ROSARY HOUSE

AERODROME ROAD, BEKESBOURNE, CANTERBURY

KENT CT4 5EX

PROPOSED RESIDENTIAL DEVELOPMENT

NOISE IMPACT ASSESSMENT

Report No. MRL/100/1764.1v1
July 2021

Report No. MRL/100/1764.1v1
July 2021

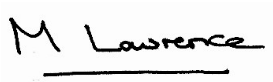
ROSARY HOUSE
AERODROME ROAD, BEKESBOURNE, CANTERBURY
KENT CT4 5EX

PROPOSED RESIDENTIAL DEVELOPMENT

NOISE IMPACT ASSESSMENT

Report prepared by:
MRL Acoustics Ltd
64 Blackwall Road South
Willesborough Lees
Ashford
Kent
TN24 0FU

On behalf of:
Woodchurch Property Developments
Waterfall Cottage
Patrixbourne Road
Canterbury
Kent
CT4 5BL

Report prepared by: Matthew Lawrence MSc MIOA – Principal Consultant	

CONTENTS

		Page
1.0	INTRODUCTION	1
2.0	DESCRIPTION OF THE SITE	3
3.0	NOISE FROM NEW ACCESS ROAD	4
4.0	RAILWAY NOISE LEVEL SURVEY	11
5.0	ASSESSMENT OF RAILWAY NOISE IMPACT	15
6.0	RECOMMENDED SCHEME OF NOISE MITIGATION MEASURES	24
7.0	SUMMARY AND CONCLUSIONS	27
APPENDIX I – NOISE UNITS AND INDICES		30
APPENDIX II – RESULTS OF NOISE LEVEL SURVEY		32
APPENDIX III – TRAIN NOISE CALCULATIONS		33
APPENDIX IV – DATA USED FOR NO. VEHICLE MOVEMENTS		34

1.0 INTRODUCTION

1.1 MRL Acoustics Limited was commissioned by Woodchurch Property Developments to assess the impact of noise on a proposed residential development scheme on land at Rosary House, Aerodrome Road, Bekesbourne, Canterbury, Kent CT4 5EX.

1.2 The scheme comprises the construction of 7 no. new houses within the curtilage of Rosary House, along with associated garages, parking spaces and garden amenity areas.

1.3 A pre-application meeting relating to the proposed development took place with Canterbury City Council in April 2021. With regard to noise, the Council stated that "A Noise Impact Assessment will be required to understand the noise and disturbance impact on neighbouring properties (particularly Sycamore Cottage and The Haven) and the impact of the railway on the proposed five dwellings'.

1.4 The assessment has therefore included:-

- a noise monitoring survey in the vicinity of the nearest affected dwellings to the access road in order to establish the existing noise climate of the area;
- calculation of likely noise levels at the nearest dwellings resulting from the use of the access road;
- assessment of the environmental noise impact of the proposed access road by reference to relevant noise planning guidelines and criteria;
- measurements of the typical noise levels of passing trains at the rear of the site;
- calculation of the daytime and night-time noise impact from passing trains using our measured noise data and the nos. of passing trains based on timetable information;
- assessment of the noise impact on the development in accordance with the National Planning Policy Framework; the Noise Policy Statement For England; the WHO Guidelines; BS 8233 : 2014; and ProPG : Planning & Noise – May 2017;

- recommendation of an appropriate noise mitigation scheme for the new dwellings, if necessary.

1.5 This report outlines our findings and our recommendations.

1.6 All measured and predicted noise levels relate to 'free-field' conditions.

1.7 Noise levels referred to in the text have been rounded to the nearest whole decibel (dB), as fractions of decibels are imperceptible.

1.8 An explanation of the various noise units, indices and acoustical terms used in this report is provided in Appendix I.

1.9 The noise survey and assessment has been carried out by Matthew Lawrence, Principal Acoustic Consultant at MRL Acoustics Ltd, who has 24 years' experience in the acoustic industry in all areas of environmental and building acoustics. The first eight years were spent working for the Environmental Health Department at Ashford Borough Council, followed by 9 years in private consultancy working for Hepworth Acoustics Ltd.

1.10 MRL Acoustics Ltd was set up in December 2009 by Matthew Lawrence as a small limited company and since then the scope of work has expanded to include noise impact assessments for residential developments for road, rail and aircraft noise, along with noise assessments for school developments under BB93; school MUGA sport pitches; noise from building services plant; BS 4142 industrial noise assessments; planning applications for new industrial premises; etc. and sound insulation advice and testing for Part E compliance for Building Regulations.

2.0 DESCRIPTION OF THE SITE

2.1 The site is located at Rosary House, Aerodrome Road, Bekesbourne, Canterbury, Kent CT4 5EX and consists of an existing detached house with a rear garden and a large piece of open land to the north-east of the dwelling.

2.2 There are existing residential properties directly adjacent to the north-west and south-east of Rosary House, along with several other dwellings in the local area. Aerodrome Road is a very quiet, low-trafficked residential road with very intermittent numbers of cars passing the site.

2.3 To the north-east of the site is a mainline railway, located approximately 88m distance from the rear elevation of Rosary House. The railway line runs directly adjacent along the north-east site boundary and is situated in a slight cutting.

2.4 The railway line runs between Bekesbourne station and Adisham station and forms part of the mainline between Canterbury East and Dover. The passing trains were very intermittent with only around 3 no. trains passing the site over any given 1-hour period.

