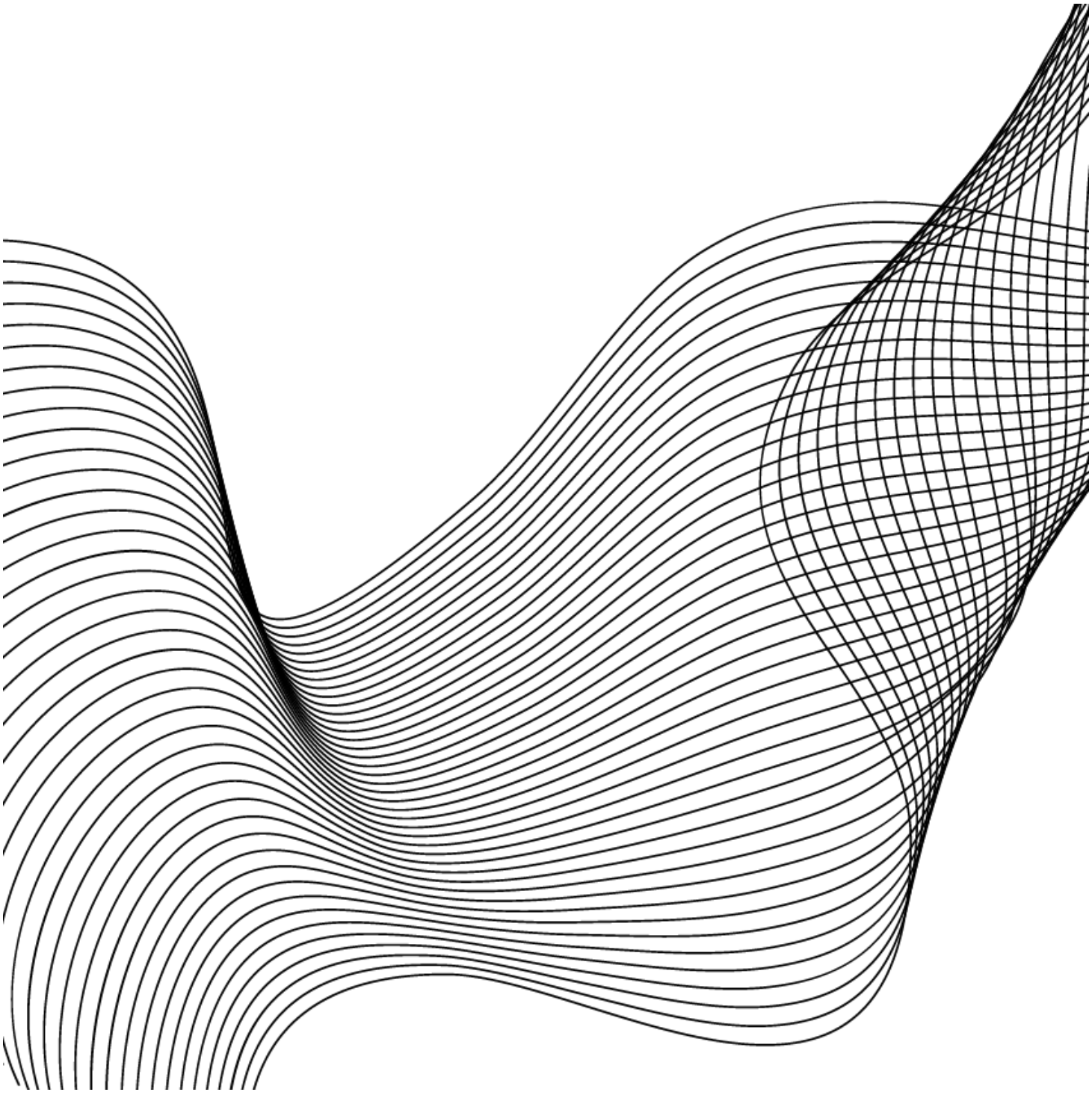
Enfonic

Rowan Engineering

Noise Impact Assessment – Knockraha BESS



Client:	Site:	Project No:
Rowan Engineering	Knockraha, Co Cork	4318

	Prepared by:	Checked by:	Approved by:
Name:	Liam Martin	Gary Duffy	Gary Duffy
Position:	Consultant	Principal Consultant	Principal Consultant
Signature:			

Document History:

Revision:	Date:	Description:
0	01.11.2024	Draft
1	10.10.2025	Updated source data
2	27.10.2025	Cumulative effects added
3	27.01.2026	Minor revision to site location
4	29.01.2026	Updated Red Line Boundary, equipment descriptions
5	11.02.2026	Minor update to Table 7-1 and Section 7.2
6	12.02.2026	Corrected equipment descriptions in Sections 5 & 6

Unit 2A, Century Business Park
Dublin, D11 T0HV, Ireland
t. +353-1-8775088
e. info@enfonic.com

t. +353-1-8775088
e. info@enfonic.com
w. www.enfonic.com

Directors: G. Duffy & S. Duffy
Registered in Ireland No. 360524

Contents

1.0 Introduction

Enfonic have been commissioned by Rowan Engineering to carry out a Noise Impact Assessment in relation to a planning application for a Battery Energy Storage System (BESS) at Knockraha, Co. Cork (the proposed development).

Baseline noise levels were assessed, and operational noise levels of the proposed development were predicted at representative noise sensitive locations. The resultant noise impact was consequently rated.

2.0 Methodology

The assessment has been undertaken using the following methodology:

- A review of the most applicable standards and guidelines has been conducted to set a range of acceptable noise criteria for the operation of the proposed development.
- Setting appropriate noise criteria.
- Predictive calculations have been performed to estimate the likely operational noise emissions at the nearest Noise Sensitive Locations (NSLs) to the site.
- The noise impact at selected representative noise sensitive locations was conducted.

3.0 Description of Effects

The significance of effects of the proposed development shall be described in accordance with the Environmental Protection Agency (EPA) document *Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR), 2022* (EPA Guidelines).

The EPA Guidelines do not however quantify the impacts in decibel terms. In the absence of such information, reference is made to *Guidelines for Environmental Noise Impact Assessment (2014)* from the Institute of Environmental Management and Assessment (IEMA Guideline). The IEMA Guidelines references similar terminology to the EPA Guidelines and quantifies the effect categories in decibel terms for various receptor categories, with residential receptors having the greatest sensitivity to noise.

The effect descriptions and their respective noise level change for residential receptors are presented in Table 3-1.

Table 3-1. Effects Description (EPA Guidelines and IMEA Guidelines) and noise level change criteria

EPA Significance of Effect	IEMA Guidelines	Noise Level Change (dB)
Imperceptible	None / Not significant	Less than 2.9
Not Significant		
Slight	Slight	3.0 - 4.9
Moderate	Moderate	
Significant	Substantial	5.0 - 9.9
Very Significant	Very Substantial	Greater than 10.0
Profound		

For the purposes of this assessment, with reference to Table 3-1, effects rated as 'Significant' or above are deemed Significant in EIA terms, and those of 'Slight/Moderate' rating or below are 'Not Significant' in EIA terms.

4.0 Applicable Guidance & Policy

The following guidance in this section is applicable to the assessment of the noise impact of the proposed development.

4.1 Construction Phase

4.1.1 Noise

BS 5228 - 1:2009 +A1 2014 Code of practice for noise and vibration control on construction and open sites – Noise provides basic information on the prediction and measurement of noise from construction sites and operations such as mines and quarries. It also includes a large database of source noise levels for commonly used equipment and activities on construction sites.

The standard provides guidance on the 'threshold of significant effect' in respect to noise impacts at dwellings. The proposed 'ABC method' derives appropriate construction noise limits from existing ambient noise levels and the relevant categories are provided in Table 4-1.

Table 4-1. BS 5228 - Example of significant effect at dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23.00−07.00)	45	50	55
Evenings and weekends [D]	55	60	65
Daytime (07.00−19.00) and Saturdays (07.00−13.00)	65	70	75

NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.

NOTE 3 Applied to residential receptors only.

A)	Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
B)	Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
C)	Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
D)	19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

In general, the noise impact due to the construction phase will depend on specific items of plant used, the duration, location, and phasing of the construction methods, and the time of day that each plant will be used and their location.

4.1.2 Vibration

The Transport Infrastructure Ireland (TII) (formally National Roads Authority) provides suitable criteria to prevent building damage from vibration in their Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (NRA, 2014) as given in Table 4-2.

Table 4-2. Summary of Applicable TII Vibration Criteria.

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
<10Hz	10-50Hz	>50-100Hz
8mm/s	12.5mm/s	20mm/s

4.2 Operational Phase

4.2.1 ISO 1996-1

Measurements of environmental noise for the purposes of impact assessment should follow the guidance set out in *ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise Part 1: Basic quantities and assessment* procedures. The standard defines the basic quantities to be used for the description of noise in community environments and describes basic assessment procedures.

4.2.2 BS 4142

An appropriate noise impact assessment methodology is provided in *BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound*. .

The procedure rates the 'Specific' noise (from the site's plant in this case) at Noise Sensitive Locations (NSLs) and compares it with the 'Background' noise levels. The level difference is an indication of the impact that the operation might have.

In addition, Rating penalties applied to the Specific noise level may be appropriate to provide for the increased significance that additional characteristics such as Tonality or Impulsivity have on noise in the community.

