



6070

External Noise Impact Analysis

TRAFFIC NOISE IMPACT ASSESSMENT

The Green Quarter

Proposed Strategic Housing Development

Cartrontroy,
Kilnafaddoge
Lissywollen and
Ardnaglug (townlands),
Athlone
Co. Westmeath

Avenir Homes Limited

DKP-M79-6070-2P
2021-12-04

Document control

DKP project no: M79
 DKP document no: 6070
 Project file no: DKP-M79-6070

Circular	Issue >	1P	2P
Clients	Avenir Homes Ltd	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Architects	Henry J Lyons	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Planning consultants	HW Planning	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Landscape architects	Forestbird	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Issue	1P#	2021-07-27	Draft issue, for review
Issue	2P	2021-07-27	Planning issue

Document issue status ID

Sketch/draft
 P Planning
 C Concept
 D Design
 G General information
 T Tender
 W Works/construction
 Z As-build/constructed

Issue	Prepared	Checked	Approved
1	201	208	208
2	208	202	201

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1 Introduction

1.1 Report purpose

This report details the effects of existing back ground noise on the perceived noise levels within the habitable rooms of the new proposed development. These impacts and final predicted noise levels within the relevant habitable rooms are compared against recommendations set out in the relevant standards to establish if any particular mitigation actions are required or not.

1.2 Instruction

DKPartnership (DKP) have been commissioned by Avenir Homes Limited to carry out the analysis and report for the proposed development at Cartronroy, Kilnafaddoge, Lissywollen and Ardnaglug (townlands), Athlone, Co. Westmeath.

1.3 Development description

Avenir Homes Limited. intend to apply to An Bord Pleanála for permission for a strategic housing development at Cartronroy, Kilnafaddoge, Lissywollen and Ardnaglug (townlands), Athlone, Co. Westmeath. The development will consist of:

The construction of a mixed use residential development of 122 no. residential units with ancillary creche, 46 no. student apartments consisting of 283 bed spaces, and all associated site development works. The proposed development makes provision for 60 no. dwelling houses comprising 38 no. 2-storey 3-bed townhouses, 7 no. 2-storey 4-bed townhouses, 7 no. 3-storey 4-bed townhouses, 6 no. 2 storey 4-bed semi-detached and 2 no. 2 storey 4-bed detached. The proposed development includes 62 no. apartments / duplexes to be provided as follows: Block R1 containing 38 no. apartments (16 no. 1 bed units and 22 no. 2 bed units) in a 3-6 storey building, and Block R2 containing 20 no. duplex units (10 no. 2 bed units and 10 no. 3 bed units) over 4 storeys with 4 no. apartments (4 no. 2 bed units) in one 5th storey feature area. The proposed student accommodation makes provision for 283 no. bed spaces in 3 no. blocks to be provided as follows: Block S1 containing 18 apartments with 117 bed spaces over 5-6 storeys, Block S2 containing 16 apartments with 107 bed spaces over 6-7 storeys, and Block S3 containing 12 apartments with 59 bed spaces over 4-5 storeys.

The proposed development will provide for two new vehicular accesses as well as pedestrian entrances onto Lissywollen Avenue east-west access road (as permitted under An Bord Pleanála Reference ABP-309513-21). Minor modifications to ABP-309513-21 are proposed to cater for these access points, alterations to cycle/pedestrian paths, the removal of a central island to facilitate the south-eastern entrance, and provision of bus stop infrastructure. Ancillary site works include public and communal open spaces, hard and soft landscaping, pedestrian / cycleways, car parking, cycle parking, bin storage, public lighting, solar panels, ESB substation and supporting distribution kiosks, and all other ancillary works above and below ground. The proposal includes pedestrian and cycle linkages onto the Old Rail Trail Greenway to the south and Blackberry Lane (L40061) to the west.

In addition to the above specified works within the red-line boundary, Westmeath County Council are facilitating some offsite works to support the project for which the applicant has confirmed written consent. These include:

Resurfacing Blackberry lane along the western extent of the site. A special development contribution has been agreed with the applicant for such purposes.

Facilitating works to complete connections to the Old Rail Trail Greenway, including

Completion of pedestrian/cycle path between Blocks R1 and S1 to the surfaced area of the greenway to the south, and;

Replacement of existing gated access between the greenway and Blackberry Lane (southwest of the site) with a revised arrangement with dedicated cycle/pedestrian access. Final works to be agreed with Westmeath County Council.

