Environmental Noise Survey, Noise Break-In Assessment & Sound Insulation Scheme

Client:	Resource Medical (UK) Ltd
Client Address:	2 Calton Avenue , Batley, West Yorkshire, WF17 7AQ
Site Address:	Wembley Works, Hemmingfield Road, Barnsley, S73 0LY
Date:	22/07/2020

WEB www.novaacoustics.co.uk **EMAIL:** info@novaacoustics.co.uk **TELEPHONE** 0113 322 7977

Authorisation and Version Control	
Report Prepared By	Mr T Watkin, BSc
Report Checked By	Mr P Soler, BEng, AMIOA
Report Approved By	Mr A T Martin, MSc, MIOA, MCIEH, MIET, MInstSCE
Date	22/07/2020
Project Number	4688RM
Version Reference	Version 1

Disclaimer

The opinions and interpretations presented in this report represent our best technical interpretation of the data made available to us. However, due to uncertainty inherent in the estimation of all parameters, we cannot, and do not guarantee the accuracy or correctness of any interpretation and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, cost, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. If additional information becomes available which may affect our comments, conclusions or recommendations, the author reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly. Except for the provision of professional services on a fee basis, NOVA Acoustics Ltd does not have a commercial arrangement with any person or company involved in the interests that are the subject of this report. NOVA Acoustics Ltd cannot accept any liability for the correctness, applicability or validity for the information they have provided, or indeed for any consequential costs or losses in this regard. Our efforts have been made on a "best endeavours" basis and no responsibility or liability is warranted or accepted by NOVA Acoustics Ltd.

CONTENTS

CONTENTS **3**

EXECUTIVE SUMMARY **5**

1. INTRODUCTION **6**
Overview 6
Scope & Objectives 6

2. ENVIRONMENTAL NOISE SURVEY **7**
Context & Subjective Impression 7
Background 7
Environmental Noise Survey Results 8
CRN Calculation 8

3. BS8233:2014 NOISE ASSESSMENT **10**
Ambient Noise Level Map 10

4. NOISE BREAK IN & EXTERNAL NOISE LEVEL ASSESSMENT **13**
Noise Break In Assessment 13
External Noise Level Assessment 13

5. SOUND INSULATION SCHEME **15**
Building Envelope 15

APPENDIX A – ACOUSTIC TERMINOLOGY **18**

APPENDIX B – LEGISLATION, POLICY AND GUIDANCE **21**
B.1 - National Planning Policy Framework (2019) 21
B.2 - Noise Policy Statement for England (2010) 21
B.3 - BS8233:2014`Guidance on sound insulation and noise reduction for buildings' 22

APPENDIX C – SITE PLANS **24**

APPENDIX D – ENVIRONMENTAL SURVEY **25**
D.1 Tabulated Summary Noise Data 25
D.2 Surveying Equipment 25
D.3 Meteorological Conditions 26

Tables

Table 1.0 – Sound Survey Summary Results 8
Table 2.0 – Average S.E.L for Trains 8
Table 3.0 – CRN Calculation – Day 9
Table 4.0 – CRN Calculation – Night 9
Table 5.0 - Sound Level Summary at the Proposed Development 12
Table 6.0 – BS8233 Internal Noise Level Analysis 13
Table 7.0 – External Noise Level Analysis 13
Table 8.0 – Glazing SRI 16
Table 9.0 – Ventilation Specification 17
Table 10.0 - BS8233 Internal Noise Level Criteria 23
Table 11.0 – Sound Survey Summary Results 25
Table 12.0 – Measurement Equipment 25
Table 13.0 – Weather Summary 26

Figures

Figure 1.0 - Indicative Site Layout 7
Figure 2.0 – Façade Layout 10
Figure 3.0 - Day-time Noise Map $L_{Aeq,16hour}$ 11
Figure 4.0 - Night-time Noise Map $L_{Aeq,8hour}$ 11
Figure 5.0 - Night-time Noise Map $L_{Amax,8hour}$ 12
Figure 6.0 - Facade Layout 15

Executive summary

An environmental noise survey and noise impact assessment has been undertaken to assess the suitability of the site at Wembley Works, Hemmingfield Road, Barnsley, S73 0LY for residential development. The measured ambient sound levels have allowed a BS8233:2014 noise assessment to be carried out.