The 'context' of the development and its environs e.g. time of day, nature of the neighbourhood, local attitudes to the development, etc ought also to be considered. There is also a degree of uncertainty applicable to the results e.g. for weather, instrumentation, measurement duration, calculation errors etc which ought to be considered.

4.2.3 EPA Noise Guidance (NG4)

The Environmental Protection Agency (EPA) (2016), *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (NG4) provides noise guidance to operators' subject to IPPC, IE, or waste licences.

Typically noise emissions limits are set at Noise Sensitive Locations (NSLs) or at the site boundary as follows:

- Daytime: 55dB L_{Aeq}
- Evening: 50dB L_{Aeq}
- Night-time: 45dB L_{Aeq}

It should be noted however that the proposed development is not an Integrated Pollution Prevention Control (IPPC) Licensed site, however the limits may be referenced as a guideline.

4.2.3.1 Quiet Area Screening of the Development Location

The location of the proposed development should be screened in order to determine if it is to be located in or near an area that could be considered a 'Quiet Area' in open country according to the Agency publication Environmental Quality Objectives - Noise in Quiet Areas.

This involves determining if the following criteria are all satisfied:

- At least 3 km from urban areas with a population >1,000 people; No
- At least 10 km from any urban areas with a population >5,000 people;
- At least 15 km from any urban areas with a population >10,000 people;
- At least 3 km from any local industry;
- At least 10 km from any major industry centre;
- At least 5 km from any National Primary Route, and;
- At least 7.5 km from any Motorway or Dual Carriageway.

The site does not meet these criteria and is not considered to be a quiet area as per the Agency definition.

4.2.4 ISO 9613

ISO 9613-2:1996 Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation describes a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level (L_{Aeq}) under meteorological conditions.

4.2.5 Local Policy

Regional guidance and planning policy for the Cork City and County administrative area comes primarily from the following:

Cork Agglomeration – Noise Action Plan 2024-2028

The Noise Action Plan 2024-2028 (NAP) is prepared as a requirement of Environmental Noise Regulations 2018. It is primarily concerned with road traffic noise but includes some useful guidance for other noise sources. The NAP is underpinned by a set of overarching noise policy principles outlined in the Noise Policy Statement as follows:

> NOISE POLICY STATEMENT
>
> Cork City Council and Cork County Council will adopt a strategic approach to managing environmental noise from road traffic, rail traffic, airports and industrial activity sites, including ports, within its functional area, and will aim to:
>
> - **Prevention –** manage the risk of additional members of the community being exposed to undesirable noise levels where it is likely to have significant adverse impact on health and quality of life.
> - **Protection** - protect areas which are desirably quiet, or which offer a sense of tranquillity through a process of identification and validation followed by formal designation of 'Quiet Areas'.
> - **Mitigation –** identify and prioritise appropriate mitigation measures to reduce noise levels where they are potentially harmful.

Additionally, the results of the strategic noise mapping have been used to identify areas within the Agglomeration to be considered for preservation for environmental noise quality. These are referred to as Candidate Quiet Areas (CQAs) and 66no. potential CQAs have been identified within Cork City Council area of the Agglomeration and none in Cork County Council's.

Cork County Development Plan 2022-2028

In relation to noise, the County Development Plan recognises:

> *"Seek the minimisation and control of noise pollution associated with activities or development, having regard to relevant standards, published guidance and the receiving environment."*

5.0 Impact Assessment

5.1 Location Description

The proposed development is located in a rural setting, immediately east of the existing Knockraha ESB 220kV Substation as shown by the Red Line Boundary in Figure 5-1.

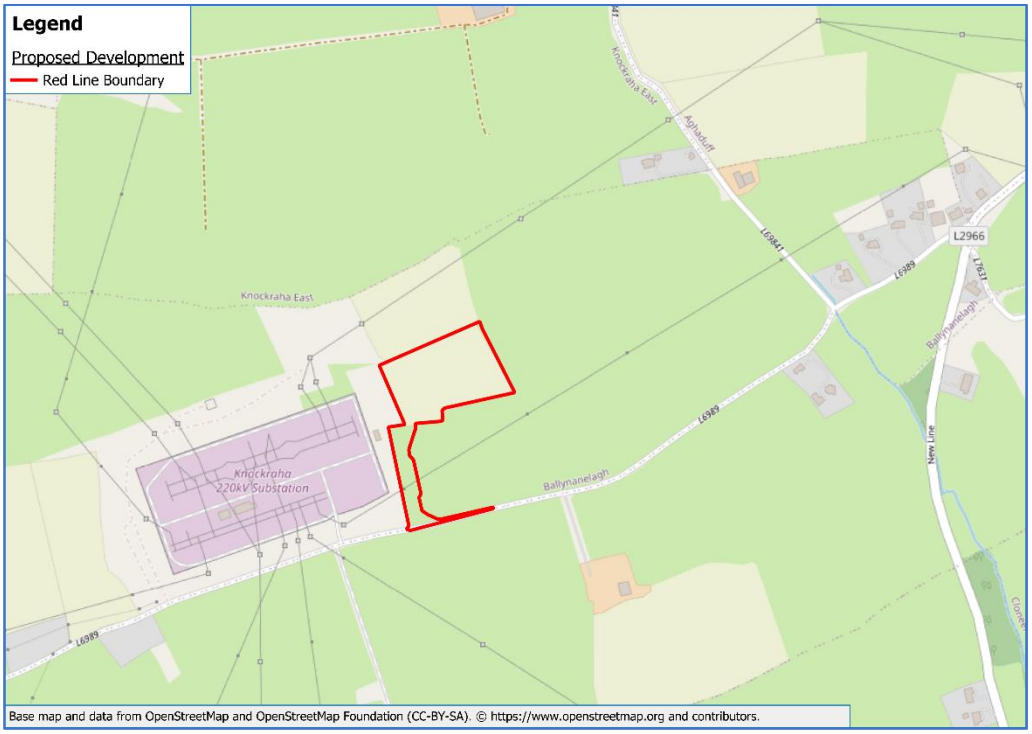


Figure 5-1. Proposed Development Location

5.2 Development Description

The development will consist of a 10-year planning permission for the construction of :

"*1 No. enclosed battery energy storage system compound on a total of c. 2-hectare site, to include:*

1 no. 110 kV AIS electrical substation building and 1 no. single-storey customer substation building, control and switch room, 33/110 kV transformer and 1 no. auxiliary transformers, up to 64 battery storage blocks on concrete support foundations including heating, ventilation and air conditioning units (HVAC units), and 32 Power Conversion Systems (PCS) contained within 16 twin skid units. Including access road and site entrance, associated electrical cabling and ducting, security gates, perimeter security fencing, CCTV system, landscaping works and all associated ancillary infrastructure. The proposed development will have a projected life span of 35 years."

The proposed site will be used as a single purpose site as a BESS facility, supporting the decarbonisation of the electrical grid.

5.3 Noise Sensitive Locations (NSLs)

A Noise Sensitive Location (NSL) is defied in EPA NG4 as:

> *"any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels."*

5.4 Study Area

The study area is defined in EPA guidance as any NSL that may be affected by noise from the proposed development. A representative sample of the closest NSLs (designated NSL1 – NSL3) were selected for this assessment. Noise levels and any associated noise impacts, diminish over distance, so assessment to the closest NSLs is considered a worst case.

The locations of these NSLs are given in Figure 5-2.

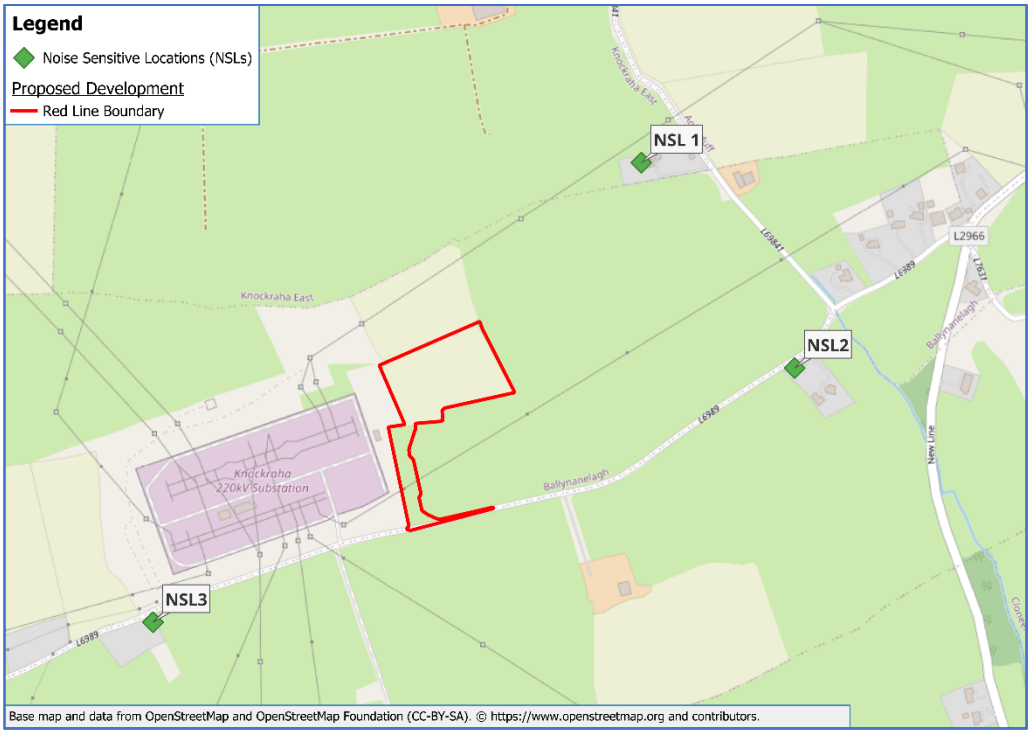


Figure 5-2. Location of the nearest Noise Sensitive Receptors.

