SAGA OFFICE SITE

CHERITON PARC, CHERITON HIGH STREET

FOLKESTONE, KENT CT18 8AN

PROPOSED RESIDENTIAL DEVELOPMENT

RAILWAY NOISE IMPACT ASSESSMENT

Report No. MRL/100/1851.1v1
March 2022

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RAILWAY NOISE IMPACT ASSESSMENT

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CONTENTS

1.0 INTRODUCTION

1.1 MRL Acoustics Limited was commissioned by Mulberry Tree Holdings Ltd to assess the impact of railway noise on a proposed residential development scheme at the former Saga Office site, Cheriton Parc, Cheriton High Street, Folkestone, Kent CT18 8AN.

1.2 The scheme comprises the conversion of a large existing 4-storey commercial office building into self-contained residential units, along with associated car parking spaces, which we understand has already been granted planning permission.

1.3 The former car park and staff amenity area at the rear of the office building is to be a new housing development comprising 43 no. houses, along with associated parking spaces and private amenity areas.

1.4 The assessment has included:-

- Measurements of the typical noise levels of passing trains to the south 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 recommendations are given for acoustic reasons only and compliance with other requirements (e.g. fire protection/structural integrity, etc.) must be checked by other specialist members of the design team.

1.7 The noise survey and report were carried out and prepared by Matthew Lawrence who has over 20 years' experience in the acoustic industry and an MSc and Diploma in Acoustics & Noise Control, and who is a Member of the Institute of Acoustics (IOA). MRL Acoustics Ltd is also a member of the Association of Noise Consultants (ANC).

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

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

2.0 DESCRIPTION OF THE SITE

2.1 The site is located at the former Saga Office site, Cheriton Parc, Cheriton High Street, Folkestone, Kent CT18 8AN. The premise comprises a large existing 4-storey office building with a large car park to the south of the site. To the west is a Holiday Inn Express hotel and to the east are some existing residential properties.

2.2 Cheriton High Street runs directly along the front of the existing office building and approximately 30m to the north of the site is the M20 motorway with the A20 Ashford Road situated just beyond that.

2.3 To the south of the site is the mainline railway between Sandling station and Folkestone West station, approximately 20m distance from the southern site boundary.

2.4 The passing trains were very intermittent with only around 4 no. trains passing the site over any given 1-hour period.

