MILLER GOODALL
ACOUSTICS AND AIR QUALITY

NOISE ASSESSMENT

on behalf of

PROSPECT (GB) LIMITED

for the site at

MITTON ROAD, WHALLEY, BB7

REPORT DATE: 08 DECEMBER 2020

REPORT NUMBER: 102403

Miller Goodall Ltd
Ground Floor
Ashworth House
Deakins Business Park
Blackburn Road
Egerton
Bolton
Lancashire
BL7 9RP

Summary

A noise assessment was undertaken to predict the potential impact of environmental noise sources on a proposed development consisting of approximately 50 new residential properties at the site.

Measurements were made at the site to identify the pre-development noise levels. This data was subsequently used to predict the potential impact of environmental noise and to provide mitigation options to ensure that suitable internal noise levels can be achieved.

Road traffic noise from Mitton Road is the dominant noise source and ambient and maximum noise levels are relatively high. Industrial type noise sources were not observed for the duration of the survey and are likely to be insignificant when compared to the prevailing road traffic noise levels.

Recommended glazing and ventilation specifications have been provided to enable the recommended internal noise limits to be achieved within the properties.

External noise levels in rear gardens can achieve the external noise criteria with the use of the 2.2 m high barriers in specified locations.

In conclusion, with the implementation of the mitigation recommended in this report, it is considered that a suitable and commensurate level of protection against noise will be provided to the occupants of the proposed accommodation.

Record of changes

Prepared By	Claire Starley AMIOA	Reviewed By	Michael Rickard MIOA
Signed			
Date	08 December 2020	Date	08 December 2020

Version	Date	Change	Initials
1	11 November 2020	Initial issue	CS
2	08 December 2020	Update of master plans	CS

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Contents

1 Introduction

1.1 Miller Goodall Ltd (MGL) has, on behalf of Prospect (GB) Limited, undertaken a noise assessment in respect of the impact of noise from road traffic and other sources for a proposed residential development in the vicinity of Mitton Road, Whalley, BB7.

2 Site Description

2.1 The site is located at Mitton Road, Whalley, BB7. The site location is shown outlined in red within Appendix A: showing the overall masterplan along with the noise monitoring position.

2.2 The site is located directly to the west of Mitton Road that runs through Whalley; this road is the main noise source for the site.

2.3 To the west and south of the site is residential housing.

2.4 The north and east sides of the site are mostly open fields. To the east of Mitton Road is a small commercial site

3 Proposed Development

3.1 The proposal is to develop the site with approximately 50 residential properties.

3.2 Road access to the development site is located off the B6246, Mitton Road.

- Parcel A has 1 access route from Mitton road.
- Parcel B has 2 separate accesses for 2 areas of the site that are not joined by any other road.

3.3 The proposed garden fencing to all plots will be constructed of overlapping solid timber panels and extend to at least 1.8m above the ground with no gaps.

4 Policy Context

4.1 Noise Policy Statement for England

4.1.1 The Noise Policy Statement for England (NPSE[1]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse effects on health and quality of life;
- mitigate and minimise adverse effects on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life."

4.1.2 The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and the quality of life occur.

4.1.3 The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the Statement). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case:

"...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development".

4.1.4 Importantly, the NPSE goes on to state:

"This does not mean that such adverse effects cannot occur".

4.1.5 The Statement does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that:

"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available"

4.1.6 It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

[1] Noise Policy Statement for England, Defra, March 2010

4.2 National Planning Policy Framework

4.2.1 The National Planning Policy Framework (NPPF[2]) initially published in March 2012, was updated in February 2019. One of the documents that the NPPF replaces is Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise"[3].

4.2.2 The revised NPPF advises that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives). One of these is an environmental objective which is described in par. 8 (c):

"to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

4.2.3 At par. 170 we are advised that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.

4.2.4 Par. 180 goes on to state:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impact 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.

4.3 Planning Practice Guidance – Noise

4.3.1 As of March 2014, a Planning Practice Guidance[4] for noise was issued which provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, 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;

[2] National Planning Policy Framework, Ministry of Housing, Communities and Local Government, July 2018

[3] Planning Policy Guidance 24: Planning and Noise, DCLG, September 1994

[4] Planning Practice Guidance – Noise, http://planningguidance.planningportal.gov.uk/blog/guidance/noise/, 06 March 2014

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

4.3.2 In line with the Explanatory Note of the NPSE, the PPG goes on to reference 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".

4.3.3 Examples of these factors include:

- The source and absolute noise level of the source along with the time of day that it occurs;
- Where the noise is non-continuous, the number of noise events and pattern of occurrence;
- The frequency content and acoustic characteristics of the noise;
- The effect of noise on wildlife;
- The acoustic environment of external amenity areas provided as an intrinsic part of the overall design;
- The impact of noise from certain commercial developments such as night clubs and pubs where activities are often at their peak during the evening and night.

4.3.4 The PPG also provides general advice on the typical options available for mitigating noise. It goes on to suggest 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".

4.3.5 The PPG was amended in December 2014 to clarify guidance on the potential effect of noise from existing businesses on proposed new residential accommodation. Even if existing noise levels are intermittent (for example, from a live music venue), noise will need to be carefully considered and appropriate mitigation measures employed to control noise at the proposed accommodation.

5 Acoustic Standards and Guidance

5.1 ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise – New Residential Development – May 2017

5.1.1 ProPG: Planning and Noise is new guidance with the aim of delivering sustainable development and promoting good health and well-being through the effective management of noise which may impact on new residential developments. The guidance aims to complement the national planning policy and encourages the use of good acoustic design at the earliest phase of the planning process. It builds upon the recommendations of various other guidance documents including NPPF, NPSE and PPG-Noise, BS 8233 and WHO.

5.1.2 The guidance is applicable to new residential developments which would be exposed predominantly to noise from existing transport sources. The ProPG advocates a risk-based approach to noise using a two-stage process:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements: –
  - 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 – consideration of 'Other Relevant Issues'.

5.1.3 The ProPG approach is underpinned by the preparation and delivery of an 'Acoustic Design Statement' (ADS), whereby the higher the risk for noise at the site, the more detailed the ADS. The ADS should address the following issues:

- Present the initial site noise risk assessment, including the pre-development acoustic conditions prior to development;
- Describe the external noise levels that occur across the site both before and after any necessary mitigation measures have been incorporated. The external noise assessment with mitigation measures in place should use an informed judgement of typical worst-case conditions;
- Demonstrate how good acoustic design is integrated into the overall design and how the proposed acoustic design responds to specific circumstances of the site;
- Confirm how the internal noise level guidelines will be achieved, including full details of the design measures and building envelope specifications;
- A detailed assessment of the potential impact on occupants should be undertaken where individual noise events are expected to exceed 45 dB $L_{AF,max}$ more than 10 times a night inside bedrooms;
- Priority should be given to enable the use of openable windows where practical across the development. Where this is not practical to achieve the internal noise level guidelines with windows open, then full details of the proposed ventilation and thermal comfort arrangements must be provided;
- Present the findings of the external amenity area noise assessment;
- Present the findings of the assessment of other relevant issues;

- Confirm for a low risk site how adverse impacts of noise will be mitigated and minimised;
- Confirm for a medium or high noise risk site how adverse impacts of noise will be mitigated and minimised and clearly demonstrate that a significant adverse noise impact has been avoided.

5.1.4 The footnotes to this table suggest that internal noise level limits can be relaxed by up to 5 dB where development is considered necessary or desirable, and still represent "reasonable" internal conditions. They also suggest that in such cases, external levels which exceed WHO guidance target levels (see WHO section below) may still be acceptable provided that reasonable internal noise levels are achieved. Although, where the acoustic environment of external amenity areas is intrinsic to the overall design, "noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$". The wording of ProPG (and BS 8233:2014) is clear that exceedance of guideline noise levels in external areas should not prohibit the development of desirable developments in any event.

5.2 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

5.2.1 This standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999)[5]. These guideline noise levels are shown in Table 1, below.

