

Appendix 8.3: Site Suitability Assessment

Cherryfield Drive, Kirkby

December 2023



Experts in noise and vibration
assessment and management

Document Control

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8.3.1 Introduction

8.3.1.1 Summary

- 8.3.1.1.1 This appendix provides a site suitability assessment for the Proposed Development and describes the existing ambient noise environment based on noise measurements carried out at the Site. Where necessary, noise mitigation measures have been recommended in respect of the impacts of the existing noise environment on the Proposed Development.
- 8.3.1.1.2 The following assessment includes:
- An assessment of road traffic noise upon the proposed development;
 - an assessment of noise from sports pitch upon the proposed development; and
 - recommendation of a scheme of noise mitigation and sound insulation measures.
- 8.3.1.1.3 This report has been prepared in accordance with relevant National legislation, policies, and guidance and by reference to appropriate British and International standards which are summarised in **Chapter 8**.
- 8.3.1.1.4 A glossary of acoustic terminology used in this report is provided in **Appendix 8.1**.

8.3.1.2 Existing Site and Environs

- 8.3.1.2.1 The Site location and wider area are shown in **Figure 8.3.1**. The Site is in an urban setting and generally sits at grade with surrounding roads, except in north-western areas of the Site that are elevated relative to Valley Road to the west.
- 8.3.1.2.2 Cherryfield Drive runs along the northern boundary, with Kirkby Gallery and Council Offices Kirkby Bus Station and Kirkby Shopping Centre to the north. Cherryfield Drive continues along the easternmost Site boundary with dwellings beyond.
- 8.3.1.2.3 Kirkby Leisure Centre (KLC) is located to the east of the Site. It has a large (full size football) floodlit all-weather sports pitch to the west of the main KLC building, which was recently opened for community use, and is surrounded by a 4m high steel mesh fence that does not incorporate anti-vibration fixings. Two smaller pitches are located between the large sports pitch and the KLC building, which NCL understand are now rarely used following the opening of the main pitch. These are also surrounded by a steel fence comparable to that of the main pitch.
- 8.3.1.2.4 KLC is open from 06:30-22:00hrs on weekdays, and 08:30-18:00hrs at weekends. The sports pitch accommodates various uses, predominantly football matches and training at both junior and senior levels. From information provided by KLC, the pitches are typically pre-booked for use on weekdays from 17:00-21:00hrs, and are rarely used between 21:00-22:00hrs.
- 8.3.1.2.5 Bewley Drive runs along the southern boundary beyond which are St Joseph The Worker R C School, Millbrook Medical Centre (open 08:00-18:30hrs on weekdays only) and The Falcon Public House (with trading until midnight daily).
- 8.3.1.2.6 The main source of noise affecting the Site is road traffic on adjacent roads and from the use of the main sports pitches at KLC. No noise from other nearby commercial/retail uses was audible within the site boundary, at any time.

Figure 8.3.1: Site Location and Proposed Site Plan

8.3.2 Assessment Approach

8.3.2.1 Assessment Criteria – Transportation Noise

Transportation Noise

- 8.3.2.1.1 In addition to the NPPF¹, NPSE², PPG(N)³, CRTN⁴, BS 8233:2014⁵ and WHO GCN⁶ summarised in the main noise chapter (**Chapter 8**), the suitability of the site for residential development, in terms of achieving appropriate internal and external noise levels (from existing sources of environmental noise) has also been assessed with reference to Professional Practice Guidance: Planning & Noise – ‘New Residential Development’ (ProPG, 2017),
- 8.3.2.1.2 ProPG, 2017 is a joint publication by the Chartered Institute of Environmental Health (CIEH), the Association of Noise Consultants (ANC) and the Institute of Acoustics (IoA). The primary goal of ProPG is;

“to assist the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise”.

- 8.3.2.1.3 The guidance has been produced to assist practitioners in matters relating to noise and new residential development. It focuses on existing transportation noise sources and has been developed to consider the Government’s overarching noise policy, planning policy and policy

¹ Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2019) National Planning Policy Framework

² DEFRA (2010) Noise Policy Statement for England

³ Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2019) Planning Practice Guidance – Noise

⁴ Department of Transport (1988) Calculation of Road Traffic Noise

⁵ British Standards Institute (2014) BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

⁶ World Health Organisation (WHO, 1999) Guidelines for Community Noise

guidance. It has also been developed to take into account other authoritative well-rehearsed sources of guidance such as BS 8233:2014.

8.3.2.1.4 The guidance provides advice for Local Planning Authorities (LPAs) and developers, and practitioners. ProPG aims to:

- Advocate the full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Promote and encourage the process of good acoustic design in and around new residential developments;
- Set out the considerations which should be taken into account in deciding planning applications for new noise-sensitive developments;
- Promoting the use of appropriate noise exposure standards and policies in assessment; and
- Provide assistance in the delivery of sustainable development.

8.3.2.1.5 ProPG advocates a two-stage assessment approach:

- **Stage 1** – an initial noise risk assessment of the proposed development site; and
- **Stage 2** – a systematic assessment considering four key elements.

8.3.2.1.6 Stage 2 of ProPG is underpinned by the preparation and delivery of an Acoustic Design Statement (ADS).

8.3.2.1.7 ProPG also provides advice and support to decision-makers when taking into account noise and new residential development. These recommendations are aligned to the outcomes of Stage 1 and Stage 2 of the assessment along with the considerations made within the ADS. Section 3 of ProPG details the recommendations to decision-makers.

8.3.2.2 ProPG Stage 1 – Initial Risk Assessment

8.3.2.2.1 Stage 1 of ProPG provides guidance to practitioners as to whether the site poses a risk in terms of noise for any future site occupants. To identify this, ProPG sets out a number of considerations for inclusion within an 'initial risk assessment'. **Table 8.3.1** reproduces Figure 1 from ProPG, which describes the initial site risk assessment.

8.3.2.2.2 ProPG is clear that an Acoustic Design Statement should be included as part of a planning application where the risk is anything above 'negligible'.

8.3.2.2.3 The ProPG site noise risk classification presented in the table above is a sliding scale that does not define precise noise exposure limits to site risk classification and is based on the measured and calculated road traffic noise levels. For the purposes of this assessment, daytime and night-time noise thresholds have been adopted to classify site noise risk and are defined in **Table 8.3.2**.

8.3.2.2.4 The thresholds defined for the 'Low' and 'Medium' site risk classifications have been selected to align with the onset of LOAEL and SOAEL. The 'High' and 'Negligible' risks have been defined using the ProPG site risk classification.

Table 8.3.1: ProPG – Stage 1 Initial Site Risk Assessment

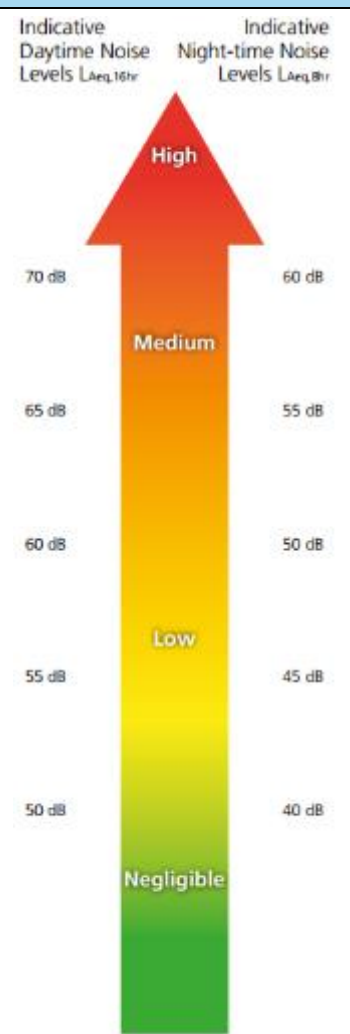
Noise Risk Assessment	Potential Effect Without Noise Mitigation	Pre-Planning Application Advice
	Increasing risk of adverse effect	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice. As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development. At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.
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 07:00 – 23:00, $L_{Aeq,8hr}$ is for night-time 23:00 – 07:00. d. An indication that there may be more than 10 noise events at night (23:00 – 07:00) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.		

Table 8.3.2: Site Risk Noise Exposure Thresholds

ProPG Site Risk Category	Daytime Noise Exposure Threshold dB LAeq,16-hour	Night-time Noise Exposure Threshold dB LAeq,8-hour	ProPG Based Pre-Planning Application Advice
Negligible (below LOAEL)	<50	<40	Indicates development site is likely to be acceptable from a noise perspective
Low (LOAEL- SOAEL)	50 – 63	40 – 53	Indicates development site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and demonstrated
Medium (SOAEL - UAEL)	63 – 70	53 – 66	Indicates site is less suitable from a noise perspective. A subsequent application may be refused unless a good acoustic design process is followed and demonstrated
High (UAEL)	>70	>66	Indicates an increased risk that the development would be refused on noise grounds.

