iAcoustics
Integrated Acoustic Solutions

Unit A16
Kingswood Business Park
Baldonnell, Dublin 22 Ireland

00353 1 452 1133
info@iacoustics.net
www.iacoustics.net

Inward Noise Impact Assessment

The Ambassador Site, Kill, Co Kildare

Report for: Kildare County Council

Report Prepared by: Glen Plunkett, Acoustic Consultant, AMIOA, MSc Acoustics

Reviewed by: Jim Dunne, Managing Director, MIOA, MSc Acoustics

Issue Date	Revision	Status
3rd September 2021	DRAFT	Suitable for review & comments.

1 Introduction

1.1 Overview

Kildare County Council has appointed iAcoustics to provide acoustic design consultancy for a social housing project at the Ambassador Site, Kill, Co Kildare. As part of our scope, we have elected to undertake an inward noise impact assessment at the site to assess the impact of road traffic noise. A noise survey was conducted in line with the appropriate measurement procedures, and detailed Noise Maps have been developed.

1.2 Development Proposals & Site Description

The project's scope includes the construction of 33 no. social housing units comprising of:

- 6 no. 1 Bed/ 2 Person own door (3 Storey Apartment blocks)
- 6 no. 2 Bed/ 4 Person own door (3 Storey Apartment blocks)
- 13 no. 2 Bed/ 4 Person (2 Storey house)
- 8 no. 3 Bed/ 5 Person (2 Storey house)

A new access road will be provided from the L2014. The site is bounded to the east and south-east by Kill GAA club. The site is bounded to the west and south-west by residential development and Embassy Manor business park. To the north, the site is bounded by the L2014 road; further north is the N7.

Due to the site's proximity to the N7 motorway, the transportation noise impact is a key consideration.

1.3 Assessment Methodology

We set out the following assessment objectives:

- Outline the standards and guidance relevant to the acoustic design of dwellings.
- Undertake a baseline noise survey to quantify the prevailing noise exposure levels at the development location.
- Prepare detailed noise maps to demonstrate the noise impacts in the context of completed development.
- Discuss the use of noise mitigation measures where required.
- Determine both the potential outward and inward noise impacts.

2 Relevant Standards & Guidance

2.1 Kildare County Council Noise Action Plan 2019 - 2023

The objectives of the Noise Action Plan are to avoid, prevent and reduce on a prioritised basis, where necessary, the harmful effects due to long term exposure to environmental noise. The Noise Action Plan proposes noise levels thresholds of 70 dB(A) L_{den}, and 57 dB(A) L_{night} for both "Major Roads" and "Major Railways" set in accordance with the Environmental Protection Agency (EPA) "Guidance Note for Noise Action Planning, July 2009". These limits are arbitrary at present as there is no existing legislation that limits environmental noise to a particular value.

2.2 World Health Organisation (WHO) *Guidelines for Community Noise* 1999

The WHO drafted the Guidelines for Community Noise (1999) as a response to the need for action on community noise. The document is widely referenced throughout the industry as a benchmark in assessing acoustics for residential developments.

- For 'outdoor living areas', a daytime limit of $L_{Aeq,16hr}$ 55dB to safeguard against the likelihood of 'serious annoyance'. A second daytime limit of $L_{Aeq,16hr}$ 50dB is also given as a 'moderate annoyance' threshold.
- For 'internal living areas', a level of $\leq L_{Aeq,16hr}$ 35dB is desirable to maintain reasonable speech intelligibility indoors and prevent moderate annoyance during day and evening times.
- A night-time threshold value of $L_{Aeq,8hr}$ 30dB should not be exceeded *indoors* in the interest of preventing adverse effects of sleep. It follows that an internal level of $L_{Aeq,T}$ 30dB is equivalent to a façade level of $L_{Aeq,T}$ 45dB for continuous, steady noise (assuming a partially open window provides 15dB's of reduction).

It should be noted that the WHO guideline values are not intended as noise limits. The WHO guideline values are evidence-based public health-oriented recommendations to serve as the basis for a policy-making process.

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

This British Standard provides guidance for the control of noise in buildings, which includes guidance on hotels and rooms for long-term residential purposes. The Standard defines upper limits for internal ambient noise levels in habitable areas of a home; these values are outlined in Table 3.1. We consider that the guideline values defined in Table 3.1 should be applied to this project as a *design target*. BS 8233:2014 adds that where development is considered necessary or desirable, "*the internal target levels may be relaxed by up to 5dB and reasonable internal conditions be achieved*".