2 Executive summary

2.1 Analysis conducted

This report details the effects of any noise impacts of the existing back ground noise levels on the new development and in particular the habitable rooms in residential units and dedicated amenity spaces within the proposed development using the survey data from noise measurements and EPA noise mapping taken of the relevant area and compares these with the maximum recommended noise data for residential units published by the world health organisation, CIBE guides, BS8233 and the EPA (Ireland).

2.2 Standards and regulations overview

The following guideline/standards have been applied and used for information:

The European Environmental Noise Regulations 2018 (S.I. No. 549), the National Planning Framework 2040, the British Standard BS 8233, the World health Organisation (WHO) and the EPA NG4 guide.

2.3 Methodology

It was established that any noise exposure in the proposed development was to be from traffic facing the N6 to the North and the R916 to the East. To the South and West there are residential estates either existing or planned and any noise from these was not assumed to be of any significance or would cause rise to noise nuisance. To establish if a development is not exposed to unduly expected noise levels we use the combined guide lines / standards of the WHO/CIBSE/BS8233/EPA stipulating maximum noise levels both externally for amenity spaces and internally for habitable rooms. To do this we have selected a representative number of residential units and amenity spaces and calculated the predicted internal ambient noise levels and external noise levels in the dedicated amenity spaces using the available round 3 EPA noise maps and noise survey data and compare the resultant internal and external noise levels with the criterion as set out under the . WHO/CIBSE/BS8233/EPA guide lines and stands.

2.4 Calculated noise levels at the facades

Table 5.3 details the calculated noise levels of the selected residential units and amenity spaces with the low and high noise data summarised in the table below. We note that only the most Northern units (closest to the N6) are subject to the higher noise levels. The main exposure is from the traffic of the N6 to the North and to a lesser degree the R916 to the East. We further note that the receiving facades environment of all houses & student apartments for the majority fall under category A in the Noise impact assessment criterion table 4.1 where it notes the noise impact need not to be considered except for the most Northern units who fall under category B where the noise impact only needs to be considered.

Summarised minimum – maximum noise levels at facades results ;

Unit ID	7.00-23.00 L _{den} / L _{Aeq16}	23.00-7.00 L _{night} / L _{Aeq8}	
Minimum-Maximum all units	51 – 63 dB	41 – 55 dB	

From table 5.3 low/high summary.

Relevant data from noise criterion data BS 8233 ;

Category	7.00-23.00 L _{den} / L _{Aeq16}	23.00-7.00 L _{night} / L _{Aeq8}	Assessment / Action.
Cat "A"	<= 55 dB	<= 45 dB	Noise need not to be considered
Cat "B"	55 – 66 dB	45 – 59 dB	Noise impact need to be considered

2.5 Predicted noise levels in habitable rooms

Using the calculated noise levels at the relevant facades (table 5.3) the internal ambient noise levels are predicted by subtracting the noise reduction capability of the facades from the external noise levels with the results of the selected residential units detailed in table 5.5 and the low / high results summarised in the table below. Modern air tight construction methods achieve high air tightness standards and therefore generally a high noise level reduction capability. Table 5.4 gives details of noise reduction capabilities of modern facades and using a conservative 30 dB reduction capability the resultant internal ambient room noise levels under the WHO/CIBSE/BS8233 guidelines (table 4.2) for both the day time and night time exposure are categorised as “Very Good to “Good”. .

Summarised minimum – maximum predicted internal ambient noise levels results ;

Unit ID	7.00–23.00 L _{den} / LAEQ16	23.00–7.00 L _{night} / LAEQ8	
Minimum-Maximum all units	22 – 33 dB	16 – 26 dB	

From table 5.5 low/high summary.

WHO/BS8233 Internal ambient noise level categories ;

Room type	Very Good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room (night time)	25	30	35	40
Living room (day time)	30	35	40	45

From table 4.2 WHO/BS8233 Internal ambient noise level categories.

2.6 Conclusion

The proposed development site is subject to traffic noise from the N6 to the North and to a slightly lesser degree the R916 to the East. The final resultant external noise exposure at the facades and internal ambient predicted noise levels (table 5.3 and 5.5) however are all comfortably within the maximum guide lines of the WHO/CIBSE/BS8233 and indeed the relevant internal ambient day time and night time noise levels according to the WHO category table 4.2 is deemed to be “Very Good / Good”. We further note that the receiving facades environment of all houses & student apartments for the majority fall under category A in the Noise impact assessment criterion table 4.1 except for the most northern units and although this would be acceptable in a country / suburban environment we recommend that some noise impact measures ought to be considered as outlined in section 5.8 to ensure the internal ambient noise levels to be “very good / Good”. For the amenity spaces when comparing the resultant calculated noise exposure without any noise reduction measures only the most northern (closest to the N6) amenity space 10 is marginally outside the EPA NG4 recommendations but by introducing dense vegetation barriers this is improved upon to the extent that all amenity space fall within the maximum recommended guidelines of the WHO/CIBSE/BS8233/EPA. We, DKP, based on the above mentioned data are therefore of the opinion that the noise exposure both internally within the residential units and student apartment block and externally in the dedicated amenity spaces are within the guidelines as set out under the WHO/CIBSE/BS8233/EPA and conclude that substantial compliance has been achieved under these relevant guides and standards.

