Noise Impact Assessment

South Heywood Phase 6

Reference: 50-225-R1-4

Date: December 2020

NOISE IMPACT ASSESSMENT

South Heywood
Residential – Phase 6

Prepared for:

Russell Homes

Report Ref: 50-225-R1-4
Date Issued: December 2020

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QUALITY ASSURANCE

PROJECT NUMBER	50-225		
VERSION	Version 1	Version 3	Version 4
REMARKS	Draft for Comment	Final	Final
DATE	7th October 2020	20th November 2020	10th December 2020
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EXECUTIVE SUMMARY

BACKGROUND

Site Address	Manchester Road, South Heywood OL10 2QA
National Grid Reference	E 385430 N 408727
Proposed Development	Erection of 64 residential dwellings with associated access and landscaping. The main sources of sound impacting upon the Site is road traffic sound associated with Manchester Road, the proposed Link Road and the M62.
Report Objectives	The objectives of this report are to: • Identify, measure and assess the potential impact of existing sound sources surrounding the Site impacting upon the proposed noise sensitive development. The report follows current and relevant British Standards in order to provide a robust assessment.

ASSESSMENT

Data	E3P has utilised traffic data in the form of 18-hour Average Annual Weekday Traffic which informed the Environmental Statement and Hybrid Application. The future years (2038) have been used to inform a worst-case assessment.
Assessments	A 3D noise model has been constructed to assess noise levels across the Site due to road traffic sound. The predicted external and internal noise levels have been compared to the criteria given in BS 8233:2014. Consideration has been given to living rooms and bedrooms within the dwellings as well as external amenity areas.
Mitigation Requirements	Acoustic barriers are proposed for exposed garden areas along the eastern boundary at heights of between 1.8 m and 2.6 m. Additionally, whole dwelling ventilation systems are required for certain dwellings along the boundaries with the roads.

CONCLUSIONS

The assessment has shown that, with the recommended mitigation measures, no adverse impact is expected due to road traffic sound.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Russell Homes to undertake a Noise Impact Assessment and provide a Mitigation Schedule for the Phase 6 residential development forming part of the wider South Heywood Development, to be referred to hereafter as '*the Site*'.

This assessment looks to determine the key noise sources impacting upon the development and undertake an assessment of external and internal amenity areas and specify mitigation measures, where required.

Specifically, this report will ensure compliance with condition 24 of the planning permission (16/01399/HYBR):

> *No development shall take place on any phase of development until a scheme of noise mitigation measures has been submitted to and approved in writing by the Local Planning Authority, that all residential units within that particular phase of development shall achieve the following internal and external noise levels:*
>
> *35 dB(A) L_{eq} (16 hour) in the bedrooms between the daytime hours 7 am and 11pm to protect daytime resting;*
> *30 dB(A) L_{eq} (8 hour) in the bedrooms between the night-time hours of 11pm and 7am;*
> *35 dB(A) L_{eq} (16 hour) in the living room/s between the daytime hours of 7 am and 11pm;*
> *40 dB(A) L_{eq} (16 hour) in any dining rooms during daytime hours;*
> *Noise in external amenity areas shall aim to achieve the guideline values given in BS8233:2014 and ProPG or the lowest practicable levels in accordance with BS8233:2014 and ProPG; to a maximum of 58 dB(A);*
> *Maximum instantaneous sound levels should not exceed 45 dB(A) $L_{max,fast}$ measured in bedrooms more than 10 times per night; and*
> *Any sound associated with existing and/or proper industrial/commercial premises shall not result in the predicted Rating Level exceeding the existing typical Background Sound Level at the closest existing or proposed receptors ($L_{A,r} = L_{A90}$).*

1.2. PROPOSED DEVELOPMENT

Russell Homes intend to develop the parcel of land for residential use of 66 units comprising detached and semi-detached dwellings with associated parking, access and landscaping.

The key sources of sound impacting upon the development site is road traffic sound associated with Manchester Road, the proposed Link Road and the M62.