A sound insulation scheme has been provided including glazing and an alternative ventilation strategy. These recommendations will be sufficient to achieve the internal and external noise levels for the proposed development according to the BS8233:2014 internal noise criteria. An overview of all recommendations can be found in the table below:

Recommendations and Mitigation Overview
- All glazing along the orange façades requires the sound reduction specific in Table 6.0. Appropriate glazing specifications can be found in Table 8.0. - All glazing along the red facades requires the octave band sound reduction specific in Table 6.0. Appropriate glazing specifications can be found in Table 8.0 - Appropriate purge ventilation and background ventilation can be found in Table 9.0. - The 2.5m high acoustic fence currently specified should have a minimum surface mass density of 10kg/m^2 and contain no holes or gaps both in the under it. A suitable example is Jacksons 12K acoustics envirofence, although any fence with the adequate acoustic properties stated above will suffice.

The findings of this report will require written approval from the Local Authority prior to work commencing.

1. Introduction

Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for residential development ('the Proposed Development') at Wembley Works, Hemmingfield Road, Barnsley, S73 0LY ('the Site').

The applicant is preparing a planning application to be submitted ('the Application') to Barnsley Metropolitan Borough Council.

The following technical noise assessment has been prepared to support the planning application to Barnsley Metropolitan Borough Council. This report details the ambient sound climate at the proposed development site and provides a sound insulation scheme to protect the amenity of the occupants of the proposed residential dwellings.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

Scope & Objectives

The scope of the noise assessment can be summarized as follows:

- Ambient sound monitoring survey to evaluate the prevailing ambient and maximum sound levels incident on the proposed development;
- Detailed sound modelling, acoustic calculation and analysis in accordance with ISO9613 – 1 prediction methodology to predict sound levels incident on the Site;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the surrounding noise sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Policy Framework (2019), Noise Policy Statement for England (2010) and British Standard BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings. Further information on the legislation can be found in Appendix B.

2. Environmental Noise Survey

Measurement Methodology

Short-term sound monitoring was conducted on the 29/06/2020, the sound level meter was placed approximately 1.5m from the ground and 8m from the edge of the railway line. The monitoring location was chosen in order to collect representative sound levels of the area during the week day time and night time periods. The measurement positions can be found in Figure 1.0.