2.7 Recommendations and / or mitigation measures

As noted in item 2.6 whereas the calculated noise internal levels are all within the “Very good / Good” internal ambient noise level standards we would recommend to ensure this high standard is achieved that facades of the houses above the centre line of the proposed development facing a direct line to the N6 should have a noise reduction capability of > 30-35dB and that any openings in the façade i.e. ventilation grills, should have a noise reduction capability of >=36dB and where possible placed in a facade not directly facing the N6.

3 Geographical overview

3.1 Project overview

Image 3.1, the (google maps) site map below is a basic overview of the site with proposed development approximately outlined in the area site map.



Image 3.1 Approximate proposed development site

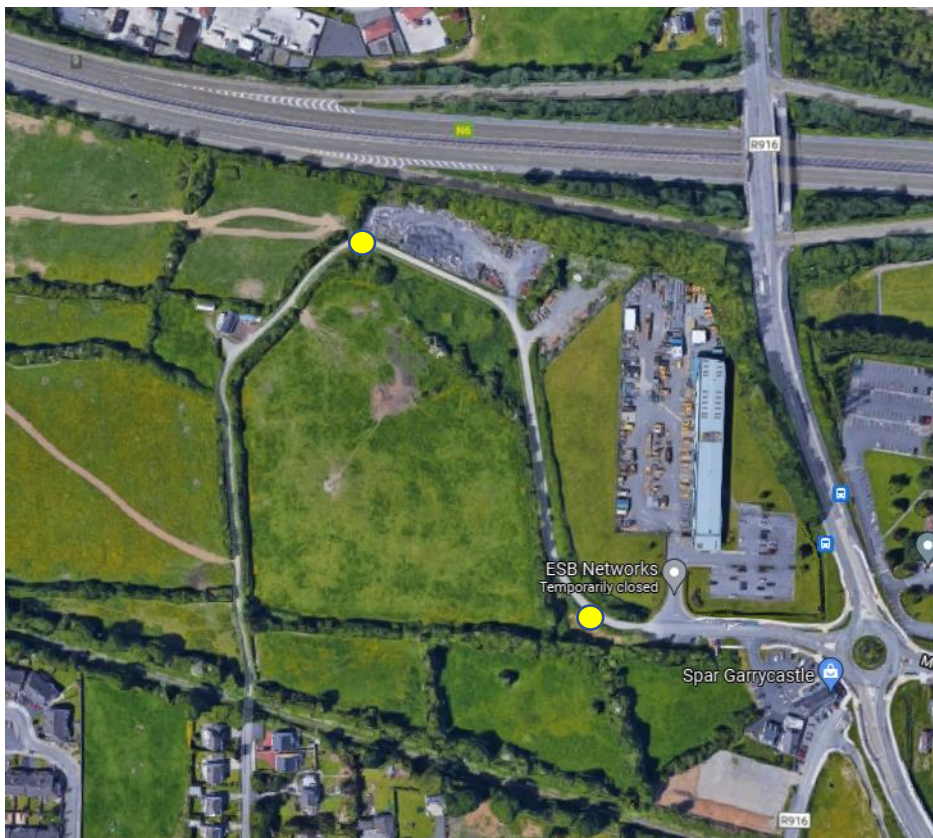
4 Approach and methodology

4.1 Methodology applied

The new development faces the N6 to the North, the R916 to the East and residential unit to the South. To the West is a proposed residential development recently awarded planning. Any noise from the residential units (South and West) is not assumed to be of any significance or would cause rise to noise nuisance hence the only possible noise nuisance generated which may effect the new proposed development is most likely the traffic noise on the N6. Traffic noise from the R916 is more then likely not an issue given the distance from the new proposed development to the R916 (approx. 100m as the crow flies). To calculate the predicted noise levels at the facades and ambient (internal) noise level within the habitable rooms of the houses facing the noise source we need to establish the background noise outside the facades of the buildings. Once established we calculate the noise reduction over the external façade construction and the final internal room noise level. This is then compared with the CIBSE/WHO/BSEN8233 maximum recommended Noise Criteria (NC) for habitable rooms detailing the NC requirements for different environments.