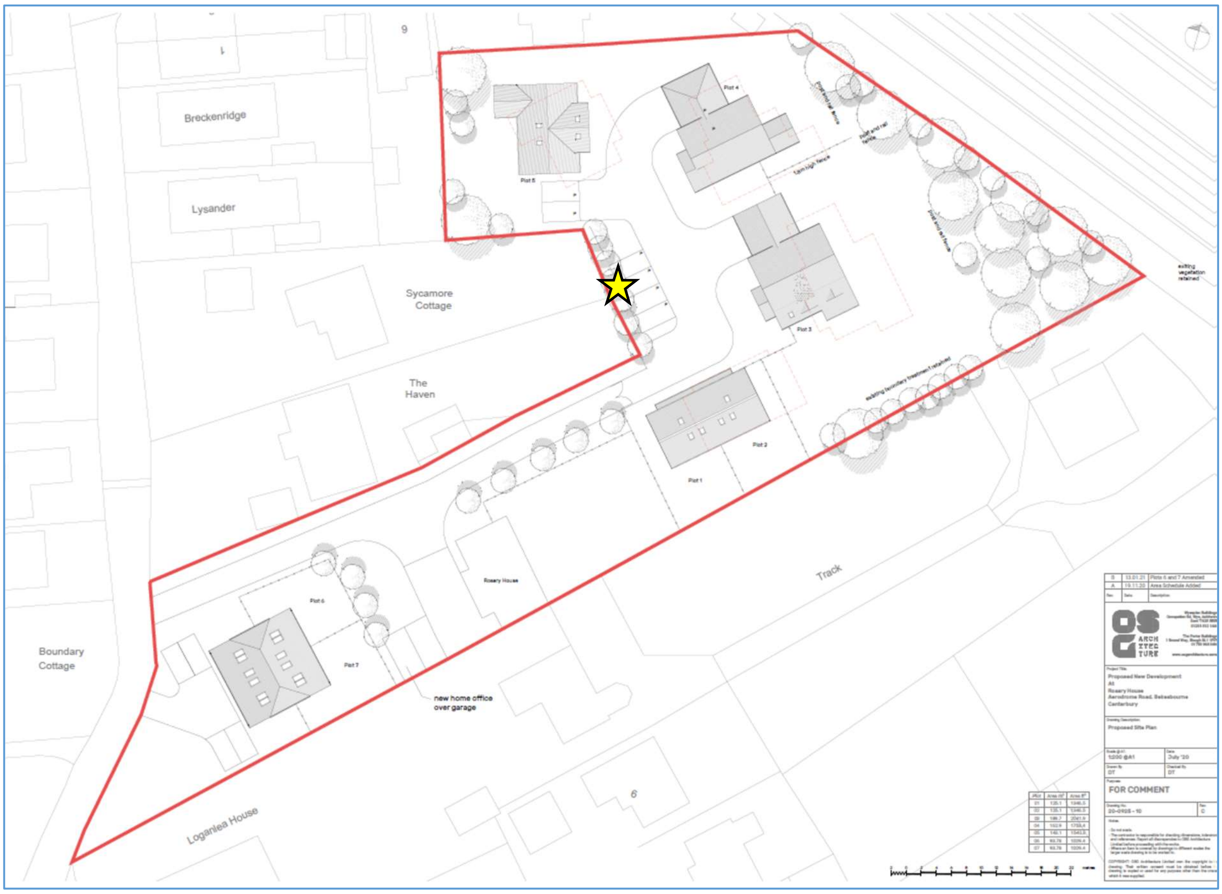
2.5 The dominant noise source in the area is from these passing trains, albeit with prolonged periods of very low noise levels in between each train event. The trains are passing the site at fairly low speeds due to the proximity of Bekesbourne station, approximately 1.2 km to the north-west of the site and Adisham station, approximately 3.65 km to the south-east of the site.

2.6 The proposed access road will serve the new 7 no. dwellings and also Rosary House, which we understand is to remain, and will be located just to the north of Rosary House. Access to the development site will be from Aerodrome Road and will continue up behind 2 no. existing dwellings; The Haven and Sycamore Cottage.

2.7 The site location and development layout plans are shown at the end of this report.

3.0 NOISE FROM NEW ACCESS ROAD

3.1 The development layout and proposed new access road is shown in the plan below:-



Noise Measurement Location ☆

3.2 A noise level survey of the existing ambient noise climate was undertaken on Friday 25th June 2021 between 07:30 - 09:30 hours. This time period was chosen in order to represent a quiet morning period before, during and just after the morning rush-hour peak period.

3.3 The existing ambient noise climate was measured over a series of consecutive 15-minute periods at the rear boundary of The Haven and Sycamore Cottage, as shown in the plan above.

3.4 This section of the access road is where cars related to Plots 1 – 5 will affect the rear gardens of these two existing dwellings. Cars related to Plots 6 and 7 will not need to use this end of the access road as both these plots have their vehicle access located adjacent to Aerodrome Road.

3.5 The noise survey was carried out using a Rion NA-28 Type 1 Sound Level Meter (serial no. 01291241) fitted on a tripod with the microphone height approximately 1.5m above ground level. The microphone was fitted with a Rion WS-10 weather-proof windshield at all times.

3.6 The calibration level of the meter was checked before and after the survey to a level of 94.0 dB with a Rion NC-74 sound calibrator (serial no. 35094450) with no variation in the levels observed.

3.7 The sound level meter was set to measure the following parameters:-

- L_{Aeq}
- L_{Amax}
- L_{A10}
- L_{A90}

3.8 The frequency weighting of the meter sub-channel was set to 'A' and the time-response set to 'Fast'. In addition, the meter main channel was set to measure the above parameters in 1/1 octave-centre frequency bands using 'Z' frequency weighting and 'Fast' time response.

3.9 The weather conditions for the survey were generally warm, dry and calm throughout.

3.10 The measured results are 'free-field' levels as the microphone was not within 3.5m of a reflective surface (other than the ground) and therefore a +2.5 dB façade correction would be applicable to the measured results to convert them to 'facade' levels, if required.

3.11 It was noted that during these measurements of the background noise, the dominant noise source was mainly from birdsong, occasional voices of local residents and intermittent passing trains from the railway line to the rear of the site.

3.12 The results of the noise survey in terms of the lowest measured noise levels are summarised in Table 1 overleaf and the detailed results are shown in Appendix II at the end of this report.

Table 1: Lowest Measured Noise Levels

Time Period (Hours)	Noise Level, dB(A)	
	$L_{Aeq\ (15\ minute)}$	$L_{A90\ (15\ minute)}$
07:30 – 09:30	44 dB	39 dB

Predicted Noise From Access Road

3.13 The Department of Transport 'Calculation of Road Traffic Noise', 1988 provides guidance on a method of calculating noise levels from road traffic, but it does not cover this type of situation where there are a low number of pass-bys at low speeds. Therefore, the results of actual noise measurements of slow moving cars have been used as the basis of the predictions.

3.14 MRL Acoustics has previously carried out measurements of noise from slow moving cars entering and leaving car parks. The typical measured Sound Exposure Level (SEL) for individual passing cars was 71 dB(A) at a distance of 3m, with an average L_{Aeq} level of approximately 61 dB. The levels were measured with a direct un-obstructed line-of-sight to the vehicles and had an average duration of 10-seconds for each measurement sample.

3.15 Calculations have been carried out of the likely resulting noise at the boundary of the adjacent dwellings produced by passing cars on the proposed access road using the following formula:-

$$L_{Aeq(T)} = SEL_{(average)} + 10 \log N - 10 \operatorname{Log} T$$

where: - $L_{Aeq\ (T)}$ = L_{Aeq} over time period T

$SEL_{Average}$ = Average 'Sound Exposure Level'

N = Number of vehicle movements in time period T

T = Time period in seconds

3.16 For the number of car movements associated with Plots 1 – 5, we have based the noise impact assessment on approximately 8 no. vehicle movements per day relating to a single dwelling, i.e. 40 no. vehicle movements in total per day from 5 no. dwellings.