8.3.2.2.5 Where the ProPG Stage 1 assessment indicates that the site is at low, medium or high risk of adverse noise effects, a ProPG Stage 2 assessment should be carried out

8.3.2.3 ProPG Stage 2 - Full Assessment

8.3.2.3.1 Stage 2 of ProPG describes four elements required for a full assessment. These are:

- **Element 1** – demonstrating a “Good Acoustic Design Process”
- **Element 2** – observing internal “Noise Level Guidelines”
- **Element 3** – undertaking an “External Amenity Area Noise Assessment”; and
- **Element 4** – the consideration of “Other Relevant Issues”.

8.3.2.3.2 A summary of the considerations required in each of the four elements is provided in **Table 8.3.3**.

Table 8.3.3: ProPG Stage 2 – Summary of Four Key Elements

Element	Potential Effect Without Noise Mitigation
Element 1 Good Acoustic Design Process	Considerations include: • Good acoustic design is not just compliance with recommended internal and external noise exposure standards. Good acoustic design should provide an integrated solution whereby the optimum acoustic outcome is achieved, without design compromises that will adversely affect living conditions and the quality of life of the inhabitants or other sustainable design objectives and requirements. • Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided. Any reliance upon building envelope insulation with closed windows should be justified in supporting documents The Planning Application MUST: • Check the feasibility of relocating, or reducing noise levels from relevant sources. • Consider options for planning the site or building layout. • Consider the orientation of proposed building(s). • Select construction types and methods for meeting building performance requirements. • Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc. • Assess the viability of alternative solutions. • Assess external amenity area noise.
Element 2 Internal Noise Level Guidelines	Considerations include: • Reference to BS 8233:2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’ for internal noise level guidelines • Most residents value the ability to open windows at will, for a variety of reasons, and LPAs should therefore normally request that designers principally aim, through the use of good acoustic design, to achieve the internal noise level guidelines in noise-sensitive rooms with windows open. Where internal noise levels are assessed with windows closed the justification for this should be included in the ADS. In the case of sites exposed to industrial and/or commercial noise is considered to be “dominant” (i.e. where the impact would be rated as adverse or greater (subject to context)) then this is outside the scope of this ProPG and regard should be had to the guidance in BS 4142:2014. In the special case where industrial and/or commercial noise is present on the site but is “not dominant” (i.e. where the impact would be rated as lower than adverse (subject to context) if a BS 4142:2014 assessment was to be carried out), its contribution may be included in the noise level used to establish the degree of risk in Stage 1 and may also be included in the consideration of Stage 2 Element 2 Internal Noise Level Guidelines (and if included, this should be clearly stated).

Element	Potential Effect Without Noise Mitigation
Element 3 External Amenity Area Noise Assessment	The assessment must provide and demonstrate: - Full details of the external amenity area noise assessment should be included in an Acoustic Design Statement. - The term “assessment” is deliberately used because this element concerns more than just the level of noise outside. - ProPG external amenity area noise assessment reflects and extends the advice contained in BS 8233:2014 and the current Government guidance in PPG-Noise Where external amenity areas are exposed to “dominant” industrial and/or commercial noise, the impact of the noise should be assessed in accordance with BS 4142:2014 over the time period that the amenity area is likely to be used. In the special case where industrial and/or commercial noise is present on the site but is “not dominant”, its contribution may be included in the noise level used to establish the degree of risk in Stage 1 and may also be included in the consideration of Stage 2 Element 3 External Amenity Area Noise Assessment (and if included, this should be clearly stated).
Element 4 Assessment of Other Relevant Issues	Consideration should be given to: - Compliance with relevant national and local policy: i.e., NPSE, PPG-Noise and The Environmental Noise Regulations. - Magnitude and extent of compliance with ProPG - Likely occupants of the development - Acoustic design vs unintended adverse consequences: Examples include sealed up balconies that result in a lack of connection with the external environment, roadside barriers that remove views or prevent crossing roads, sealed facades that affect personal control over the internal environment etc. Wherever possible, such unintended adverse consequences should be obviated by good acoustic design. - Acoustic design vs wider planning objectives

Internal Noise Guidelines

8.3.2.3.3 For the purpose of considering internal noise levels for road traffic noise, the assessment will be undertaken with reference to the internal noise guidelines set out in BS 8233:2014 as advocated by ProPG. The adopted internal noise criteria are presented in **Table 8.3.4**.

Table 8.3.4: Adopted Internal Noise Criteria – Road Traffic Noise

Location	Activity	Daytime Noise Level (07:00-23:00hrs)	Night-time Noise Level (23:00-07:00hrs)
Living Room	Resting	≤ 35 dB LAeq,16hr	-
Dining Room	Dining	≤ 40 dB LAeq,16hr	-
Bedroom	Sleeping (daytime resting)	≤ 35 dB LAeq,16hr	≤ 30 dB LAeq,16hr 45 dB LAFmax (normally no more than 10 times a night)

8.3.2.3.4 It should be an aspiration that where possible, the above noise criteria be achieved on an open windows basis. However, as bare minimum, the criteria should be achieved on a closed windows basis with an appropriate means of ventilation provided in accordance with Building Regulations (201) Approved Document F: Ventilation (Volume 1: Dwellings)(ADF).

8.3.2.3.5 For a partially open window, Appendix B of the AVO Guide states that the noise insulation can be assumed to be approximately 13 dB and applied to an external free-field level. It is also noted that the value of 13 dB is not appropriate for all situations, however, it does enable a ProPG Stage 2 assessment to be undertaken.

8.3.2.3.6 When windows are closed the sound insulation performance is determined by the building's façade construction including the performance of glazing and ventilation components and their respective areas. For the purposes of this assessment the following assumptions have been adopted for the 'closed window' scenario:

- The wall and room constructions of the dwellings are of a standard nature, i.e. brick and block wall construction as per the standard assumptions made within BS 8233:2014 with a sound reduction index (SRI) summarised in **Table 8.3.5**.
- Standard thermal double glazing and one in/over-frame trickle ventilator per room will be incorporated into the dwellings to achieve a sound reduction index (SRI) summarised in **Table 8.3.5**.

Table 8.3.5: Assumed SRI for Standard Thermal Double Glazing, External Wall and Ventilator

Element	Sound Reduction Index (SRI) at Octave Centre Band Frequency (Hz)								R _w (C; C _{tr})
	63	125	250	500	1k	2k	4k	8k	
Double Glazing (6:12:4)	20	24	20	25	35	38	35	35	32 (-2; -5)
Brick and Block External Wall	40	40	44	45	51	56	56	56	52 (-2; -5)
Element	63	125	250	500	1k	2k	4k	8k	D _{ne,w} (C; C _{tr})
Standard In/over-frame Trickle Vent	20	23	26	29	30	33	33	35	33 (-2; -4)

External Noise Amenity

8.3.2.3.7 External noise amenity is considered with reference to the guidance provided within BS 8233:2014. As the Proposed Development is likely to include rear gardens and patios, the assessment will consider adherence with external noise levels below 55 dB L_{Aeq,16hr} as an 'upper' guideline value, and 50 dB L_{Aeq,16hr} as a design target for road traffic noise.

8.3.2.4 ProPG Acoustic Design Statement

8.3.2.4.1 ProPG requires that the Acoustic Design Statement (ADS) provides sufficient evidence that the ProPG Stage 1 and Stage 2 Elements 1 – 4 have been followed. It also advises that the ADS should be proportionate to the scale of the development and the degree of noise risk at the proposed development site. In this context, ProPG states that the level of detail to be provided within the ADS should increase with the increasing level of risk.

8.3.2.5 Assessment Criteria - Kirkby Leisure Centre – External Pitches

8.3.2.5.1 Noise from the sports pitches for an existing part of the noise climate⁷ and is not a new source of noise. Therefore, it is appropriate to incorporate noise mitigation measures needed to reduce adverse noise impacts impact into the design of new residential, and other noise-sensitive development.

8.3.2.5.2 In addition to the guidance summarised the main noise chapter^{Error! Bookmark not defined.} noise impact from the existing sports pitches at the Kirkby Leisure Centre, has been considered

⁷ Para 187 of NPPF states that "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."

with reference to Sport England Guidelines – Design Guidance Note: Artificial Grass Pitch (AGP) Acoustics – Planning Implications, 2015.

- 8.3.2.5.3 Sport England’s AGP guidance was prepared in support of the design and specification of new artificial grass pitches (APG) located in close proximity to existing dwellings states that noise generated by new Multi-Use Game Areas is normally dominated by human voices, as was found in the baseline noise survey.
- 8.3.2.5.4 The Guidance concerns new sports pitches and advocates an upper noise limit of 50 dB $L_{Aeq,1hr}$ which has been adopted as limiting noise criteria for external amenity. The AGP references the WHO GCN in terms of internal noise limits of 35 dB L_{Aeq} during the daytime and associated external limits of 50 dB L_{Aeq} at 1m from the façade of living spaces, so that the guideline noise levels of BS 8233 (**Table 8.3.4**) can be achieved with open windows.
- 8.3.2.5.5 However, it is argued that new residential development introduced in proximity to existing pitches may be subject to less onerous criteria than would be applied to existing residential properties, because any proposed new development would incorporate appropriate noise mitigation measures.
- 8.3.2.5.6 For noise ingress, noise criteria shown in **Table 8.3.4** has been adopted for a 1-hour period, i.e. 35dB $L_{Aeq,1h}$. The AGP does not consider, nor does Kirkby Council have any specific guidance for daytime peaks in noise (L_{AFmax}) for sports noise, which has therefore been considered separately.
- 8.3.2.5.7 Importantly, the sports pitches are not used at night (2300 – 0700 hrs), and typically close around 21:00hrs.