This assessment has been undertaken in accordance with the following supplied drawings:

- Planning Layout (19104 SK01 Rev P7) dated 7th December 2020.

The Layout is shown in Figure 1 of Appendix II.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment at the time.

E3P will endeavour to capture all existing and proposed sources of sound and vibration at the time of the surveys and/or assessments. However, should new sources of sound be introduced, existing sources modified/changed, or characteristics of the sound be altered following completion of such, E3P cannot be held accountable for this.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance, for either absolute levels or frequency content.

2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

The national planning policy framework states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local planning authorities' plan-making and decision-making should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or is likely to occur.
- Whether or not an adverse effect is occurring or is likely to occur.
- Whether or not a good standard of amenity can be achieved.

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The "observed effect levels" are as follows:

- **Significant observed adverse effect level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- **Lowest observed adverse effect level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
- **No observed effect level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

TABLE 2.1 NOISE EXPOSURE HIERARCHY

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
Not Noticeable	No effect.	No observed effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television, speaking more loudly, or having to close windows for some of the time because of the noise where there is no alternative ventilation. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed effect	Avoid
Noticeable and Very Disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening, loss of appetite, significant/medically definable harm (auditory and non-auditory).	Unacceptable adverse effect	Prevent

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.
- The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.
- If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. BRITISH STANDARD BS 8233:2014 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

2.3.1. NOISE CRITERIA LIMITS

The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 2.2.

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

CRITERION	TYPICAL SITUATION	DESIGN CRITERION, $L_{Aeq,T}$ (dB)
Suitable Resting and Sleeping Conditions	Living Room	35
	Bedroom	30

BS 8233 goes on to recommend noise levels for gardens:

> *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 recognised 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 might be warranted.*

BS 8233 goes on to say:

> *In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.*

2.3.2. VENTILATION REQUIREMENTS

Where a partially open window cannot be relied upon to provide an adequate level of façade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS 8233 states:

> *The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.*
>
> *Alternatively, acoustic ventilation units (see 7.7.2 below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans.*

Section 7.7.2 states:

> *NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.*

2.4. WORLD HEALTH ORGANISATION (WHO) – GUIDELINES FOR COMMUNITY NOISE

The WHO gives guidance on desirable levels of environmental noise. The levels presented in the WHO Community Guidelines are those at which adverse effects become measurable. The 1980 WHO document suggested that *"general daytime outdoor noise levels of less than 55 dB(A) $L_{eq,16hr}$ are desirable to prevent any significant community annoyance."* This level is an external free-field noise level. The 1980 document also stated in relation to internal levels, *"that night-time noise levels of 35 dB(A) $L_{eq,8hr}$ or less will not interfere with the restorative process of sleep"*.

A report was submitted to the WHO in 1995 for consideration as a revision to the 1980 document and revised community guidelines were issued in 2000. In the 2000 guidelines, it is considered that the sleep disturbance criteria should be taken as an internal noise level of 30 dB $L_{Aeq,8\,hr}$ or an external level of 45 dB $L_{Aeq,8\,hr}$. It also recommends that internal L_{Amax} levels of 45 dB and external L_{Amax} levels of 60 dB should be limited where possible.

3. TRAFFIC DATA

E3P has utilised the results of the Transport Assessment undertaken by Axis and submitted as part of the initial Hybrid Application for the basis for the road traffic noise assessment. The traffic data supplied in the form of 18-hour Average Annual Weekday Traffic (AAWT) flows with associated speeds and Heavy Goods Vehicle (HGV) percentage.

These have been inputted into the noise model directly and verified by way of calculation using the Calculation of Road Traffic Noise (CRTN) calculator. As such, the following resultant 16-hour day and 8-hour night-time noise levels have been used to inform the assessment.

TABLE 3.1 ROAD TRAFFIC NOISE LEVELS INPUTTED AS ROAD SOURCES – 2038 WITH DEVELOPMENT

ROAD	PERIOD	CALCULATED SOUND PRESSURE LEVEL FROM 18-HOUR AAWT, $L_{Aeq,T}$ (dB)
MANCHESTER ROAD	Daytime	63.5
	Night-time	55.2
LINK ROAD	Daytime	71.7
	Night-time	62.6
M62	Daytime	83.8
	Night-time	73.5

4. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2019 MR1, to determine the impact of noise from Manchester Road, Link Road and M62.