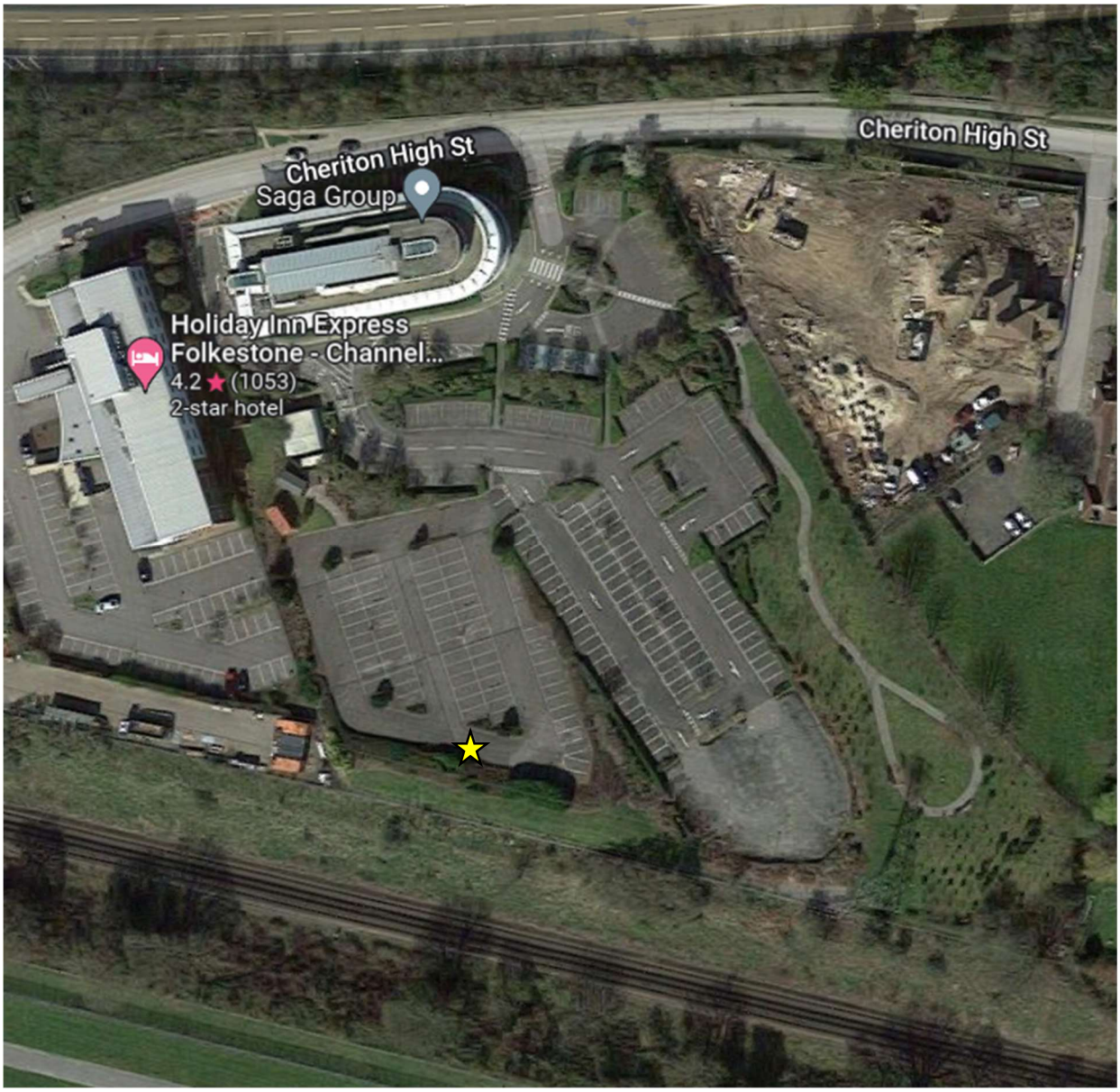
2.5 The actual tracks are located in a deep cutting to such an extent that no passing trains were visible at all at the site. The passing trains were also traveling at fairly slow speeds due to the close proximity of Folkestone West station, located approximately 2 km to the east of the development site.

2.6 The development site layout plan is shown at the end of this report.

3.0 RAILWAY NOISE LEVEL SURVEY

Railway Noise

3.1 A noise level survey of passing trains was carried out at the site on Monday 28th February 2022 between 10:00 hours and 11:30 hours at the location indicated on the site plan below:-



Noise Measurement Location ☆

3.2 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 and was approximately 30m distance from the nearside track.

3.3 For every train pass, a short-term sample of noise was measured to obtain the average 'pass-by' noise level. A total of 6 no. passenger train movements were recorded. The trains generally comprised passenger trains of between 4 – 8 no. carriages from what we could assess from an oral subjective assessment (as the trains were not visible at all from the site).

3.4 During the survey period we did not observe any freight train movements.

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 Details of the equipment used during the noise level survey are shown in Table 1 below. Current calibration certificates for the equipment can be provided if required.

Table 1: 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

3.8 The weather conditions for the survey were generally cold and dry with a light breeze throughout and are shown in Table 2 below:-

Table 2: Weather Conditions During Noise Survey

Date	Temperature (°C)		Wind Speed (m/s)	Wind Direction	Rainfall (mm)	Cloud Cover (%)	Acceptable Conditions
	Day	Night					
28/02/2022	10	-	1.2	SW	0	30	Yes

3.9 The weather conditions were measured on-site using a Kestrel 2000 hand-held weather meter and supported by weather data from the Meteorological Office app 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.

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.

Results

3.11 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.

3.12 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.

3.13 The number of trains passes, N, used in the calculations was 40 no. (daytime) and 6 no. (night-time) for electrically powered passenger trains.

3.14 The results are detailed in Appendix II at the end of this report and are summarised in Table 3 below:-

Table 3: 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 Elevation of Proposed Dwellings Nearest to the Railway Line	36	31

4.0 ASSESSMENT OF RAILWAY NOISE IMPACT

National Planning Policy Framework (NPPF)

4.1 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.

