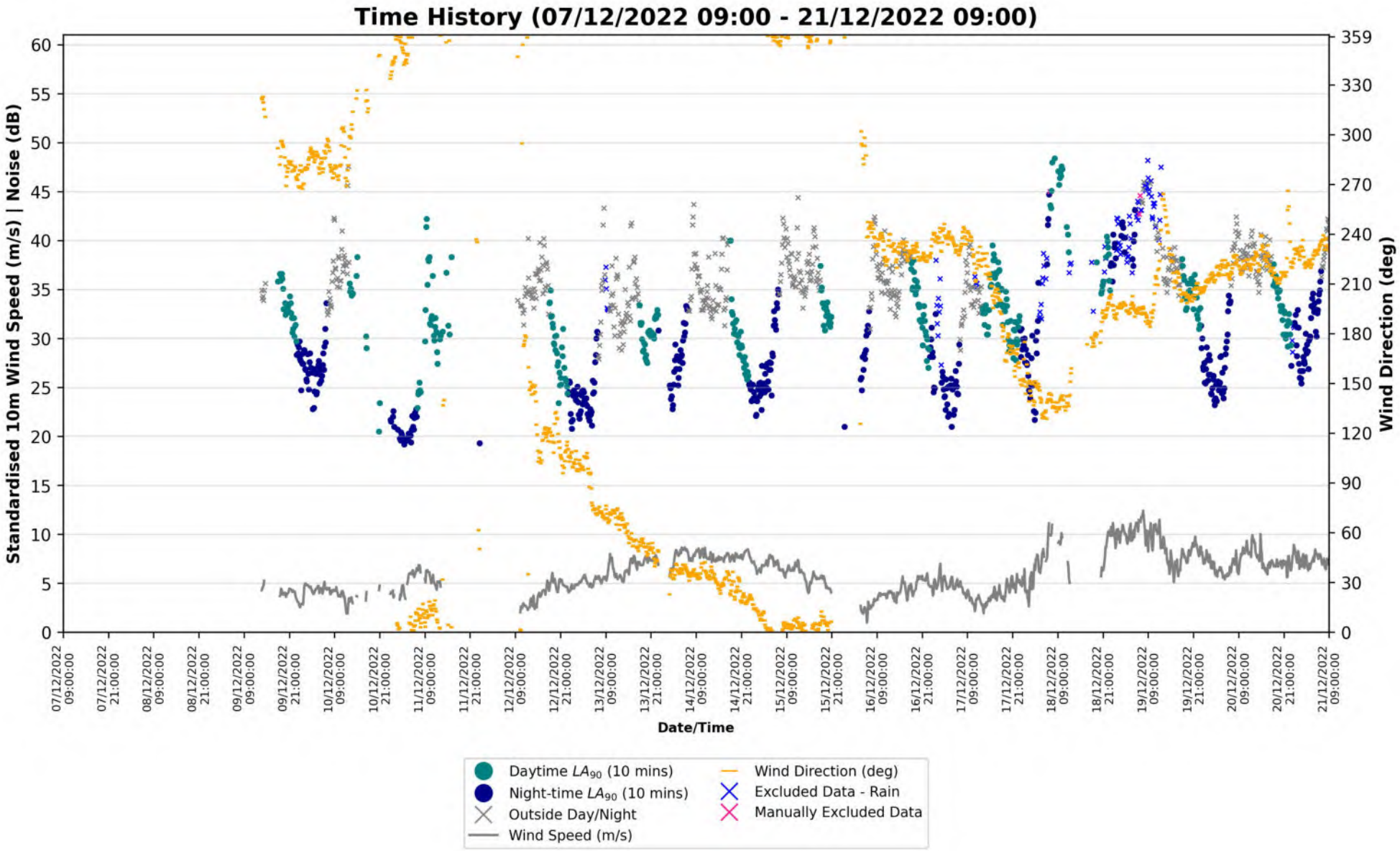
Annex 4 – Time Series Graphs

- Background noise data time series graphs

IE00061 - Killoshulan Wind Farm

Figure A4.1a

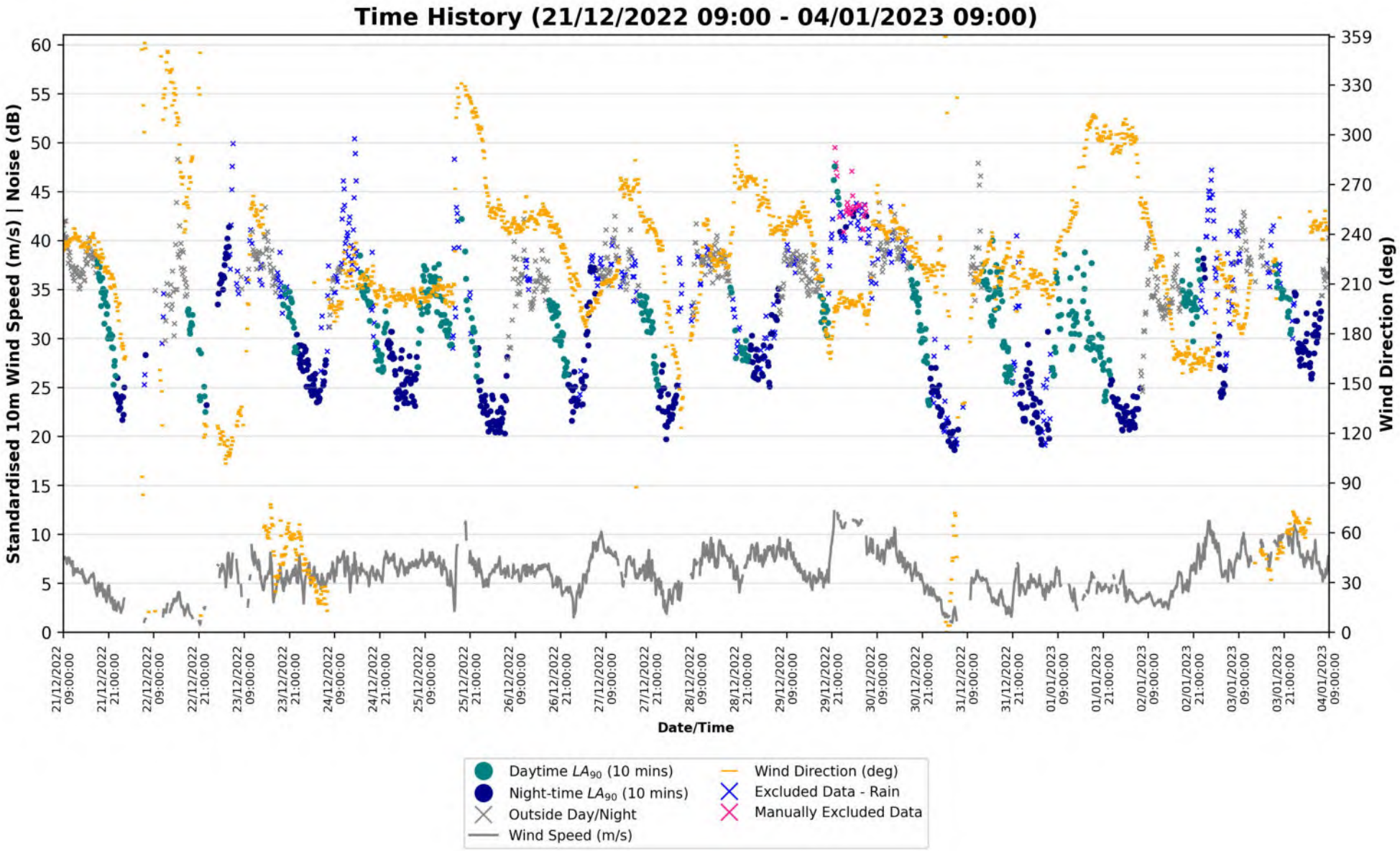
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IE00061 - Killoshulan Wind Farm

Figure A4.1a

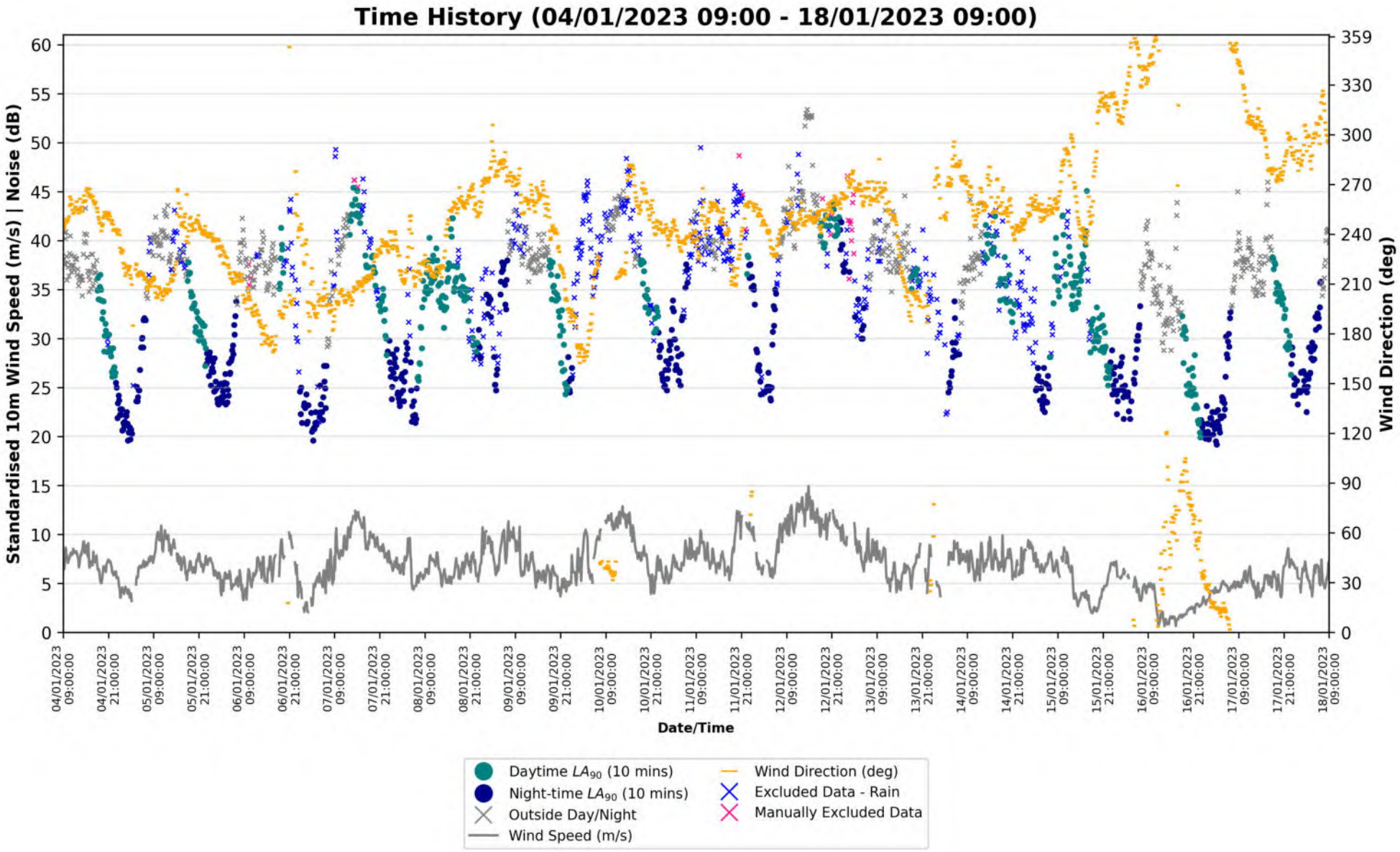
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IE00061 - Killoshulan Wind Farm

Receptor Name: NML1

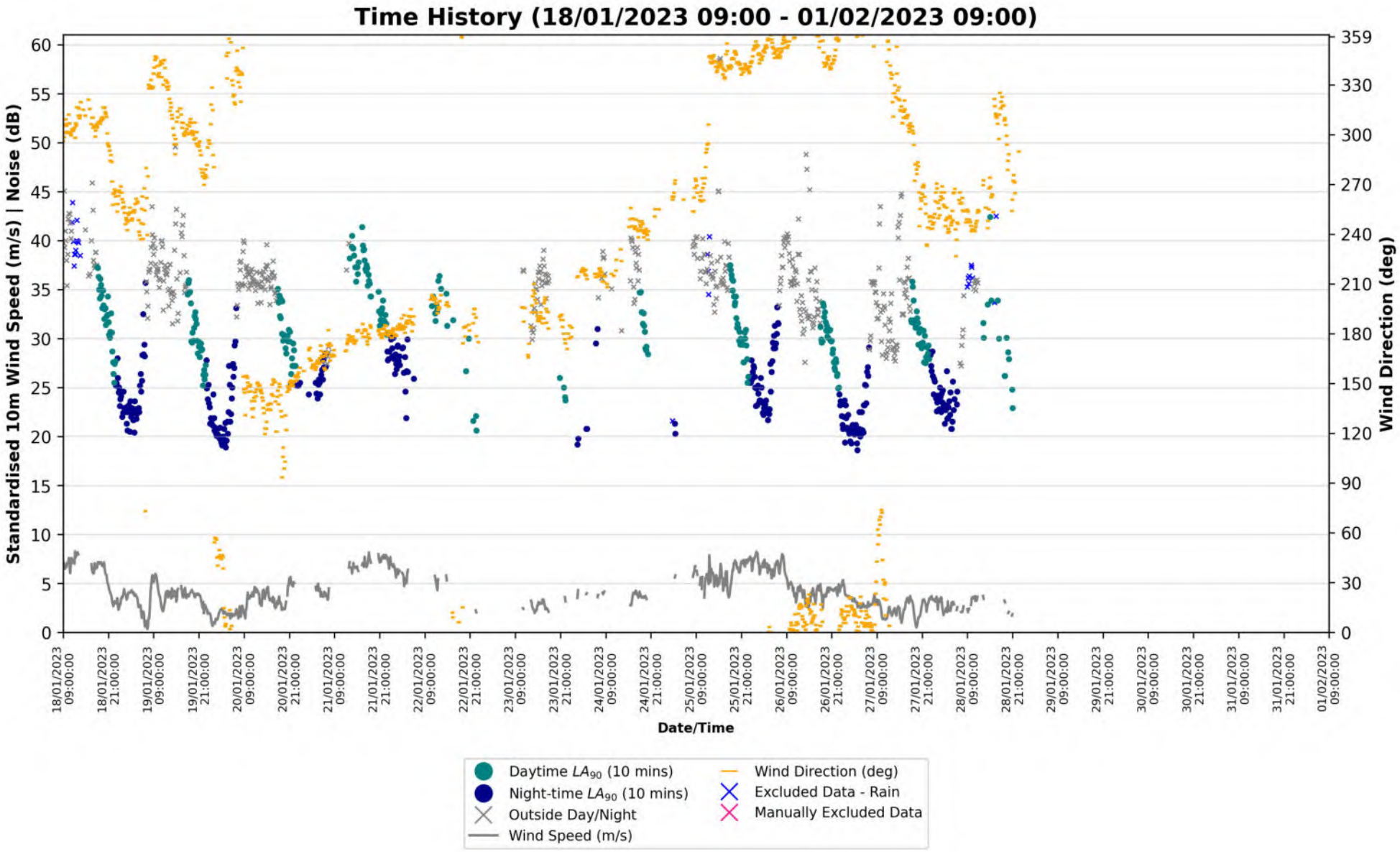
Figure A4.1a



IE00061 - Killoshulan Wind Farm

Receptor Name: NML1

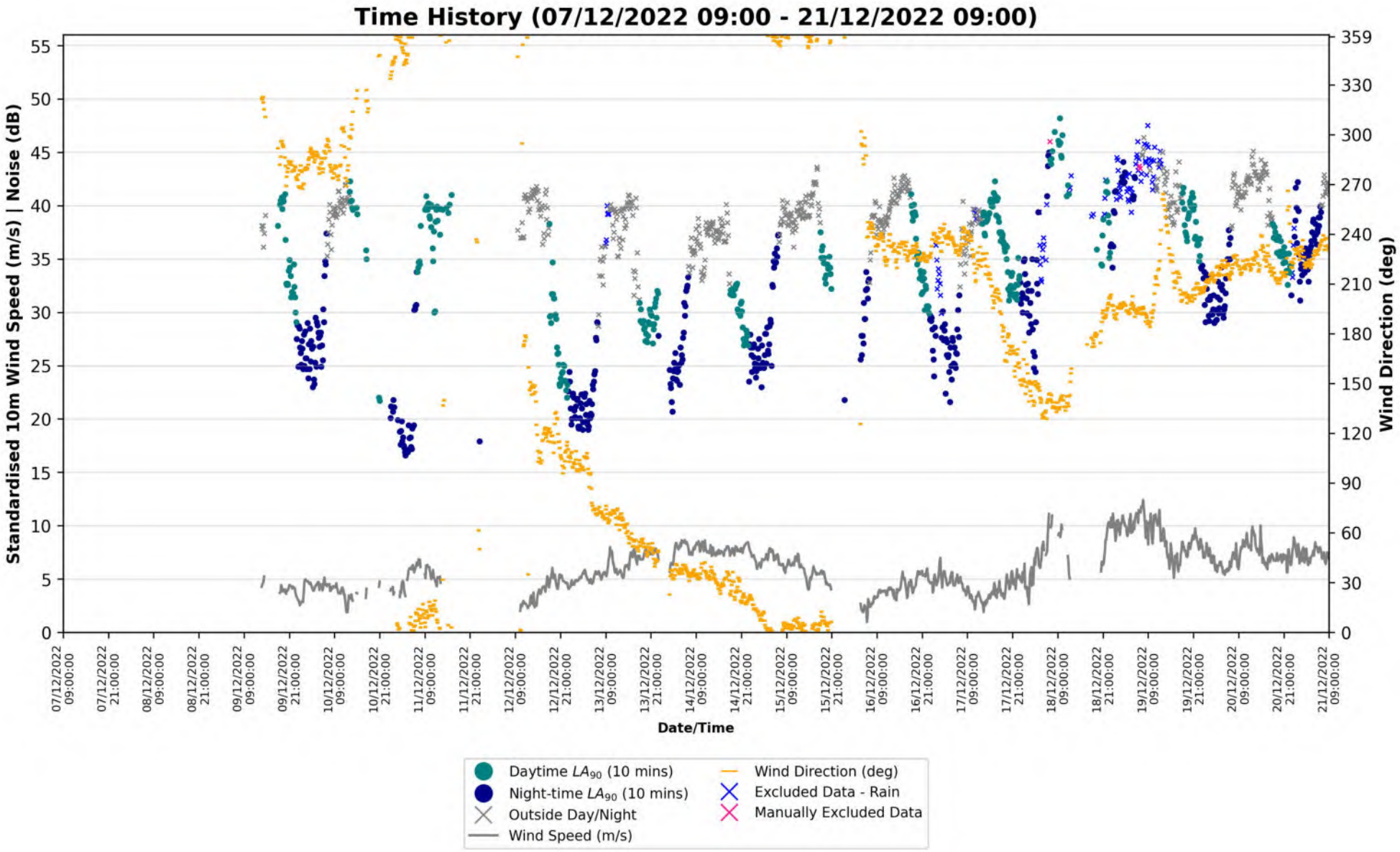
Figure A4.1a



IE00061 - Killoshulan Wind Farm

Figure A4.1b

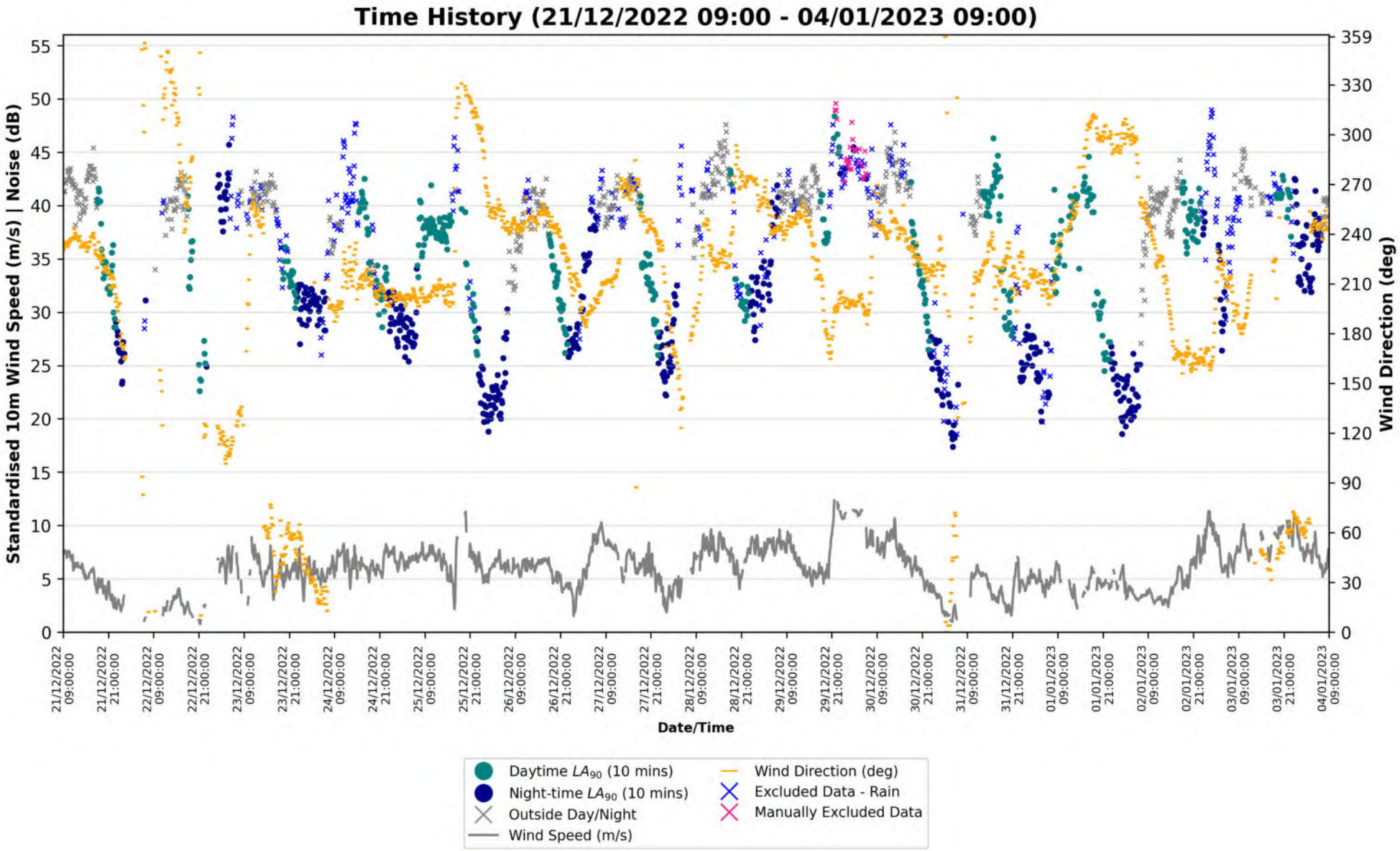
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IE00061 - Killoshulan Wind Farm