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	$L_{Aeq,16hr}$ 35dB	-

Dining	Dining Room	$L_{Aeq,16hr}$ 40dB	-
Sleeping	Bedroom	$L_{Aeq,16hr}$ 35dB	$L_{Aeq,8hr}$ 30dB

Table 2-1 BS 8233:2014 guidance on internal ambient noise levels in dwellings

BS 8233:2014 adds that where a development is considered necessary or desirable, "*the internal target levels may be relaxed by up to 5dB and reasonable internal conditions be achieved*". This relaxation is also noted in the World Health Organisations' *Guidelines for Community Noise* (1999).

2.4 Project Ireland 2040: National Planning Framework (2018)

The National Planning Framework (2018) lists noise management as one of its Environment and Sustainability Goals for creating a clean environment for a healthy society. The Framework lists National Policy Objective 65 as follows,

"Promote the pro-active management of noise where it is likely to have significant adverse impacts on health and quality of life and support the aims of the Environmental Noise Regulations through national planning guidance and Noise Action Plans."

In addressing these issues, the National Planning Framework will support:

- Noise Management and Action Planning

Measures to avoid, mitigate, and minimise or promote the pro-active management of noise, where it is likely to have significant adverse impacts on health and quality of life, through strategic noise mapping, noise action plans and suitable planning conditions.

- Noise, Amenity and Privacy

This includes but is not limited to, good acoustic design in new developments, in particular residential development, through a variety of measures such as setbacks and separation between noise sources and receptors, good acoustic design of buildings, building orientation, layout, building materials and noise barriers and buffer zones between various uses and thoroughfares.

- Quiet Areas

The further enjoyment of natural resources, such as our green spaces, through the preservation of low sound levels or a reduction in undesirably high sound levels, is particularly important for providing respite from high levels of urban noise. As part of noise action plans, an extra value placed on these areas, in terms of environmental quality and the consequential positive impact on quality of life and health, due to low sound levels and the absence of noise, can assist in achieving this.

3 Noise Survey

3.1 Survey Methodology

On the 16th of June 2021, a noise survey was conducted at the site in accordance with the CRTN Shortened Measurement Procedure [1]. The procedure involves measuring the L_{A10} over three consecutive hours between 10am and 5pm. Taking the arithmetic mean of the three consecutive L_{A10} measurements, the current value of $L_{A10(18hour)}$ and L_{den} is obtained as follows:

$$L_{10,18hr} = L_{10,3hr} - 1\ dB(A)$$

$$L_{den} = 0.86\left(L_{10,18hr}\right) + 9.86dB$$

Three measurement locations were chosen to capture the prevailing noise environment at the proposed dwelling across the site. See Figure 3-1. The following measurement standards were also referenced:

- ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures.
- ISO 1996-2:2017 Acoustics — Description, measurement and assessment of environmental noise — Part 2: Determination of sound pressure levels.

The complete sound measuring system deployed conforms to BS EN 61672-1, Class 1. Sound calibrators deployed for use conform to BS EN 60942, Class 1.

Type	Make & Model	Serial No.	Next Calibration
Sound Level Meter	*NTI XL2-TA*	*a2a-06306-EO*	*Mar-2023*
Microphone	*NTI MA220*	*8285*	*Mar-2023*
Calibrator	*Castle GA607*	*044447*	*Oct-2021*

Table 3-1 – Noise Monitoring equipment. Calibration certificates are avaiable on request.

Wind Speed & Direction	*Easterly, average 3m/s*
Mean Temperature	*17 ^{O}C*
Average Precipitation	*N/A*
Fog, Frost, Ice or Snow present?	*N/A*
Cloud Cover	*Scattered*

