Hertfordshire County Council

Land to the rear of Filbert Close, Hatfield, Hertfordshire

Noise Assessment

297166-01(02)

AUGUST 2019

RSK GENERAL NOTES

Project No.: 297166-01(02)

Title: Land to the rear of Filbert Close, Hertfordshire – Noise Assessment

Client: Hertfordshire County Council

Date: 23 August 2019

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Status: FINAL

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1 INTRODUCTION

1.1 Instruction

RSK Environment Ltd has been instructed by Hertfordshire County Council (the applicant) to undertake a noise assessment for a proposed residential led development on land to the rear of Filbert Close, Hatfield (Hertfordshire).

The applicant is seeking outline planning permission for a residential development including communal and private amenity space on the site of the former Hazel Grove School playing field, together with the adjoining land owned by Hertfordshire County Council (HCC) to the south west.

This report describes the assessment methodology, the baseline conditions prevailing across the application site and the effect of the noise levels on the proposed residential development.

Mitigation measures have been identified where necessary and practicable to achieve appropriate acoustic standards.

1.2 Objectives

The noise assessment is required to:

- Identify sources of noise that may impact upon the residents of the proposed development;
- Quantify and report the noise climate across the site to determine the suitability of the site for the proposed residential use;
- Specify the level of noise mitigation that would be required to reduce the potential for disturbance at future sensitive receptors; and
- Inform the architect design and suggest any appropriate mitigation measures.

1.3 Exclusions

Traffic movements from the development are expected to be minimal in relation to the current traffic composition and significantly below the required level to affect nearby receptors. The potential for noise impacts as a result of traffic movements associated with the development would therefore be negligible (in accordance with The Design Manual for Roads and Bridges (DMRB)) and has been discounted for the purposes of this assessment.

Levels of vibration from typical free-flowing traffic would be imperceptible at nearest proposed residential locations and therefore an assessment of traffic induced vibration has been discounted.

2 REGULATORY FRAMEWORK

2.1 National Planning Policy Framework (NPPF): 2019

The National Planning Policy Framework (NPPF) (published March 2012 & updated February 2019) is the means by which noise is considered within the planning regime. The NPPF does not contain assessment design target, instead providing a series of policies, giving local authorities the flexibility in meeting the needs of local communities. The NPPF states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by […] 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."

"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."*

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

The suitability of internal noise levels within a development for its intended uses can be determined with reference to BS8233.

2.2 Noise Policy Statement for England (NPSE): 2010

The Noise Policy Statement for England is published by the Department for Environment, Food and Rural Affairs (Defra) and sets out the approach to noise within the Government's sustainable development strategy.

The significance of impacts from noise within the NPSE are defined as follows:

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

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.*

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

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

The three aims of the NPSE are stated as:

- *Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

2.3 National Planning Practice Guidance (NPPG): 2014

The National Planning Practice Guidance (NPPG) is written in support of the NPPF and provides an increased level of specific planning guidance. NPPG states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. NPPG also states that, where practicable, there may be opportunities to consider improvements to the acoustic environment and that noise can over-ride other planning concerns but should not be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development. NPPG reflects the overall aim of NPSE and expands on many of its concepts, in particular NOEL, LOAEL and SOAEL.

2.4 BS 7445-1:2003 'Description and measurement of environmental noise. Guide to quantities and procedures'

The three-part standard BS 7445 provides the framework within which environmental noise should be quantified. Part 1 provides a guide to quantities and procedures and Part 2 provides a guide to the acquisition of data pertinent to land use. Part 3 provides a guide to the application of noise limits.

BS 7445 also refers to a further standard, BS EN 61672, which prescribes the equipment necessary for such measurements. Whilst BS 7445 does not prescribe the meteorological conditions under which noise measurements should or should not be taken, it does (part 2, paragraph 5.4.3.3) recommend that in order

> *"…to facilitate the comparison of results (measurements of noise from different sources), it may be necessary to carry out measurements under selected*

meteorological conditions which are reproducible and correspond to quite stable propagation conditions."

These conditions include:

- wind speed not exceeding 5 m/s (measured at a height of 3 to 11 m above the ground);
- no strong temperature inversions near the ground; and
- no heavy precipitation.

2.5 BS 8233: 2014 'Guidance on sound insulation and noise reduction for buildings'

British Standard (BS) 8233 establishes internal ambient noise levels for dwellings based upon occupancy patterns and derived from World Health Organisation (WHO) guidelines for community noise. These are summarised below:

Table 2.1 Summary of Internal Ambient Noise Levels

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16h}$	---
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	---
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

BS8233 also provides design targets for external noise; 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 centres 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."

2.6 World Health Organisation Environmental Noise Guidelines for the European Region

Periodically the World Health Organisation (WHO) sponsors expert reviews of published research in order to develop noise exposure guidelines in order to support member states in the Proposed Scheme of their own targets and limits in the interests of public health.

In the WHO Night Noise Guidelines (NNG - 2009) a level of 40 dB L_{night} (an annualised average over all nights) outdoors is said to be 'equivalent to the LOAEL for night noise'. The information used to support the WHO Guidelines for Community Noise 1999 indicated that daytime sound levels of less than 50 dB L_{Aeq} cause little or no serious annoyance in the community. The WHO Guidelines for Community Noise also identified 60 dB L_{AFMax} outside as the guideline value for sleep disturbance with windows open when such a level occurs more than 10-15 times per night.

As reported in the NNG a number of European countries set a noise limit for traffic noise affecting new residential proposed schemes that range from 40 to 62 dB L_{night} outside. This may well reflect how enforcement might take place in the different countries but also highlights the difficulty in reconciling the evidence-based guidelines with other factors taken into consideration by policy makers at a national level.

The Environmental Noise Guidelines for the European Region 2018 published by the WHO regional office for Europe provides recommended maximum noise levels for noise from specific sources in terms of L_{den} and L_{night} for roads, railways, aircraft, wind turbines and leisure. In doing so it has built on the END 2002 by using these parameters as respectively the indicators of annoyance and sleep disturbance.

For average noise exposure, the most recent guidelines recommend reducing noise levels produced by road traffic below 53 dB L_{den}, as road traffic noise above this level is associated with adverse health effects. For night noise exposure, it is recommended not to exceed 45 dB L_{night}, as road traffic noise above this level is associated with adverse effects on sleep.

2.7 International Standard ISO 9613:1996 - Acoustics – Attenuation of sound during propagation outdoors

International Standard: ISO 9613-2: 1996: '*Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation*' provides a prediction methodology which is suitable for a wide range of engineering applications where external noise propagation is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect;
- Reflection from surfaces; and
- Screening by obstacles.

The method predicts noise levels under metrological conditions favourable to propagation from the sound source to the receiver, such as downwind conditions, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night.

2.8 Professional Practice guidance on Planning and Noise (ProPG): 2017

The Professional Practice Guidance on Planning and Noise is written to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The CIEH, IOA and the ANC have worked together to produce the guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. This Professional Practice Guidance is based on the best knowledge available at the time of publication. It does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate.

In relation with achieving internal noise values with open windows ProPG states that:

“*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”.*

Acoustic Design

ProPG encourages the use of acoustic design as a means to inform the site masterplans and is key to avoiding or reducing to a minimum any adverse effects on any sensitive internal or external spaces. In considering acoustic design, consideration should be given by the developer to the management of noise through a hierarchy of potential mitigation measures which may include:

- Maximising the separation distance between source and receiver;
- Incorporate noise barriers (where applicable) to screen the development site (or individual plots) from significant sources of noise;
- Use existing features to reduce noise propagation across the site;
- Orientate the buildings in a manner which reduces the noise levels within habitable rooms (particularly bedrooms);
- Building envelope design to mitigate the noise to acceptable levels, whilst providing adequate ventilation.