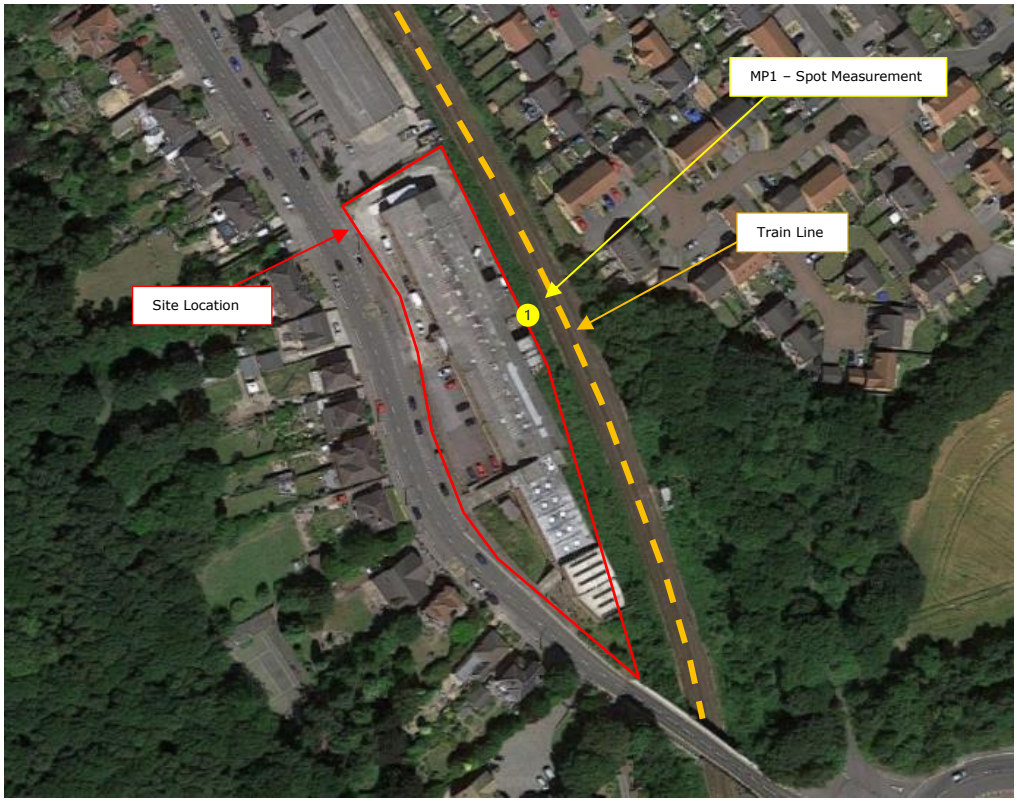

Figure 1.0 - Indicative Site Layout

Context & Subjective Impression

The proposed development is situated between Hemmingfield Road, which facilitates moderate traffic flow, and the Northern rail line service. The area surrounding site is primarily residential with commercial scattered along Hemmingfield Road. When trains are not passing the noise profile of the area is dominated by road traffic travelling along Hemmingfield Road.

Background

The proposed development is for the demolition of part of the existing buildings and the erection of 17 No. residential dwellings including access, associated parking spaces. The site development is close to the rail train and a moderate number of trains passes during the day. Full location plans and site plans can be found in Appendices C and D respectively.

Environmental Noise Survey Results

Summary Results

The following table shows a summary of the sound survey results; L_{Aeq}, L_{Amax}, L_{A90} and the L_{A10} for the measurement period.

Measurement Position MP1				
Measurement Time Period ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Hour 1 - 29/06/20 – 13:30 – 14:30	60.0	84.0	46.0	51.0
Hour 2 – 29/06/20 – 14:30 – 15:30	59.0	84.0	46.0	51.0
Hour 3 – 29/06/20 – 15:30 – 16:30	60.0	85.0	46.0	52.0
Full Measurement Period	60.0	85.0	46.0	51.0

Table 1.0 – Sound Survey Summary Results

CRN Calculation

The following table shows the average S.E.L of all train pass-bys measured at MP1 on 29th of June 2020.

Measurement Position	Description	Average S.E.L (dB)
MP1	Passengers Train Movements	88.0
MP1	Freight Train Movements	92.0

Table 2.0 – Average S.E.L for Trains

The following table shows the calculated $L_{Aeq,16hour}$ and $L_{Aeq,8hour}$ values based on the shortened CRN Procedure. The number of train movements throughout the day time and night time periods has been taken from the 'Real Train Times' time table and the Network Rail working timetable. This has been compared to train pass-bys recorded on site. Freight train SEL values have been ascertained from a previous report with similar freight train movements and the value utilized is deemed indicative of the rail line in question.

Description	Day time	
	Freight	**Passengers**
Average Train SEL	92.0 dB	88.0dB
Total Train Movements	5	63
$L_{Aeq,16hour}$	**51.0 dB**	**59.0 dB**

Total $L_{Aeq,16hour}$	**59.0 dB**

Table 3.0 – CRN Calculation – Day

Description	**Night time**	
	Freight	**Passengers**
Average Passenger Train SEL	92.0 dB	88.0 dB
Total Train Movements	1	3
$L_{Aeq,8hour}$	**47.0 dB**	**48.0 dB**
Total $L_{Aeq,8hour}$	**51.0 dB**	

Table 4.0 – CRN Calculation – Night

3. BS8233:2014 Noise Assessment

Ambient Noise Level Map

The specific sound level at the NSRs has been calculated using SoundPlan 8.1, which undertakes its calculation in accordance with the guidance given in IS09613 – 1:1993 and ISO9613 – 2:1996. The following assumptions have been made within the calculation software:

- To accurately model the land surrounding the development the topographical data has been taken from Google Maps, it is assumed this has an accuracy within the last 3 years.
- The ground between the source and receiver is considered 'hard'.
- The proposed 2.5m high acoustic fence specified in the site plan has been inputted.

The following parameters have been used to calibrate the sound model:

- The results of the CRN calculations;
- The highest L_{Amax} of train passbys from the full measurement period.

The proposed development has been separated in facades (façade A & façade B) for the purpose of the specification of building elements and mitigation measures. Figure 2.0 below shows façade A highlighted in orange and façade B highlighted in Red.

Figure 2.0 – Façade Layout

The sound map showing the specific day time $L_{Aeq,16hour}$ sound levels at the Proposed Development can be seen below in Figure 2.0.