8.3.2.6 Sound Survey

- 8.3.2.6.1 To quantify existing levels of environmental noise on the Site during the daytime (07:00 – 23:00hrs) and night-time (23:00 – 07:00hrs) periods for this assessment, a part-attended noise survey has been undertaken.
- 8.3.2.6.2 Full details of the survey, including details of the noise monitoring locations are provided in **Appendix 8.2**. The baseline noise monitoring locations are shown in **Figure 8.3.2**.

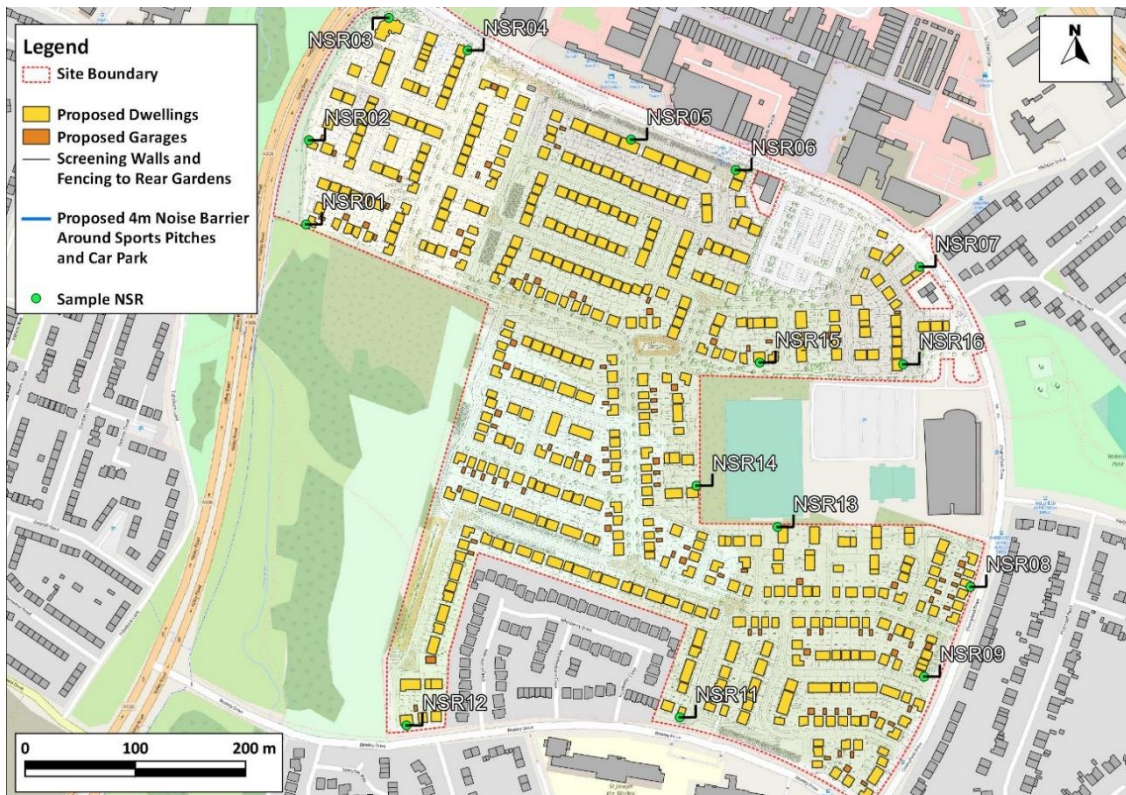
8.3.3 Survey Summary and Analysis

8.3.3.1 Survey Observations

- 8.3.3.1.1 Table 8.3.6 details the noise survey observations undertaken at the baseline noise monitoring locations, shown in Figure 8.3.2.

Table 8.3.6: Noise Survey Observations

Measurement Location	Observations
LT1	Road traffic on Cherryfield Drive is the dominant noise source in the day and night.
LT2	Road traffic on Valley Road is the dominant noise source in the day and night.
LT3	Road traffic on Valley Road and Cherryfield Drive is the dominant noise source in the day and night.
LT4	Road traffic on Cherryfield Drive is the dominant noise source in the day and night.
CRTN1	Road traffic on Valley Road is the dominant noise source in the day and night.
CRTN2	Distant traffic on Valley Road is the dominant noise source throughout the day and night.
CRTN3	Road traffic on Bewley Drive is the dominant noise source in the day and night.
CRTN4	Road traffic on Cherryfield Drive and occasional passing traffic on Rushey Hey Road are the dominant noise source in the day.
ST1	Distant traffic on surrounding roads is the dominant noise source throughout the day and night.
ST2 - 5	Distant traffic on surrounding roads is the main noise source throughout the day and night. Voices on sports pitch is the main source when in intensive use..

Figure 8.3.2: Noise Monitoring Locations

8.3.3.2 Summary

8.3.3.2.1 A summary of the measured ambient noise levels is presented in **Table 8.3.7**.

Table 8.3.7: Summary of Measured Ambient Sound Levels

Measurement Location	Period	dB L _{Aeq,T}	n th Highest dB L _{AFmax}				
			1	5	10	15	20
LT1	Daytime (07:00-23:00hrs)	60	-	-	-	-	-
	Night-time (23:00-07:00hrs)	50	74	72	71	69	69
LT2	Daytime (07:00-23:00hrs)	60	-	-	-	-	-
	Night-time (23:00-07:00hrs)	54	74	70	69	68	67
LT3	Daytime (07:00-23:00hrs)	57	-	-	-	-	-
	Night-time (23:00-07:00hrs)	50	70	63	60	60	59
LT4	Daytime (07:00-23:00hrs)	63	-	-	-	-	-
	Night-time (23:00-07:00hrs)	56	88	75	74	74	73
CRTN1	Daytime (07:00-23:00hrs)	59	-	-	-	-	-
	Night-time (23:00-07:00hrs)	59	71	70	68	67	66
CRTN2	Daytime (07:00-23:00hrs)	47	-	-	-	-	-
	Night-time (23:00-07:00hrs)	51	62	56	54	54	53
CRTN3	Daytime (07:00-23:00hrs)	58	-	-	-	-	-
	Night-time (23:00-07:00hrs)	55	75	70	69	68	68
CRTN4	Daytime (07:00-23:00hrs)	64	-	-	-	-	-
ST1	Daytime (07:00-23:00hrs)	47	-	-	-	-	-
ST2	Evening (19:15-21:02hrs)	56	75	74	71	70	69
ST3		61	79	75	74	73	72
ST4		59	79	75	74	73	72
ST5		56	78	73	71	70	68

8.3.3.3 Analysis

8.3.3.3.1 The measured noise data at locations **LT1-LT4** show the diurnal change in levels commensurate with sites exposed to road traffic noise. Peaks in noise are attributable to passing vehicles. At locations **CRTN1-4**, the main source of noise was road traffic with peaks in noise attributable to passing vehicles. At location **ST1**, distant road traffic from surrounding roads was the main source of noise.

8.3.3.3.2 The analysis of the L_{AFmax} noise levels at night was based on;

- 5-minute sample periods at night at locations **LT1-LT4**; and,
- 1-minute sample periods at locations **CRTN1-3**, due to the short night-time survey duration.

8.3.3.3.3 At locations ST2-5, the assessment during the day was based on the measured 10-second sample periods due to the nature of noise being considered. Voices from juniors using the pitch for training and matches were the main source of noise. Peaks in noise from balls

impacting the steel fencing around the pitch were highly infrequent, and lower in level than voices, and is predominantly due to there being a large field of play.

8.3.4 Noise Modelling: Methodology and Results

- 8.3.4.1.1 To determine external noise levels across the Site, a sound propagation model has been developed based on the results of the baseline noise survey. The model was developed using LimA® Predictor (v2022) computational sound modelling software, configured to calculate sound levels in accordance with ISO 9613-2:1996 'Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation'. The modelling procedure assumes downwind conditions for all sources in all directions.

8.3.4.2 Noise Model Parameters

- 8.3.4.2.1 Geospatial data for the model was obtained by publicly available mapping data⁸ and the proposed development layout as shown in **Figure 8.3.1** using the input parameters summarised in the following table.

Table 8.3.8: Road Traffic and Sports Pitch Noise Modelling Input Parameters

Modelling Parameter	Input Parameter
Topography	Obtained from Environment Agency's National LIDAR Programme ⁹ , 1.0m intervals
Order of reflections	1
Ground absorption, G	0.5
Temperature / Humidity	10 °C / 70%
Adverse weather conditions	No
Existing building heights	Determined from Environment Agency's National LIDAR Programme (DTM and DSM data) and on site observations
Proposed building heights	Dwellings - 7.0m Garages - 3.0m

8.3.4.3 Model Calibration – Road Traffic Noise

- 8.3.4.3.1 The model includes the digitisation of adjacent roads as line sources, 0.5m above the carriageway centres with Valley Road modelled to two separate carriageways. A model calibration exercise was first carried out which involved digitising receptor points representative of sound monitoring locations LT1, LT2, LT4 and CRTN3. At these locations road traffic noise from adjacent roads is dominant and the measured noise data spans most of the day and night and is therefore considered representative.
- 8.3.4.3.2 The emission levels of the roads were then calibrated to the measured road traffic noise levels through an iterative process. Table 8.3.9 shows a slight over-prediction of road traffic noise levels, with all results within +1dB of the adopted day and night-time road traffic noise exposure levels. This accuracy is considered acceptable for the purposes of the noise assessment and presents a reasonable worst-case assessment.