2.9 Calculation of Road Traffic Noise, 1988

The Calculation of Road Traffic Noise (CRTN) describes the procedures for calculating noise from Road traffic. The memorandum uses traffic flows, %HGV’s and Road speed, amongst other parameters to calculate the noise level in terms of the $L_{A10,\ 18hr}$. The 18-hour period is defined between 06:00 and 00:00.

CRTN also allows provision for a shortened measurement procedure which is equally appropriate for the calculation of road traffic noise. The procedure involves obtaining traffic noise measurements throughout a representative sample period within any three consecutive hours between 10:00 and 17:00. In order to calculate an equivalent daytime noise ($L_{Aeq,\ 16hrs}$), the correction of $L_{A10,\ 3hrs}$ – 3 dB would be applied.

The 2006 DEFRA update to CRTN, ‘*Method For Converting The UK Road Traffic Noise Index $L_{A10,18h}$ To The EU Noise Indices For Road Noise Mapping*’, is a guide for converting the calculated $L_{A10,\ 18hour}$ value into L_{day}, $L_{evening}$ and L_{night} values and subsequently calculating an $L_{Aeq,\ 8hour}$ for the site, using the following formulae:

Table 2.3 Conversion calculations

No.	Non-motorway roads	No.	Motorways
2	L_{day} = 0.95 x $L_{A10,18h}$ + 1.44 dB	5	L_{day} = 0.98 x $L_{A10,18h}$ + 0.09 dB
3	$L_{evening}$ = 0.97 x $L_{A10,18h}$ – 2.87 dB	6	$L_{evening}$ = 0.89 x $L_{A10,18h}$ + 5.08 dB
4	L_{night} = 0.90 x $L_{A10,18h}$ – 3.77 dB	7	L_{night} = 0.87 x $L_{A10,18h}$ + 4.24 dB
8	$L_{Aeq,\ 16h} = 10Log_{10}$ [1/16] (12 x $10^{Lday/10}$ + 4 x $10^{Levening/10}$)		

2.10 Local Authority Consultation

Consultation was sought via email with the officer David Elmore (Senior Development Management) at Welwyn Hatfield Borough Council on 29th May 2018 as part of the initial submission. No formal response was received to the RSK's noise monitoring and assessment methodology however, it is acknowledged from previous communications between the planning consultant and Local Authority, whether the siting of the dwellings and their gardens from the motorway in particular could be acceptable from a noise perspective.

Given the size of the site and based on experience of similar projects, the number and length of the proposed monitoring strategy described in Section 4, is considered suitable for the purposes of this assessment.

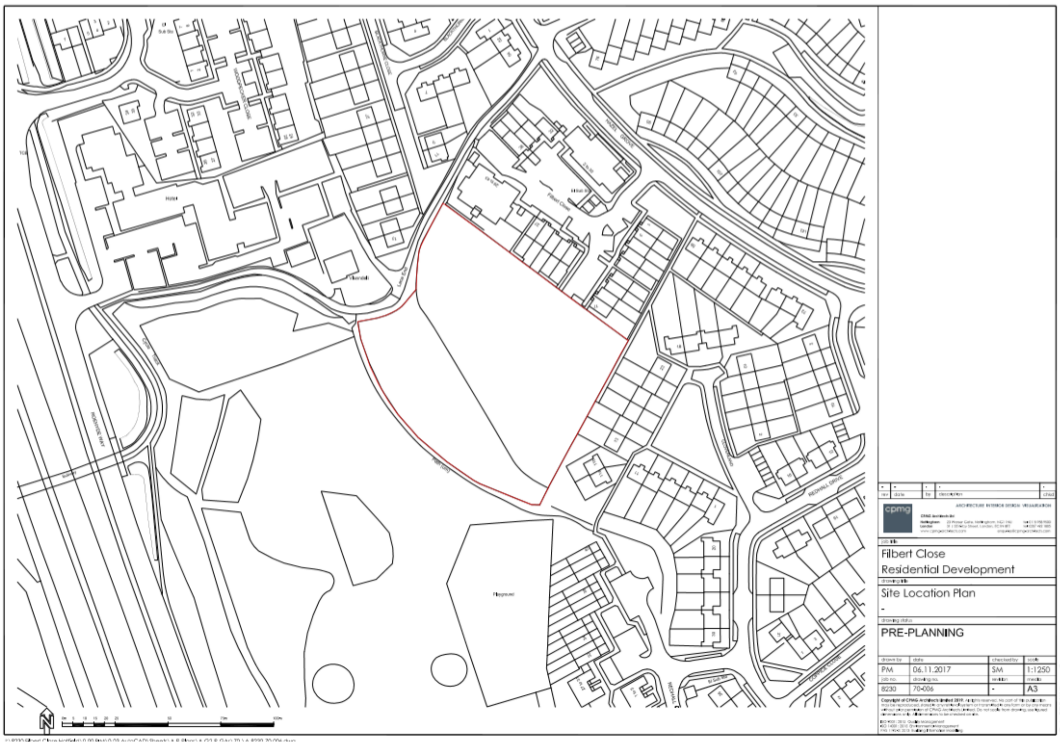
3 DEVELOPMENT LOCATION

3.1 Site Location and Description

The site is located in a predominantly residential area, around 500 metres south-west of the amenities available at the High View Large Neighbourhood Centre located off Bishops Rise. Major infrastructure links such as the A1(M) motorway and South Way road are situated approximately 160 metres to the west and 430 metres to the south of the site respectively.

The terrain within the development site is mostly flat with almost no inclination or sloping.

Figure 3.1 Site Location Map (*Drawing no. 70-006, dated 06.11.2017*)



3.2 Proposed Development

The proposed scheme comprises of approximately 39 new residential units in the form of 1 to 2 bed flats and 2 to 4 bed houses with parking and private amenity space comprising a total area of 0.94 ha.

Figure 3.2 Site Location Map (*Drawing no. 70-008, dated 17.08.2018*)

3.3 Existing Sensitive Receptors

The closest sensitive receptors to the proposed development site are situated adjacent to its north-western boundary along Lane End, the north-eastern boundary along Filbert Close and Hazel Grove and along Cloverland and Redhall Drive to the south-east.

4 NOISE MEASUREMENT METHOD

4.1 Survey Measurement Details

A baseline noise survey was undertaken between 15 and 19 June 2018. Two unattended measurements were undertaken over a 96-hour period along the external boundaries of the site. These locations were chosen as they provide a good representation of the noise levels spatially distributed across the site as a result of the dominant traffic noise sources identified in the area, namely A1(M) to the south-west, along with local network to its north-east providing access to the site.

Three additional short-term measurements were undertaken during daytime hours at positions within the site to characterise the sound attenuation in free field conditions and to inform the computer noise modelling. Monitoring positions are illustrated in **Figure 4.1**:

Figure 4.1 Monitoring Locations

4.2 Survey Equipment

Noise monitoring was undertaken using the following equipment:

Table 4.1 Monitoring Equipment

Equipment	Type	Serial number	Calibration date
Class 1 Sound Level Meter	Rion NL-52	00453833	28/04/2017
		00453834	07/10/2016
	Rion NL-32	00503253	20/10/2016

Equipment	Type	Serial number	Calibration date
Acoustic Calibrator	Rion NC-74	34167506	29/11/2017

All measurements were undertaken in free field conditions with the microphone positioned away from reflecting surfaces and at 1.5 m above the ground height to the requirements of BS 7445.

