Environmental Noise Solutions Limited

Suite 24
Doncaster Business Innovation Centre
Ten Pound Walk
Doncaster
DN4 5HX

Proposed Residential Development Barnsley West (Phase One) Land to the South of Barugh Green Road, Barnsley

Noise Impact Assessment

For:
Strata Homes Limited

25th April 2024

Ref: NIA/8576/21/9800/v3/Barnsley West (Phase 1)
Issue: Second
Author: C. Parker BSc (Hons) MIOA
R. Ashby BSc (Hons) MIOA

Contents

1 Introduction

1.1 Overview

Environmental Noise Solutions Ltd (ENS) has been commissioned by Strata Homes Limited to undertake a noise impact assessment for a proposed residential development at a parcel of land in the north-west area of a wider mixed-use application (known as 'Barnsley West') on land to the south of Barugh Green Road in Barnsley (hereafter referred to as 'the site').

This report details:

- The methodology and results of a baseline noise survey conducted at the site
- The assessment of potential impact with regard to existing and future local noise sources that may affect the proposed development
- Recommendations for building envelope design (fenestration and ventilation) at key locations within the proposed development

The report has been prepared for Strata Homes Limited for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties referring to the report should consult Strata Homes Limited and ENS as to the extent to which the findings may be appropriate for their use.

A glossary of acoustic terms used in the main body of the text is contained in Appendix A.

1.2 Site Description

The site is located to the south of Barugh Green Road (A635) in the Higham / Barugh Green area, approximately 2 km to the north-west of Barnsley town centre, as shown in Appendix B.

The site is bound by:

- Barugh Green Road (A635) to the north with Claycliffe Business Park further beyond
- Higham village (residential area) to the west
- Vacant land to the east (part of the proposed 'Barnsley West' development planning application) with Gawber village (residential area) further beyond
- Vacant land to the south (part of the proposed 'Barnsley West' development planning application) with the M1 motorway further beyond

The proposed development comprises 216 no. new residential units along with access and landscaping works.

2 Policy Context and Assessment Guidance

2.1 Assessment Guidance

National Planning Policy Framework

The National Planning Policy Framework (NPPF)[1] was updated in December 2023 and sets out the Government's planning policies for England and how these are expected to be applied.

Where issues of noise impact are concerned the NPPF provides brief guidance in paragraph 180 where it states that 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…..noise pollution'.

Paragraph 191 advises that:

'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'

The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NPSE) which reinforces and supplements the NPPF.

2.2 Noise Policy Statement for England

The Noise Policy Statement for England[2] (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

- Avoid significant adverse impacts on health and quality of life
- Mitigate and minimise adverse impacts on health and quality of life
- Where possible, contribute to the improvement of health and quality of life

The NPSE describes the following levels at which noise impacts may be identified:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected
- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur

1 National Planning Policy Framework. Ministry of Housing, Communities and Local Government (2023)
[2] Noise Policy Statement for England. Government Department for Environment, Food and Rural Affairs (2010)

According to the explanatory notes in the statement, where a noise level falls between the lowest observable adverse effect level (LOAEL) and a level which represents a significant observable adverse effect level (SOAEL):

'....all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.'

2.3 Planning Practice Guidance on Noise

Planning Practice Guidance[3] (PPG) is an online resource which provides additional guidance and elaboration on the NPPF. It advises that the Local Planning Authority should consider the acoustic environment in relation to:

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

In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

'...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 particular situation'.

The PPG also provides general advice on the typical options available for mitigating noise, suggesting that Local Plans may include noise standards applicable to proposed developments within the Local Authority's administrative boundary, although it states that:

'Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed'.

With regard to the mitigation of extant environmental noise at a proposed residential development, the guidance states that:

'... 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. Further information on ventilation can be found in the Building Regulations'.

2.4 Assessment Guidance

British Standard 8233:2014

British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (BS 8233)[4] provides recommendations for the control of noise both in and around buildings and suggests criteria and limits appropriate to their function. For dwellings, the main considerations are:

- Bedrooms - the effect of noise upon sleep
- Other habitable rooms - the effect of noise upon resting, listening and communicating

[3] Planning Practice Guidance on Noise: http://planningguidance.planningportal.gov.uk/blog/guidance/noise/
[4] British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings. BSI

It is desirable that the internal ambient noise level does not exceed the guideline values as replicated in Table 2.1.

Table 2.1: Indoor Ambient Noise Levels for Dwellings – BS 8233:2014

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

BS8233 states:

'If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.'

For traditional external areas that are used for amenity space, such as gardens, BS8233 states that:

'.....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.'

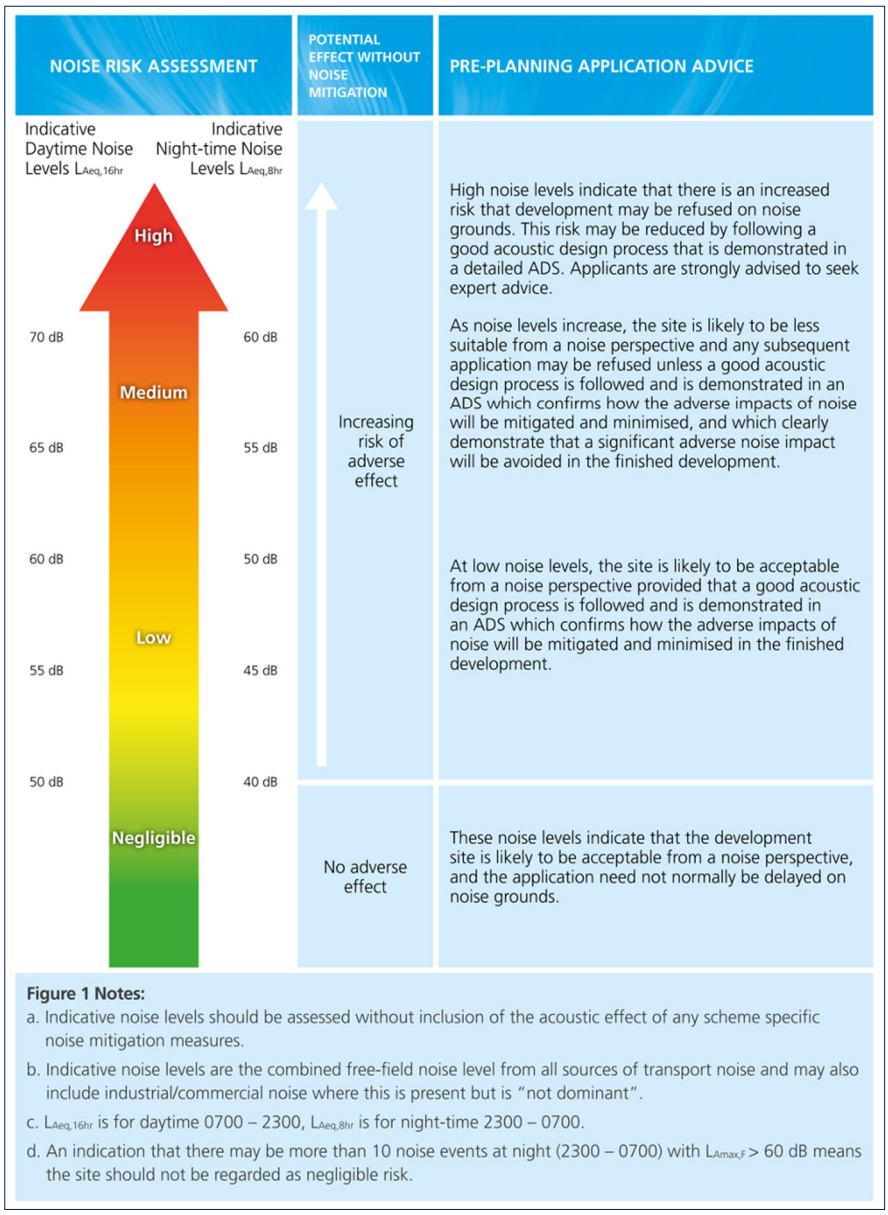
ProPG Planning and Noise: New Residential Development

ProPG Planning and Noise: New Residential Development (ProPG)[5] promotes a systematic two-stage, risk-based approach to noise assessments that inform planning applications for new residential developments.