Table 1: BS 8233: 2014 guideline indoor ambient noise levels for dwellings

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

5.2.2 BS 8233:2014 advises that:

> *"regular individual noise events…can cause sleep disturbance. A guideline value may be set in terms of SEL[6] or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values".*

5.2.3 BS 8233:2014 adopts guideline external noise values provided in WHO for external amenity areas such as gardens and patios. The standard states that it is "desirable" that the external noise does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ whilst recognising that development in higher noise areas such as urban areas or those close to the transport network may require a compromise between elevated noise levels and other factors that determine if development in such areas is warranted. In such circumstances, the development should be designed to achieve the lowest practicable noise levels in external amenity areas.

[5] World Health Organisation Guidelines for Community Noise, 1999

[6] Sound exposure level or L_{AE}

5.3 World Health Organisation (WHO) Guidelines for Community Noise 1999

5.3.1 The WHO Guidelines 1999 recommends that to avoid sleep disturbance, indoor night-time guideline noise values of 30 dB L_{Aeq} for continuous noise and 45 dB L_{AFmax} for individual noise events should be applicable. It is to be noted that the WHO Night Noise Guidelines for Europe 2009[7] makes reference to research that indicates sleep disturbance from noise events at indoor levels as low as 42 dB L_{AFmax}. The number of individual noise events should also be taken into account and the WHO guidelines suggest that indoor noise levels from such events should not exceed approximately 45 dB L_{AFmax} more than 10 – 15 times per night.

5.3.2 The WHO document recommends that steady, continuous noise levels should not exceed 55 dB L_{Aeq} on balconies, terraces and outdoor living areas. It goes on to state that to protect the majority of individuals from moderate annoyance, external noise levels should not exceed 50 dB L_{Aeq}.

6 Noise Survey

6.1 Measurements of Existing Noise Sources

6.1.1 Noise monitoring was undertaken at 4 Queen Mary Terrace by Miller Goodall Ltd between 24th – 25th September 2020. Details of the survey can be found in Appendix B.

6.1.2 The measurement position (logger) was set up out of a first-floor window that overlooks Mitton Road, positioned 1m from the building facade; this location can be found in Appendix B.

6.1.3 Mitton Road was the dominant noise source within the vicinity of the measurement locations. Other noise sources include bird noise. Industrial type noise sources were not observed for the duration of the survey and are likely to be insignificant when compared to the prevailing road traffic noise levels.

7 Impact of Existing Noise Sources on the Development

7.1 Computer Modelling

7.1.1 Predictions of noise levels impacting the proposed site have been undertaken using the CadnaA noise modelling package by applying the measurement survey levels onto the proposed building forms. Specific model parameters were applied as follows:

- Propagation of noise using algorithms within ISO 9613: 1993 *Acoustics - Attenuation of sound during propagation outdoors.* Roads were modelled as line sources at a height of 0.5 m above ground level and calibrated using spectral data measured during the survey.
- Ground absorption G = 0.5.
- Ground attenuation: spectral all sources
- No adverse meteorological effects
- Two orders of reflection
- Topographical data was not required as the site is relatively flat.

[7] WHO Night Noise Guidelines for Europe 2009

7.2 Validation of the Noise Model

7.2.1 A noise level receptor was incorporated into the CadnaA model at the noise survey measurement location to calibrate the model using the measured octave band L_{eq} and L_{Fmax} noise levels, which are accurate in the model to within 0.1 dB.

7.3 Noise Model Predictions

7.3.1 Three scenarios were modelled for the site; daytime L_{Aeq}, night-time L_{Aeq} and night-time L_{AFMax} noise levels. Noise maps for the daytime L_{Aeq} and night-time L_{Aeq} model variants are provided in Appendix C, with a grid height of 1.5 m and 4.5 m respectively.

7.3.2 The noise modelling demonstrates the drop-off in noise levels with increasing distance from the road, the most significant noise source affecting the site.

7.4 External Noise Levels

7.4.1 The model indicates that the external noise levels in some of the rear garden areas across the site are at the worst case 60 dB L_{Aeq} during the day. This level is over the upper limit of 55 dB, recommended by WHO, for external amenity areas, shown in Appendix C Figure C1.

7.4.2 Mitigation in the form of 2.2m high barriers will be required to achieve levels ≤ 55 dBA in all gardens, as described in section 8 below.

8 Mitigation for Achieving Good Acoustic Design

8.1 Acoustic Barrier

8.1.1 As well as the proposed 1.8m timber panel fencing to all gardens, it is recommended that a taller noise barrier, 2.2 m high, is to be erected at specific locations around the site to reduce the noise levels in gardens from the road noise to below the WHO guidance of 55 dB.

8.1.2 The 2.2m noise barriers should be constructed from continuous, imperforate material with a minimum mass of 12 kg/m^2, and extend from the ground to their specified height. Close-boarded or overlapped timber panelling would be suitable in this regard; hit-and-miss fencing would not. Alternatively, a proprietary acoustic fence with a minimum weighted sound reduction index of 25 dB R_w would be appropriate.