Figure A4.1b

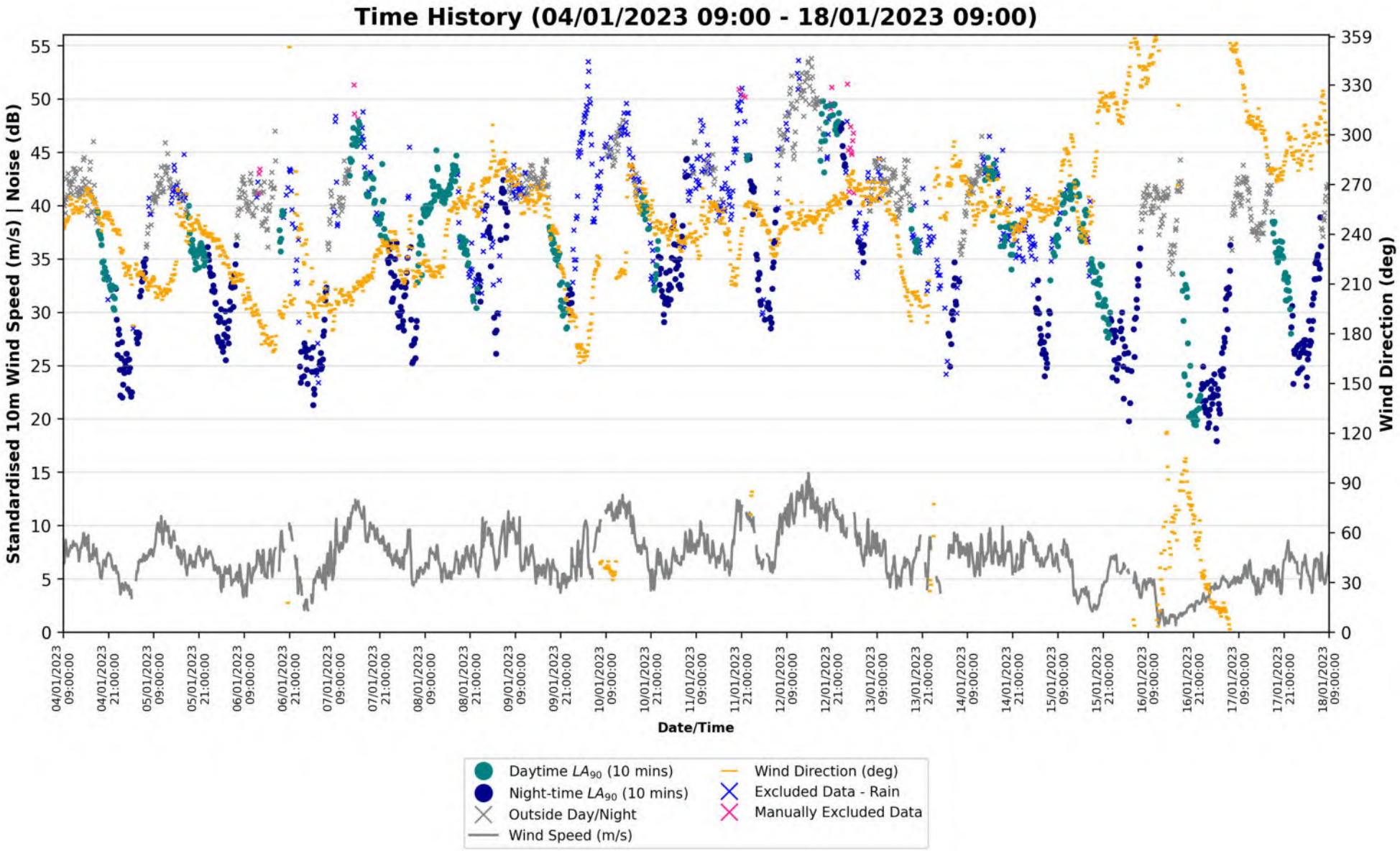
Receptor Name: NML2



IE00061 - Killoshulan Wind Farm

Receptor Name: NML2

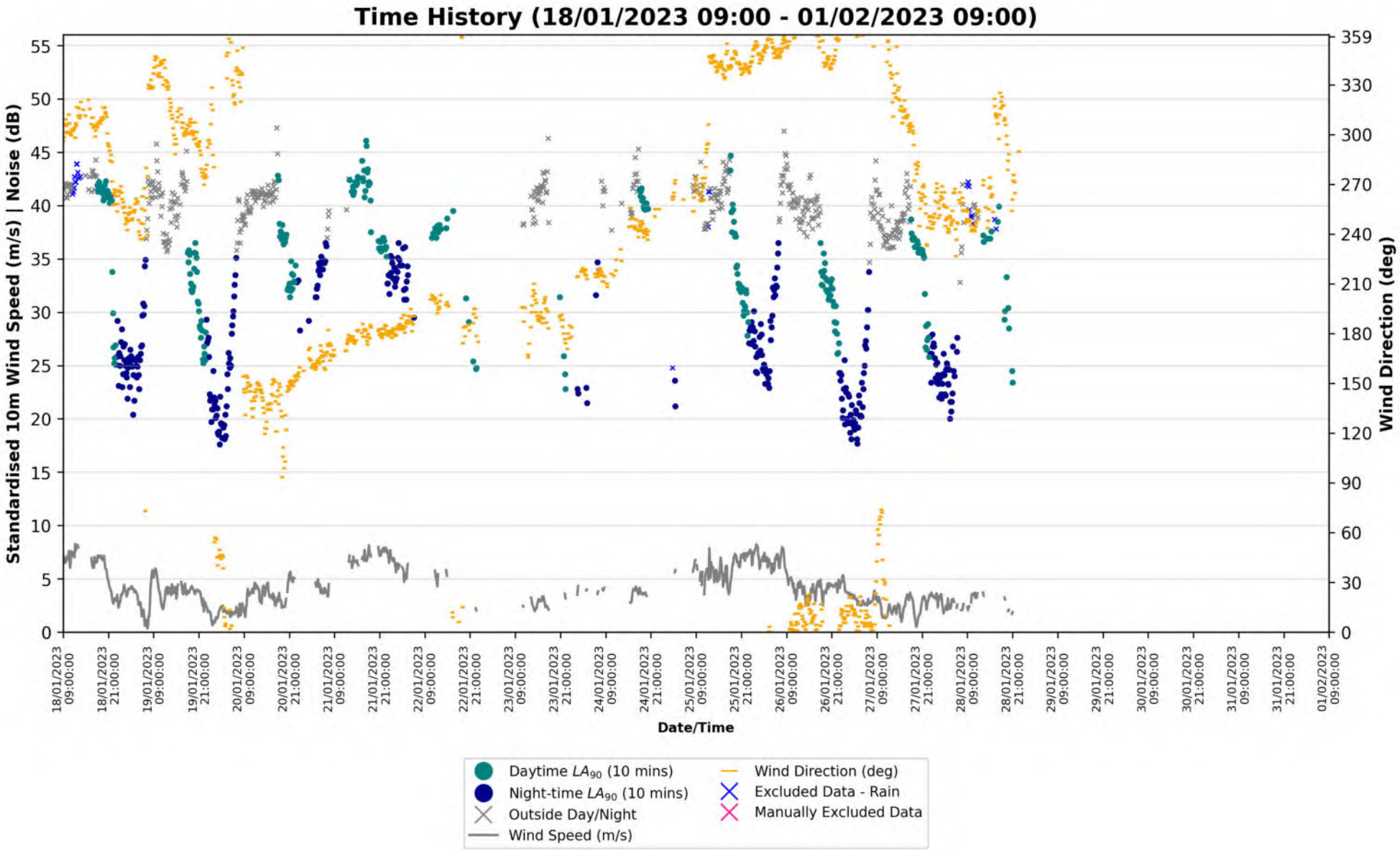
Figure A4.1b



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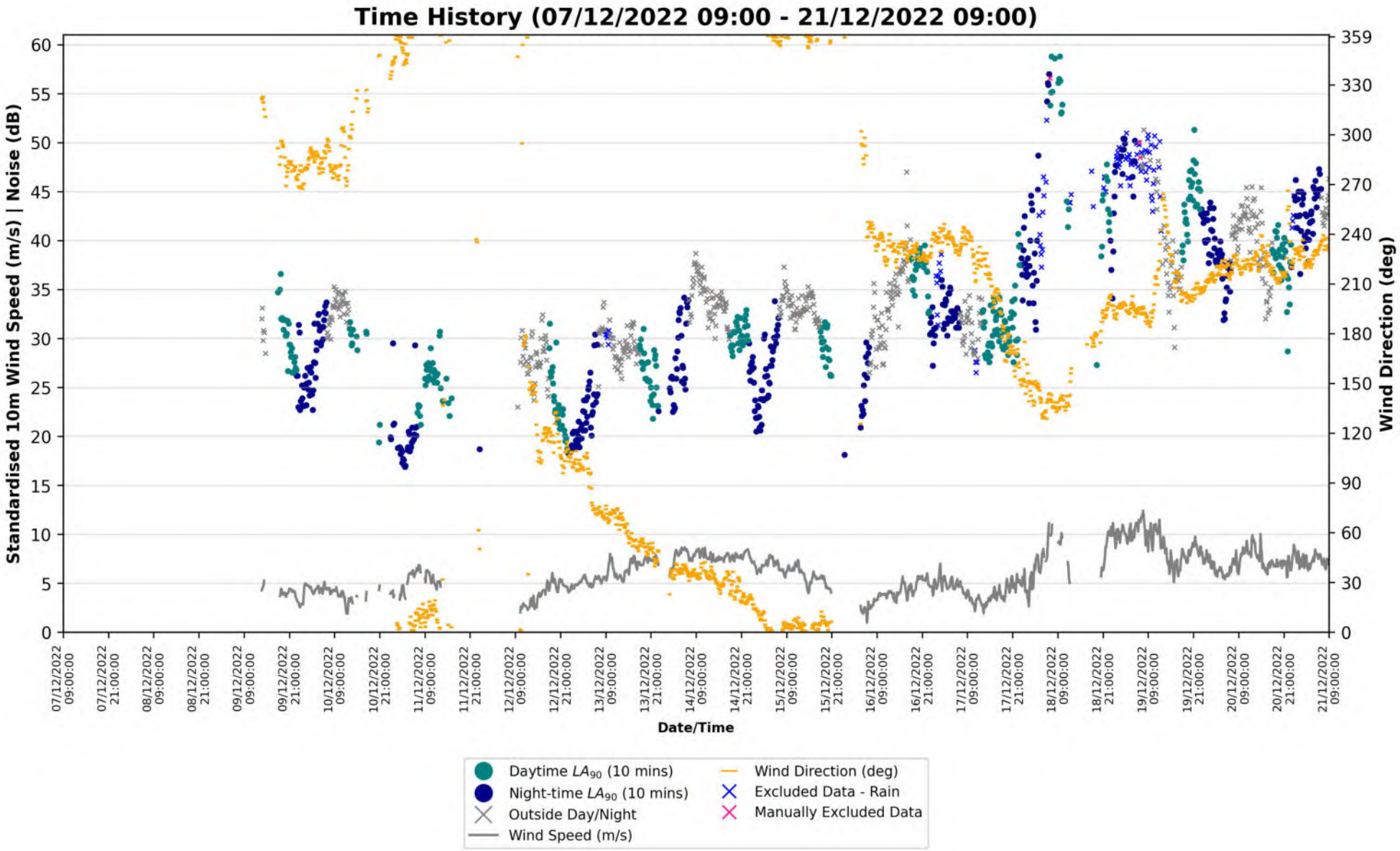
Figure A4.1b



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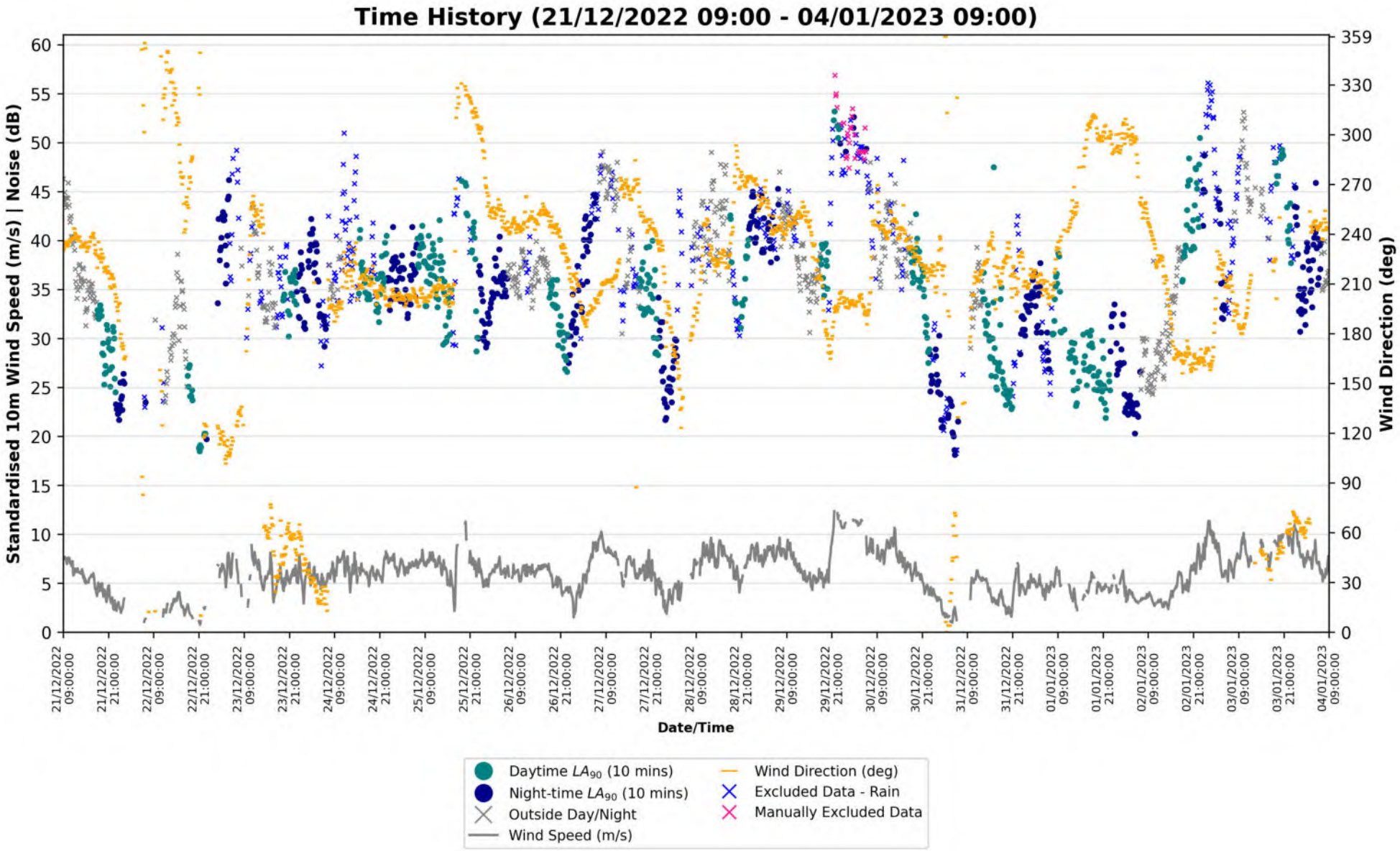
Figure A4.1c



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Receptor Name: NML3

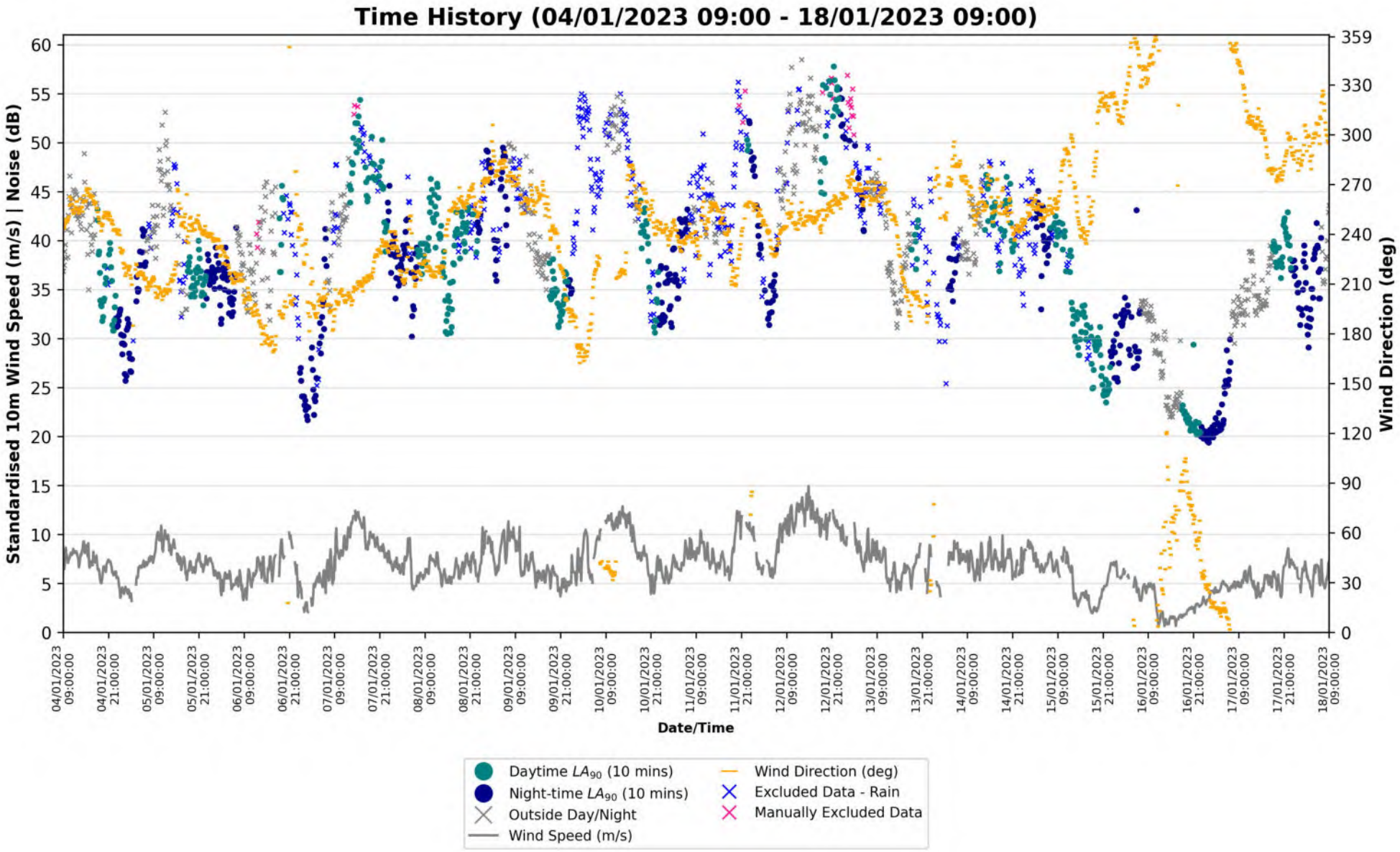
Figure A4.1c



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Receptor Name: NML3

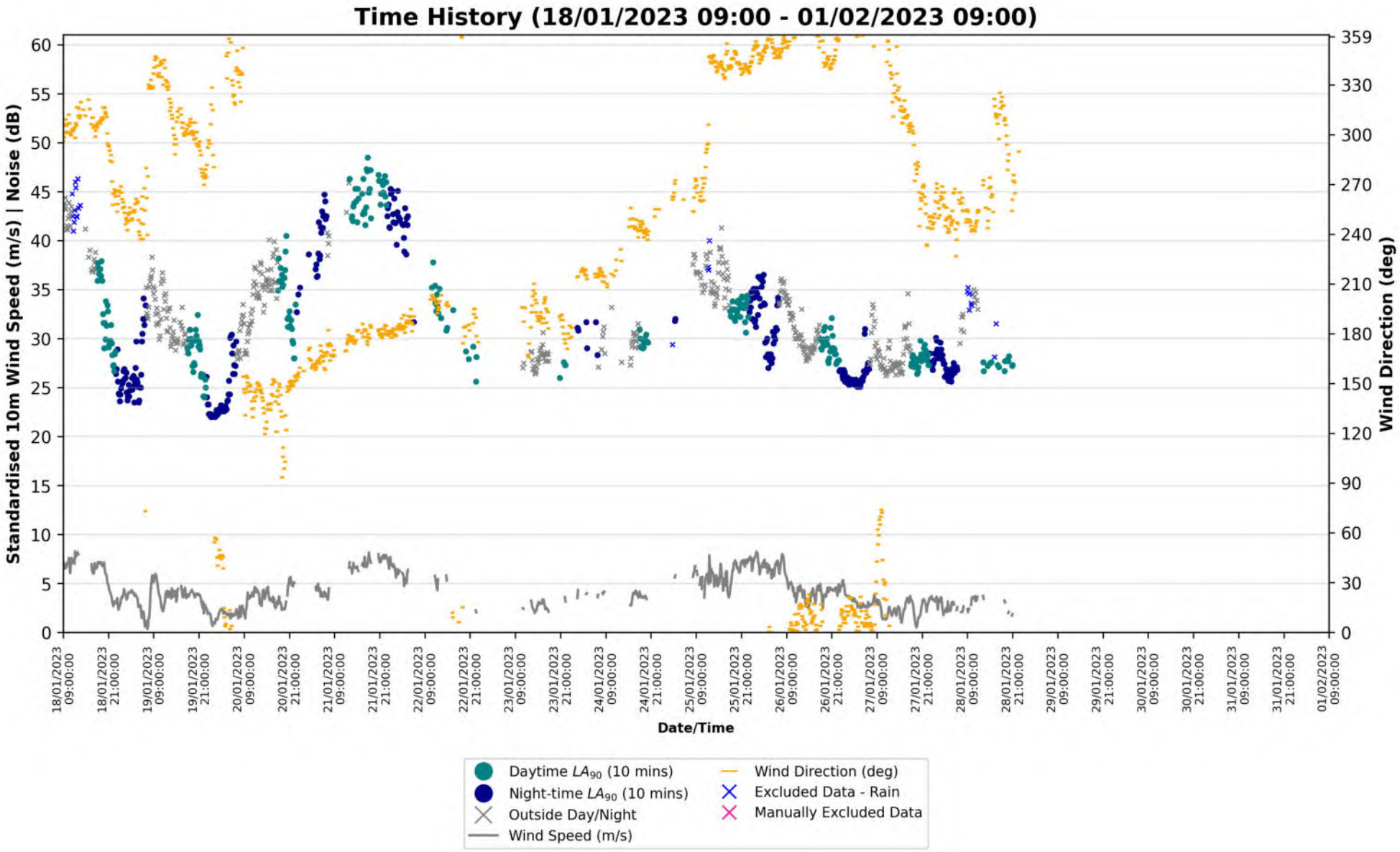
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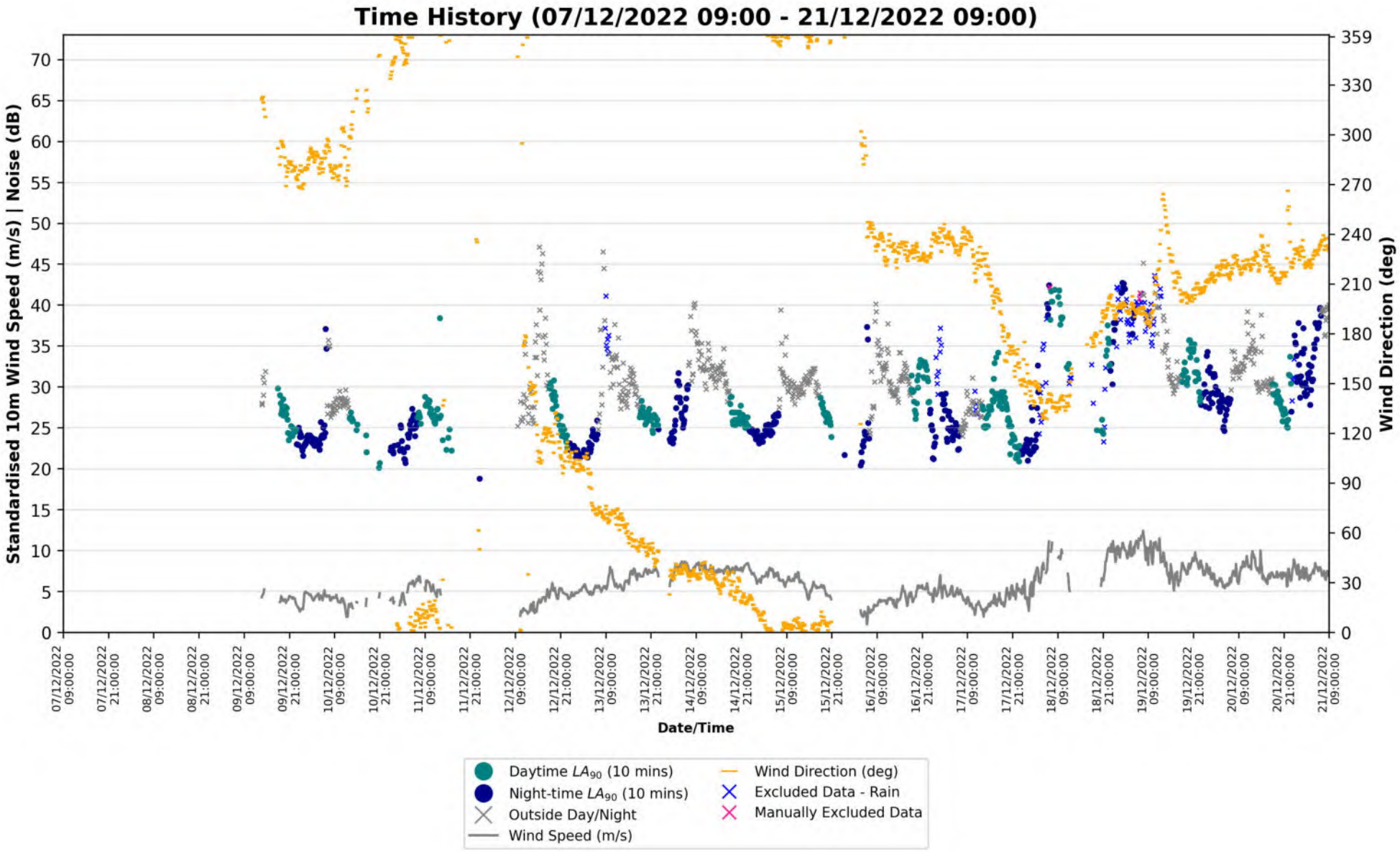
Figure A4.1c