Table 3-2 – Weather conditions throughout the survey

[1] *Department of Transport (UK), 1988. 'Calculation of Road Traffic Noise'*

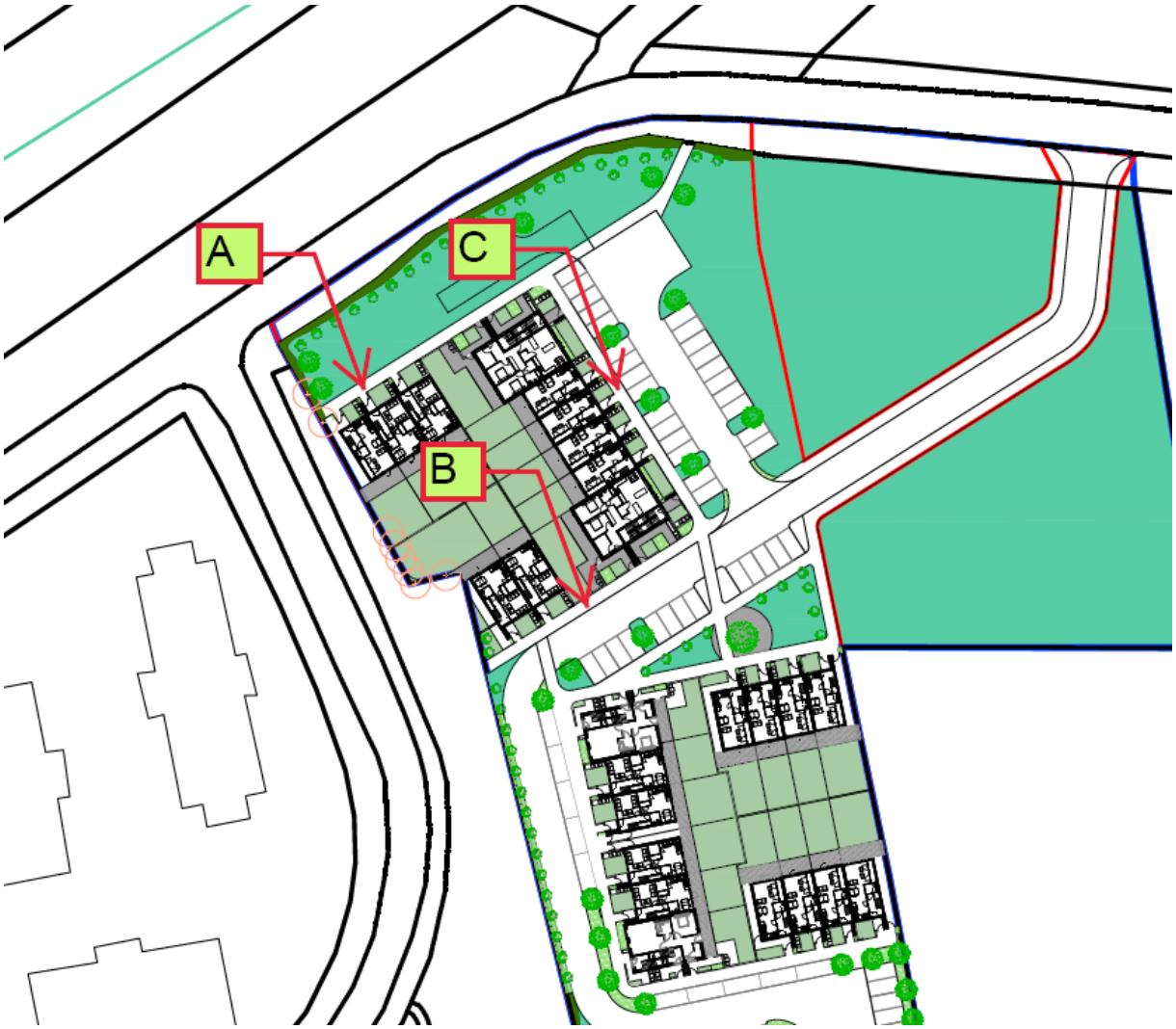

Figure 3-1 – Locations A, B & C represent the locations where noise monitoring took place, shown here in the context of the proposed site plan.

3.2 Noise Survey Results

The noise survey results are summarised in Table 3-1 below. Please refer to Appendix A for more details.

Location	$L_{Aeq, 3hr}$	$L_{A10, 3hr}$	$L_{A90, 3hr}$	L_{AFMax}	Calculated $L_{A10, 18hr}$	Calculated L_{den}
A	58	60	55	67	57	59
B	53	55	50	68	52	55
C	54	56	51	64	54	56

Table 3-2 – Summary of noise measurements

4 Noise Mapping

4.1 Modelling Assumptions

Traffic count data for the N7 is available from Transport Infrastructure Ireland (TII). Monitoring station *TMU N07 020.0 E* is situated less than a kilometre from the subject site between *J7 Kill* and *J8 Johnstown*. We applied the 2019 counts to our noise model. According to TII's Daily Volume Report for the 16th June 2021, the average daily flow was 87,579 (both directions); this indicates that the traffic volumes were not unduly low on the day the noise survey was carried out.