8.1.3 The barrier locations can be seen in Figures 1 and 2 below.

Figure 1: Location of proposed 2.2 m high barriers in parcel A

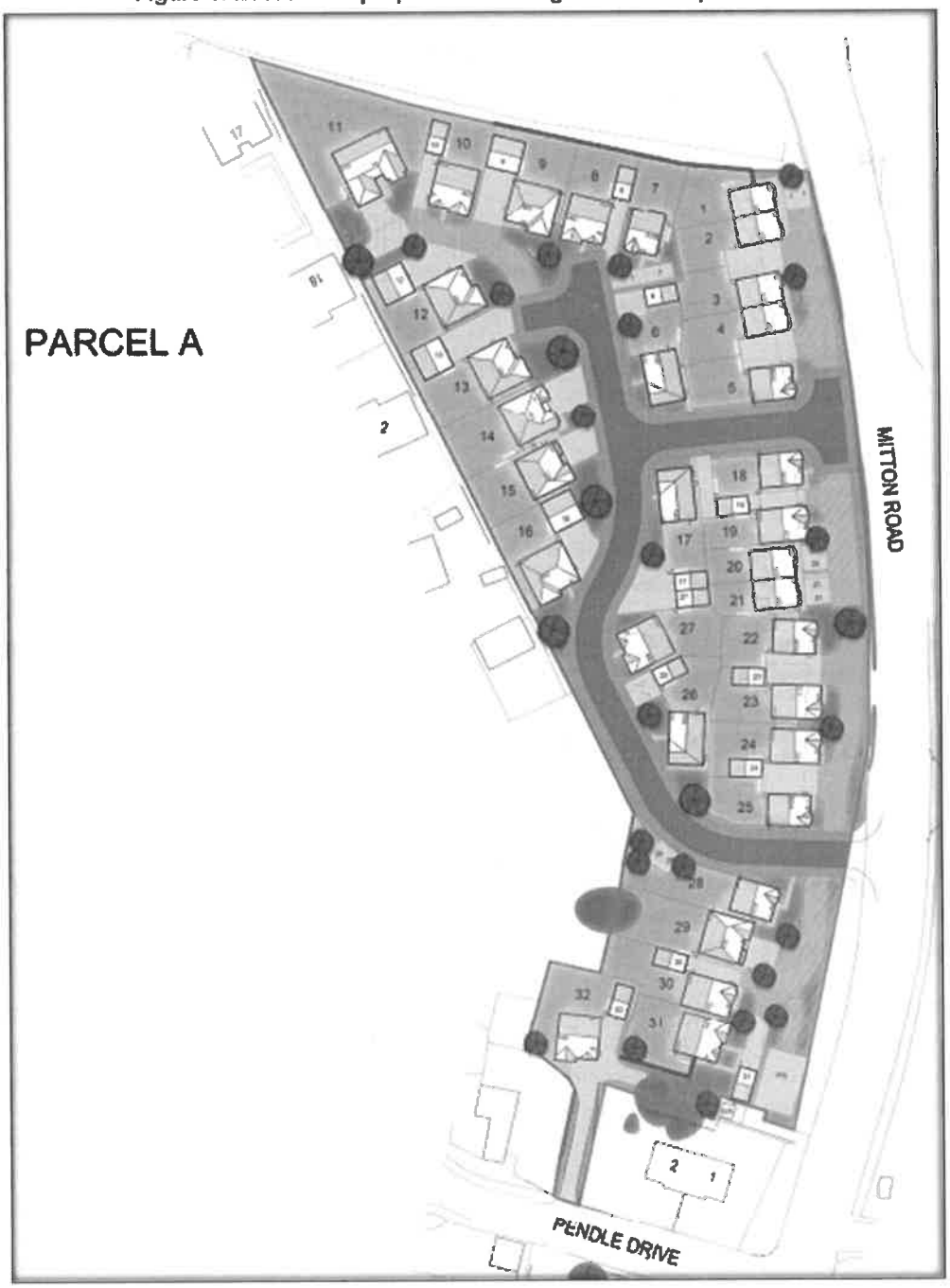
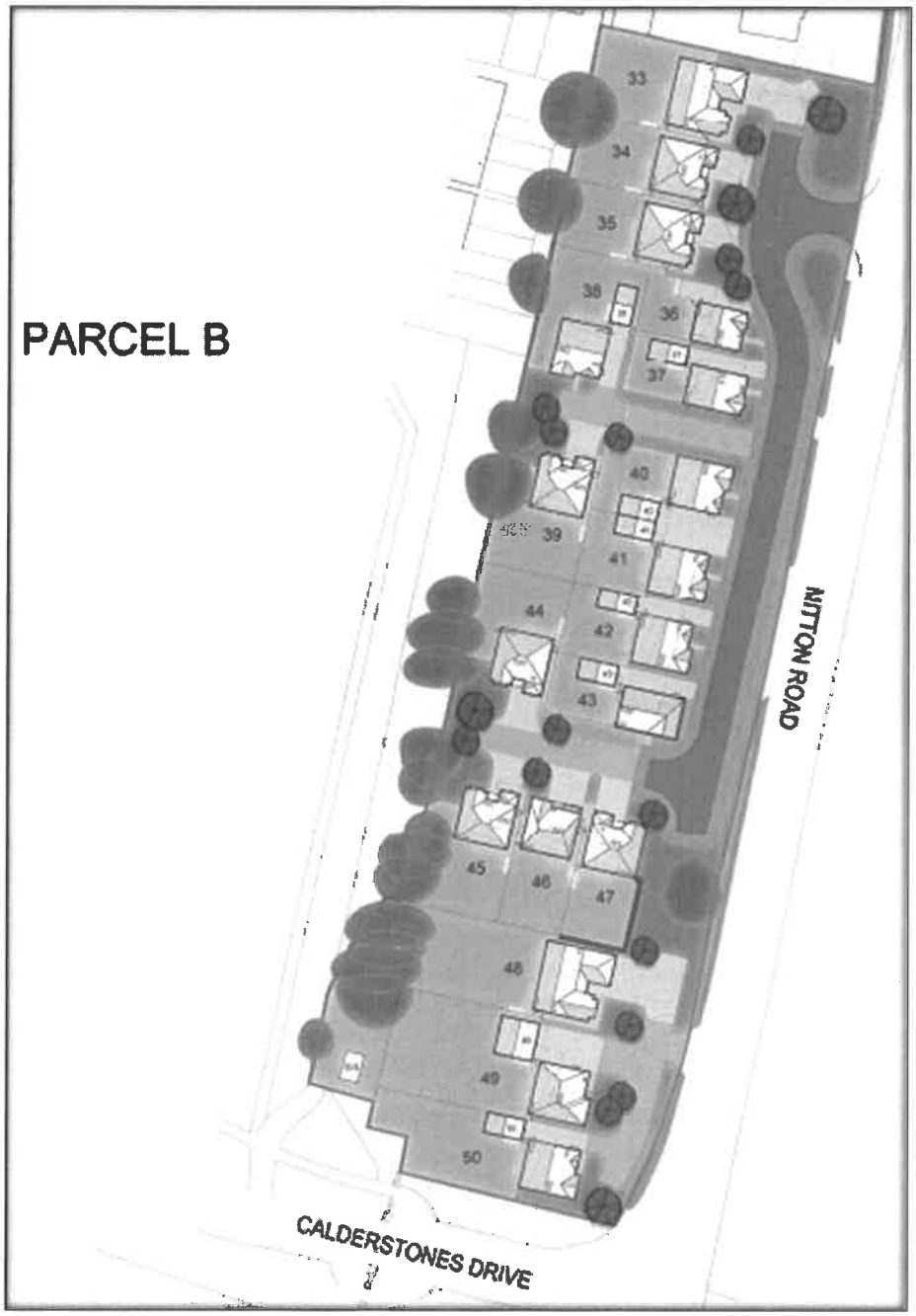


Figure 2: Location of proposed 2.2 m high barriers in parcel B



8.2 Glazing and Ventilation

8.3 Glazing and ventilation requirements have been assessed for the site. The recommendations are provided as three different 'types' depending on the acoustic conditions at different areas of the proposed building facades:

- **Type 1** - Glazing with minimum weighted sound reduction index of 27 dB $R_W + C_{tr}$ (e.g. 4/12/4); ventilators with a minimum element normalised sound level difference of 29 dB $D_{ne,w} + C_{tr}$.
- **Type 2** - Glazing with minimum weighted sound reduction index of 29 dB $R_W + C_{tr}$ (e.g. 6/12/6); ventilators with a minimum element normalised sound level difference of 34 dB $D_{ne,w} + C_{tr}$.
- **Type 3** - Glazing with minimum weighted sound reduction index of 29 dB $R_W + C_{tr}$ (e.g. 6/12/6); ventilators with a minimum element normalised sound level difference of 38 dB $D_{ne,w} + C_{tr}$.

8.4 The required octave band sound insulation performance for the glazing is specified in Table 2 below. The specification applies to the complete glazed assembly (i.e. including frames and seals).

Table 2: Minimum sound reduction indices of glazing

Specification Type	Typical build-up (glass/air gap/glass) mm	Minimum Sound Reduction Index, R_w (dB) in Octave Band Centre Frequency, Hz*								R_w	C_{tr}	$R_w + C_{tr}$
		63	125	250	500	1k	2k	4k	8k			
1	4/12/4	18	24	20	25	35	38	35	35	31	-4	27
2 & 3	6/12/6	18	24	22	29	39	33	38	38	32	-3	29

* In some cases a slight shortfall in performance at a given octave band centre frequency may be acceptable but this should be checked by a qualified acoustician to ensure that the overall noise levels will not be exceeded.

8.4.1 The required octave band sound insulation performance for the trickle ventilators are specified in Table 3 below. The specification applies for a single trickle ventilator that is supplying the required background ventilation rate according to Part F of the Building Regulations.

Table 3: Minimum sound reduction performance of trickle ventilators

Specification Type	Ventilator type	Minimum Element Normalised Sound Level Difference, D_{ne} (dB) in Octave Band Centre Frequency, Hz								D_{new}	C_{tr}	$D_{new} + C_{tr}$
		63	125	250	500	1k	2k	4k	8k			
1	Standard trickle vent	29	33	32	29	28	30	34	40	30	-1	29
2	Acoustic trickle vent	32	38	38	34	32	42	49	55	36	-2	34
3	Acoustic trickle vent	32	38	37	35	40	42	45	54	40	-2	38

* In some cases a slight shortfall in performance at a given octave band centre frequency may be acceptable but this should be checked by a qualified acoustician to ensure that the overall noise levels will not be exceeded.

8.4.2 The trickle ventilator specifications are based on a single trickle ventilator that is supplying the required background ventilation rate according to Part F of the Building Regulations. If more than one trickle ventilator is to be installed to achieve the minimum background ventilation rates, then the individual rating for each ventilator must increase from that specified above, according to the relationship described below:

- 2 ventilators per room; each ventilator to be rated +3 dB
- 3 ventilators per room; each ventilator to be rated +5 dB
- 4 ventilators per room; each ventilator to be rated +6 dB

8.5 For example, the Type 3 specification for a single ventilator is rated 38 dB $D_{ne,w} + C_{tr}$; if two ventilators are to be used within a room requiring Type 3 mitigation, then the rating of each ventilator is +3 dB greater than that for a single ventilator, i.e. 41 dB $D_{ne,w} + C_{tr}$. The specification would also increase by 3 dB at each octave band.