The following inputs have been included in the model:

- Layout Rev P7.
- Site elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government Licence v3.0.
- The proposed 2.5 m high fence provided in order to protect existing properties that back on to the Link Road has been included in all scenarios.
- Existing buildings that provide shielding from any of the noise sources have been included in the model.
- A reflection order of 2 has been used in all calculations.
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

Figures 2 and 3 determine the noise levels across the Site during the daytime and night-time periods, respectively.

4.1. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

The noise model has been used to predict noise levels in rear gardens which are to be used for relaxation. The predicted levels range between below 48 dB and up to 60 dB. Most garden areas achieve levels of below 50 and 55 dB. However, certain gardens along the northern and eastern boundaries will experience an exceedance of the upper criterion of 58 dB without mitigation in place.

As such, for most of the gardens, it is predicted that the No Observed Adverse Effect Level (NOAEL) is achieved with the following commentary:

> *"Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life."*

Accordingly, no action is required for these areas.

However, certain gardens along the northern and eastern boundaries will require mitigation in order to achieve the above. Section 5.0 discusses appropriate measures and their impact.

4.2. INTERNAL NOISE LEVEL ASSESSMENT

A standard glazing specification of 4 mm glass/20 mm air space/4 mm glass is assumed which affords a sound insulation performance in the order of 35 dB R_w however this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+C_{tr}' correction, has a sound insulation performance value of approximately 29 dB and so this value has been used to calculate internal noise levels.

The recently published AVO has found that a common reduction for an open window is 13 dB based on research undertaken. As such, a figure of 13 dB is applied here.

The model has been used to predict façade noise levels at ground and first floors for the worst affected facades. To determine any requirements for mitigation, E3P has added the reduction provided by the glazing (29 dB) to the relevant criterion for day (35 dB) and for night (30 dB). As such, any facades subject to noise levels higher than 64 dB during the day and/or 59 dB during the night will require higher specification glazing. The highest predicted day and night façade levels here are 64 dB and 59 dB respectively. As such, standard glazing is sufficient.

With regards opening windows, there is a requirement to consider the need to open windows for ventilation and the mitigation of overheating. At this stage, the assessment assumes that ventilation would be provided by way of extract fans in kitchens and bathrooms and openable windows.

When considering a partially open window for ventilation purposes, E3P has assessed whether the BS 8233:2014 internal criterion can be achieved with windows open for ventilation. Here ventilation is defined as:

> *To provide fresh air to the building and to dilute and disperse residual water vapour not dealt with by extract ventilation as well as removing other pollutants which are released throughout the building.*

Thermal comfort and overheating are considered in Section 4.2.2. Purge ventilation is provided by an open window regardless of the ventilation strategy.

As such, a comparison of predicted internal noise levels, with windows open, with the BS 8233:2014 criterion is required. Plots along the northern boundary are subject to external noise levels of up to 64 dB during the day and 59 dB during the night. As such, these exceed the internal ambient noise level criteria, by 16 dB. Plots along the eastern boundary are subject to external noise levels of up to 60 dB during the day and 55 dB during the night. As such, these exceed the internal ambient noise level criteria, by 12 dB. A whole dwelling ventilation system will be required for certain plots that exceed external noise levels of 48 dB during the day and 43 dB during the night that does not rely on open windows, to provide the necessary ventilation.

With regards the maximum instantaneous noise level, an attended noise survey was undertaken as part of the Hybrid Application and a 10th highest level of 83 dB was measured at 4 m from Manchester Road. In order to inform a worst-case assessment, this level has been distance corrected to the closest façade, resulting in a predicted level of 67 dB $L_{Amax,fast}$. When considering closed windows, glazing would provide a reduction of 31 dB resulting in an internal noise level of 36 dB $L_{Amax,fast}$. As such, standard glazing is sufficient. However, with an open window, the criterion of 45 dB $L_{Amax,fast}$ would be exceeded. This is not above and beyond the requirements for the average noise level and, as such, additional measures are not required.