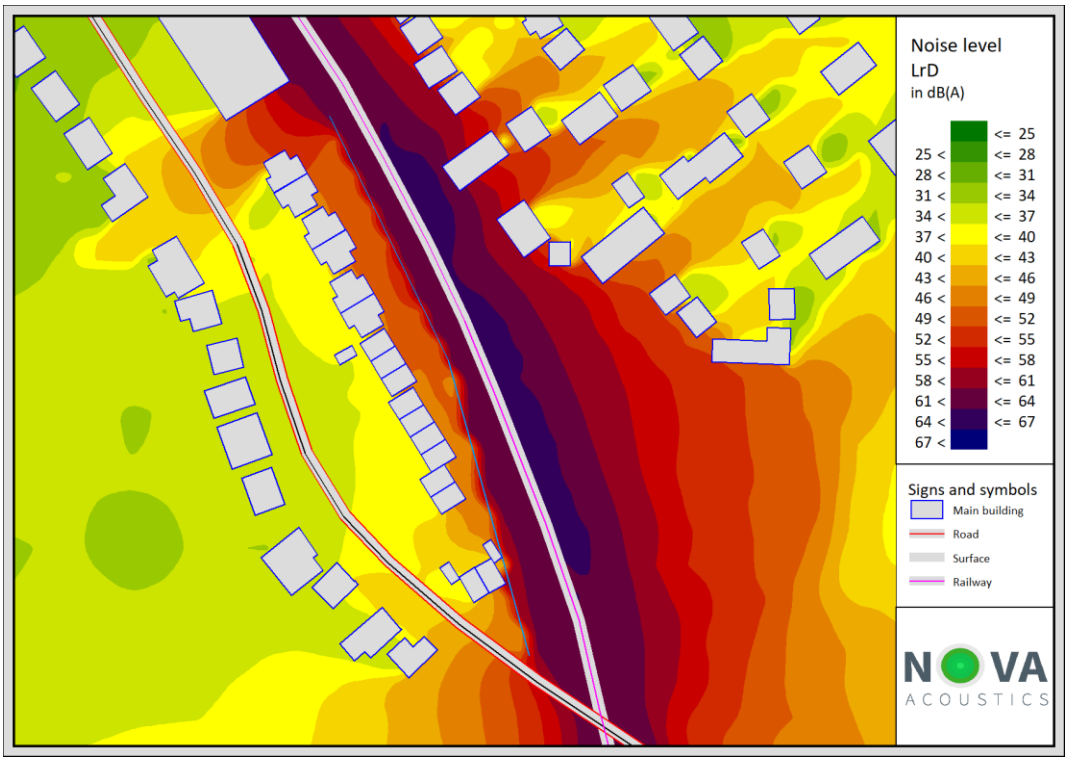

Figure 3.0 - Day-time Noise Map $L_{Aeq,16hour}$

The sound map showing the specific night-time $L_{Aeq,8hour}$ sound levels at the Proposed Development can be seen below in Figure 3.0.