The 'Stage 1 Initial Site Noise Risk Assessment' should be conducted, at the proposed development site, at the earliest opportunity, before any planning application is submitted. The noise risk assessment should provide an indication of the likely risk of adverse effects from noise were no subsequent mitigation to be included as part of the development proposal. It should indicate whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective. Figure 2.1 summarises the initial noise risk assessment and demonstrates how measured site noise levels relate to potential adverse effects from noise.

[5] 'ProPG Planning and Noise: New Residential Development (ProPG)', 2017. Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH)

Figure 2.1: ProPG Stage 1 – Initial Site Noise Risk Assessment



ProPG recommends compliance with indoor noise level targets in residential dwellings based on the guidance contained in BS 8233 (see Table 2.2). Additionally, with regard to individual noise events, ProPG states:

'Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night.'

ProPG acknowledges that the internal target noise level**s** may only be practically achieved with windows closed in certain areas (e.g. in urban areas or sites adjacent to transportation noise sources) and states that:

'In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide 'whole dwelling ventilation' in accordance with Building Regulations Approved Document F (e.g. trickle ventilators in the open position).

It should also be noted that the internal noise level guidelines are generally not applicable under 'purge ventilation' conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).'

ProPG also considers compliance with ambient noise level targets for external amenity areas in line with the recommendation of BS8233. On this issue, ProPG states that:

'Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.'*

3 Noise Survey and Results

3.1 Overview

In order to quantify the level of external noise affecting the site and local vicinity, noise monitoring was carried out between Monday 7th October 2019 and Wednesday 9th October 2019.

The adopted noise monitoring positions (shown in Appendix B) were as follows:

- 1 – Northern boundary of the site approximately 18m from the nearside kerb
- 2 – North-western boundary of the site
- 3 – Western boundary of the site

3.2 Equipment

Noise measurements were undertaken using a Bruel & Kjaer 2250 Type 1 integrating sound level meter. The meter was connected to a windshield covered microphone positioned at a height of 1.5 metres above ground in free-field conditions at the locations detailed in the foregoing Section 3.1.

The measurement system calibration was verified immediately before and after each survey period using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration levels greater than 0.5 dB was noted.

Measurements consisted of A–weighted broadband parameters including L_{Aeq}, L_{A10}, L_{A90} and $L_{Amax,F}$ together with linear octave and third octave band data.

3.3 Weather

The noted weather conditions during the survey were generally dry / slightly damp, mild and calm (with average wind speeds ≤ 5 m/s). Weather conditions were therefore considered appropriate for noise monitoring.

3.4 Summary of Results

Table 3.1 presents a summary of the noise data for each measurement session, at each measurement position, rounded to the nearest decibel.

Table 3.1: Summary of Noise Measurement Data

Position	Date	Time (hh:mm)	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{A10} (dB)	$L_{A90,15min}$ Range (dB)	Comment
1	07/10/2019	10:02 – 11:02	60	79	63	52 – 53	Road traffic on Barugh Green Road (A635)
		11:02 – 12:02	59	74	62	51	
		12:02 – 13:02	59	73	62	51 – 53	
		23:01 – 23:16	55	79	58	47	
	08/10/2019	00:04 – 00:19	50	64	53	45	
		23:00 – 23:15	56	74	59	50	
	09/10/2019	00:00 – 00:16	51	64	54	45	
2	08/10/2019	01:20 – 01:35	46	59	48	43	Distant road traffic on M1 Motorway
		01:35 – 01:50	45	53	48	42	
		11:17 – 11:32	53	65	54	50	
		11:32 – 11:47	53	73	56	49	
	09/10/2019	01:39 – 01:54	48	58	50	45	
		01:54 – 02:09	48	61	50	43	
		11:23 – 11:38	49	61	52	45	
		11:38 – 11:53	47	55	49	46	
3	08/10/2019	12:01 – 12:16	53	62	54	51	Distant road traffic on M1 Motorway
		12:16 – 12:31	53	62	55	51	
	09/10/2019	11:56 – 12:11	51	57	52	49	
		12:11 – 12:26	50	61	52	48	

3.5 Analysis

Northern Boundary

At Position 1, the dominant noise source was observed to be road traffic on Barugh Green Road (A635). No contributions from the existing nearby commercial premises (to the north) were observed at any time during the noise survey.

For the prediction of daytime road traffic noise, the Department of Transport's Memorandum on the Calculation of Road Traffic Noise (CRTN) explains that the following shortened measurement procedure may be used. Measurements of L_{A10} are made over any three consecutive hours between 10:00 - 17:00 hrs.

Using $L_{A10,\ 3hr}$ as the arithmetic mean of the three consecutive values of hourly L_{A10}, the $L_{A10,\ 18hr}$ can be calculated from the equation:

(i) $L_{A10,\ 18hr} = L_{A10,\ 3hr} - 1$ dB

(ii) $L_{Aeq,\ 16hr} \approx L_{A10,\ 18hr} - 2$ dB

Substituting (ii) into (i) gives the following approximation:

(iii) $L_{Aeq,\ 16hr} \approx L_{A10,\ 3hr} - 3$ dB

Based on the above formula, the 16-hr daytime ambient noise level is calculated to be 59 dB $L_{Aeq,16hr}$.

A study prepared by TRL Limited on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) entitled 'Converting the UK Traffic Noise Index $L_{A10\ (18\ hour)}$ to EU Noise Indices for Noise Mapping' presents a methodology for calculating night-time road traffic noise levels, based on daytime road traffic noise levels, using the following formulae:

(iv) $L_{Aeq,\ 8hr}$ ≈ 0.9 x $L_{A10,\ 18hr}$ – 3.77 (for non-motorway roads)

(v) $L_{Aeq,\ 8hr}$ ≈ 0.87 x $L_{A10,\ 18hr}$ + 4.24 (for motorways)

Based on the above formula (iv) for non-motorway roads, the 8-hr night-time ambient noise level is calculated to be 51 dB $L_{Aeq,8hr}$.

Maximum noise levels were due to passing vehicle movements and were ≤ 79 dB L_{AFmax} at night.

North-Western Boundary

At Position 2, the dominant noise source was observed to be distant road traffic on the M1 Motorway. Daytime ambient noise levels were around 47 – 53 dB $L_{Aeq,T}$ and night-time ambient noise levels were around 45 – 48 dB $L_{Aeq,T}$. Maximum noise levels were ≤ 61 dB L_{AFmax} at night.

Background noise levels ranged from 45 – 50 dB $L_{A90,15min}$ during the day and 42 – 45 dB $L_{A90,15min}$ at night. Typical background noise levels were around:

- 48 dB $L_{A90,15min}$ during the day
- 43 dB $L_{A90,15min}$ at night

Western Boundary

At Position 3, the dominant noise source was observed to be distant road traffic on the M1 Motorway with daytime ambient noise levels of around 50 – 53 dB $L_{Aeq,T}$.

4 Noise Assessment

4.1 Initial Site Noise Risk Assessment

Assessment of the measured/calculated ambient noise level data, using the ProPG initial site noise risk assessment diagram shown in Section 2, has determined that the residential areas of the development would be categorised as shown in Table 4.1 in terms of adverse effects from existing noise.