Table 5-1. NSL Locations.

Location	X – ITM	Y – ITM	Description
NSL1	578607	578530	c. 430 m Northeast of Proposed Development
NSL2	578832	578230	c. 520 m East of Proposed Development
NSL3	577891	577857	c. 560 m Southwest of Proposed Development

5.5 Baseline Noise Survey

A combination of attended Daytime noise measurements and unattended noise monitoring over several days was undertaken to quantify the existing baseline conditions. Two (2no.) Attended Survey Locations (ASLs) and 1no. Noise Monitoring Location (NML) were chosen to be representative of the prevailing noise conditions within the study area.

The measurement locations are shown in Figure 5-3 and are detailed in Table 5-2.

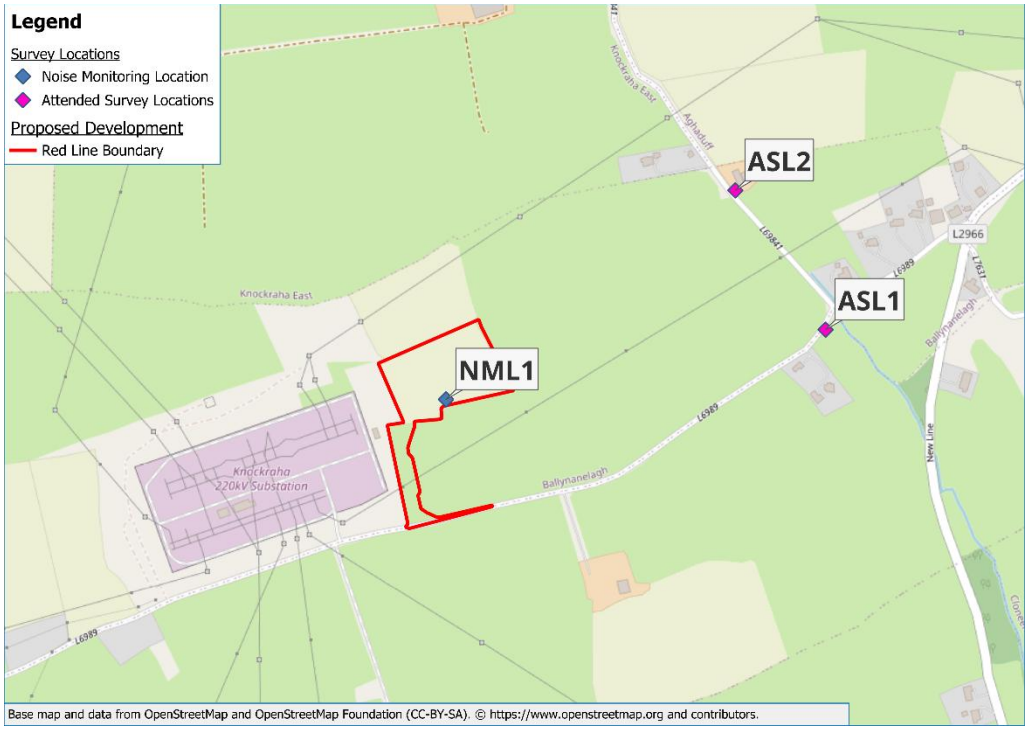


Figure 5-3. Noise Monitoring and Attended Survey Locations

Table 5-2. Survey Locations.

Location	X – ITM	Y – ITM	Description
NML 1	578322	578181	Field, c125m east of Knockraha substation, c170m north of Ballynanelagh Road
ASL 1	578878	578283	Lay-by in road close to NSL
ASL 2	578746	578486	Lay-by at gate to farmhouse. Close to NSL

Noise monitoring took place between September 25 and 29, 2024 and attended measurements taken on October 1, 2024.

Weather conditions during the attended surveys were calm and dry throughout with an average temperature of 10 °C. Weather conditions during the monitoring period were generally favourable with occasional light precipitation.

The general area is rural in nature, with occasional traffic along the local road network and general anthropogenic and natural activities being the dominant noise sources.

Photographs of the survey locations are given in Appendix A.

5.5.1 Instrumentation

Criteria for noise levels affected by precipitation and excessive wind speed are set out in ISO1996 and affected periods were eliminated. The remaining noise data was analysed and the typical background noise levels for each period were derived following the procedure set out in BS 4142:2014.

The relevant Background noise level (L_{A90}) per period are used for the purposes of the noise impact assessment and the results (rounded to the nearest integer) are presented in Table 5-3 below.

Table 5-3. Summary of Survey Results

Location	Daytime (L_{Aeq}) dB[1]	Daytime (L_{A90}) dB	Night-time (L_{A90}) dB
Attended (ASL1 & ASL2 average)	46	41	N/A
Unattended (NML1)	N/A	N/A	35
[1]Provided to set the Construction Noise Category.			

The relevant Background noise levels (L_{A90}) are summarised as follows:

- Daytime (07:00 – 23:00): 41dB
- Nighttime (23:00 – 07:00): 35dB

A time-history of the noise monitoring results is given in Appendix B.

5.6 Noise Modelling

A noise propagation model has been prepared to predict the noise levels of the proposed development to the NSLs. This section discusses the methodology behind the noise modelling process and presents the results of the modelling exercise.

5.6.1 Noise Prediction Software

DGMR's iNoise Pro is used for the modelling of this assessment which calculates noise levels in accordance with *ISO 9613-2:1996.* In general, the resultant noise level is calculated taking account a range of factors affecting the propagation of sound, including:

- The magnitude of the noise source in terms of sound power;
- The distance between the source and receiver;
- The presence of obstacles such as screens or barriers in the propagation path;
- The presence of reflecting surfaces, and;
- The hardness of the ground between the source and the receiver.

5.6.2 Noise Model Inputs

The noise model was prepared using the following data:

- Scaled map of the area around the site
- The built environment
- Sound power data of the main sources
- Ground types
- Receptor locations

The site was modelled over flat and level ground and an appropriate range of parameters values were set as follows:

- General Ground absorption factor is 0.8 (site and Substation compound: 0.0)
- Temperature of 20 degrees C
- Relative humidity of 60%
- Air pressure: 101.325 kPa

5.6.3 Noise Sources

The batteries themselves emit no noise but have some associated items of plant that are noise emitters. It is these items that are considered in this assessment, the most significant sources of which are:

1. **32no. Power Conversion Systems (Inverters).**
2. **64no. Battery Containers (Batteries).**
3. **1no. 110kV Transformer**

The **Inverters** include 2no. cooling fans and are to be fitted with Noise Attenuation kits. Fan speeds (and related noise levels) are proportional to ambient temperature and plant electrical loading.

The **Batteries** include chiller and HVAC units (both of which have fans), whose operating mode is governed by temperature and plant electrical loading.

The **Transformer** include chiller and HVAC units (both of which have fans), whose operating mode is governed by temperature and plant electrical loading.

It is prudent to consider 24-hour operation of the site, as power import/export from the battery units may happen at any time.

Fan speeds at various operating conditions for the Inverters and Batteries are given in Table 5-4 and Table 5-5 respectively.

Table 5-4. Summary of Inverter Noise Emission/Temperature range.

Ambient Temperature	Fan Speed
Up to 25 °C	60%
25 to 50 °C	80%
>50 °C	100%

Table 5-5. Summary of Battery operating modes.

Operation Mode	Charge Rate	Fan Speed (Chiller / HVAC)
Silent	Up to 0.3 CP	40% / 60%
Normal	Up to 0.5 CP	60% / 60%
Extreme	Up to 0.5 CP	80% / 80%
Regarding Extreme Mode, the manufacturer notes: "The maximum fan speed of chiller does not exceed 80% in extreme condition that battery operating is up to 0.5 CPrate and the ambient temperature of enclosure is over 40℃."		

Considering the temporal climate in an Irish context, it is considered reasonable to adopt fan speeds of 60% for both the Inverter and Battery units during both Daytime and Night-time operation for the purposes of a worst-case noise impact assessment.

5.6.4 Noise Emission Levels

The associated noise emission levels for the **Inverters** were provided by the applicant and are given in Table 5-6 below.

Table 5-6. Inverter - Octave Band Noise Levels

Inverter operating fan speed	Octave Band Sound Power (L_{Aw}) levels (dB)								Total
	63	125	250	500	1k	2k	4k	8k	
60%	56.7	69.4	78.1	73.5	73.3	75.1	77.2	76.3	83.9[1]
80%	60.4	73.1	81.8	77.2	77.0	78.8	80.9	80.0	87.9[2]

[1]Rises to 86.8dB without noise attenuation kit.
[2]Rises to 91.8dB without noise attenuation kit.

The associated noise emission levels for the **Batteries** were provided by the applicant and are given in Table 5-7.

Table 5-7. Battery - Octave Band Noise Levels.

Inverter operating fan speed	Octave Band Sound Power (L_{Aw}) levels (dB)									Total
	31.5	63	125	250	500	1k	2k	4k	8k	
60%	25.2	40.1	58.0	74.6	77.2	76.2	76.5	71.0	64.3	82.6
80%	33.3	48.2	66.0	82.7	85.2	84.3	84.5	79.0	72.4	90.7

The associated noise emission levels for the **Transformer** were provided by the applicant and are given in Table 5-8 below.