3.17 From these 40 no. vehicles movements per day, we have assumed that 10 no. events will occur during the morning peak hour of between 8am – 9am. It should be noted that a trip is a one-way journey – either a departure or an arrival.

3.18 The number of car movements has been taken from the TRICS database which is a universally accepted guide to the level of traffic generation created by a consortium of County Councils across the South of England to provide them with a predictive tool with which they might assess the levels of traffic likely to be generated by new developments.

3.19 The levels of traffic generated by developments across the country have been collated in the database, categorised by development type, thereby enabling users of the database to extract levels of traffic generation from comparable developments.

3.20 An extract from the database for privately owned houses is provided in Appendix III at the end of this report.

3.21 The predicted noise level from the access road has been based on an assumed worst case morning rush hour peak period of 10 no. vehicle movements within that rush hour peak. The calculated predicted noise impact level is shown in Table 2 below:-

Table 2: Access Road Predicted Noise Level

Time Period	Vehicle Movements	Predicted Noise Level At 3m $L_{Aeq\ (1\ hour)}$
1-Hour Peak	10 No.	55 dB

3.22 Calculations have been carried out of the resulting noise level at 3m distance from the proposed access road at the adjacent residential properties produced by traffic on the access road generated by the development in order to represent the noise impact within the garden areas.

3.23 It should be noted that the calculated noise impact does not allow for any screening between the passing cars and the adjacent garden areas.

3.24 The predicted noise level generated by traffic from the development during the morning peak hour is 55 dB $L_{Aeq\ (1\text{-}Hour)}$.

3.25 The calculation is shown below:-

Site:	**Rosary House, Aerodrome Road, Bekesbourne, Canterbury, Kent**				
LAeq = SEL + 10 log N - 10 log T (where N = No. of Events, T = Required Time Period in seconds)					
Measured SEL	**No. of Events**	**Required Time Period**		**Resultant LAeq**	
81.0	10.0	3600	(1 Hour)	**55.4**	

3.26 The predicted noise level of 55 dB $L_{Aeq\ (1\text{-}Hour}$ within the curtilage of the adjacent properties to the proposed access road is quite low, despite the dwellings proximity to the access road. This is due to the low number of vehicles which will be using the access road and the slow speeds when passing these properties.

3.27 The noise impact of 55 dB L_{Aeq} over a typical rush hour peak period when compared to the lowest measured 15-minute ambient noise level of 44 dB L_{Aeq} represents an overall increase of 11 dB(A) over the existing noise climate.

3.28 This represents a significant increase in the ambient noise climate at the site over this 1-hour period and therefore a scheme of noise mitigation measures is required in order to minimise any noise impact at the nearest affected dwellings.

3.29 Therefore, we would recommend the following scheme of noise mitigation measures:-

3.30 The proposed access road should be provided with 1.8m high (minimum) acoustic fencing at the boundaries indicated below:-

Extent of Acoustic Fencing

3.31 The acoustic screens should be constructed from solid material with a minimum mass/unit area of at least 15 kg/m^2. It may therefore be typically constructed from solid timber of nominal 25mm thickness and density of at least 600 kg/m^3 and with no holes or gaps in its construction (e.g. Jacksons Fencing 'Jakoustic' fencing or similar acoustic fencing), or it could consist of dense masonry (e.g. brick or dense concrete blocks);

3.32 Provision of effective acoustic fencing as indicated above should provide at least 10 dB(A) attenuation in noise levels experienced in the garden areas of the adjacent dwellings. The noise impact from the cars using the new access road over the 1-hour peak period would therefore be negligible with the provision of such screening.

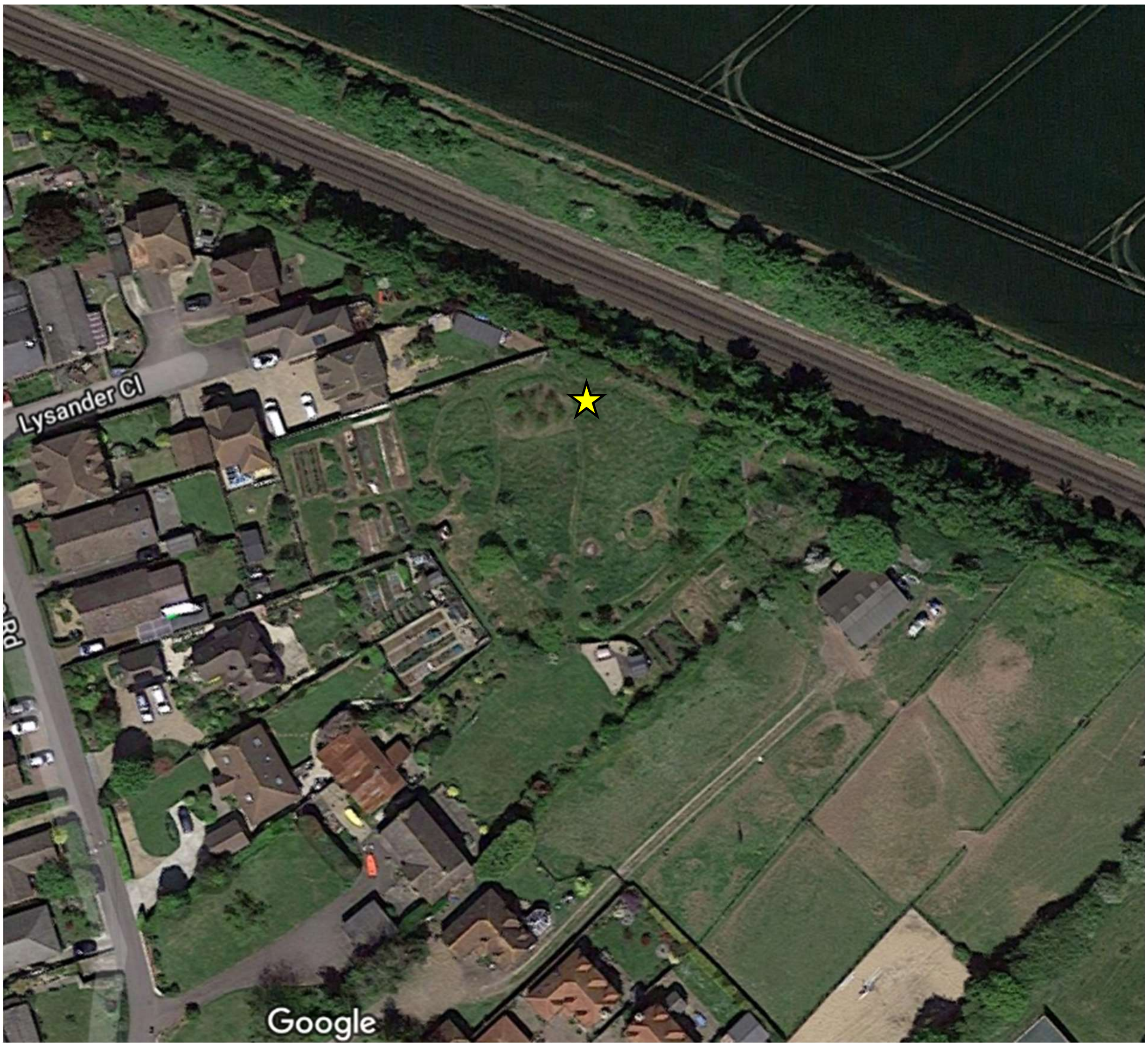
3.33 Therefore, the noise impact will not be significant in terms of the existing ambient noise levels at the neighbouring properties.