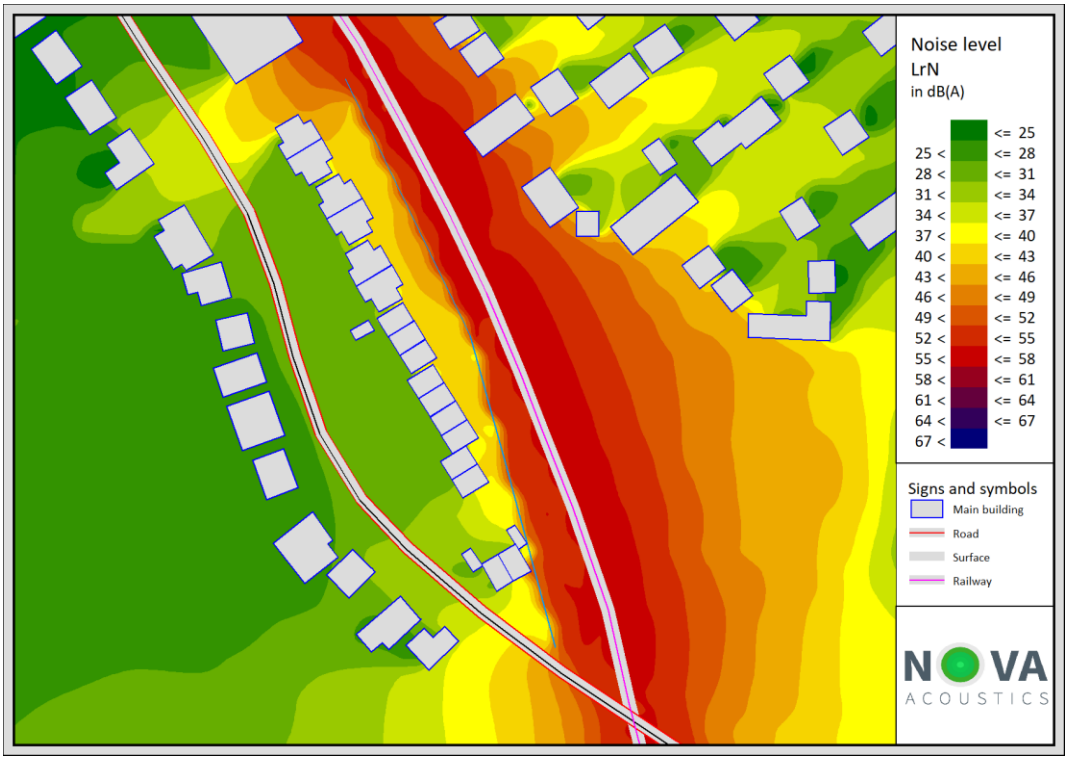

Figure 4.0 - Night-time Noise Map $L_{Aeq,8hour}$

The sound map showing the specific night-time $L_{Amax,8hour}$ sound levels at the Proposed Development can be seen below in Figure 4.0.

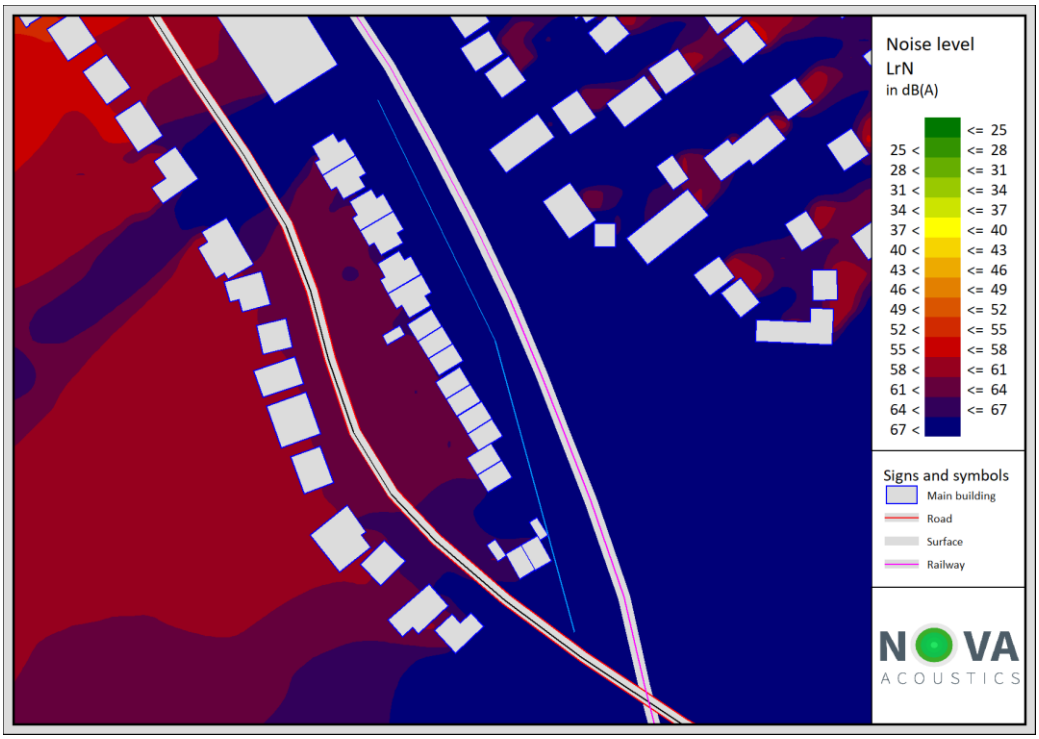

Figure 5.0 - Night-time Noise Map $L_{Amax,8hour}$

A summary of the sound levels incident on the proposed development, based on the sound map shown in Figure 2.0, 3.0 & 4.0, can be seen in the following table.