4.2 Noise level survey

Based on the above assumptions the N6 and R916 traffic noise is to be assessed for impacts on the new development using actual survey data of the existing back ground noise levels by means of a 24 hour (16hour + 8hour) local monitoring survey on Friday November 12th 2021 and the data provided by the EPA noise maps. The survey point location is +/- 2m from the edge of the road in both locations.



● Approximate location survey point.

Image 4.1 Noise survey point locations.

4.3 Irelands noise framework

Environmental noise is unwanted sound arising from all areas of human activity such as noise from transport (road, rail, air traffic) as well as from industrial activities. The EPA is the national authority for overseeing the implementation of the Regulations. This role includes noise mapping and action planning for the purpose of the Directive. The EPA has made available the strategic noise mapping of agglomeration, major airports, major roads and major rail networks, in the form of noise contours for the L_{den} (day, evening, night) and L_{night} (night) periods. A noise map is a graphical representation of the predicted situation with regards to noise in a particular area with different colours representing different noise levels in decibels dB(A). All noise maps are presented in terms of two noise indicators: L_{den} and L_{night} .

- L_{den} is the day-evening-night noise indicator and it represents the noise indicator for overall annoyance. It is 'weighted' to account for extra annoyance in the evening and night periods. The Environmental Noise Directive defines an L_{den} threshold of 55 dB for reporting on the numbers of people exposed.
- L_{night} is the night time noise indicator and is used in the assessment of sleep disturbance. An L_{night} threshold of 50 dB is defined for reporting on the numbers of people exposed. These indicators are based on year long averages of the day (07:00-19:00), evening (19:00-23:00) and night (23:00-07:00) time periods.

4.4 Legislation and guidelines

The following guideline / standards have been applied:

- National Planning Framework 2040. Document sets out the Government's planning policies for Ireland and how these are expected to be applied. the aim is to prevent both new and existing development from contributing to or being put at unacceptable risk from or being adversely affected by unacceptable levels of noise pollution
- European Environmental Noise Regulations 2018 (S.I. No. 549). (Environmental Noise Regulations 2006).
- British Standard BS 8233 Sound insulation and noise reduction for buildings. BS 8233 contains guidance on the minimum recommended levels of noise reduction from external sources and general guidance on maximum habitable room noise standards.
- British Standard BS 4142:1997 'Method for Rating industrial noise affecting mixed residential and industrial areas'. To be used for assessing the effect of noise of an industrial nature, including mechanical services plant noise.
- World health Organisation(WHO). Published External Environmental Noise Guidelines for the European Region which sets out how noise pollution in towns and cities is increasing, and that excessive noise particularly from transport sources is a health risk. To be used for assessing the effect of noise of an industrial nature, including mechanical services plant noise.
- British Standard 7445-1. Defines parameters, procedures and instrumentation for noise measurement and analysis.
- BS 5228-2 'Code of practice for noise and vibration control on construction and open sites. provides comparable 'best practice' for vibration control, including guidance on the human response to vibration and building damage.
- World health Organisation(WHO). Published External Environmental Noise Guidelines for the European Region which sets out how noise pollution in towns and cities is increasing, and that excessive noise particularly from transport sources could be a health risk.
- EPA NG4. Noise limits in external dedicated amenity space in NG4 are based on the principle that an NSL "for its proper enjoyment requires the absence of noise at nuisance levels". The EPA sets a daytime limit of 55 dB(A), reducing to 50 dB(A) in the evening and 45 dB(A) at night.

4.5 Noise criterion at the facades of residential receptors

The table below shows the different noise categories as published by BS 8233 in residential area's for the day time and night time periods with the relevant assessment criterion.

Category	7.00-23.00 L_{den} / L_{Aeq16}	23.00-7.00 L_{night} / L_{Aeq8}	Assessment / Action.
Cat "A"	<= 55 dB	<= 45 dB	Noise need not to be considered
Cat "B"	55 – 66 dB	45 – 59 dB	Noise impact need to be considered
Cat "C"	66 – 72 dB	59 – 66 dB	Noise impact mitigation need to be considered
Cat "D"	> 72 dB	> 66 dB	Unless quieter sites are not available residential use should not be considered

Table 4.1

4.6 Maximum recommended room noise level guidelines

The table below shows the maximum recommended noise levels for residential dwellings as published by BS8233, CIBSE and the world Health Organisation for habitable rooms in different environments as illustrated below;

Room type	Very Good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room	25	30	35	40
Living room	30	35	40	45

Table 4.2

4.7 Recommended day & night time amenity space noise.

EPA NG4 guidelines. Amenity spaces.