4.2 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."

4.3 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)

4.4 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."

4.5 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."

4.6 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.

4.7 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.

4.8 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.

4.9 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.

4.10 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)

4.11 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.

4.12 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.

4.13 Based on the calculated free-field indicative daytime noise level of 36 dB $L_{Aeq\ (16\text{-}Hour)}$ and the free-field indicative night-time noise level of 31 dB $L_{Aeq\ (8\text{-}Hour)}$, the site can be classified as being of 'Negligible' Risk according to Figure 1 of the ProPG document.

4.14 Figure 1 of the ProPG document and also Figure 2 of the ProPG document indicating the internal noise level guidelines are reproduced on the following pages.

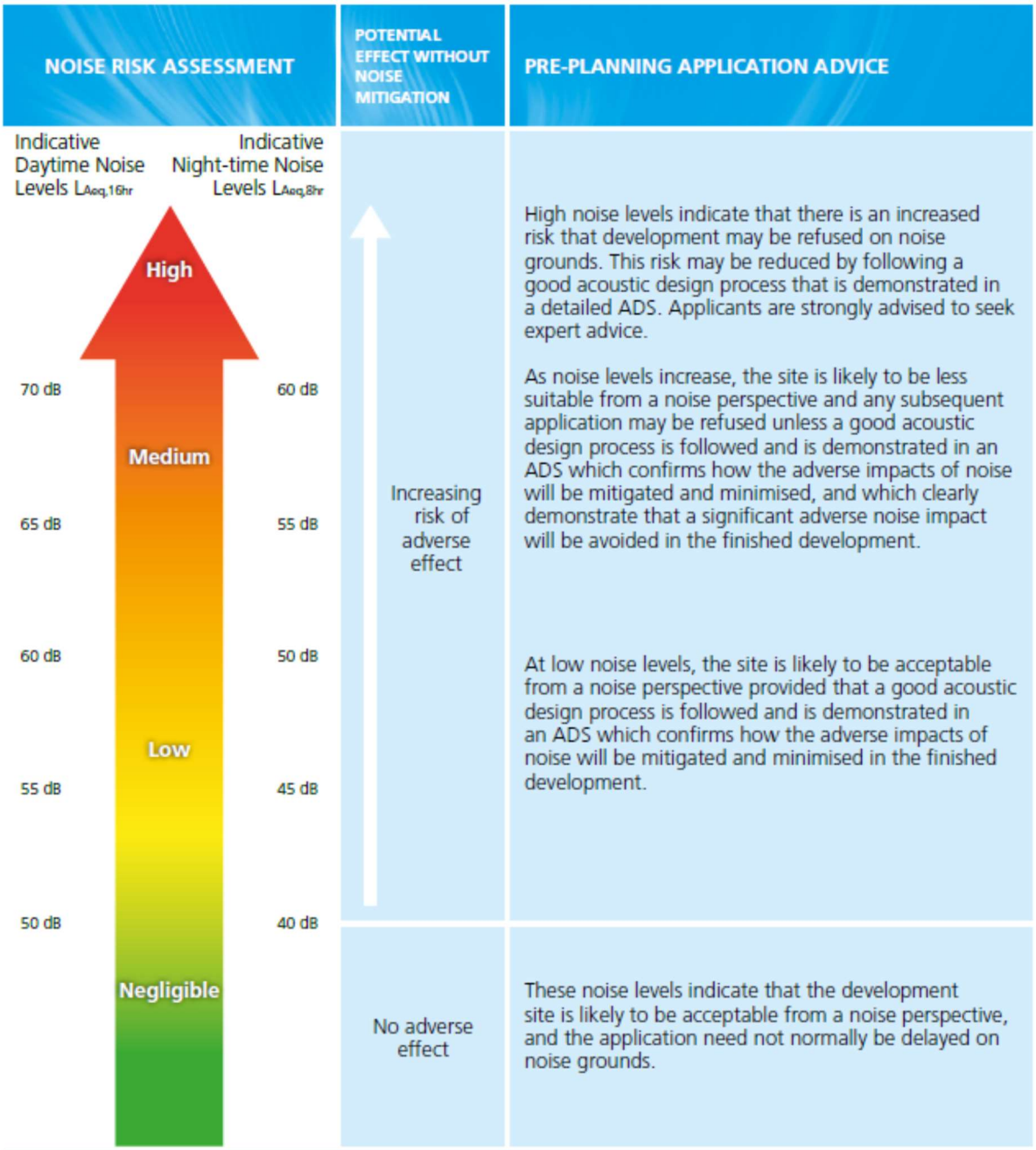


Figure 1 Notes:

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

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

4.15 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 4 below:-

Table 4: 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}
Garden	Desired Limit Not Exceeding 50 dB L_{Aeq} Upper limit of 55 dB L_{Aeq}	

Assessment of Noise Impact

4.16 The results of the noise level survey indicate that at the noise monitoring position at the southern part of the site is exposed to a daytime external noise level of 36 dB L_{Aeq} from passing trains.

4.17 For the night-time period, the site is exposed to an external noise level of 31 dB L_{Aeq} and an average maximum noise level of 58 dB L_{Amax} from passing trains.

4.18 Allowing -13 dB attenuation for an open window, based on the measured daytime noise level of 36 dB L_{Aeq}, the resultant internal noise level within habitable rooms during the daytime will be 23 dB L_{Aeq} (36 dB – 13 dB).

4.19 For the night-time period, allowing -13 dB attenuation for an open window, based on the measured night-time noise level of 31 dB L_{Aeq}, the resultant internal noise level within bedrooms will be 18 dB L_{Aeq} (31 dB – 13 dB).

4.20 Therefore, with windows open, the internal noise limits outlined within BS 8233 : 2014 of 35 dB L_{Aeq} within living rooms and bedrooms and 40 dB L_{Aeq} within dining rooms during the daytime will be achieved.

4.21 At night-time with the windows open the 30 dB L_{Aeq} criteria in bedrooms will also be achieved.

Night-time Maximum Noise Levels

4.22 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."

4.23 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.

4.24 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.

4.25 According to the train timetable data, there are only 6 no. trains in total passing the site during the night-time period, i.e. between 11pm and 7am. The average measured maximum noise level of the passing trains was 58 dB L_{Amax}.

4.26 External maximum noise levels of 58 dB(A) would result in internal maximum levels of around 45 dB(A) with the bedroom windows open, however, as there are only 6 no. trains events at night, the limit of 10 no. maximum noise levels events will not be exceeded and

therefore, for this particular development scheme, the WHO criteria and ProPG guidance limits for L_{Amax} levels at night should be achieved with windows open.

4.27 Therefore, it is considered that no specific scheme of noise mitigation measures is required for the new dwellings due to noise from passing trains.

External Areas

4.28 The general outdoor noise climate due to passing trains at the site is well below the upper external daytime noise limit of 55 dB L_{Aeq} outlined in both BS 8233 and the WHO Guidelines.