Location	L_{Aeq} Day Sound Level (dBA)	L_{Aeq} Night Sound Level (dBA)	L_{AMax} Night Sound Level (dBA)
Façade A (Orange)	62.0	54.0	88.0
Façade B (Red)	41.0	33.0	67.0

Table 5.0 - Sound Level Summary at the Proposed Development

4. Noise Break In & External Noise Level Assessment

Noise Break In Assessment

The following section analyses the ambient sound levels incident on the development compared with the internal noise level criteria presented within BS8233:2014.

To ensure a robust analysis the following considerations have been taken:

- The highest $L_{Aeq,16hour}$ and $L_{Aeq,8hour}$ predicted using the sound model.
- The predicted LAmax using the sound model.

The following table analyses the required composite SRI required of the dwelling to achieve appropriate internal noise levels.

FaçadeOrange	Location	Time Period	Façade Noise Level	BS8233 Criteria	Min. SRI Required (dB)
Façade A (Orange)	Bedroom / Living Room	Day time	62.0	35 dB $L_{Aeq,16hour}$	27.0 R_w + C_{tr}
	Bedroom	Night time	54.0	30 dB $L_{Aeq,8hour}$	24.0 R_w + C_{tr}
	Bedroom	Night time	88.0	45 dB $L_{Amax,8hour}$	43.0 R_w
Façade B (Red)	Bedroom / Living Room	Day time	41.0	35 dB $L_{Aeq,16hour}$	6.0 R_w + C_{tr}
	Bedroom	Night time	33.0	30 dB $L_{Aeq,8hour}$	3.0 R_w + C_{tr}
	Bedroom	Night time	67.0	45 dB $L_{Amax,8hour}$	22.0 R_w

Table 6.0 – BS8233 Internal Noise Level Analysis

External Noise Level Assessment

The following table analyses the external noise levels within the external amenity areas of the Proposed Development. The garden noise level was derived from the highest ground floor façade level within the noise model.

Measurement position	Time Period	Garden Noise Level	BS8233 Criteria	Min. Attenuation Required (dB)
MP3	Day time	56.0	50 - 55 dB $L_{Aeq,16hour}$	1.0

Table 7.0 – External Noise Level Analysis

Discussion

The external noise assessment above indicates that the most exposed dwelling exceeds the criteria by 1.0 dB. It should be noted that BS8233:2014 section 7.7.3.2 states:

> *"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,t}$ with an upper guideline value of 55 dB $L_{Aeq,t}$ which would be acceptable in noisier environments. However, it is also recognized*

that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centers or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

The proposed development currently specifies a 2.5m acoustic fence which has been modelled into the sound map. The fence cannot be relocated closer to the railway line nor the development due to limited space, nor is it aesthetically desirable to have a fence over 3m in height. Therefore, the lowest practicable levels have been achieved and may be deemed acceptable. It is also worth noting that the noise level used for the assessment is within the most exposed garden of plot 16.

The acoustic fence currently specified should have a minimum surface mass density of 10kg/m^2 and contain no holes or gaps both in and under it. A suitable example is Jacksons 12K acoustics envirofence, although any fence with the adequate acoustic properties stated above will suffice.

5. Sound Insulation Scheme

The following section outlines the required sound insulation scheme that should be installed at the proposed development to protect the amenity of the future residents. The sound insulation scheme should be installed prior to occupation and be retained thereafter.

Building Envelope

The noise levels within the proposed dwellings will be dictated by the configuration, materials, and elements of the façade. The non-glazed elements of the facade will contribute significantly to the reduction of ambient noise levels. The façade construction for lightweight or heavyweight constructions will provide ample levels of sound insulation, for the purposes of this report it is assumed the façade provides a minimum sound reduction of 50dB R_w. The following section provides a sound insulation scheme based on the weakest elements of the façade, including the glazing, ventilation and roof construction.

a) Roof Specification

If the development has rooms within the roof space the roof system will require additional sound insulation to achieve appropriate internal noise levels. Where the roof, is being utilized as a voided loft space with thermal insulation the following detailing is not required. Where rooms are within the roof, the ceilings should consist of standard roofing slates, 100mm 45kg/m^3 insulation fitted tightly between the 200mm roof joists and 1no. 15mm SoundBloc plasterboard fixed to British Gypsum RB1 resilient bars to achieve a minimum sound reduction of 50dB R_w. Any other configuration of roof that would achieve at least 50dB R_w will be suitable for the development.

b) Glazing Specification

Windows can be considered the weakest point of a façade in terms of noise reduction from external noise. The glazed elements installed in all the living rooms and bedrooms require the minimum sound reduction as shown in Section 3.0. Figure 6.0 indicates the facades where acoustic glazing is required.