External space	Day time	Evening time	Night time
Amenity space	55	50	45

Table 4.3

4.8 Predicted noise nuisance complaints

The table below shows the predicted level of compliant for residential dwellings as a result of exceeding the particular sound level. This table is an appraisal in terms of both the margin of excess above the measured back ground noise and existing sound environment which may already have a high ambient or residual sound level. It is also noted that not all differences or impacts lead to complaints and that not every complaint is proof of an adverse impact.

Level over the back ground noise	Compliant indication
10 dB or more	Likely to cause noise nuisance complaints
5 dB	May give rise to some extend of noise nuisance complaints
0 dB	Unlikely to give rise to noise nuisance complaints

Table 4.4

4.9 Noise measurement

The noise survey measurements have been performed using a Bruel & Kjaer Type 2260 sound level meter and Bruel & Kjaer 4231 sound level calibrator.

5 Development noise exposure assessment

5.1 EPA data

Below are the EPA generated traffic noise maps for the day time (L_{den}) and night time (L_{night}) period we have downloaded as a double check on the survey results.

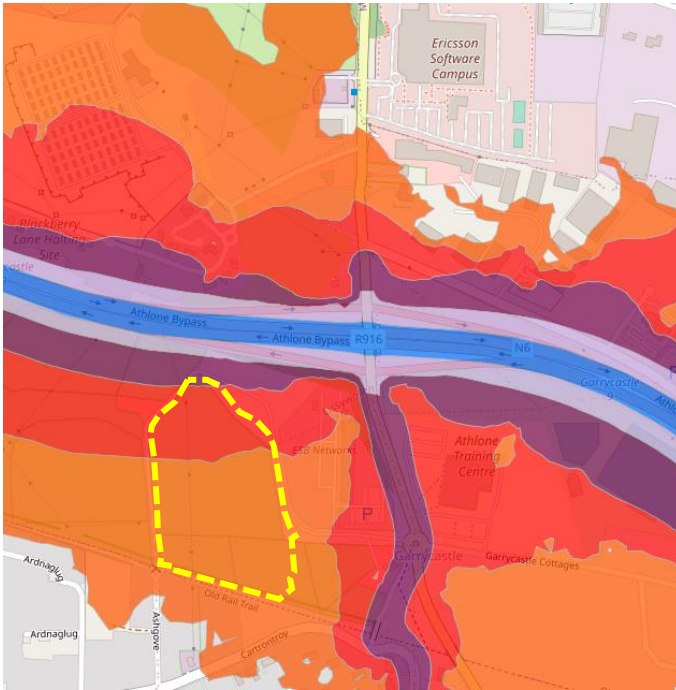


Image 5.1 EPA noise map Lissywollen area day time.

EPA Day time (L_{den}) noise data map.

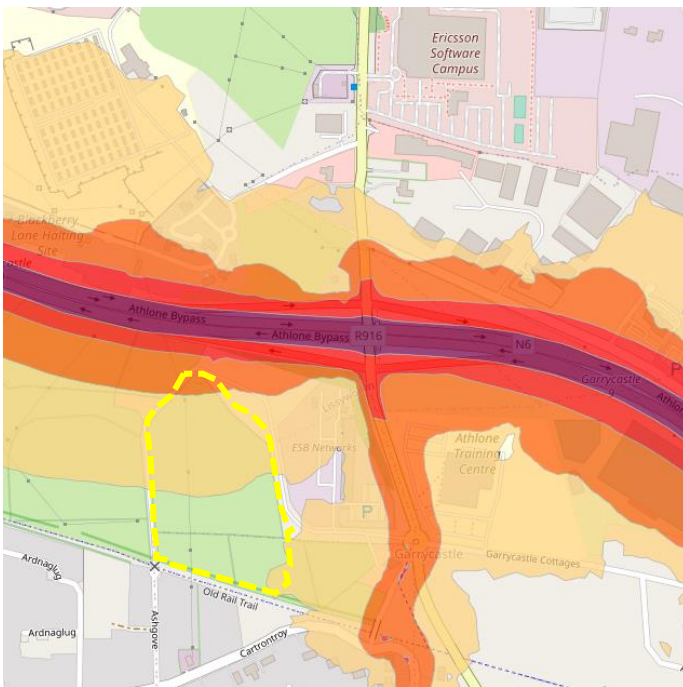
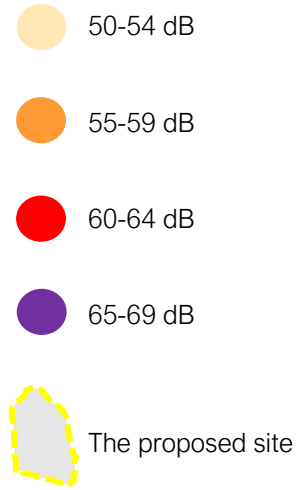


Image 5.2 EPA noise map Lissywollen area night time.