3.34 It is generally accepted that a 3 dB(A) change in noise levels is the minimum perceptible to the human ear and therefore the resulting noise impact will not result in an adverse effect on the existing residential amenity.

4.0 RAILWAY NOISE LEVEL SURVEY

Railway Noise

4.1 A noise level survey of passing trains was carried out at the site on Friday 25th June 2021 between 10:00 hours and 14:30 hours at the location indicated on the site plan below:-



Noise Measurement Location ☆

4.2 This location was chosen in order to represent the windows of the proposed dwellings that will be affected by the highest levels of environmental noise in terms of passing trains.

4.3 For every train pass, a short-term sample of noise was measured to obtain the average 'pass-by' noise level. A total of 10 no. passenger train movements were recorded. The trains generally comprised passenger trains of between 4 – 8 no. carriages. During the survey period we did not observe any freight train movements.

4.4 The noise survey was carried out using a Rion NA-28 Type 1 Sound Level Meter (serial no. 01291241) fitted on a tripod with the microphone height approximately 1.5m above ground level. The microphone was fitted with a Rion WS-10 weather-proof windshield at all times.

4.5 The calibration level of the meter was checked before and after the survey to a level of 94.0 dB with a Rion NC-74 sound calibrator (serial no. 35094450) with no variation in the levels observed.

4.6 Details of the equipment used during the noise level survey are shown in Table 3 below. Current calibration certificates for the equipment can be provided if required.

Table 3: Details of Equipment Used During Noise Survey

Equipment Description	Manufacturer	Type/Number	Serial Number	Date of Expiration of Calibration	Calibration Certification Number
Sound Level Meter	Rion	Type NA-28	01291241	12/05/2022	TCRT20/1224
Microphone	Rion	UC-59	01683	12/05/2022	TCRT20/1224
Pre-Amplifier	Rion	NH-23	81273	12/05/2022	TCRT20/1224
Calibrator	Rion	Type NC-74	35094450	12/05/2022	TCRT20/1223

4.7 It was noted that the trains passed by the site at fairly slow-speeds. This was probably due to the fact that the site is between Bekesbourne station and Adisham station, both of which are only a short distance away, therefore the trains are either slowing down to enter the stations or have just left the stations.

4.8 The weather conditions for the survey were generally warm, dry and calm throughout and are shown in Table 4 below:-

Table 4: Weather Conditions During Noise Survey

Date	Temperature (°C)		Wind Speed (m/s)	Wind Direction	Rainfall (mm)	Cloud Cover (%)	Acceptable Conditions
	Day	Night					
25/06/2021	19	-	0.8	SW	0	30	Yes

4.9 The weather conditions were measured on-site using a Kestrel 2000 hand-held weather meter and supported by weather data from the Meteorological Office website relating to local weather conditions for this area. The noise survey was carried out in general accordance with the requirements outlined in BS 7455 – 1 : 2003 for environmental noise surveys.

4.10 The measured results are 'free-field' levels as the microphone was not within 3.5m of a reflective surface (other than the ground) and therefore a +2.5 dB façade correction would be applicable to the measured results to convert them to 'facade' levels, if required.

Results

4.11 Railway noise is evaluated in terms of the 'equivalent continuous noise level', L_{Aeq} and can be evaluated in separate day and night L_{Aeq} values. These L_{Aeq} values can be calculated from the results of the noise surveys using the formula:-

$$L_{Aeq\,(T)} = SEL_{Average} + 10 \log N - 10 \log T$$

where: $L_{Aeq\,(T)}$ = L_{Aeq} over time period T;

$SEL_{Average}$ = Average 'Sound Exposure Level';

N = Number of train passes in time period T;

T = Time period in seconds.

4.12 Railway noise calculations have been undertaken for the proposed residential development site based on the measured noise levels and numbers of train passes identified from timetable information.

4.13 The number of trains passes, N, used in the calculations was 44 (daytime) and 10 (night-time) for electrically powered passenger trains.

4.14 The results are detailed in Appendix II at the end of this report and are summarised in Table 5 below:-

Table 5: Daytime and Night-time Railway Noise Levels

Monitoring Location	Daytime dB $L_{Aeq\ (0700\text{-}2300\ hrs)}$	Night-time dB $L_{Aeq\ (2300\text{-}0700\ hrs)}$
Location: At Proposed Dwelling Nearest Railway Line	37	34

5.0 ASSESSMENT OF RAILWAY NOISE IMPACT

National Planning Policy Framework (NPPF)

5.1 National Government Guidance is available in the form of the National Planning Policy Framework (NPPF) - 2021. The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

5.2 Paragraph 174 of Section 15 of the NPPF, 'Conserving and enhancing the natural environment' provides general guidance regarding planning and noise. It states:-

"Planning policies and decisions should contribute to and enhance the natural and local environment by:-

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;

c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;

d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;

e) 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; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate."

5.3 Paragraph 185 of Section 15 of the NPPF, 'Conserving and enhancing the natural environment' goes on to state:-

"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 impacts 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."

The Noise Policy Statement for England 2010 (NPSE)

5.4 The NPSE sets out the long term vision for government noise policy which is 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."

5.5 This is supported by the following 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; and
- where possible, contribute to the improvement of health and quality of life."

5.6 The first aim of the NPSE should be read in the context of Government policy on sustainable development indicating that significant adverse effects on health and quality of life should be avoided while accommodating the principles of sustainable development.