⁸ LIDAR DTM and DSM data for the site and wider area was obtained from DEFRA at <https://environment.data.gov.uk/DefraDataDownload/>

⁹ LIDAR DSM and DTM data for the site and wider area was obtained from the Defra Data Services Platform

Table 8.3.9: Noise Model Verification (dB L_{Aeq,T})

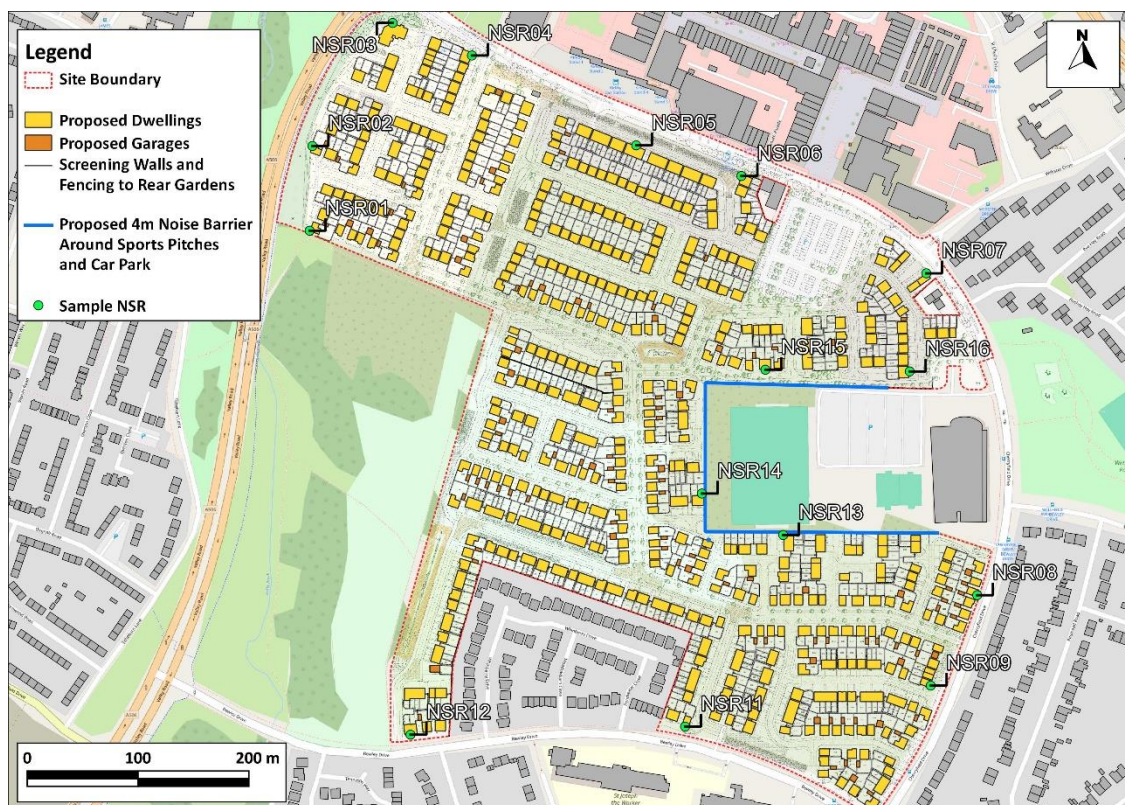
Measurement Location	Daytime 07:00-23:00hrs (16hr)			Night-time 23:00-07:00hrs (8hr)		
	Measured	Predicted	Difference	Measured	Predicted	Difference
LT1	59.9	60.0	+0.1	49.6	50.2	+0.6
LT2	60.1	60.3	+0.2	54.1	54.2	+0.1
LT4	61.7	62.1	+0.4	58.3	58.7	+0.4
CRTN3	58.3	58.4	+0.1	55.3	55.3	0.0

8.3.4.4 Model Calibration – KLC Sport Pitches

- 8.3.4.4.1 A separate noise model has been constructed to predict noise propagation from the use of the main sports pitch at KLC. The model includes the digitisation of the main sports pitch as an area source at a height of 1.5m.
- 8.3.4.4.2 The model has been calibrated in octave-bands to the measurements carried out at ST3 (around 15m from the pitch sideline) where sports pitch noise was the (62.5dB L_{Aeq}, between 19:27-19:38hrs, and with approximately 80 juniors present over a 2hr junior training session. The adopted value was assumed to persist at the same levels for a whole 1-hour period. Consequently, the predicted noise levels at locations ST2 and ST4-5 are higher than were measured during the baseline survey and the modelling results are an over-estimate in these areas of the Site.
- 8.3.4.4.3 This approach is considered a reasonable worst-case scenario, as the measured noise level exceeds the typical noise emission levels advised in the Sport England APG guidance by at least 10 dB(A).
- 8.3.4.4.4 The calibrated noise emission level for the main pitch has then been applied to the two smaller pitches located closer to the main leisure centre building that were not in use at the time of the survey.

8.3.4.5 Sample Receptors

- 8.3.4.5.1 A sample number of Noise Sensitive Receptors (NSRs) have been added to the 'with development' model as calculation points (as shown in **Figure 8.3.3**) to enable the prediction of free-field noise levels at facades of proposed dwellings. **NSR01** to **NSR12** have been used to determine if uprated glazing/ventilation is/are required for dwellings exposed to road traffic noise. Similarly, **NSR13-NSR16** have been used to determine if uprated glazing/ventilation is/are required for dwellings most exposed to noise from the KLC's sports pitches.

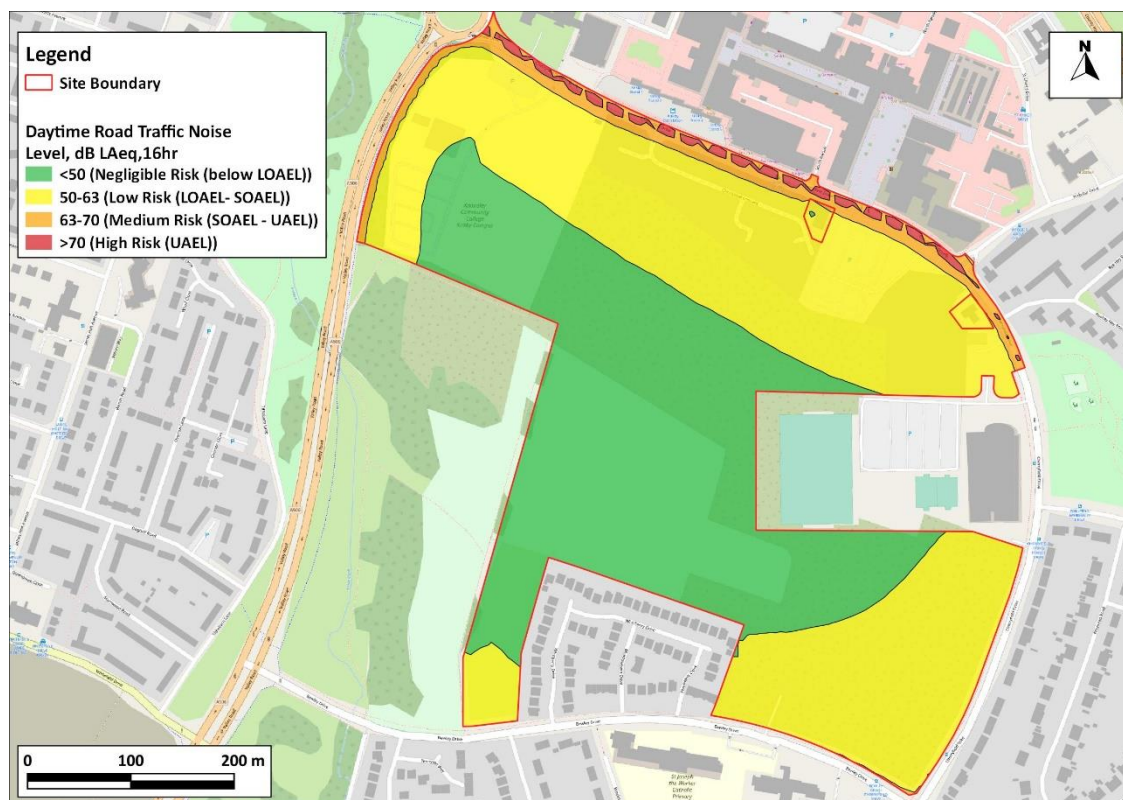
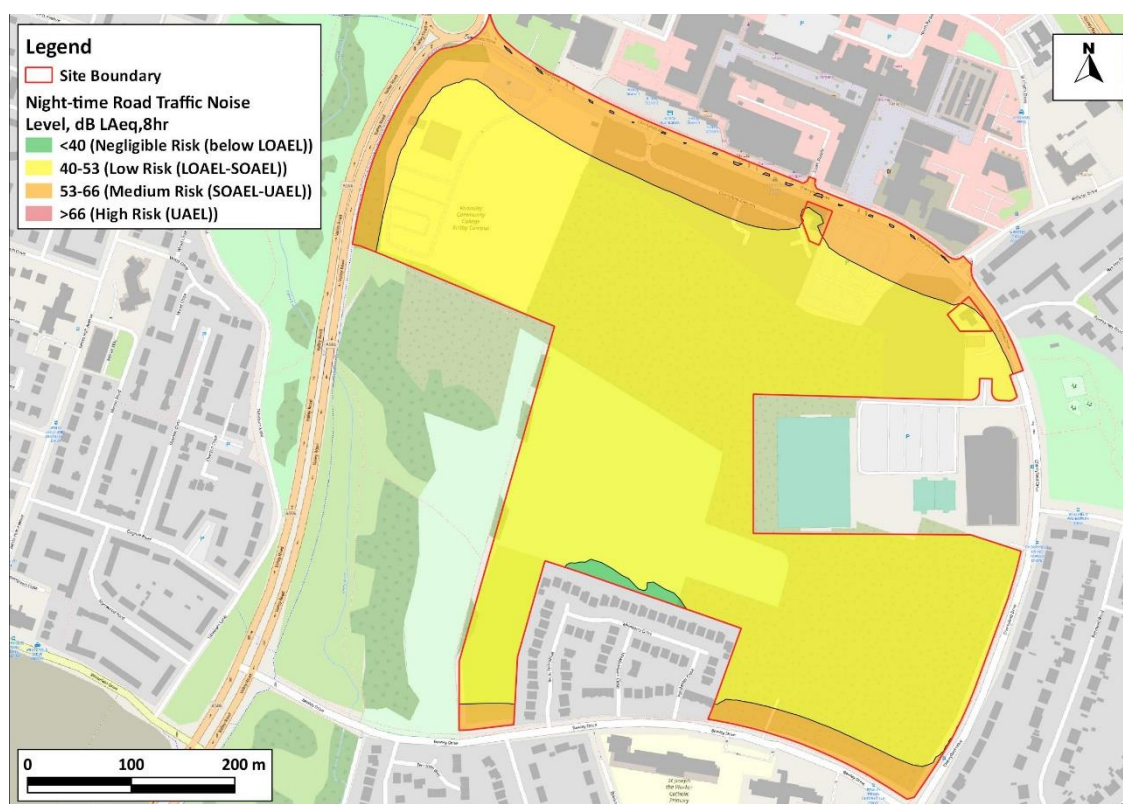
Figure 8.3.3: Sample Noise Receptors