EPA Night time (L_{night}) noise data map.

5.2 Survey results

The table below details the summarised noise survey data from the noise survey location covering the high and maximum sound exposure and average equivalent weighted noise levels for day and night on Friday November 12th 2021. We note that high and maximum sound exposure data is only given for general information as this relates to a single (short time) event which is averaged as part overall weighted equivalent noise levels.

Survey results ;

Location	Single sound exposure	Maximum noise level	Day noise indicator	Night noise indicator
Survey point A (N6)	92 dB(A)	76 dB(A)	63 dB(L _{AEQ16})	56 dB(L _{AEQ16})
Survey point B (R916)	84 dB(A)	74 dB(A)	56 dB(L _{AEQ16})	50 dB(L _{AEQ16})

Table 5.1

5.3 Receiving environment

For the purpose of this exercise we will assess the noise levels on the selected units having a direct line to the noise source, i.e a direct line without any obstacles (other dwelling/blocks).



The new development faces the N6 to the North and the R916 to the East.

Image 5.3 Selected receptor locations.

The table below details the relevant receptor distance to source data;

Receptor	Distance to source	Source
Dwelling 01 (most Northern)	68m	N6
Dwelling 02	77m	N6
Dwelling 03	108m	N6
Dwelling 04	147m	N6
Dwelling 05	122m	N6
Dwelling 06	145m / 217m	N6 / R916
Dwelling 07	121m / 164m	N6 / R916
Student apartment 08	164m	R916
Student apartment 09	169m	R916
Amenity space 10	92m	N6
Amenity space 11	156m	N6
Amenity space 12	249m	R916
Amenity space 13	192m	R916
Amenity spaces (gardens) 14	178m	N6

Table 5.2 Receptor location data.

5.4 Receptor façade noise exposure

To determine any possible action from the predicted internal (ambient) noise levels we first of all need to establish the external noise exposure at the relevant receptor facades. We had previously established that any noise exposure in the new proposed development was predominantly traffic noise from the N6 and to a lesser extent the R916. The facades of the receptors of the new proposed development are all a certain distance away from their relevant noise source which would result in a noise reduction calculated at " $L_r = L_w \cdot 20\log_{10} \cdot \text{distance m} - 10.9$ " which assessing this in a direct line without any obstacles. For comparison we have also taken in account the EPA data to arrive at reasonable accurate final predicted noise levels at the relevant facades. The table below details the final predicted & calculated noise levels at the relevant facades.

Noise levels at relevant facades ;

Location	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}
Dwelling 01 (most Northern)	63 dB	55 dB
Dwelling 02	61 dB	52 dB
Dwelling 03	59 dB	51 dB
Dwelling 04	56 dB	49 dB
Dwelling 05	58 dB	50 dB
Dwelling 06	56 dB	49 dB
Dwelling 07	58 dB	50 dB
Student apartment 08	52 dB	46 dB
Student apartment 09	52 dB	46 dB
Amenity space 10	60 dB	50 dB (44-45 dB)
Amenity space 11	56 dB	45 dB (43-44 dB)
Amenity space 12	51 dB	41 dB
Amenity space 13	53 dB	43 dB
Amenity space 14	52 dB	42 dB (40-41 dB)

Table 5.3 Receptor external façade noise exposure data.

(xx dB) Noise levels with 2.5m tall dense evergreen vegetation boundary to North boundary)

5.5 Predicted internal ambient noise levels

To finally establish the noise impact we need to calculate the internal ambient noise levels in the living/dining rooms (day time) and bed rooms (night time). The internal ambient noise levels are predicted by subtracting the noise reduction capability of the dwelling façade from the calculated external noise level at the relevant façade. The new proposed development will be of modern construction and as part of the new building regulations and in particular the requirement to have a high level airtightness standard (Part L) which will consequently give the construction a relative high noise reduction capability. For this report we have applied conservative “standard” noise reduction capabilities.

Noise reduction capability of a modern façade ;

	Solid external walls	Glazing	Façade average
Noise reduction capability good	> 55 dB	34 dB	35 dB
Noise reduction capability standard	> 50 dB	29 dB	30 dB
Noise reduction capability low	> 45 dB	24 dB	25 dB

< Applied for assessment

Table 5.4

We note these noise reduction capabilities are conservative figures and the final façade noise reduction capability is more than likely to be higher than represented in the table above.