The calibration of each sound level meter was checked before and after the measurements, using the acoustic calibrator at 94 dB at 1 kHz; no significant calibration drift (less than 0.2 dB) was noted.

The sound level meters used conform to the requirements of *BS EN 61672-1: 2013 Electroacoustics. Sound level meter, Specifications*. The calibrator used conforms to the requirements of *BS EN 60942: 2018 Electroacoustics, Sound calibrators*. The equipment used has a calibration history that is traceable to a certified calibration institution.

4.3 Noise Environment

The noise environment was dominated by consistent road traffic from the A1(M) and A1001 (Roehyde Way) from the west of the site. Occasional road traffic noise from the local traffic network, including Hazel Grove and Bishops Rise was also noted during the survey.

As the site is largely surrounded by existing residential dwellings, it was noted during the site visits that there was audible neighbour and domestic noise. The use of mowing equipment and electric power tools, plus the opening/closing of doors and children playing also formed part of the ambient noise environment on occasion within the development site. Other sources noted during attendance were occasional aircraft movements and bird song during lulls in the residual noise climate.

4.4 Weather Conditions

Weather conditions during the monitoring were noted at the beginning of the survey and during collection of the equipment as being dry and sunny, with no discernible winds. Representative weather conditions have been obtained from Wunderground (www.wunderground.com), with the nearest weather station situated in Old Hatfield (IHATFIEL11), 2.54 km north-west of the site. The main weather variables are summarised in **Table 4.2**.

Table 4.2 Weather Data

Date	Temp / °C		Wind Speed / ms^{-1}	Dominant Wind Direction	Precipitation (mm)
	Mean	Max	Mean		
15 June 2018	16.7	24.6	0.5	NW	0.0
16 June 2018	17.2	21	0.83	SW	0.0
17 June 2018	16.1	20.8	1.1	W, SW	0.0
18 June 2018	20.5	27.1	1.1	W, NW	0.0
19 June 2018	19.3	21.8	0.83	NW	0.0

Weather conditions noted above are considered suitable for the monitoring period.

5 NOISE MEASUREMENT RESULTS

Noise monitoring was undertaken at strategic positions across the development site based on the primary noise sources in relation with the site layout. Monitoring encompassed both short and long term measurements to quantify the noise environment, particularly the contribution from the main road links.

5.1 Long Term Monitoring

Noise levels measured at locations L1 (north-east boundary facing Filbert Close) and L2 (west boundary facing the playing fields are summarised in terms of overall day-time and night-time levels and presented in **Tables 5.1 - 5.2**. The values are rounded up to the nearest whole number.

Table 5.1 Long Term Noise Monitoring Results – Location L1

Location L1 – North-east Boundary (facing Filbert Close)							
Date	Time period	Start Time	Duration (hr:min)	$L_{Aeq, T}$ dB	$L_{AFmax, T}$ dB*	$L_{A90, T}$ dB	$L_{A10, T}$ dB
Friday 15 June 2018	Day	13:43	09:30	61	100	55	60
	Night	23:13	08:00	53	79	48	54
Saturday 16 June 2018	Day	07:13	16:00	59	88	57	61
	Night	23:13	08:00	52	70	46	54
Sunday 17 June 2018	Day	07:13	16:00	61	102	57	62
	Night	23:13	08:00	57	70	49	56
Monday 18 June 2018	Day	07:13	16:00	61	92	58	62
	Night	23:13	08:00	55	71	49	57
Tuesday 19 June 2018	Day	07:13	06:15	60	100	56	60
	Night	--	--	--	--	--	--
Resultant Daytime Noise Level				**61**	**102**	**56**	**61**
Resultant Night Time Noise Level				**54**	**79**	**48**	**55**

**Maximum noise level during assessment period*

Table 5.2 Long Term Noise Monitoring Results – Location L2

Location L2 – West Boundary (facing playing fields)							
Date	Time period	Start Time	Duration (hr:min)	$L_{Aeq, T}$ dB	$L_{AFmax, T}$ dB*	$L_{A90, T}$ dB	$L_{A10, T}$ dB
Friday 15 June 2018	Day	13:23	09:45	57	94	54	58
	Night	23:08	08:00	52	70	47	54
Saturday 16 June 2018	Day	07:08	16:00	60	85	57	61
	Night	23:08	08:00	52	71	45	54
Sunday 17 June 2018	Day	07:08	16:00	60	83	57	62
	Night	23:08	08:00	56	71	48	56
Monday 18 June 2018	Day	07:08	16:00	60	86	57	62
	Night	23:08	08:00	54	83	48	56

Location L2 – West Boundary (facing playing fields)							
Date	**Time period**	**Start Time**	**Duration (hr:min)**	**$L_{Aeq,T}$ dB**	**$L_{AFmax,T}$ dB***	**$L_{A90,T}$ dB**	**$L_{A10,T}$ dB**
Tuesday 19 June 2018	Day	07:08	06:30	59	78	56	60
	Night	--	--	--	--	--	--
Resultant Daytime Noise Level				**59**	**94**	**56**	**61**
Resultant Night Time Noise Level				**54**	**83**	**47**	**55**

**Maximum noise level during assessment period*

The highest averaged noise level obtained during the daytime period was 61 $L_{Aeq,T}$ dB at location L1, closest to Filbert Close. Such a level is 2 dB(A) higher than the measured values to the west of the site (location L2) for the same time period. Averaged measured noise levels for the night time period were 54 dB(A) $L_{Aeq,T}$ dB at both locations.

Other parameters such as the statistical parameters L_{10} (typically associated with road traffic noise) and L_{90} (used to describe background noise) indicate minimal variation between the two monitoring positions.

5.2 Short-Term Monitoring

Noise levels measured at locations S1, S2 and S3 during the short-term attended measurements are summarised in **Table 5.3** below (rounded up to the nearest whole number).

Table 5.3 Short-Term Noise Monitoring Results

Location	Date	Start Time	Duration (hr:min)	$L_{Aeq,T}$ dB	$L_{AFmax,T}$ dB*	$L_{A90,T}$ dB	$L_{A10,T}$ dB
S1	15.06.18	11:36	01:26	55	69	53	57
S2	15.06.18	11:57	01:09	57	67	56	59
S3	15.06.18	11:39	01:21	57	67	55	58

Measured noise levels show a maximum difference of 2 dB(A) between the three measurements taken across the site, with the lowest measured values being obtained at the monitored position facing Cloverland Road (S1). Road traffic noise was observed to be the dominant and stable audible noise source during the attended monitoring.

One additional short-term 3-hour measurement was undertaken along South Way Road, to the south of the site following the shortened method in CRTN to obtain representative noise emissions from the road to feed the noise model. The noise meter was situated at 4 metres from the edge of the road surface.

A summary of the measured noise level is presented in **Table 5.4** along with the calculation of long term daytime and night time parameters.

Table 5.4 CRTN Short Term Noise Measurement - South Way Road

Location	Date	Start Time	Duration (hr:min)	$L_{Aeq,T}$ dB	$L_{AFmax,T}$ dB*	$L_{A90,T}$ dB	$L_{A10,T}$ dB
S4	19.06.18	14:00	03:00	76	92	58	80

5.3 Maximum Event Levels

A detailed appraisal of the night-time event levels has been undertaken to establish the 10th highest event level, in line with the most conservative interpretation of the WHO guidelines, which occurred on each night of the survey for assessment purposes. The appraisal has been undertaken by plotting the data obtained at measurement positions L1 – L2 over the night-time periods, from which individual noise events have been derived.

Analysis of the data set has been included within the noise model for calibration purposes, to inform potential maximum noise levels at development plots and apartments.