Table 5-8. 110kV Transformer - Octave Band Noise Levels

110kV Transformer	Octave Band Sound Power (L_{Aw}) levels (dB) [1]								Total
	63	125	250	500	1k	2k	4k	8k	
	37.0	48.7	58.2	60.3	60.0	54.9	50.7	43.0	65.1

[1]Normalised Spectrum derived from supplied and measured data.

5.6.5 Noise Model

A noise propagation model following the *ISO 9613:2024 Acoustics — Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors* standard was developed.

The general site layout and location of the units as shown in Figure 5-4 was adopted in the noise model.

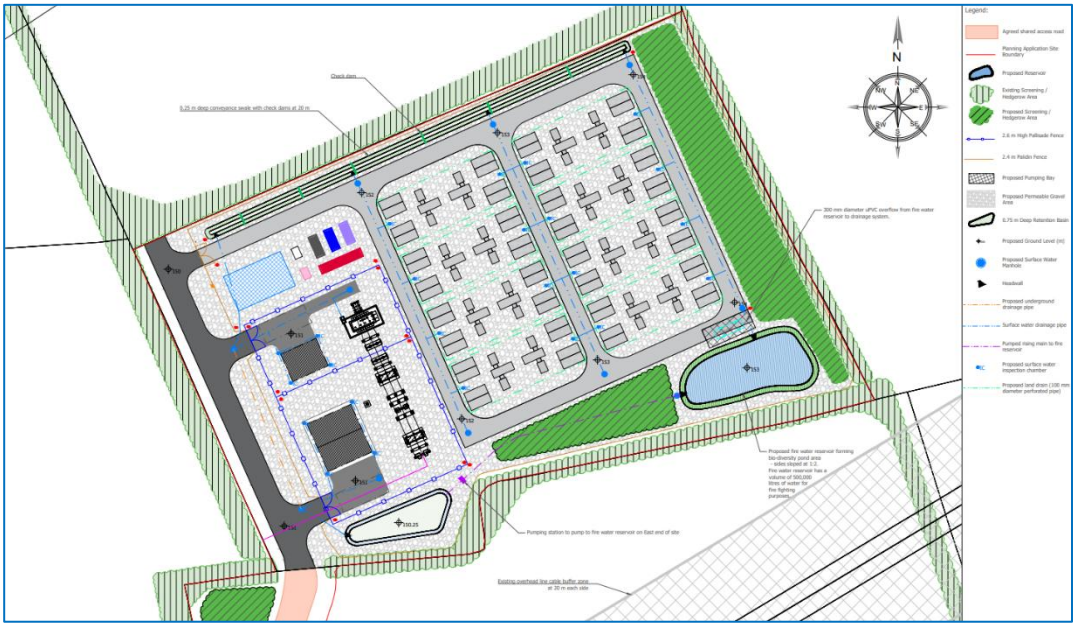


Figure 5-4. General site layout and unit locations.

The source heights in the noise model for the Inverter and Transformer were set as 1.5 m and 2 m respectively.

5.6.6 Predicted Noise Levels

The predicted Specific noise levels from the proposed development at the nearest NSLs are given in Table 5-9.

Table 5-9. Predicted Noise Levels at nearest NSLs

Location	Predicted L_{Aeq} Specific Noise Level (dB)
NSL1	38.1
NSL2	35.8
NSL3	35.9

The maximum noise levels occur at NSL1, and therefore, the impact assessment at this location represents a worst-case analysis.

A noise propagation contour plot is given in Appendix C.

6.0 Noise Impact Assessment

6.1 Acoustic Characteristics

Various acoustic characteristics may warrant a penalty being applied to the predicted noise levels at the NSLs, to produce a Rated Level (L_{Ar}), as described in BS4142:2014. The appropriate characteristics are assessed below.

6.1.1 Tonality

6.1.1.1 Inverters

BS4142: 2014 guidance sets out methodologies for the assessment of tonality and it is appropriate to use the 1/3 octave methodology here. This provides the following criteria for any 1/3 octave bands being greater then both adjacent bands:

- 15dB in Low-frequency one-third-octave bands (25Hz to 125Hz);
- 8dB in Mid-frequency bands (160Hz to 400Hz), and
- 5dB in High-frequency bands (500Hz to 10,000Hz).

A graph of the 1/3 octave bands noise emission levels from the Inverter is given in Figure 6-1.

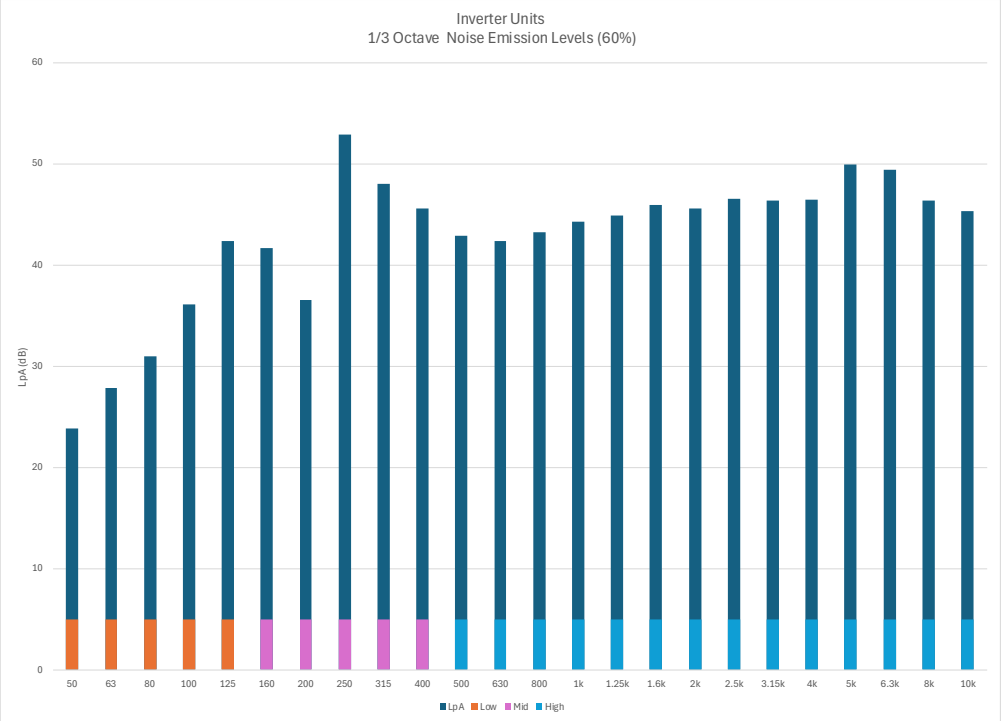


Figure 6-1. Inverter 1/3 Octave Band Noise Spectrum (L_{pA})

The criteria for identifying a tonal component are not satisfied and therefore no penalty is applicable.

6.1.1.2 Batteries

A graph of the 1/3 octave band sound power levels from the Batteries is given in Figure 6-2.

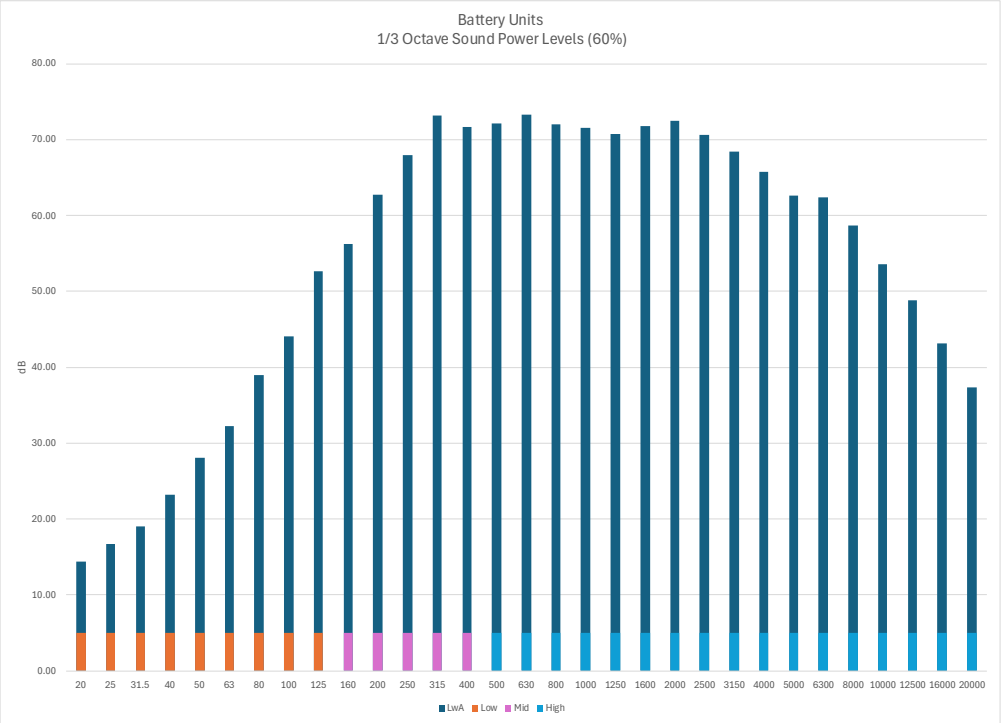


Figure 6-2. Battery 1/3 Octave Bands Sound Power Spectrum (L_{wA})

The criteria for identifying a tonal component are not satisfied and therefore no penalty is applicable.