5. MITIGATION

5.1. GARDEN AREAS

Section 4.1 determined that certain garden areas along the eastern and southern boundaries would experience an exceedance of the 58 dB criterion without mitigation measures in place. As such, an additional noise model has been run with appropriate acoustic barriers installed at various heights that achieves the criterion, see Figure 4.

The following barriers are proposed in order to achieve 58 dB as a maximum:

- 1.8 m high barrier at gardens of plots 1, 5 and 6; and
- 2.6 m high barrier at gardens of plot 19.

The barriers can be of wooden fence or brick wall construction but must be sealed at the base, be free from holes and have a minimum mass of 10 kg/m^2.

5.2. GLAZING AND VENTILATION REQUIREMENTS

The previous section determined that a whole dwelling ventilation system is required for all plots across the Site. As such, all plots will require a whole dwelling ventilation system to provide fresh air flow and background ventilation without the need for opening windows. Windows, however, are to remain openable for purge ventilation and at the discretion of the occupants.

The highest required reduction in relation to any through window or through wall ventilators is 29 dB $D_{n,e,w} + C_{t,r}$ in the open position. Most sound attenuating acoustic ventilators will typically achieve this. For example, Titon SF Xtra Sound attenuator trickle ventilators can achieve up to 41 dB in the open position. However, it is recommended that an acoustic consultant is consulted to determine if a chosen ventilator or system is enough in terms of sound reduction and acoustic performance.

It is expected that, as a minimum, the above will be combined with extract fans in wet rooms to provide a system 1 ventilation.

The actual system to be used is ultimately down to the developer and any requirements of the Local Planning Authority. The above only advises on the noise reduction required for any trickle ventilators, where required as some systems negate the need for these.

6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Russell Homes in order to undertake a Noise Impact Assessment for the Phase 6 of the South Heywood Development.

E3P has utilised the 2038 traffic flow data, as used for the Hybrid Application, for Manchester Road, the proposed Link Road and the M62.

A 3D noise model has been constructed to assess noise levels across the site due to road traffic sound. The predicted external and internal noise levels have been compared to the criteria given in BS 8233:2014 and stipulated in the planning condition.

Consideration has been given to external amenity space and internal habitable rooms.

This report has advised on glazing and alternative ventilation requirements for all plots and also recommended acoustic barriers across the Site.

The assessment has shown that, with mitigation measures in place, no adverse impact is expected due to road traffic sound.

END OF REPORT

APPENDIX I
GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the "A"-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain

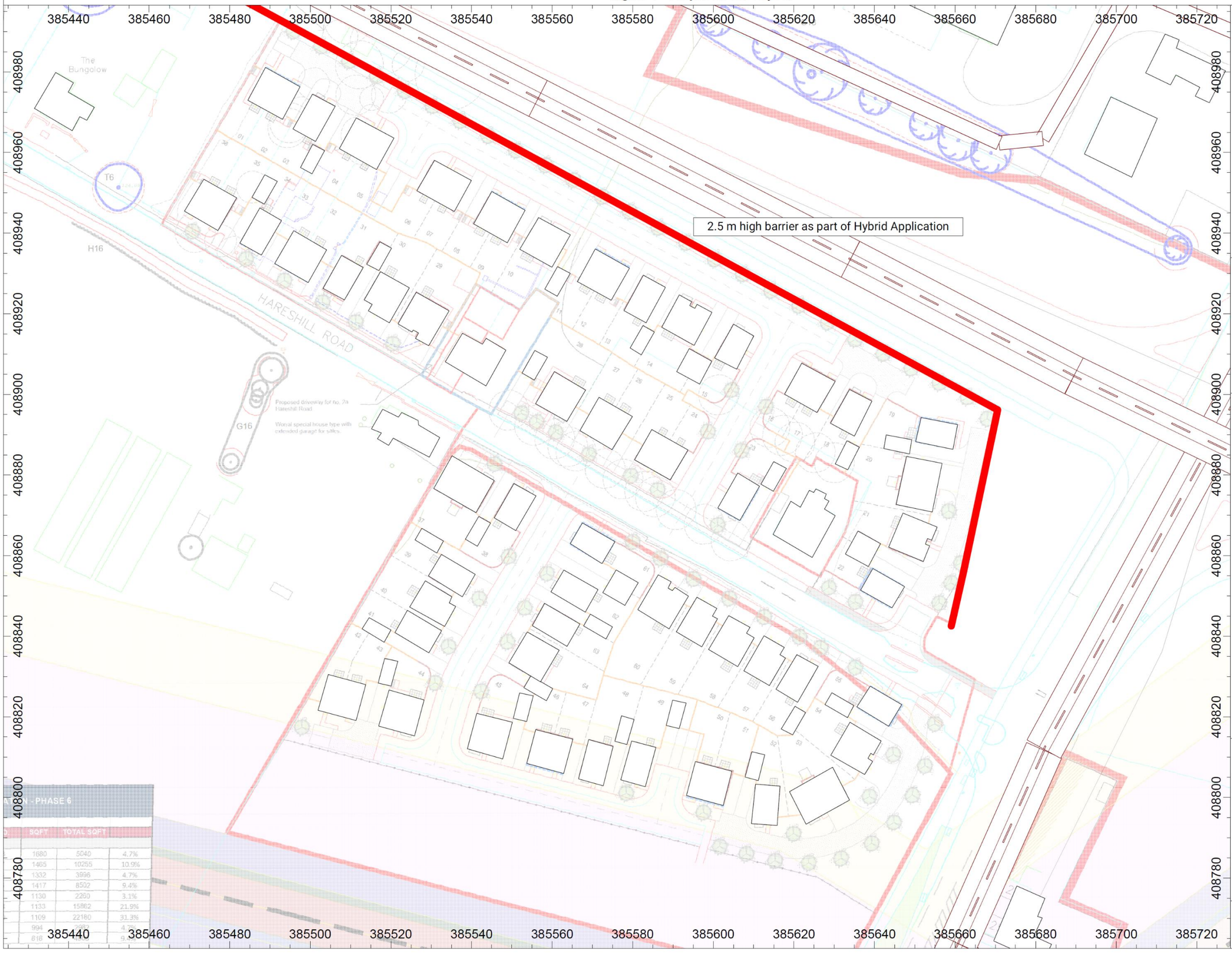
ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the "fast" sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L_{90} is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.