Table 5.5 Maximum Noise Level Data Analysis

Night Period Commencing	10-th Highest L_{max} Night-Time 23.00-07.00	
	L1 – North-east Boundary	L2 – West Boundary
15/06/2018	62	**65**
16/06/2018	63	63
17/06/2018	**65**	64
18/06/2018	**65**	64
Adopted representative Lmax value for assessment purposes Based on the analysis of $L_{max,15min}$ samples		

6 NOISE MODELLING

A computer noise model of the site has been constructed using SoundPLAN (v8.1) noise prediction software. The baseline noise model is calibrated to the measured noise levels during the day and night time periods considering the dominant, long term and stable sources observed during the survey. The model has been set up with the following parameters.

Table 6.1 Modelling Parameters

Item	Setting
Algorithms	Calculation of Road Traffic Noise (CRTN)
Ground Absorption	Hard, acoustically reflective ground (0.25 coefficient) – Roads Acoustically soft (assumed 0.75 coefficient) – grass or vegetated areas
Met Conditions	10 degrees Celsius 70% humidity Wind from source to receiver
Receptor Height	Ground Floor 1.5m above ground First Floor 4m above ground
Source Modelling	External noise sources, such as road traffic have been treated as line sources. Noise from road traffic sources was deemed as being the dominant source affecting the proposed development site; modelling is therefore based on this source only (motorway and non-motorway surrounding roads). Existing buildings and structures identified modelled as structures.
Traffic Information	Individual road traffic noise levels calculated from measured noise data.
Terrain	OS terrain data (2m contours) has been included within the model.
Site Layout	Illustrative Layout by CPMG Architects Ref. 70-008, dated 17/08/2018
Uncertainty	Model validation based on long term and attended noise data collected during the survey. Domestic noise or other random noisy events are not included in the calculations.

6.1 Validation of Model

The model has been validated against the measured noise levels. Differences between measured and predicted levels are presented in **Table 6.2** (rounded up to the nearest whole number).

Table 6.2 Noise Model Validation

Location	Measured level, $L_{Aeq, T}$ dB		Predicted Level, $L_{Aeq, T}$ dB		Difference, dB	
	Day	Night	Day	Night	Day	Night
L1	61	54	57	51	4	3
L2	59	54	60	54	1	0

Location	Measured level, $L_{Aeq, T}$ dB		Predicted Level, $L_{Aeq, T}$ dB		Difference, dB	
	Day	Night	Day	Night	Day	Night
S4	77	67	77	67	0	0

The model provides a good level of calibration at those locations highly influenced by stable road traffic noise, such as L2 and S4. Even though a reduction of approximately 2 dB(A) was expected at L1 (in relation to L2) due to simple distance attenuation from the A1(M) emissions, it should be noted that the influence of sporadic and unpredictable local noisy events around the existing residential areas (including the use of mowing equipment and electric power tools, plus the opening/closing of doors and children playing) has increased the measured daytime and night time levels at L1.

All efforts have been made to keep the uncertainty of the modelled noise sources to a minimum based on the monitoring strategy adopted. Whilst the discrepancies between the predicted noise levels and the measured values at all positions cannot be avoided, it is still considered that the noise model provides a high degree of accuracy for those stable and predictable noise sources deemed to influence the development site.

The output of the noise model will be used in conjunction with the results of the long-term noise measurements to inform the assessment of the site constraints, allowing for a conservative scenario.

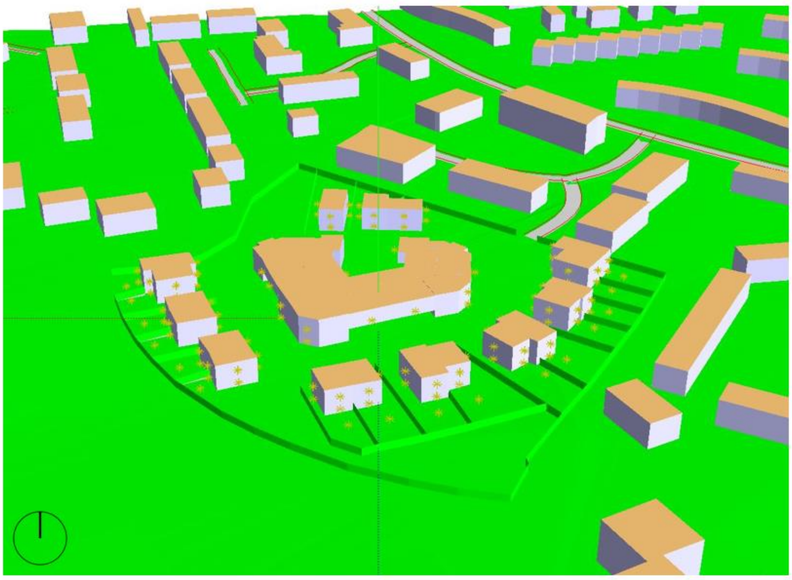
6.2 Predicted Noise Levels

Noise predictions have been undertaken at a number of building plot locations (at ground and first floor level) based on the site plan provided by the Client.

Calibration of the noise model against the daytime (16hr) and night-time (8hr) averaged levels has been achieved in order to provide assessment against the relevant design target.

A screenshot showing an overview of the modelling undertaken on SoundPLAN is provided in **Figure 6.1.**

Figure 6.1 3D Model View



6.3 Maximum Noise Levels

An assessment of the maximum noise levels projected at each proposed dwelling has been undertaken taking into consideration the maximum 10th highest individual night maximum (L_{max}) events analysed during the night-time dataset in accordance with WHO guidelines.

The assessment considered the analysis of the data measured between 23:00-07:00 at each of the two long term monitoring positions to obtain a true maximum noise level, in order to identify individual events. The noise modelling considers the following sources:

- Pass-by road traffic events along A1001 and Filbert Close roads.

6.4 Design Targets for Residential Development

For the purposes of this assessment, the acoustic design target presented in **Table 6.3** have been adopted. The design targets are based on the requirements of the appropriate guidelines for residential development.

Table 6.3 Noise Design target for Residential Use

Condition	Criterion
Internal ambient daytime noise levels within dining rooms/areas (BS 8233)	40 dB $L_{Aeq,16hrs}$
Internal ambient noise levels within bedrooms at night (BS 8233)	30 dB $L_{Aeq,8hrs}$
Internal individual event levels within bedrooms during the night (>10 occurrences - ProPG)	45 dB L_{AFmax}
Noise levels within external amenity areas associated with the proposed dwellings* (BS 8233)	50 to 55 dB $L_{Aeq,16hrs}$
** 50 dB $L_{Aeq,T}$ is the desirable threshold level, 55 dB $L_{Aeq,T}$ is the upper guideline level. However, these guideline values may not achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels.*	

7 SITE SUITABILITY ASSESSMENT

7.1 Predicted Noise Levels

Table 7.1 summarises the predicted noise levels across the proposed development site at individual plot locations. The receptors included in the noise model and provided in the table below detail the predicted noise level at receptor heights of 1.5 metres and 4.5 metres, indicative of ground and first floor level. The predicted façade levels are the highest levels per plot location and are indicative of those facades facing the dominant noise sources.

An assessment of the maximum noise levels projected at the nearest indicative building line has also been undertaken considering the 10th highest individual night maximum (L_{max}) events in accordance with WHO guidelines. The existing noise model has been adopted by calibration of the measured maximum levels to inform likely night-time levels at indicative property locations.

Daytime (07:00 – 23:0) and night-time (23:00 – 07:00) noise contour maps and the locations of the assessment receptors are provided in **Appendices 1 and 2**.