8.3.5 Site Suitability Assessment

8.3.5.1.1 An initial ProPG site noise risk assessment has been undertaken to provide an indication of the likely risk of adverse effects, excluding any subsequent mitigation measures which may be included as part of the development proposals. The suitability of the Site for residential development has been undertaken following the approach advocated by ProPG, produced to assist practitioners in matters relating to noise and new residential development. It focuses on existing transportation noise sources and has been developed to consider the Government's overarching noise policy, planning policy and policy guidance. It has also been developed to take into account other authoritative sources of guidance such as BS 8233:2014.

8.3.5.2 Assessment Levels

- 8.3.5.2.1 Road traffic noise exposure has been predicted across the open site (in the absence of any development) in terms of $L_{Aeq,16hr}$ (daytime) and $L_{Aeq,8hr}$ (night-time) metrics. The noise exposure, presented in **Figure 8.3.4** and **Figure 8.3.5**. The noise thresholds that have been adopted in order to classify site risk are defined in Error! Reference source not found. and are determined for the daytime and night-time periods with thresholds defined for the 'Low' and 'Medium' site risk classifications selected to align with the onset of LOAEL and SOAEL. The 'High' and 'Negligible' risks have been defined using the ProPG site risk classification.
- 8.3.5.2.2 Consideration has also been given to L_{AFmax} during the night-time period. The 10th highest measured $L_{Amax,5min}$ during the night-time periods have been applied for the night-time assessment (as detailed in Error! Reference source not found.).

Figure 8.3.4: Daytime ProPG Assessment (Ground Floor, Excludes MUGA noise)**Figure 8.3.5: Night-time ProPG Assessment (First Floor)**

8.3.5.3 Stage 1 – Initial Assessment

- 8.3.5.3.1 With reference to the assessment criteria and the advice provided in ProPG Stage 1 and the results of the noise modelling shown in the above figures, the Site is of a 'Low' to 'Medium' noise risk in both the day and night.

8.3.5.3.2 A Stage 2 full assessment is therefore required, incorporating an Acoustic Design Statement (ADS) to demonstrate a good acoustic design process.

8.3.5.4 Stage 2 - Full Assessment

Internal Noise Levels

8.3.5.4.1 Internal noise levels have been calculated based on the assumptions in **Table 8.3.5** using the rigorous methodology outlined in BS 8233:2014. **Table 8.3.10** presents the calculated internal noise levels at sample receptors NSR01-NSR12 (shown in **Figure 8.3.3**) and then compared against the adopted noise design criteria.

Table 8.3.10: BS 8233:2014 Assessment Assuming a Standard Building Envelope Solution

Sample Receptor	Window Condition ¹⁰	Living Areas	Bedrooms		Comment
		L _{Aeq} , 16hr	L _{Aeq} , 8hr	L _{Amax} (night)	
NSR01	Open	45	39	55	Achieves BS 8233:2014 guidelines with windows closed for living areas and bedrooms. Bedrooms meet the requirements of ADO at night based on openable windows ¹⁰
	Closed	34	28	43	
NSR02	Open	47	41	56	Minor exceedance of BS 8233:2014 guidelines with windows closed.
	Closed	38	32	45	
NSR03	Open	49	44	56	Enhanced glazing and/or ventilation required.
	Closed	38	34	45	
NSR04	Open	48	44	61	Minor exceedance of BS 8233:2014 guidelines with windows closed. Exceeds 45dB L _{AFmax} in bedrooms at night.
	Closed	39	37	50	
NSR05	Open	47	44	57	Enhanced glazing and/or ventilation required.
	Closed	37	34	46	
NSR06	Open	48	44	61	Minor exceedance of BS 8233:2014 guidelines with windows closed. Enhanced glazing and/or ventilation required.
	Closed	40	37	50	
NSR07	Open	47	41	58	Minor exceedance of BS 8233:2014 guidelines with windows closed. Exceeds 45dB L _{AFmax} in bedrooms at night. Enhanced glazing and/or ventilation required.
	Closed	38	33	47	
NSR08	Open	47	38	58	Minor exceedance of BS 8233:2014 guidelines with windows closed in daytime. Exceeds 45dB L _{AFmax} in bedrooms at night. Enhanced glazing and/or ventilation required.
	Closed	38	28	47	

¹⁰ It is assumed that a partially open window will provide an outside to inside level difference of 13 dB, as advocated in ProPG. Ultimately, the resulting internal noise level is dependent upon the spectrum of the noise incident on the window etc, could be higher or lower, but allows for a PropPG Stage 2 assessment to be carried out.

NSR09	Open	44	34	44	Achieves BS 8233:2014 guidelines with closed windows for living areas and bedrooms.
	Closed	30	21	34	Bedrooms meet the requirements of ADO at night based on openable windows ¹⁰
NSR10	Open	50	46	56	Minor exceedance of BS 8233:2014 guidelines with windows closed. Enhanced glazing and/or ventilation required.
	Closed	37	32	44	
NSR11	Open	46	43	56	
	Closed	36	33	44	
NSR12	Open	47	44	56	
	Closed	37	33	44	
Key					
Achieves BS 8233:2014 Guidelines or < 45 dB L _{Amax} in bedrooms				No Action	
Within +5 dB of BS 8233:2014 'Guidelines				Mitigate and reduce if sustainable	
Exceeds BS 8233:2014 Guidelines by more than 5 dB and/or > 45 dB L _{Amax} in bedrooms				Avoid – sound attenuated measures required	

8.3.5.4.2 Table 8.3.10 shows that;

- For dwellings set reasonably well back from nearby roads, noise levels for living areas and bedrooms comply with the BS 8233:2014 guidelines with closed windows only; and,
- For some dwellings closest to nearby roads, noise levels for living areas and bedrooms exceed with the BS 8233:2014 guidelines with closed windows.

8.3.5.4.3 The calculations assume standard (non-uprated) glazing and in/over-frame trickle ventilation. Therefore, enhanced acoustic glazing/ventilation measures are required for some dwellings most exposed to road traffic noise in order to achieve the BS 8233:2014 internal guideline criteria.

External Amenity

8.3.5.4.4 Both the measured levels and predicted noise contours shown in **Figure 8.3.4** demonstrate that mitigation is required to reduce daytime road traffic noise levels in “traditional external areas that are used for amenity space” (i.e. private rear garden) to be ≤55dB L_{Aeq,16hr}.