Year	ADT	% HGV	Coverage
2021	63811	10.1%	66.9%
2020	53163	10.1%	100%
2019	83566	8.2%	93.5%
2018	81107	7.8%	99.7%
2017	82829	7.2%	99.7%
2016	80891	7.1%	99.6%
2015	78146	7.2%	99.7%
2014	74261	7%	99.7%
2013	73788	7%	83.5%

Table 4-1 – Yearly traffic data obtained from the TII website for TMU N07 020.0 E. The volume data for 2019 has been used as a basis for our noise modelling.

The topography of the surrounding lands is relatively flat; we have not included topographical data in our modelling as this information is unlikely to affect the predictions. Noise modelling was carried out in CadnaA suite of software.

4.2 Noise Maps

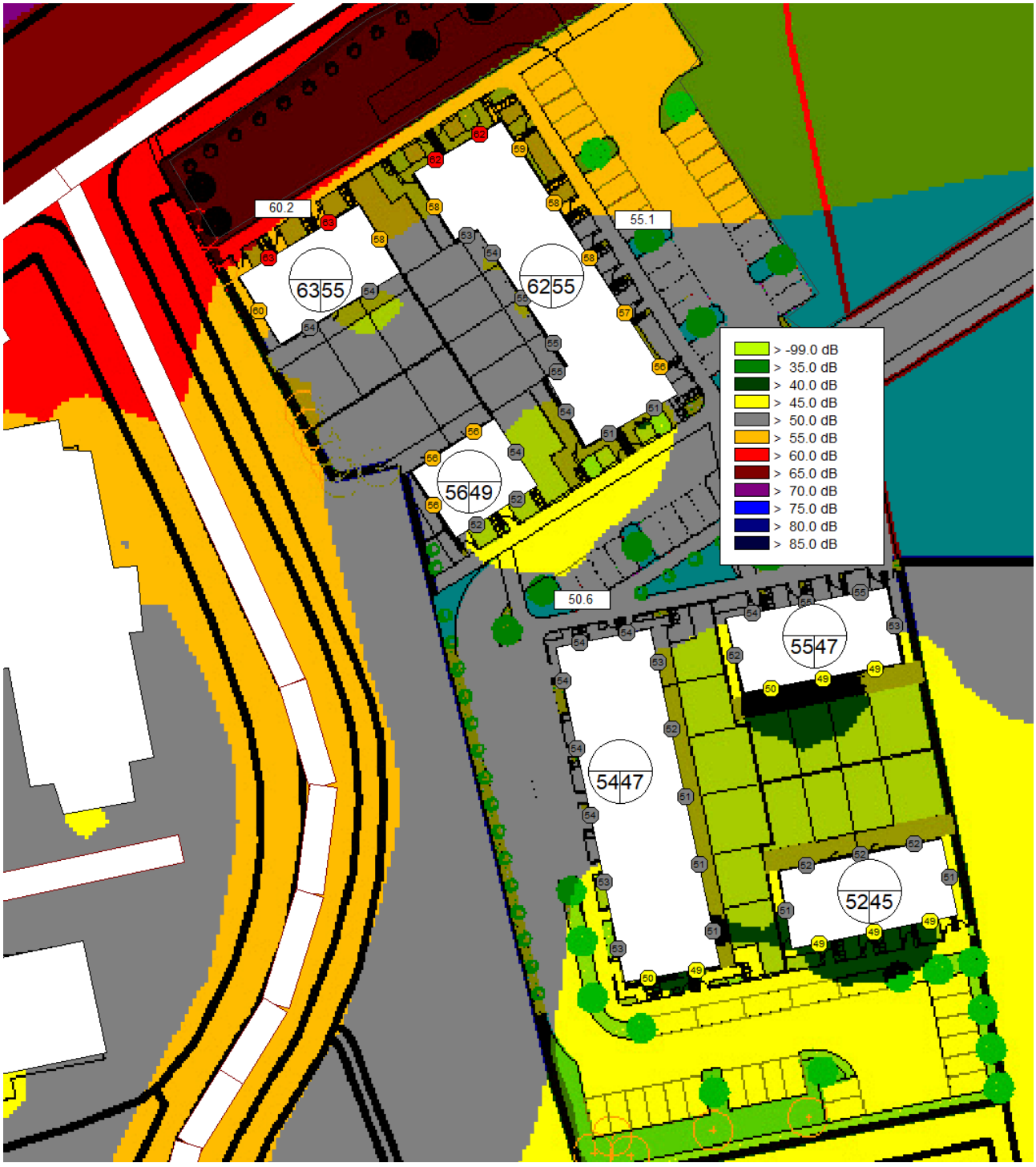

Figure 4-1 – Predicted noise levels, Lday. Receiver grid height of 1.5m to represent ground floor level.