5.7 The second aim of the NPSE is applicable where the impact falls between LOAEL and SOAEL (see Section 4.9 below) requiring that all reasonable measures to mitigate and minimise adverse impacts on health and quality of life be implemented while accommodating the principles of sustainable development. This does not imply that any adverse effects cannot occur.

5.8 The third aim of the NPSE is to actively improve health and quality of life through effective management of noise within the context of Government policy on sustainable development wherever it is possible and reasonable to do so.

5.9 The NPSE applies the following concepts adapted from toxicology:-

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.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

5.10 It should be noted that there are no numerical values for these concepts defined in the NPSE. There is also no single objective noise-based measure that defines Observed Effect Levels that is applicable to all sources of noise in all situations and consequently, the levels are likely to be different for different noise sources, for different receptors and at different times.

Professional Practice Guidance On Planning & Noise (ProPG)

5.11 The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The National Planning Policy Framework (NPPF) encourages improved standards of design. The CIEH, IOA and the ANC have worked together to produce this guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.

5.12 This ProPG provides advice for Local Planning Authorities (LPAs) and developers, and their respective professional advisers. It aims to complement Government planning and noise policy and guidance. In particular, it strives to:

- advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- encourage the process of **good acoustic design** in and around new residential developments;
- outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
- improve understanding of how to determine the extent of potential noise impact and effect; and assist the delivery of sustainable development.

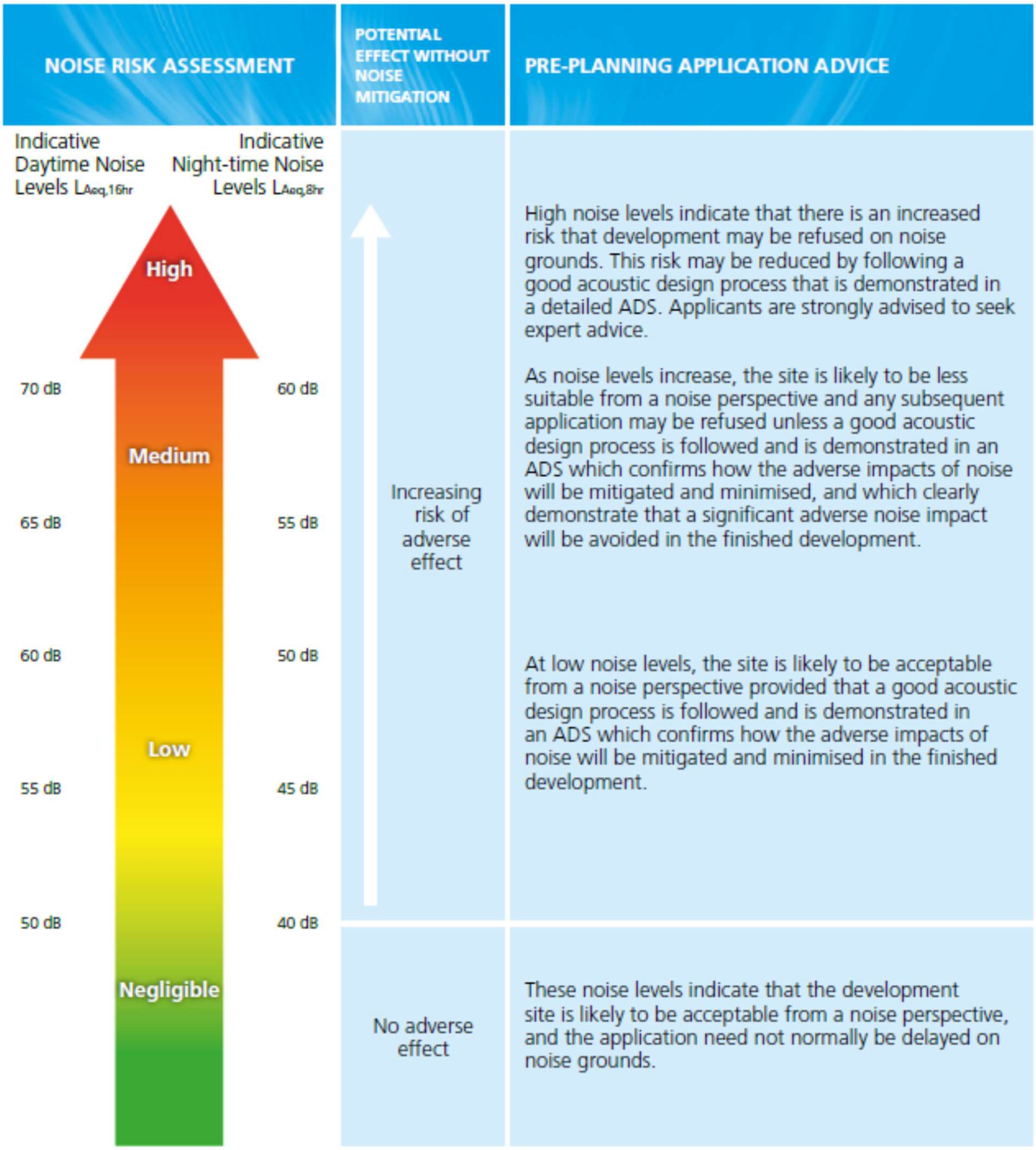


Figure 1 Notes:

a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".

c. $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.

d. An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.

Figure 1. Stage 1– Initial Site Noise Risk Assessment

5.13 Based on the calculated free-field indicative noise levels of 37 dB L_{Aeq} (daytime) and 34 dB L_{Aeq} (night-time), the site would be classified as being of 'Negligible' Risk according to Figure 1 of the ProPG document. However, Note D from Figure 1 must be considered in this case.

5.14 Figure 1 of the ProPG document is reproduced on the previous page and Figure 2 of the ProPG document indicating the internal noise level guidelines is reproduced below:-

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16 hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16 hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16 hr}$	30 dB $L_{Aeq,8 hr}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form **(see Section 3.D)**.

Figure 2. ProPG Internal Noise Level Guidelines (additions to BS8233:2014 shown in blue)

British Standard 8233 : 2014

5.15 Guidance on acoustic design goals for new residential developments is set out in British Standard 8233 : 2014 *'Guidance on sound insulation and noise reduction for buildings'*. The World Health Organisation *'Guidelines for Community Noise'* and the ProPG guidance generally concurs with the recommendations of BS 8233 : 2014. The criteria are summarised in Table 6 below:-

Table 6: BS 8233 Recommended Acoustic Design Criteria

Location	Internal Noise Levels	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Living Room	35 dB L_{Aeq}	-
Dining Room	40 dB L_{Aeq}	-
Bedroom	35 dB L_{Aeq}	30 dB L_{Aeq} 45 dB L_{Amax}
Garden	Desired Limit Not Exceeding 50 dB L_{Aeq} Upper limit of 55 dB L_{Aeq}	

Assessment of Noise Impact

5.16 The results of the noise level survey indicate that at the noise monitoring position approximately 10m distance from the railway line, the site is exposed to a daytime external railway noise level of 37 dB L_{Aeq}.