Table 4.1: Risk of Adverse Effects from Noise

Location	Period	External Noise Levels (dB L_{Aeq})	Risk
Northern Boundary	Day (07:00–23:00)	59	Low
	Night (23:00–07:00)	51	Low
North-Western Boundary	Day (07:00–23:00)	53	Low
	Night (23:00–07:00)	48	Low

It can be seen that proposed dwellings will experience a low risk of adverse effects from road traffic noise. At low risk sites, ProPG advises that the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed.

4.2 Proposed Site Access / Link Road

Projected traffic data, associated with the new link road, have been provided by Fore Consulting Limited, the transport consultants for the project. 18hr Annual Average Weekday Traffic (AAWT) data has been provided for the forecast year of completion (2033) and is replicated in Table 4.2.

Table 4.2: Forecast Link Road Traffic Data – 2033

Link / Road Name	18hr AAWT With Development and Other Committed Developments	% HGV	Vehicle Speed (kph)
Full Link Road	13423	4	48

The above traffic flow data has been used, along with the methodology outlined in CRTN, to calculate road traffic noise from the proposed link road. Noise from major roads surrounding the site has been calculated based on traffic data for the future year (2033) including committed developments, representing the most onerous assessment.

4.3 Noise Propagation

In order to calculate noise propagation across the site to proposed building facades and within private external areas of proposed residential dwellings, a three-dimensional model of the site and the immediate surrounding area has been created using the proprietary noise modelling software CadnaA. This approach enables the beneficial shielding effects, due to the built form of the proposed development, to be accurately accounted for.

The data files and input parameters used to create the model are presented in Table 4.3.

Table 4.3: CadnaA Model Input Data

Input Parameter	Data Source / Model Settings
Base landline map	Drawing 20-CL4-SEGB-BWP1-02 Rev Q by Strata Homes Limited
Topography	Sourced from Environment Agency LIDAR Composite DSM (Digital Surface Model) 2022
Receptor Positions	Living rooms - 1.5m above ground level (agl) Bedrooms - 4m agl Garden receptor locations at a height of 1.5m agl and at least 3.5m from buildings where possible.
Building Heights	Residential buildings - 8m agl Proposed garages – 4m agl
Barriers	None included in preliminary modelling exercise
Ground Absorption	The default ground absorption setting for the site is 0.5 (i.e. mixed ground)
Reflections	Maximum order of reflection is 2, with buildings reflective
Existing Noise Sources	Barugh Green Road is the primary existing noise source Source verified with L_{Aeq} noise level monitoring data acquired on site
Proposed Noise Sources	Contributions from proposed site access / link road calculated using CRTN module within CadnaA based on forecast traffic flow data detailed in Section 4.2
Relative Humidity (%)	70
Temperature (°C)	10

4.4 External Noise Levels

Façade noise plots are presented as figures D1 and D2 in Appendix D, whilst a daytime noise contour plot illustrating the propagation of noise across the site is presented as Figure D3.

The results of the noise modelling indicate that the most easterly plots within approximately 50m of the proposed link road would be exposed to noise levels ≤64 dB $L_{Aeq,16hr}$ during the daytime, and ≤ 56 dB $L_{Aeq,8hr}$ during the night time on the most noise affected façades.

More distant properties, and those which benefit from the acoustic barrier formed by intervening properties to surrounding noise sources are predicted to be exposed to noise levels ≤ 55 dB $L_{Aeq,16hr}$ and ≤ 50 dB $L_{Aeq,8hr}$.

4.5 External Amenity Areas

With regard to external noise levels during the day, external noise levels in most proposed gardens are expected to satisfy the upper 'desirable' guideline value of ≤ 55 dB $L_{Aeq,T}$ for external amenity areas, as recommended by BS8233 / ProPG. However, gardens associated with the following plots have been identified as areas where external noise levels are expected to exceed the guideline value:

- Plots 1 to 5
- Plots 8 to 13
- Plots 17 & 18
- Plots 212, 213 and 208

For the above plots, it is recommended that gardens are protected by 1.8m high imperforate acoustic barrier e.g. solid masonry wall or fencing (close-boarded timber, mass per unit area ≥ 10kg/m²) at garden perimeters.

4.6 Indoor Noise Levels

Feasibility of Open Windows

With regard to internal noise levels when windows are open, the World Health Organisation (WHO) Guidelines for Community Noise (1999) states:

'the noise reduction from outside to inside with the window partly open is 15 decibels'.

With reference to the façade noise plots presented in Appendix D, the majority of the site is predicted to be exposed to façade noise levels > 50 dB $L_{Aeq,16hr}$ during the day, and/or > 45 dB $L_{Aeq,8hr}$ during the night time. On this basis it is not recommended that permanently open windows or simple façade openings are relied upon as the primary means of ventilation for habitable rooms.

A scheme of sound insulation will be required with acoustically attenuated ventilation for the most noise affected areas such that the minimum ventilation rates specified in Approved Document Part F can be achieved with closed windows. Windows can be opened for temporary purge ventilation (to enable discretionary rapid air changing) however, this would be on a short-term, temporary basis.

For habitable rooms on façades which are exposed to noise levels < 50 dB $L_{Aeq,16hr}$ during the day, and <45 dB $L_{Aeq,8hr}$ during the night time (see Appendix D), ventilation via simple façade openings would be appropriate for all habitable rooms.

4.7 Scheme of Sound Insulation

Table 4.4 presents a summary of the proposed glazing and ventilation performance requirements, and should be read in conjunction with Figures D1 and D2.

Table 4.4: Required Sound Reduction of Façade Elements

Element	Required Sound Reduction (dB)						Indicative Specification
	125 Hz	250 Hz	500 Hz	1kHz	2kHz	Weighted R_w ($R_w + C_{tr}$) / $D_{n,e,w}$ ($D_{n,e,w} + C_{tr}$)	
Eastern Boundary – Bedrooms (Orange façades)							
Glazing	22	25	38	41	36	**37 (32)**	8/18/6 acoustic double glazing
Ventilator	42	37	37	43	57	**43 (41)**	1 no. Ryton AAC125HP
Eastern Boundary – All other habitable rooms (Orange façades)							
Glazing	22	22	31	41	40	**35 (30)**	4/16-20/6 acoustic double glazing
Ventilator	42	37	37	43	57	**43 (41)**	2 no. Ryton AAC125HP
All dwellings exposed to noise levels > 50 dB $L_{Aeq,16hr}$ and/or > 45 dB $L_{Aeq,8hr}$ – All habitable rooms (Yellow)							
Glazing	20	20	30	40	35	**32 (28)**	6/16/6 thermal double glazing
Ventilator	42	37	37	43	57	**43 (41)**	2 no. Ryton AAC125HP

Alternative solutions to the indicative specifications shown in Table 4.1 may be considered if sound reduction performances are equivalent to (or greater than) those stipulated.

The glazing recommendations apply to the window within a sealed unit. It is the responsibility of the window supplier to ensure that the window frame does not compromise the performance of the glazing.

The opening and free area of the proposed ventilation units should be checked by mechanical services engineer before designs are finalised. Should the equivalent open area be insufficient to meet the minimum requirements of Part F of the Building Regulations, it may be necessary to increase the number of units per habitable room. Where this applies, the required sound reduction of the ventilation units should be increased accordingly (3 dB per doubling of required no. of vent units).

The scheme of mitigation set out above is typical for a residential development of this type which is subject to road traffic noise.

4.8 Mitigation of Overheating

With reference to the ADO guidance set out in Section 2, when mitigating overheating, noise levels internally should not exceed 40 dB $L_{Aeq,8hr}$ or 55 dB $L_{Amax,F}$ during the night time (23:00-07:00).