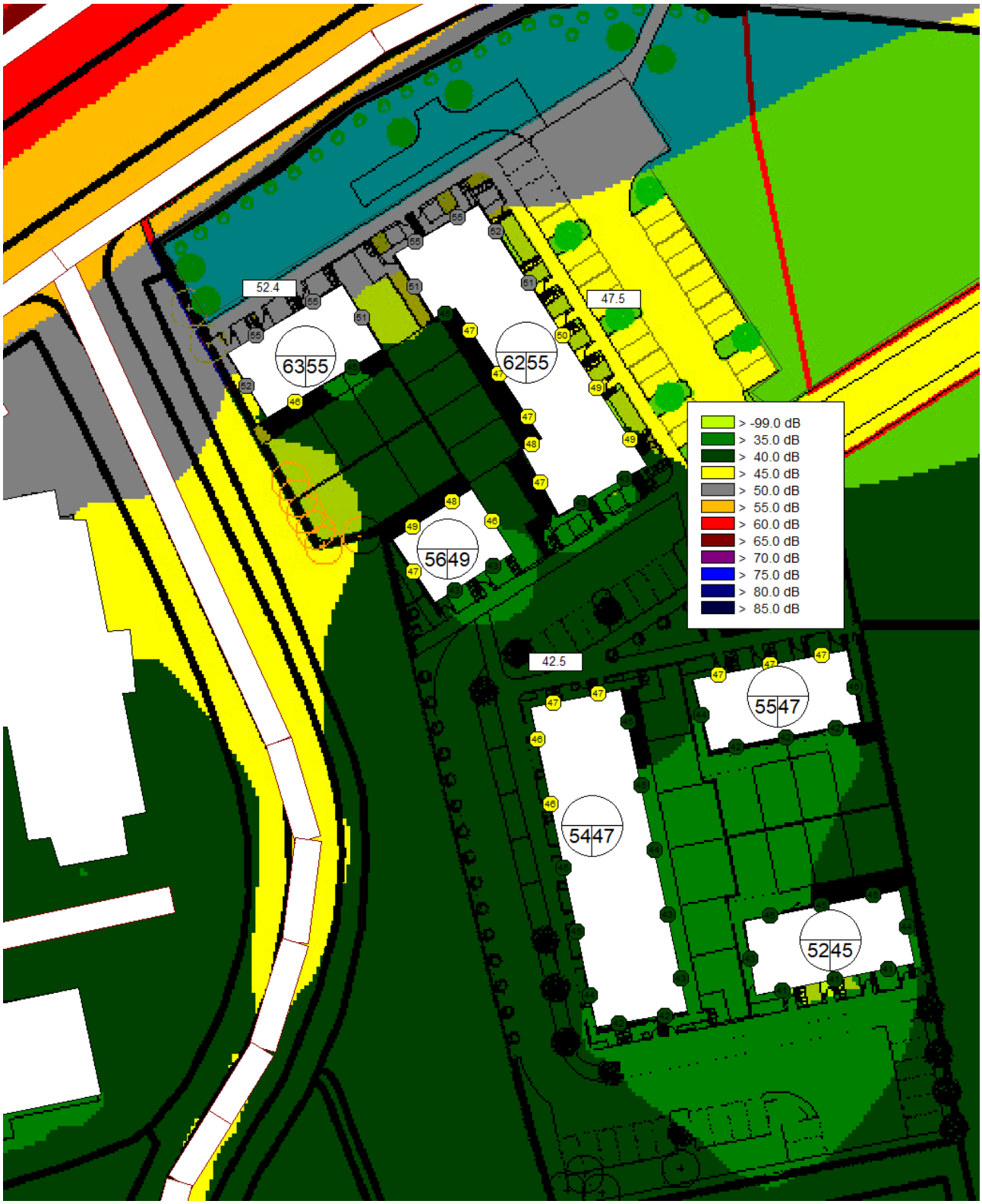

Figure 4-2 - Predicted noise levels, Lnight. Receiver grid height of 1.5m to represent ground floor level.