APPENDIX II
FIGURES

Figure 1 - Proposed Site Layout



Project:
Phase 6 South Heywood

Project-No:
50-225

Client:
Russell Homes

N

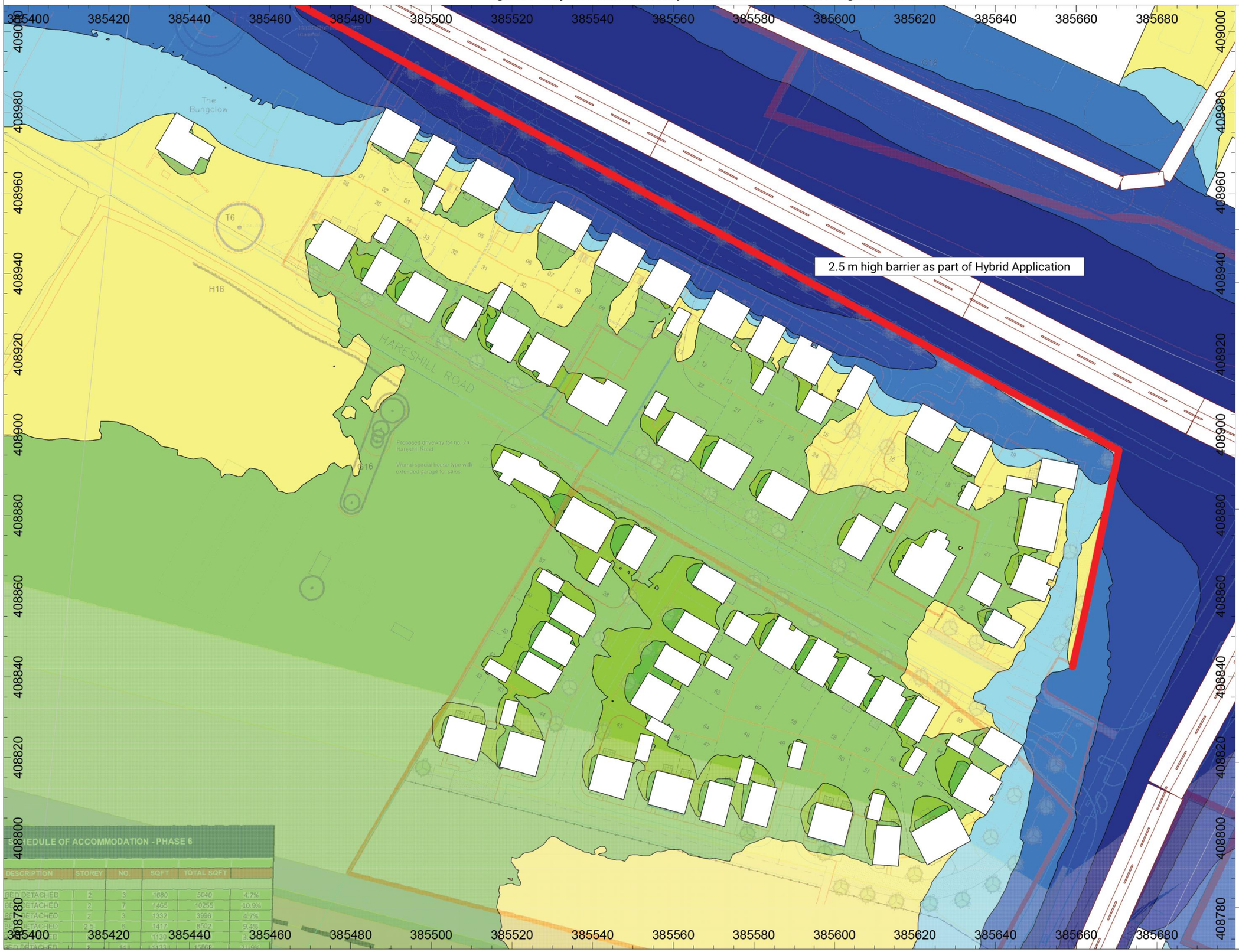
Noise Map Objects

- Road
- Parking Lot
- Building
- Barrier
- Embankment
- Built-up Area
- Foliage
- Contour Line
- Calculation Area

e3p

Project Engineer: Lee Faulkner
Date: 10/12/2020

Figure 2 - Daytime Grid Noise Map - Calculation at 1.5m above ground level



Project:
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Daytime Noise Level, LAeq,16hr (dB)

- ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ...

Noise Map Objects

- Road
- Parking Lot
- Building
- Barrier
- Embankment
- Built-up Area
- Foliage
- Contour Line
- Calculation Area