ADO states that for moderate risk locations (i.e. outside of London) the minimum free area of the open window should be at least 4% of the floor area of the room however it is typical to require a minimum free area of at least 5%. As the equivalent free area of a window varies as a function of the floor area, for a typical floor-to-ceiling height of 2.4m, a window open area of 5% of the floor area equates to an external to internal noise reduction of 9 dB.

Based on the above it is assumed that mitigation of overheating can be achieved with partially open windows where façade noise levels do not exceed 49 dB $L_{Aeq,8hr}$ or 64 dB $L_{Amax,F}$ during the night.

Figure D4 in Appendix D presents a façade markup indicating in red those façades which exceed the levels above.

With reference to Figure D4, the majority of properties are predicted to be exposed to noise levels <49 $L_{Aeq,8hr}$ during the night time. Bedrooms in these properties should be provided with a means of mitigating overheating which is not reliant on open windows and/or simple façade openings.

It should be noted that the above guidance is based on the assumption that the chosen solutions would provide a minimum 9 dB attenuation based on an opening of no more than 5% of the floor area of the room in question. In the event that a greater free area is required to mitigate overheating, a more detailed assessment would be required.

4.9 Proposed Link Road Screening

A transport assessment undertaken in relation to the link road determined that a modest 1-2 dB reduction was required in the vicinity of existing dwellings on Hermit Lane in order to reduce the impact of the link road, and proposed a noise barrier.

Subsequently, Pollution Control at BMBC have requested that a noise model was produced in order to show the noise levels with the proposed barrier at various heights in order to understand the reduction.

For context, the location of the proposed barrier is shown in Figure 4.1 below. The barrier will take the form of a masonry wall. For reference, a masonry wall will readily meet the requirements for an acoustic barrier, i.e. a minimum mass per unit area of ≥ 10 kg/m² with no gaps or holes.

Figure 4.1: Proposed Barrier Location

In order to assess the efficacy of the barrier at various heights, noise level predictions have been performed using iNoise acoustic modelling software. The results are summarised in Table 4.5 below, with noise contour plots presented as Appendix E.

Table 4.5: Proposed Barrier Screening at Various Heights

Barrier Height	Noise Level at Receptor	Barrier Attenuation
0 metres (no barrier)	64 dB	-
0.5 metres	64 dB	0 dB
1.0 metres	61 dB	3 dB
1.2 metres	60 dB	4 dB
1.5 metres	60 dB	4 dB

It is understood that the preference is for a barrier height of 1.2 metres. This achieves barrier attenuation of circa 4 dB, which readily meets the minimum reduction required.

5 Summary and Conclusions

A noise survey and assessment has been performed for a proposed mixed-use development on land to the south of Barugh Green Road in Barnsley.

Noise monitoring was carried out between Monday 7th October 2019 and Wednesday 9th October 2019 to quantify the level of external noise affecting the site. The results of the baseline noise survey are presented in Section 3.

Section 4 presents an initial site noise risk assessment using ProPG guidance. Proposed dwellings will experience a low risk of adverse effects from road traffic noise.

Section 4 also presents recommendations for a noise mitigation strategy to protect future residents at the site using relevant criteria and guidance including BS8233 / ProPG.

Appendix A – Abbreviations and Definitions

Sound Pressure Level (L_p)
The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

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

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_o = reference sound pressure (20 μPa).

A-weighting
A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$
The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$
The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$
The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

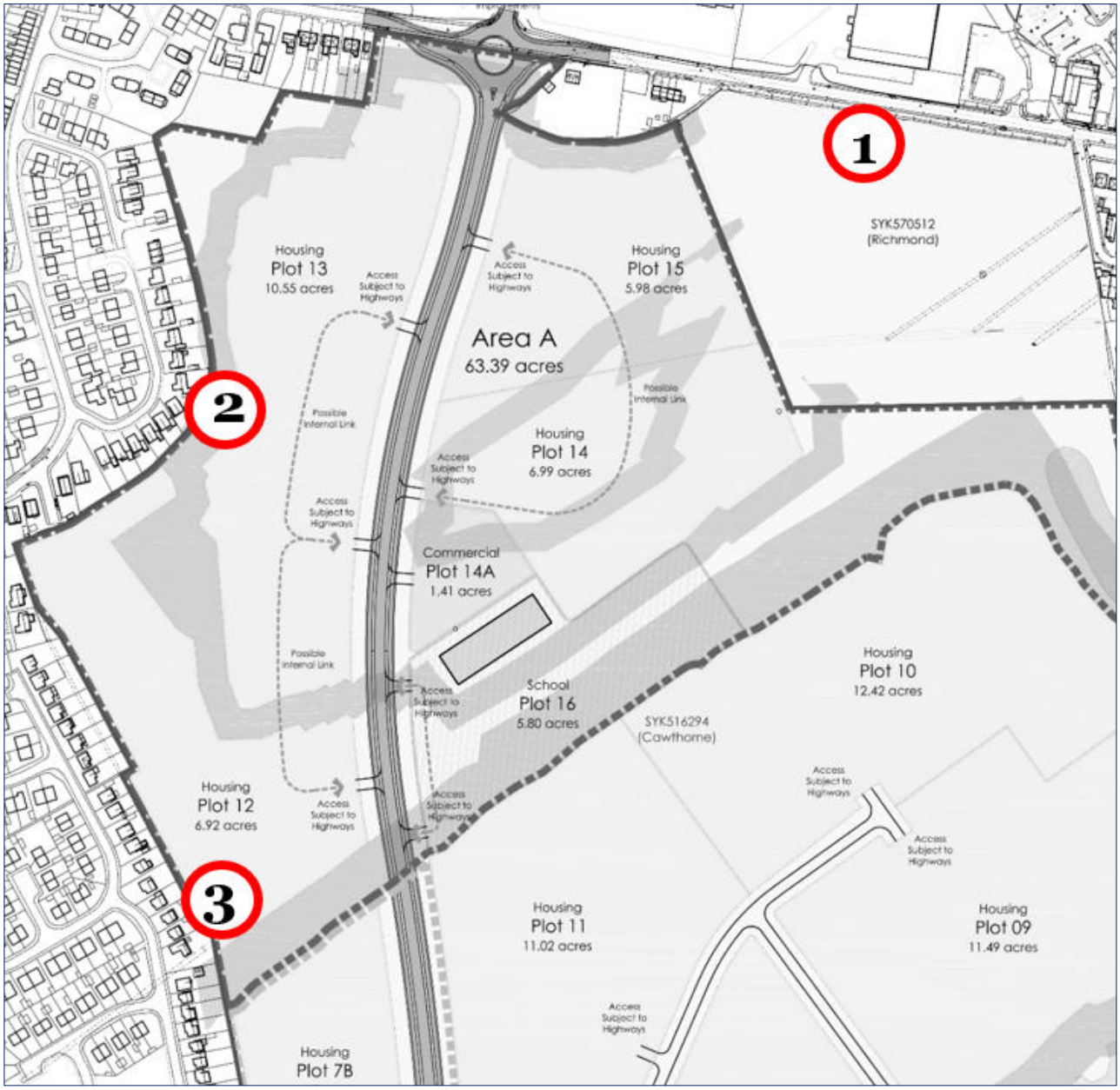
L_{AFmax}
The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Single Event Level / Sound Exposure Level (SEL or L_{AE})
The energy produced by a discrete noise event averaged over one second, regardless of the event duration. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_W)
Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_W is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix B – Site Layout Plan