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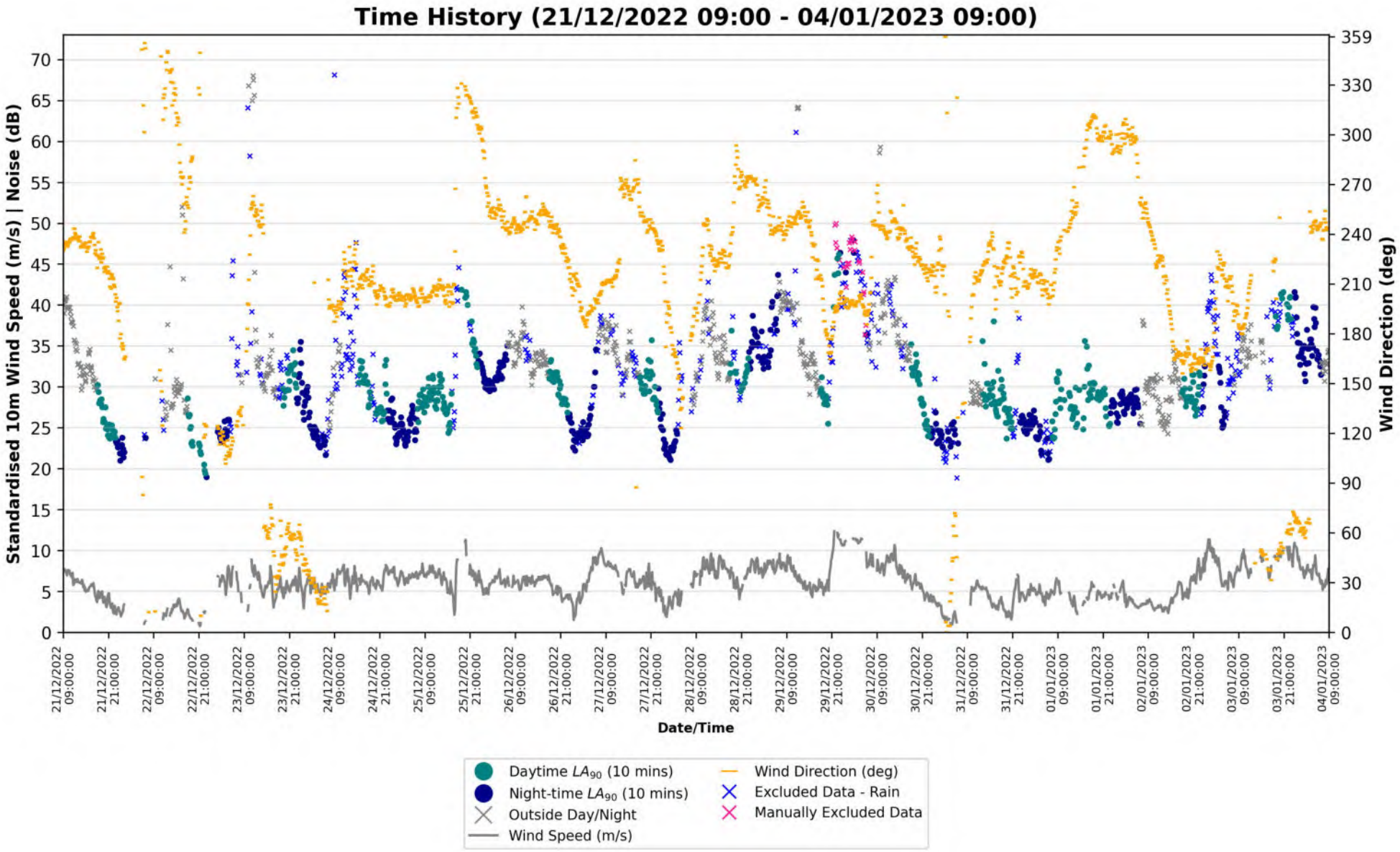
Figure A4.1d



IE00061 - Killoshulan Wind Farm

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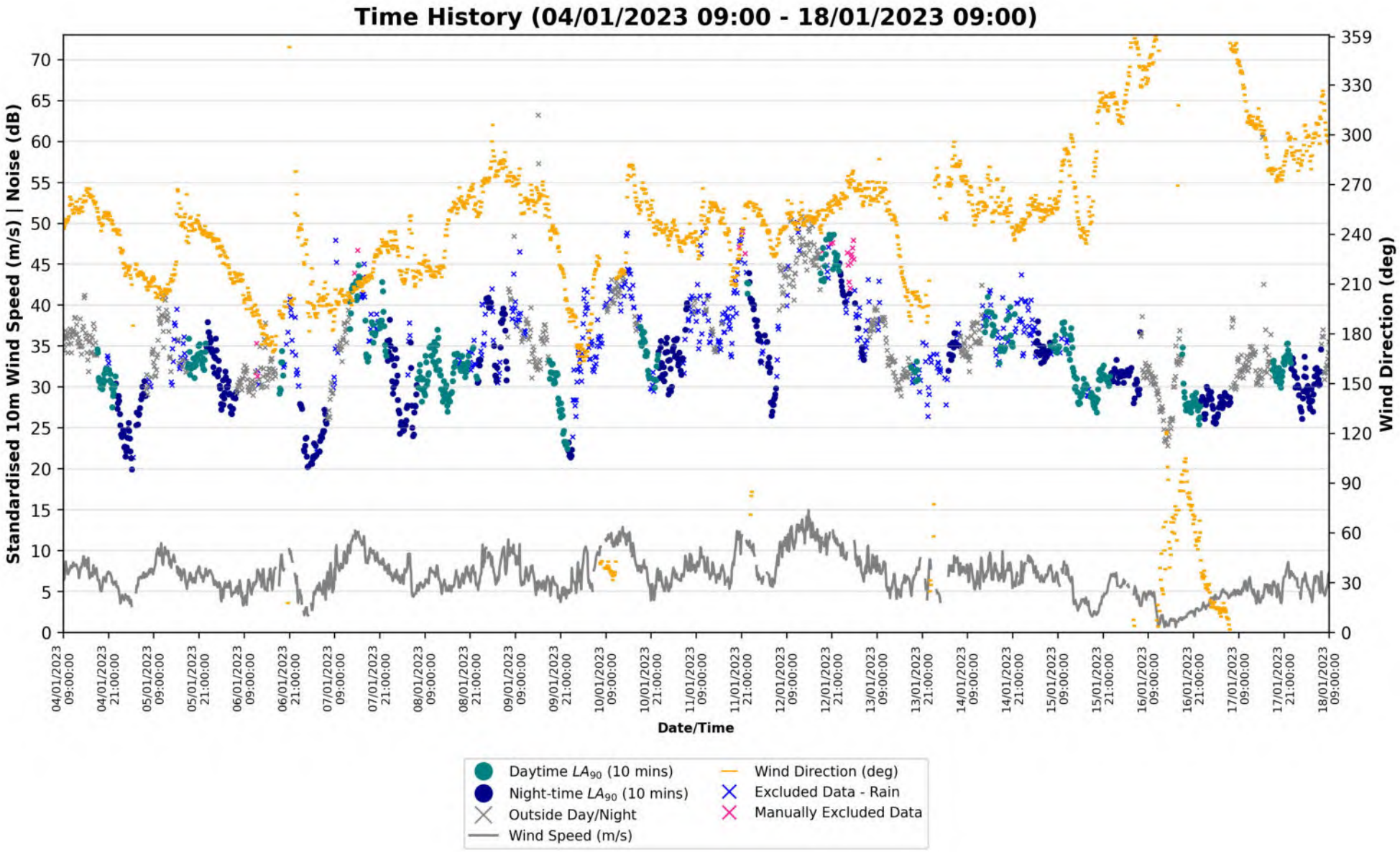
Figure A4.1d



IE00061 - Killoshulan Wind Farm

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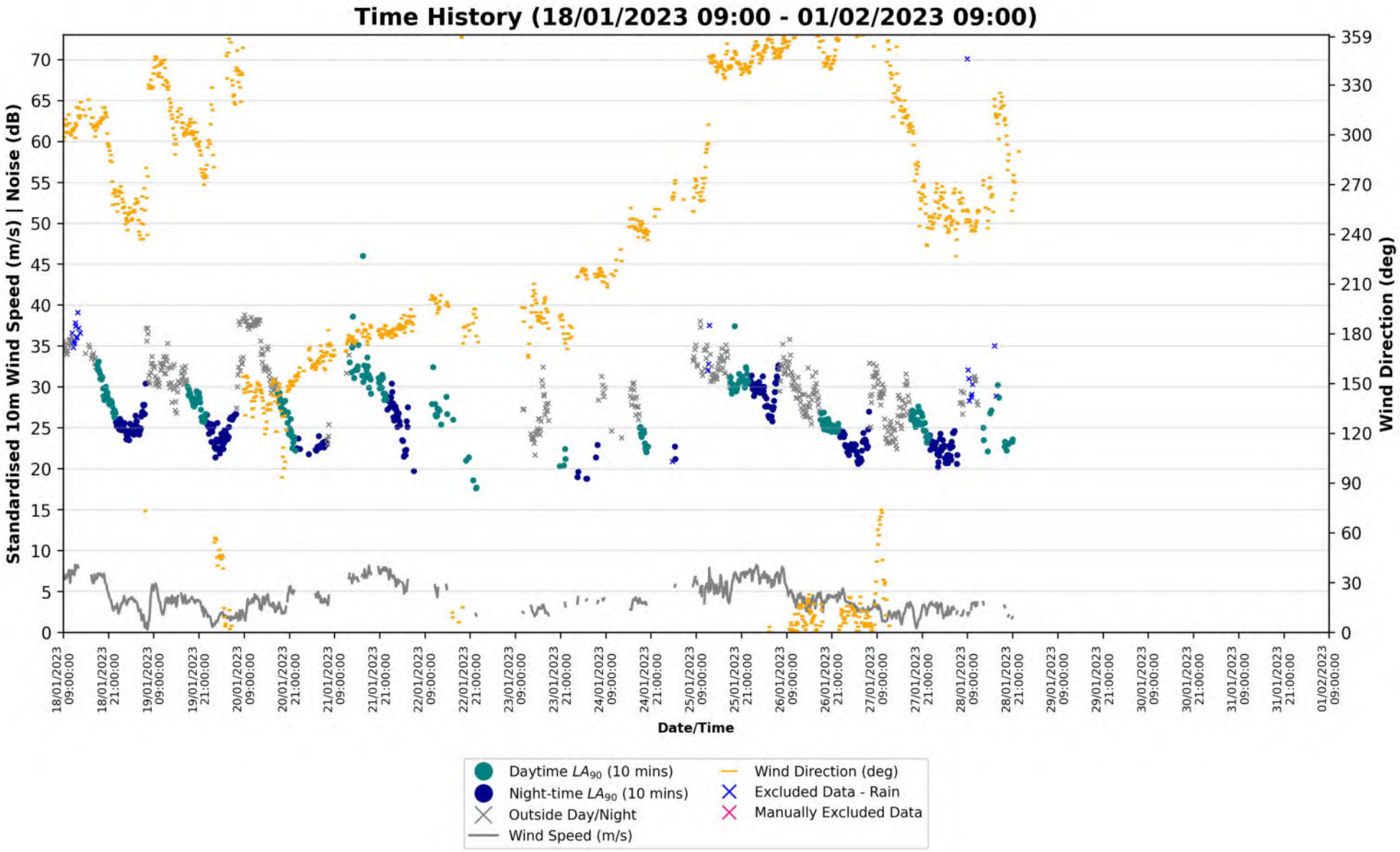
Figure A4.1d



IE00061 - Killoshulan Wind Farm

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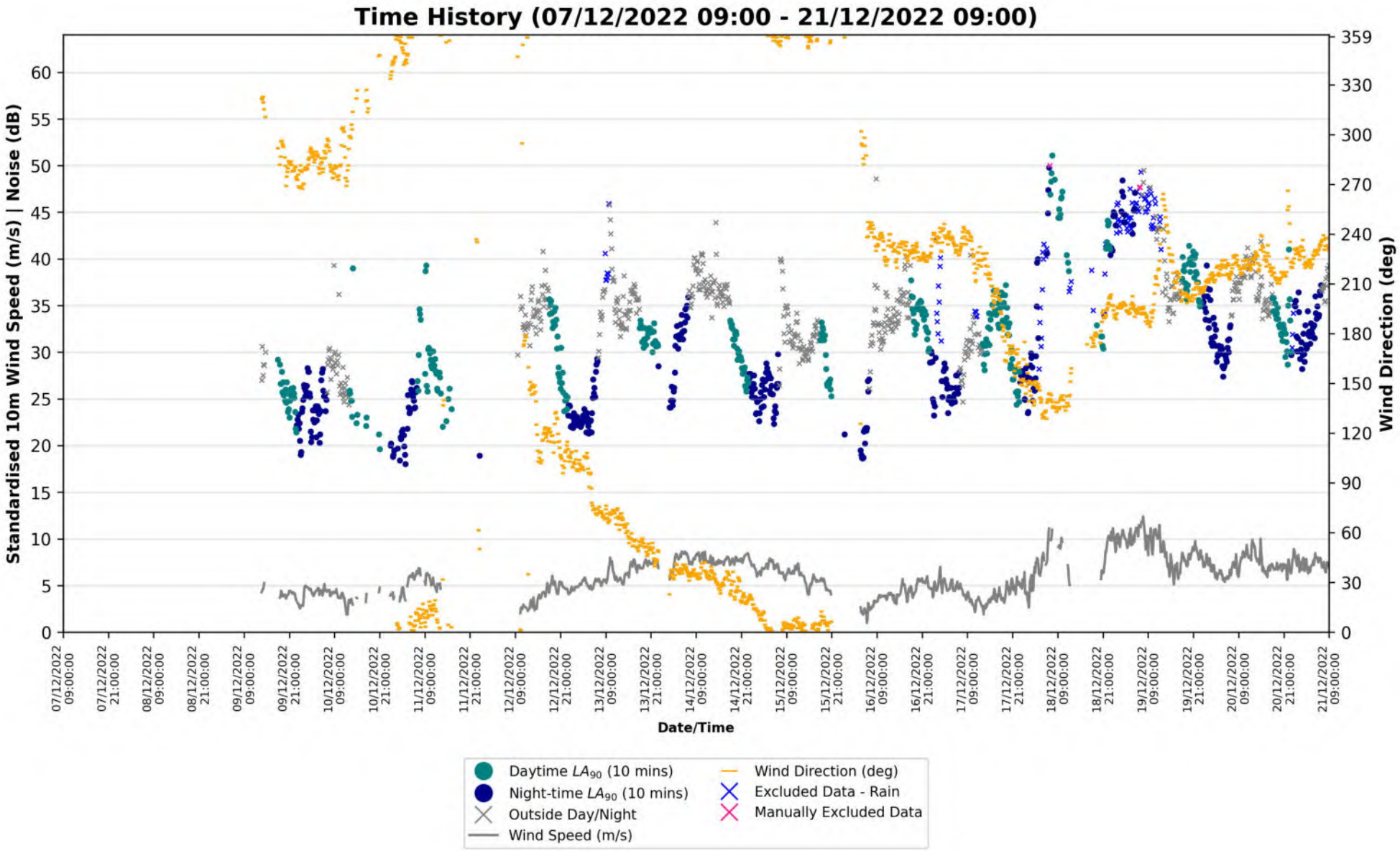
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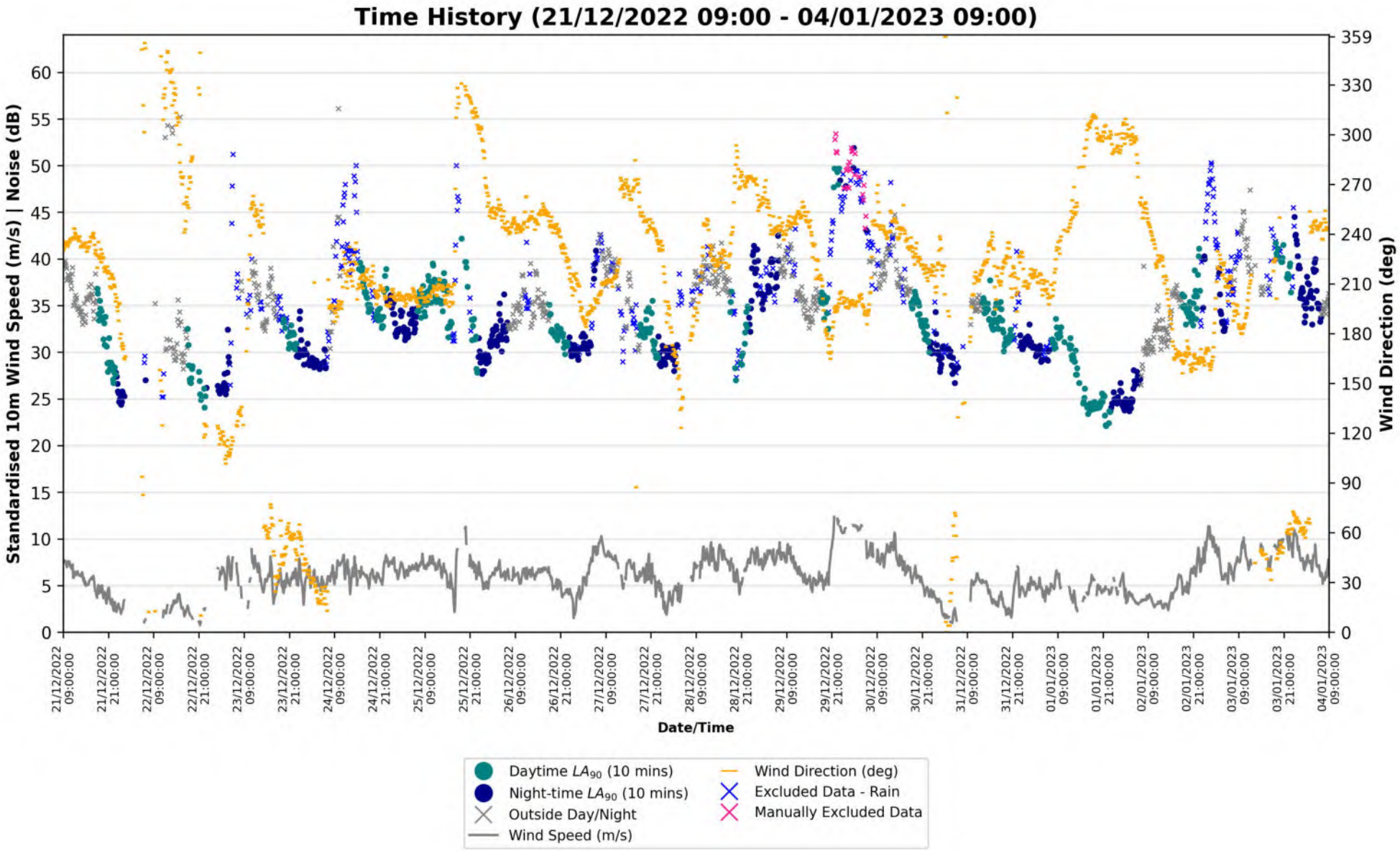
Figure A4.1e