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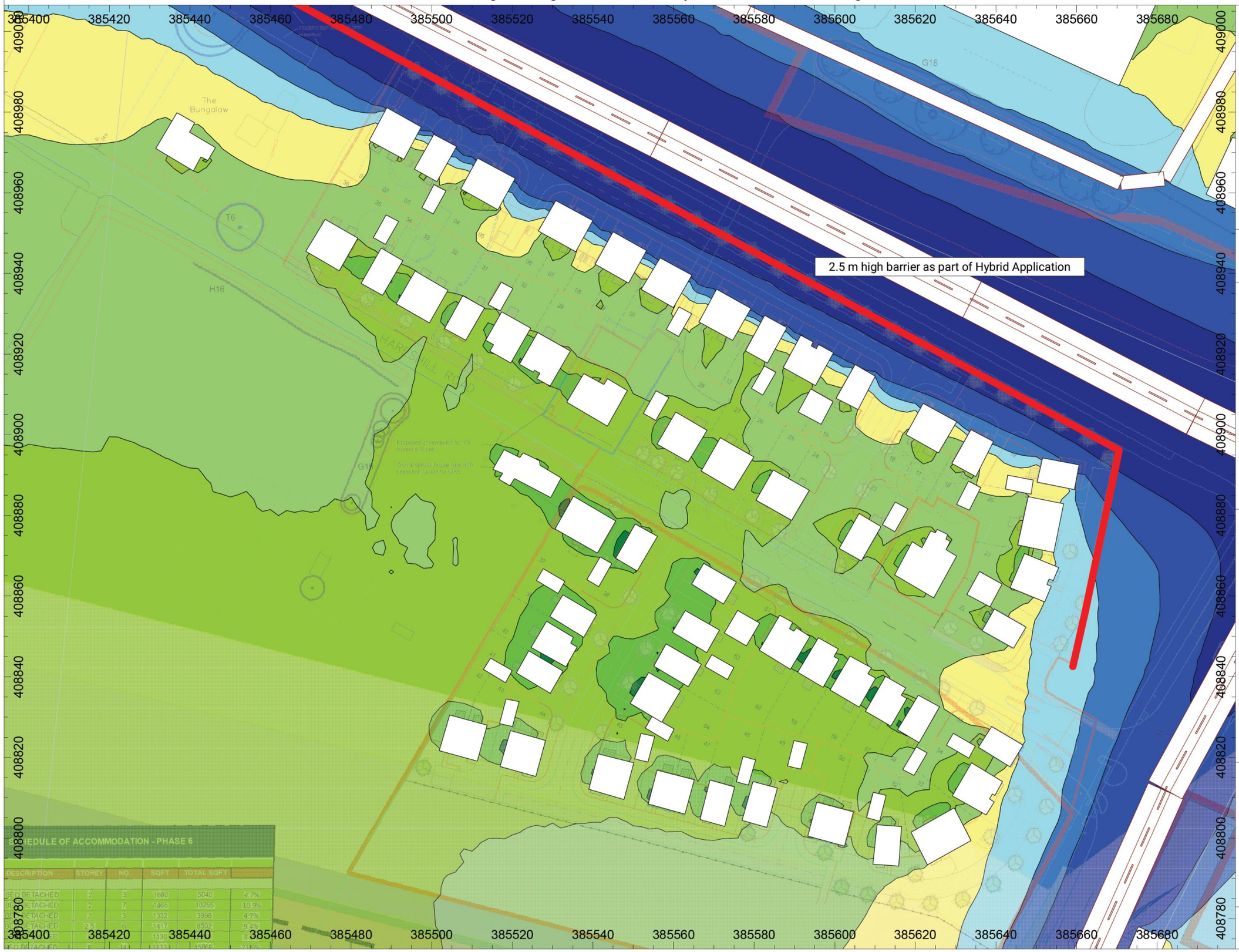
Project Engineer: L Faulkner
Date: 10/12/2020

Figure 3 - Night-time Grid Noise Map - Calculation at 3.5m above ground level



Project:
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Project-No:
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Night-time Noise Level, LAeq,8hr (dB)

- ... <= 43
- 43 < ... <= 45
- 45 < ... <= 47
- 47 < ... <= 51
- 51 < ... <= 53
- 53 < ... <= 55
- 55 < ... <= 57
- 57 < ... <= 60
- 60 < ...