Figure 4-3 - Predicted noise levels, Lday. Receiver grid height of 4m to represent first floor level.

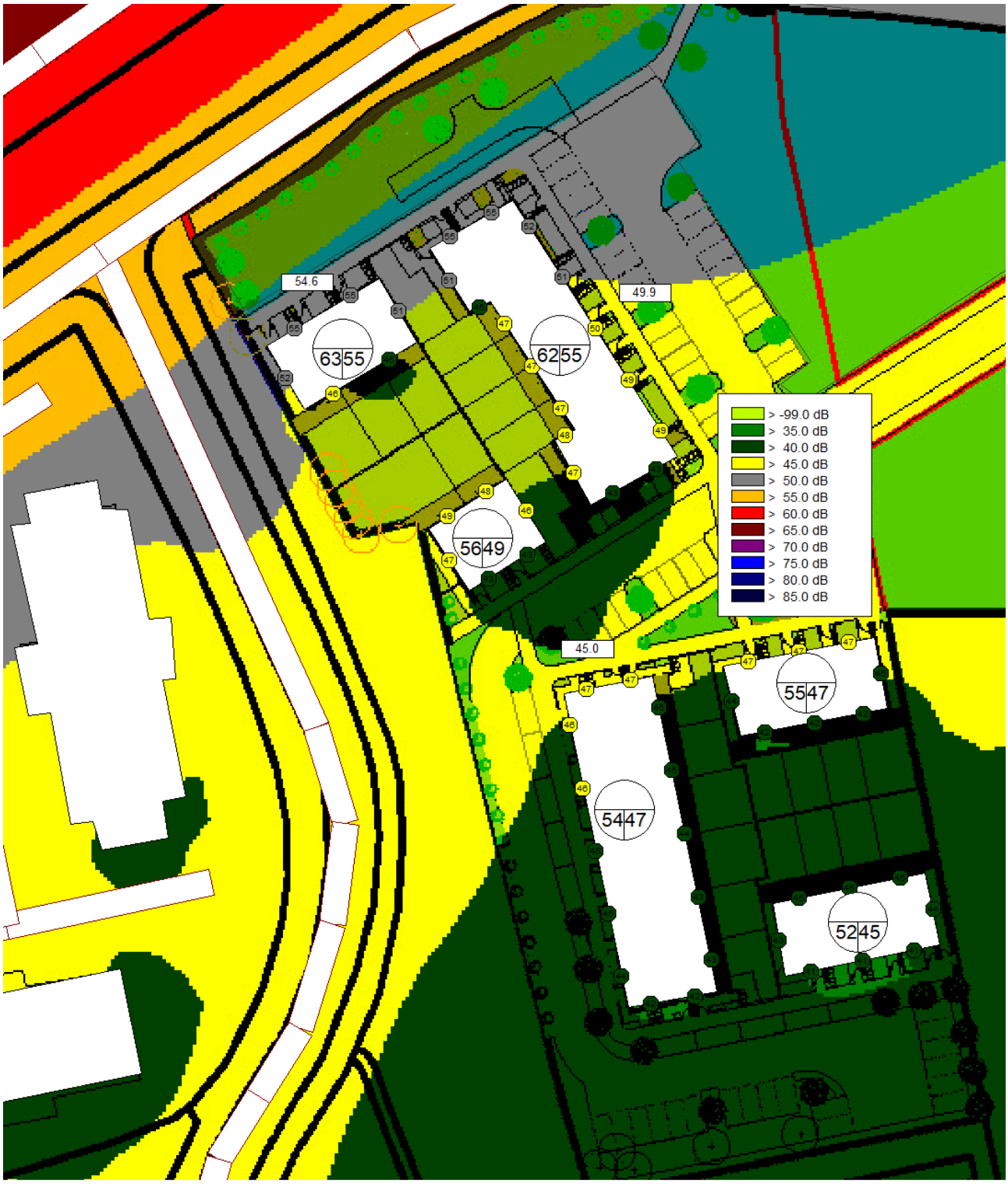

Figure 4-4 - Predicted noise levels, Lnight. Receiver grid height of 4m to represent first floor level.