8.3.6 Acoustic Design Statement (ADS)

8.3.6.1.1 The ProPG assessment above has shown that good acoustic design is required with respect to achieving suitable internal noise levels for living rooms, bedrooms and external amenity spaces.

8.3.6.1.2 The following sections provide acoustic design information that should be considered during any further detailed design of the Proposed Development.

8.3.6.2 Dwelling Orientation and Acoustic Screening

8.3.6.2.1 As shown in **Figure 8.3.4** daytime road traffic noise levels in areas of the Site closest to adjacent roads exceed the ‘upper’ guideline value of 55 dB L_{Aeq,16hr} of BS 8233:2014 in the absence of any development and noise mitigation.

- 8.3.6.2.2 Minimising daytime noise levels in gardens in any alternative layout is best achieved by first considering the orientation of the dwellings so that the associated rear garden(s) are positioned to the less exposed (acoustically shielded) side of dwellings with respect to road traffic from the closest road. This will enable the dwellings to self-screen garden areas. The proposed layout has been well planned so that the majority of dwellings self-screen rear gardens.

8.3.6.3 Glazing and Ventilation

- 8.3.6.3.1 **Table 8.3.10** indicates, based on the results of the noise survey and noise modelling exercise, that some dwellings will require acoustically enhanced glazing/ventilation to achieve the adopted internal noise criteria. The adopted internal noise criteria for dwellings set well back from the site boundaries will be met with open windows.

8.3.6.4 Further Considerations for Mitigation

Internal Building Layout

- 8.3.6.4.1 Consideration of the internal building layout (where noise sensitive rooms such as bedrooms could be positioned to the least exposed elevations of the dwellings with respect to the road traffic noise sources) could afford further reductions to internal noise levels, reducing the likelihood of the requirement to uprate the building envelope sound insulation and increasing the likelihood that internal noise guideline criteria can be achieved with open windows.

Setback Distances

- 8.3.6.4.2 Where dwellings are significantly closer to adjacent roads, acoustic glazing and ventilation may be required. In this instance the “equivalent area” of the ventilation openings could be reduced by adopting mechanical extract ventilation (MEV), mechanical ventilation and heat recovery (MVHR, with summer bypass), positive input ventilation (PIV) or other suitable ventilation solution, thereby reducing the required acoustic performance for the remaining ventilation area. If mechanical ventilation with heat recovery (MVHR) was adopted any attenuation required could readily be provided within the ductwork.

8.3.7 Assessment of Development Layout – Road Traffic

- 8.3.7.1.1 The proposed development layout is shown in **Figure 8.3.1**, and has been well planned such that, as noted in the ADS above, the majority of dwellings self-screen rear gardens.
- 8.3.7.1.2 The layout has been incorporated into the noise model developed for the Development, and the resulting daytime and night-time road traffic noise exposure levels calculated at heights of 1.5m and 4.0m above local ground (respectively).

8.3.7.2 External Amenity – Road Traffic Noise

- 8.3.7.2.1 Initial results of the noise modelling exercise indicate that daytime road traffic noise levels in the vast majority of rear gardens will be less than 50 dB $L_{Aeq,16hr}$. Gardens closest to adjacent roads will generally be less than 55dB $L_{Aeq,16hr}$. A limited number of gardens closest to Cherryfield Drive were predicted to slightly exceed 55dB $L_{Aeq,16hr}$ even with the inclusion of a 1.8m high closed-boarded timber fence.
- 8.3.7.2.2 Therefore, the height of fencing to these gardens has been optimised through iterative noise modelling to determine the minimum height of fencing required to reduce daytime road traffic noise levels to ≤ 55 dB $L_{Aeq,16hr}$, below the ‘Upper’ level of BS 8233:2014, and to achieve the adopted noise criteria.
- 8.3.7.2.3 It is therefore recommended that any timber fencing (or screening walls) to the outer boundaries of rear gardens should:

- be of a height no less than shown in Figure 8.3.6 - Figure 8.3.10 (relative to the centre of the gardens);
- timber fencing should be closed-boarded, be imperforate (i.e. have no holes or gaps) and incorporate suitable gravel boards to seal the gap at the base of the fence; and achieve a surface mass of at least 12kg/m^2 (typically at least 12mm thick).

Figure 8.3.6: Recommended Acoustic Screening [1]