Figure 6.0 - Facade Layout

The glazing units shown in the following table provide a suitable sound reduction, any other window capable of providing this attenuation will be suitable. The performance is specified for the whole

window unit, including frame and other design features. The glazing specifications have been taken from the Pilkington Optiphon Range.

Facade	Location	Glazing Configuration	Attenuation (dB)
Orange	Living rooms	*Double Glazing* 6mm Glass – (6-16mm) Air Cavity – 4mm Glass	27.0 dB R_w+ C_{tr}
	Bedrooms	*Double Glazing* 10mm Glass / (16mm) Argon Cavity / 8.8mm Pilkingotn Optiphon Glass	38.0 dB R_w+ C_{tr} 44.0 dB R_w
Red	All rooms	*Double Glazing* 4mm Glass – (6-16mm) Air Cavity – 4mm Glass	25.0 dB R_w+ C_{tr} 29.0 dB R_w

Table 8.0 – Glazing SRI

The glazing system above will protect the amenity of the occupants of the dwellings against the extraneous noise. The glazing specifications have been taken from the BS6262 – 2 and Pilkington's Optiphon range however any glazing providing the same attenuation can be used.

The glazing suppliers are required to demonstrate the acoustic performance of their proposed system either by providing an acoustic test report in accordance with BS EN ISO 10140-2:2010 or an evidence based calculation.

c) Ventilation Specification

BS8233 States;

"If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

and

"The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice. Alternatively, acoustic ventilation units are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

It is recommended that an alternative ventilation system is installed to fully protect the amenity of future inhabitants. As stated in BS8233:2014 section 5.4.4, having complete enclosure of the noise source or receiver is the most effective barrier of sound. An alternative ventilation strategy allows for maximum sound insulation from the noise source whilst still maintaining a sufficient level of

ventilation. It is recommended that the alternative ventilation should provide the same resistance to sound as the glazed elements. The following table provides ventilation systems that meet the above recommendations for each facade

Facade	Model	Attenuation (dB)
Orange	Titon SF XTRA V75 + C75	44dB Open (Ctr:-3) / 55dB Closed $D_{n,e,w}$ (Ctr:-5)
Red	Titon SF XTRA Standard Vent + Standard Canopy	32dB Open (Ctr:0) / 52dB Closed $D_{n,e,w}$ (Ctr:-4)

Table 9.0 – Ventilation Specification

If the above ventilation systems are not deemed suitable for the development, then a mechanical heat-recovery ventilation (MHRV) system should be employed. It should be noted that if a MHRV system is used, the self-generating noise from the system will need to conform to the internal noise levels outlined in BS8233:2014.

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

B.1 - National Planning Policy Framework (2019)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2019. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 170e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 180 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) *Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
b) *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

B.2 - Noise Policy Statement for England (2010)

Paragraph 180 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life;*
- *Where possible, contribute to the improvement of health and quality of life.*

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that "significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development".

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: "where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 - BS8233:2014`Guidance on sound insulation and noise reduction for buildings'

The British Standard BS 8233: 2014, Guidance on Sound insulation and noise reduction for buildings provides additional guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, WHO Guidelines on Community Noise, 1999. The criteria desirable levels of steady state, "anonymous" noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below:

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35 dB $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 10.0 - BS8233 Internal Noise Level Criteria

It is noted, however that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

The standard also recommends that for traditional external amenity areas, such as gardens, it is desirable that external noise levels do not exceed 50 dB $L_{Aeq,T}$, and that 55 dB $L_{Aeq,T}$ would be acceptable in noisier environments. However, it is recognised that these values may not be achievable in all areas where development is desirable and in such locations, development should be designed to achieve the lowest practicable levels.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the LOAEL as defined in the NPSE above.