8.6 Facades directly overlooking Mitton Road will need higher specifications than facades that don't overlook Mitton Road directly. Appendix D provides glazing mark-ups, Figure D1 for daytime, ground floor rooms and Figure D2 for night-time, first floor rooms.

9 Conclusions

9.1 A noise assessment was undertaken to predict the potential impact of environmental noise sources on a proposed development consisting of approximately 50 new residential properties at the site.

9.2 Measurements were made at the site to identify the pre-development noise levels. This data was subsequently used to predict the potential impact of environmental noise and to provide mitigation options to ensure that suitable internal noise levels can be achieved.

9.3 Road traffic noise from Mitton Road is the dominant noise source and ambient and maximum noise levels are relatively high. Industrial type noise sources were not observed for the duration of the survey and are likely to be insignificant when compared to the prevailing road traffic noise levels.

9.4 Recommended glazing and ventilation specifications have been provided to enable the recommended internal noise limits to be achieved within the properties.

9.5 External noise levels in rear gardens can achieve the external noise criteria with the use of the 2.2 m high barriers in specified locations.

9.6 In conclusion, with the implementation of the mitigation recommended in this report, it is considered that a suitable and commensurate level of protection against noise will be provided to the occupants of the proposed accommodation.

APPENDICES

Appendix A: Site Plans

Figure A1: Project Masterplan

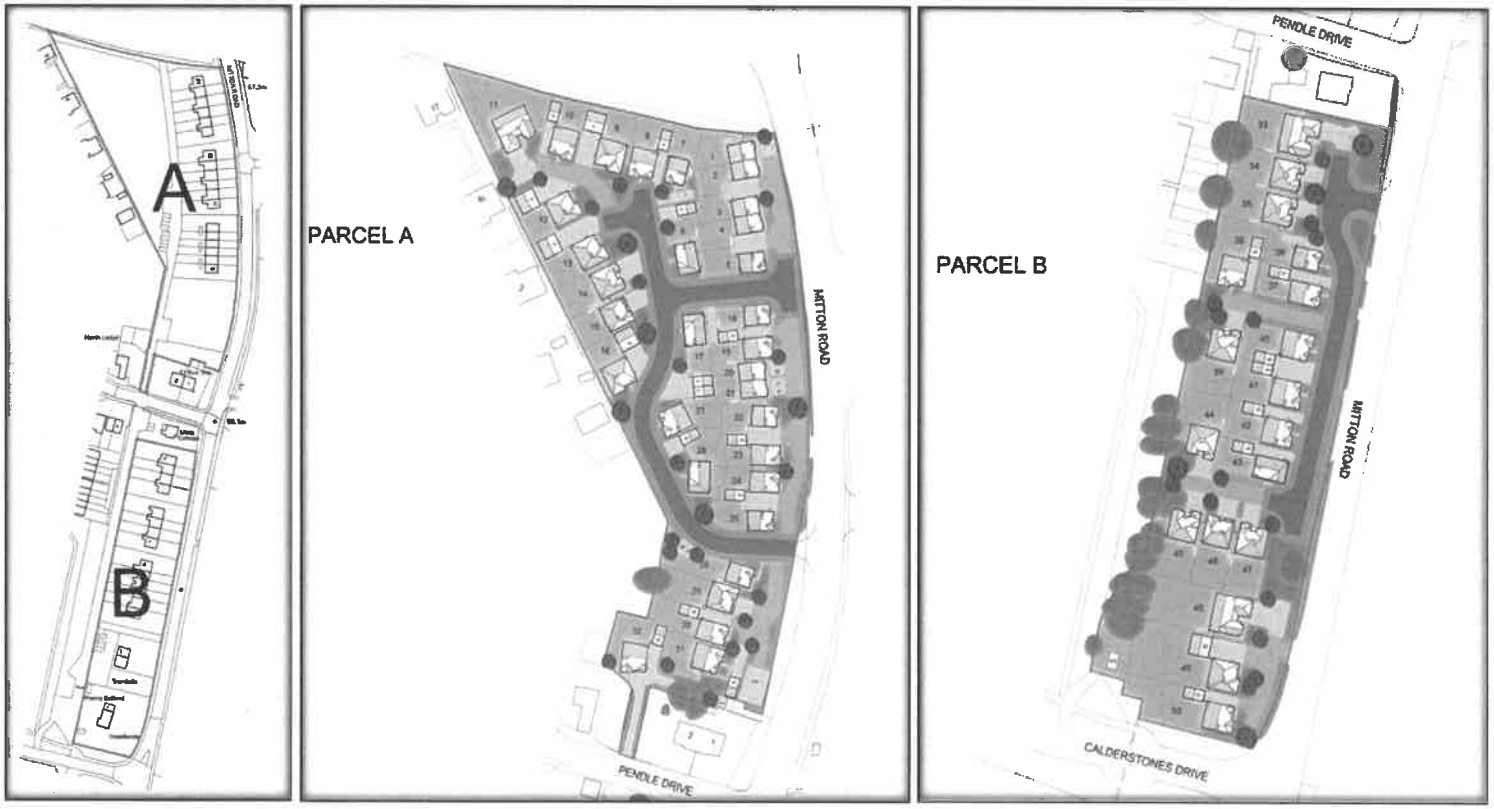
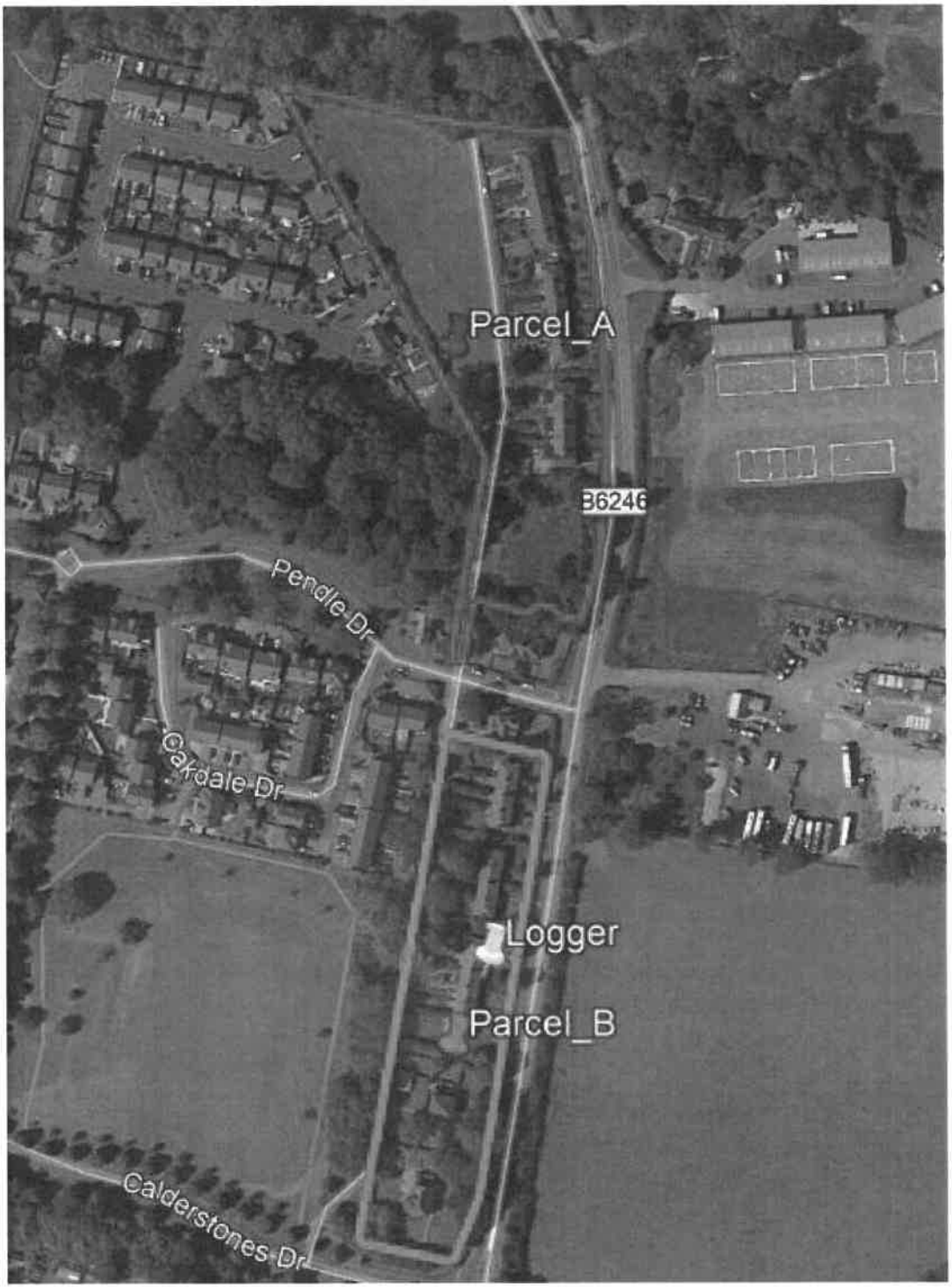