Table 7.1 Predicted Highest Façade Noise Levels

ID.	Daytime / $L_{Aeq,16hr}$ dB	Night-time / $L_{Aeq,8hr}$ dB	Night-time / L_{max} dB	Mitigation provided by building envelope*
	Ground floor	First floor	First floor	
Plot 01	53	51	63	21
Plot 02	52	50	61	20
Plot 03	52	51	63	21
Plot 04	53	51	63	21
Plot 05	54	53	65	23
Plot 06	56	54	65	24
Plot 07	55	54	65	24
Plot 08	58	55	66	25
Plot 09	57	55	66	25
Plot 10	59	56	68	26
Plot 11	59	57	69	27
Plot 12	59	57	69	27
Plot 13	60	57	69	27
Plot 14	59	57	69	27
Plot 15	60	57	69	27
Plot 16	59	57	69	27
Plot 17	54	52	63	22
Plot 18	54	52	62	22
Plot 19	54	51	62	21
Apt 01	48	41	56	13

ID.	Daytime / $L_{Aeq,16hr}$ dB	Night-time / $L_{Aeq,8hr}$ dB	Night-time / L_{max} dB	Mitigation provided by building envelope*
	Ground floor	First floor	First floor	
Apt 02	54	49	58	19
Apt 03	57	52	63	22
Apt 04	56	51	62	21
Apt 05	55	49	61	20
Apt 06	52	46	58	17
Apt 07	53	47	59	18
Apt 08	53	46	59	18
Apt 09	55	49	60	20
Apt 10	57	52	62	22
Apt 11	56	51	62	21
Apt 12	57	52	63	22
Apt 13	59	54	66	24
Apt 14	59	53	64	24
Apt 15	59	54	65	24
Apt 16	59	54	64	24
Apt 17	58	52	63	23
Apt 18	55	49	60	20
Apt 19	52	46	56	17
Apt 20	53	47	58	18

** Based on simple level difference i.e façade prediction minus design target. BS8233 Daytime design target at ground floor, night-time design target at first floor for 2-storey plots. Daytime and night-time noise levels upon apartments apply at ground floor or first floor only, according to the site layout. Mitigation values take into account the higher of either L_{eq} or L_{max} predictions against the respective design targets.*

Based on the predictions Table 7.1, the level of mitigation required by the building envelope to adhere to the design targets in BS 8233/WHO is provided. The highest predictions across the development site are understandably along the south-western portion of the site, at closest distances to the A1(M) and A1001. Plots 11 to 16 require the highest level of mitigation at 27 dB due to its position facing to the motorway.

Plots situated to the north of the site facing Filbert Close can afford a lower level of façade treatment of 22 dB; this is primarily the result of the increased distance to the A1(M).

7.2 Internal Noise Levels

Façade Treatments

On the basis that a partially open window typically provides up to 15 dB of attenuation (BS 8233), it is apparent that the predicted noise levels will result in an exceedance of the recommended internal acoustic design target during a situation in which windows are partially open for ventilation purposes.

To ensure an appropriate internal acoustic standard within the proposed residential properties during normal conditions (non-overheating), the acoustic specifications set out in Table 7.2 are recommended for occupied bedrooms at first floor level. The values in the table represent the highest level of attenuation afforded by the building envelope at each residential plot. Understandably, treatments at those façades facing away from the dominant noise source can afford a lower level of specification.

Specifications are based on a standard spectrum for road traffic noise and internal layout for bedrooms (i.e facade area = 25m^2, window area = 3m^2, room volume = 35m^3).

Table 7.2 Initial Façade Treatment Recommendations

Mitigation required	Element	Maximum Acoustic requirement for façade	
		First floor (1)	Type
<30 dB	Window	32 $R_W + C_{tr}$	6/14/6
	Ventilation	33 $D_{ne,W} + C_{tr}$	Greenwood 5000EA vent
<25 dB	Window	26 $R_W + C_{tr}$	4/16/4
	Ventilation	29 $D_{ne,W} + C_{tr}$	Greenwood 8000HA (6400mm EA)

(1) First floor is based on a typical bedroom.

It should be noted that the acoustic performance requirements set out in Table 7.2 are readily available via a number of different specifications. Notwithstanding this, the acoustic performance requirements will be confirmed once the internal layouts are finalised.

Overheating

When considering an overheating scenario, open windows should not be relied upon to control internal temperatures in instances where the external daytime and/or night-time noise levels exceed the relevant design targets. This has the potential to affect a number of the proposed dwellings and therefore supplementary ventilation or comfort cooling may be required. It is recommended that the specific ventilation requirements for addressing overheating should adhere to the outcomes of both this acoustic report and any supplementary feasibility report to ensure internal conditions are suitable for resident occupation.

It should be noted that the proposed mitigation should not inhibit the choice for occupiers to open windows should they wish. Section 8.4.5.4 of BS 8233 clearly states this fact:

"*The Building Regulations' supporting documents on ventilation… 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."*

7.3 External Amenity Noise Levels

It is expected that the proposed development includes provision for outdoor amenity areas associated with the residential buildings in the form of gardens. Under such circumstances and considering the inclusion of a 2.5 metres height fence along the south-west boundary facing the motorway together, plus a standard 1.8 metre height fence which partitions individual plot locations, it is likely that noise levels would be below the upper design target threshold of 55 dB(A) as prescribed in BS 8233: 2014. This is supported by predicted noise levels at those most exposed amenity/garden areas of plots 10 to 16.

It is recommended that the standard type specification for any such timber fencing should include;

- A superficial timber mass of at least 10 - 15 kg/m^2;
- Avoid using timbers that show signs of warping, knot holes or any visible damage that could affect the sound transmission;
- Where possible, an absorptive layer, covered with a protective membrane is recommended on the inner side of the barrier to reduce reflected sound to existing closest receptors;
- For a longer life, lower maintenance solution with potentially more acceptable visual impact other materials could be considered providing they have the same surface density.

For its installation it is recommended to ensure there is a board timber thickness of at least 25 mm which is fixed to timber rails and connected to galvanised steel posts or similar. This ensures that no gaps occur which sound could pass through; therefore, maximising performance.

The position of the modelled 2.5 metre height fence is shown in **Appendix 4**.

7.4 Appraisal of Acoustic Design

The development has where possible, adopted the principles of acoustic design through the inclusion of the mitigation measures discussed earlier in this report. Those design considerations include;

- *Maximising the separation distance between source and receiver* – the development has sought to increase the distance between the A1(M) and A1001 (Roehyde Way), particularly those plots towards the south-west where garden areas are used as a buffer to increase distances;
- *Orientate the buildings in a manner which reduces the noise levels within habitable rooms (particularly bedrooms)* – bedrooms to be located away (where possible) from the road traffic emanating from the A1(M) and A1001 (Roehyde Way);
- *Elevated South-West fence to protect outdoor amenity areas* – it is recommended to incorporate a 2.5 metre height fence (close boarded) to protect those most exposed garden areas within plots 10 – 16 from the A1(M) and A1001 (Roehyde Way) to reduce amenity noise levels;
- *Building envelope design to mitigate the noise to acceptable levels, whilst providing adequate ventilation* – appropriate façade treatments, suggested by the noise assessment report to be incorporated.

8 CONCLUSIONS & RECOMMENDATIONS

RSK Environment Ltd has been instructed by Hertfordshire County Council to undertake a noise impact assessment for a proposed residential development on land to the rear of Filbert Close, Hatfield.

A baseline noise survey has been undertaken to establish the pre-development noise levels across the site, with the resulting dataset used to inform the assessment. Noise monitoring comprised both attended and unattended measurements.

The dominant noise source across the application site was noted to be attributable to the A1(M) motorway and slip road A1001 (Roehyde Way), both to the south-west of the application site.