Appendix C – Noise Measurement Positions



Appendix D – Noise Modelling

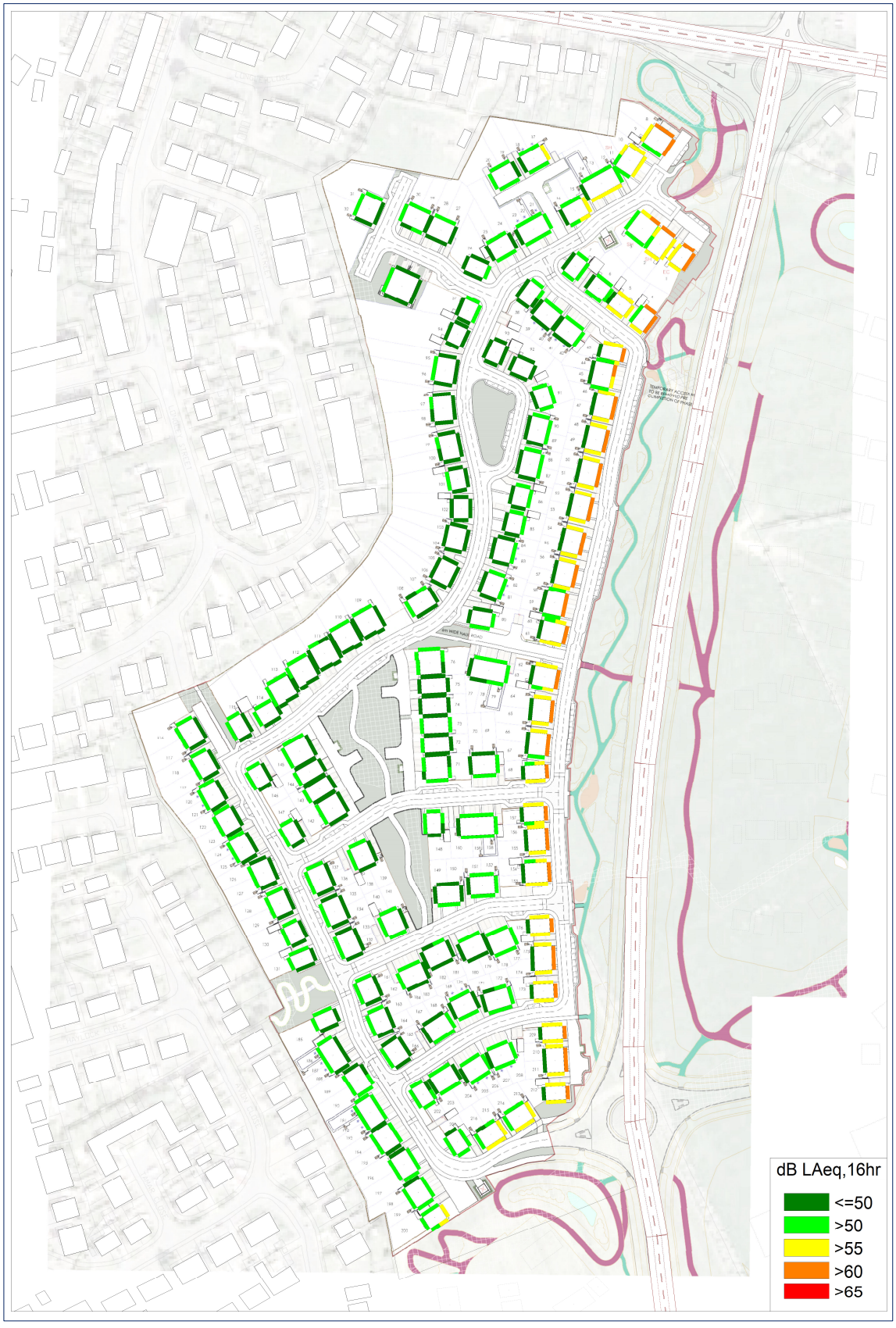


Figure D1: Daytime Façade noise levels (07:00-23:00)

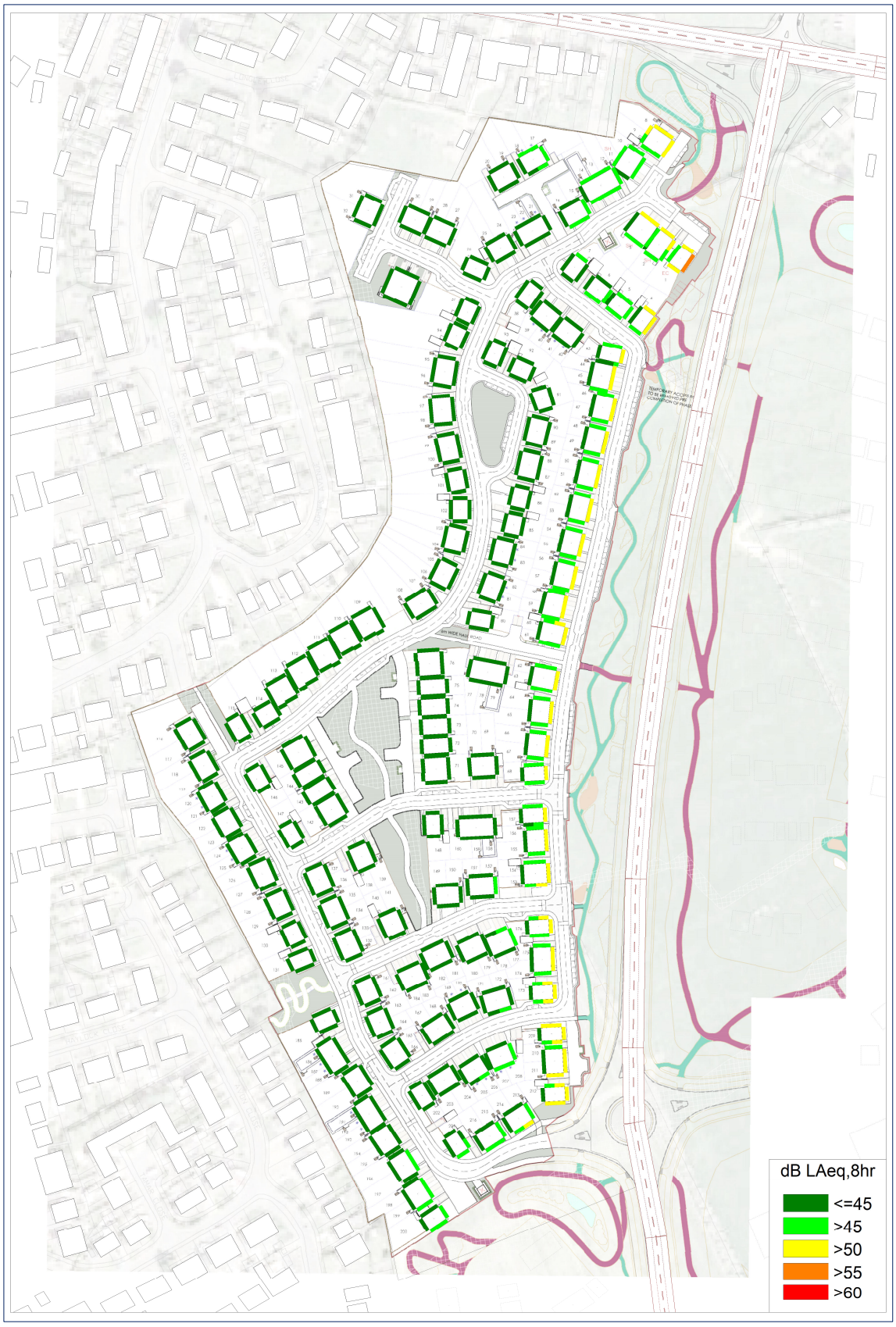


Figure D2: Night time façade noise levels (23:00-07:00)

Figure D3: Daytime noise contour plot at 1.5m above ground level (23:00-07:00)