Figure A2: Site boundaries and measurement position (Logger)



Appendix B: Survey Data

Table B1: Noise monitoring equipment

Equipment Description	Type Number	Manufacturer	Serial No.	Date Calibrated	Calibration Certification Number
Outdoor microphone housing	NOR 1217	Norsonic	12175146	N/a	N/a
Class 1[8],[9] Integrating Real Time 1/3 Octave Sound Analyser	NOR 140	Norsonic	1406017	22/10/19	U33164
Microphone	NOR 1225	Norsonic	358159	22/10/19	33163
Class 1 Calibrator[10]	Type 4231	Brüel & Kjær	2478249	29/05/19	04255/1

[8] IEC 61672-1 (2002) Electroacoustics – Sound level meters Part 1: Specifications

[9] IEC 61260 (1995) Electroacoustics – Octave-band and fractional-octave-band filters

[10] IEC 60942 (2003) Electroacoustics – Sound calibrators

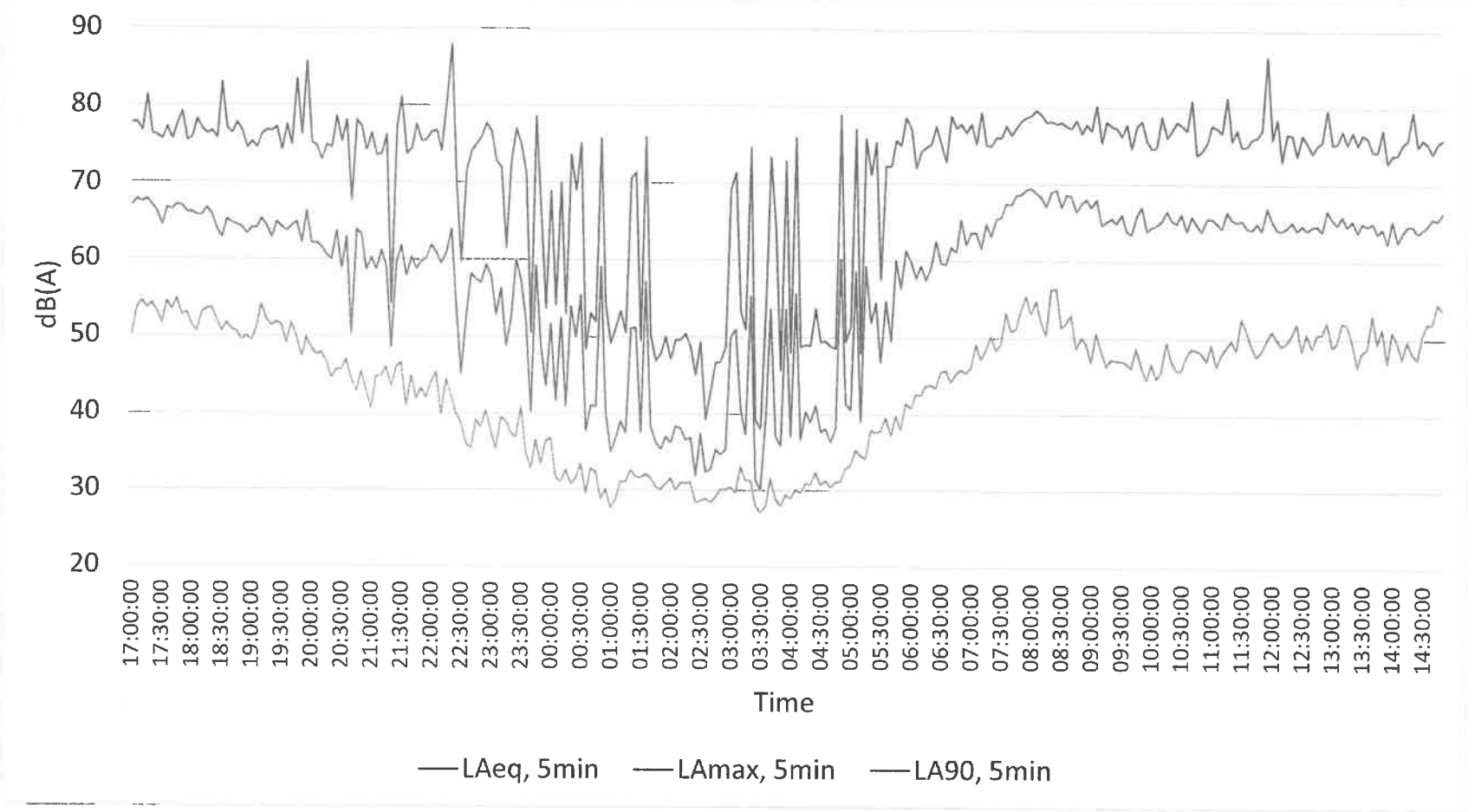
Table B2: Dates, times and weather conditions during noise measurements

Measurement Locations	Date/Time	Weather conditions		
		Description	At Start of Survey	On Completion
P1	24/09/20, 16:30 to 25/09/20, 15:00	Temperature:	12 °C	13 °C
		Precipitation:	Dry	Dry
		Cloud cover (oktas – see opposite):	6	6
		Any fog/snow/ice?	No	No
		Any damp roads/wet ground?	No	No
		Wind speed:	None	None
		Wind direction:	n/a	
		Any conditions that may cause temp. inversion (e.g. calm nights with no cloud):	No	No

Cloud Cover

Symbol	Scale in oktas (eighths)	
	0	Sky completely clear
	1	
	2	
	3	
	4	Sky half cloudy
	5	
	6	
	7	
	8	Sky completely cloudy
	(9)	Sky obstructed from view

Graph B1: Time History of Measured Sound Levels



Appendix C: CadnaA data used

Table C1: Measured noise spectrums used in Cadna modelling

ID	63	125	250	500	1000	2000	4000	8000	A
Daytime average, L_{eq} (Logger position)	64	57	55	59	63	57	46	38	65
Night-time average, L_{eq} (Logger position)	58	50	44	49	53	47	38	32	55
Night-time maximum, L_{max} (Logger position)	73	65	67	70	75	68	61	56	77