Receptor internal noise levels using a 30 dB noise reduction capability ;

Location	7.00-23.00 L _{den} / L _{AEQ16}	23.00-7.00 L _{night} / L _{AEQ8}
Dwelling 01 (most Northern)	33 dB	25 dB
Dwelling 02	31 dB	22 dB
Dwelling 03	29 dB	21 dB
Dwelling 04	26 dB	19 dB
Dwelling 05	28 dB	20 dB
Dwelling 06	26 dB	19 dB
Dwelling 07	28 dB	20 dB
Student apartment 08	22 dB	16 dB
Student apartment 09	22 dB	16 dB

Table 5.5 Receptor internal ambient noise level.

(xx dB) Noise levels with 2.5m tall dense evergreen vegetation boundary to North boundary)

When applying the rather conservative noise reduction capability of the façade of 30 dB (table 5.4) the resultant predicted internal ambient noise levels (table 5.5) when comparing these with the WHO/BS8233/CIBSE recommended maximum day time and night time noise levels (table 4.2) would be classified as Good to Very good and are unlikely to be subject to noise nuisance complaints.

5.6 Calculated noise levels in amenity spaces

The resultant internal ambient room noise levels at the relevant facades in the relevant blocks shown below in table

Location	7.00-23.00 L _{den} / L _{AEQ16}	23.00-7.00 L _{night} / L _{AEQ8}
Amenity space 10	60 dB (54-55 dB)	50 dB (44-45 dB)
Amenity space 11	56 dB (51-52 dB)	45 dB (43-44 dB)
Amenity space 12	51 dB	41 dB
Amenity space 13	53 dB	43 dB
Amenity space 14	52 dB (47-48 dB)	42 dB (40-41 dB)

Table 5.6 Amenity space noise exposure data.

(xx dB) Noise levels with a dense evergreen vegetation boundary to North boundary)

When comparing the resultant calculated noise exposure of the 5 no. selected amenity spaces (table 5.5) with the EPA NG4 guidelines (table 4.3) we note that with direct line exposure (without any obstacles / noise reduction measures) all the amenity spaces are all within the range of acceptance except for amenity space 10 which is marginally over the minimum recommendation. To improve on the noise level exposure for amenity space 10 a dense vegetation barrier was applied to review the calculation results. The noise reduction created by a vegetation barrier is pending its density / solidness and should be made up by dense evergreen trees/vegetation and whereas a solid barrier archives an accurate calculated noise reduction a tree barrier can absorb (reduce) noise levels up to +/- 10dB. Thus by applying the noise reduction formula " $L_r = L_w \cdot 20 \log_{10} \cdot D(m) - 10.9$ " the recalculated noise exposure, where this actually changed, was reduced by a conservative additional 6dB. When we review the noise exposure and compare these again with the EPA NG4 guide (table 4.3) we note that all amenity spaces are now within an acceptable range for both the day time and night time noise exposure.

We note that reducing traffic noise is always most effective at source, i.e at the edge of the N6 however this is an issue which can only be assessed by the National Road Authority. The N6 does have a significant mature green vegetation barrier adjacent to the carriage way which will absorb noise and this has not been taken into account in the noise calculation but would improve the results.