IE00061 - Killoshulan Wind Farm

Receptor Name: NML5

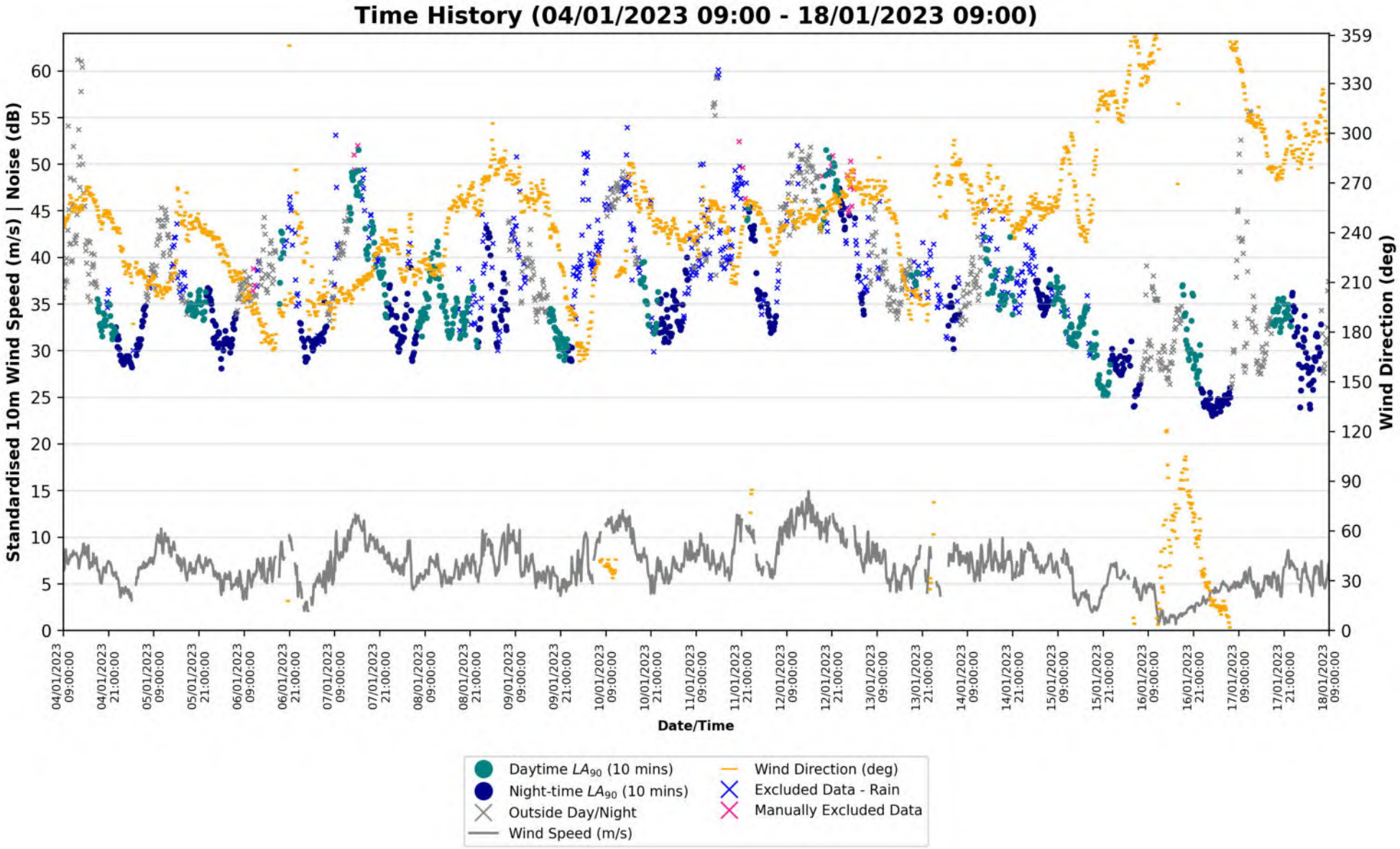
Figure A4.1e



IE00061 - Killoshulan Wind Farm

Receptor Name: NML5

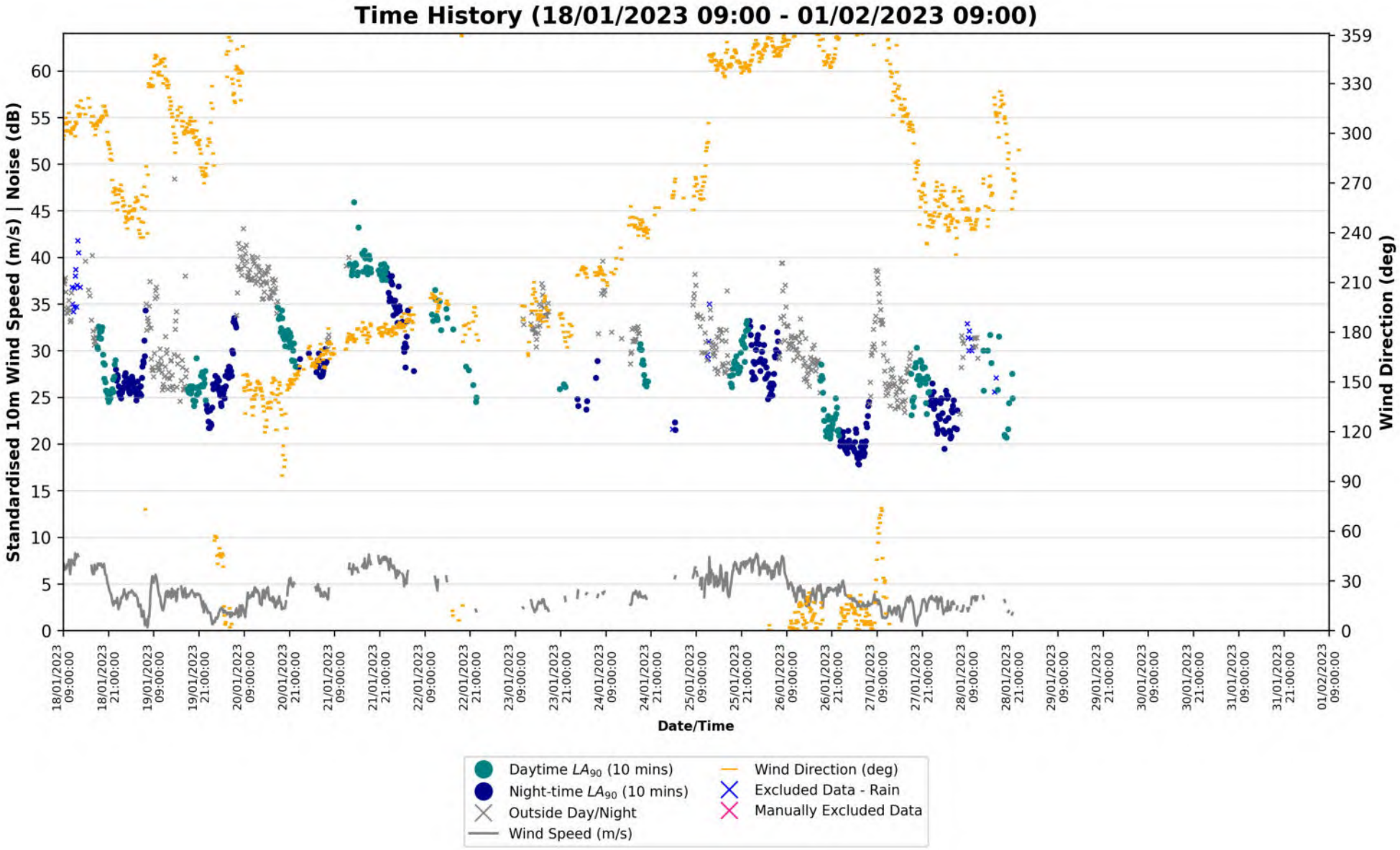
Figure A4.1e



IE00061 - Killoshulan Wind Farm

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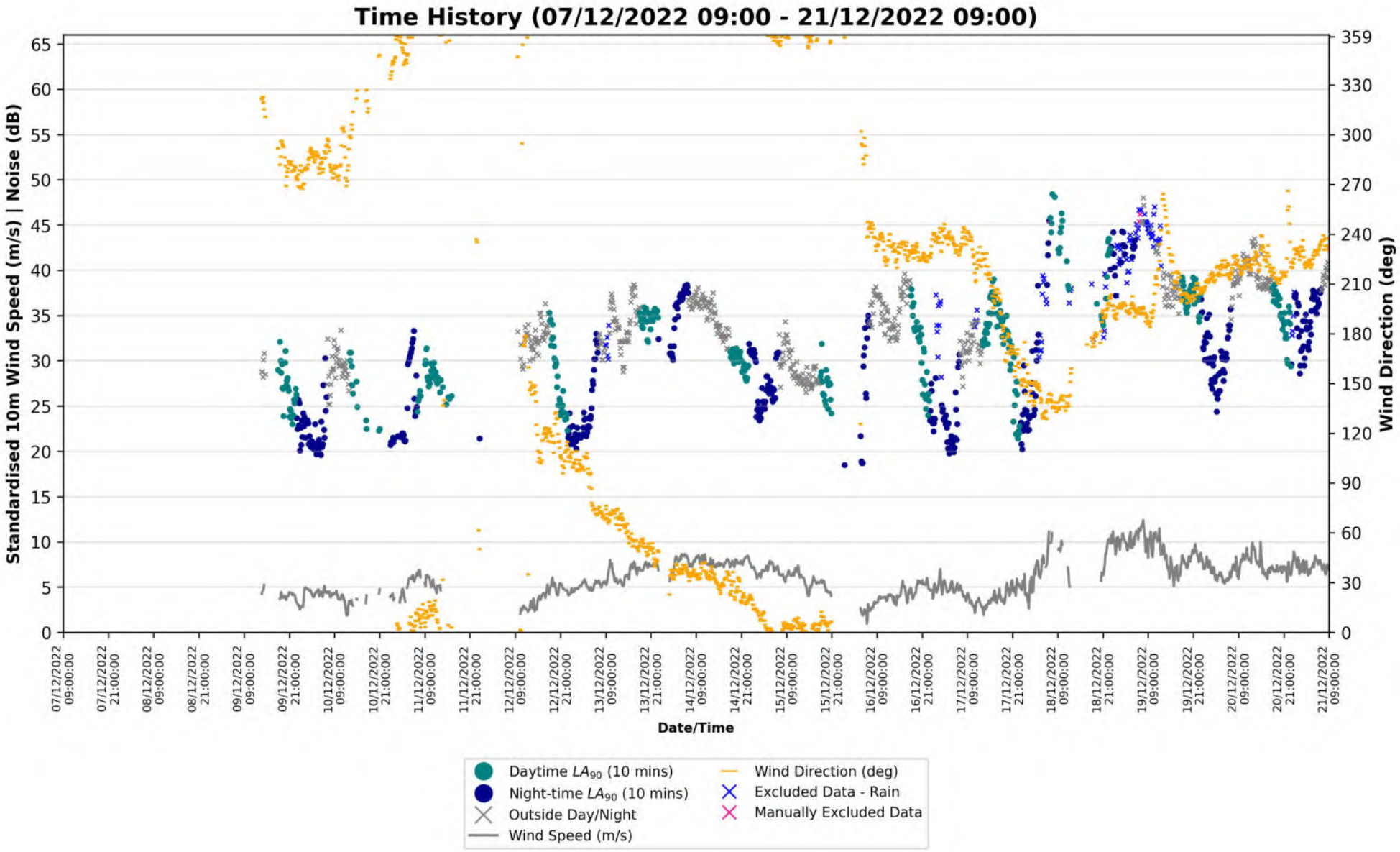
Figure A4.1e



IE00061 - Killoshulan Wind Farm

Receptor Name: NML6

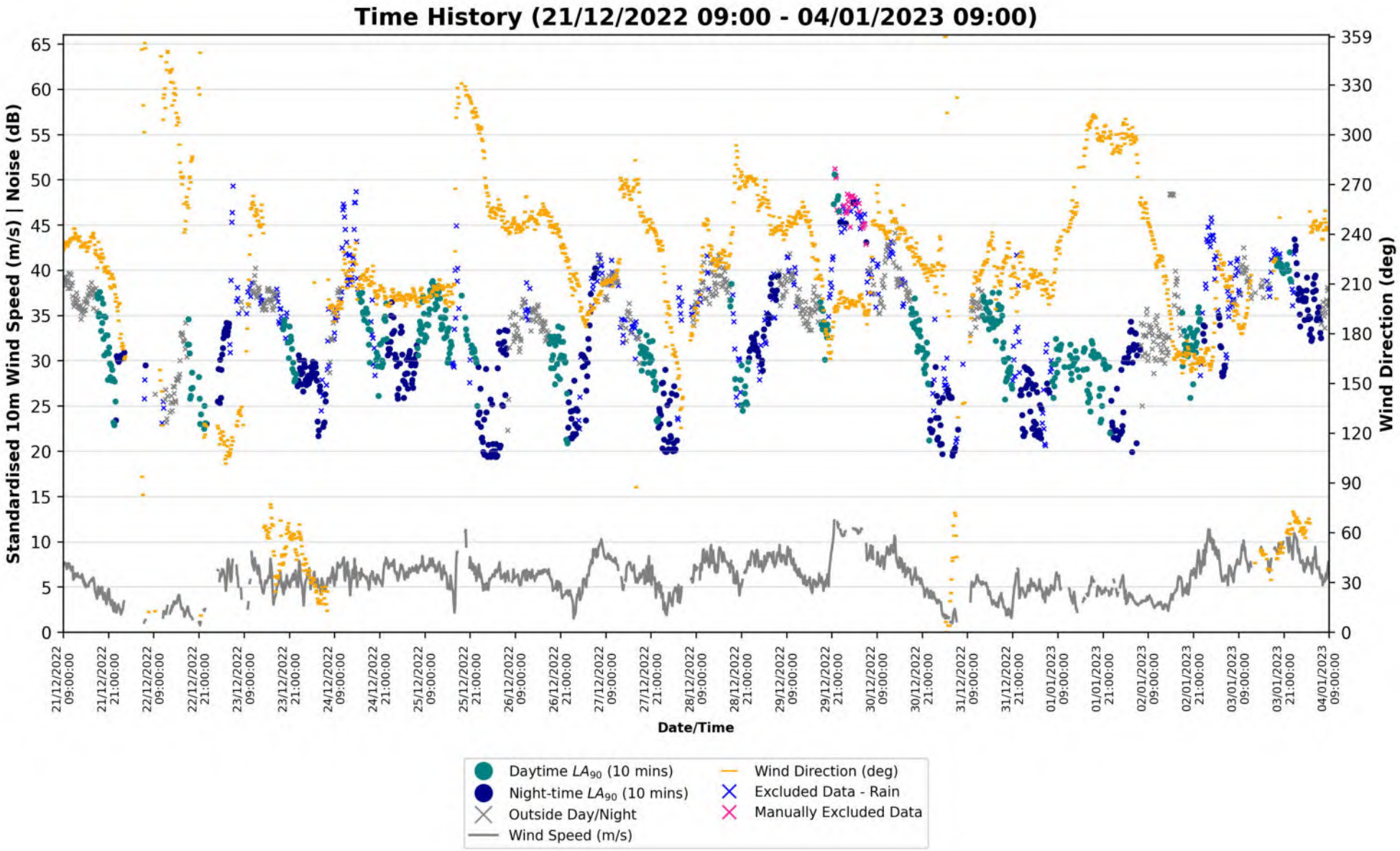
Figure A4.1f



IE00061 - Killoshulan Wind Farm

Receptor Name: NML6

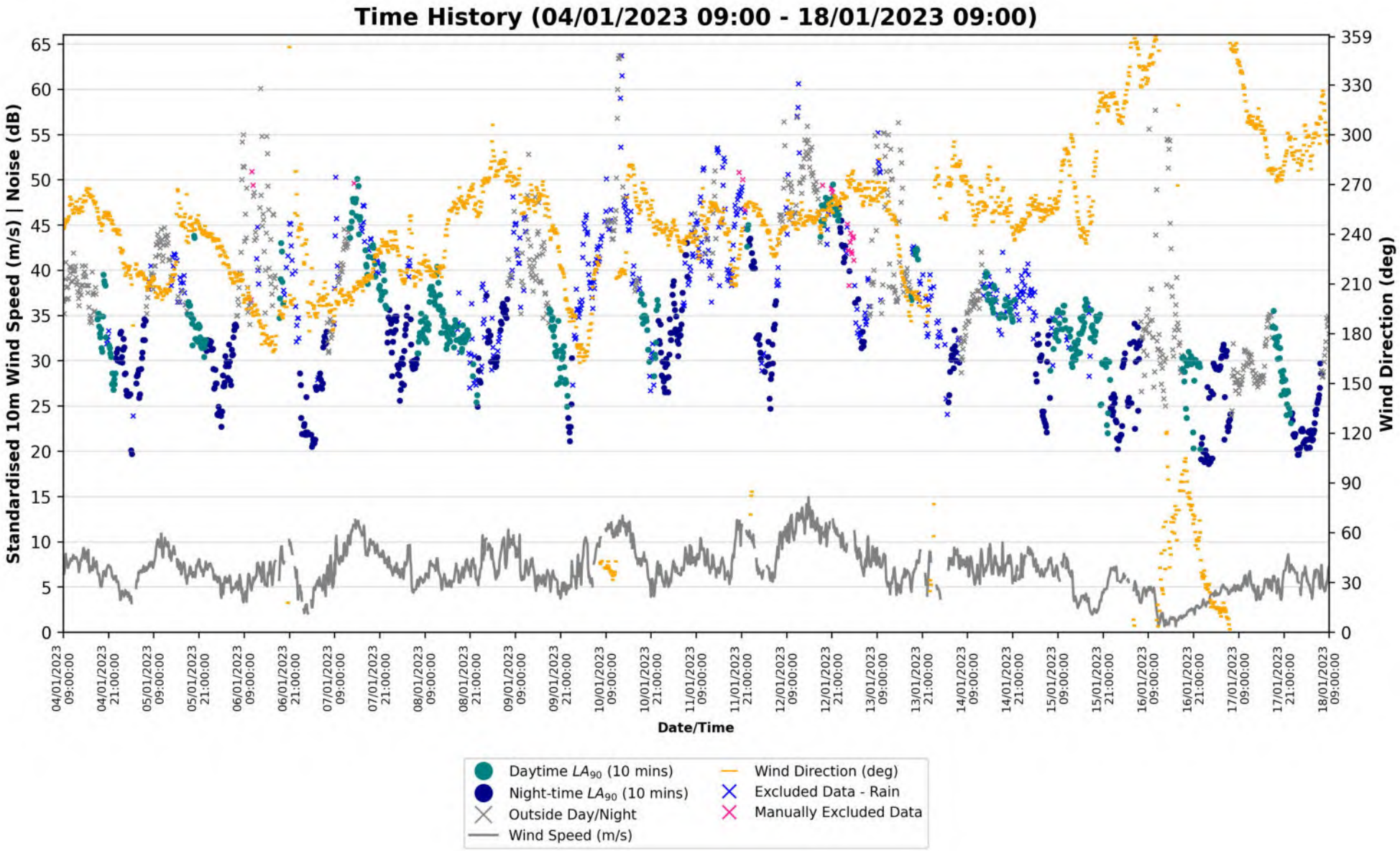
Figure A4.1f



IE00061 - Killoshulan Wind Farm

Receptor Name: NML6

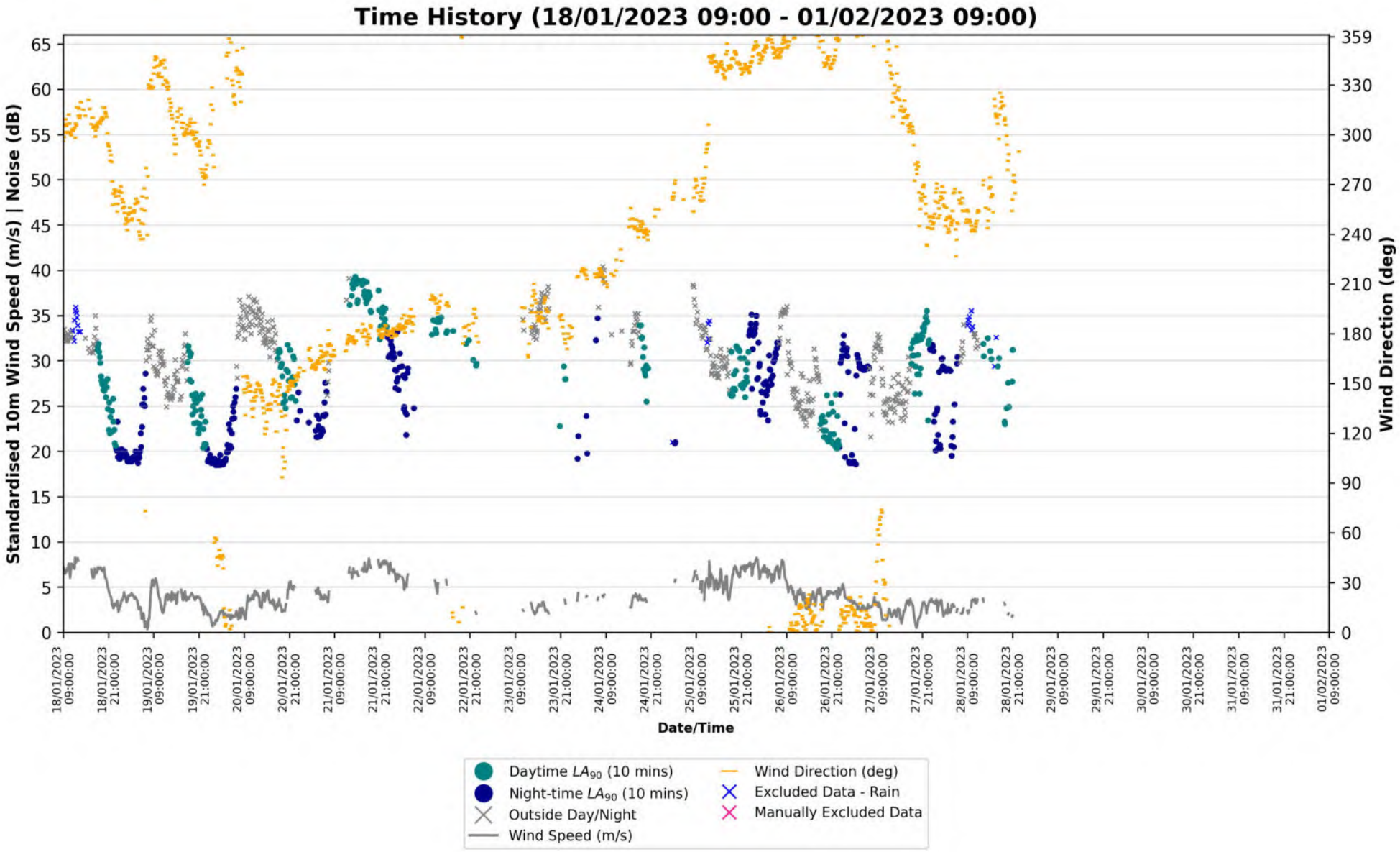
Figure A4.1f



IE00061 - Killoshulan Wind Farm

Receptor Name: NML6

Figure A4.1f



Annex 5 – NSR Coordinates and Prediction Modelling Results

- Table A5.1 – Noise Sensitive Receptor (NSR) Coordinates
- Table A5.2 – NSR Noise Predictions

Table A5.1: Noise Sensitive Receptors

Noise Sensitive Receptor (NSR)	Eircode	Easting (m)	Northing (m)	Elevation (m AOD)	Background Noise Data Used	Is this NSR also an NAL?	Non-Residential?
NSR150	E41 WR88	631713	667762	162	NML2	No	No
NSR153	E41 PV38	631762	667694	163	NML2	No	No
NSR156	E41 H520	631779	666427	172	NML2	No	No
NSR157	E41 E028	631807	667996	170	NML2	No	No
NSR159	E41 P9X2	631831	667684	167	NML2	No	No
NSR167	E41 X2V3	631910	667817	171	NML2	No	No
NSR168	E41 AY19	631915	667964	170	NML2	No	No
NSR170	E41 HK03	631952	665535	185	NML1	Yes - NAL05	No
NSR172	E41 KP20	631974	666374	187	NML2	No	No
NSR174	E41 DF85	632010	668360	155	NML2	No	No
NSR176	E41 RP40	632058	666463	191	NML2	No	No
NSR186	E41 YW70	632187	666468	200	NML2	No	No
NSR187	E41 EY10	632234	666702	201	NML2	No	No
NSR191	E41 E522	632272	667236	191	NML2	No	No
NSR192	E41 TD65	632278	667192	192	NML2	No	No
NSR193	E41 WF22	632285	667088	191	NML2	No	No
NSR198	E41 XE00	632366	666444	213	NML2	No	No
NSR202	E41 RX54	632512	666583	219	NML2	No	No
NSR203	E41 N925	632614	666963	215	NML2	No	No
NSR207	E41 VY31	632749	666725	240	NML2	No	No
NSR210	E41 C3K8	632843	666846	244	NML2	Yes - NAL06	No
NSR244	E41 KT18	633658	668944	175	NML3	No	No
NSR245	E41 YV18	633664	667809	281	NML3	Yes - NAL07	No
NSR250	E41 T186	633735	669045	164	NML3	No	No
NSR251	E41 HY65	633777	669033	162	NML3	No	No
NSR252	E41 H012	633804	668813	172	NML3	No	No
NSR254	E41 VW11	633838	668879	167	NML3	No	No
NSR259	E41 X5H2	633952	664436	188	NML6	Yes - NAL04	No
NSR261	E41 F7H6	634012	664101	162	NML6	No	No
NSR262	E41 V6W9	634045	663864	148	NML6	No	No
NSR264	E41 P527	634100	668899	160	NML3	No	No
NSR265	E41 N924	634100	668821	166	NML3	No	No
NSR266	E41 XE36	634117	663892	149	NML6	No	No
NSR267	E41 H425	634130	663826	146	NML6	No	No
NSR271	E41 KN36	634297	667956	280	NML3	No	No
NSR273	E41 AH70	634316	663640	139	NML6	No	No
NSR276	E41 TK82	634342	667852	280	NML3	Yes - NAL08	No
NSR277	E41 A3T1	634366	663784	144	NML6	No	No
NSR279	E41 C1W2	634419	663611	138	NML6	No	No
NSR286	E41 K316	634609	663745	142	NML6	No	No
NSR287	E41 C583	634627	668021	276	NML3	No	No
NSR288	E41 EW29	634643	668127	266	NML3	No	No
NSR289	E41 VP94	634671	668602	180	NML3	No	No
NSR291	E41 H9W6	634725	665192	228	NML6	Yes - NAL03	No
NSR292	E41 VY72	634771	663937	148	NML6	No	No
NSR293	E41 D2E7	634779	664721	185	NML6	No	No
NSR294	E41 H797	634780	665204	227	NML6	No	No
NSR295	E41 NH97	634846	668834	163	NML3	No	No
NSR296	E41 YE94	634875	668847	162	NML3	No	No
NSR297	E41 A0X9	634911	664410	168	NML6	No	No
NSR299	E41 CK33	635011	664586	173	NML6	No	No
NSR301	E41 F6P5	635058	663093	120	NML6	No	No
NSR303	E41 F1W8	635108	668151	234	NML3	No	No
NSR304	E41 Y3C5	635119	663162	120	NML6	No	No
NSR305	E41 NP66	635120	667785	234	NML3	Yes - NAL09	No
NSR306	E41 N9D0	635171	663453	127	NML6	No	No
NSR307	E41 C670	635185	663204	120	NML6	No	No
NSR308	E41 XC03	635202	668789	170	NML3	No	No
NSR309	E41 PY76	635222	663329	120	NML6	No	No
NSR311	E41 D596	635225	663353	121	NML6	No	No
NSR313	E41 Y310	635269	663194	120	NML6	No	No
NSR315	E41 WD59	635290	668830	170	NML3	No	No
NSR316	E41 Y578	635316	668839	170	NML3	No	No
NSR319	E41 T2N3	635345	668273	204	NML3	No	No
NSR320	E41 PD71	635389	662891	122	NML6	No	No
NSR321	E41 PW90	635447	668677	161	NML3	No	No
NSR322	E41 VH58	635458	668194	196	NML3	No	No
NSR324	E41 NT68	635524	668605	163	NML3	No	No
NSR325	E41 RW89	635538	664086	141	NML6	No	No
NSR327	E41 F248	635555	662885	132	NML6	No	No
NSR328	E41 VP71	635593	663492	120	NML6	No	No
NSR329	E41 TP65	635598	668093	189	NML3	No	No
NSR330	E41 V020	635601	668607	160	NML3	No	No
NSR331	E41 AV63	635608	668636	160	NML3	No	No
NSR332	E41 H958	635610	668564	161	NML3	No	No
NSR333	E41 YX38	635615	668619	160	NML3	No	No
NSR334	E41 HP82	635620	668559	161	NML3	No	No
NSR335	E41 Y202	635622	665496	221	NML5	No	Yes - Vacant