Figure C1: Entire Site – 1.5 m high noise map - Daytime

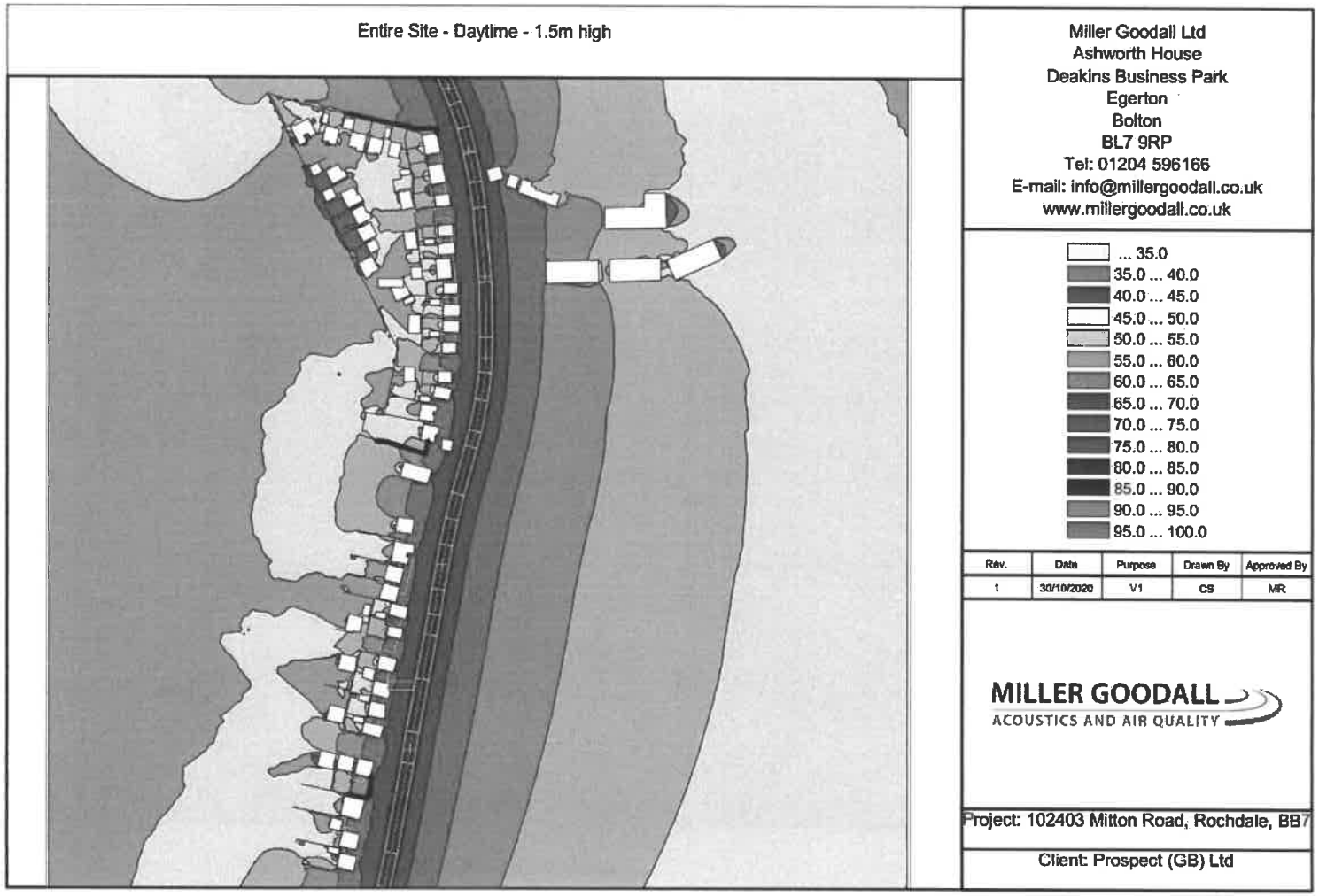
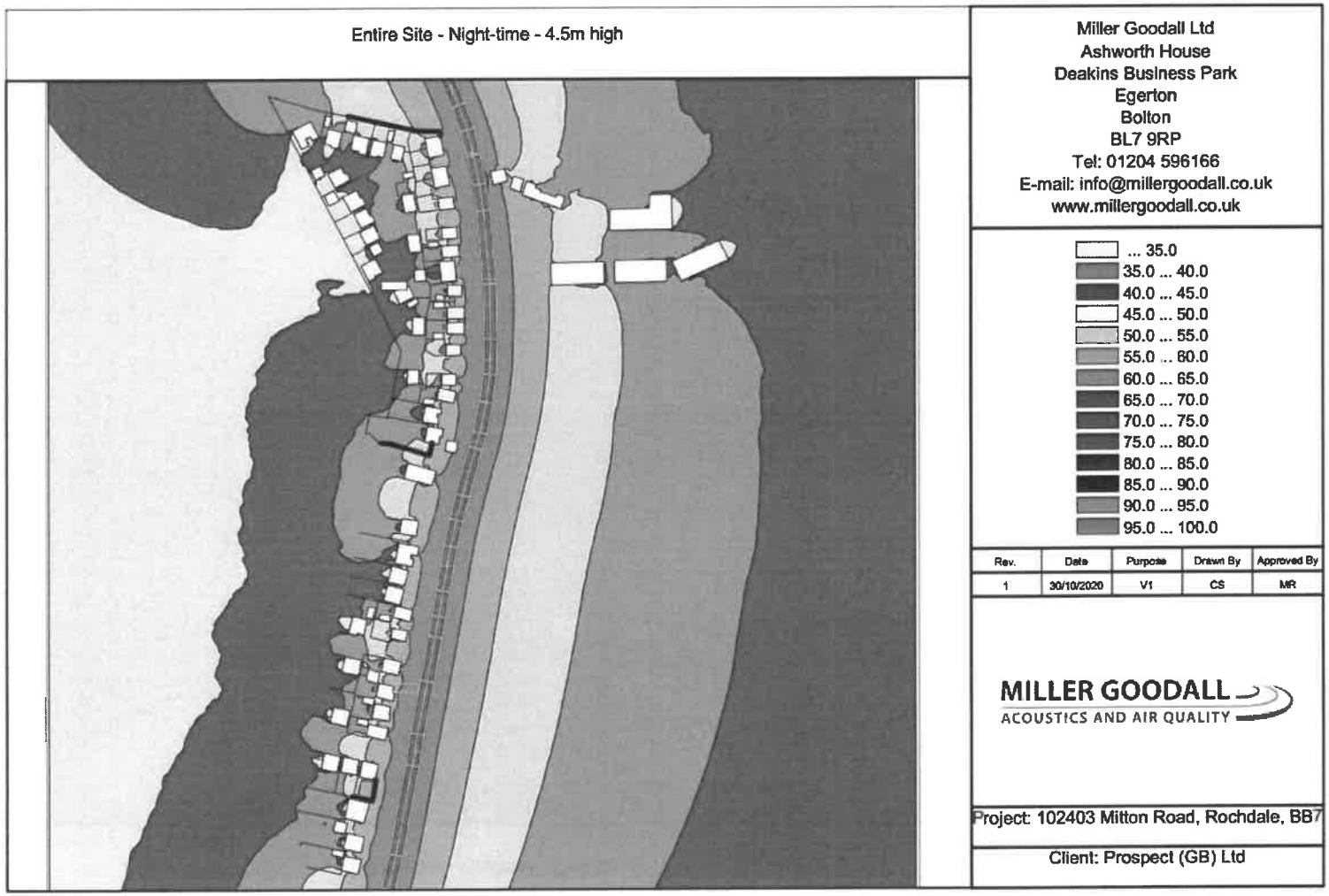


Figure C2: Entire Site – 4.5 m high noise map – Night-time



Appendix D: Glazing recommendations

Figure D1: Parcel A - Daytime Glazing guidance - Ground Floor Rooms (living room/dining)