Appendix C – Site Plans

Appendix D – Environmental Survey

D.1 Tabulated Summary Noise Data

Graphical Time History

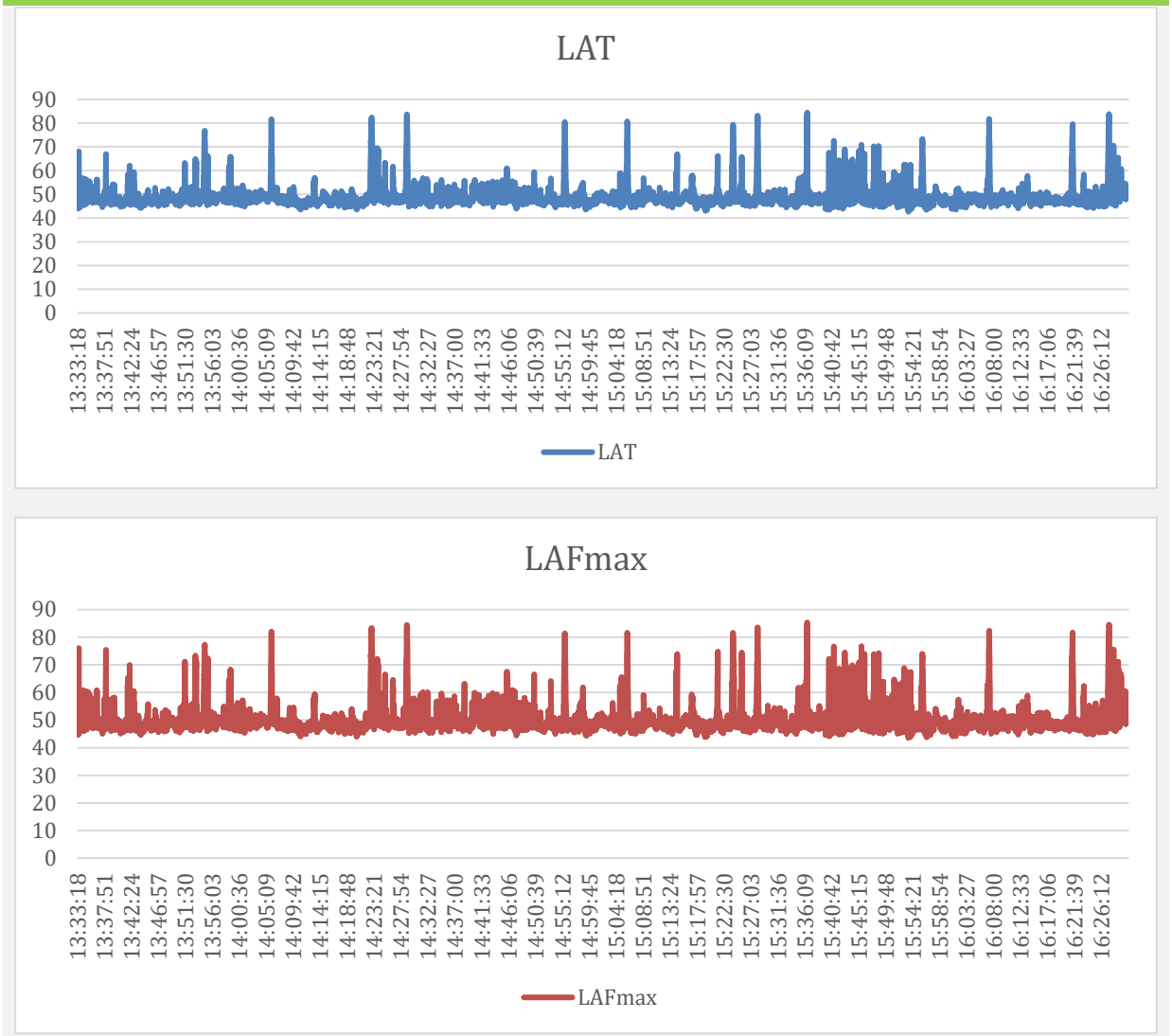

Table 11.0 – Sound Survey Summary Results

D.2 Surveying Equipment

Piece of Equipment	Serial No	Calibration Deviation
CESVA SC420 Class 1 Sound level meter	T244498	≤0.5
CESVA CB006 Class 1 Calibrator	901910	

Table 12.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All

microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localized records of weather conditions were taken. However, during the set up and collection of the monitoring equipment the weather conditions have been documented in the following table. All measurements have been compared with met office weather data of the area, specifically the closest weather station, the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather conditions – Worsborough – 4.5km				
Time period	**Air temp (^{0}C)**	**Rainfall mm/h**	**Prevailing Wind Direction**	**Wind Speed (m/s)**
Monitor Set-up & Collection - 29/06/2020	12.1 – 14.1	0.0 – 1.5	SW	3.9 – 11.3

Table 13.0 – Weather Summary

*** correct wind speed from knots to m/s divide knots by 2*