6.1.1.3 Transformer

A graph of the 1/3 octave band noise levels from the Transformer is given in Figure 6-3.

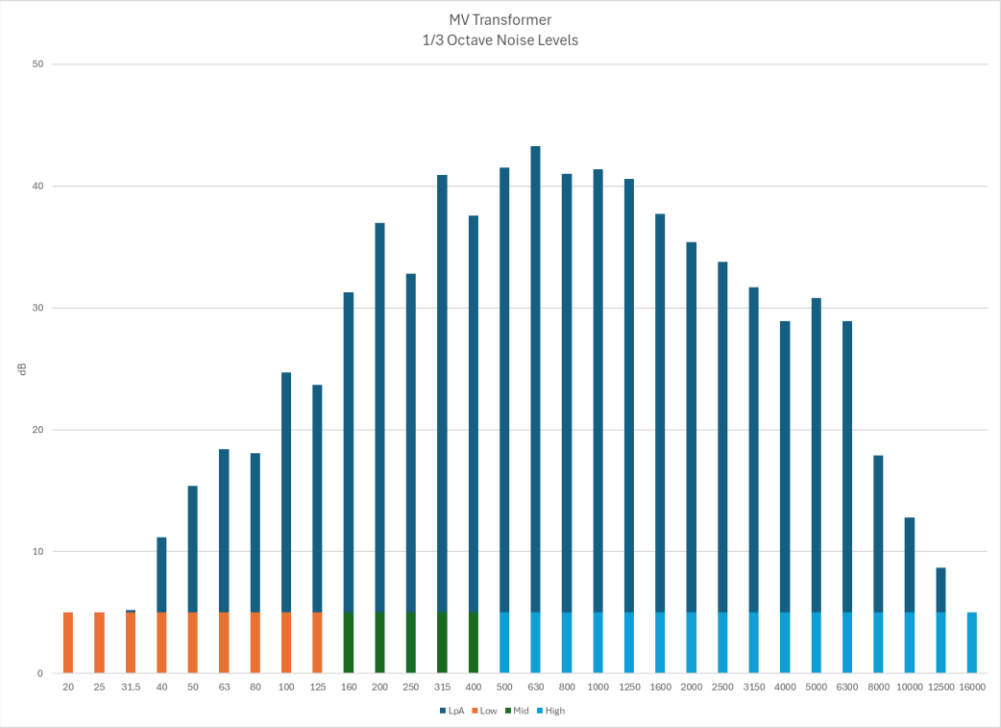


Figure 6-3. Transformer 1/3 Octave Band Noise Spectrum (LpA)

The criteria for identifying a tonal component are not satisfied and therefore no penalty is applicable.

6.1.2 Other Characteristics

There are no Impulsivity or Intermittency characteristics associated with the operation of the proposed development and therefore no penalties are applicable.

6.2 Assessment

Following BS 4142:2014 guidance, the Specific noise level at the nearest NSLs from the proposed development in Table 5-9, is compared with the measured Background noise levels in Table 5-3.

Given that the proposed development may operate at the rated capacity during the Daytime or Night-time period, it is appropriate to assess both periods. The BS4142 Impact Assessment for the closest NSL1 location is given in Table 3-1 and Table 6-1 for the Daytime and Night-time periods respectively.

Table 6-1. BS4142 Impact Assessment Summary at NSL1 (Daytime).

Parameter	Results	Commentary
Measured background sound level, (L_{AF90})	41 dB	
Calculated specific sound level, Ls (L_{Aeq})	38.1 dB	At closest location (NSL1)
Acoustic feature correction	0 dB	Tone Standard: ISO 1996-2:2007 (simplified)
Manual correction	0 dB	
Rating level, L_{Ar}	38.1 dB	
Excess of rating over background sound level	-2.9 dB	Imperceptible in EIA terms.
Assessment indicates a likely adverse impact?	No, not likely	
Context of the assessment		An existing 220kV sub-station is adjacent to the proposed development. The nature of the

Parameter	Results	Commentary
		existing noise climate at the NSLs will therefore not alter as a result of the proposed development.

Table 6-2. BS4142 Impact Assessment Summary at NSL1 (Night-time).

Parameter	Results	Commentary
Measured background sound level, (L_{AF90})	35 dB	
Calculated specific sound level, Ls (L_{Aeq})	38.1 dB	At closest location (NSL1)
Acoustic feature correction	0 dB	Tone Standard: ISO 1996-2:2007 (simplified)
Manual correction	0 dB	
Rating level, L_{Ar}	38.1 dB	
Excess of rating over background sound level	3.1 dB	Slight in EIA terms.
Assessment indicates a likely adverse impact?	No, unlikely	
Context of the assessment		An existing 220kV sub-station is adjacent to the proposed development. The nature of the existing noise climate at the NSLs will therefore not alter as a result of the proposed development.

The uncertainty budget is given in Table 6-3 below.

Table 6-3. Summary of uncertainty budget.

Measurement Uncertainty (Table 1 in ISO 1996-2:2007)					
Standard Uncertainty [dB]				Combined Standard Uncertainty σt [dB]	Expanded Measurement Uncertainty ±2σt [dB]
Due to instrumentation I	Due to operating conditions X	Due to weather and ground conditions Y	Due to residual sound Z		
1	0	1	0	1.4	2.8

The differences between the existing Background noise level (L_{A90}) and the predicted Specific noise level (L_{Aeq}) are c. 3 dB for the Day-time period, and c. -3 dB for the Night-time period.

The Daytime effect would be Imperceptible, and the Night-time effect would be Slight. Therefore in EIA terms, the effect is **Not Significant** at the closest NSL (NSL1).

6.2.1 Description of Effects – Summary

With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest NSLs associated with the operational phase are given in Table 6-4.

Table 6-4. Summary of Description of Effects (Operational Phase)

Period	Quality	Significance	Duration
Daytime	Negative	Imperceptible	Long-term
Night-time	Negative	Slight	Long-term

There no significant effect associated with the noise emissions of the proposed development for either the Daytime or Night-time periods.

6.2.2 EPA NG4 criteria

Notwithstanding that the site is not an EPA scheduled activity, the proposed development shall be compliant to the Daytime (55dB L_{Aeq}), Evening (50dB L_{Aeq}) and Night-time (45dB L_{Aeq}) noise limitations as set out by NG4.

6.3 Mitigation Measures - Operational Phase

Notwithstanding that there is no significant noise effect expected, available mitigation measures may be applied to further reduce the noise impact as set out below.

6.3.1 Operational Mode

A suitable curtailment programme can de-rate the Inverters for specific periods as required.

6.3.2 Noise Barrier

As a 'proof of concept' exercise, the effect of a noise barrier has been investigated as an appropriate mitigation measure.

A barrier, which may be constructed as an earth bund, solid wall, acoustic fence or similar, has been modelled at the location indicated in Figure 6-4.

The modelled barrier had the following parameters:

- **Height:** 2.3 m
- **Type:** Reflective (coefficient 0.8)

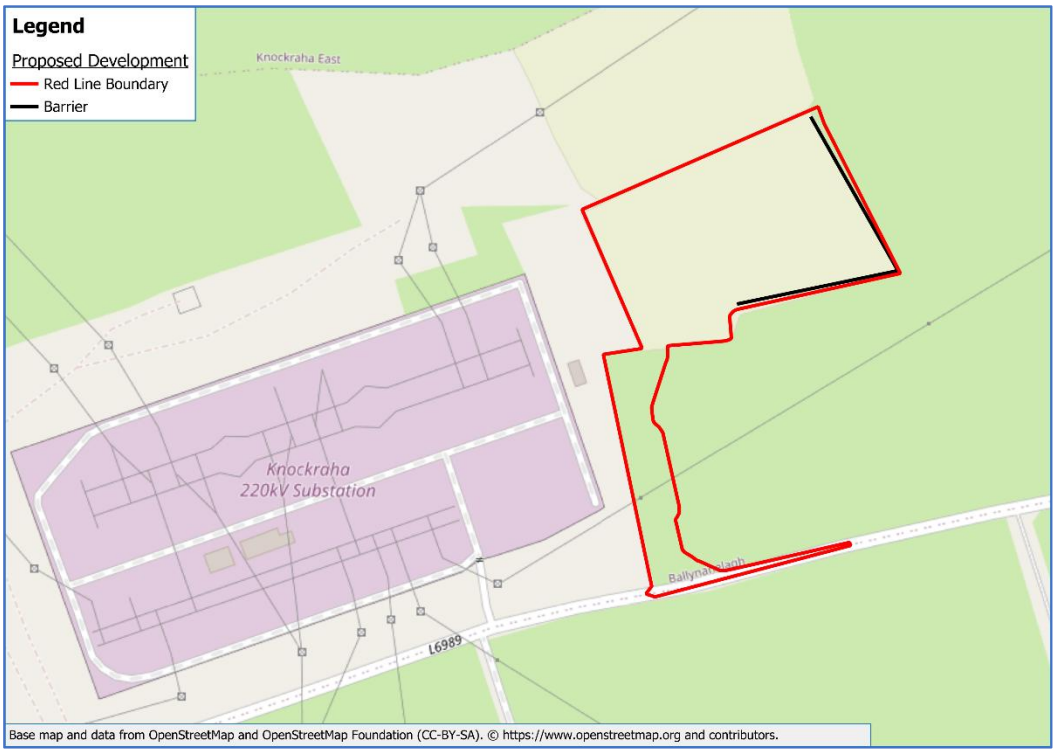


Figure 6-4. Potential Noise Barrier Location.