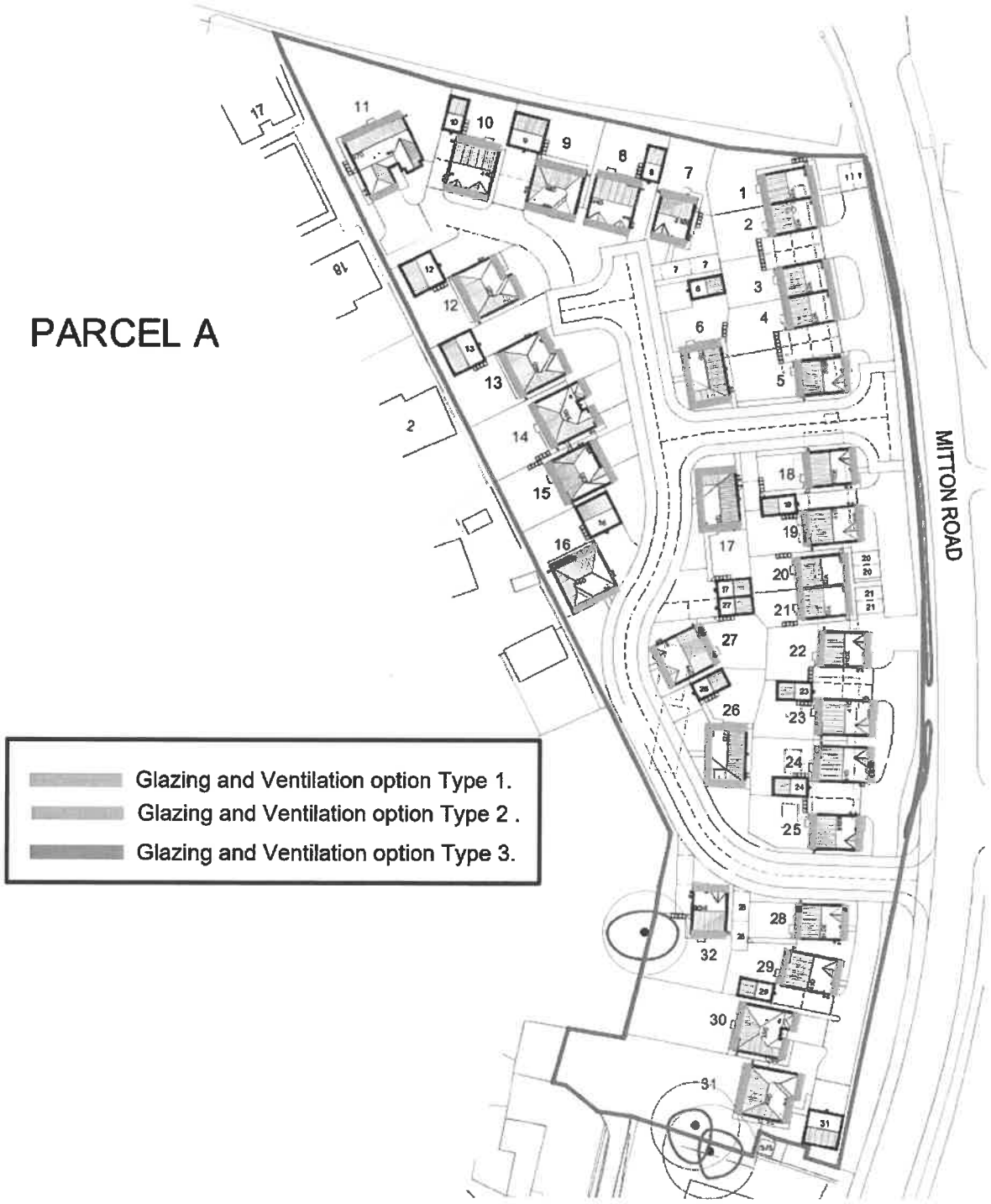


Figure D2: Parcel B - Daytime Glazing guidance - Ground Floor Rooms (living room/dining)

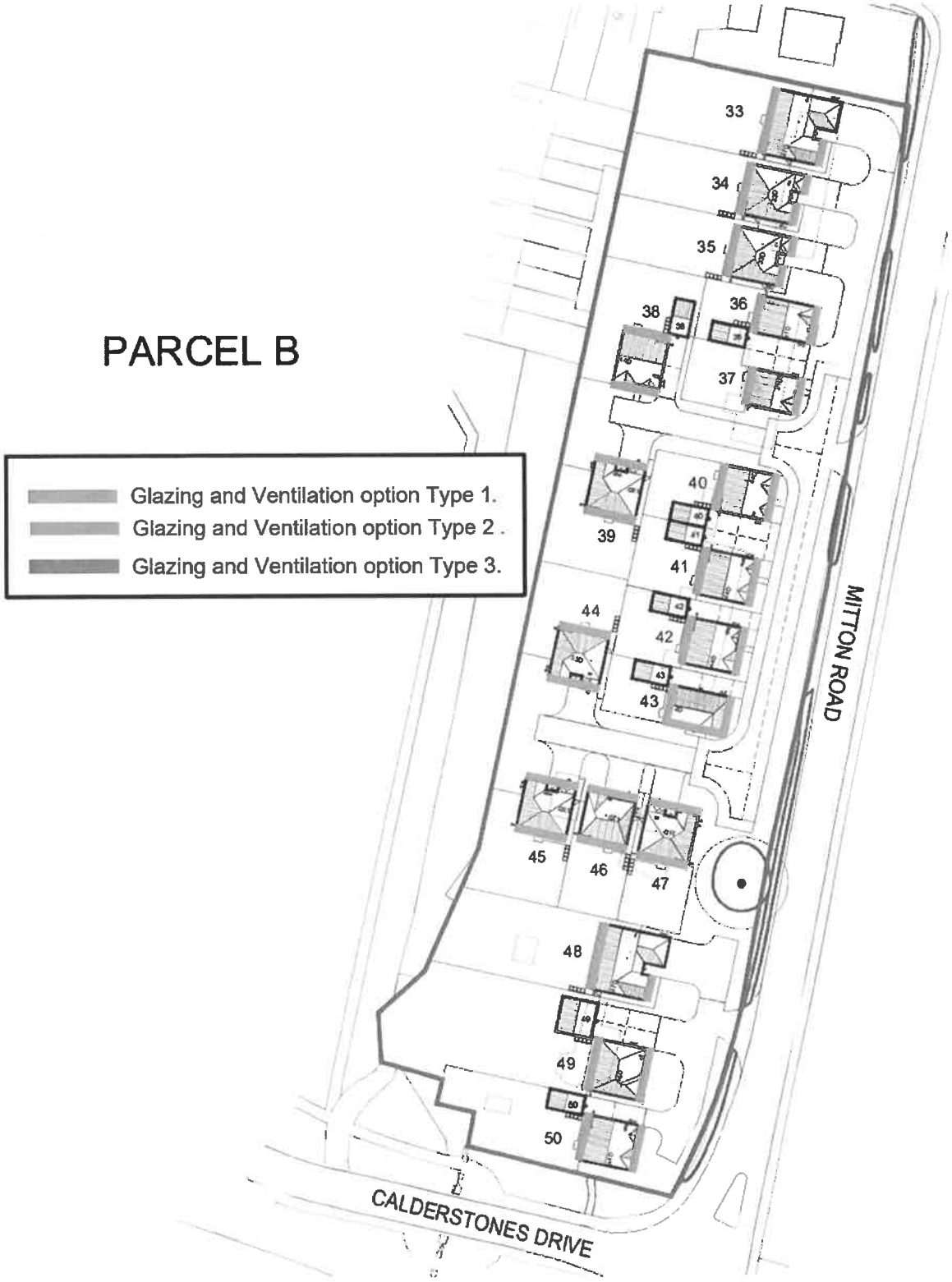


Figure D3: Parcel A - Night-time glazing requirements for 1st floor (bedrooms)