Table A5.1: Noise Sensitive Receptors

Noise Sensitive Receptor (NSR)	Eircode	Easting (m)	Northing (m)	Elevation (m AOD)	Background Noise Data Used	Is this NSR also an NAL?	Non-Residential?
NSR336	E41 ND23	635631	668485	163	NML3	No	No
NSR337	E41 W5P2	635637	663564	121	NML6	No	No
NSR338	E41 A2F8	635641	662907	137	NML6	No	No
NSR339	E41 V2K5	635650	663199	125	NML6	No	No
NSR340	E41 XN47	635653	668575	159	NML3	No	No
NSR341	E41 PR62	635672	668533	159	NML3	No	No
NSR342	E41 T6Y4	635692	663580	121	NML6	No	No
NSR343	E41 KF66	635701	663917	134	NML6	No	No
NSR344	E41 Y680	635713	668734	159	NML3	No	No
NSR345	E41 N2E9	635717	663991	135	NML6	No	No
NSR346	E41 VY83	635751	663917	132	NML6	No	No
NSR347	E41 P864	635757	668464	156	NML3	No	No
NSR348	E41 N6C4	635758	663981	134	NML6	No	No
NSR349	E41 AY03	635785	663910	131	NML6	No	No
NSR350	E41 KT21	635789	663661	122	NML6	No	No
NSR351	E41 XK03	635809	663952	132	NML6	No	No
NSR352	E41 C1W7	635801	668018	185	NML4	No	No
NSR354	E41 RF24	635831	663892	130	NML6	No	No
NSR357	E41 D7P1	635922	663752	120	NML6	No	Yes - Squash Club
NSR359	E41 A033	635935	668017	180	NML4	No	No
NSR361	E41 A621	636000	663748	120	NML6	No	No
NSR362	E41 T2D0	636054	663853	120	NML6	No	No
NSR363	E41 H6V2	636054	668054	172	NML4	No	No
NSR364	E41 KV62	636066	663823	120	NML6	No	No
NSR365	E41 A309	636075	668002	175	NML4	Yes - NAL10	No
NSR366	E41 KR98	636093	663857	120	NML6	No	Yes - Bar & Restaurant (Closed)
NSR367	E41 E950	636116	664251	138	NML5	No	Yes - Farmyard
NSR368	E41 HE03	636137	667972	174	NML4	No	No
NSR369	E41 X094	636149	667834	178	NML4	No	No
NSR370	E41 F7V0	636155	663913	119	NML6	No	Yes - Derelict
NSR371	E41 X3K6	636155	667802	179	NML4	No	No
NSR372	E41 V8N7	636156	668365	148	NML4	No	No
NSR373	E41 RR62	636166	663955	120	NML6	No	No
NSR374	E41 FD45	636196	663891	117	NML6	No	No
NSR375	E41 T802	636207	667934	171	NML4	No	No
NSR376	E41 F5P2	636222	663606	120	NML6	No	No
NSR378	E41 C827	636236	668296	150	NML4	No	No
NSR379	E41 K231	636245	663634	118	NML6	No	No
NSR380	E41 X925	636268	667955	167	NML4	No	No
NSR381	E41 W9X4	636289	666025	222	NML5	Yes - NAL01	No
NSR382	E41 XE62	636313	667978	164	NML4	No	No
NSR383	E41 A3P8	636333	664308	130	NML5	Yes - NAL02	No
NSR384	E41 EN82	636341	666085	221	NML5	No	No
NSR385	E41 T665	636341	668009	162	NML4	No	No
NSR386	E41 K7W8	636356	664034	122	NML5	No	No
NSR387	E41 RR94	636380	664077	124	NML5	No	No
NSR388	E41 K302	636442	664131	124	NML5	No	No
NSR389	E41 E672	636468	664196	125	NML5	No	No
NSR390	E41 YY00	636487	664228	125	NML5	No	No
NSR391	E41 YP03	636540	663276	151	NML6	No	No
NSR392	E41 X7D5	636546	664186	122	NML5	No	No
NSR393	E41 K4W9	636587	664228	122	NML5	No	No
NSR394	E41 V9W2	636644	665869	175	NML5	No	No
NSR395	E41 E860	636653	667651	168	NML4	No	No
NSR396	E41 HK46	636658	667635	169	NML4	No	No
NSR397	E41 F8K3	636661	664391	123	NML5	No	No
NSR398	E41 XT61	636682	667993	146	NML4	No	No
NSR399	E41 D789	636704	667902	147	NML4	No	No
NSR400	E41 W718	636731	668014	143	NML4	No	No
NSR401	R95 AE27	636757	665590	152	NML5	No	No
NSR402	E41 VW74	636767	667858	149	NML4	No	No
NSR403	E41 T258	636769	667621	166	NML4	No	No
NSR404	E41 K371	636777	667422	178	NML4	No	No
NSR405	E41 RX81	636780	664484	121	NML5	No	No
NSR406	E41 YY31	636799	667365	180	NML4	No	No
NSR408	E41 N2D0	636828	667490	171	NML4	No	No
NSR410	E41 H6C5	636841	664529	121	NML5	No	No
NSR411	E41 A440	636844	668117	138	NML4	No	No
NSR412	E41 A592	636855	664493	120	NML5	No	No
NSR414	E41 EP26	636865	667255	181	NML4	Yes - NAL11	No
NSR415	E41 V577	636886	668099	136	NML4	No	No
NSR416	E41 E521	636888	664516	120	NML5	No	No
NSR417	E41 P208	636909	667668	154	NML4	No	No
NSR420	E41 V3W8	636975	667482	167	NML4	No	No
NSR423	E41 FD76	637054	667164	174	NML4	No	No
NSR424	R95 TP68	637069	666098	164	NML5	No	No
NSR425	R95 P970	637101	664985	130	NML5	No	No
NSR426	R95 CYR8	637112	665010	130	NML5	No	No

Table A5.1: Noise Sensitive Receptors

Noise Sensitive Receptor (NSR)	Eircode	Easting (m)	Northing (m)	Elevation (m AOD)	Background Noise Data Used	Is this NSR also an NAL?	Non-Residential?
NSR427	R95 FP74	637127	665032	130	NML5	No	No
NSR428	E41 PC65	637130	667394	163	NML4	No	No
NSR431	R95 NY17	637155	665105	129	NML5	No	No
NSR434	R95 F752	637165	666170	165	NML5	No	No
NSR437	E41 Y032	637173	667618	142	NML4	No	No
NSR438	R95 R156	637177	666251	168	NML5	No	No
NSR440	R95 V3K1	637191	665130	128	NML5	No	No
NSR444	E41 E430	637219	667405	157	NML4	No	No
NSR447	R95 D7Y3	637270	665298	125	NML5	No	No
NSR448	R95 NT20	637276	665757	145	NML5	No	No
NSR449	E41 D516	637290	667332	157	NML4	No	No
NSR450	E41 HT02	637316	667277	159	NML4	No	No
NSR451	R95 YK29	637322	665324	123	NML5	No	No
NSR453	E41 E9X3	637368	667351	150	NML4	No	No
NSR454	R95 A362	637415	665390	124	NML5	No	No
NSR456	R95 W2V6	637468	667281	148	NML4	No	No
NSR457	R95 YH33	637518	667028	156	NML4	No	No
NSR459	R95 XK51	637601	665563	130	NML5	No	No
NSR461	R95 K280	637635	665391	121	NML5	No	No
NSR462	R95 T9P7	637645	664808	108	NML5	No	No
NSR465	R95 NT38	637718	665597	129	NML5	No	No
NSR468	R95 NV02	637778	665661	131	NML5	No	No
NSR469	R95 RC44	637800	665831	144	NML5	No	No
NSR507	E41 A3E9	631852	667950	170	NML2	No	No
NSR509	E41 Y4E8	633878	664412	189	NML6	No	No
NSR510	E41 A4W0	634801	665213	228	NML6	No	No
NSR511	E41 YX74	635101	663115	120	NML6	No	No
NSR512	E41 C6Y5	635783	663047	148	NML6	No	No
NSR513	E41 HK72	635787	663139	141	NML6	No	No
NSR515	E41 P2P2	636654	667466	179	NML4	No	No
NSR516	E41 T9W9	636814	664520	121	NML5	No	No
NSR517	N/A	636106	668040	170	NML4	No	No
NSR518	N/A	635819	663879	130	NML6	No	No

Table A5.2 Total WEDG (Guidelines (DoEHLG, 2006)) Noise Limits Compliance Table at NSRs – Daytime

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR150	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.7	30.9	31.9	32.0	32.0	32.0	32.0	32.0
	Exceedance Level	-	-	-18.3	-14.1	-13.1	-13.0	-13.0	-13.9	-17.2	-21.8
NSR153	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.1	31.3	32.3	32.3	32.3	32.3	32.3	32.3
	Exceedance Level	-	-	-17.9	-13.7	-12.7	-12.7	-12.7	-13.6	-16.9	-21.5
NSR156	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.0	31.3	32.4	32.5	32.5	32.5	32.5	32.5
	Exceedance Level	-	-	-18.0	-13.7	-12.6	-12.5	-12.5	-13.4	-16.7	-21.3
NSR157	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.1	31.2	32.2	32.2	32.2	32.2	32.2	32.2
	Exceedance Level	-	-	-17.9	-13.8	-12.8	-12.8	-12.8	-13.7	-17.0	-21.6
NSR159	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.2	31.4	32.4	32.4	32.4	32.4	32.4	32.4
	Exceedance Level	-	-	-17.8	-13.6	-12.6	-12.6	-12.6	-13.5	-16.8	-21.4
NSR167	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.4	31.6	32.6	32.6	32.6	32.6	32.6	32.6
	Exceedance Level	-	-	-17.6	-13.4	-12.4	-12.4	-12.4	-13.3	-16.6	-21.2
NSR168	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.4	32.4	32.4	32.4	32.4	32.4	32.4
	Exceedance Level	-	-	-17.7	-13.6	-12.6	-12.6	-12.6	-13.5	-16.8	-21.4
NSR170	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7	49.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.4	30.7	31.8	31.8	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-18.6	-14.3	-13.2	-13.2	-13.1	-13.1	-13.8	-17.6
NSR172	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.9	32.2	33.3	33.3	33.3	33.3	33.3	33.3
	Exceedance Level	-	-	-17.1	-12.8	-11.7	-11.7	-11.7	-12.6	-15.9	-20.5
	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR174	Cumulative Wind Turbine Noise LA90 dB	-	-	27.4	31.4	32.3	32.3	32.3	32.3	32.3	32.3
	Exceedance Level	-	-	-17.6	-13.6	-12.7	-12.7	-12.7	-13.6	-16.9	-21.5
NSR176	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.4	32.8	33.8	33.9	33.9	33.9	33.9	33.9
	Exceedance Level	-	-	-16.6	-12.2	-11.2	-11.1	-11.1	-12.0	-15.3	-19.9
NSR186	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.1	33.5	34.6	34.6	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-15.9	-11.5	-10.4	-10.4	-10.4	-11.3	-14.6	-19.2
NSR187	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.6	34.0	35.1	35.1	35.1	35.1	35.1	35.1
	Exceedance Level	-	-	-15.4	-11.0	-9.9	-9.9	-9.9	-10.8	-14.1	-18.7
NSR191	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.5	33.9	34.9	35.0	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-15.5	-11.1	-10.1	-10.0	-10.0	-10.9	-14.2	-18.8
NSR192	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.6	34.0	35.0	35.0	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-15.4	-11.0	-10.0	-10.0	-10.0	-10.9	-14.2	-18.8
NSR193	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.7	34.1	35.2	35.2	35.2	35.2	35.2	35.2
	Exceedance Level	-	-	-15.3	-10.9	-9.8	-9.8	-9.8	-10.7	-14.0	-18.6
NSR198	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.0	34.5	35.6	35.6	35.6	35.6	35.6	35.6
	Exceedance Level	-	-	-15.0	-10.5	-9.4	-9.4	-9.4	-10.3	-13.6	-18.2
NSR202	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.6	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-13.8	-9.4	-8.3	-8.3	-8.3	-9.2	-12.5	-17.1
NSR203	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.3	36.7	37.8	37.8	37.8	37.8	37.8	37.8
	Exceedance Level	-	-	-12.7	-8.3	-7.2	-7.2	-7.2	-8.1	-11.4	-16.0

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR207	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.6	38.0	39.1	39.1	39.1	39.1	39.1	39.1
	Exceedance Level	-	-	-11.4	-7.0	-5.9	-5.9	-5.9	-6.8	-10.1	-14.7
NSR210	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2
	Exceedance Level	-	-	-10.4	-5.9	-4.8	-4.8	-4.8	-5.7	-9.0	-13.6
NSR244	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.1	36.9	37.7	37.7	37.7	37.7	37.7	37.7
	Exceedance Level	-	-	-11.9	-8.1	-7.3	-7.8	-10.9	-14.1	-17.5	-20.9
NSR245	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.0	39.4	40.4	40.4	40.4	40.4	40.4	40.4
	Exceedance Level	-	-	-10.0	-5.6	-4.6	-5.1	-8.2	-11.4	-14.8	-18.2
NSR250	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.7	37.4	38.2	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-11.3	-7.6	-6.8	-7.3	-10.4	-13.6	-17.0	-20.4
NSR251	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.8	37.5	38.2	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-11.2	-7.5	-6.8	-7.3	-10.4	-13.6	-17.0	-20.4
NSR252	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.0	36.8	37.6	37.6	37.6	37.6	37.6	37.6
	Exceedance Level	-	-	-12.0	-8.2	-7.4	-7.9	-11.0	-14.2	-17.6	-21.0
NSR254	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.3	37.1	37.9	37.9	37.9	37.9	37.9	37.9
	Exceedance Level	-	-	-11.7	-7.9	-7.1	-7.6	-10.7	-13.9	-17.3	-20.7
NSR259	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.0	33.5	34.6	34.6	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-16.0	-11.5	-10.4	-10.4	-10.4	-11.7	-15.2	-19.2
NSR261	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.1	32.6	33.7	33.7	33.7	33.7	33.7	33.7

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-16.9	-12.4	-11.3	-11.3	-11.3	-12.6	-16.1	-20.1
NSR262	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.8	32.9	32.9	32.9	32.9	32.9	32.9
	Exceedance Level	-	-	-17.7	-13.2	-12.1	-12.1	-12.1	-13.4	-16.9	-20.9
NSR264	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.7	37.4	38.1	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-11.3	-7.6	-6.9	-7.3	-10.4	-13.6	-17.0	-20.4
NSR265	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.8	37.5	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-11.2	-7.5	-6.7	-7.2	-10.3	-13.5	-16.9	-20.3
NSR266	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.6	32.0	33.1	33.2	33.2	33.2	33.2	33.2
	Exceedance Level	-	-	-17.4	-13.0	-11.9	-11.8	-11.8	-13.1	-16.6	-20.6
NSR267	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.5	32.0	33.1	33.1	33.1	33.1	33.1	33.1
	Exceedance Level	-	-	-17.5	-13.0	-11.9	-11.9	-11.9	-13.2	-16.7	-20.7
NSR271	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.5	38.9	40.0	40.0	40.0	40.0	40.0	40.0
	Exceedance Level	-	-	-10.5	-6.1	-5.0	-5.5	-8.6	-11.8	-15.2	-18.6
NSR273	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.7	32.8	32.8	32.8	32.8	32.8	32.8
	Exceedance Level	-	-	-17.7	-13.3	-12.2	-12.2	-12.2	-13.5	-17.0	-21.0
NSR276	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.3	39.8	40.9	40.9	40.9	40.9	40.9	40.9
	Exceedance Level	-	-	-9.7	-5.2	-4.1	-4.6	-7.7	-10.9	-14.3	-17.7
NSR277	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.0	32.4	33.5	33.5	33.5	33.5	33.5	33.5
	Exceedance Level	-	-	-17.0	-12.6	-11.5	-11.5	-11.5	-12.8	-16.3	-20.3
	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR279	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.8	32.9	32.9	32.9	32.9	32.9	32.9
	Exceedance Level	-	-	-17.7	-13.2	-12.1	-12.1	-12.1	-13.4	-16.9	-20.9
NSR286	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.3	32.7	33.8	33.8	33.8	33.8	33.8	33.8
	Exceedance Level	-	-	-16.7	-12.3	-11.2	-11.2	-11.2	-12.5	-16.0	-20.0
NSR287	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.0	38.4	39.5	39.5	39.5	39.5	39.5	39.5
	Exceedance Level	-	-	-11.0	-6.6	-5.5	-6.0	-9.1	-12.3	-15.7	-19.1
NSR288	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.2	37.6	38.7	38.7	38.7	38.7	38.7	38.7
	Exceedance Level	-	-	-11.8	-7.4	-6.3	-6.8	-9.9	-13.1	-16.5	-19.9
NSR289	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.2	37.9	38.6	38.7	38.7	38.7	38.7	38.7
	Exceedance Level	-	-	-10.8	-7.1	-6.4	-6.8	-9.9	-13.1	-16.5	-19.9
NSR291	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-9.2	-4.7	-3.6	-3.6	-3.6	-4.9	-8.4	-12.4
NSR292	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.6	34.1	35.2	35.2	35.2	35.2	35.2	35.2
	Exceedance Level	-	-	-15.4	-10.9	-9.8	-9.8	-9.8	-11.1	-14.6	-18.6
NSR293	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.9	38.3	39.4	39.4	39.4	39.4	39.4	39.4
	Exceedance Level	-	-	-11.1	-6.7	-5.6	-5.6	-5.6	-6.9	-10.4	-14.4
NSR294	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	36.1	40.5	41.6	41.7	41.7	41.7	41.7	41.7
	Exceedance Level	-	-	-8.9	-4.5	-3.4	-3.3	-3.3	-4.6	-8.1	-12.1
NSR295	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.5	38.2	38.9	39.0	39.0	39.0	39.0	39.0
	Exceedance Level	-	-	-10.5	-6.8	-6.1	-6.5	-9.6	-12.8	-16.2	-19.6

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR296	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.3	38.1	38.8	38.9	38.9	38.9	38.9	38.9
	Exceedance Level	-	-	-10.7	-6.9	-6.2	-6.6	-9.7	-12.9	-16.3	-19.7
NSR297	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.9	37.4	38.5	38.5	38.5	38.5	38.5	38.5
	Exceedance Level	-	-	-12.1	-7.6	-6.5	-6.5	-6.5	-7.8	-11.3	-15.3
NSR299	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.7	39.2	40.3	40.3	40.3	40.3	40.3	40.3
	Exceedance Level	-	-	-10.3	-5.8	-4.7	-4.7	-4.7	-6.0	-9.5	-13.5
NSR301	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.0	30.5	31.6	31.6	31.6	31.6	31.6	31.6
	Exceedance Level	-	-	-19.0	-14.5	-13.4	-13.4	-13.4	-14.7	-18.2	-22.2
NSR303	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.0	37.1	38.0	38.0	38.0	38.0	38.0	38.0
	Exceedance Level	-	-	-12.0	-7.9	-7.0	-7.5	-10.6	-13.8	-17.2	-20.6
NSR304	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.4	30.8	31.9	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-18.6	-14.2	-13.1	-13.1	-13.1	-14.4	-17.9	-21.9
NSR305	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.1	39.5	40.5	40.5	40.5	40.5	40.5	40.5
	Exceedance Level	-	-	-9.9	-5.5	-4.5	-5.0	-8.1	-11.3	-14.7	-18.1
NSR306	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.8	32.3	33.4	33.4	33.4	33.4	33.4	33.4
	Exceedance Level	-	-	-17.2	-12.7	-11.6	-11.6	-11.6	-12.9	-16.4	-20.4
NSR307	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.6	31.1	32.2	32.2	32.2	32.2	32.2	32.2
	Exceedance Level	-	-	-18.4	-13.9	-12.8	-12.8	-12.8	-14.1	-17.6	-21.6
NSR308	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.7	37.6	38.4	38.4	38.4	38.4	38.4	38.4