5 Discussion

5.1 The noise levels at any dwelling will not exceed the 70 dB(A) L_{den} and 57 dB(A) L_{night} threshold values proposed in kildare County Council's *Noise Action Plan*. Noise measurements taken at the location of the worst-affected dwelling show an L_{den} of 58dB. We note the noise readings from which the Lden was derived is based on a measurement height of 1.5m; noise levels will be 1-2dB higher at the first floor level. Accounting for this increase, the levels will still be significantly below the threshold values at first floor levels.

5.2 An open window will provide approximately 15dB of attenuation against outdoor sound. Where noise maps show façade noise levels below 55 dB L_{day} and 50dB L_{night}, it will be possible to achieve "reasonable noise levels indoors" with open windows, in accordance with BS 8233:2014. The predicted noise levels show that more than half of the development will be exposed to levels below 55 dB L_{day} and 50 dB L_{night}.

5.3 Where predictions show façade levels to be in excess of 55dB L_{day} and 50dB L_{night}, the sound insulation performance of the façade becomes essential. It is unlikely that these dwellings will be able to achieve "reasonable noise levels indoors" with open windows. The appropriate design approach in this scenario is to

(a) specify a minimum acoustic performance requirement for façade elements, including glazing and vents. Specific design guidance is contained in Section 6 of this report.

(b) provide an alternative means of ventilation that does not require windows to be opened (except for purge ventilation).

5.4 Reffering to Figure 4-1, the noise predictions indicate that the W.H.O's $L_{Aeq,16hr}$ 55dB threshold for outdoor amenety areas can be achieved in most areas across the site. Some areas closer to the N7 are likely to exceed $L_{Aeq,16hr}$ 55dB; however, all rear gardens appear to fall within the threshold. We are satisfied that the development largely complies with the W.H.O's recommendation and that no further noise mitigation is required.

6 Design Guidance

6.1 Glazing & Background Ventilation

Some dwelling units will experience higher noise exposure levels than others due to their proximity and orientation to the N7. For this reason, we have proposed two glazing types. The procedure described in Annex G of BS 8233:2014 provides a simple calculation procedure that involves arithmetically subtracting the R_w values of the glazing from the free-field noise exposure level at the façade to obtain an internal noise level. We have applied this procedure to determine a suitable acoustic performance rating for the glazing.

Type	Locations	Minimum Reccomended Performance R_w (C_{tr})	Typical Buildup
A	Bedrooms, kitchens and living rooms	35 (-5) dB	Insulating glass unit 10mm/(6-16mm cavity)/4mm
B	Bedrooms, kitchens and living rooms	32 (-4) dB	Insulating glass unit 6mm/(6-16mm cavity)/4mm

Notes:

1. The minimum acoustic performance requirement applies to the complete glazing system, including the frame.
2. The glazing supplier must provide evidence showing the acoustic performance achieved by the glazing systems.
3. There is no acoustic performance requirement for glazing into bathrooms or for common internal areas.

Table 6-1 – Proposed minimum acoustic performance for glazing across the development.

Figure 6-1 depicts the locations of Glazing Types A & B. In general, the facades with the highest nosie exposure levels across Blocks 1-3 will received an enhanced acoustic glazing system. Blocks 4-7 are all set back from the noise source and do not require an enhanced glazing specification in order to achieve reasonable internal acoustic conditions.

Note, bathroom glazing will not need to meet the acoustic performance requirement.