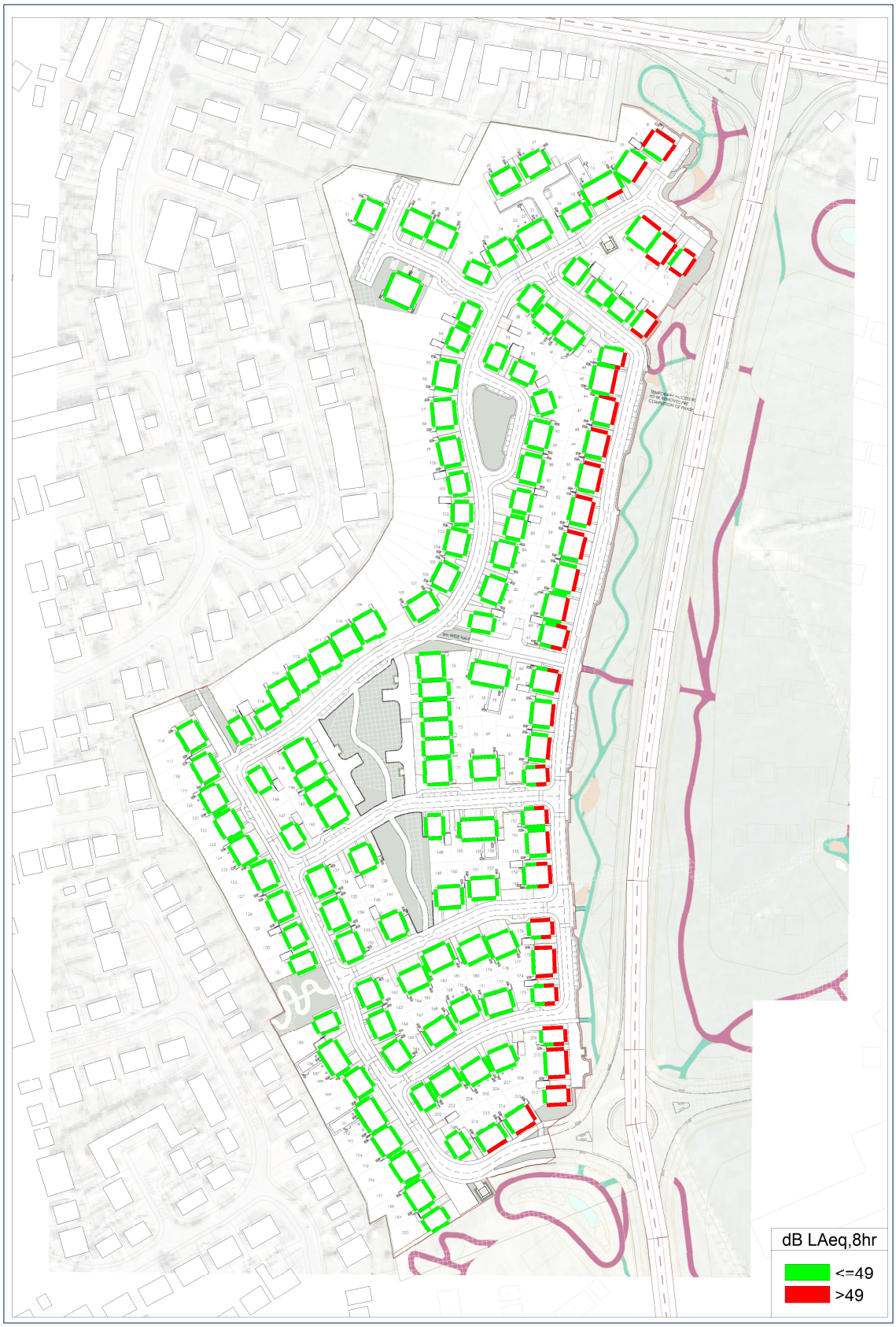


Figure D4: Night time overheating (23:00-07:00)

Appendix E – Noise Barrier Modelling

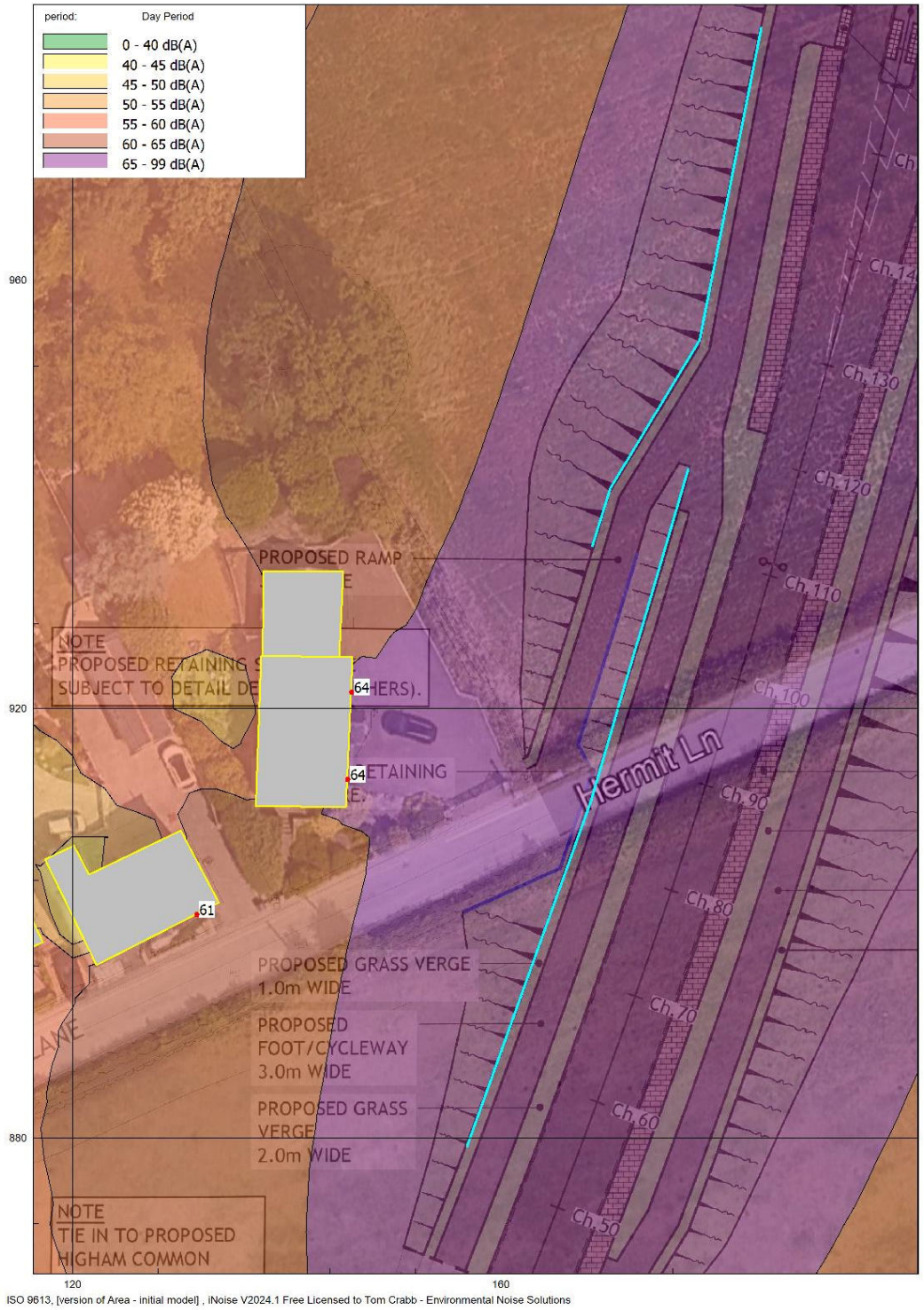


Figure E1: No Barrier (proposed location indicated)