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-11.3	-7.4	-6.6	-7.1	-10.2	-13.4	-16.8	-20.2
NSR309	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.7	32.8	32.8	32.8	32.8	32.8	32.8
	Exceedance Level	-	-	-17.7	-13.3	-12.2	-12.2	-12.2	-13.5	-17.0	-21.0
NSR311	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.4	31.8	32.9	33.0	33.0	33.0	33.0	33.0
	Exceedance Level	-	-	-17.6	-13.2	-12.1	-12.0	-12.0	-13.3	-16.8	-20.8
NSR313	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.6	31.1	32.2	32.2	32.2	32.2	32.2	32.2
	Exceedance Level	-	-	-18.4	-13.9	-12.8	-12.8	-12.8	-14.1	-17.6	-21.6
NSR315	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.8	37.6	38.4	38.4	38.4	38.4	38.4	38.4
	Exceedance Level	-	-	-11.2	-7.4	-6.6	-7.1	-10.2	-13.4	-16.8	-20.2
NSR316	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.7	37.6	38.4	38.4	38.4	38.4	38.4	38.4
	Exceedance Level	-	-	-11.3	-7.4	-6.6	-7.1	-10.2	-13.4	-16.8	-20.2
NSR319	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.1	37.1	38.0	38.0	38.0	38.0	38.0	38.0
	Exceedance Level	-	-	-11.9	-7.9	-7.0	-7.5	-10.6	-13.8	-17.2	-20.6
NSR320	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.7	31.2	32.3	32.3	32.4	32.4	32.4	32.4
	Exceedance Level	-	-	-18.3	-13.8	-12.7	-12.7	-12.6	-13.9	-17.4	-21.4
NSR321	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.2	36.1	37.0	37.0	37.0	37.0	37.0	37.0
	Exceedance Level	-	-	-12.8	-8.9	-8.0	-8.5	-11.6	-14.8	-18.2	-21.6
NSR322	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.8	36.9	37.8	37.9	37.9	37.9	37.9	37.9
	Exceedance Level	-	-	-12.2	-8.1	-7.2	-7.6	-10.7	-13.9	-17.3	-20.7
	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR324	Cumulative Wind Turbine Noise LA90 dB	-	-	31.7	35.7	36.6	36.6	36.6	36.6	36.6	36.6
	Exceedance Level	-	-	-13.3	-9.3	-8.4	-8.9	-12.0	-15.2	-18.6	-22.0
NSR325	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.9	37.4	38.5	38.5	38.5	38.5	38.5	38.5
	Exceedance Level	-	-	-12.1	-7.6	-6.5	-6.5	-6.5	-7.8	-11.3	-15.3
NSR327	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.2	31.6	32.8	32.8	32.8	32.8	32.8	32.8
	Exceedance Level	-	-	-17.8	-13.4	-12.2	-12.2	-12.2	-13.5	-17.0	-21.0
NSR328	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.3	32.8	33.9	33.9	33.9	33.9	33.9	33.9
	Exceedance Level	-	-	-16.7	-12.2	-11.1	-11.1	-11.1	-12.4	-15.9	-19.9
NSR329	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.7	36.8	37.8	37.8	37.8	37.8	37.8	37.8
	Exceedance Level	-	-	-12.3	-8.2	-7.2	-7.7	-10.8	-14.0	-17.4	-20.8
NSR330	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.5	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-13.5	-9.5	-8.6	-9.1	-12.2	-15.4	-18.8	-22.2
NSR331	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.5	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-13.5	-9.5	-8.6	-9.1	-12.2	-15.4	-18.8	-22.2
NSR332	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.4	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-13.6	-9.6	-8.7	-9.2	-12.3	-15.5	-18.9	-22.3
NSR333	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.5	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-13.5	-9.5	-8.6	-9.1	-12.2	-15.4	-18.8	-22.2
NSR334	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.4	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-13.7	-9.6	-8.7	-9.2	-12.3	-15.5	-18.9	-22.3

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR335	Vacant										
NSR336	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.3	36.2	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-13.8	-9.7	-8.8	-9.3	-12.4	-15.6	-19.0	-22.4
NSR337	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.8	33.2	34.4	34.4	34.4	34.4	34.4	34.4
	Exceedance Level	-	-	-16.2	-11.8	-10.6	-10.6	-10.6	-11.9	-15.4	-19.4
NSR338	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.7	32.9	32.9	32.9	32.9	32.9	32.9
	Exceedance Level	-	-	-17.7	-13.3	-12.1	-12.1	-12.1	-13.4	-16.9	-20.9
NSR339	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.2	32.6	33.7	33.7	33.7	33.7	33.7	33.7
	Exceedance Level	-	-	-16.8	-12.4	-11.3	-11.3	-11.3	-12.6	-16.1	-20.1
NSR340	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.3	36.2	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-13.7	-9.7	-8.8	-9.3	-12.4	-15.6	-19.0	-22.4
NSR341	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.2	36.1	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-13.8	-9.8	-8.9	-9.3	-12.4	-15.6	-19.0	-22.4
NSR342	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.9	33.3	34.4	34.5	34.5	34.5	34.5	34.5
	Exceedance Level	-	-	-16.1	-11.7	-10.6	-10.5	-10.5	-11.8	-15.3	-19.3
NSR343	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.9	37.0	37.0	37.0	37.0	37.0	37.0
	Exceedance Level	-	-	-13.6	-9.1	-8.0	-8.0	-8.0	-9.3	-12.8	-16.8
NSR344	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.3	36.2	36.2	36.2	36.2	36.2	36.2

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-13.7	-9.7	-8.8	-9.3	-12.4	-15.6	-19.0	-22.4
NSR345	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.1	36.6	37.7	37.7	37.7	37.7	37.7	37.7
	Exceedance Level	-	-	-12.9	-8.4	-7.3	-7.3	-7.3	-8.6	-12.1	-16.1
NSR346	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.9	37.0	37.0	37.0	37.0	37.0	37.0
	Exceedance Level	-	-	-13.6	-9.1	-8.0	-8.0	-8.0	-9.3	-12.8	-16.8
NSR347	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	35.0	35.9	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-14.1	-10.0	-9.1	-9.6	-12.7	-15.9	-19.3	-22.7
NSR348	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.0	36.5	37.6	37.6	37.6	37.6	37.6	37.6
	Exceedance Level	-	-	-13.0	-8.5	-7.4	-7.4	-7.4	-8.7	-12.2	-16.2
NSR349	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.8	36.9	36.9	36.9	36.9	36.9	36.9
	Exceedance Level	-	-	-13.7	-9.2	-8.1	-8.1	-8.1	-9.4	-12.9	-16.9
NSR350	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.4	33.8	34.9	35.0	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-15.6	-11.2	-10.1	-10.0	-10.0	-11.3	-14.8	-18.8
NSR351	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.7	36.1	37.2	37.2	37.2	37.2	37.2	37.2
	Exceedance Level	-	-	-13.3	-8.9	-7.8	-7.8	-7.8	-9.1	-12.6	-16.6
NSR352	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.2	36.4	37.3	37.3	37.3	37.3	37.3	37.3
	Exceedance Level	-	-	-7.8	-3.6	-7.7	-7.7	-7.7	-7.7	-9.4	-13.6
NSR354	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.1	35.6	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-13.9	-9.4	-8.3	-8.3	-8.3	-9.6	-13.1	-17.1

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR357	Non-Residential										
NSR359	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.7	35.9	36.9	36.9	36.9	36.9	36.9	36.9
	Exceedance Level	-	-	-8.3	-4.1	-8.1	-8.1	-8.1	-8.1	-9.8	-14.0
NSR361	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.8	34.2	35.3	35.3	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-15.2	-10.8	-9.7	-9.7	-9.6	-10.9	-14.4	-18.4
NSR362	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.9	36.0	36.0	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-14.6	-10.1	-9.0	-9.0	-9.0	-10.3	-13.8	-17.8
NSR363	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.0	35.2	36.2	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-9.0	-4.8	-8.8	-8.8	-8.8	-8.8	-10.5	-14.7
NSR364	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.6	35.7	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-14.8	-10.4	-9.3	-9.3	-9.3	-10.6	-14.1	-18.1
NSR365	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.5	36.4	36.5	36.5	36.5	36.5	36.5
	Exceedance Level	-	-	-8.7	-4.5	-8.6	-8.5	-8.5	-8.5	-10.2	-14.4
NSR366	Non-Residential										
NSR367	Non-Residential										
NSR368	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.1	35.3	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-8.9	-4.7	-8.7	-8.7	-8.7	-8.7	-10.4	-14.6

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR369	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.6	36.6	36.6	36.6	36.6	36.6	36.6
	Exceedance Level	-	-	-8.6	-4.4	-8.4	-8.4	-8.4	-8.4	-10.1	-14.3
NSR370	Derelict										
NSR371	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.7	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-8.6	-4.3	-8.3	-8.3	-8.3	-8.3	-10.0	-14.2
NSR372	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.6	33.8	34.8	34.8	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-10.4	-6.2	-10.2	-10.2	-10.2	-10.2	-11.9	-16.1
NSR373	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	35.3	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-14.2	-9.7	-8.6	-8.6	-8.6	-9.9	-13.4	-17.4
NSR374	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.7	35.8	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-14.7	-10.3	-9.2	-9.1	-9.1	-10.4	-13.9	-17.9
NSR375	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	35.2	36.1	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-9.1	-4.8	-8.9	-8.8	-8.8	-8.8	-10.5	-14.7
NSR376	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.5	32.9	34.0	34.0	34.0	34.0	34.0	34.0
	Exceedance Level	-	-	-16.5	-12.1	-11.0	-11.0	-11.0	-12.3	-15.8	-19.8
NSR378	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.5	33.7	34.7	34.7	34.7	34.7	34.7	34.7
	Exceedance Level	-	-	-10.5	-6.3	-10.3	-10.3	-10.3	-10.3	-12.0	-16.2
NSR379	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.6	33.0	34.1	34.1	34.1	34.1	34.1	34.1

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-16.4	-12.0	-10.9	-10.9	-10.9	-12.2	-15.7	-19.7
NSR380	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.5	34.7	35.7	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-9.5	-5.3	-9.3	-9.2	-9.2	-9.2	-10.9	-15.1
NSR381	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	36.1	40.6	41.7	41.7	41.7	41.7	41.7	41.7
	Exceedance Level	-	-	-8.9	-4.4	-3.3	-3.3	-3.3	-5.9	-9.1	-12.6
NSR382	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.3	35.3	35.3	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-9.8	-5.7	-9.7	-9.7	-9.6	-9.6	-11.3	-15.5
NSR383	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.7	37.2	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-12.3	-7.8	-6.7	-6.7	-6.7	-9.3	-12.5	-16.0
NSR384	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.4	39.9	41.0	41.0	41.0	41.0	41.0	41.0
	Exceedance Level	-	-	-9.6	-5.1	-4.0	-4.0	-4.0	-6.6	-9.8	-13.3
NSR385	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.3	35.2	35.3	35.3	35.3	35.3	35.3
	Exceedance Level	-	-	-9.8	-5.7	-9.8	-9.7	-9.7	-9.7	-11.4	-15.6
NSR386	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	35.1	36.2	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-14.3	-9.9	-8.8	-8.8	-8.8	-11.4	-14.6	-18.1
NSR387	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	35.3	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-14.2	-9.7	-8.6	-8.6	-8.6	-11.2	-14.4	-17.9
NSR388	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	35.3	36.5	36.5	36.5	36.5	36.5	36.5
	Exceedance Level	-	-	-14.1	-9.7	-8.5	-8.5	-8.5	-11.1	-14.3	-17.8
	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR389	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.6	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-13.8	-9.4	-8.3	-8.3	-8.3	-10.9	-14.1	-17.6
NSR390	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.7	36.8	36.8	36.8	36.8	36.8	36.8
	Exceedance Level	-	-	-13.8	-9.3	-8.2	-8.2	-8.2	-10.8	-14.0	-17.5
NSR391	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.7	33.2	34.3	34.3	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-16.3	-11.8	-10.7	-10.7	-10.7	-12.0	-15.5	-19.5
NSR392	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	35.1	36.2	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-14.3	-9.9	-8.8	-8.7	-8.7	-11.3	-14.5	-18.0
NSR393	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	35.2	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-14.3	-9.8	-8.7	-8.7	-8.7	-11.3	-14.5	-18.0
NSR394	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.5	38.0	39.0	39.1	39.1	39.1	39.1	39.1
	Exceedance Level	-	-	-11.5	-7.0	-6.0	-5.9	-5.9	-8.5	-11.7	-15.2
NSR395	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.2	35.2	35.4	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-9.7	-5.8	-9.8	-9.6	-9.6	-9.6	-11.3	-15.5
NSR396	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.3	35.3	35.4	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-9.7	-5.7	-9.7	-9.6	-9.6	-9.6	-11.3	-15.5
NSR397	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.1	35.6	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-13.9	-9.4	-8.3	-8.3	-8.3	-10.9	-14.1	-17.6
NSR398	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.7	33.4	34.4	34.5	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-10.3	-6.6	-10.6	-10.5	-10.4	-10.4	-12.1	-16.3

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR399	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.9	33.6	34.5	34.7	34.7	34.7	34.7	34.7
	Exceedance Level	-	-	-10.1	-6.4	-10.5	-10.3	-10.3	-10.3	-12.0	-16.2
NSR400	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.2	32.9	33.9	34.1	34.1	34.1	34.1	34.1
	Exceedance Level	-	-	-10.8	-7.1	-11.1	-10.9	-10.9	-10.9	-12.6	-16.8
NSR401	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.1	37.5	38.6	38.6	38.6	38.6	38.6	38.6
	Exceedance Level	-	-	-11.9	-7.5	-6.4	-6.4	-6.4	-9.0	-12.2	-15.7
NSR402	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.1	33.8	34.8	34.9	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-9.9	-6.2	-10.2	-10.1	-10.1	-10.1	-11.8	-16.0
NSR403	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.3	35.3	35.4	35.5	35.5	35.5	35.5
	Exceedance Level	-	-	-9.6	-5.7	-9.7	-9.6	-9.5	-9.5	-11.2	-15.4
NSR404	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	34.6	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-9.3	-5.4	-9.4	-9.3	-9.3	-9.3	-11.0	-15.2
NSR405	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	35.2	36.3	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-14.2	-9.8	-8.7	-8.6	-8.6	-11.2	-14.4	-17.9
NSR406	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	34.7	35.6	35.7	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-9.3	-5.3	-9.4	-9.3	-9.2	-9.2	-10.9	-15.1
NSR408	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.6	34.5	35.5	35.6	35.6	35.6	35.6	35.6
	Exceedance Level	-	-	-9.4	-5.5	-9.5	-9.4	-9.4	-9.4	-11.1	-15.3
NSR410	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.6	35.0	36.1	36.2	36.2	36.2	36.2	36.2

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-14.4	-10.0	-8.9	-8.8	-8.8	-11.4	-14.6	-18.1
NSR411	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.2	32.9	33.9	34.1	34.2	34.2	34.2	34.2
	Exceedance Level	-	-	-10.8	-7.1	-11.1	-10.9	-10.8	-10.8	-12.5	-16.7
NSR412	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.8	35.9	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-14.6	-10.2	-9.1	-9.1	-9.1	-11.7	-14.9	-18.4
NSR414	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	34.8	35.8	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-9.2	-5.2	-9.2	-9.1	-9.1	-9.1	-10.8	-15.0
NSR415	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.3	33.0	34.0	34.2	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-10.7	-7.0	-11.0	-10.8	-10.7	-10.7	-12.4	-16.6
NSR416	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.7	35.8	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-14.8	-10.3	-9.2	-9.2	-9.2	-11.8	-15.0	-18.5
NSR417	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.3	35.3	35.4	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-9.6	-5.7	-9.7	-9.6	-9.6	-9.6	-11.3	-15.5
NSR420	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	34.7	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-9.2	-5.3	-9.4	-9.3	-9.3	-9.3	-11.0	-15.2
NSR423	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	34.7	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-9.2	-5.3	-9.4	-9.3	-9.3	-9.3	-11.0	-15.2
NSR424	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	35.1	36.2	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-14.2	-9.9	-8.8	-8.7	-8.7	-11.3	-14.5	-18.0
	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR425	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.7	35.8	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-14.7	-10.3	-9.2	-9.2	-9.2	-11.8	-15.0	-18.5
NSR426	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.7	35.8	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-14.8	-10.3	-9.2	-9.2	-9.2	-11.8	-15.0	-18.5
NSR427	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.6	35.7	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-14.8	-10.4	-9.3	-9.3	-9.3	-11.9	-15.1	-18.6
NSR428	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.1	34.9	35.8	35.9	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-8.9	-5.1	-9.2	-9.1	-9.0	-9.0	-10.7	-14.9
NSR431	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.1	34.5	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-14.9	-10.5	-9.4	-9.3	-9.3	-11.9	-15.1	-18.6
NSR434	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.7	35.8	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-14.6	-10.3	-9.2	-9.2	-9.2	-11.8	-15.0	-18.5
NSR437	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	34.5	35.5	35.6	35.6	35.6	35.6	35.6
	Exceedance Level	-	-	-9.2	-5.5	-9.5	-9.4	-9.4	-9.4	-11.1	-15.3
NSR438	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.6	35.7	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-14.7	-10.4	-9.3	-9.3	-9.3	-11.9	-15.1	-18.6
NSR440	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.0	34.4	35.5	35.5	35.5	35.5	35.5	35.5
	Exceedance Level	-	-	-15.0	-10.6	-9.5	-9.5	-9.5	-12.1	-15.3	-18.8
NSR444	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.1	36.0	36.1	36.1	36.1	36.1	36.1
	Exceedance Level	-	-	-8.7	-4.9	-9.0	-8.9	-8.9	-8.9	-10.6	-14.8

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR447	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.7	34.0	35.1	35.2	35.2	35.2	35.2	35.2
	Exceedance Level	-	-	-15.3	-11.0	-9.9	-9.8	-9.8	-12.4	-15.6	-19.1
NSR448	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.9	34.2	35.3	35.4	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-15.1	-10.8	-9.7	-9.6	-9.6	-12.2	-15.4	-18.9
NSR449	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.1	36.0	36.1	36.1	36.1	36.1	36.1
	Exceedance Level	-	-	-8.7	-4.9	-9.0	-8.9	-8.9	-8.9	-10.6	-14.8
NSR450	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.0	35.9	36.0	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-8.8	-5.0	-9.1	-9.0	-9.0	-9.0	-10.7	-14.9
NSR451	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.4	33.7	34.8	34.9	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-15.6	-11.3	-10.2	-10.1	-10.1	-12.7	-15.9	-19.4
NSR453	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.2	36.1	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-8.5	-4.8	-8.9	-8.8	-8.8	-8.8	-10.5	-14.7
NSR454	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.9	33.2	34.3	34.3	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-16.1	-11.8	-10.7	-10.7	-10.7	-13.3	-16.5	-20.0
NSR456	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.2	36.1	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-8.5	-4.8	-8.9	-8.8	-8.8	-8.8	-10.5	-14.7
NSR457	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	34.7	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-9.1	-5.3	-9.4	-9.3	-9.3	-9.3	-11.0	-15.2
NSR459	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.4	32.7	33.7	33.7	33.7	33.7	33.7	33.7

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-16.6	-12.3	-11.3	-11.3	-11.3	-13.9	-17.1	-20.6
NSR461	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.1	32.3	33.4	33.4	33.4	33.4	33.4	33.4
	Exceedance Level	-	-	-16.9	-12.7	-11.6	-11.6	-11.6	-14.2	-17.4	-20.9
NSR462	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.6	32.7	32.8	32.8	32.8	32.8	32.8
	Exceedance Level	-	-	-17.7	-13.4	-12.3	-12.2	-12.2	-14.8	-18.0	-21.5
NSR465	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.9	32.1	33.2	33.2	33.2	33.2	33.2	33.2
	Exceedance Level	-	-	-17.1	-12.9	-11.8	-11.8	-11.8	-14.4	-17.6	-21.1
NSR468	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.7	32.0	33.0	33.0	33.0	33.0	33.0	33.0
	Exceedance Level	-	-	-17.3	-13.0	-12.0	-12.0	-12.0	-14.6	-17.8	-21.3
NSR469	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.0	32.2	33.2	33.2	33.2	33.2	33.2	33.2
	Exceedance Level	-	-	-17.0	-12.8	-11.8	-11.8	-11.8	-14.4	-17.6	-21.1
NSR507	Total WEDG Noise Limit LA90 dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.1	31.3	32.2	32.3	32.3	32.3	32.3	32.3
	Exceedance Level	-	-	-17.9	-13.7	-12.8	-12.7	-12.7	-13.6	-16.9	-21.5
NSR509	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.7	33.2	34.3	34.3	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-16.3	-11.8	-10.7	-10.7	-10.7	-12.0	-15.5	-19.5
NSR510	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	36.2	40.7	41.8	41.8	41.8	41.8	41.8	41.8
	Exceedance Level	-	-	-8.8	-4.3	-3.2	-3.2	-3.2	-4.5	-8.0	-12.0
NSR511	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.2	30.6	31.7	31.7	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-18.8	-14.4	-13.3	-13.3	-13.3	-14.6	-18.1	-22.1
	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR512	Cumulative Wind Turbine Noise LA90 dB	-	-	28.2	32.6	33.7	33.8	33.8	33.8	33.8	33.8
	Exceedance Level	-	-	-16.8	-12.4	-11.3	-11.2	-11.2	-12.5	-16.0	-20.0
NSR513	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.3	32.8	33.9	33.9	33.9	33.9	33.9	33.9
	Exceedance Level	-	-	-16.7	-12.2	-11.1	-11.1	-11.1	-12.4	-15.9	-19.9
NSR515	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.5	34.5	35.5	35.6	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-9.5	-5.5	-9.5	-9.4	-9.3	-9.3	-11.0	-15.2
NSR516	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	35.2	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-14.3	-9.8	-8.7	-8.7	-8.7	-11.3	-14.5	-18.0
NSR517	Total WEDG Noise Limit LA90 dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	35.1	36.1	36.1	36.1	36.1	36.1	36.1
	Exceedance Level	-	-	-9.1	-4.9	-8.9	-8.9	-8.9	-8.9	-10.6	-14.8
NSR518	Total WEDG Noise Limit LA90 dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.0	35.5	36.6	36.6	36.6	36.6	36.6	36.6
	Exceedance Level	-	-	-14.0	-9.5	-8.4	-8.4	-8.4	-9.7	-13.2	-17.2

Table A5.3 Total WEDG (Guidelines (DoEHLG, 2006)) Noise Limits Compliance Table at NSRs – Night-time

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR150	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.7	30.9	31.9	32.0	32.0	32.0	32.0	32.0
	Exceedance Level	-	-	-16.3	-12.1	-11.1	-11.0	-11.0	-12.6	-15.9	-19.3
NSR153	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.1	31.3	32.3	32.3	32.3	32.3	32.3	32.3
	Exceedance Level	-	-	-15.9	-11.7	-10.7	-10.7	-10.7	-12.3	-15.6	-19.0
NSR156	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.0	31.3	32.4	32.5	32.5	32.5	32.5	32.5
	Exceedance Level	-	-	-16.0	-11.7	-10.6	-10.5	-10.5	-12.1	-15.4	-18.8
NSR157	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.1	31.2	32.2	32.2	32.2	32.2	32.2	32.2
	Exceedance Level	-	-	-15.9	-11.8	-10.8	-10.8	-10.8	-12.4	-15.7	-19.1
NSR159	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.2	31.4	32.4	32.4	32.4	32.4	32.4	32.4
	Exceedance Level	-	-	-15.8	-11.6	-10.6	-10.6	-10.6	-12.2	-15.5	-18.9
NSR167	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.4	31.6	32.6	32.6	32.6	32.6	32.6	32.6
	Exceedance Level	-	-	-15.6	-11.4	-10.4	-10.4	-10.4	-12.0	-15.3	-18.7
NSR168	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.4	32.4	32.4	32.4	32.4	32.4	32.4
	Exceedance Level	-	-	-15.7	-11.6	-10.6	-10.6	-10.6	-12.2	-15.5	-18.9
NSR170	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9	49.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.4	30.7	31.8	31.8	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-16.6	-12.3	-11.2	-11.2	-11.1	-11.1	-13.0	-17.7
NSR172	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.9	32.2	33.3	33.3	33.3	33.3	33.3	33.3
	Exceedance Level	-	-	-15.1	-10.8	-9.7	-9.7	-9.7	-11.3	-14.6	-18.0
	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR174	Cumulative Wind Turbine Noise LA90 dB	-	-	27.4	31.4	32.3	32.3	32.3	32.3	32.3	32.3
	Exceedance Level	-	-	-15.6	-11.6	-10.7	-10.7	-10.7	-12.3	-15.6	-19.0
NSR176	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.4	32.8	33.8	33.9	33.9	33.9	33.9	33.9
	Exceedance Level	-	-	-14.6	-10.2	-9.2	-9.1	-9.1	-10.7	-14.0	-17.4
NSR186	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.1	33.5	34.6	34.6	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-13.9	-9.5	-8.4	-8.4	-8.4	-10.0	-13.3	-16.7
NSR187	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.6	34.0	35.1	35.1	35.1	35.1	35.1	35.1
	Exceedance Level	-	-	-13.4	-9.0	-7.9	-7.9	-7.9	-9.5	-12.8	-16.2
NSR191	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.5	33.9	34.9	35.0	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-13.5	-9.1	-8.1	-8.0	-8.0	-9.6	-12.9	-16.3
NSR192	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.6	34.0	35.0	35.0	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-13.4	-9.0	-8.0	-8.0	-8.0	-9.6	-12.9	-16.3
NSR193	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.7	34.1	35.2	35.2	35.2	35.2	35.2	35.2
	Exceedance Level	-	-	-13.3	-8.9	-7.8	-7.8	-7.8	-9.4	-12.7	-16.1
NSR198	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.0	34.5	35.6	35.6	35.6	35.6	35.6	35.6
	Exceedance Level	-	-	-13.0	-8.5	-7.4	-7.4	-7.4	-9.0	-12.3	-15.7
NSR202	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.6	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-11.8	-7.4	-6.3	-6.3	-6.3	-7.9	-11.2	-14.6
NSR203	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.3	36.7	37.8	37.8	37.8	37.8	37.8	37.8
	Exceedance Level	-	-	-10.7	-6.3	-5.2	-5.2	-5.2	-6.8	-10.1	-13.5