The resultant noise impact assessment of the effects of the noise barrier for the Day and Night-time periods are given in Table 6-5 and Table 6-6.

Table 6-5. Noise Impact Assessment Summary (Daytime)

Location	Measured Background L_{A90} (dB)	Predicted Specific (L_{Aeq}) Noise Level (dB)	Level Difference	EPA Significance of Effects
NSL1	41	33.8	-7.2	Imperceptible
NSL2		29.6	-11.4	Imperceptible
NSL3		35.9	-5.1	Imperceptible

Table 6-6. Noise Impact Assessment Summary (Night-time)

Location	Measured Background L_{A90} (dB)	Predicted Specific (L_{Aeq}) Noise Level (dB)	Level Difference	EPA Significance of Effects
NSL1	35	33.8	-1.2	Imperceptible
NSL2		29.6	-5.4	Imperceptible
NSL3		35.9	0.9	Imperceptible

Such a barrier is expected to provide a reduction of 4.3 dB (from 38.1 dB to 33.8 dB) at the closest NSL (NSL1).

7.0 Cumulative Noise Impact Assessment

7.1 Considered Developments

The permitted developments noted in Table 7-1 were considered for the purposes of a cumulative assessment:

Table 7-1. Nearby Permitted Developments.

Development Description	Planning Reference	Distance /direction from Proposed Development
Ballynanelagh BESS	Cork - 235992	c. 565 m / West-Northwest
Grid-stabilising synchronous compensator	Cork - 224488	c. 200 m / South-Southeast
Ballyvatta / Clash Solar Farm Panels & Inverters	ACP - 300434	c. 1700 m / North-Northeast
110 kV Substation, Knockraha East, Ballynanelagh and Kileena (Substation for ACP – 300434 Ballyvatta / Clash Solar Farm)	ACP - 320532	c. 130 m / North-Northwest

These site are graphically represented in Figure 7-1 below.

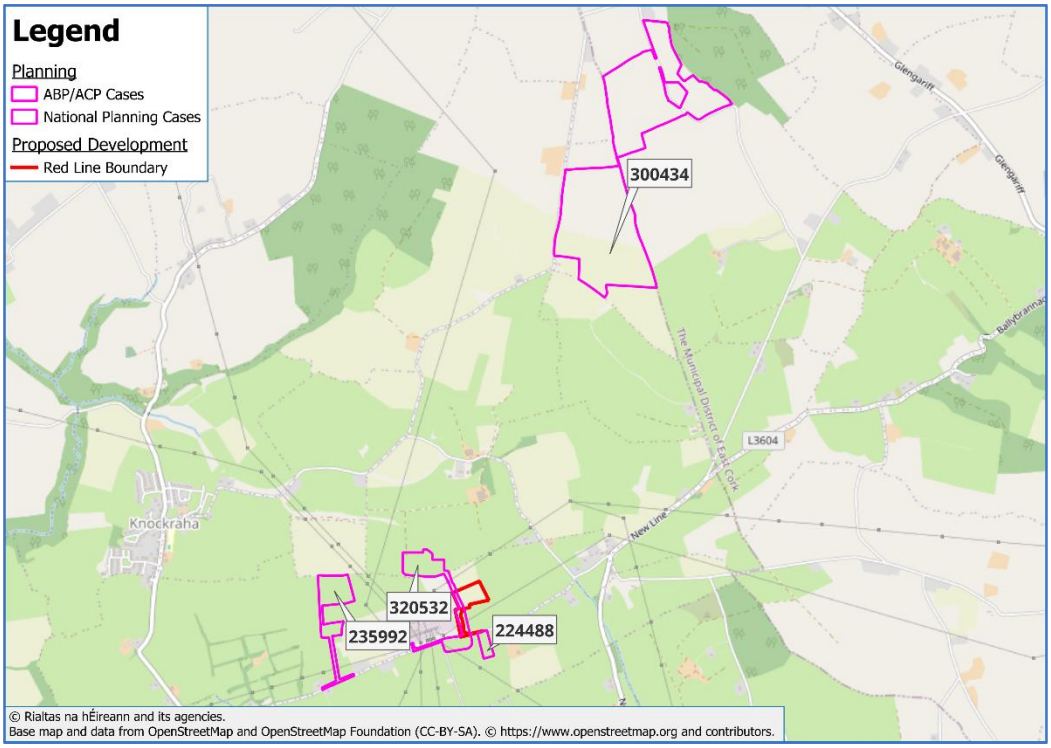


Figure 7-1. Permitted developments considered for cumulative assessment.

7.2 Sources to Disregard

The existing 220 kV substation serving the Celtic Interconnector has not been considered for this cumulative assessment, as it was present during the baseline noise surveys, and thus forms part of the existing Ambient noise of the locality.

Modifications to the existing 220 kV substation under case ABP-310798, including works at the existing 220 kV substation have been deemed insignificant in Section 13.4.1.3 of Document 229100428-508-D (Mott McDonald) and thus have not been considered in this assessment.

Works also noted in ABP-310798 at another location c. 7.5 km distant from the existing 220 kV substation have not been considered in this assessment due to the distance from the area of the proposed development.

Modifications to the 220 kV substation under case ABP-318258 (linked to ABP-310798) have been deemed to not be materially significant by An Coimisiún (formerly Bord) Pleanála, are also not significant in terms of noise, and therefore have not been considered in this assessment.

7.3 Noise Sensitive Locations

A greater number of noise sensitive locations were identified for the cumulative assessment due to their locations relative to the permitted developments considered from Table 7-1.

Their locations are presented in Figure 7-2.

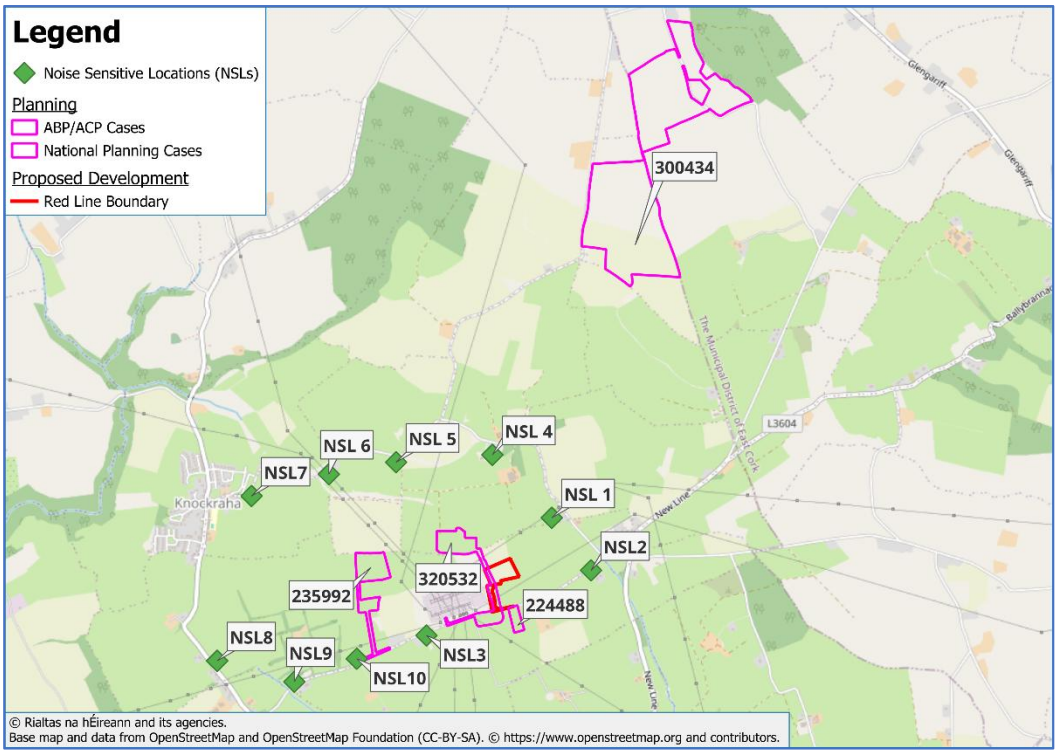


Figure 7-2. NSLs considered for Cumulative Assessment.

Location details are given in Table 7-2.

Table 7-2. Noise Sensitive Locations - Cumulative Assessment

Location	X – ITM	Y – ITM	Description
NSL 1	578607	578530	c. 430 m Northeast of Proposed Development
NSL 2	578832	578230	c. 520 m East of Proposed Development
NSL 3	577891	577857	c. 560 m West-Southwest of Proposed Development
NSL 4	578268	578890	c. 620 m North of Proposed Development
NSL 5	577718	578847	c. 820 m Northwest of Proposed Development
NSL 6	577334	578779	c. 1100 m Northwest of Proposed Development
NSL 7	576892	578654	c. 1470 m West-Northwest of Proposed Development

NSL 8	576696	577713	c. 1620 m West-Southwest of Proposed Development
NSL 9	577137	577593	c.1250 m West-Southwest of Proposed Development
NSL 10	577493	577724	c. 880 m West-Southwest of Proposed Development

7.4 Inputs for Cumulative Assessment

This report drew upon the relevant noise chapters of Environmental Impact Assessment Reports (EIARs) for the permitted developments set out in Table 7-1.