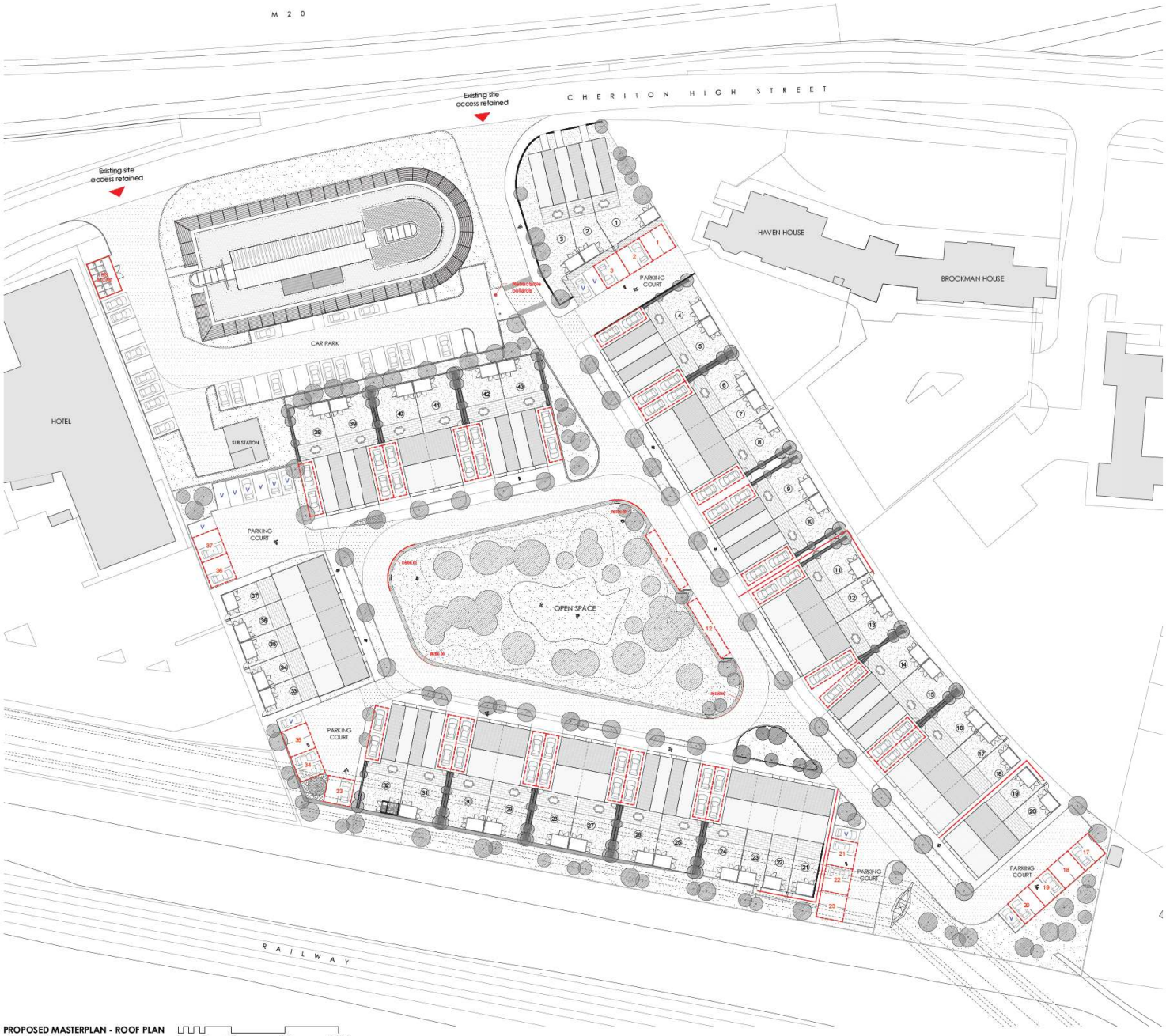
4.29 Therefore, no specific scheme of acoustic screening is required for any rear garden amenity areas.

5.0 SUMMARY AND CONCLUSIONS

5.1 The impact of railway noise has been assessed for the proposed residential development scheme at the Saga Office site, Cheriton Parc, Cheriton High Street, Folkestone, Kent CT18 8AN.

5.2 The results of the noise level survey and assessment indicate that the development site is exposed to low levels of rail noise during both the daytime and the night-time periods.

5.3 In conclusion, it is considered that no additional scheme of noise mitigation measures is required for the new dwellings 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.



PROPOSED MASTERPLAN - ROOF PLAN
SCALE 1:500 @ A2

0 5 10 20 30M

SCHEDULE OF ACCOMMODATION				
PROPOSED HOUSES				
Unit Type	*Unit No.'s*	*Bed No.*	*SQM*	*SQ.FT.*
TopHat C9 - 3T	1-3	4	124	1335
TopHat C5 - 2T - 1	4-5, 9-10, 14-15, 25-26, 31-32, 38-39 & 42-43	3	90	969
TopHat C5 - 3T	6-8 & 11-13	3	90	969
TopHat C9 - 5T	16-20 & 33-37	4	124	1335
TopHat C9 - 4T	21-14	4	124	1335
TopHat C5 - 2T - 2	27-30 & 40-41	3	90	969