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR207	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.6	38.0	39.1	39.1	39.1	39.1	39.1	39.1
	Exceedance Level	-	-	-9.4	-5.0	-3.9	-3.9	-3.9	-5.5	-8.8	-12.2
NSR210	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2
	Exceedance Level	-	-	-8.4	-3.9	-2.8	-2.8	-2.8	-4.4	-7.7	-11.1
NSR244	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.1	36.9	37.7	37.7	37.7	37.7	37.7	37.7
	Exceedance Level	-	-	-9.9	-6.1	-5.3	-6.9	-10.1	-13.2	-16.1	-18.8
NSR245	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.0	39.4	40.4	40.4	40.4	40.4	40.4	40.4
	Exceedance Level	-	-	-8.0	-3.6	-2.6	-4.2	-7.4	-10.5	-13.4	-16.1
NSR250	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.7	37.4	38.2	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-9.3	-5.6	-4.8	-6.4	-9.6	-12.7	-15.6	-18.3
NSR251	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.8	37.5	38.2	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-9.2	-5.5	-4.8	-6.4	-9.6	-12.7	-15.6	-18.3
NSR252	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.0	36.8	37.6	37.6	37.6	37.6	37.6	37.6
	Exceedance Level	-	-	-10.0	-6.2	-5.4	-7.0	-10.2	-13.3	-16.2	-18.9
NSR254	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.3	37.1	37.9	37.9	37.9	37.9	37.9	37.9
	Exceedance Level	-	-	-9.7	-5.9	-5.1	-6.7	-9.9	-13.0	-15.9	-18.6
NSR259	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.0	33.5	34.6	34.6	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-14.0	-9.5	-8.4	-8.4	-8.4	-10.6	-14.3	-18.0
NSR261	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.1	32.6	33.7	33.7	33.7	33.7	33.7	33.7

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-14.9	-10.4	-9.3	-9.3	-9.3	-11.5	-15.2	-18.9
NSR262	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.8	32.9	32.9	32.9	32.9	32.9	32.9
	Exceedance Level	-	-	-15.7	-11.2	-10.1	-10.1	-10.1	-12.3	-16.0	-19.7
NSR264	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.7	37.4	38.1	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-9.3	-5.6	-4.9	-6.4	-9.6	-12.7	-15.6	-18.3
NSR265	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.8	37.5	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-9.2	-5.5	-4.7	-6.3	-9.5	-12.6	-15.5	-18.2
NSR266	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.6	32.0	33.1	33.2	33.2	33.2	33.2	33.2
	Exceedance Level	-	-	-15.4	-11.0	-9.9	-9.8	-9.8	-12.0	-15.7	-19.4
NSR267	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.5	32.0	33.1	33.1	33.1	33.1	33.1	33.1
	Exceedance Level	-	-	-15.5	-11.0	-9.9	-9.9	-9.9	-12.1	-15.8	-19.5
NSR271	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.5	38.9	40.0	40.0	40.0	40.0	40.0	40.0
	Exceedance Level	-	-	-8.5	-4.1	-3.0	-4.6	-7.8	-10.9	-13.8	-16.5
NSR273	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.7	32.8	32.8	32.8	32.8	32.8	32.8
	Exceedance Level	-	-	-15.7	-11.3	-10.2	-10.2	-10.2	-12.4	-16.1	-19.8
NSR276	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.3	39.8	40.9	40.9	40.9	40.9	40.9	40.9
	Exceedance Level	-	-	-7.7	-3.2	-2.1	-3.7	-6.9	-10.0	-12.9	-15.6
NSR277	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.0	32.4	33.5	33.5	33.5	33.5	33.5	33.5
	Exceedance Level	-	-	-15.0	-10.6	-9.5	-9.5	-9.5	-11.7	-15.4	-19.1
	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR279	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.8	32.9	32.9	32.9	32.9	32.9	32.9
	Exceedance Level	-	-	-15.7	-11.2	-10.1	-10.1	-10.1	-12.3	-16.0	-19.7
NSR286	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.3	32.7	33.8	33.8	33.8	33.8	33.8	33.8
	Exceedance Level	-	-	-14.7	-10.3	-9.2	-9.2	-9.2	-11.4	-15.1	-18.8
NSR287	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.0	38.4	39.5	39.5	39.5	39.5	39.5	39.5
	Exceedance Level	-	-	-9.0	-4.6	-3.5	-5.1	-8.3	-11.4	-14.3	-17.0
NSR288	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.2	37.6	38.7	38.7	38.7	38.7	38.7	38.7
	Exceedance Level	-	-	-9.8	-5.4	-4.3	-5.9	-9.1	-12.2	-15.1	-17.8
NSR289	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.2	37.9	38.6	38.7	38.7	38.7	38.7	38.7
	Exceedance Level	-	-	-8.8	-5.1	-4.4	-5.9	-9.1	-12.2	-15.1	-17.8
NSR291	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-7.2	-2.7	-1.6	-1.6	-1.6	-3.8	-7.5	-11.2
NSR292	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.6	34.1	35.2	35.2	35.2	35.2	35.2	35.2
	Exceedance Level	-	-	-13.4	-8.9	-7.8	-7.8	-7.8	-10.0	-13.7	-17.4
NSR293	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.9	38.3	39.4	39.4	39.4	39.4	39.4	39.4
	Exceedance Level	-	-	-9.1	-4.7	-3.6	-3.6	-3.6	-5.8	-9.5	-13.2
NSR294	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	36.1	40.5	41.6	41.7	41.7	41.7	41.7	41.7
	Exceedance Level	-	-	-6.9	-2.5	-1.4	-1.3	-1.3	-3.5	-7.2	-10.9
NSR295	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.5	38.2	38.9	39.0	39.0	39.0	39.0	39.0
	Exceedance Level	-	-	-8.5	-4.8	-4.1	-5.6	-8.8	-11.9	-14.8	-17.5

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR296	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.3	38.1	38.8	38.9	38.9	38.9	38.9	38.9
	Exceedance Level	-	-	-8.7	-4.9	-4.2	-5.7	-8.9	-12.0	-14.9	-17.6
NSR297	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.9	37.4	38.5	38.5	38.5	38.5	38.5	38.5
	Exceedance Level	-	-	-10.1	-5.6	-4.5	-4.5	-4.5	-6.7	-10.4	-14.1
NSR299	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	34.7	39.2	40.3	40.3	40.3	40.3	40.3	40.3
	Exceedance Level	-	-	-8.3	-3.8	-2.7	-2.7	-2.7	-4.9	-8.6	-12.3
NSR301	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.0	30.5	31.6	31.6	31.6	31.6	31.6	31.6
	Exceedance Level	-	-	-17.0	-12.5	-11.4	-11.4	-11.4	-13.6	-17.3	-21.0
NSR303	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.0	37.1	38.0	38.0	38.0	38.0	38.0	38.0
	Exceedance Level	-	-	-10.0	-5.9	-5.0	-6.6	-9.8	-12.9	-15.8	-18.5
NSR304	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.4	30.8	31.9	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-16.6	-12.2	-11.1	-11.1	-11.1	-13.3	-17.0	-20.7
NSR305	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.1	39.5	40.5	40.5	40.5	40.5	40.5	40.5
	Exceedance Level	-	-	-7.9	-3.5	-2.5	-4.1	-7.3	-10.4	-13.3	-16.0
NSR306	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.8	32.3	33.4	33.4	33.4	33.4	33.4	33.4
	Exceedance Level	-	-	-15.2	-10.7	-9.6	-9.6	-9.6	-11.8	-15.5	-19.2
NSR307	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.6	31.1	32.2	32.2	32.2	32.2	32.2	32.2
	Exceedance Level	-	-	-16.4	-11.9	-10.8	-10.8	-10.8	-13.0	-16.7	-20.4
NSR308	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.7	37.6	38.4	38.4	38.4	38.4	38.4	38.4

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-9.3	-5.4	-4.6	-6.2	-9.4	-12.5	-15.4	-18.1
NSR309	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.7	32.8	32.8	32.8	32.8	32.8	32.8
	Exceedance Level	-	-	-15.7	-11.3	-10.2	-10.2	-10.2	-12.4	-16.1	-19.8
NSR311	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.4	31.8	32.9	33.0	33.0	33.0	33.0	33.0
	Exceedance Level	-	-	-15.6	-11.2	-10.1	-10.0	-10.0	-12.2	-15.9	-19.6
NSR313	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.6	31.1	32.2	32.2	32.2	32.2	32.2	32.2
	Exceedance Level	-	-	-16.4	-11.9	-10.8	-10.8	-10.8	-13.0	-16.7	-20.4
NSR315	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.8	37.6	38.4	38.4	38.4	38.4	38.4	38.4
	Exceedance Level	-	-	-9.2	-5.4	-4.6	-6.2	-9.4	-12.5	-15.4	-18.1
NSR316	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.7	37.6	38.4	38.4	38.4	38.4	38.4	38.4
	Exceedance Level	-	-	-9.3	-5.4	-4.6	-6.2	-9.4	-12.5	-15.4	-18.1
NSR319	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.1	37.1	38.0	38.0	38.0	38.0	38.0	38.0
	Exceedance Level	-	-	-9.9	-5.9	-5.0	-6.6	-9.8	-12.9	-15.8	-18.5
NSR320	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.7	31.2	32.3	32.3	32.4	32.4	32.4	32.4
	Exceedance Level	-	-	-16.3	-11.8	-10.7	-10.7	-10.6	-12.8	-16.5	-20.2
NSR321	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.2	36.1	37.0	37.0	37.0	37.0	37.0	37.0
	Exceedance Level	-	-	-10.8	-6.9	-6.0	-7.6	-10.8	-13.9	-16.8	-19.5
NSR322	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.8	36.9	37.8	37.9	37.9	37.9	37.9	37.9
	Exceedance Level	-	-	-10.2	-6.1	-5.2	-6.7	-9.9	-13.0	-15.9	-18.6
	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR324	Cumulative Wind Turbine Noise LA90 dB	-	-	31.7	35.7	36.6	36.6	36.6	36.6	36.6	36.6
	Exceedance Level	-	-	-11.3	-7.3	-6.4	-8.0	-11.2	-14.3	-17.2	-19.9
NSR325	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.9	37.4	38.5	38.5	38.5	38.5	38.5	38.5
	Exceedance Level	-	-	-10.1	-5.6	-4.5	-4.5	-4.5	-6.7	-10.4	-14.1
NSR327	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.2	31.6	32.8	32.8	32.8	32.8	32.8	32.8
	Exceedance Level	-	-	-15.8	-11.4	-10.2	-10.2	-10.2	-12.4	-16.1	-19.8
NSR328	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.3	32.8	33.9	33.9	33.9	33.9	33.9	33.9
	Exceedance Level	-	-	-14.7	-10.2	-9.1	-9.1	-9.1	-11.3	-15.0	-18.7
NSR329	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.7	36.8	37.8	37.8	37.8	37.8	37.8	37.8
	Exceedance Level	-	-	-10.3	-6.2	-5.2	-6.8	-10.0	-13.1	-16.0	-18.7
NSR330	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.5	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-11.5	-7.5	-6.6	-8.2	-11.4	-14.5	-17.4	-20.1
NSR331	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.5	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-11.5	-7.5	-6.6	-8.2	-11.4	-14.5	-17.4	-20.1
NSR332	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.4	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-11.6	-7.6	-6.7	-8.3	-11.5	-14.6	-17.5	-20.2
NSR333	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.5	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-11.5	-7.5	-6.6	-8.2	-11.4	-14.5	-17.4	-20.1
NSR334	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.4	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-11.7	-7.6	-6.7	-8.3	-11.5	-14.6	-17.5	-20.2

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR335	Vacant										
NSR336	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.3	36.2	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-11.8	-7.7	-6.8	-8.4	-11.6	-14.7	-17.6	-20.3
NSR337	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.8	33.2	34.4	34.4	34.4	34.4	34.4	34.4
	Exceedance Level	-	-	-14.2	-9.8	-8.6	-8.6	-8.6	-10.8	-14.5	-18.2
NSR338	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.7	32.9	32.9	32.9	32.9	32.9	32.9
	Exceedance Level	-	-	-15.7	-11.3	-10.1	-10.1	-10.1	-12.3	-16.0	-19.7
NSR339	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.2	32.6	33.7	33.7	33.7	33.7	33.7	33.7
	Exceedance Level	-	-	-14.8	-10.4	-9.3	-9.3	-9.3	-11.5	-15.2	-18.9
NSR340	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.3	36.2	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-11.7	-7.7	-6.8	-8.4	-11.6	-14.7	-17.6	-20.3
NSR341	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.2	36.1	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-11.8	-7.8	-6.9	-8.4	-11.6	-14.7	-17.6	-20.3
NSR342	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.9	33.3	34.4	34.5	34.5	34.5	34.5	34.5
	Exceedance Level	-	-	-14.1	-9.7	-8.6	-8.5	-8.5	-10.7	-14.4	-18.1
NSR343	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.9	37.0	37.0	37.0	37.0	37.0	37.0
	Exceedance Level	-	-	-11.6	-7.1	-6.0	-6.0	-6.0	-8.2	-11.9	-15.6
NSR344	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.3	36.2	36.2	36.2	36.2	36.2	36.2

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-11.7	-7.7	-6.8	-8.4	-11.6	-14.7	-17.6	-20.3
NSR345	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.1	36.6	37.7	37.7	37.7	37.7	37.7	37.7
	Exceedance Level	-	-	-10.9	-6.4	-5.3	-5.3	-5.3	-7.5	-11.2	-14.9
NSR346	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.9	37.0	37.0	37.0	37.0	37.0	37.0
	Exceedance Level	-	-	-11.6	-7.1	-6.0	-6.0	-6.0	-8.2	-11.9	-15.6
NSR347	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	35.0	35.9	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-12.1	-8.0	-7.1	-8.7	-11.9	-15.0	-17.9	-20.6
NSR348	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.0	36.5	37.6	37.6	37.6	37.6	37.6	37.6
	Exceedance Level	-	-	-11.0	-6.5	-5.4	-5.4	-5.4	-7.6	-11.3	-15.0
NSR349	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.8	36.9	36.9	36.9	36.9	36.9	36.9
	Exceedance Level	-	-	-11.7	-7.2	-6.1	-6.1	-6.1	-8.3	-12.0	-15.7
NSR350	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.4	33.8	34.9	35.0	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-13.6	-9.2	-8.1	-8.0	-8.0	-10.2	-13.9	-17.6
NSR351	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.7	36.1	37.2	37.2	37.2	37.2	37.2	37.2
	Exceedance Level	-	-	-11.3	-6.9	-5.8	-5.8	-5.8	-8.0	-11.7	-15.4
NSR352	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.2	36.4	37.3	37.3	37.3	37.3	37.3	37.3
	Exceedance Level	-	-	-10.8	-6.6	-5.7	-5.7	-5.7	-6.6	-9.8	-13.0
NSR354	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.1	35.6	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-11.9	-7.4	-6.3	-6.3	-6.3	-8.5	-12.2	-15.9

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR357	Non-Residential										
NSR359	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.7	35.9	36.9	36.9	36.9	36.9	36.9	36.9
	Exceedance Level	-	-	-11.3	-7.1	-6.1	-6.1	-6.1	-7.0	-10.2	-13.4
NSR361	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.8	34.2	35.3	35.3	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-13.2	-8.8	-7.7	-7.7	-7.6	-9.8	-13.5	-17.2
NSR362	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.9	36.0	36.0	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-12.6	-8.1	-7.0	-7.0	-7.0	-9.2	-12.9	-16.6
NSR363	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.0	35.2	36.2	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-12.0	-7.8	-6.8	-6.8	-6.8	-7.7	-10.9	-14.1
NSR364	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.6	35.7	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-12.8	-8.4	-7.3	-7.3	-7.3	-9.5	-13.2	-16.9
NSR365	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.5	36.4	36.5	36.5	36.5	36.5	36.5
	Exceedance Level	-	-	-11.7	-7.5	-6.6	-6.5	-6.5	-7.4	-10.6	-13.8
NSR366	Non-Residential										
NSR367	Non-Residential										
NSR368	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.1	35.3	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-11.9	-7.7	-6.7	-6.7	-6.7	-7.6	-10.8	-14.0

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR369	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.6	36.6	36.6	36.6	36.6	36.6	36.6
	Exceedance Level	-	-	-11.6	-7.4	-6.4	-6.4	-6.4	-7.3	-10.5	-13.7
NSR370	Derelict										
NSR371	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.4	35.7	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-11.6	-7.3	-6.3	-6.3	-6.3	-7.2	-10.4	-13.6
NSR372	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.6	33.8	34.8	34.8	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-13.4	-9.2	-8.2	-8.2	-8.2	-9.1	-12.3	-15.5
NSR373	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	35.3	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-12.2	-7.7	-6.6	-6.6	-6.6	-8.8	-12.5	-16.2
NSR374	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.7	35.8	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-12.7	-8.3	-7.2	-7.1	-7.1	-9.3	-13.0	-16.7
NSR375	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	35.2	36.1	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-12.1	-7.8	-6.9	-6.8	-6.8	-7.7	-10.9	-14.1
NSR376	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.5	32.9	34.0	34.0	34.0	34.0	34.0	34.0
	Exceedance Level	-	-	-14.5	-10.1	-9.0	-9.0	-9.0	-11.2	-14.9	-18.6
NSR378	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.5	33.7	34.7	34.7	34.7	34.7	34.7	34.7
	Exceedance Level	-	-	-13.5	-9.3	-8.3	-8.3	-8.3	-9.2	-12.4	-15.6
NSR379	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.6	33.0	34.1	34.1	34.1	34.1	34.1	34.1

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-14.4	-10.0	-8.9	-8.9	-8.9	-11.1	-14.8	-18.5
NSR380	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.5	34.7	35.7	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-12.5	-8.3	-7.3	-7.2	-7.2	-8.1	-11.3	-14.5
NSR381	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	36.1	40.6	41.7	41.7	41.7	41.7	41.7	41.7
	Exceedance Level	-	-	-6.9	-2.4	-1.3	-1.3	-1.9	-5.5	-9.2	-13.0
NSR382	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.3	35.3	35.3	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-12.8	-8.7	-7.7	-7.7	-7.6	-8.5	-11.7	-14.9
NSR383	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	32.7	37.2	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-10.3	-5.8	-4.7	-4.7	-5.3	-8.9	-12.6	-16.4
NSR384	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	35.4	39.9	41.0	41.0	41.0	41.0	41.0	41.0
	Exceedance Level	-	-	-7.6	-3.1	-2.0	-2.0	-2.6	-6.2	-9.9	-13.7
NSR385	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.3	35.2	35.3	35.3	35.3	35.3	35.3
	Exceedance Level	-	-	-12.8	-8.7	-7.8	-7.7	-7.7	-8.6	-11.8	-15.0
NSR386	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	35.1	36.2	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-12.3	-7.9	-6.8	-6.8	-7.4	-11.0	-14.7	-18.5
NSR387	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	35.3	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-12.2	-7.7	-6.6	-6.6	-7.2	-10.8	-14.5	-18.3
NSR388	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	35.3	36.5	36.5	36.5	36.5	36.5	36.5
	Exceedance Level	-	-	-12.1	-7.7	-6.5	-6.5	-7.1	-10.7	-14.4	-18.2
	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR389	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.6	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-11.8	-7.4	-6.3	-6.3	-6.9	-10.5	-14.2	-18.0
NSR390	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.7	36.8	36.8	36.8	36.8	36.8	36.8
	Exceedance Level	-	-	-11.8	-7.3	-6.2	-6.2	-6.8	-10.4	-14.1	-17.9
NSR391	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.7	33.2	34.3	34.3	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-14.3	-9.8	-8.7	-8.7	-8.7	-10.9	-14.6	-18.3
NSR392	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	35.1	36.2	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-12.3	-7.9	-6.8	-6.7	-7.3	-10.9	-14.6	-18.4
NSR393	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	35.2	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-12.3	-7.8	-6.7	-6.7	-7.3	-10.9	-14.6	-18.4
NSR394	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.5	38.0	39.0	39.1	39.1	39.1	39.1	39.1
	Exceedance Level	-	-	-9.5	-5.0	-4.0	-3.9	-4.5	-8.1	-11.8	-15.6
NSR395	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.2	35.2	35.4	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-12.7	-8.8	-7.8	-7.6	-7.6	-8.5	-11.7	-14.9
NSR396	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.3	35.3	35.4	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-12.7	-8.7	-7.7	-7.6	-7.6	-8.5	-11.7	-14.9
NSR397	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.1	35.6	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level	-	-	-11.9	-7.4	-6.3	-6.3	-6.9	-10.5	-14.2	-18.0
NSR398	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.7	33.4	34.4	34.5	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-13.3	-9.6	-8.6	-8.5	-8.4	-9.3	-12.5	-15.7

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR399	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.9	33.6	34.5	34.7	34.7	34.7	34.7	34.7
	Exceedance Level	-	-	-13.1	-9.4	-8.5	-8.3	-8.3	-9.2	-12.4	-15.6
NSR400	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.2	32.9	33.9	34.1	34.1	34.1	34.1	34.1
	Exceedance Level	-	-	-13.8	-10.1	-9.1	-8.9	-8.9	-9.8	-13.0	-16.2
NSR401	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	33.1	37.5	38.6	38.6	38.6	38.6	38.6	38.6
	Exceedance Level	-	-	-9.9	-5.5	-4.4	-4.4	-5.0	-8.6	-12.3	-16.1
NSR402	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.1	33.8	34.8	34.9	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-12.9	-9.2	-8.2	-8.1	-8.1	-9.0	-12.2	-15.4
NSR403	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.3	35.3	35.4	35.5	35.5	35.5	35.5
	Exceedance Level	-	-	-12.6	-8.7	-7.7	-7.6	-7.5	-8.4	-11.6	-14.8
NSR404	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	34.6	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-12.3	-8.4	-7.4	-7.3	-7.3	-8.2	-11.4	-14.6
NSR405	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	35.2	36.3	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-12.2	-7.8	-6.7	-6.6	-7.2	-10.8	-14.5	-18.3
NSR406	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	34.7	35.6	35.7	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-12.3	-8.3	-7.4	-7.3	-7.2	-8.1	-11.3	-14.5
NSR408	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.6	34.5	35.5	35.6	35.6	35.6	35.6	35.6
	Exceedance Level	-	-	-12.4	-8.5	-7.5	-7.4	-7.4	-8.3	-11.5	-14.7
NSR410	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.6	35.0	36.1	36.2	36.2	36.2	36.2	36.2