A site suitability assessment, to the requirements of BS 8233: 2014 has been undertaken to determine internal and external noise levels at locations across the development site.

Predicted levels at Plots 11 - 16, in conjunction with highest maximum noise levels are of a magnitude where a standard specification double glazed system (providing a sound reduction index of 27 dB (R_{w+Ctr}) would be required to meet recommended internal day and night ambient noise levels (at a worse case). The glazing would need to be accompanied by a similar specification trickle ventilation system (in the open position) to preclude the need to open windows. In practice, the predicted noise levels are considered to be not significant. Following their introduction, the recommended internal acoustic conditions within BS 8233 and WHO can be achieved within the proposed dwellings.

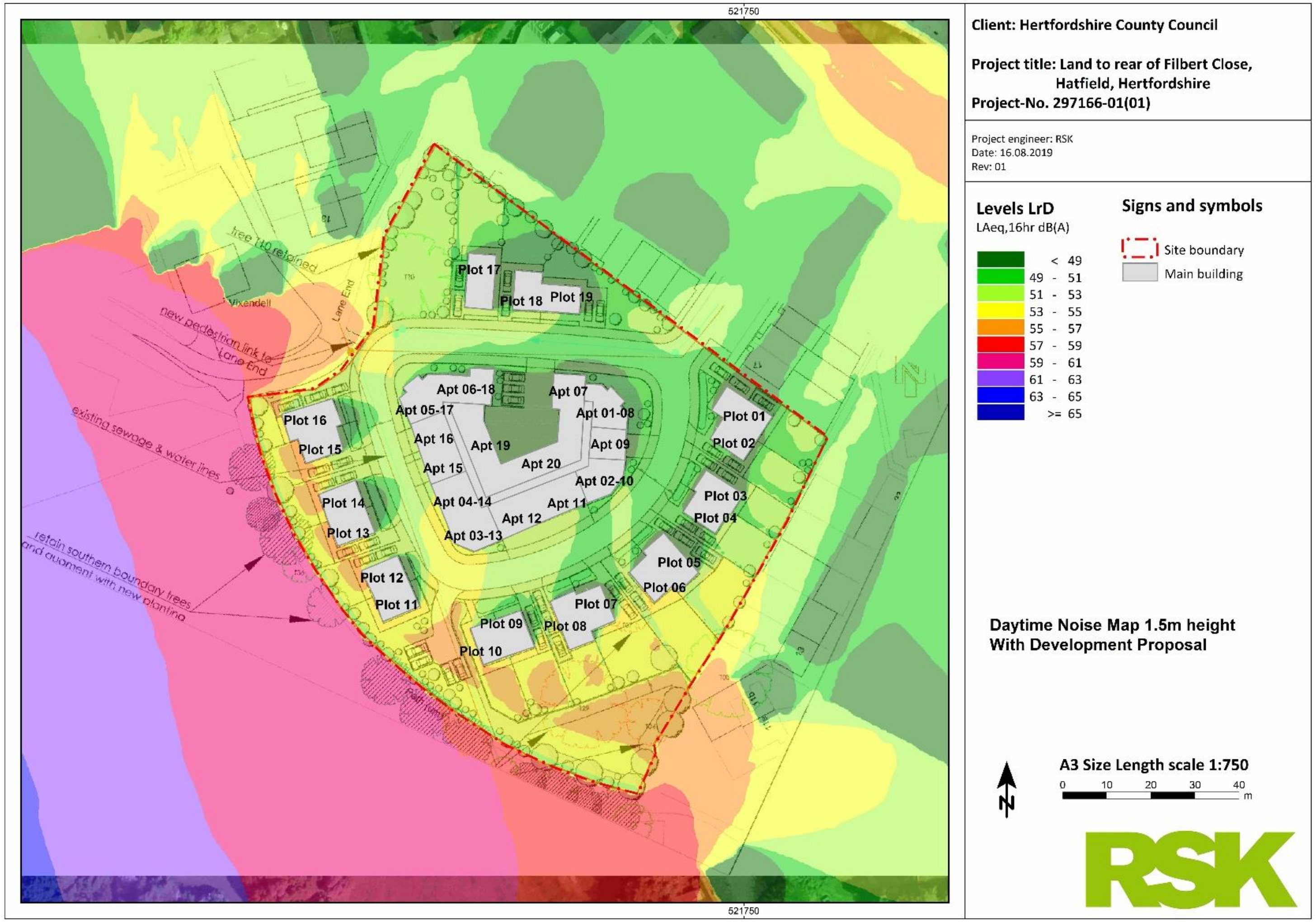
Provided the mitigation measures set out in Section 7.3 are incorporated, the predicted free field noise levels within external amenity across the site would be below the BS 8233 upper design target of 55 dB $L_{Aeq,16hrs}$ at all plot locations.

In summary, existing noise levels across the site are predicted to be of a magnitude suitable for the development assuming appropriate mitigation measures are included through design. The proposed development site is therefore considered to be suitable for the intended development.