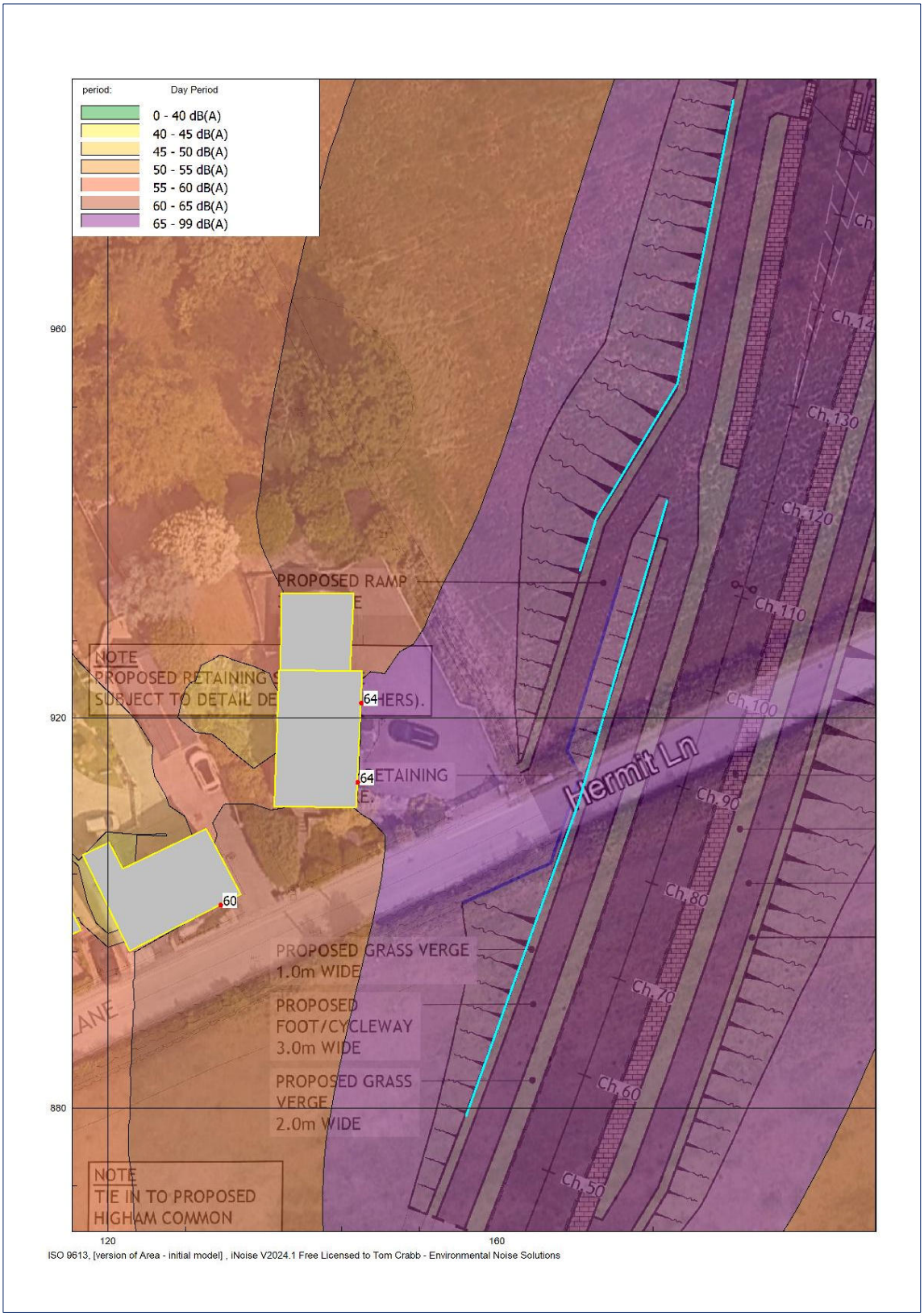


Figure E2: 0.5m High Barrier

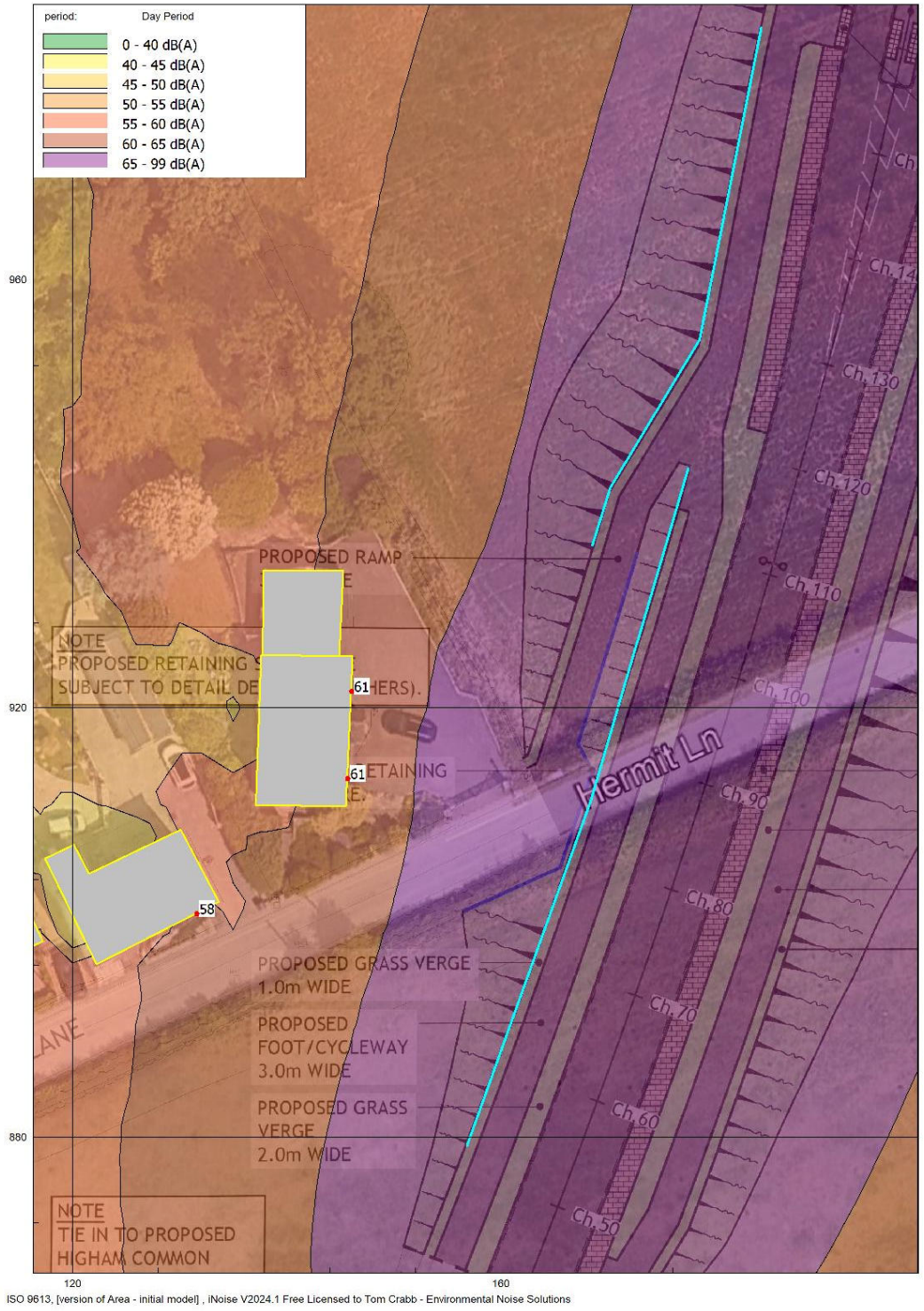


Figure E3: 1m High Barrier