5.17 For the night-time period, the site is exposed to an external railway noise level of 34 dB L_{Aeq} and an average maximum noise level of 60 dB L_{Amax}.

5.18 Allowing -13 dB attenuation for an open window, based on the measured daytime noise level of 37 dB L_{Aeq}, the resultant internal noise level within habitable rooms during the daytime will be 24 dB L_{Aeq} (37 dB – 13 dB).

5.19 For the night-time period, allowing -13 dB attenuation for an open window, based on the measured night-time noise level of 34 dB L_{Aeq}, the resultant internal noise level within bedrooms will be 21 dB L_{Aeq} (34 dB – 13 dB).

5.20 Therefore, the daytime noise criteria of 35 dB L_{Aeq} for living rooms and bedrooms and 40 dB L_{Aeq} for dining rooms during the daytime period will be achieved, even with the windows open.

5.21 The night-time criteria for bedrooms at night of 30 dB L_{Aeq} will also be achieved with the windows open.

Night-time Maximum Noise Levels

5.22 With regard to individual event maximum noise levels BS 8233 states:-

"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F,}$ depending on the character and number of events per night. Sporadic noise events could require separate values."

5.23 The WHO Guidelines for Community Noise give a specific maximum internal noise level of 45 dB L_{Amax} that should not normally be exceeded more than 10 -15 times per night.

5.24 The ProPG guidance states that in noise-sensitive rooms at night, e.g. bedrooms, individual noise events (from all sources) should not normally exceed 45 dB L_{Amax} more than 10 times per night as this represents a threshold below which the effects of individual noise events on sleep can be regarded as negligible.

5.25 In terms of maximum noise levels, the measured average maximum noise level of passing trains was 60 dB L_{Amax}. Therefore, with windows open, the resultant internal maximum noise level at night for each passing train would be approximately 47 dB L_{Amax}.

5.26 As there are at least 10 no. trains passing the site between 11pm and 7am, the noise criteria for internal maximum noise levels will be slightly exceeded with the bedroom windows open.

5.27 Therefore, a scheme of noise mitigation measures is required in order to reduce the night-time internal maximum noise levels.

5.28 Our recommendations are set out in Section 6.0.

6.0 RECOMMENDED SCHEME OF NOISE MITIGATION MEASURES

6.1 Table 7 below provides information on the typical sound insulation performance of various glazing specifications:-

Table 7: Sound Insulation of Typical Windows

Description	Weighted Sound Reduction Index, R_w
Any type of window in a facade when partially open	15
Single glazed windows (4mm glass)	29
Single glazed windows (6mm glass)	31
Double glazed units (4-16-4)	33
Double glazed units (4-16-6)	35
Double glazed units (6-16-6)	36
Double glazed units (4-16-6.4mm laminated glass)	39
Secondary glazed windows (4-100-4)	35 - 40
Secondary glazed windows (6-200-6)	40 - 45

6.2 We would recommend that **for all living room, dining room and bedroom windows throughout the development,** that the window configuration should consist of the following:-

- 4mm thick glass – nominal 16mm air gap - 4mm thick glass.

Ventilation

6.3 Since opening the windows would reduce the sound insulation of the building envelope, it is considered that an acoustically treated alternative method of ventilation should be provided for all affected living rooms, dining rooms and bedrooms.

6.4 This approach, which is recommended in BS 8233 : 2014, would provide the new residents with the option of ventilating rooms whilst maintaining the sound insulation of the building envelope.

6.5 We would recommend that for all bedrooms for Plot 3 and Plot 4 with windows on the north, east and south facing elevations, i.e. those with a view toward the railway line, acoustically treated ventilation will be required to meet the required internal noise limit for night-time maximum noise levels without the need to open the windows for ventilation and cooling.

6.6 Standard slot-frame trickle-vents **should not** be fitted to the windows outlined above. If trickle-vent are fitted they should be acoustically rated with a minimum sound reduction performance level of **at least 35 dB $D_{n,e,w}$ + C_{tr} with the vent open**.

6.7 We therefore recommend provision of one of the following acoustic ventilation options:-

- acoustically screened wall mounted mechanical (i.e. powered) acoustic ventilators such as Titon 'Sonair F+' or Silavent Energex SHHRV units; or
- a fully ducted passive or mechanical ventilation system with appropriate sound attenuation measures incorporated into the design; or
- Xcell QVW or QVI Mechanical Ventilation with Heat Recovery Units; or
- Titon – HRV 2 Q Plus (MVHR) system 4 - This system is a 'whole house' continuous ventilation system that does not use trickle vents and is considered to be acceptable for this development; or
- Silavent HRX MVHR 'whole house' Heat Recovery Unit; or

- Domus Ventilation HXRE MVHR 'whole house' Unit; or

- Envirovent Whole House Positive Ventilation System ventilation system that does not use trickle vents and is considered to be acceptable for this development; or

- any other similar performing acoustic ventilators or ventilation system.

6.8 However, we would recommend that the ventilation requirements are checked with the Local Authority Building Control Officer at an early stage.

6.9 It is considered that provision of any one of the above ventilation schemes should provide sufficient sound insulation from railway noise and any other general environmental noise sources to ensure that the required internal noise limits are achieved.

6.10 Any mechanical ventilation system provided must also achieve the internal noise limits outlined in BS 8233 of 30 dB L_{Aeq} in bedrooms during the night-time period.

6.11 This can usually be easily achieved by installing the unit either in the loft space or within a cupboard with well-fitted doors which normally ensures a very quiet operating noise.

External Areas

6.12 The general daytime external noise climate was calculated as being 37 dB $L_{Aeq\ (07:00 – 23:00\ Hours)}$. This level of noise impact is 18 dB(A) below the upper noise limit of 55 dB L_{Aeq} outlined in both BS 8233 : 2014 and the WHO Guidelines.

6.13 The predicted daytime noise level is also 13 dB(A) below the desired level of 50 dB L_{Aeq} outlined in both BS 8233 : 2014 and the WHO Guidelines.

6.14 Therefore, in terms of the general daytime external noise climate, no specific scheme of noise mitigation measures is considered necessary for the proposed external amenity areas.