From these reports, the sound power levels of the noise sources (where available) were used as input for the noise model. Where sound power was not available, the noise source was calibrated by predicting the noise level at the nearby NSLs outlined in the relevant report and scaled to match.

The locations of these noise sources were approximated from the reports themselves, or from planning datasets provided by Irish governmental bodies[1].

Third-octave band source data was not provided in the reports, and therefore no tonal penalty has been applied for this cumulative assessment.

7.5 Results of Cumulative Assessment

7.5.1 Contributors to Cumulative Noise

From the noise prediction model, the total cumulative noise level and the individual contributing sources were predicted. The results are detailed in Table 7-3.

Table 7-3. Contributors to Cumulative Noise Level, per NSL.

Location	Total Cumulative Noise Level	Contributing Noise Levels (dBA)			
		Knockraha BESS (Proposed Development)	**Ballyvatta Solar Inverters** Planning Reference 300434	**Bally-nanelagh BESS** Planning Reference 235992	**Synchronous Compensator** Planning Reference 22488
NSL 1	38.9	37.9	24.5	25.7	28.7
NSL 2	37.4	35.9	23.4	24.3	30.2
NSL 3	38.7	35.9	21.2	32.8	30.8
NSL 4	35.1	32.6	25.7	27.0	25.0
NSL 5	34.5	29.4	24.0	31.3	23.2
NSL 6	33.8	26.4	22.6	31.9	21.5
NSL 7	30.8	23.2	21.2	28.7	19.9
NSL 8	28.5	21.9	18.8	26.0	18.7
NSL 9	31.2	25.3	19.3	28.6	21.4
NSL 10	34.8	29.5	20.1	32.2	24.8

The Ballyvatta Substation (Planning reference 320532) does not materially contribute to the cumulative noise level at nearby NSLs.

Daytime noise contours for the cumulative assessment are presented in Appendix D.

For information purposes, a graphical representation of the proportion of contributing noise sources to the total cumulative noise levels at the NSLs is provided in Figure 7-3. For appropriate map scaling, the Ballyvatta Solar Inverters do not appear in Figure 7-3.

[1] Táilte Éireann, An Comisiún/Bord Pleanála, Cork County Council, wherever applicable.

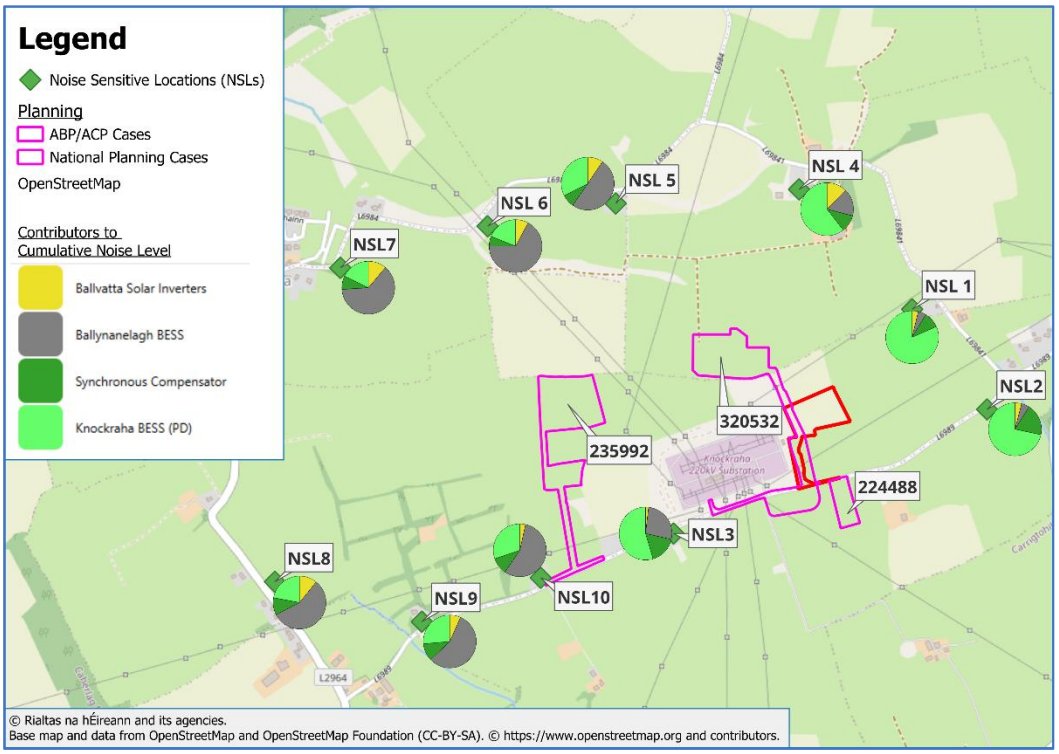


Figure 7-3. Contributors to Cumulative Noise Level, per NSL.

7.5.2 Cumulative Noise Impact Assessment

Predictions show that NSL 1 is most affected by the results of the cumulative assessment, and therefore is representative of the worst-case impact.

The BS 4142:2014 impact assessment results for Daytime and Night-time are given in Table 7-4 and Table 7-5 respectively below.

Table 7-4. BS4142 Impact Assessment Summary at NSL1 (Daytime).

Parameter	Results	Commentary
Measured background sound level, (L_{AF90})	41 dB	
Calculated specific sound level, Ls (L_{Aeq})	38.9 dB	At closest location (NSL1)
Acoustic feature correction	0 dB	Tone Standard: ISO 1996-2:2007 (simplified)
Manual correction	0 dB	
Rating level, L_{Ar}	38.9 dB	
Excess of rating over background sound level	-2.1 dB	Imperceptible
Assessment indicates a likely adverse impact?	No, not likely	
Context of the assessment		An existing 220kV sub-station is adjacent to the proposed development. The nature of the existing noise climate at the NSLs will therefore not alter as a result of the proposed development.

Table 7-5. BS4142 Impact Assessment Summary at NSL1 (Night-time).

Parameter	Results	Commentary
Measured background sound level, (L_{AF90})	35 dB	
Calculated specific sound level, Ls (L_{Aeq})	38.9 dB	At closest location (NSL1)
Acoustic feature correction	0 dB	Tone Standard: ISO 1996-2:2007 (simplified)
Manual correction	0 dB	
Rating level, L_{Ar}	38.9 dB	
Excess of rating over background sound level	3.9 dB	Slight/Moderate.
Assessment indicates a likely adverse impact?	No, unlikely	
Context of the assessment		An existing 220kV sub-station is adjacent to the proposed development. The nature of the existing noise climate at the NSLs will therefore not alter as a result of the proposed development.

The uncertainty budget is given in Table 6-3 below.

Table 7-6. Summary of uncertainty budget.

Measurement Uncertainty (Table 1 in ISO 1996-2:2007)					
Standard Uncertainty [dB]				Combined Standard Uncertainty σt [dB]	Expanded Measurement Uncertainty ±2σt [dB]
Due to instrumentation I	Due to operating conditions X	Due to weather and ground conditions Y	Due to residual sound Z		
1	0	1	0	1.4	2.8

There is a 1dB increase in the cumulative noise levels, nevertheless, the worst-case effect remains as **Not Significant** at the closest NSL (NSL1).

8.0 Construction Noise

Noise sources associated with the construction phase include traffic movements on the existing road network and items of plant during site enabling (clearance and excavation) and erection of the site structure.

All construction works will be managed in adherence to appropriate mitigation measures set out in the Construction Environmental Management Plan (CEMP) which will minimise any potential noise and vibration impacts.

From the measured L_{Aeq} noise level in Table 5-3, the site is defined as Category A and the adopted construction noise limits are set out in Table 8-1 below.

Table 8-1. Defined Construction Noise Limits at Noise Sensitive Locations

Period	Noise Levels	
	$L_{Aeq\ (1hr)}$	L_{AFmax}
Monday to Friday 07:00 to 19:00hrs	65	70
Saturdays 07:00 to 13:00hrs	65	70
Any other times*	55	60
** Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.*		

These criteria satisfy TII and BS 5228 guidance and should be included in the Construction Environment Management Plan (CEMP) and appropriate mitigation measures applied to ensure that the criteria are not exceeded.

Construction details are not available at this stage of the development however, considering the likely works involved and experience of similar BESS schemes, in the expert opinion of the authors, the above criteria can be easily achieved by employing appropriate mitigation measures for example; plant selection, operational times, phasing of the works, screening etc. BS 5228-1 provides advise on suitable noise control techniques.

No significant sources of vibration e.g. piling or rock breaking, are expected to be deployed however if required, the impact will be assessed and mitigated accordingly.

8.1 Decommissioning Phase

During the decommissioning phase of the proposed development , there will be some effect on nearby noise sensitive properties due to noise emissions from site traffic and other on-site activities. Similar overall noise levels as those calculated for the construction phase would be expected, as similar tools and equipment will be used. The noise and vibration impacts associated with any decommissioning of the site are considered to be comparable to those outlined in relation to the construction of the proposed project.

8.2 Description of Effects – Summary

With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest NSLs associated with the construction/decommissioning phase are given in Table 8-2.