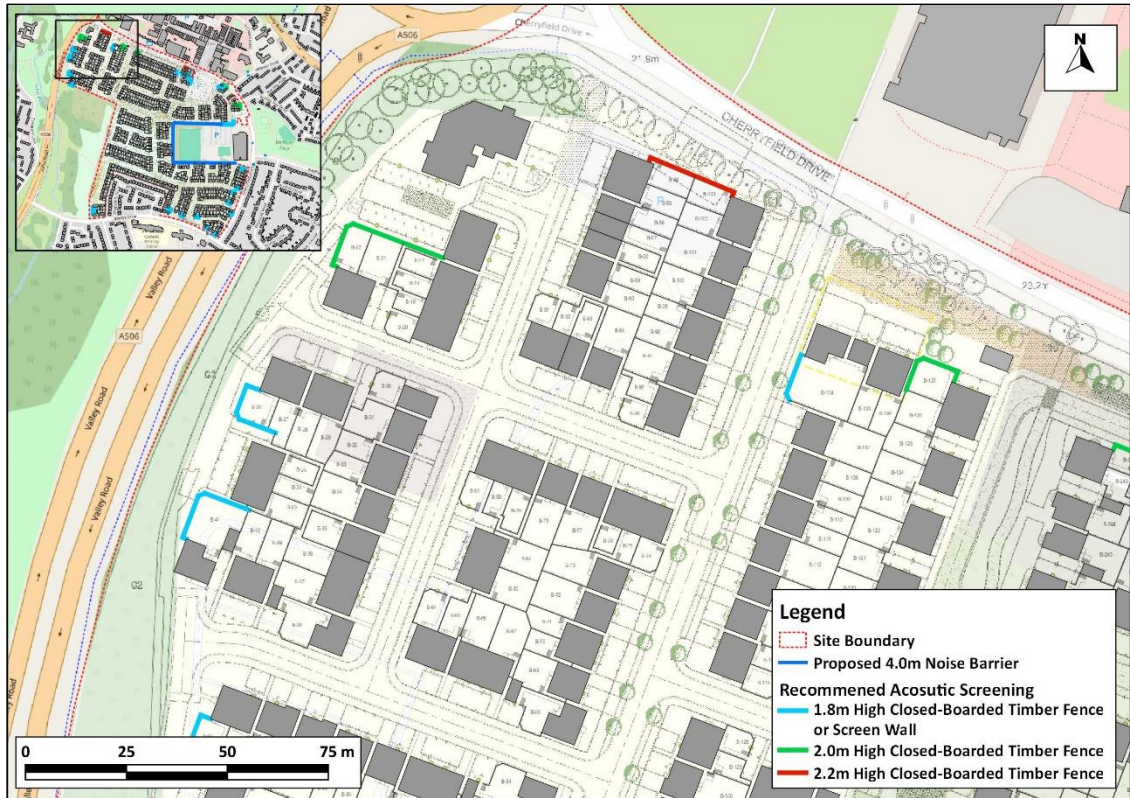


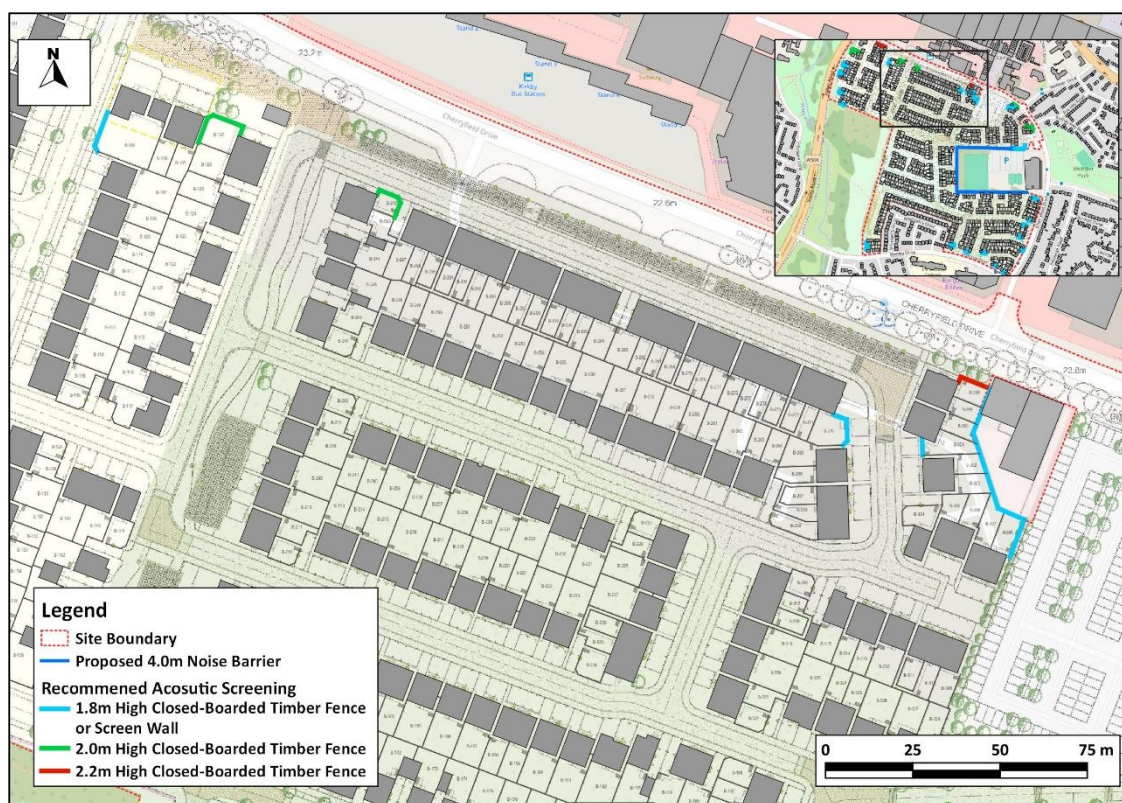
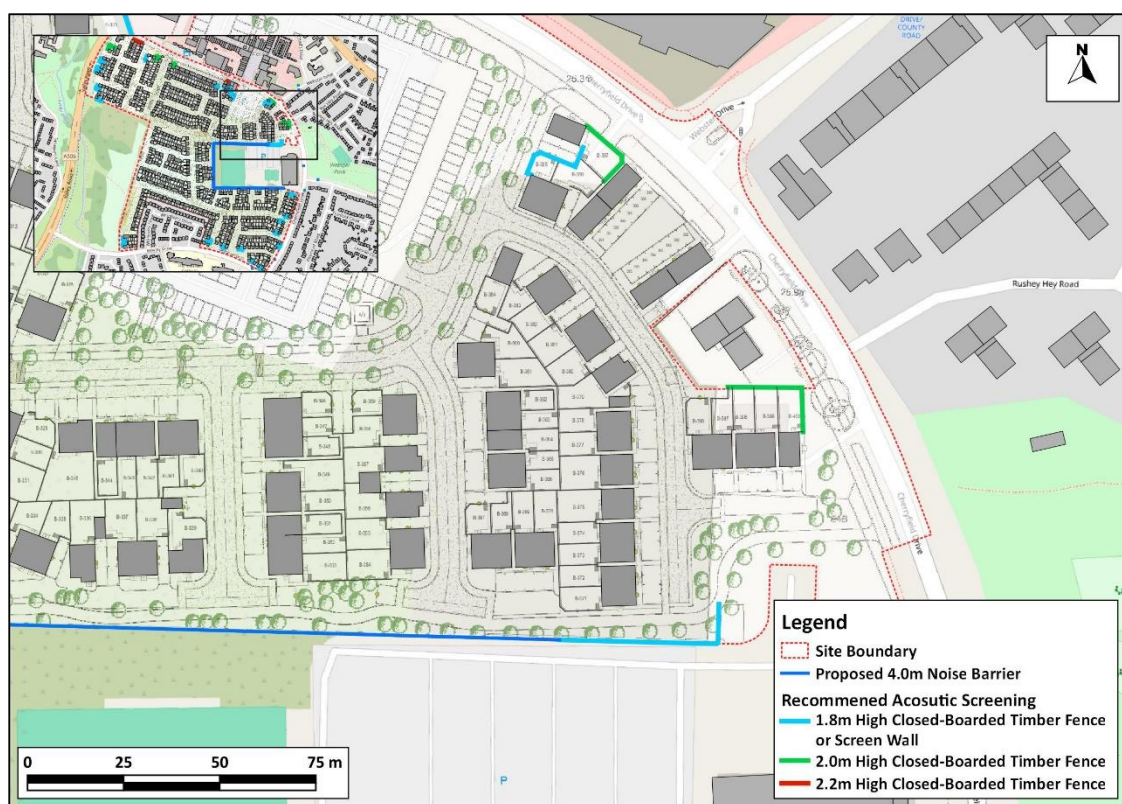
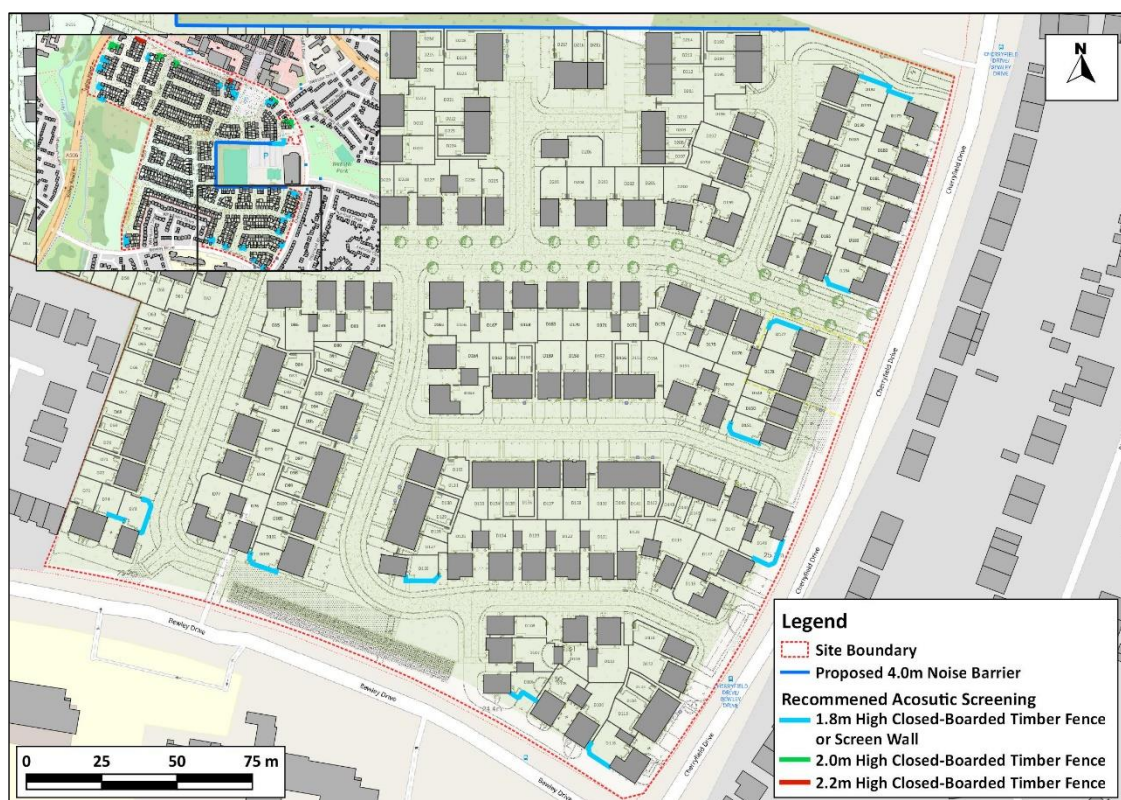
Figure 8.3.7: Recommended Acoustic Screening [2]**Figure 8.3.8: Recommended Acoustic Screening [3]**

Figure 8.3.9: Recommended Acoustic Screening [4]**Figure 8.3.10: Recommended Acoustic Screening [5]**

8.3.7.3 Internal Amenity – Road Traffic Noise

8.3.7.3.1 As noted in **Table 8.3.10**, some habitable rooms of some dwellings most exposed to road traffic noise will require acoustic glazing and/or ventilation.

8.3.7.3.2 It is recommended that the glazing and ventilation of habitable rooms highlighted in **Figure 8.3.11 to Figure 8.3.15** achieve the minimum octave-band sound insulation performance standards detailed in **Table 8.3.11**. The broadband sound reductions in **Table 8.3.11** are provided as a guide. Where beneficial the sound insulation scheme can be rationalised, provided that the sound insulation performance of the glazing/ventilation does not decrease.