7.0 SUMMARY AND CONCLUSIONS

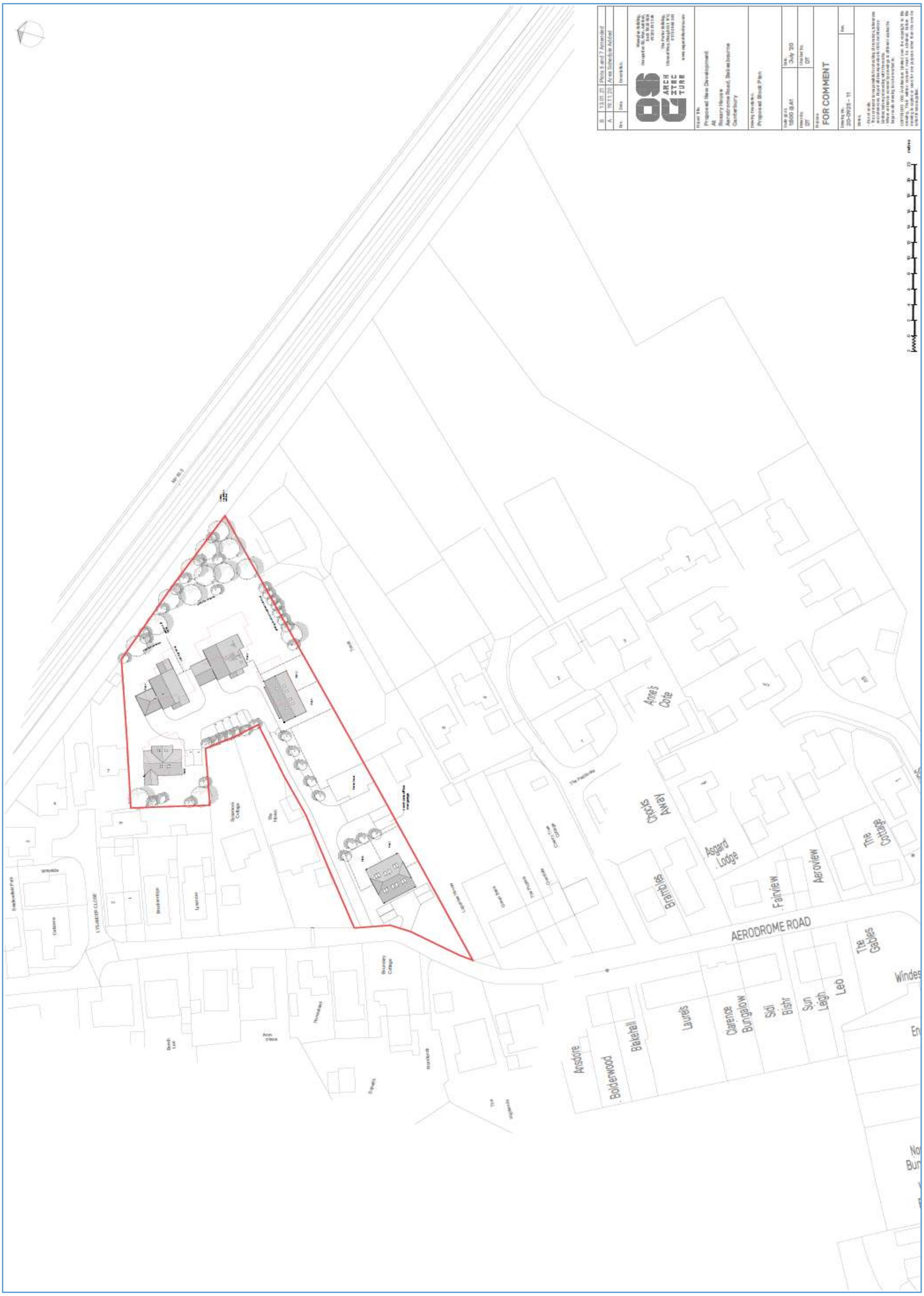
7.1 The impact of noise has been assessed for the proposed residential development scheme at Rosary House, Aerodrome Road, Bekesbourne, Canterbury, Kent CT4 5EX.

7.2 The results of the noise level survey and assessment indicate that the development site is exposed to fairly low levels of noise from passing trains. However, the noise from passing trains during the night-time period will lead to a slight exceedance of the noise criteria for maximum noise levels which means an appropriate scheme of noise mitigation measures is required for Plots 3 and 4 nearest to the railway line.

7.3 The impact of noise from cars using the new access road can be adequately attenuated by the provision of suitable 1.8m high acoustic perimeter fencing along the boundaries with the existing adjacent dwellings.

7.4 An appropriate noise mitigation scheme has been recommended for the new dwellings which should provide sufficient noise attenuation to meet the required internal acoustic criteria and fully protect the amenity of future residents in accordance with the standards outlined in the WHO Guidance, BS 8233 : 2014 and the ProPG guidance document.

7.5 In conclusion, with the implementation of the scheme of noise mitigation measures outlined in this report, noise impact from the railway line on the new dwellings and the noise impact from the proposed access road will be within acceptable limits with no adverse effect on the proposed and existing residential amenity.


AERODROME ROAD
FOR COMMENT
Arone's Cote
Chocks Away
Asgard Lodge
Brambles
Fairview
Aeroview
The Cottage
The Gables
Ansdore
Bolderwood
Bakehell
Laurels
Clarence Bungalow
Sidi Bishr
Sun Leigh
Leo
Windes


existing vegetation retained
post and rail fence
Plot 1
Plot 2
Plot 3
Plot 4
Plot 5
Plot 6
Plot 7
Track
Rosary House
new home office over garage
Sycamore Cottage
The Haven
Breckenridge
Lysander
Boundary Cottage
Loganlea House
FOR COMMENT

APPENDIX I – NOISE UNITS AND INDICES

a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

b) Frequency and hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20,000 Hz. However, the upper frequency limit gradually reduces as a person gets older.

c) A-weighting

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters and is denoted dB(A) or dBLA.

d) Glossary of Terms

When a noise level is constant and does not fluctuate over time, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below:-

L_{Aeq} The A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period.

L_{Amax} The maximum A-weighted noise level recorded during the monitoring period.

L_{A10} The A-weighted noise level exceeded for 10% of the specified time period. L_{A10} is most often used as a measure of traffic noise.

L_{A90} The A-weighted noise level exceeded for 90% of the specified time period. L_{A90} is used as a measure of 'background noise'.

SEL The 'sound exposure level' of a single event (such as a passing train) and is the L_{Aeq} value of the whole event normalised to a 1 second period level of a sound.