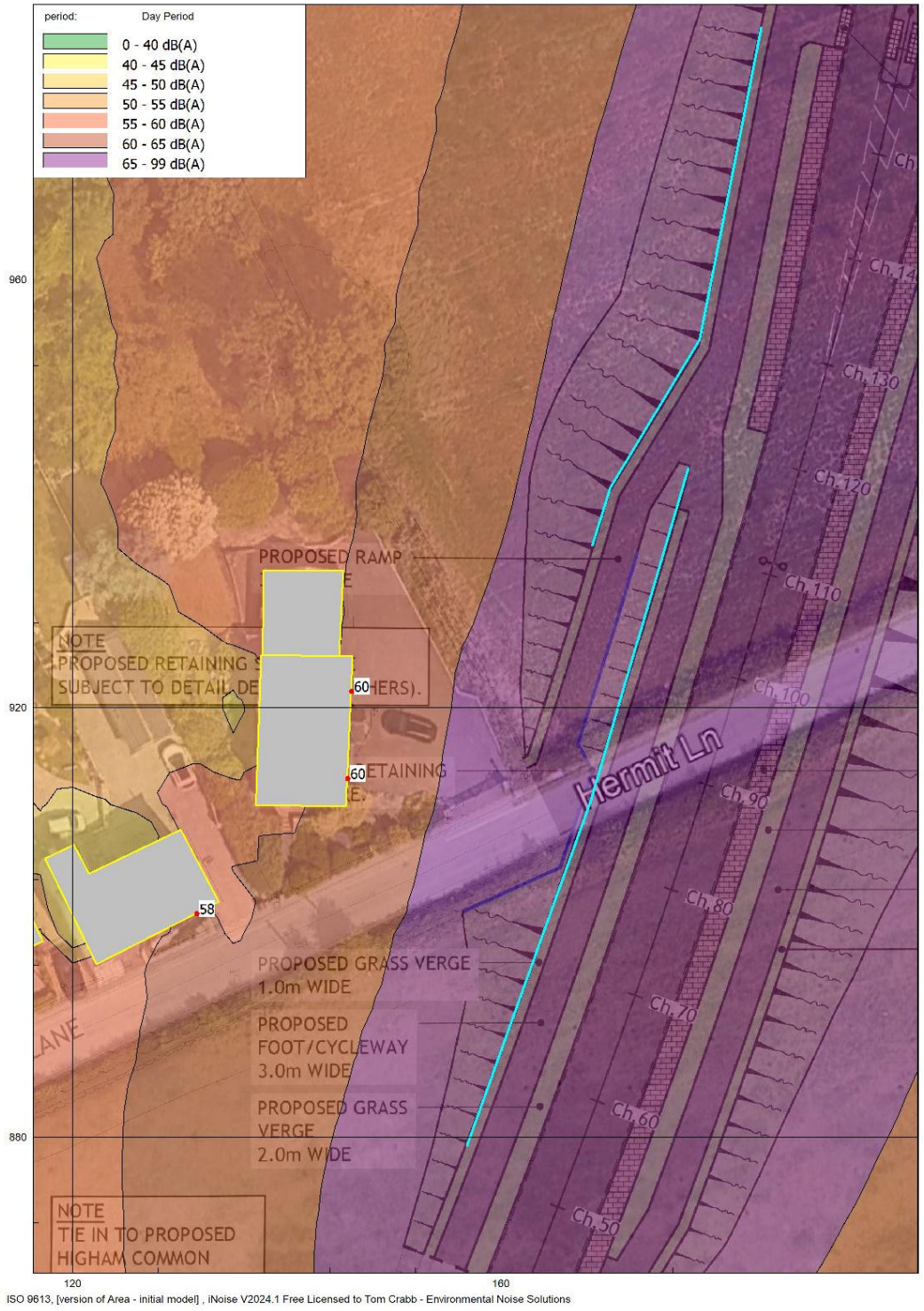


Figure E4: 1.2m High Barrier

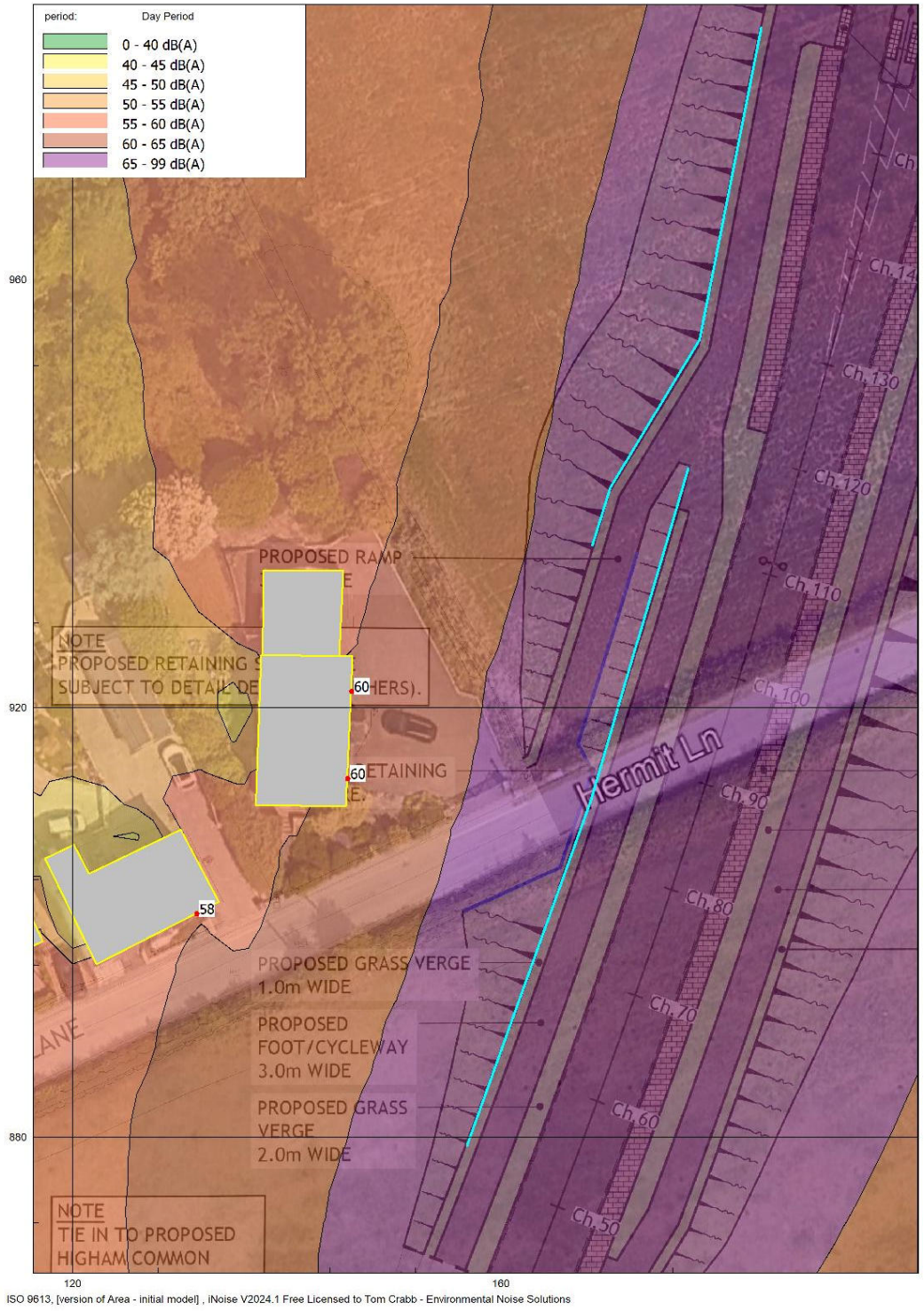


Figure E4: 1.5m High Barrier