CHERITON PARC CONVERSION				
Unit Type	*Unit No.'s*	*Bed No.*	*SQM*	*SQ.FT.*
1B-APT	5, 9, 13, 16, 23 & 26	1	~53	~570
2B-APT	1-4, 6-8, 10-12, 14-15, 17-22, 24-25 & 27-31	2	~72	~775

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Project | CHERITON PARC
HIGH STREET

Client | OLIVER DAVIS HOMES

Title | PROPOSED MASTERPLAN - ROOF PLAN

Status | PLANNING

Scale@A2 | 1:100 **Date** | JAN 22 **Drawn** | RT **Chk'd** | NO

Project Number 21.081
Bim Number

Drawing Number 12

Revision ----

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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.

RT Measured reverberation time in receiver room in seconds.

RT_0 Standard reverberation time of 0.5 seconds.

D Level difference, effectively D = source level - (receiver level corrected for background level).

D_{nT} Standardised level difference, standardised to a receiver room reverberation time of 0.5 seconds, $D_{nT} = D + 10 \log (RT/RT_0)$.

$D_{nT,w}$ Weighted standardised level difference, a single figure generated by comparing the D_{nT} with a reference curve. The reference curve is shifted in 1dB steps until the sum of adverse deviation of the test curve, compared to the reference curve, is as large as possible, but no more than 32.0 dB. The value of the shifted reference curve at 500Hz is taken as the $D_{nT,w}$. N.B. As $D_{nT,w}$ for airborne transmission represents a level difference, an improvement generates a larger figure.

C_{tr} A 'spectrum adaptation term' used to correct the $D_{nT,w}$ in order to reflect low frequency performance of the wall or floor tested.

APPENDIX II – RESULTS OF NOISE LEVEL SURVEY

Date: Monday 28th February 2022

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

Weather: Generally cold and dry with a light breeze throughout

Results: All values in dB(A)

Table A1: Results of Train Passy-By Noise Level Survey

Store Name:	MAN_0100		Index NA-28:														
	SUB					Octave Bands											Store Time
Address	F-weight	T-weight	LAeq	LAmax	SEL	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	56.4	59.7	66.2	70.7	71.5	71.3	60.8	54.4	50.2	50.9	49.1	45.5	37.7	21.9	28/02/2022 10:16
2	A	F	59.5	63.1	69.8	75.5	72.8	70.8	60.8	55	51.3	54.3	54.7	48.3	40.7	19.7	28/02/2022 10:22
3	A	F	57.7	61.4	67.5	69.9	69.2	69.7	59	52.1	48.1	54	51.4	46.5	44.3	19.9	28/02/2022 10:32
4	A	F	56.2	59.4	66.0	70.5	71.3	71.1	60.6	54.2	50	50.7	48.9	45.3	37.5	21.7	28/02/2022 10:44
5	A	F	58.4	62.8	69.4	75.1	72.4	70.4	60.4	54.6	50.9	53.9	54.3	47.9	40.3	19.3	28/02/2022 11:17
6	A	F	57.3	60.3	67.2	69.4	68.7	69.2	58.5	51.6	47.6	53.5	50.9	46	43.8	19.4	28/02/2022 11:24
Average Level			57.7	57.6	61.1												

Job No :	MRL/100/1851.1v1
Date :	28/02/2022

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

Distance:	15

Calculate Average SELs			
No.	Passenger	Freight	Other
1	66.2	1.0	1.0
2	69.8		
3	67.5		
4	66.0		
5	69.4		
6	67.2		
7	0.0		
8	0.0		
9	0.0		
10	0.0		
11	0.0		
12	0.0		
13	0.0		
14	0.0		
15	0.0		
16	0.0		
Average	67.9	1.0	1.0

NB: SEL Averages Are Logarithmic

DAY (07:00-23:00)		
	No. Trains	SEL
Passenger	40	67.9
Freight	0	1.0
Other	0	1.0
L_{Aeq}	36.4	
Category	A	

NIGHT (23:00-07:00)		
	No. Trains	SEL
Passenger	6	67.9
Freight	0	1.0
Other	0	1.0
L_{Aeq}	31.1	
Category	A	