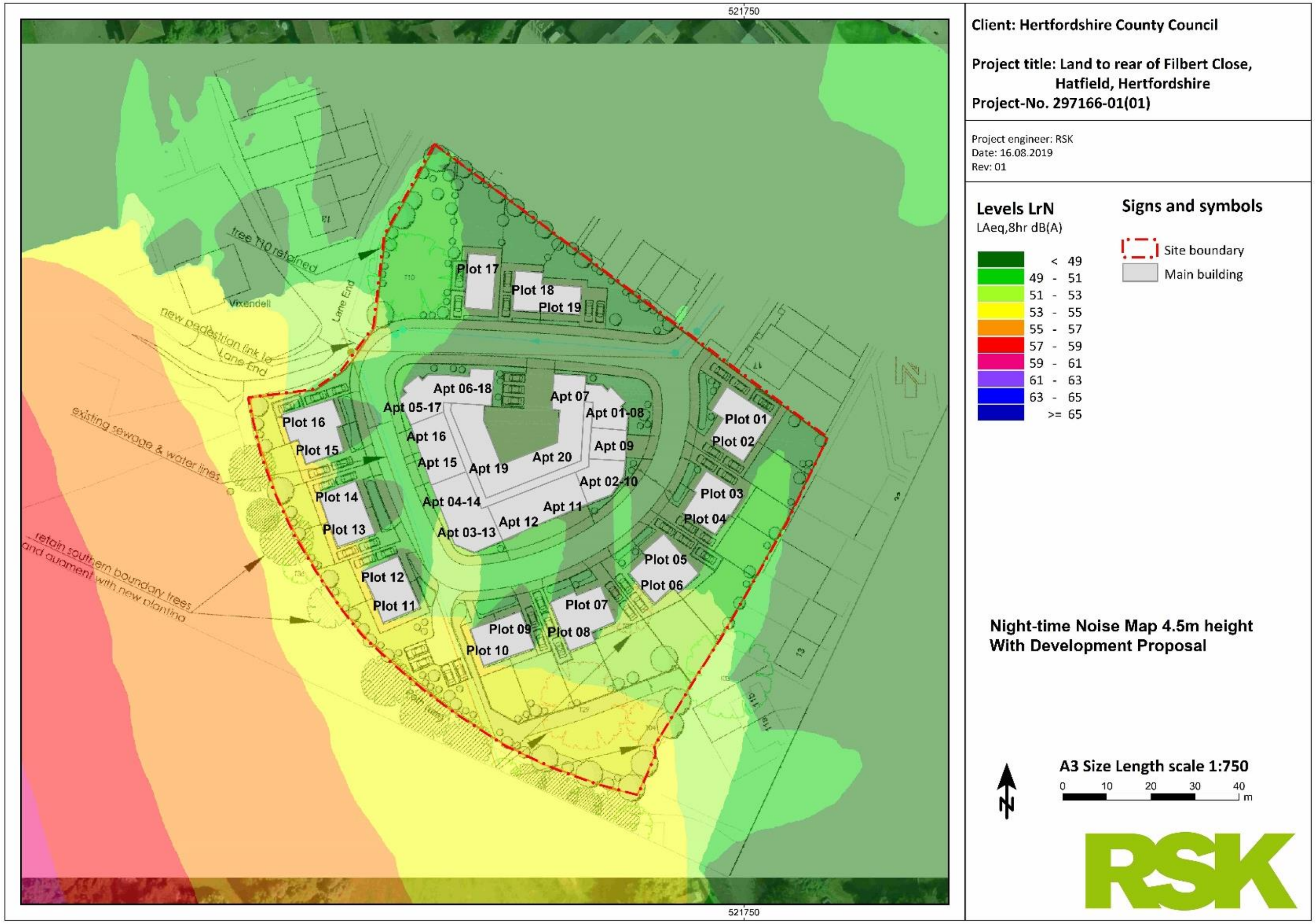
9 REFERENCES

1. National Planning Policy Framework – Department for Communities and Local Government. March 2012 (as amended February 2019).
2. National Planning Policy Framework (NPPF): 2012
3. Noise Policy Statement for England (NPSE). DEFRA, 2010.
4. Professional Practice guidance on Planning and Noise (ProPG): 2017
5. Environmental Noise Guidelines for the European Region, WHO Regional Office for Europe, 2018
6. ISO 9613-2:1996, Acoustics. Attenuation of sound during propagation outdoors. General method of calculation. International Organization to Standardization, 1996.
7. British Standard 7445-1:2003, Description and measurement of environmental noise – Part 1: Guide to quantities and procedures. British Standards Institution, 2003.
8. British Standard 8233: 2014, Sound insulation and noise reduction in buildings – code of practice. British Standards Institution, 2014.
9. Calculation of Road Traffic Noise. Department of Transport, Welsh Office HMSO.

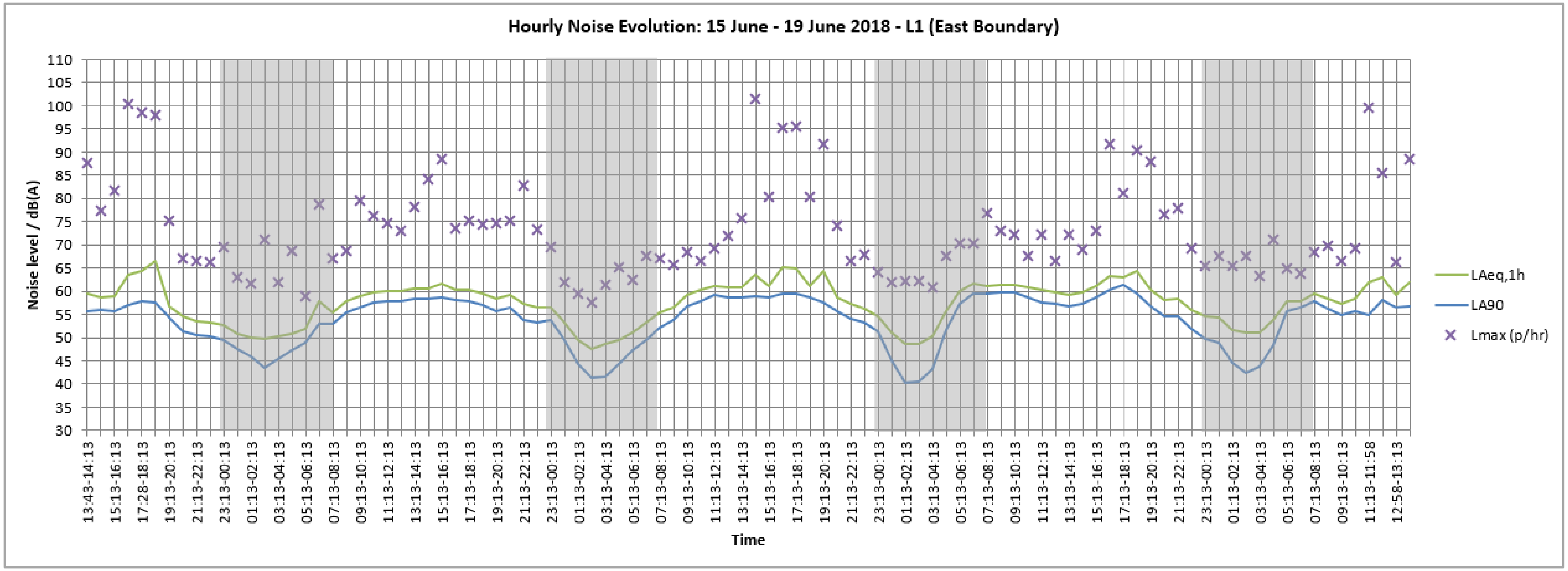
APPENDIX 1: DAYTIME NOISE CONTOUR MAP (1.5m HEIGHT)

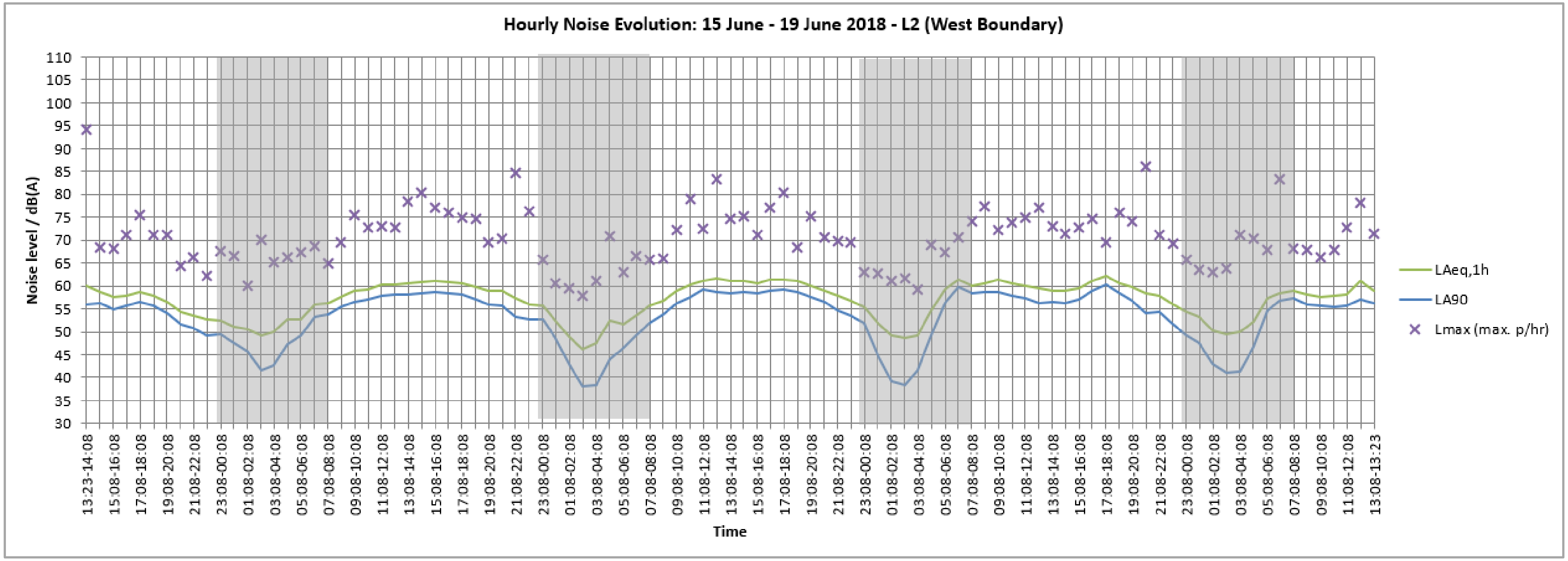


APPENDIX 2: NIGHT-TIME NOISE CONTOUR MAP (4.5m HEIGHT)