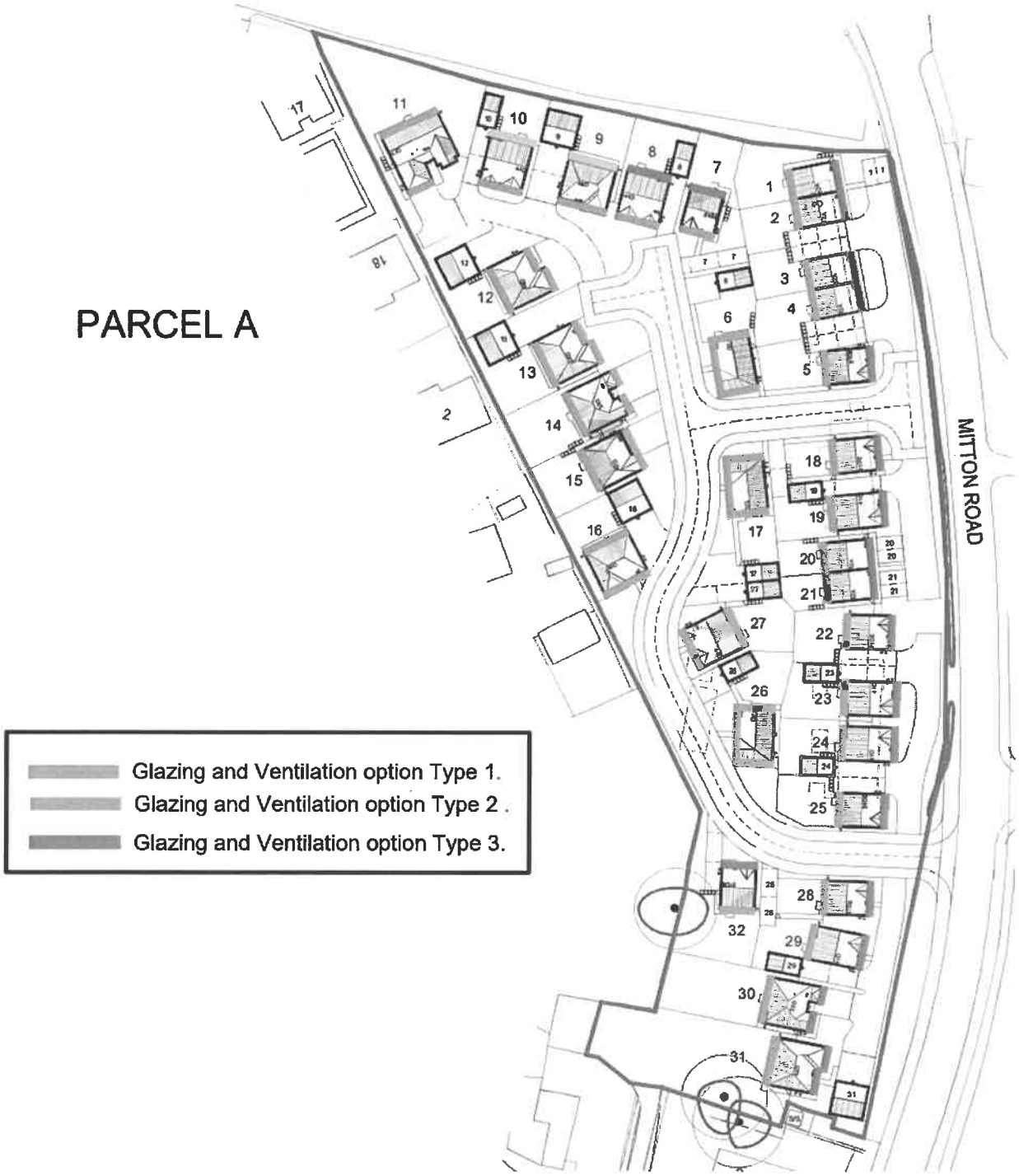
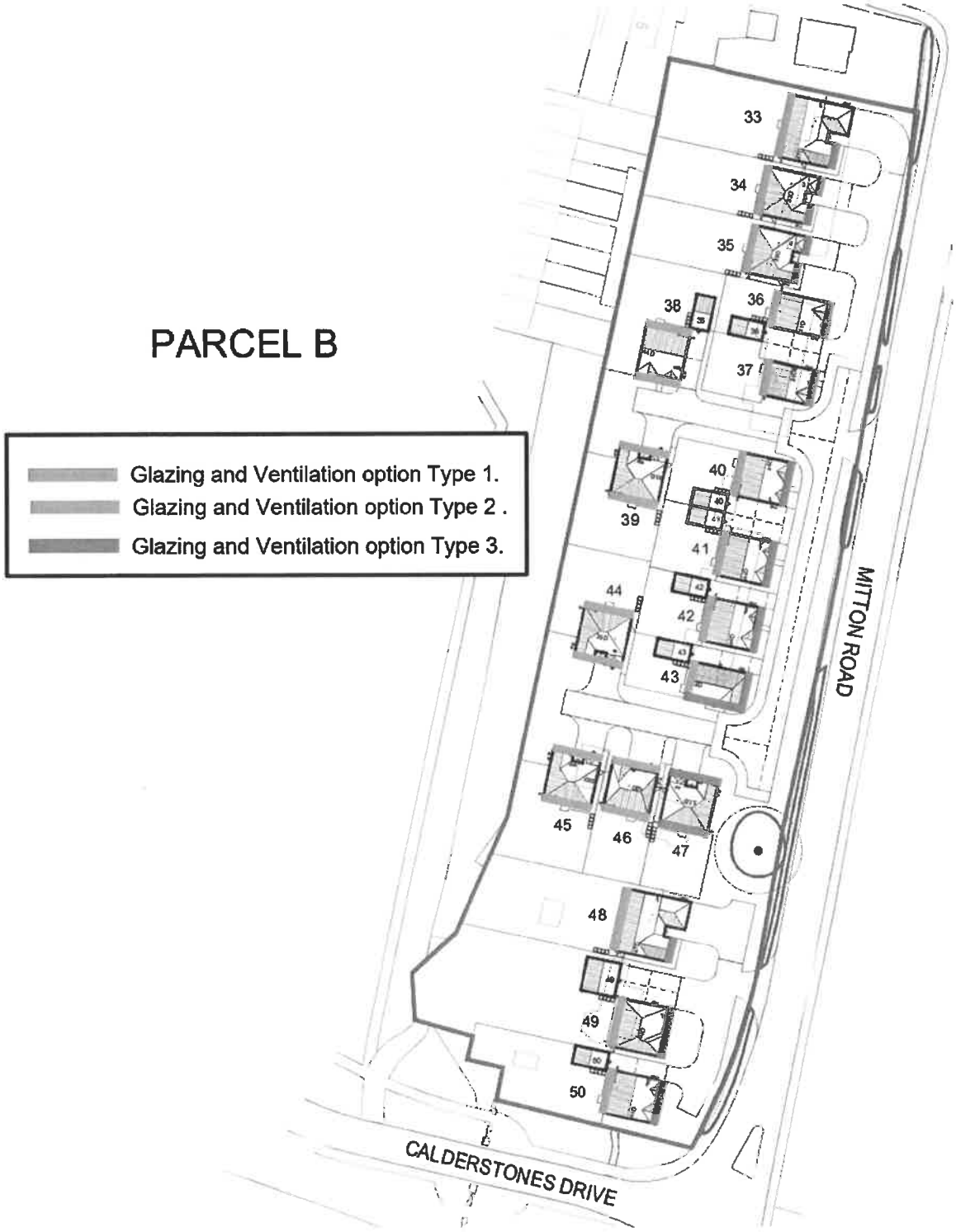


Figure D4: Parcel B - Night-time glazing requirements for 1st floor (bedrooms)



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Glossary of Terms

Decibel (dB) The unit used to quantify sound pressure levels; it is derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is usually only perceptible under controlled conditions.

dB L_A Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB L_A broadly agree with an individual's assessment of loudness. A change of 3 dB L_A is the minimum perceptible under normal conditions, and a change of 10 dB L_A corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB L_A; normal conversation about 60 dB L_A at 1 meter; heavy road traffic about 80 dB L_A at 10 meters; the level near a pneumatic drill about 100 dB L_A.

$L_{A90,T}$ The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014+A1:2019 it is used to define background noise level.

$L_{Aeq,T}$ The equivalent continuous sound level. The sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

L_{Amax} The highest A weighted noise level recorded during the time period. It is usually used to describe the highest noise level that occurred during the event.

R_w Single number rating used to describe the sound insulation of building elements and is defined in BS EN ISO 10140-2: 2010 (formerly BSEN ISO 140-3:1995). It is derived by measurement under laboratory conditions and does not take into account the effects of flanking transmissions.

$D_{nT,w}$ The weighted standardized level difference is a single figure rating used to describe the sound insulation of a construction separating two rooms, for example a wall or floor, and is defined in BS EN ISO 16283-1:2014 (formerly BSEN ISO 140-4:1998). It is derived by measurement of an in-situ construction and therefore takes into account the effects of flanking transmissions, workmanship etc.

$D_{ne,w}$ The weighted element-normalized level difference is a single figure rating used to describe the sound insulation of small elements within a larger construction and is defined in BS EN ISO 10140-2:2010 (BSEN ISO 140-10:1991). It is most often used to rate the sound insulation performance of ventilator units e.g. trickle vents.

C_{tr} A single-number spectrum adaptation term used to characterise the sound insulation rating with respect to urban traffic. It is defined in ISO 717-1:20-13.

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MILLER GOODALL
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