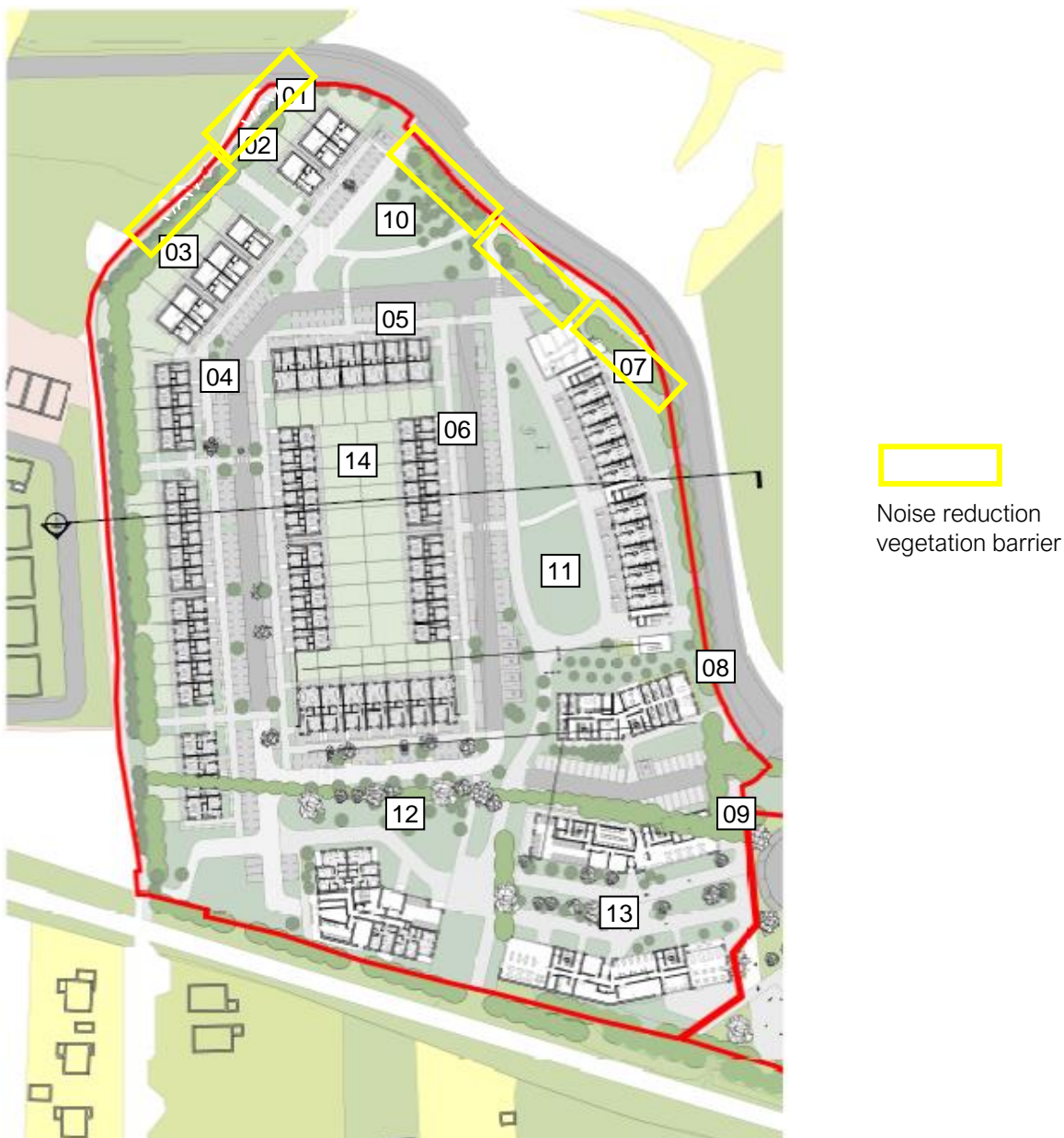


Image 5.4 Highlighted vegetation barriers on the proposed development site.

5.7 Conclusion

The proposed development site is subject to traffic noise from the N6 to the North and to a slightly lesser degree the R916 to the East. The final resultant external noise exposure at the facades and internal ambient predicted noise levels (table 5.3 and 5.5) however are all comfortably within the maximum guide lines of the WHO/CIBSE/BS8233 and indeed the relevant internal ambient day time and night time noise levels according to the WHO category table 4.2 is deemed to be "Very Good / Good". We further note that the receiving facades environment of all houses & student apartments for the majority fall under category A in the Noise impact assessment criterion table 4.1 except for the most northern units and although this would be acceptable in a country / suburban environment we recommend that some noise impact measures ought to be considered as outlined in section 5.8 to ensure the internal ambient noise levels to be "very good / Good". For the amenity spaces when comparing the resultant calculated noise exposure without any noise reduction measures only the most northern (closest to the N6) amenity space 10 is marginally outside the EPA NG4 recommendations but by introducing dense vegetation barriers this is improved upon to the extent that all amenity space fall within the maximum recommended guidelines of the WHO/CIBSE/BS8233/EPA. We, DKP, based on the above mentioned data are therefore of the opinion that the noise exposure both internally within the residential units and student apartment block and externally in the dedicated amenity spaces are within the guidelines as set out under the WHO/CIBSE/BS8233/EPA and conclude that substantial compliance has been achieved under these relevant guides and standards.

5.8 Recommendations and / or mitigation measures

As noted in item 5.7 whereas the calculated noise internal levels are all within the "Very good / Good" internal ambient noise level standards we would recommend to ensure this high standard is achieved that facades of the houses above the centre line of the proposed development facing a direct line to the N6 should have a noise reduction capability of > 30-35dB and that any openings in the façade i.e. ventilation grills, should have a noise reduction capability of >=36dB and where possible placed in a facade not directly facing the N6.