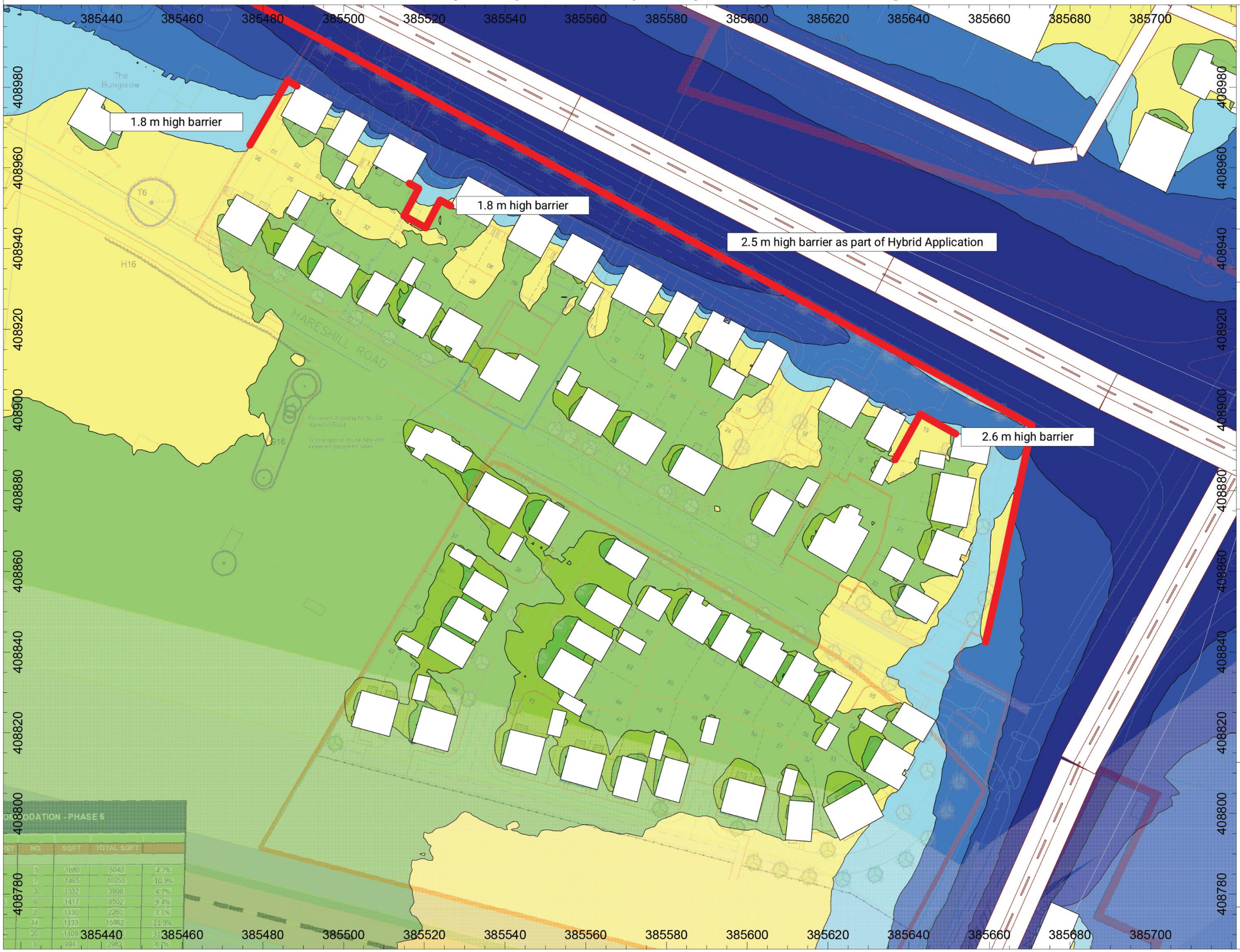
Noise Map Objects

- Road
- Parking Lot
- Building
- Barrier
- Embankment
- Built-up Area
- Foliage
- Contour Line
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 10/12/2020

Figure 4 - Daytime Grid Noise Map with Mitigation - Calculation at 1.5m above ground level



Project:
South Heywood Phase 6

Project-No:
50-225

Client:
Russell Homes

Daytime Noise Level, LAeq,16hr (dB)

- ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ...

Noise Map Objects

- Road
- Parking Lot
- Building
- Barrier
- Embankment
- Built-up Area
- Foliage
- Contour Line
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 10/12/2020