Table 8.3.11: Recommended Minimum Sound Insulation Performance (See Figure 8.3.11 to Figure 8.3.15)

Façade Element	Scheme	Specification / Octave Band Sound Reduction Index, dB R_w								Broadband Sound Reduction, dB $R_w + C_{tr}$
		63	125	250	500	1000	2000	4000	8000	
Double Glazing	1	Standard thermal double glazing (i.e. 4mm glass (min) : nominal cavity : 4mm glass(min))								27
	2	Achieves a minimum sound insulation rating of 34 dB $R_w + C_{tr}$ and the sound insulation performance below								34 ¹¹
		24	24	22	29	40	44	46	46	
Façade Element	Scheme	Octave Band Sound Reduction Index, dB $D_{ne,w}$								Broadband Sound Reduction, dB $D_{ne,w}$
		63	125	250	500	1000	2000	4000	8000	
Ventilation	1 & 2	In/over-frame trickle vents, that achieve a minimum of 42 dB $D_{ne,w}$ and the sound insulation performance below, and/or PIV/MVHR or alternative mechanical ventilation in lieu of trickle vents if necessary/desirable/preferred ¹² .								42 ¹³
		33	39	45	44	48	48	48	48	

¹¹ Example glazing: 4mm glass – nominal cavity – 6.4mm Saint Gobain Stadip Silence

¹² Where duct terminations can be located to less noise exposed elevations the required attenuation can be reduced

¹³ Example acoustic ventilator: Aereco EHA² with acoustic canopy and sleeve

Figure 8.3.11: Recommended Road Traffic Sound Insulation Scheme [1]



Figure 8.3.12: Recommended Road Traffic Sound Insulation Scheme [2]



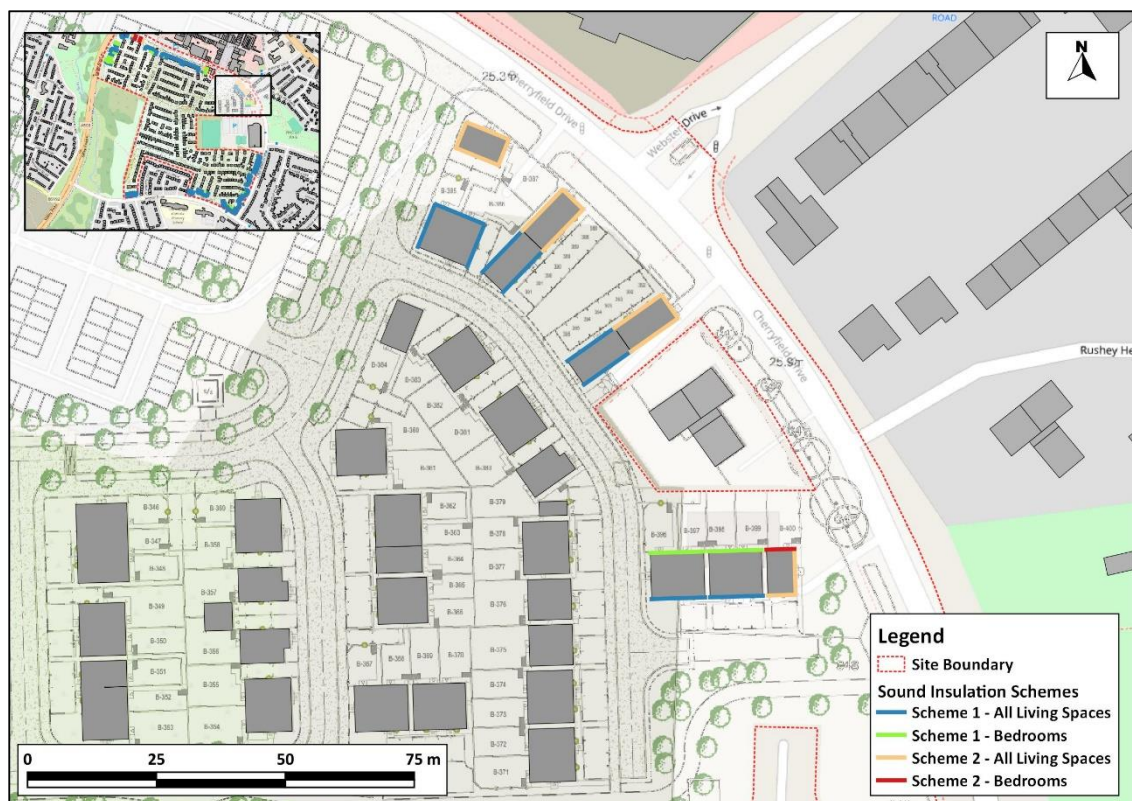
Figure 8.3.13: Recommended Road Traffic Sound Insulation Scheme [3]**Figure 8.3.14: Recommended Road Traffic Sound Insulation Scheme [4]**

Figure 8.3.15: Recommended Road Traffic Sound Insulation Schemes [5]

8.3.8 Assessment of Development Layout – Sports Pitches

8.3.8.1.1 Initial noise modelling, based on the noisier junior training, demonstrates that noise from the KLC main sports pitch would be above the 50 dB $L_{Aeq,1h}$ advocated by Sport England Guidelines, and on this basis the potential for unacceptable noise impacts upon local residents is significant enough to justify mitigation measures in the form of acoustic screening, because noise from pitch users cannot be mitigated at source.

8.3.8.2 External Amenity

- 8.3.8.2.1 The height and location of acoustic screening has been optimised through iterative noise modelling to reduce sports pitch noise levels to $\leq 50\text{dB } L_{Aeq,1hr}$ in rear gardens.
- 8.3.8.2.2 The results of the modelling indicate that the proposed 4.0m high noise barrier is required to the Site boundary with the main pitch, with the proposed 1.8m closed-boarded timber fence along a small section of the Site boundary furthest away from the main and smaller sports pitches, as indicated in **Figure 8.3.16**. The acoustic screen should be a proprietary noise barrier from a suitable manufacturer (such as Jacksons Fencing, Gramm Barriers, etc.).
- 8.3.8.2.3 With the recommended mitigation, the predicted L_{AFmax} levels at the ground floor façade of affected dwellings closest to the pitches is around 53 dB L_{AFmax} .
- 8.3.8.2.4 During other normal uses (i.e. non-junior training), noise levels from the sports pitches can be expected to be lower, and well below the Sport England suggested criterion.

8.3.8.3 Internal Amenity

- 8.3.8.3.1 The results of the noise modelling has been used to determine the resulting internal noise levels from the KLC sports pitches based on the recommended acoustic screens shown in **Figure 8.3.16**.
- 8.3.8.3.2 In all cases, the internal noise limit of 35 dB L_{Aeq} recommended in AGP can be achieved with closed windows.

- 8.3.8.3.3 Assuming a 13 dB reduction for an open window, the results of the noise modelling show that at ground floor, the internal $L_{Aeq,T}$ noise criteria of AGP is capable of being met in habitable rooms of dwellings set back from the main sports pitch and smaller pitches, in addition to those that are reasonably well screened by intervening dwellings of the proposed development. Typical L_{AFmax} noise levels will be below 45dB with closed windows, but could occasionally be exceeded with open windows when considering the highest measured values, rather than the typical values.
- 8.3.8.3.4 Acoustic ventilation (mechanical extract ventilation (MEV), mechanical ventilation and heat recovery (MVHR, with summer bypass), positive input ventilation (PIV) or other suitable ventilation solution is to be incorporated into the design of the dwellings most exposed o noise from the sports pitch (as shown in **Figure 8.3.16** and **Figure 8.3.17**), thereby obviating the need to open windows to provide ventilation, if required. If mechanical ventilation with heat recovery (MVHR) was adopted any attenuation required could readily be provided within the ductwork, however alternative solutions may require a bespoke solution which can be determined during the detailed design of the dwellings and, if necessary, secured by a carefully worded planning condition.

8.3.8.4 Ball-impact Mitigation

- 8.3.8.4.1 To minimise noise from ball impacts upon the existing steel mesh fencing surrounding around the outdoor pitches at KLC, it is recommended that effective shock-resistant impact reduction measures, such as anti-vibration bushings, are retrofitted to this fencing, prior to occupation of dwellings surrounding KLC's sports pitches.

Figure 8.3.16: Calculated Sports Pitch Noise Levels (Ground Floor) and Proposed Sports Pitch Acoustic Screening, and Acoustic Ventilation



Figure 8.3.17: Calculated Sports Pitch Noise Levels (First Floor), Proposed Sports Pitch Acoustic Screening and Acoustic Ventilation



8.3.9 Summary

8.3.9.1 Internal Noise Levels – Road Traffic

- 8.3.9.1.1 The adopted internal noise criteria for the majority of proposed dwellings will be met with standard thermal double glazing and non-acoustic ventilation. Achieving the adopted noise criteria in some dwellings requires enhanced acoustic glazing and ventilation. A scheme of sound insulation measures has been recommended.

8.3.9.2 External Noise Levels – Road Traffic

- 8.3.9.2.1 External noise levels in private amenity spaces (rear gardens) will achieve the adopted daytime noise criteria in the majority of the site without and additional noise mitigation measures.
- 8.3.9.2.2 To achieve the adopted daytime noise criteria in a small number of rear gardens exposed to the highest levels of road traffic noise, a slight increase in the height of garden fencing is recommended up to 2.2m.

8.3.9.3 Sports Pitch Noise

- 8.3.9.3.1 The proposed layout has been well planned so as to locate the majority of rear gardens of dwellings closest to the Kirkby Leisure Centre sports pitch, such that they benefit from a self-screening from the dwellings themselves.
- 8.3.9.3.2 Based on measured noise data, rather than reliance on source levels advised in Sport England's AGP Guidance that are comparatively lower, the proposed 4.0m noise barrier is required for properties closest to the Leisure Centre to achieve the AGP guideline levels for rear gardens. In order to remove the need to open windows and provide enhanced ventilation, acoustic ventilation will be incorporated into some dwellings.

8.3.9.4 Conclusions

- 8.3.9.4.1 The proposed layout has been well planned, reducing the number of dwellings requiring any additional noise mitigation and sound insulation measures to achieve an acceptable level of amenity for future residents.
- 8.3.9.4.2 Provided that appropriate noise mitigation and sound insulation measures are incorporated into the design and layout of the proposed development, a reasonable degree of amenity for future incomings residents can be achieved. The need to incorporate any noise mitigation can be secured by a suitably worded planning condition, if necessary.