Table 8-2. Summary of Description of Effects (Construction/Decommissioning Phase)

Quality	Significance	Duration
Negative	Slight	Temporary

8.3 Mitigation Measures – Construction/Decommissioning Phase

The Construction Environmental Management Plan (CEMP) will specifically address management processes and strategic mitigation measures to eliminate or reduce significant noise and vibration impacts, as well as cumulative noise and vibration impacts from construction activities. The Plan will also define noise and vibration monitoring and reporting requirements. Each phase of the works will be accompanied by method statements within the CEMP, detailing specific measures to minimize noise and vibration as far as reasonably practicable for each set of works, along with a detailed appraisal of the anticipated construction noise and vibration generated.

The contract documents will specify that the Contractor undertaking the construction works will be required to implement specific noise abatement measures as necessary to comply with the recommendations of *BS 5228-1:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites – Noise*.

The following list of measures will be implemented, where necessary, to ensure compliance with the relevant construction noise criteria:

- No plant used on site will be permitted to cause an on-going public nuisance due to noise.

- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working for the duration of the contract.
- Compressors will be attenuated models, fitted with properly lines and sealed acoustic convers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.
- During the construction programme, supervision of the works will be include ensuring compliance with the appropriate limits.
- The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 07:00hrs and 19:00hrs weekdays and between 08:00hrs and 16:00hrs on Saturdays. However, any necessary or emergency out of hours working will be agreed in advance with the local Planning Authority.

9.0 Residual Impacts

No residual impacts are expected for the construction, decommissioning or operational phases of the proposed development.

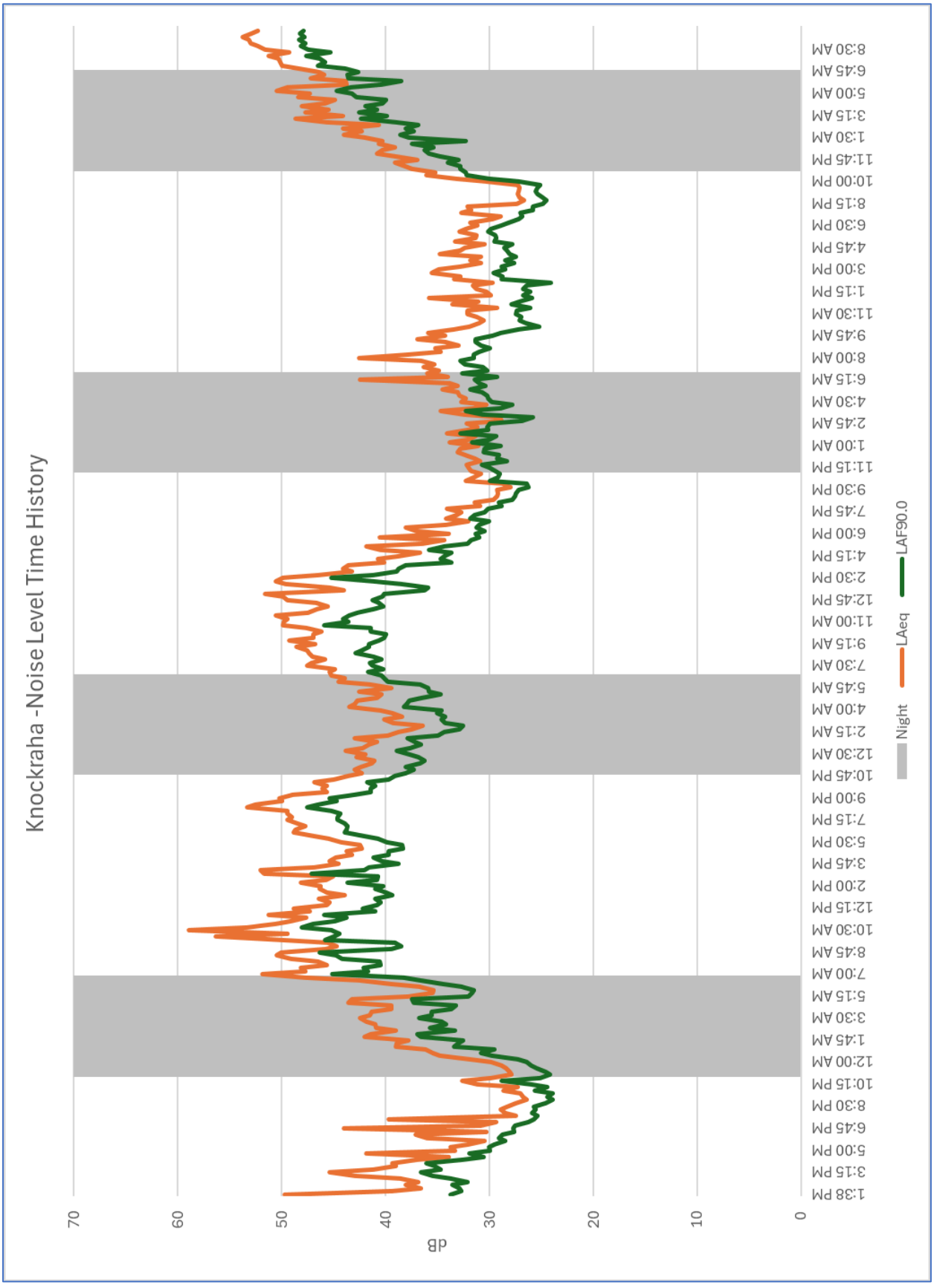
Appendix A

Background Noise Survey Locations:

Unattended Noise Monitor	Attended Noise Monitor #1
	
Attended Noise Monitor #2	
	

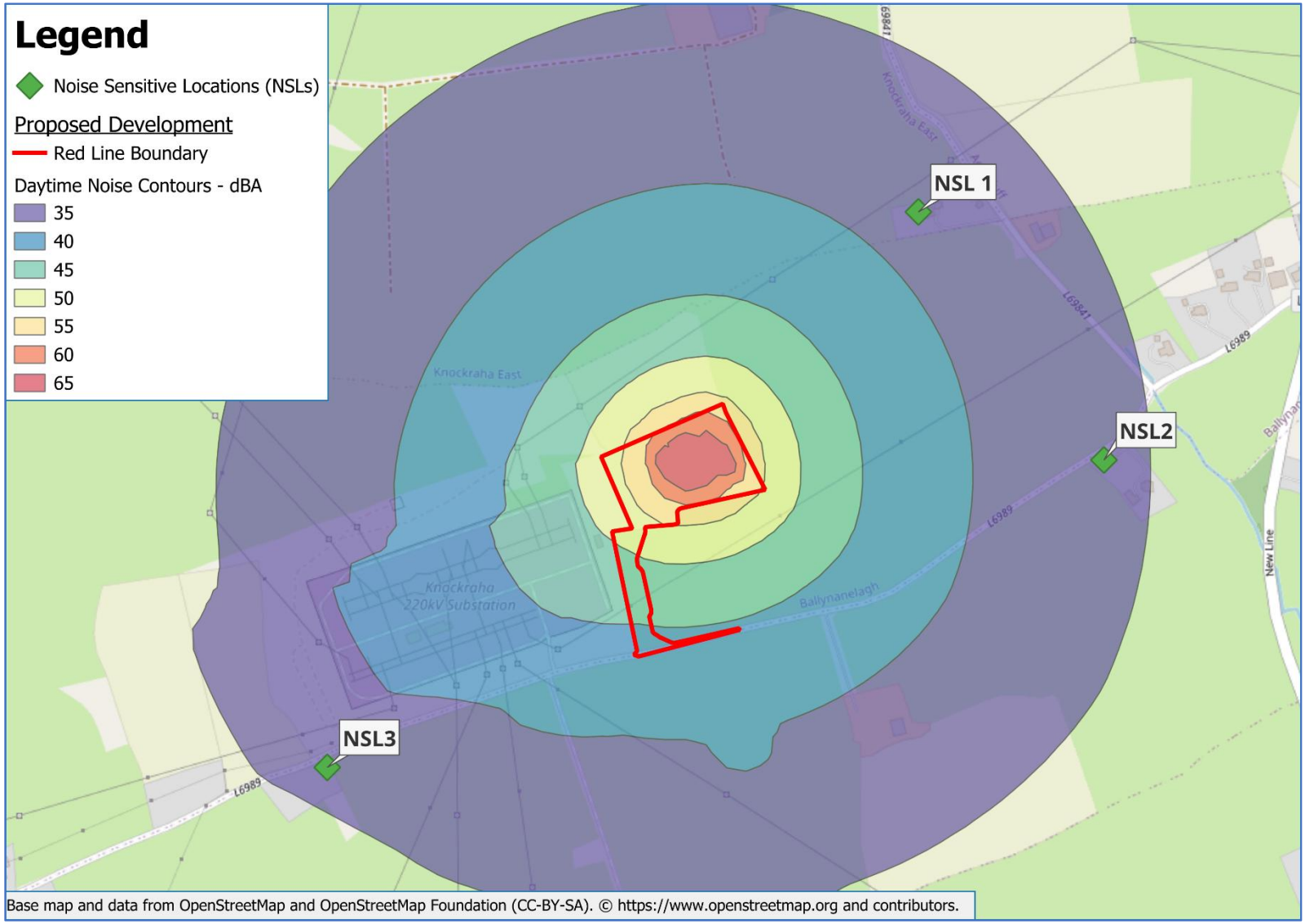
Appendix B

Unattended Time-History data:



Appendix C

Daytime L_{Aeq} noise contours at 4m height:



Appendix D

Daytime L_{Aeq} noise contours at 4m height, cumulative assessment: