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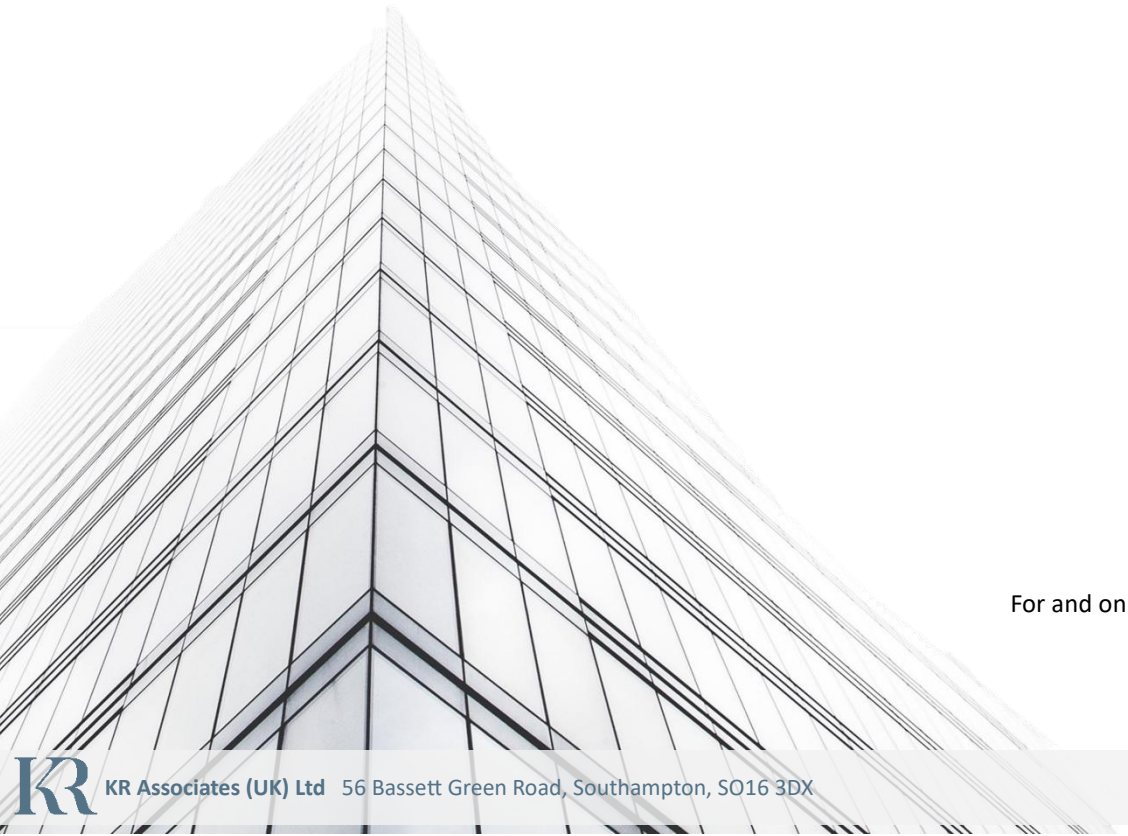
Noise Impact Assessment

Cardiff East Park and Ride, Eastern Avenue, Llanrumney, Cardiff. CF23 8HH.

Hybrid Planning Application (part full/part outline) for the demolition of existing structures and redevelopment of the site to provide a data centre and associated buildings and structures, associated car parking and access roads, a bridge across the Rhymney River, site wide landscaping and associated works.



KR07942

Version: 1.0

1st December 2025

Mr. R. M. Scrivener, MSc, MIOA

For and on behalf of KR Associates (UK) Ltd

Quietly Confident…

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1 Executive Summary

1.1 Introduction and Scope of Report

1.1.1 KR Associates (UK) Ltd have been instructed to prepare a noise impact assessment at Cardiff East Park and Ride, Eastern Avenue, Old St Mellons in Cardiff to support the hybrid planning application for the following development.

> *"Hybrid Planning Application (part full/part outline) for the demolition of existing structures and redevelopment of the site to provide a data centre and associated buildings and structures, associated car parking and access roads, a bridge across the Rhymney River, site wide landscaping and associated works."*

1.2 Previous Planning Application

1.2.1 Cardiff Council granted planning permission in June 2024 under application number 22/02673/FUL for the following development.

> *"Demolition of existing structures and redevelopment of the site to provide commercial floorspace (Use classes B1, B2, B8 and A3 and/or ancillary Class A1); associated drive-thru and car parking; the reprovision of the park and ride; a bridge across the Rhymney River; site wide landscaping and associated works."*

1.2.2 The approved planning application was supported by a previous KR Associates (UK) Ltd report reference KR06922 v1.9 dated June 2024. The Local Authority accepted the findings of the original report.

1.3 Discussion with Local Authority

1.3.1 KR Associates (UK) Ltd have discussed the current planning application with Rhys Morgan of Cardiff Council. It was agreed that in terms of the detailed portion of the planning application the noise generating activities of the proposed scheme will have a similar or less of an impact on the existing residential dwellings as the original scheme.

- The road layout, entrances and exits to the site and the bridge have remained unchanged.
- The proposed data centre will be likely to generate significantly less traffic than the original scheme.
- The removal of the park and ride and drive-thru elements will reduce the traffic noise from the site.

1.3.2 It was agreed that the specific details of the data centre which are within the outline section of the application are not yet known. However, it was agreed that an assessment would be undertaken in line with the original noise impact assessment to determine if the principle of a data centre on this site could be supported in terms of the impact of noise.

1.4 Executive Summary

1.4.1 The following provides a non-technical summary of the above sections to provide an overview of the impact of noise and vibration from the construction and operation of the proposed development

1.4.2 Noise Sensitive Properties

Residential	Group	Address and Description
NSP1	Group 1	246 Bryn Celyn – 2 Storey semi-detached residential dwelling
NSP2	Group 2	3 Ball Lane – 1st floor residential flat
NSP3	Group 3	10 Ball Close – 2 storey detached residential dwelling

1.4.3 Existing Background Noise Levels

The following table shows the background noise level results that were measured at position 1 on the eastern boundary of the site adjacent to the A48 and position 2 on the western boundary adjacent to the residential dwellings around Ball Lane.

Background Position		07:00 to 23:00	23:00 to 07:00	Commentary
Position 1	Measured	$L_{Aeq,\ 16\ hour}$ 66 dB	$L_{Aeq,\ 8\ hour}$ 60 dB	Measured levels are compared against the levels from the 2017 Strategic Noise Maps.
Position 2	Measured	$L_{Aeq,\ 16\ hour}$ 57 dB	$L_{Aeq,\ 8\ hour}$ 52 dB	

1.4.4 Key Legislative and Policy Criterion (Section 1.6)

The Welsh Government Planning Policy Wales ("PPW") Edition 11 was fully adopted in February 2021 including Chapter 6 entitled *''Distinctive and Natural Places''*. The Planning Guidance (Wales), Technical Advice Note (Wales) 11 entitled *"Noise"* was published in October 1997 but is due to be replaced to bring it in line with the PPW. In terms of local policy, the development will need to comply with policy EN13 entitled *''Air, Noise, Night Pollution and Land Contamination''* of the current Cardiff Local Development Plan.

1.4.5 Summary of Report

The assessments indicate that the principle of a large data centre on this site will be acceptable in terms of the likely noise emissions and the impact on existing residential dwellings. The development complies with policy EN13 entitled *''Air, Noise, Night Pollution and Land Contamination''* of the current Cardiff Local Development Plan and all other material considerations. The scheme is unlikely to give rise to any adverse impact on local residential occupiers as a result of the likely noise emissions from the data centres.

1.5 Layout of the Site

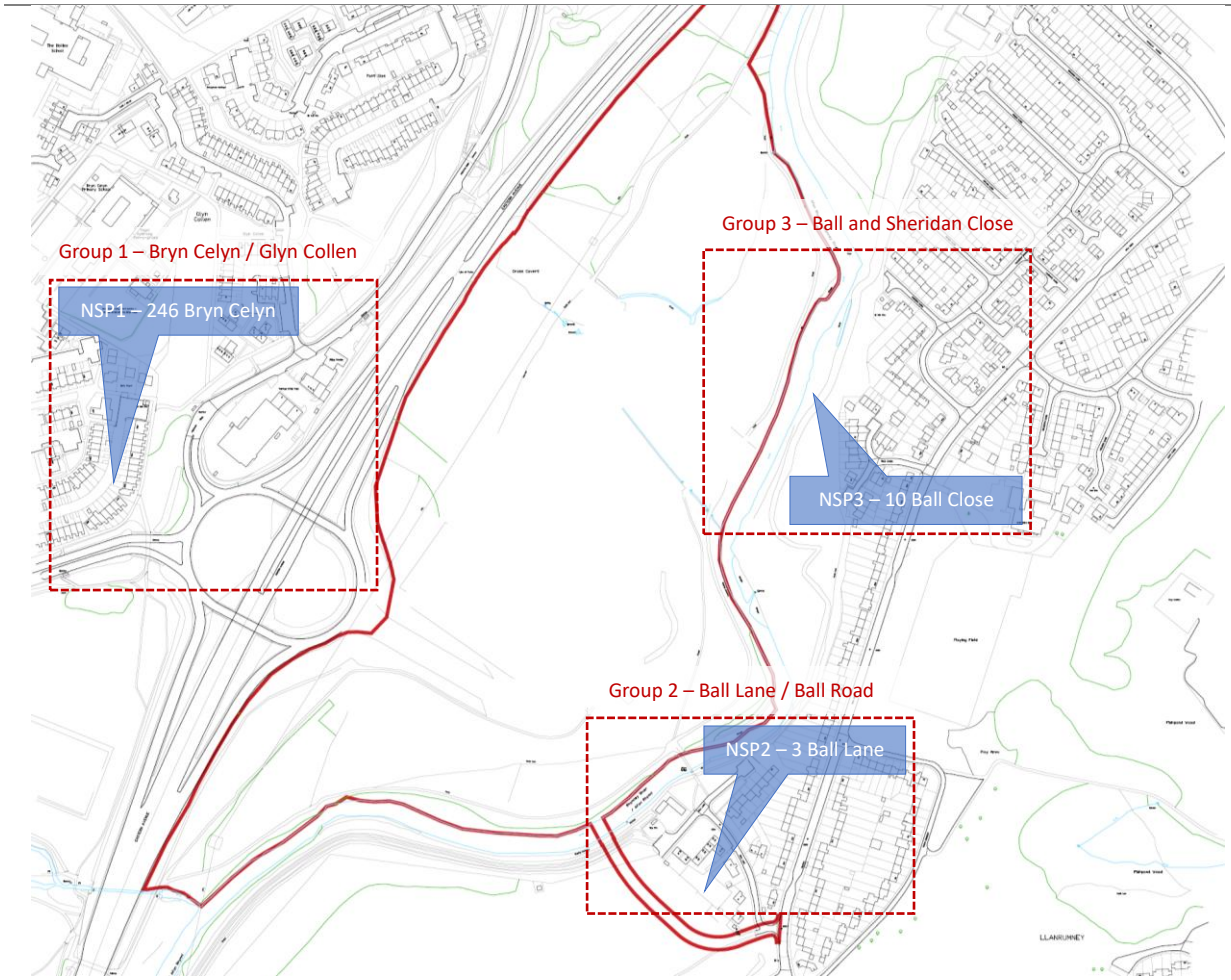
1.5.1 The Site encompasses approximately 23.4 hectares of land within the existing Cardiff Park and Ride East, located inside the administrative boundary of Cardiff City Council. The current Park and Ride facility occupies a hard-surfaced area of 4.9 hectares and provides approximately 900 car parking spaces, along with bus drop-off and pick-up points, an office/amenity building, and various service compounds. Access to the Site is via the A48 (Eastern Avenue).

1.5.2 Beyond the Park and Ride infrastructure, the Site includes areas of woodland and scrubland, interspersed with public rights of way and informal footpaths. The total developed area, including the Park and Ride, would comprise approximately 7.4 hectares. The Rhymney River forms the southern boundary of the Site, with the Rhymney Trail running parallel to the river. The Trail crosses the river via an existing footbridge located to the south of the Site.

1.5.3 The Site is not allocated for any specific use on the Council's adopted proposals map. However, it does include notable planning designations, such as areas of ancient woodland to the north and a smaller section to the south, as well as several trees protected by Tree Preservation Orders (TPOs). The northern portion of the Site and a corridor along the Rhymney River fall within an area of high flood risk, while the remainder of the Site is classified as low flood risk. The Site lies within the River Rhymney corridor.

1.5.4 Immediately northwest of the Site is the A48 dual carriageway, which connects southward toward Cardiff City Centre. Beyond this lies the residential area of Pentwyn, while Llanrumney is situated to the east. To the south, across the river, planning permission for a residential development comprising 98 units was granted under application reference 18/02594/MJR, and construction on that scheme is largely complete.

1.5.5 The following shows the existing plan of the Cardiff East Park and Ride site. The site is currently accessed from the roundabout over the A48 to the south western side of the site. There are three groups of existing residential dwellings that have the potential to be impacted by the development. Group 1 are the residential dwellings on Bryn Celyn and Glyn Collen on the western side of the development. Group 2 are the residential dwellings within Ball Lane off Ball Road to the south eastern side of the development. Group 3 are the residential dwellings within Ball Close and Sheridan Close on the eastern boundary.



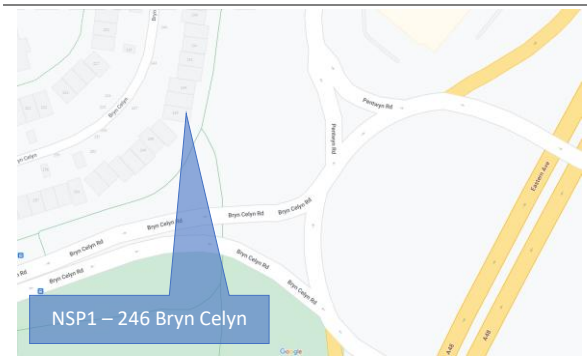
1.6 Noise Sensitive Properties

1.6.1 For the purposes of the assessments within this chapter the following dwellings are considered the most sensitive properties within each group.

Residential	Group	Address and Description
NSP1	Group 1	246 Bryn Celyn – 2 Storey semi-detached residential dwelling
NSP2	Group 2	3 Ball Lane – 1st floor residential flat
NSP3	Group 3	10 Ball Close – 2 storey detached residential dwelling

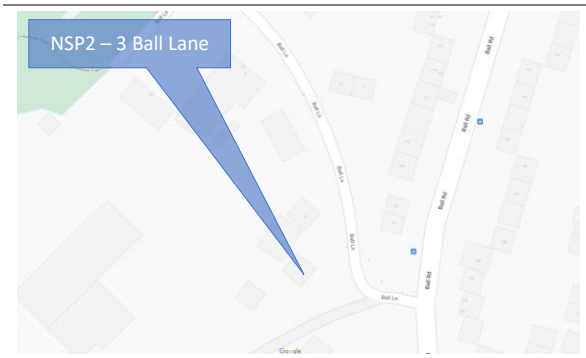
1.6.2 Noise Sensitive Property 1 – 246 Bryn Celyn

The residential dwelling at 246 Bryn Celyn could be impacted by the noise from the additional traffic using the roundabout above the A48.



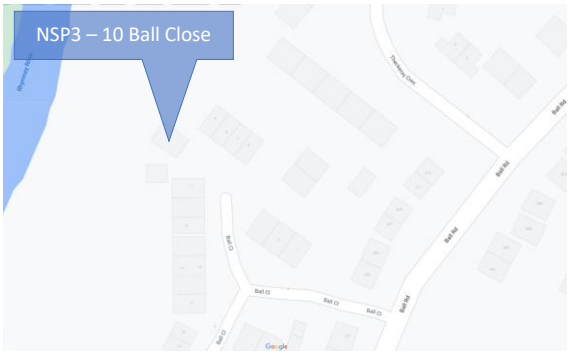
1.6.3 Noise Sensitive Property 2 – 3 Ball Lane

The residential dwelling at 3 Ball Lane could be impacted by traffic noise generated on the new link road which will connect the development to Ball Road generally to the south east of the development.



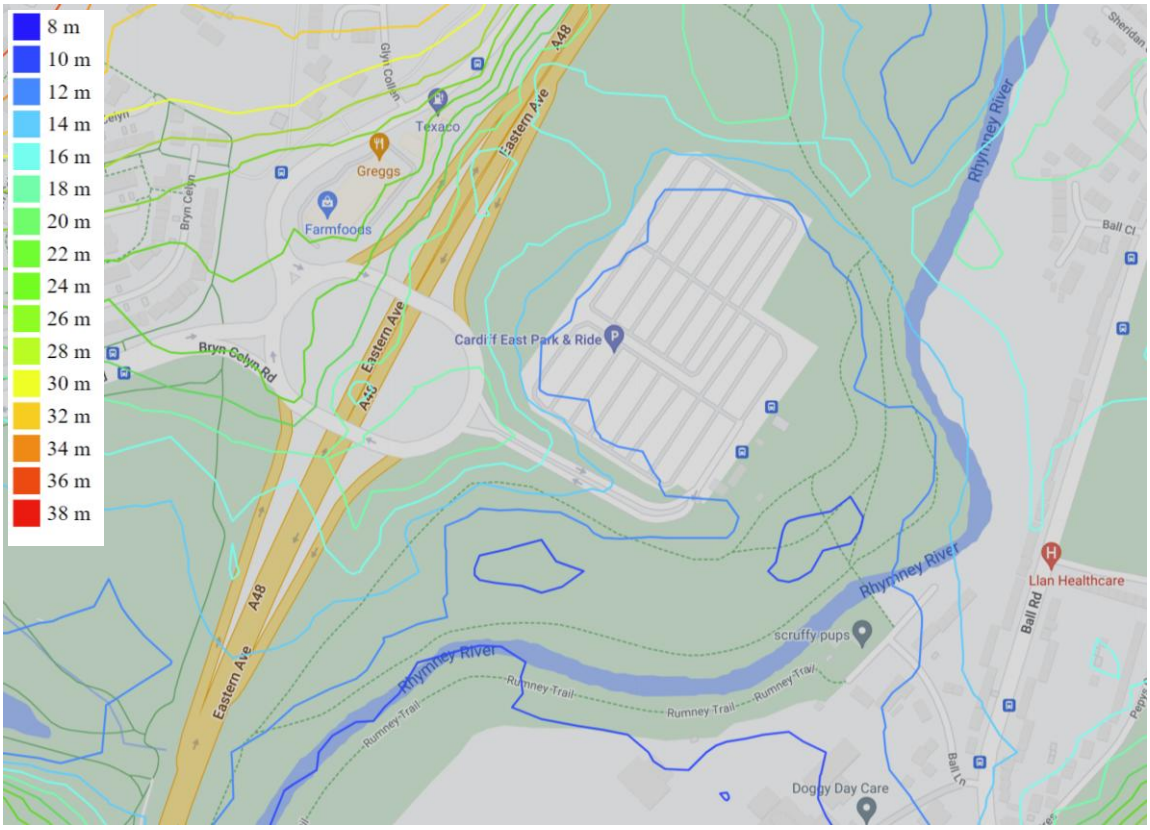
1.6.4 Noise Sensitive Property 3 – 10 Ball Close

The residential dwelling at 10 Ball Close could be impacted by the addition of the commercial units generally on the north eastern side of the proposed development.



1.7 Topographical Layout of Site

1.7.1 The existing park and ride car parking area is roughly between 11 and 12m above sea level with the access road to the south rising to around 19m on the roundabout above the A48 which is roughly at 15m. The residential dwelling at 246 Bryn Celyn (NSP1) is 24m above sea level, the residential flat at 3 Ball Lane (NSP2) is around 12m above sea level and the residential house at 10 Ball close is 19m above sea level.

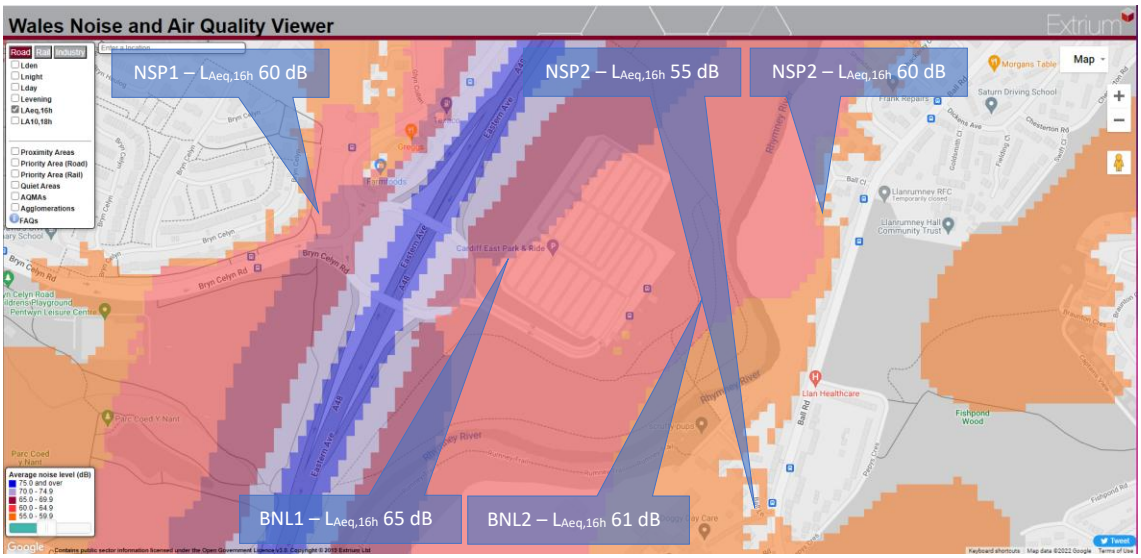


1.7.2 Rhymney river flows generally adjacent to the north east boundary of the site at a height of around 14m above sea level to the southern side of the site before it turns southwards to run parallel to the A48 at a height of 8m above sea level.

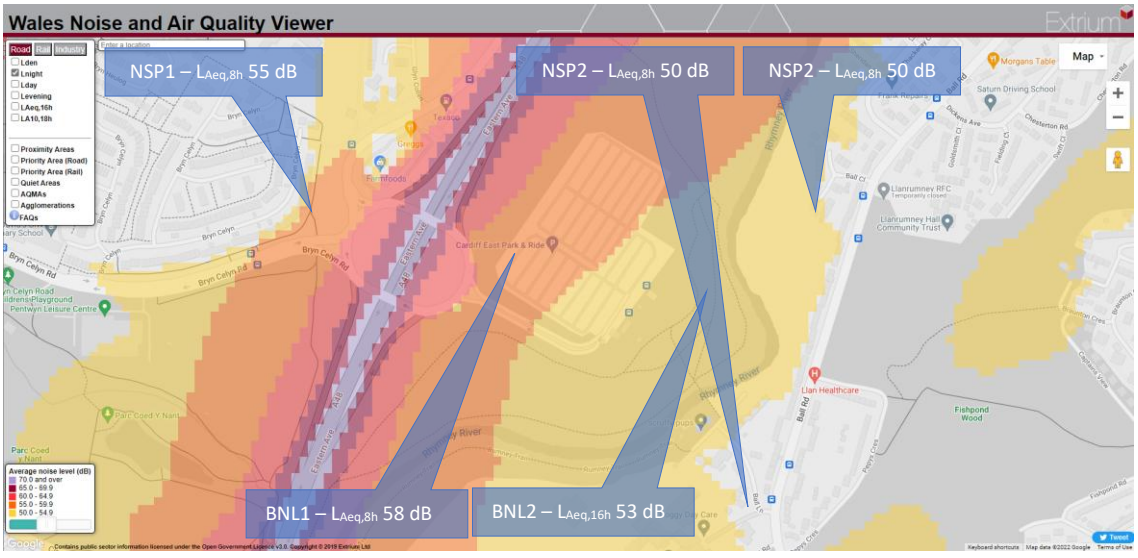
1.8 Strategic Noise Maps

1.8.1 Strategic noise maps of Wales are produced under the Environmental Noise (Wales) Regulations, 2006 (as amended) ("Regulations"). The Regulations transpose Directive 2002/49/EC (aka the Environmental Noise Directive, or END) into law. The noise maps are produced using detailed 3-dimensional geographic models of Wales. The 3-dimensional data is overlaid with transport models of relevant parts of the road and railway network, which details vehicle types, speed, etc.

1.8.2 Existing Day Time Noise Levels – Strategic Noise Maps

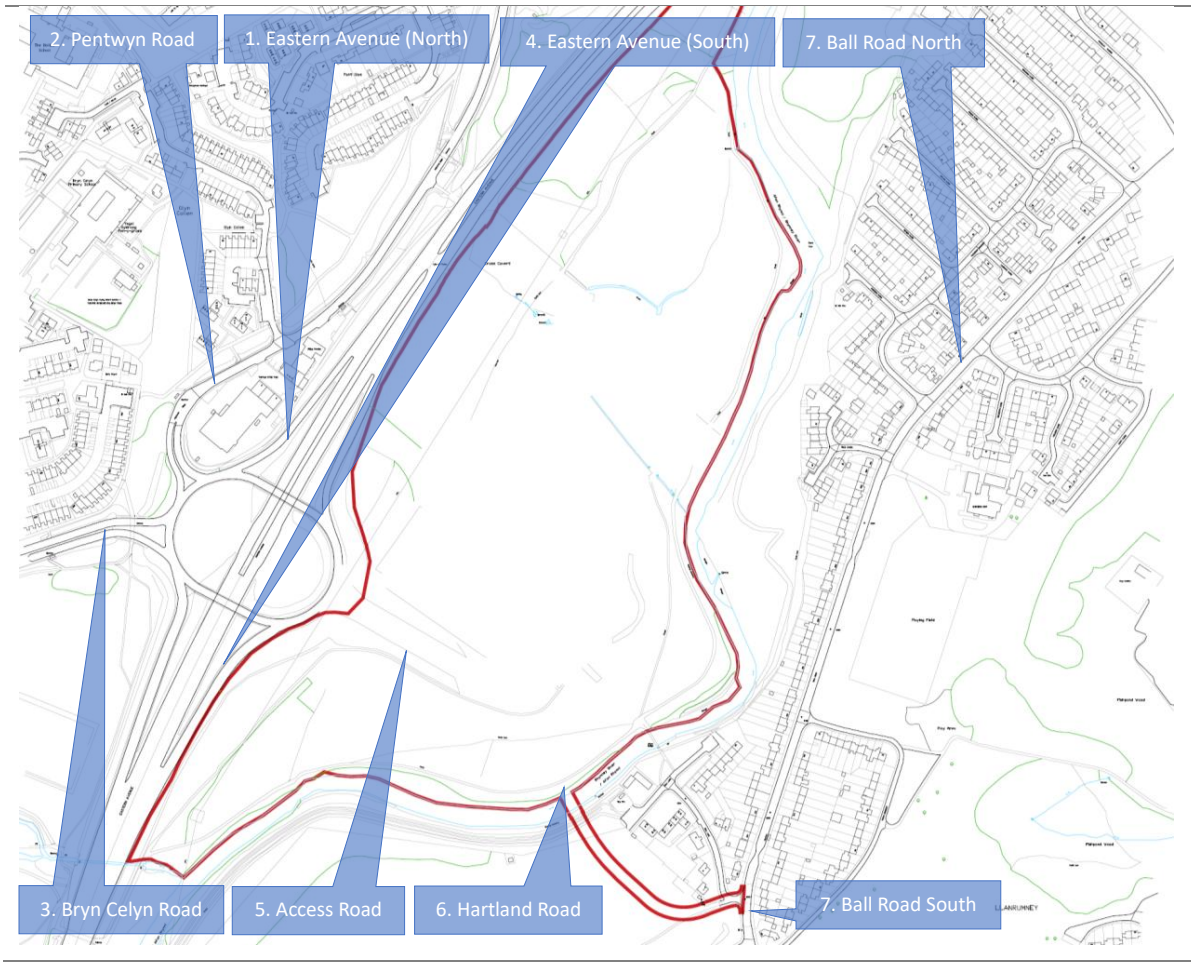


1.8.3 Existing Night Time Noise Levels – Strategic Noise Maps



1.8.4 It should be noted that the above noise maps do not include the noise from the existing park and ride facility in terms of cars and buses using the access road and parking in the car park.

1.9 Layout of Roads and Existing Traffic Flows



1.9.1 Existing and Proposed Traffic Flows

The following table provides the total 24-hour Annual Average Daily Traffic ("AADT") flows for all vehicles and the percentage of vehicles that are considered HGV.

Ref	Road Name	Speed Limit	Current Baseline Position (2025)	
			Total Vehicles	% HGV
1	Eastern Avenue Slip Road (North)	50 mph	10,802	2.8%
2	Pentwyn Road	30 mph	12,885	3.7%
3	Bryn Celyn Road	30 mph	12,207	2.0%
4	Eastern Avenue Slip Road (South)	50 mph	11,959	3.4%
5	Park and Ride Access Road	30 mph	2,006	11.0%
6	Hartland Road (New Link Road)	20 mph	480	3.6%
7	Ball Road North	20 mph	3,918	2.9%
8	Ball Road South	20 mph	3,918	2.9%

2 Noise Criterion

2.1 Determination of Application in line with the Local Development Plan

2.1.1 Section 38 (6) of the Planning and Compulsory Purchase Act 2004 and section 70 (2) of the Town and Country Planning Act 1990 requires the following when determining planning applications.

> *"Section 38 Development Plan*
>
> *(6) If regard is to be had to the development plan for the purpose of any determination to be made under the planning Acts the determination must be made in accordance with the plan unless material considerations indicate otherwise.*
>
> *Section 70 Determination of applications: general considerations*
>
> *(2) In dealing with an application for planning permission or permissions in principle the authority shall have regard to:*
>
> *(a) the provisions of the development plan, so far as material to the application,*
> *(c) any other material consideration."*

2.2 Environmental Protection Act 1990 (Amended 1993)

2.2.1 The Environmental Protection Act 1990 as amended by the 1993 Noise and Statutory Nuisance Act 1993 includes section 79 (1) in Part III entitled *"Statutory Nuisance and Clean Air"* which describes Statutory Nuisance as *"g) noise emitted from premises as to be prejudicial to health or a nuisance".* Should the site cause a nuisance to its neighbours the Local Authority have a duty to serve an Abatement Notice under section 80(1). Failure to comply with the requirements of the Abatement Notice will result in the operators of the site committing a criminal offence and upon successful prosecution which could make them liable for fines to Level 5, which are currently unlimited.

2.3 Control of Pollution Act 1974

2.3.1 The key legislation in dealing with the noise and vibration from construction is the remaining parts of the Control of Pollution Act 1974. Under section 60, the Local Authority can serve a notice, often referred to as a "Section 60 Prohibition Notice" which can impose conditions, restrict, or stop construction works that are creating excessive noise and vibration and disturbing nearby noise sensitive properties. An application for prior approval for construction works can be made under Section 61 and if the methods and type of working are adhered to the Local Authority can't serve a section 60 notice. The Act also introduces the principle of Best Practical Means as a defence.

2.4 Environmental Noise (Wales) Regulations 2006 (Amended 2009)

2.4.1 The European Union Directive 2002/49/EC known as the Environmental Noise Directive ("END") still applies in Wales as it is currently enacted by the Environmental Noise (Wales) Regulations 2006 (Amended 2009). The END provides a common approach to avoid, prevent, and reduce the harmful effects of environmental noise. In the main this involves the creation of strategic noise maps for large agglomerations of more than 100,000 inhabitants and providing access to the general public on environmental noise and its adverse impacts.

2.5 Planning Policy Wales Edition 11

2.5.1 The Welsh Government Planning Policy Wales (PPW) Edition 11 was fully adopted in February 2021 including Chapter 6 entitled *''Distinctive and Natural Places''*. Paragraph 6.7.4 entitled "*Framework for Addressing Air quality and Soundscape"* reducing the population exposure to air and noise pollution.

> "*The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.''*

2.5.2 Paragraph 6.7.5 discusses the agent of change principal.

> *''In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments……..*
>
> *The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable.''*

2.5.3 Paragraph 6.7.6 refers to considerations for new development.

> *''In proposing new development, planning authorities and developers must, therefore:*
>
> *address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
>
> *not create areas of poor air quality or inappropriate soundscape; and*
>
> *seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes.''*

2.5.4 Paragraph 6.7.7 confirms what is required by the Planning authority to assist decision making.

> *''To assist decision making it will be important that the most appropriate level of information is provided and it may be necessary for a technical air quality and noise assessment to be undertaken by a suitably qualified and competent person on behalf of the developer.''*

2.6 Technical Advice Note 11 (TAN 11) 1997

2.6.1 The Planning Guidance (Wales), Technical Advice Note (Wales) 11 entitled *"Noise"* was published in October 1997. This document includes the Noise Exposure Categories A to D within Appendix A which provides absolute noise levels for road traffic and combined sources. Paragraph 8 provides the following advice under section 8 entitled *"Noise Generating Development"*:

> *"Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions."*

2.7 Consultation on Technical Advice Note 11

2.7.1 The Welsh Government published a consultation document on 10th February 2020 ahead of the proposed update to TAN11. The amendments will provide updated details on soundscapes and noise pollution to align with the Planning Policy Wales Edition 11. It is likely that this consultation will remove the Noise Exposure Categories currently provided in Appendix A.

2.8 Policy EN13 of Cardiff Council Local Development Plan 2006 – 2026

2.8.1 The Cardiff Council Local Development Plan was fully adopted in January 2016 including policy EN13 entitled *''Air, Noise, Night Pollution and Land Contamination.''*

> *''Development will not be permitted where it would cause or result in unacceptable harm to health, local amenity, ….. because of ….. noise….''*

2.9 Policy 33 of the Future of Wales National Plan 2040

2.9.1 The Future Wales National Plan 2040 was fully adopted in February 2021 including Policy 33 entitled *'' National Growth Area – Cardiff, Newport, and the Valleys.''*

> *''Cardiff, Newport, and the Valleys will be the main focus for growth and investment in the South East region. Strategic and Local Development Plans should recognise the National Growth Area as the focus for strategic economic and housing growth; essential services and facilities; advanced manufacturing; transport and digital infrastructure. The Welsh Government will work with regional bodies and local authorities in the region and in neighbouring regions of England to promote and enhance Cardiff, Newport and the Valleys' strategic role and ensure key investment decisions support places in the National Growth Area and the wider region. The Welsh Government supports Cardiff's status as an internationally competitive city and a core city*

on the UK stage. Cardiff will retain and extend its role as the primary national centre for culture, sport, leisure, media, the night time economy and finance…"

2.10 British Standard 4142: 2014 (Amended A1: 2019)

2.10.1 British Standard 4142: 2014 + A1: 2019 provides a method for assessing the likely effects of sound from industrial or commercial nature on *"people who might be inside or outside a dwelling used for residential purposes"*.

"This British Standard describes the methods for rating and assessing sound of a…. commercial nature, which includes:

b) sound from fixed installations which comprise mechanical and electrical plant and equipment."

2.10.2 The standard may be used to establish the following:

"This standard is applicable to the determination of the following levels at outdoor locations:

a) rating levels for sources of sound of a …. commercial nature.

b) ambient, background and residual noise levels.

For the purposes of:

…2) assessing sound from proposed, new….source(s) of sound of a …. Commercial nature."

2.10.3 <u>Feature Correction - Subjective Method</u>

The standard provides the following commentary on the subjective assessment of tonality, impulsivity, character, and intermittency.

Feature Correction	Perceptibility of specific noise at assessment position against residual noise			
	Not	Just	Clearly	Highly
Tonality	+0 dB	+2 dB	+4 dB	+6 dB
Impulsivity	+0 dB	+3 dB	+6 dB	+ dB
Character	+0 dB	+3 dB		
Intermittency	+0 dB	+3 dB		

2.10.4 Initial Estimate of Impact

The initial estimate of the adverse impact can indicate the following:

"a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

d) Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

2.11 Night Noise Guidelines 2009

2.11.1 The aim of the *Night Noise Guidelines* (4) published in 2009 was to update the *WHO – Guidelines for Community Noise* (5) published in 1999 and provides health-based guidelines for acceptable night time noise levels following the work previously undertaken for the *European Union Directive 2002/49/EC* (6) known as the Environmental Noise Directive. The report goes on to recommend the following thresholds based on the relationship between the night-time noise levels and the effect on the person sleeping.

Effect	Health Effects Observed in the Population	$L_{night, outside}$
NOEL	Up to this level no biological effects are observed	30 dB
LOAEL	Effects on sleep, body movements, awakening	40 dB
SOAEL	Significant adverse health effects	> 55 dB

3 Background Noise Levels

3.1 Measurement Period

3.1.1 The background noise measurements were measured at two positions between Monday 13th September 2021 and Wednesday 22nd September 2021 as shown on the map below. The meters were installed on lamp posts within the site and set to record continuously in 1/3rd octave for the measurement duration.

Position	Latitude	Longitude	Height
Measurement Position 1	51.521641°	-3.137800°	12m + 4m = 16m
Measurement Position 2	51.521280°	-3.134348°	11m + 4m = 15m

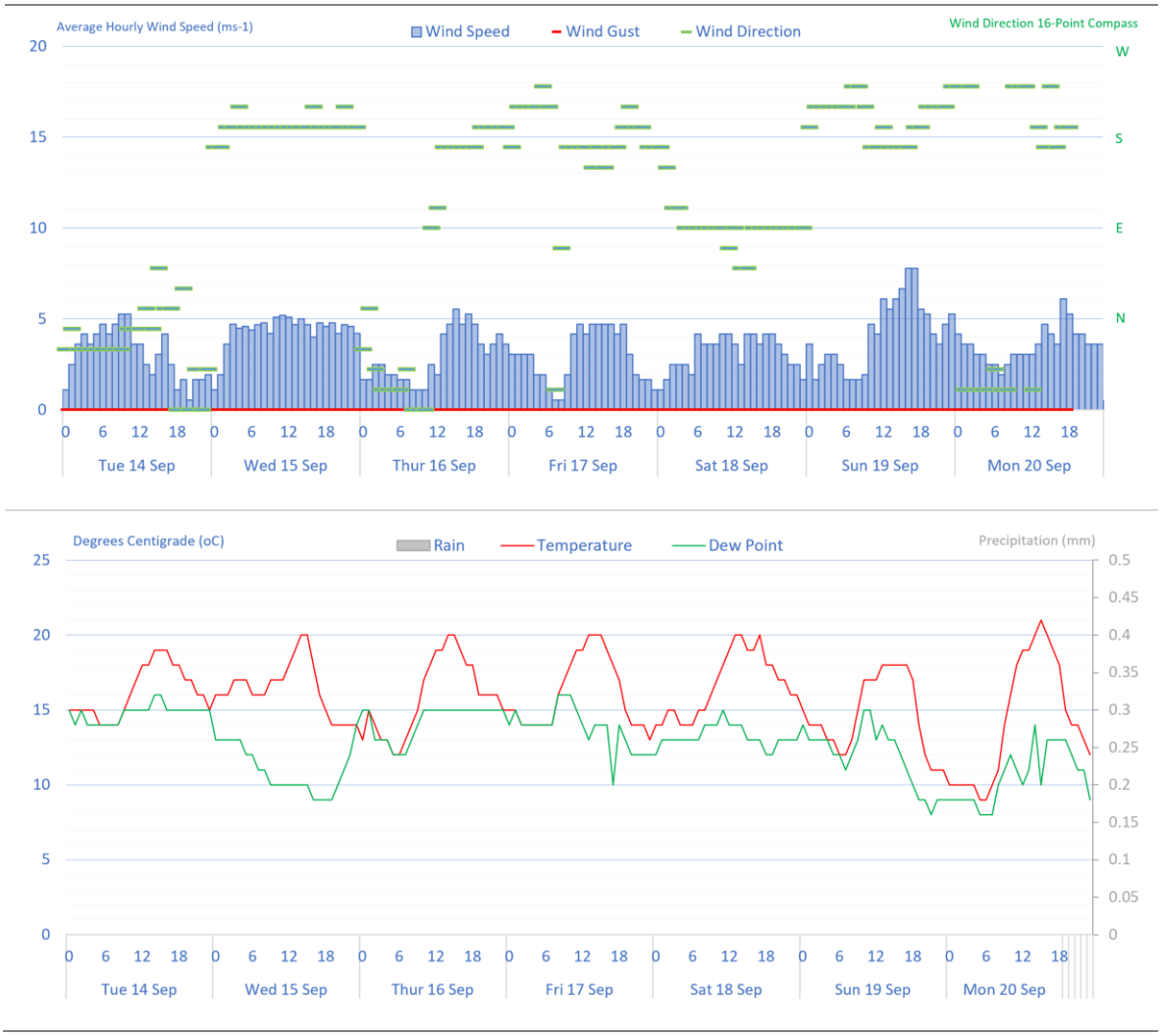
3.2 Measurement Equipment

3.2.1 The following measurement equipment was used to undertake the background noise measurements.

Equipment Type	Sound Level Meter		Microphone		Calibrator	
Equipment Reference	KRE/07	KRE/08	KRE/07	KRE/08	KRE/07	KRE/08
Background Position	1	2	1	2	1	2
Manufacturer / Model	Casella / CEL-633C1		Casella / CEL-251		Casella - CEL-120/1	
Serial Number	2206846	2145391	00663	00598	5231002	5231003
Certificate Number	U38258	U36902	38257	36901	U38256	U36900
Calibration Date	28/06/21	28/01/21	28/06/21	28/01/21	28/06/21	28/01/21

3.3 Weather Conditions

3.3.1 The following graphs show the prevailing weather conditions during the measurement period. In general terms the weather did not impact the background noise measurements.

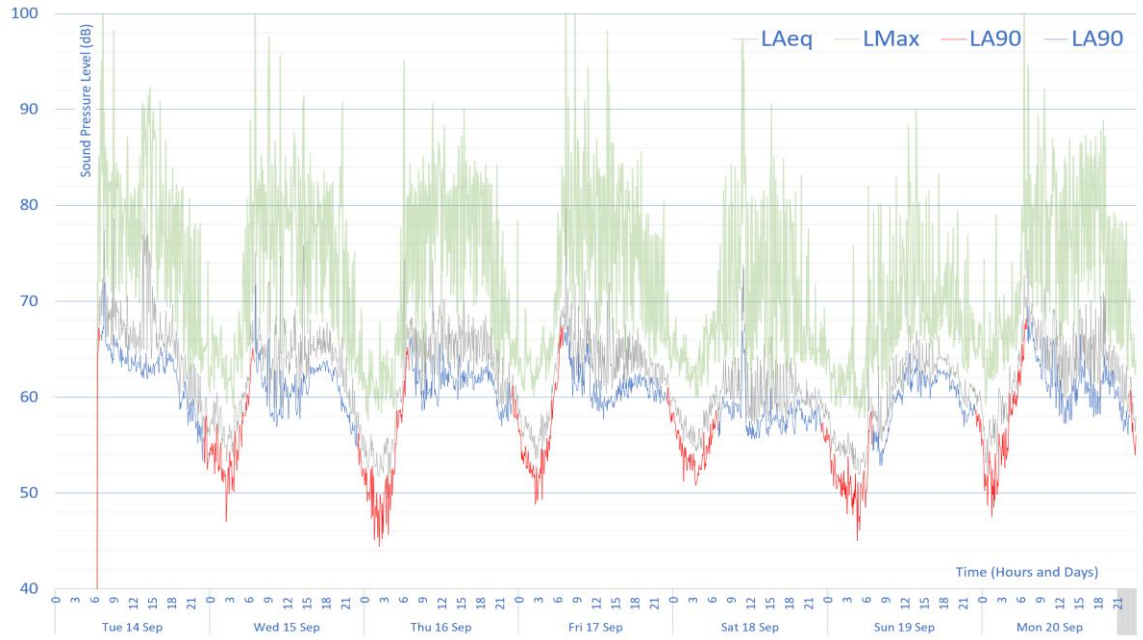


3.4 Comparison with Levels from Strategic Noise Map

3.4.1 The following table details the approximate levels which have been derived from the strategic noise maps. These are used only as a reference point to ensure the background noise levels recorded at the two positions are representative.

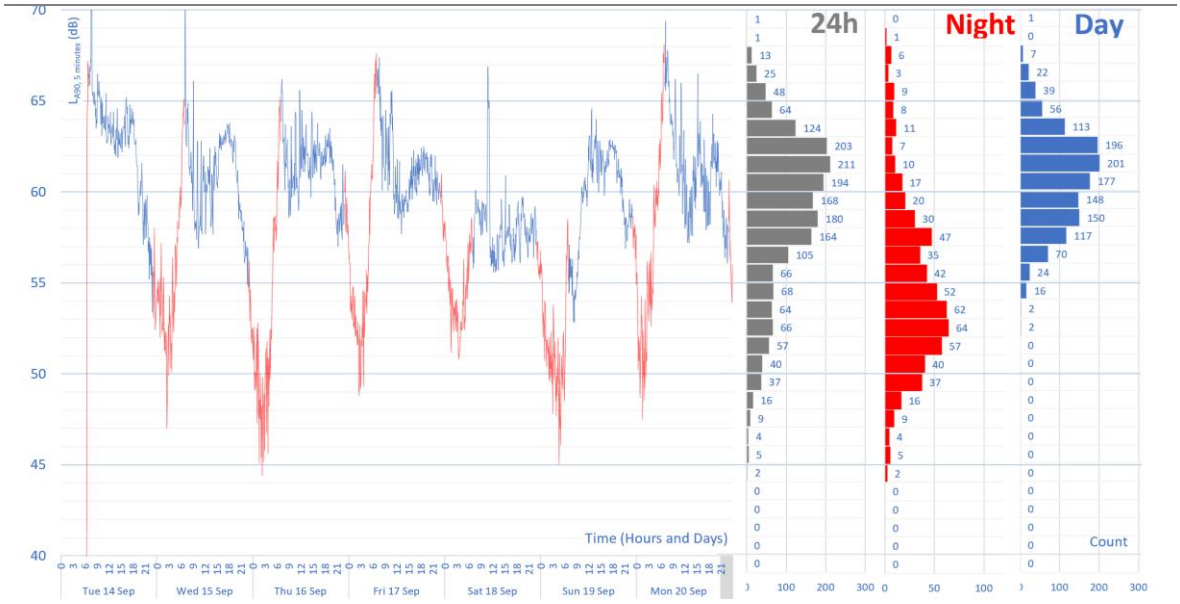
Background Position	07:00 to 23:00	23:00 to 07:00	Commentary
Positiion 1	$L_{Aeq,\ 16\ hour}$ 65 dB	$L_{Aeq,\ 8\ hour}$ 61 dB	Strategic Noise Map Traffic Noise Only
Position 2	$L_{Aeq,\ 16\ hour}$ 58 dB	$L_{Aeq,\ 8\ hour}$ 53 dB	

3.5 Background Noise Levels Measured at Position 1



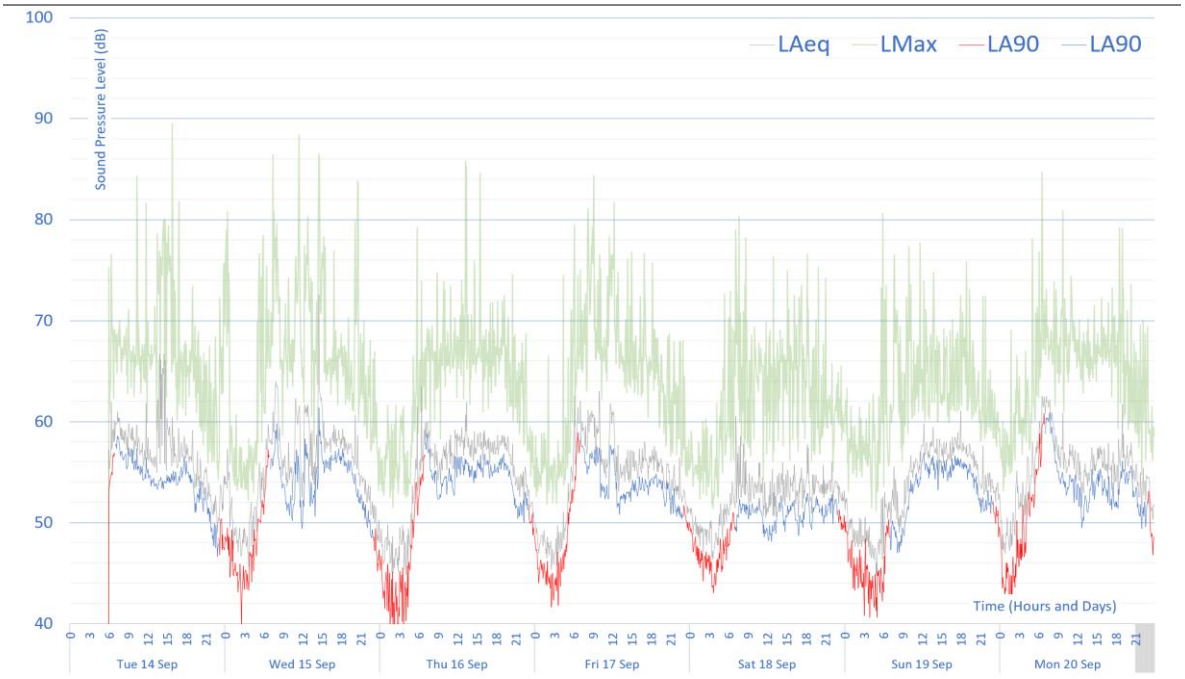
Day Time (07:00 to 23:00)			Night Time (23:00 to 07:00)		
$L_{Amax,\ 5\ minutes}$	$L_{Aeq,\ 5\ minutes}$	$L_{A90,\ 5\ minutes}$	$L_{Amax,\ 5\ minutes}$	$L_{Aeq,\ 5\ minutes}$	$L_{A90,\ 5\ minutes}$
61 – 109 dB	55 – 80 dB	53 – 72 dB	58 – 81 dB	49 – 65 dB	44 – 63 dB
Sound Pressure Level (dB) – Reference 2 x 10^{-5} Nm^{-2}					

3.5.1 Modal Analysis and Average Noise Levels at Measurement Position 1



Day Time (07:00 to 23:00)		Night Time (23:00 to 07:00)	
Minimum Modal $L_{A90,\ 1\ hour}$	44 dB	Modal $L_{A90,\ 15\ minutes}$	54 dB
Average $L_{Aeq,\ 16\ hour}$	66 dB	Average $L_{Aeq,\ 8\ hour}$	60 dB

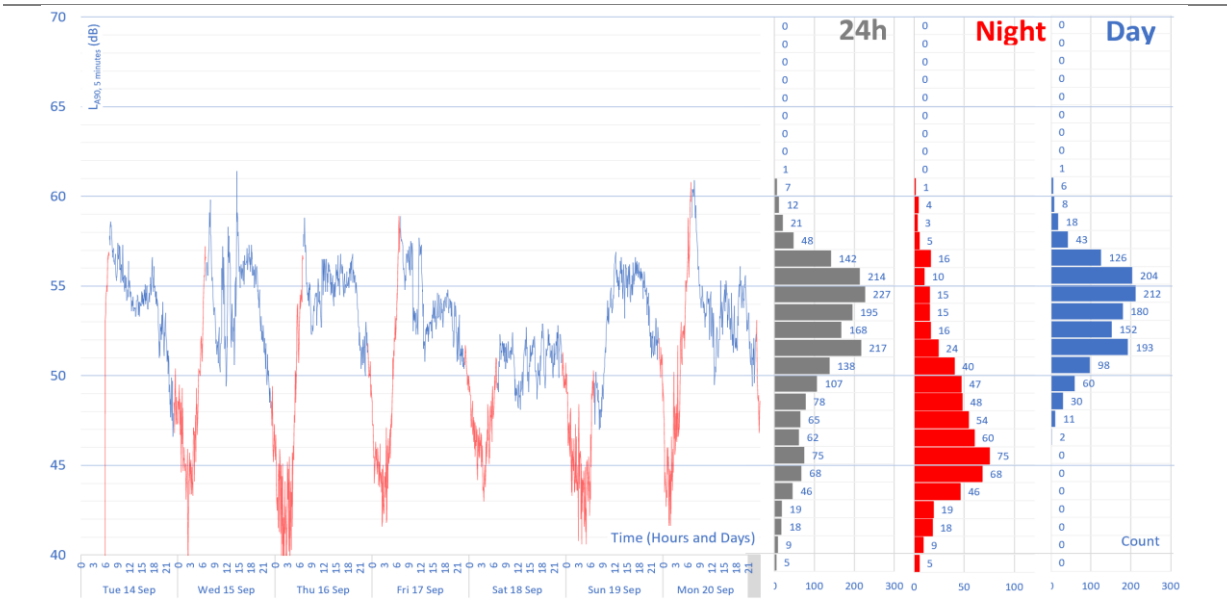
3.6 Background Noise Levels Measured at Position 2



Day Time (07:00 to 23:00)			Night Time (23:00 to 07:00)		
$L_{Amax,\ 5\ minutes}$	$L_{Aeq,\ 5\ minutes}$	$L_{A90,\ 5\ minutes}$	$L_{Amax,\ 5\ minutes}$	$L_{Aeq,\ 5\ minutes}$	$L_{A90,\ 5\ minutes}$
54 – 90 dB	49 – 73 dB	47 – 61 dB	51 – 81 dB	45 – 61 dB	38 – 55 dB

Sound Pressure Level (dB) – Reference 2 x 10^{-5} Nm^{-2}

3.6.1 Modal Analysis and Average Noise Levels at Measurement Position 2



Day Time (07:00 to 23:00)		Night Time (23:00 to 07:00)	
Minimum Modal $L_{A90,\ 1\ hour}$	43 dB	Modal $L_{A90,\ 15\ minutes}$	39 dB
Average $L_{Aeq,\ 16\ hour}$	57 dB	Average $L_{Aeq,\ 8\ hour}$	52 dB

3.7 Summary of Background Noise Levels

3.7.1 The following table shows the measured 16-hour day time and 8-hour average noise levels measured at position 1 and 2 correlate nearly perfectly with the levels extrapolated from the strategic noise maps.

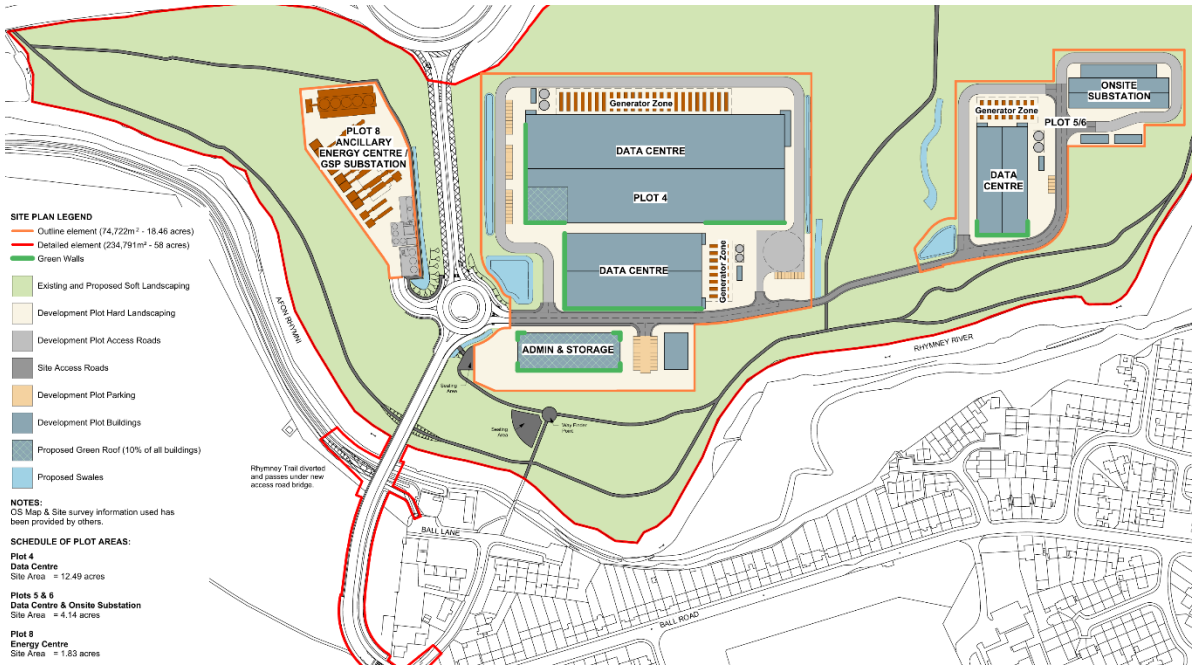
Background Position		07:00 to 23:00	23:00 to 07:00	Commentary
Position 1	Measured	$L_{Aeq,\ 16\ hour}$ 66 dB	$L_{Aeq,\ 8\ hour}$ 60 dB	Measured levels are compared against the levels from the 2017 Strategic Noise Maps.
	Noise Map	$L_{Aeq,\ 16\ hour}$ 65 dB	$L_{Aeq,\ 8\ hour}$ 61 dB	
	Difference	+1 dB	-1 dB	
Position 2	Measured	$L_{Aeq,\ 16\ hour}$ 57 dB	$L_{Aeq,\ 8\ hour}$ 52 dB	
	Noise Map	$L_{Aeq,\ 16\ hour}$ 58 dB	$L_{Aeq,\ 8\ hour}$ 53 dB	
	Difference	-1 dB	-1 dB	

3.7.2 The above table indicates that the prevailing weather did not impact the background noise measurements and that the traffic flows were similar to those used to create the Strategic Noise maps in 2017. The fact that the average noise levels were 1 dB below the Strategic Noise map figures could indicate that the traffic flows were slightly less, but it may not be possible to draw that conclusion due to the uncertainty in the measurements. The slight increase at position 1 during the day time may indicate the contribution from cars using the park and ride, though again due to the uncertainty in the measurements no reliance is placed on this assumption.

4 Proposed Development

4.1 Proposed Site Location Plan

4.1.1 The following details the layout of the site showing the areas which will be subject to the outline portion of the application. This is where the data and energy centres will be located.



4.2 Electricity Supply

4.2.1 The data centre is expected to require around 150 MW of to run under normal conditions. The available connection in terms of available supply and time scales for connection is not yet known. It is expected that the energy centre on plot 8 will generate around 49 MW including temporary energy and backup generators.

4.2.2 It is understood that the temporary power will provided by 7-No PGM70 gas turbines with a combined capacity of around 49 MW. These will be provided in a packaged form and it is understood they will have an overall sound power level of around $L_{w(A)}$ 95 dB.

4.2.3 The main substation will be a Grid Supply Point which convert the proportion of the data centre 150 MW requirement from the main transmission network. This will likely consist of a number of 50 MVA transformers which tend to have a sound power level of around $L_{w(A)}$ 90 dB. There is often a built-in redundancy of N+1 or N+2 depending on the configuration of the substation. For the purposes of the outline application it is assumed there will be 8 - No transformers on the substation.

4.2.4 It is understood that the standby generators will be similar to the Cummins C2500D5A 2500 kVA 50 Hz 3 phase open diesel generators. These are expected to have a sound power levels of around $L_{w(A)}$ 116 dB. In terms of the outline design there are expected to be 32-No generators on Plot 4 and 8-No generators on Plot 5 / 6. It should be noted that the standby generators will only operate between 10:00 and 16:00 on weekdays with a total annual run time of less the 72 hours.

4.3 Data Centre Cooling

4.3.1 The ASHRAE TC 9.9 Technical guidelines provide details of the maximum allowable internal temperatures for different classes of data centres from A1 which recommended not to exceed 27oC to Class A4 which is not recommended to exceed 45°C.

4.3.2 It is not known how the end user will cool the data centre but if we assume a system running on R744 (CO2) with a GWP of around 1, the system would require around 90 No Gas Coolers each measuring around 5m long x 2.0m wide with around 6 plate fans running at 800 rpm each moving around 43 m3s-1 of air on the hottest summers day. These would likely have a maximum sound power level of around $L_{w(A)}$ 88 dB(A). In terms of the outline planning application this is an absolute worst-case scenario.

4.4 Assumed Individual Sound Power Levels

4.4.1 For the purposes of assessing the proposed outline proposal for the 150 MW data centre the following are likely to be the typical number and rating of the noise sources that could impact the residential dwellings.

Ref	Detailed Description of Source	Octave Band Centre Frequency (Hz)								$L_{w(A)}$
		63	125	250	500	1K	2K	4K	8K	
1	7-No 8MW Gas Turbines *Equivalent Sound Pressure Level 62 dB(A) at 10m*	84	88	90	91	90	88	85	82	95
2	8-No 50 MW Transformers *Equivalent Sound Pressure Level 57 dB(A) at 10m*	92	94	90	89	83	79	73	66	90
3	90-No Twin gas cooler (cooling) *Equivalent Sound Pressure Level 55 dB(A) at 10m*	79	68	88	69	83	85	68	60	88
4	40 No Cummins C2500D5A Generators *Equivalent Sound Pressure Level 83 dB(A) at 10m*	101	120	118	113	110	106	103	101	116

Sound Power Level, dB – reference 1 x 10^{-12} watts

4.4.2 It should be noted that during the details designed stage equipment should be selected to meet the above requirements. It may be necessary depending on the final customers requirements to include acoustic screening around the gas turbines, substation and possibly some or all of the temporary generators.

5 Assessment of Noise Levels

5.1 Assessment of the Significance of Noise

5.1.1 Uncertainty of Assessment

Section 10 of British Standard 4142: 2014 entitled *"Uncertainty"* requires the following:

> *"Consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty. Report the level and potential effects of uncertainty."*

5.1.2 Uncertainty of Measured Values

Reference	Source of Uncertainty Section 10.2 British Standard 4142: 2014	Value dB(A)	Distribution (Divisor)	Uncertainty dB(A)
a	Variability and complexity of sound source	0.50	$\sqrt{2}$	0.35
b	Variability and complexity of residual sound	0.00	$\sqrt{3}$	0.00
c	Residual sound present in specific sound	0.00	$\sqrt{3}$	0.00
d	Background noise position selection	0.10	$\sqrt{3}$	0.06
e	Distance between source and receiver	0.15	$\sqrt{2}$	0.11
f	Number of measurements taken (Days)	0.10	$\sqrt{3}$	0.06
g	Measurement time interval variation	0.00	$\sqrt{2}$	0.00
h	Range of times measurements taken	0.10	$\sqrt{3}$	0.06
i	Suitable weather conditions during measurements	0.20	$\sqrt{3}$	0.12
j	Application of British Standard 4142: 2014	0.10	$\sqrt{2}$	0.07
k	Rounding of each measurement	0.05	$\sqrt{3}$	0.03
l	Instrumentation – Calibration	1.20	$\sqrt{3}$	0.69
Reported Expanded Uncertainty (95% confidence, convergence k = 2)				1.61

5.1.3 Uncertainty in Calculations

Reference	Source of Uncertainty Section 10.2 British Standard 4142: 2014	Value dB(A)	Distribution (Divisor)	Uncertainty dB(A)
a	Impact of measured sound level on calculations	0.00	$\sqrt{2}$	0.00
b	Assumption on sound power level of source	0.00	$\sqrt{3}$	0.00
c	Uncertainty of calculation method (ISO 9613)	0.20	$\sqrt{3}$	0.12
d	Model fit against real world conditions	0.10	$\sqrt{3}$	0.06
e	Error in the calculation process	0.15	$\sqrt{2}$	0.11
Reported Expanded Uncertainty (95% confidence, convergence k = 2)				0.33

5.1.4 Uncertainty from Other Factors

Reference	Source of Uncertainty Section 10.2 British Standard 4142: 2014	Value dB(A)	Distribution (Divisor)	Uncertainty dB(A)
a	Standing waves or interference patterns	0.15	$\sqrt{3}$	0.09
b	Approximation of sound source to a point source	0.10	$\sqrt{3}$	0.06
c	Maintenance and repair of source over 15 years	0.50	$\sqrt{3}$	0.29
Reported Expanded Uncertainty (95% confidence, convergence k = 2)				0.61

5.1.5 Combined Reported Expanded Uncertainty

Reference	Source of Uncertainty Section 10.2 British Standard 4142: 2014	Value dB(A)	Distribution (Divisor)	Uncertainty dB(A)
a	Section 7.1.2. Uncertainty of measured values	2.7	$\sqrt{2}$	1.14
b	Section 7.1.3. Uncertainty of calculations	2.7	$\sqrt{2}$	0.23
c	Section 7.1.4. Uncertainty from other factors	2.7	$\sqrt{2}$	0.43
Combined Reported Expanded Uncertainty (95% confidence, convergence k = 2)				2.5

5.2 Assessment of Noise Levels at NSP1 - 246 Bryn Celyn

5.2.1 The following table provides an initial estimate of the impact on residents both inside and outside the residential dwellings from the proposed development based on the outdoor sound incident on the building.

Results	Day Time	Night Time	Commentary
Specific	$L_{Aeq,\ 1\ hour}$ 35 dB	$L_{Aeq,\ 15\ min}$ 35 dB	7.3.6 – Calculated levels
Feature	+0 dB	+0 dB	9.2 - Subjective corrections
Rating	$L_{Aeq,\ 1\ hour}$ 35 dB	$L_{Aeq,\ 15\ min}$ 35 dB	9.2 - Worst case scenario
Background	$L_{A90,\ 1\ hour}$ 60 dB	$L_{A90,\ 15\ min}$ 51 dB	8 - No correction for residual
Assessment	-25 dB	-16 dB	11 - Rating Level – Background Level
Uncertainty	+- 2.5 dB		10 – 95% Confidence, k = 2

5.3 Assessment of Noise Levels at NSP2 - 3 Ball Lane

5.3.1 The following table provides an initial estimate of the impact on residents both inside and outside the residential dwellings from the proposed development based on the outdoor sound incident on the building.

Results	Day Time	Night Time	Commentary
Specific	$L_{Aeq, 1\ hour}$ 29 dB	$L_{Aeq, 15\ min}$ 29 dB	7.3.6 – Calculated levels
Feature	+0 dB	+0 dB	9.2 - Subjective corrections
Rating	$L_{Aeq, 1\ hour}$ 29 dB	$L_{Aeq, 15\ min}$ 29 dB	9.2 - Worst case scenario
Background	$L_{A90, 1\ hour}$ 49 dB	$L_{A90, 15\ min}$ 40 dB	8 - No correction for residual
Assessment	-20 dB	-11 dB	11 - Rating Level – Background Level
Uncertainty	+- 2.5 dB		10 – 95% Confidence, k = 2

5.3.2 Assessment of Noise Levels at NSP3 - 10 Ball Close

The following table provides an initial estimate of the impact on residents both inside and outside the residential dwellings from the proposed development based on the outdoor sound incident on the building.

Results	Day Time	Night Time	Commentary
Specific	$L_{Aeq, 1\ hour}$ 34 dB	$L_{Aeq, 15\ min}$ 34 dB	7.3.6 – Calculated levels
Feature	+0 dB	+0 dB	9.2 - Subjective corrections
Rating	$L_{Aeq, 1\ hour}$ 34 dB	$L_{Aeq, 15\ min}$ 34 dB	9.2 - Worst case scenario
Background	$L_{A90, 1\ hour}$ 46 dB	$L_{A90, 15\ min}$ 41 dB	8 - No correction for residual
Assessment	-12 dB	-7 dB	11 - Rating Level – Background Level
Uncertainty	+- 2.5 dB		10 – 95% Confidence, k = 2

5.4 Conclusions

5.4.1 The proposed development will generate noise but will not have an adverse impact on the existing noise sensitive properties. The design of the scheme has been maximised with passive mitigation measures to ensure that impact of noise and vibration is kept to a minimum.