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-12.4	-8.0	-6.9	-6.8	-7.4	-11.0	-14.7	-18.5
NSR411	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.2	32.9	33.9	34.1	34.2	34.2	34.2	34.2
	Exceedance Level	-	-	-13.8	-10.1	-9.1	-8.9	-8.8	-9.7	-12.9	-16.1
NSR412	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.8	35.9	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-12.6	-8.2	-7.1	-7.1	-7.7	-11.3	-15.0	-18.8
NSR414	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	34.8	35.8	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-12.2	-8.2	-7.2	-7.1	-7.1	-8.0	-11.2	-14.4
NSR415	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.3	33.0	34.0	34.2	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-13.7	-10.0	-9.0	-8.8	-8.7	-9.6	-12.8	-16.0
NSR416	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.7	35.8	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-12.8	-8.3	-7.2	-7.2	-7.8	-11.4	-15.1	-18.9
NSR417	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.3	35.3	35.4	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-12.6	-8.7	-7.7	-7.6	-7.6	-8.5	-11.7	-14.9
NSR420	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	34.7	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-12.2	-8.3	-7.4	-7.3	-7.3	-8.2	-11.4	-14.6
NSR423	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	34.7	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-12.2	-8.3	-7.4	-7.3	-7.3	-8.2	-11.4	-14.6
NSR424	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	35.1	36.2	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-12.2	-7.9	-6.8	-6.7	-7.3	-10.9	-14.6	-18.4
	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR425	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.7	35.8	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-12.7	-8.3	-7.2	-7.2	-7.8	-11.4	-15.1	-18.9
NSR426	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.7	35.8	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-12.8	-8.3	-7.2	-7.2	-7.8	-11.4	-15.1	-18.9
NSR427	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.2	34.6	35.7	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-12.8	-8.4	-7.3	-7.3	-7.9	-11.5	-15.2	-19.0
NSR428	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.1	34.9	35.8	35.9	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-11.9	-8.1	-7.2	-7.1	-7.0	-7.9	-11.1	-14.3
NSR431	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.1	34.5	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-12.9	-8.5	-7.4	-7.3	-7.9	-11.5	-15.2	-19.0
NSR434	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.4	34.7	35.8	35.8	35.8	35.8	35.8	35.8
	Exceedance Level	-	-	-12.6	-8.3	-7.2	-7.2	-7.8	-11.4	-15.1	-18.9
NSR437	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.8	34.5	35.5	35.6	35.6	35.6	35.6	35.6
	Exceedance Level	-	-	-12.2	-8.5	-7.5	-7.4	-7.4	-8.3	-11.5	-14.7
NSR438	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.3	34.6	35.7	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-12.7	-8.4	-7.3	-7.3	-7.9	-11.5	-15.2	-19.0
NSR440	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.0	34.4	35.5	35.5	35.5	35.5	35.5	35.5
	Exceedance Level	-	-	-13.0	-8.6	-7.5	-7.5	-8.1	-11.7	-15.4	-19.2
NSR444	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.1	36.0	36.1	36.1	36.1	36.1	36.1
	Exceedance Level	-	-	-11.7	-7.9	-7.0	-6.9	-6.9	-7.8	-11.0	-14.2

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR447	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.7	34.0	35.1	35.2	35.2	35.2	35.2	35.2
	Exceedance Level	-	-	-13.3	-9.0	-7.9	-7.8	-8.4	-12.0	-15.7	-19.5
NSR448	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.9	34.2	35.3	35.4	35.4	35.4	35.4	35.4
	Exceedance Level	-	-	-13.1	-8.8	-7.7	-7.6	-8.2	-11.8	-15.5	-19.3
NSR449	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.3	35.1	36.0	36.1	36.1	36.1	36.1	36.1
	Exceedance Level	-	-	-11.7	-7.9	-7.0	-6.9	-6.9	-7.8	-11.0	-14.2
NSR450	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.2	35.0	35.9	36.0	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-11.8	-8.0	-7.1	-7.0	-7.0	-7.9	-11.1	-14.3
NSR451	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	29.4	33.7	34.8	34.9	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-13.6	-9.3	-8.2	-8.1	-8.7	-12.3	-16.0	-19.8
NSR453	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.2	36.1	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-11.5	-7.8	-6.9	-6.8	-6.8	-7.7	-10.9	-14.1
NSR454	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.9	33.2	34.3	34.3	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-14.1	-9.8	-8.7	-8.7	-9.3	-12.9	-16.6	-20.4
NSR456	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.5	35.2	36.1	36.2	36.2	36.2	36.2	36.2
	Exceedance Level	-	-	-11.5	-7.8	-6.9	-6.8	-6.8	-7.7	-10.9	-14.1
NSR457	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	34.7	35.6	35.7	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-12.1	-8.3	-7.4	-7.3	-7.3	-8.2	-11.4	-14.6
NSR459	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.4	32.7	33.7	33.7	33.7	33.7	33.7	33.7

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-14.6	-10.3	-9.3	-9.3	-9.9	-13.5	-17.2	-21.0
NSR461	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.1	32.3	33.4	33.4	33.4	33.4	33.4	33.4
	Exceedance Level	-	-	-14.9	-10.7	-9.6	-9.6	-10.2	-13.8	-17.5	-21.3
NSR462	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.3	31.6	32.7	32.8	32.8	32.8	32.8	32.8
	Exceedance Level	-	-	-15.7	-11.4	-10.3	-10.2	-10.8	-14.4	-18.1	-21.9
NSR465	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.9	32.1	33.2	33.2	33.2	33.2	33.2	33.2
	Exceedance Level	-	-	-15.1	-10.9	-9.8	-9.8	-10.4	-14.0	-17.7	-21.5
NSR468	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.7	32.0	33.0	33.0	33.0	33.0	33.0	33.0
	Exceedance Level	-	-	-15.3	-11.0	-10.0	-10.0	-10.6	-14.2	-17.9	-21.7
NSR469	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.0	32.2	33.2	33.2	33.2	33.2	33.2	33.2
	Exceedance Level	-	-	-15.0	-10.8	-9.8	-9.8	-10.4	-14.0	-17.7	-21.5
NSR507	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	27.1	31.3	32.2	32.3	32.3	32.3	32.3	32.3
	Exceedance Level	-	-	-15.9	-11.7	-10.8	-10.7	-10.7	-12.3	-15.6	-19.0
NSR509	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.7	33.2	34.3	34.3	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-14.3	-9.8	-8.7	-8.7	-8.7	-10.9	-14.6	-18.3
NSR510	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	36.2	40.7	41.8	41.8	41.8	41.8	41.8	41.8
	Exceedance Level	-	-	-6.8	-2.3	-1.2	-1.2	-1.2	-3.4	-7.1	-10.8
NSR511	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	26.2	30.6	31.7	31.7	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-16.8	-12.4	-11.3	-11.3	-11.3	-13.5	-17.2	-20.9
	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR512	Cumulative Wind Turbine Noise LA90 dB	-	-	28.2	32.6	33.7	33.8	33.8	33.8	33.8	33.8
	Exceedance Level	-	-	-14.8	-10.4	-9.3	-9.2	-9.2	-11.4	-15.1	-18.8
NSR513	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	28.3	32.8	33.9	33.9	33.9	33.9	33.9	33.9
	Exceedance Level	-	-	-14.7	-10.2	-9.1	-9.1	-9.1	-11.3	-15.0	-18.7
NSR515	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.5	34.5	35.5	35.6	35.7	35.7	35.7	35.7
	Exceedance Level	-	-	-12.5	-8.5	-7.5	-7.4	-7.3	-8.2	-11.4	-14.6
NSR516	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.7	35.2	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-12.3	-7.8	-6.7	-6.7	-7.3	-10.9	-14.6	-18.4
NSR517	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Cumulative Wind Turbine Noise LA90 dB	-	-	30.9	35.1	36.1	36.1	36.1	36.1	36.1	36.1
	Exceedance Level	-	-	-12.1	-7.9	-6.9	-6.9	-6.9	-7.8	-11.0	-14.2
NSR518	Total WEDG Noise Limit LA90 dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Cumulative Wind Turbine Noise LA90 dB	-	-	31.0	35.5	36.6	36.6	36.6	36.6	36.6	36.6
	Exceedance Level	-	-	-12.0	-7.5	-6.4	-6.4	-6.4	-8.6	-12.3	-16.0

Annex 6 – Topographical Corrections/ Turbine Coordinates

- Table A6.1 – Cumulative Wind Turbine Coordinates
- Table A6.1 – Topographical Correction Matrix for Cumulative Wind Farms

Table A6.1: Turbine Coordinates

Name	ITM X	ITM Y	Hub Height (m)	Tip Height (m)
Killoshulan	635685	664858	103.5	185.0
Killoshulan	635854	665392	103.5	185.0
Killoshulan	635539	665835	103.5	185.0
Killoshulan	635095	666027	103.5	185.0
Killoshulan	634654	666159	103.5	185.0
Killoshulan	633855	666146	103.5	185.0
Killoshulan	633782	666683	103.5	185.0
Killoshulan	633553	667069	103.5	185.0
Killoshulan	634570	667074	103.5	185.0
Killoshulan	635249	666901	103.5	185.0
An Cnoc	631657	655640	58.0	93.5
An Cnoc	631695	654927	64.0	99.5
An Cnoc	631987	654710	64.0	99.5
An Cnoc	631744	655289	64.0	99.5
An Cnoc	632068	655072	64.0	99.5
Ballybeagh	633193	656495	69.0	110.0
Ballybeagh	633058	656689	69.0	110.0
Ballybeagh	633468	656789	69.0	110.0
Ballybeagh	633096	656134	69.0	110.0
Ballybeagh	633390	656096	69.0	110.0
Ballybeagh	633658	655934	69.0	110.0
Bruckana	622571	668684	99.5	150.0
Bruckana	622389	669148	99.5	150.0
Bruckana	623016	669916	99.5	150.0
Bruckana	622518	669985	99.5	150.0
Bruckana	622837	670387	99.5	150.0
Bruckana	623198	669427	99.5	150.0
Bruckana	622345	670458	99.5	150.0
Bruckana	622159	670931	99.5	150.0
Bruckana	621980	671396	99.5	150.0
Bruckana	621801	671853	99.5	150.0
Bruckana	621847	670534	99.5	150.0
Bruckana	621664	671005	99.5	150.0
Bruckana	621485	671469	99.5	150.0
Bruckana	621305	671936	99.5	150.0
Lisdowney	638529	670423	80.0	121.5
Lisdowney	638143	670356	80.0	121.5
Lisdowney	638228	670628	80.0	121.5
Lisdowney	637830	670631	80.0	121.5
Lisheen 1	619181	668772	98.0	139.0
Lisheen 1	619339	668368	98.0	139.0

Name	ITM X	ITM Y	Hub Height (m)	Tip Height (m)
Lisheen 1	619733	668224	98.0	139.0
Lisheen 1	619963	667870	98.0	139.0
Lisheen 1	619124	667575	98.0	139.0
Lisheen 1	619538	667787	98.0	139.0
Lisheen 1	619897	667417	98.0	139.0
Lisheen 1	619474	667293	98.0	139.0
Lisheen 1	620322	667448	98.0	139.0
Lisheen 1	620269	667088	98.0	139.0
Lisheen 1	619996	666818	98.0	139.0
Lisheen 1	620886	667287	98.0	139.0
Lisheen 1	621159	666947	98.0	139.0
Lisheen 1	621480	667027	98.0	139.0
Lisheen 1	621716	666787	98.0	139.0
Lisheen 1	622031	666720	98.0	139.0
Lisheen 1	621836	666361	98.0	139.0
Lisheen 1	622148	665991	98.0	139.0
Lisheen 2	622102	663986	95.0	140.0
Lisheen 2	622017	664554	95.0	140.0
Lisheen 2	622415	664314	95.0	140.0
Lisheen 2	622646	663723	95.0	140.0
Lisheen 2	622832	664139	95.0	140.0
Lisheen 2	623073	664518	95.0	140.0
Lisheen 2	622648	664700	95.0	140.0
Lisheen 2	620892	668907	95.0	140.0
Lisheen 2	620891	668373	95.0	140.0
Lisheen 2	621129	668650	95.0	140.0
Lisheen 2	621226	668259	95.0	140.0
Lisheen 2	621146	667928	95.0	140.0
Lisheen 3	623283	668045	101.0	169.0
Lisheen 3	623451	668524	101.0	169.0
Lisheen 3	623682	669234	101.0	169.0
Lisheen 3	623648	669727	101.0	169.0
Lisheen 3	623502	670221	101.0	169.0
Lisheen 3	623546	670698	101.0	169.0
Lisheen 3	624290	671171	101.0	169.0
Lisheen 3	624780	671442	101.0	169.0
Seskin	641792	675091	100.0	175.0
Seskin	641224	674883	100.0	175.0
Seskin	641939	674425	100.0	175.0
Seskin	641393	674394	100.0	175.0
Seskin	641969	673942	100.0	175.0
Seskin	641797	673301	100.0	175.0
Seskin	642441	673026	100.0	175.0

Name	ITM X	ITM Y	Hub Height (m)	Tip Height (m)
Seskin	641873	672889	100.0	175.0
Gathabawn	634022	671688	102.0	170.0
Gathabawn	633566	671032	102.0	170.0
Gathabawn	634151	670746	102.0	170.0
Gathabawn	633885	670427	102.0	170.0
Gathabawn	634175	670130	102.0	170.0
Gathabawn	634977	669443	82.0	150.0
Gathabawn	634940	669846	82.0	150.0
Gathabawn	638460	669108	102.0	170.0
Gathabawn	638904	669223	82.0	150.0
Gathabawn	638746	668850	102.0	170.0
Gathabawn	638396	668679	102.0	170.0
Gathabawn	638734	668431	102.0	170.0

Table A6.2 - Topographical (concave ground/ barrier) Noise Prediction Adjustment Table

Notes/Comments

Requirement to include a concave ground profile correction of +3dB has been calculated in accordance with section 4.3.9 of the IOA GPG (July 2013)

A barrier correction of -2dB is included where the landform completely obscures a turbine at the noise assessment location

Where analysis indicates that both are required the barrier correction take precedence and a correction of -2dB is applied

Wind Farm	SRC_ID	Hub Height (m)	Tip Height (m)	NAL01	NAL02	NAL03	NAL04	NAL05	NAL06	NAL07	NAL08	NAL09	NAL10	NAL11	NAL12	NAL13
Killoshulan - T1	1	103.5	185	0	0	0	0	-2	-2	-2	0	0	0	0	0	3
Killoshulan - T2	2	103.5	185	0	0	0	0	-2	-2	-2	0	0	0	0	0	3
Killoshulan - T3	3	103.5	185	0	0	0	0	-2	-2	-2	0	0	0	0	3	3
Killoshulan - T4	4	103.5	185	0	0	0	0	-2	-2	0	3	0	0	0	3	3
Killoshulan - T5	5	103.5	185	0	0	0	0	-2	0	0	3	3	0	0	3	3
Killoshulan - T6	6	103.5	185	0	0	0	-2	0	0	-2	3	3	0	0	3	3
Killoshulan - T7	7	103.5	185	0	0	0	-2	0	0	0	0	0	0	0	3	3
Killoshulan - T8	8	103.5	185	0	0	-2	-2	0	0	0	0	0	0	3	3	3
Killoshulan - T9	9	103.5	185	0	0	-2	-2	-2	0	0	0	0	0	0	3	3
Killoshulan - T10	10	103.5	185	0	0	-2	-2	-2	-2	0	0	0	0	0	3	3
An Cnoc	11	58	93.5	3	3	3	3	3	-2	-2	-2	-2	-2	-2	3	3
An Cnoc	12	64	99.5	3	3	3	3	3	-2	-2	-2	-2	-2	-2	3	3
An Cnoc	13	64	99.5	3	3	3	3	3	-2	-2	-2	-2	-2	-2	3	3
An Cnoc	14	64	99.5	3	3	3	3	3	-2	-2	-2	-2	-2	-2	3	3
An Cnoc	15	64	99.5	3	3	3	3	3	-2	-2	-2	-2	-2	-2	3	3
Ballybeagh	16	69	110	3	3	3	3	3	-2	-2	-2	-2	-2	-2	3	3
Ballybeagh	17	69	110	3	3	3	3	3	-2	-2	-2	-2	-2	-2	3	3
Ballybeagh	18	69	110	3	3	3	3	3	-2	-2	-2	-2	-2	-2	3	3
Ballybeagh	19	69	110	3	0	3	3	3	-2	-2	-2	-2	-2	-2	3	3
Ballybeagh	20	69	110	3	-2	3	3	3	-2	-2	-2	-2	-2	-2	3	3
Ballybeagh	21	69	110	3	-2	3	3	3	-2	-2	-2	-2	-2	-2	3	3
Bruckana	22	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Bruckana	23	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Bruckana	24	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Bruckana	25	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Bruckana	26	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Bruckana	27	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Bruckana	28	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Bruckana	29	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Bruckana	30	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Bruckana	31	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Bruckana	32	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Bruckana	33	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2

Wind Farm	SRC_ID	Hub Height (m)	Tip Height (m)	NAL01	NAL02	NAL03	NAL04	NAL05	NAL06	NAL07	NAL08	NAL09	NAL10	NAL11	NAL12	NAL13
Bruckana	34	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Bruckana	35	99.5	150	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Lisdowney	36	80	121.5	3	3	-2	-2	-2	-2	3	3	3	3	3	0	0
Lisdowney	37	80	121.5	3	3	-2	-2	-2	-2	3	3	3	3	3	0	0
Lisdowney	38	80	121.5	3	3	-2	-2	-2	-2	3	3	3	3	3	0	0
Lisdowney	39	80	121.5	3	3	-2	-2	-2	-2	3	3	3	3	3	3	0
Lisheen 1	40	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	41	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	42	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	43	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	44	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	45	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	46	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	47	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	48	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	49	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	50	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	51	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	52	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	53	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	54	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	55	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	56	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 1	57	98	139	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 2	58	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Lisheen 2	59	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Lisheen 2	60	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Lisheen 2	61	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Lisheen 2	62	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Lisheen 2	63	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Lisheen 2	64	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	-2
Lisheen 2	65	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 2	66	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 2	67	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 2	68	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 2	69	95	140	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 3	70	101	169	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3

Wind Farm	SRC_ID	Hub Height (m)	Tip Height (m)	NAL01	NAL02	NAL03	NAL04	NAL05	NAL06	NAL07	NAL08	NAL09	NAL10	NAL11	NAL12	NAL13
Lisheen 3	71	101	169	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 3	72	101	169	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 3	73	101	169	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2	-2	3
Lisheen 3	74	101	169	-2	-2	-2	-2	0	3	-2	-2	-2	-2	-2	-2	-2
Lisheen 3	75	101	169	-2	-2	-2	-2	0	3	-2	-2	-2	-2	-2	-2	-2
Lisheen 3	76	101	169	-2	-2	-2	-2	0	3	-2	3	-2	-2	-2	-2	-2
Lisheen 3	77	101	169	-2	-2	-2	-2	3	3	-2	3	-2	-2	-2	-2	3
Seskin	78	100	175	0	-2	-2	-2	-2	-2	3	-2	-2	-2	0	-2	-2
Seskin	79	100	175	3	-2	-2	-2	-2	-2	3	3	-2	-2	-2	-2	-2
Seskin	80	100	175	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	-2
Seskin	81	100	175	3	0	-2	-2	-2	-2	3	-2	-2	-2	0	-2	3
Seskin	82	100	175	3	-2	-2	-2	-2	-2	-2	3	-2	-2	0	-2	3
Seskin	83	100	175	3	-2	-2	-2	-2	-2	-2	3	3	-2	0	-2	3
Seskin	84	100	175	0	-2	-2	-2	-2	-2	-2	3	-2	-2	-2	-2	0
Seskin	85	100	175	0	-2	-2	-2	-2	-2	3	3	3	-2	-2	-2	3
Gathabawn	86	102	170	-2	-2	-2	-2	-2	-2	3	0	-2	0	0	0	0
Gathabawn	87	102	170	-2	-2	-2	-2	0	-2	3	0	-2	0	0	0	0
Gathabawn	88	102	170	-2	-2	-2	-2	-2	-2	3	3	3	0	0	0	0
Gathabawn	89	102	170	-2	-2	-2	-2	0	-2	3	3	3	0	3	0	3
Gathabawn	90	102	170	-2	-2	-2	-2	-2	-2	3	3	3	3	3	0	3
Gathabawn	91	82	150	3	-2	-2	-2	-2	-2	3	3	3	3	3	0	3
Gathabawn	92	82	150	3	-2	-2	-2	-2	-2	3	3	3	3	3	0	3
Gathabawn	93	102	170	3	3	-2	-2	-2	-2	3	3	3	3	3	0	0
Gathabawn	94	82	150	3	3	-2	-2	-2	-2	3	3	3	3	3	0	0
Gathabawn	95	102	170	3	3	-2	-2	-2	-2	3	3	3	3	3	0	0
Gathabawn	96	102	170	3	0	-2	-2	-2	-2	3	3	3	3	3	0	0
Gathabawn	97	102	170	3	0	-2	-2	-2	-2	3	3	3	3	3	0	0

Annex 7 – Summary of Wind Turbine Noise Source Data

- Turbine Sound Power Level Data

Table A7.1: Sound Power Level Data

Wind Farm	Turbine	Hub height (of source data)	Added Uncertainty	Reference Wind Speed (ms^{-1}) Standardised to 10m Height									
				3	4	5	6	7	8	9	10	11	12
Killoshulan	Nordex N163 6.X MW with Serrated Blades	103.5	2	Restricted / NDA - data available on request. Max sound power is 109.4 dB.									
An Cnoc	Enercon E70 2.3 MW Generic Blades	64	1		91.8	94.6	99.8	102.4	104.1	105.5	105.5	105.5	105.5
Ballybeagh	Enercon E82 2.3 MW Generic Blades	60	2			96.7	101.8	104.7	105.8	106.0	106.0	106.0	106.0
Bruckana	Siemens SWT-3.0-101 Generic Blades	100	2	93.4	97.7	102.6	106.9	108.6	109.0	109.0	109.0	109.0	109.0
Lisdowney	Enercon E82 2.3 MW Generic Blades	64	2			97.1	102.0	104.8	105.8	106.0	106.0	106.0	106.0
Lisheen 1&2	Vestas V90 2.0 MW with Serrated Blades	98	2	94.8	98.2	102.4	105.0	105.8	106.0	106.0	106.0	106.0	106.0
Lisheen 3	Vestas V136 3.45 MW with Serrated Blades	100	2	Restricted / NDA - data available on request. Max sound power is 107.5 dB.									
Seskin	Vestas V150 6.0 MW with Serrated Blades	100	2	Restricted / NDA - data available on request. Max sound power is 106.9 dB.									
Gathabawn	Vestas V136 4.5 MW with Serrated Blades	82	2	Restricted / NDA - data available on request. Max sound power is 105.2 dB.									

Table A7.2: Octave Band Data

Wind Farm	Turbine	Reference Wind Speed (m/s)	Octave Band (Hz)								
			63	125	250	500	1000	2000	4000	8000	Overall
Killoshulan	Nordex N163 6.X MW with Serrated Blades	Restricted / NDA - data available on request									
An Cnoc	Enercon E70 2.3 MW Generic Blades	10	89.4	98	100.5	99.1	97.6	94.3	87.4	79.8	105.5
Ballybeagh	Enercon E82 2.3 MW Generic Blades	10	90.1	97.7	96.9	99.5	101.4	97.1	85.6	78.3	106
Bruckana	Siemens SWT-3.0-101 Generic Blades	8	89.4	95.9	99.7	101.5	104.5	102.6	96.5	82.9	109
Lisdowney	Enercon E82 2.3 MW Generic Blades	10	90.1	97.7	96.9	99.5	101.4	97.1	85.6	78.3	106
Lisheen 1 & 2	Vestas V90 2.0 MW with Serrated Blades	8	88	92.3	96.2	99.5	100	99.5	96.9	85.4	106
Lisheen 3	Vestas V136 3.45 MW with Serrated Blades	Restricted / NDA - data available on request									
Seskin	Vestas V150 6.0 MW with Serrated Blades	Restricted / NDA - data available on request									
Gathabawn	Vestas V136 4.5 MW with Serrated Blades	Restricted / NDA - data available on request									