APPENDIX II – RESULTS OF NOISE LEVEL SURVEY

Date: Friday 25th June 2021

Equipment: Rion NA-28 'Class 1' sound level meter, Rion NC-74 acoustic calibrator, Rion WS-10 windshield, microphone, tripod

Weather: Generally warm dry and calm throughout

Results: All results in dB(A) or dB(Z) where indicated

Table A1: Ambient Noise Level Survey

	SUB					MAIN			Octave Bands											Store Time
Data No.	F-weight	T-weight	LAeq	LAmax	LA90	F-weight	T-weight	AP Main	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	16 kHz	
1	A	F	44.8	58.7	39.6	Z	F	72.2	63.9	56.2	47.8	43.4	40.2	38.3	36.1	35.8	40.5	33.4	24.5	25/06/2021 07:30
2	A	F	44.9	54.1	40.0	Z	F	67.9	58.9	55.1	53.2	50.6	44.3	41.8	40.6	37.8	46.6	36.8	23.1	25/06/2021 07:45
3	A	F	44.4	54.5	40.1	Z	F	67.8	58.8	55.6	54.1	51.2	44.6	42.3	40.7	38.1	44.6	35.0	24.4	25/06/2021 08:00
4	A	F	45.2	60.9	39.4	Z	F	70.1	61.8	51.2	45.7	40.0	35.0	37.8	35.6	33.1	40.7	39.8	18.0	25/06/2021 08:15
5	A	F	44.9	57.6	39.8	Z	F	69.7	62.7	54.2	48.3	47.7	45.3	40.9	35.9	34.0	40.5	30.7	22.1	25/06/2021 08:30
6	A	F	44.5	57.8	39.4	Z	F	72.7	63.4	55.4	46.3	37.0	32.5	36.3	33.5	33.1	40.5	30.2	17.4	25/06/2021 08:45
7	A	F	45.0	61.8	39.6	Z	F	71.3	61.9	53.1	46.7	41.0	34.8	40.9	37.0	36.0	40.5	28.7	23.5	25/06/2021 09:00
8	A	F	45.1	65.3	40.2	Z	F	70.5	62.4	53.9	47.7	48.0	46.0	40.7	35.7	33.5	40.1	30.5	19.8	25/06/2021 09:15

Table A2: Results of Train Noise Survey

Date & Time	Type	Noise Levels (dB)		
		L_{Aeq}	SEL	L_{Amax}
25/06/2021 10:10	Domestic Passenger	56.0	66.8	60.2
25/06/2021 10:14	Domestic Passenger	54.5	66.9	57.8
25/06/2021 11:11	Domestic Passenger	58.8	69.6	63.5
25/06/2021 11:14	Domestic Passenger	57.2	69.5	62.4
25/06/2021 12:12	Domestic Passenger	55.3	70.1	57.9
25/06/2021 12:15	Domestic Passenger	57.6	68.5	58.3
25/06/2021 13:10	Domestic Passenger	57.3	69.7	61.2
25/06/2021 13:15	Domestic Passenger	55.3	66.7	59.7
25/06/2021 14:11	Domestic Passenger	54.8	69.4	57.7
25/06/2021 14:13	Domestic Passenger	55.6	66.6	63.2

APPENDIX III – TRAIN NOISE CALCULATIONS

Job No :	**MRL/100/1764.1v1**
Date :	**25/06/2021**

Calculates $L_{Aeq\ (07:00-23:00)}$ and $L_{Aeq\ (23:00-07:00)}$

Distance:	10

Calculate Average SELs			
No.	**Passenger**	**Freight**	**Other**
1	66.8	1.0	1.0
2	66.9		
3	69.6		
4	69.5		
5	70.1		
6	68.5		
7	69.7		
8	66.7		
9	69.4		
10	66.6		
11	0.0		
12	0.0		
13	0.0		
14	0.0		
15	0.0		
16	0.0		
Average	**68.6**	**1.0**	**1.0**

NB: SEL Averages Are Logarithmic

DAY (07:00-23:00)		
	No. Trains	**SEL**
Passenger	44	68.6
Freight	0	1.0
Other	0	1.0
L_{Aeq}	**37.4**	
Category	**A**	

NIGHT (23:00-07:00)		
	No. Trains	**SEL**
Passenger	10	68.6
Freight	0	1.0
Other	0	1.0
L_{Aeq}	**34.0**	
Category	**A**	

APPENDIX IV – DATA USED FOR NO. VEHICLE MOVEMENTS

TRIP RATE for Land Use RESIDENTIAL/HOUSES PRIVATELY OWNED

Calculation Factor: Per Household

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. HHOLDS	Trip Rate	No. Days	Ave. HHOLDS	Trip Rate	No. Days	Ave. HHOLDS	Trip Rate
00:00-01:00	65	181	0.04	65	181	0.02	65	65	0.06
01:00-02:00	65	181	0.01	65	181	0.01	65	65	0.02
02:00-03:00	65	181	0.01	65	181	0.01	65	65	0.02
03:00-04:00	65	181	0.01	65	181	0.01	65	65	0.01
04:00-05:00	65	181	0.01	65	181	0.01	65	65	0.02
05:00-06:00	65	181	0.01	65	181	0.05	65	65	0.06
06:00-07:00	78	204	0.04	78	204	0.13	78	78	0.17
07:00-08:00	116	260	0.10	116	260	0.38	116	116	0.48
08:00-09:00	121	250	0.23	**121**	**250**	**0.54**	121	121	0.77
09:00-10:00	121	250	0.19	121	250	0.25	121	121	0.44
10:00-11:00	121	250	0.16	121	250	0.19	121	121	0.35
11:00-12:00	121	250	0.18	121	250	0.18	121	121	0.36
12:00-13:00	121	250	0.22	121	250	0.18	121	121	0.41
13:00-14:00	121	250	0.21	121	250	0.21	121	121	0.42
14:00-15:00	121	250	0.21	121	250	0.19	121	121	0.40
15:00-16:00	121	250	0.30	121	250	0.23	121	121	0.53
16:00-17:00	121	250	0.35	121	250	0.24	121	121	0.59
17:00-18:00	**121**	**250**	**0.53**	121	250	0.28	**121**	**121**	**0.81**
18:00-19:00	121	250	0.43	121	250	0.30	121	121	0.73
19:00-20:00	78	204	0.37	78	204	0.29	78	78	0.66
20:00-21:00	78	204	0.26	78	204	0.21	78	78	0.47
21:00-22:00	78	204	0.20	78	204	0.14	78	78	0.34
22:00-23:00	65	181	0.16	65	181	0.10	65	65	0.26
23:00-24:00	65	181	0.12	65	181	0.06	65	65	0.18
Daily Trip Rates:			**4.35**			**4.19**			**8.54**