End of Main Body of Report

A Appendix A – Relevant Material Considerations

A.1 Other Documents providing guidance on LOAEL and SOAEL

A.1.1 Aecom were commissioned by Defra to produce a document entitled *"Possible Options for the Identification of SOAEL and LOAEL in Support of NPSE"* under reference NANR 316 which was published in 2015. Table 1.1 entitled *"Summary of Outcomes"* provides an indication of numerical values for NOEL and SOAEL for various sources.

Source	Annoyance 07:00 to 23:00		Sleep Disturbance 23:00 to 07:00	
	LOAEL	SOAEL	LOAEL	SOAEL
Road	56 dB $L_{Aeq, 16\ hours}$	66 dB $L_{Aeq, 16\ hours}$	46 $L_{Aeq, 8\ hours}$	56 $L_{Aeq, 8\ hours}$
Rail	63 dB $L_{Aeq, 16\ hours}$	72 dB $L_{Aeq, 16\ hours}$	55 $L_{Aeq, 8\ hours}$	68 $L_{Aeq, 8\ hours}$
Air	52 dB $L_{Aeq, 16\ hours}$	60 dB $L_{Aeq, 16\ hours}$	41 $L_{Aeq, 8\ hours}$	53 $L_{Aeq, 8\ hours}$

A.1.2 During the planning for the High Speed 2 rail link (HS2) the factsheet entitled *"HS2 - Control of Airborne Noise"* version 3.0 dated June 2019 was produced which provided the following clarification of the absolute noise levels for LOAEL and SOAEL. Table 1 in Appendix B provided the *"Operational airborne noise impact and effects levels from altered roads and operational railway"*.

Source	Annoyance Day Time 07:00 to 23:00		Sleep Disturbance Night Time 23:00 to 07:00	
	LOAEL	SOAEL	LOAEL	SOAEL
Road and Rail	50 dB $L_{Aeq, 16\ hours}$	65 dB $L_{Aeq, 16\ hours}$	40 dB $L_{Aeq, 8\ hours}$	55 dB $L_{Aeq, 8\ hours}$
			60 dB L_{AFMax}	80 dB L_{AFMax}

A.1.3 The World Health Organisation published a document entitled *"Guidelines for Community Noise"* in 1999 which included the following guideline values in Table 1 entitled *"Guidelines values for community noise in specific environments"*.

Environment		$L_{Aeq,t}$	$L_{AMaxfast}$
Inside Dwelling	Moderate annoyance daytime and evening	35 dB $L_{Aeq, 8\ hours}$	--
	Bedrooms sleep disturbance night-time	30 dB $L_{Aeq, 8\ hours}$	45 dB L_{AFMax}
Outside	Bedrooms sleep disturbance (window open)	45 dB $L_{Aeq, 8\ hours}$	60 dB L_{AFMax}

A.1.4 The World Health Organisation then published another document entitled *"Night Noise Guidelines for Europe"* in 2009. Table 3 within the summary of the document entitled *"Effects of different levels of night noise on the populations health"* provides useful guidance on the NOEL and SOAEL thresholds.

Effect Level	Health Effects on Population	$L_{night, outside}$
NOEL	No substantial observed biological effects	30 dB $L_{Aeq, 8 hours}$
SOAEL	Situation considered increasingly dangerous for public health	above 55 dB $L_{Aeq, 8 hours}$

A.1.5 The World Health Organisation then published a document entitled "*Environmental Nosie Guidelines for the European Region – Executive Summary"* in 2018.

Source	Annoyance Day Time 07:00 to 23:00	Sleep Disturbance Night Time 23:00 to 07:00
Road	53 dB $L_{Aeq, 16 hours}$	45 dB $L_{Aeq, 8 hours}$

A.1.6 British Standard 389: Part 7: 2019 entitled *"Acoustics: Reference zero for the calibration of audiometric equipment. Reference threshold of hearing under free-field and diffuse-field listening conditions"* provides the threshold at which noise is likely to be inaudible for a young healthy adult.

Noise Source	Octave Band Centre Frequency (Hz)								Sum A	NR Curve
	63	125	250	500	1K	2K	4K	8K		
1st Floor Bedroom	45	28	17	10	8	6	5	2	21	12
Sound Pressure Levels (dB) – Reference 2 x 10^{-5} watts – Uncertainty of +- 2.5 dB (95% confidence, k=2)										

A.1.7 Napier University produced a document under reference NANR 116 entitled *"Open / Closed Window Research – Sound Insulation through ventilated domestic windows"* in April 2007. The document provided the estimated performance of a partially open window with an area of 0.2 m^2 in table 5-6 entitled *"Statistically Derived Dn,e insulation ratings for window openings (dB)"*. However, if you apply the principles of British Standard 12354 – Part 3 entitled *"Building acoustics. Estimation of acoustic performance of buildings from the performance of elements – Airborne Sound"* you can estimate the performance of an open window with an area of 1.5 m^2.

Noise Source	Octave Band Centre Frequency (Hz)								ΔSum A	R_w
	63	125	250	500	1K	2K	4K	8K		
Partially Open Window (0.2 m^2)	20	14	14	16	14	17	19	20	19	16
Fully Open Window (1.5 m^2)	5	6	7	7	7	7	7	7	5	8

Transmission Loss (dB)

A.1.8 We can therefore use the threshold of hearing and the worst-case performance of an open window derived from the methodology within BS 12354 – Part 3 to determine the No Observed Adverse Effect Level (NOEL) externally from any bedroom window.

Position	Octave Band Centre Frequency (Hz)								Sum A	NR
	63	125	250	500	1K	2K	4K	8K		
External from Habitable Room	50	34	24	17	15	13	12	9	26	18

A.2 British Standard 8233: 2014 (BS 8233)

A.2.1 British Standard 8233: 2014 entitled *"Guidance on sound insulation and noise reduction for buildings"* provides some useful criterion for internal noise levels within dwellings within section 7.7.2 entitled *"Internal ambient noise levels for dwellings"*. (CD12.5). ProPG provides a criterion for the maximum internal noise (L_{AMax}) during the night time period in figure 2 in section 2.27 (CD12.3).

Area of Development	Day Time (07:00 to 23:00)	Night Time (23:00 to 07:00)
Resting Living Room	35 dB $L_{Aeq, 16\ hours}$	--
Sleeping Bedroom	35 dB $L_{Aeq, 16\ hours}$	30 dB $L_{Aeq, 8\ hours}$
		45 dB $L_{Amax, 10\text{-}event}$
External Amenity Area	55 dB $L_{Aeq, 16\ hours}$	--

A.2.2 It should be noted that the criterion is based on sources without character as detailed in paragraph 7.7.1 .

> *"This subclause applies to external noise as it affects the internal acoustic environment from sources without a specific character, previously termed "anonymous noise". Occupants are usually more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions. For simplicity, only noise without character is considered in Table 4.*
>
> *NOTE Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate."*

A.2.3 BS8233 provides the following advice for the assessment of industrial noise, which is often considered to have a specific character in section 6.5.2 entitled *"Assessment of Industrial Noise".*

> *"Where industrial noise affects residential or mixed residential areas, the methods for rating the noise in BS 4142 should be applied. BS 4142 describes methods for determining, at the outside of a building:*
>
> *a) noise levels from factories, industrial premises or fixed installations, or sources of an industrial nature in commercial premises; and*
>
> *b) background noise level."*

A.2.4 It is therefore considered appropriate to apply a correction to the criterion within BS 8233 to account for the character of the noise from the proposed development to establish a suitable level of LOAEL and SOAEL.

A.3 British Standard 4142: 2014 + A1: 2019 (BS 4142)

A.3.1 British Standard 4142: 2014 + A1: 2019 entitled *"Methods for rating and assessing industrial and commercial sound"* provides a methodology to determine the impact of industrial noise on occupiers of residential dwellings. The overall scope of the standard is clarified in the last paragraph of section 1.1.

> *"The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident."*

A.3.2 The 2019 amendment to the standard added the following clarification that it is not designed as a methodology to assess internal noise levels within residential dwellings from industrial sources.

> *"The methodology set out in Clauses 7, 8, and 9 of this standard is not intended to be used to assess the extent of the impact at indoor locations. Internal sound levels can be taken into account as outlined in Clause 11.*
>
> *The standard is not intended to be applied to the assessment of indoor sound levels."*

A.3.3 The assessment methodology uses the calculated specific noise levels at the assessment position and applies a feature correction to account for the specific character of the noise to determine the rating noise levels. The rating noise level is then compared against the underlying background noise levels. The assessment of the results is defined within the commentary of section 11 entitled *"Assessment of the Impacts*".

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

A.4 Approved Document O

A.4.1 The recent update to the Building Regulations came into effect on 15th June 2022 and now includes Part O of Schedule 1 entitled *"Requirement 01 overheating mitigation (regulations 40B)"*. Approved Document O entitled *"Overheating"* now includes a requirement to protect future occupants of residential dwellings by reducing the occurrence of high indoor temperatures through simplified or dynamic thermal modelling.

"01 Overheating Mitigation
(1) Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to—

(a) limit unwanted solar gains in summer;
(b) provide an adequate means to remove heat from the indoor environment.

A.4.2 Section 3 entitled *"Ensuring the overheating mitigation strategy is useable"* provides details of the internal noise levels within sleeping hours within the bedrooms with the windows opened as detailed within the simplified model.

"Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

a. 40dB $L_{Aeq,T,}$ averaged over 8 hours (between 11pm and 7am).
b. 55dB $L_{AFmax,}$ more than 10 times a night (between 11pm and 7am)."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