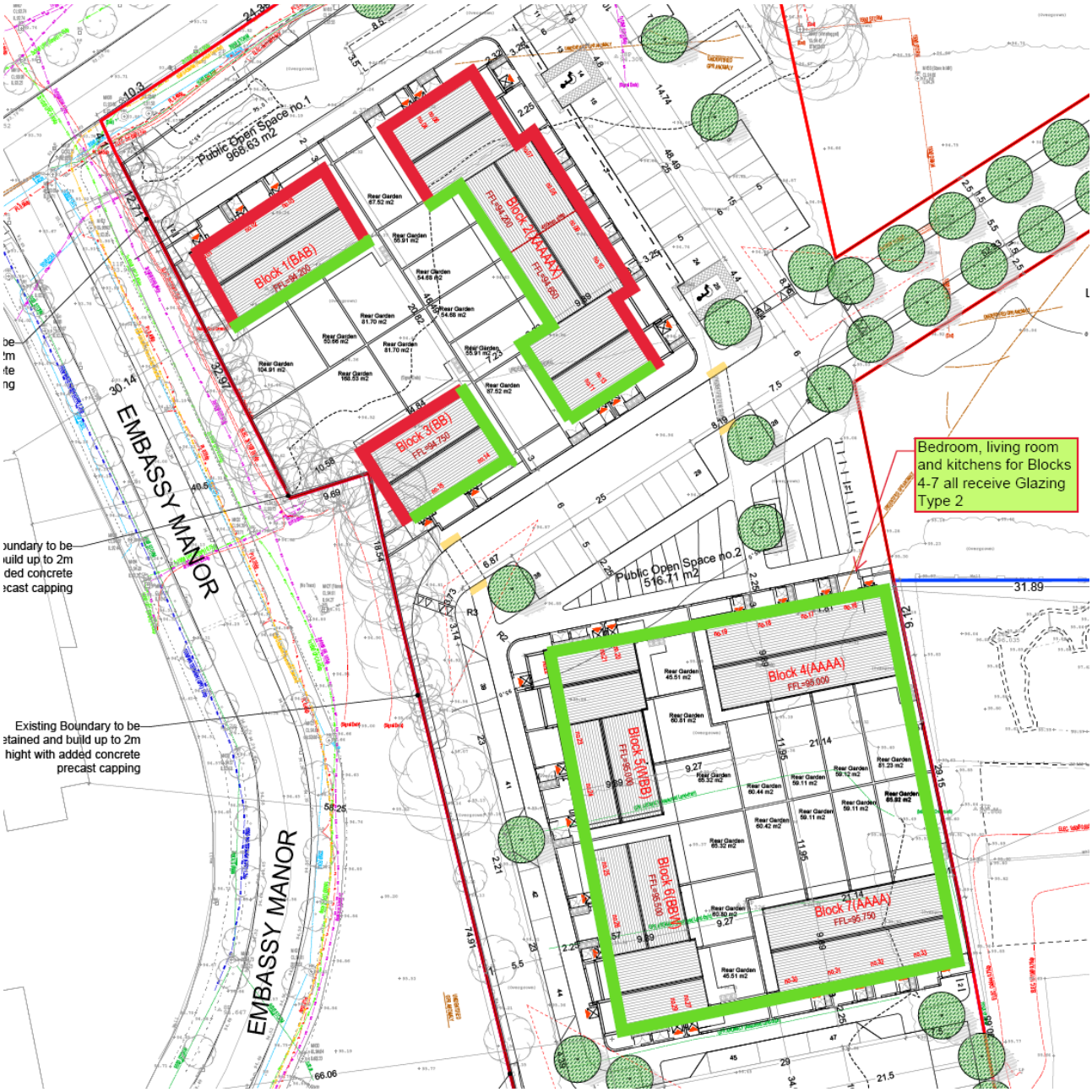

Figure 6-1 – Proposed location of Glazing Types A (RED) and B (GREEN).

6.2 Background Ventilation

Background ventilators/trickle vents must satisfy a *minimum* weighted normalised level difference as follows:

- ≥ $D_{ne,w}$ 38dB (open position) for all facades where Glazing Type A is specified.
- ≥ $D_{ne,w}$ 35dB (open position) for all facades where Glazing Type B is specified.

6.3 External Wall Construction

The solid, non-glazed elements of the building envelope provide sufficient resistance to the passage of sound. The sound insulation performance is achieved by the mass of the external masonry and by the degree of isolation provided by the cavity. We do not consider it necessary to incorporate any additional mitigation measures into the solid façade elements since the overall sound insulation performance will be dictated by the glazing and background ventilation.

7 Outward Noise Impacts

To our knowledge, there are no mechanical or electrical noise sources associated with this development which would justify concern from an acoustic perspective. The ambient noise environment in the vicinity of the development will remain largely unchanged during the operational phase of the proposed development, as is the case with most residential developments.

While there would be expected to be an increase in traffic volumes along the L2014, given the scale of the development, any associated increase in noise levels will be negligible (no more than 0.5dB). It is also worth noting that noise from vehicular movements along the N7 will be more dominant in level than noise from the L2014.

The construction phase of the development will generate noise & vibration, which may impact nearby noise-sensitive locations. However, we note that such impacts are temporary. We refer to the following standards, which the construction contractor will be expected to follow.

- BS 5228-1:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites - Noise
- BS 5228-2:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites - Vibration