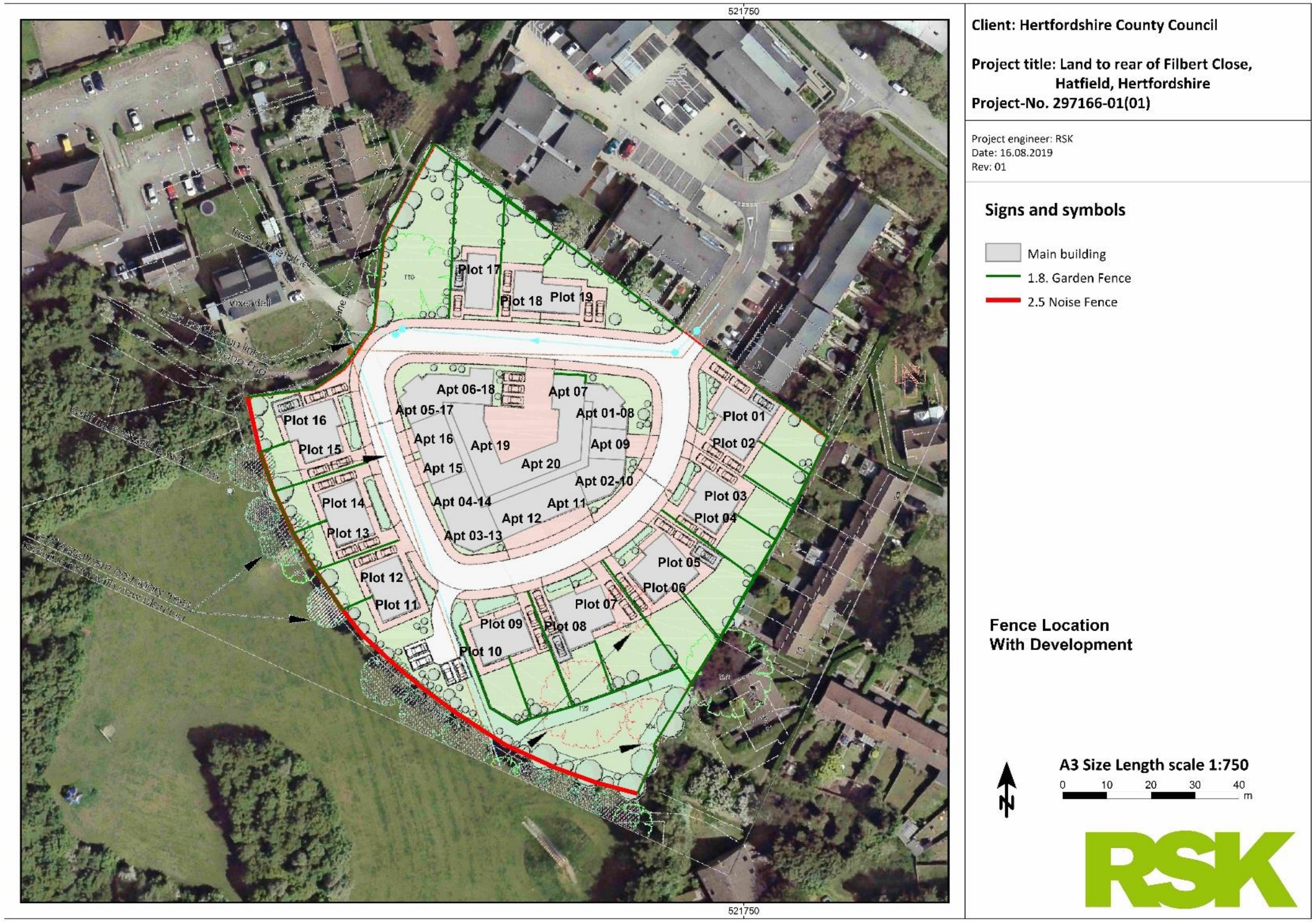


APPENDIX 3: NOISE MONITORING RESULTS




Hourly Noise Evolution: 15 June - 19 June 2018 - L2 (West Boundary)
Noise level / dB(A)
Time
LAeq,1h
LA90
Lmax (max. p/hr)

APPENDIX 4: BOUNDARY FENCE



APPENDIX 5: PHOTOGRAPHIC REPORT

L1 - Long term monitoring (North-east Boundary)

L2 – Long term monitoring location (West Boundary)

APPENDIX 6: ACOUSTIC GLOSSARY

***L_p* - Sound Pressure Level**

The basic unit of sound measurement is the sound pressure level, which is measured on a logarithmic scale and expressed in decibels (dB). The logarithmic scale makes it easier to manage the large range of audible sound pressures, and also more closely represents the way the human ear responds to differences in sound pressure:

$L_p = 20 \log_{10} (p/p_o)$

where p = RMS (root mean square) sound pressure; and

p_0 = reference sound pressure 2×10^{-5} Pa.

Frequency Weighting Networks

Frequency weighting networks, which are generally built into sound level meters, attenuate the signal at some frequencies and amplify it at others. The A-weighting network approximately corresponds to human frequency response to sound. Sound levels measured with the A-weighting network are expressed in dB(A). Other weighting networks also exist, such as C-weighting which is nearly linear (i.e. unweighted) and other more specialised weighting networks. Variables such as L_p and L_{eq} that can be measured using such weightings are expressed as L_{pA} / L_{pC}, L_{Aeq} / L_{Ceq} etc.

Time Weighting

Sound level meters use various averaging times for the measurement of RMS sound pressure level. The most commonly used are fast (0.125 s averaging time), slow (1 s averaging time) and impulse (0.035 s averaging time). Variables that are measures with time weightings are expressed as L_{AFmax} etc.

***L_{Aeq}* – Equivalent Continuous Sound Pressure Level**

Sound levels tend to fluctuate, and as such an 'instantaneous' measurement like sound pressure level cannot fully describe many real-world situations. A summation can be made of the measured sound energy over a certain period, and a notional steady level can be calculated which would contain the same total energy as the fluctuating sound. This notional level is termed the equivalent continuous sound level L_{eq}. L_{eq} can be determined over any time period, which is indicated as $L_{eq,T}$ where T is the time period (e.g. $L_{eq,24h}$).

In mathematical terms, for n discrete sound level measurements, Leq is given by:

$L_{eq,T}$ = 10 log10 (t1 x 10L1/10 + t2 x 10L2/10 +… tn x 10Ln/10)/T

where t_1 = time at level L_1 dB;

t_2 = time at level L_2 dB;

and T = total time

***L_{max}* - Maximum Sound Pressure Level or Maximum Noise Level**

This is the maximum RMS sound pressure level occurring within a specified period. The time weighting is usually specified, such as in L_{Fmax}.

***L_N* - Percentile or Statistical Levels**

Sometimes it is useful to calculate the level which is exceeded for a certain percent of a total period. Background noise is often defined as the A-weighted sound pressure level exceeded for 90% of the specified period T, expressed $L_{90,T}$. Road traffic noise is often characterised in terms of $L_{A10,18}$