# 10. NOISE AND VIBRATION

## 10.1 Introduction

### 10.1.1 Overview

This chapter describes potential noise and vibration impacts associated with the Proposed Development, as described in Chapter 4. Potential noise and vibration impacts may be divided into the following categories:

- Construction phase noise impacts on surrounding receptors.
- Construction phase vibration impacts on surrounding receptors.
- Operational phase noise impacts on surrounding receptors.
- Operational phase vibration impacts on surrounding receptors.
- Noise impacts within the completed/operational development from external sources ('inward impacts').

Following a preliminary scoping exercise, it was concluded that the Proposed Development will not give rise to any vibration impacts following construction, therefore Operational Phase Vibration Impacts have been scoped out. The remaining four categories are assessed in this chapter.

The 'Proposed Development' considered for the purposes of this EIAR consists of the following, divided across several planning applications:

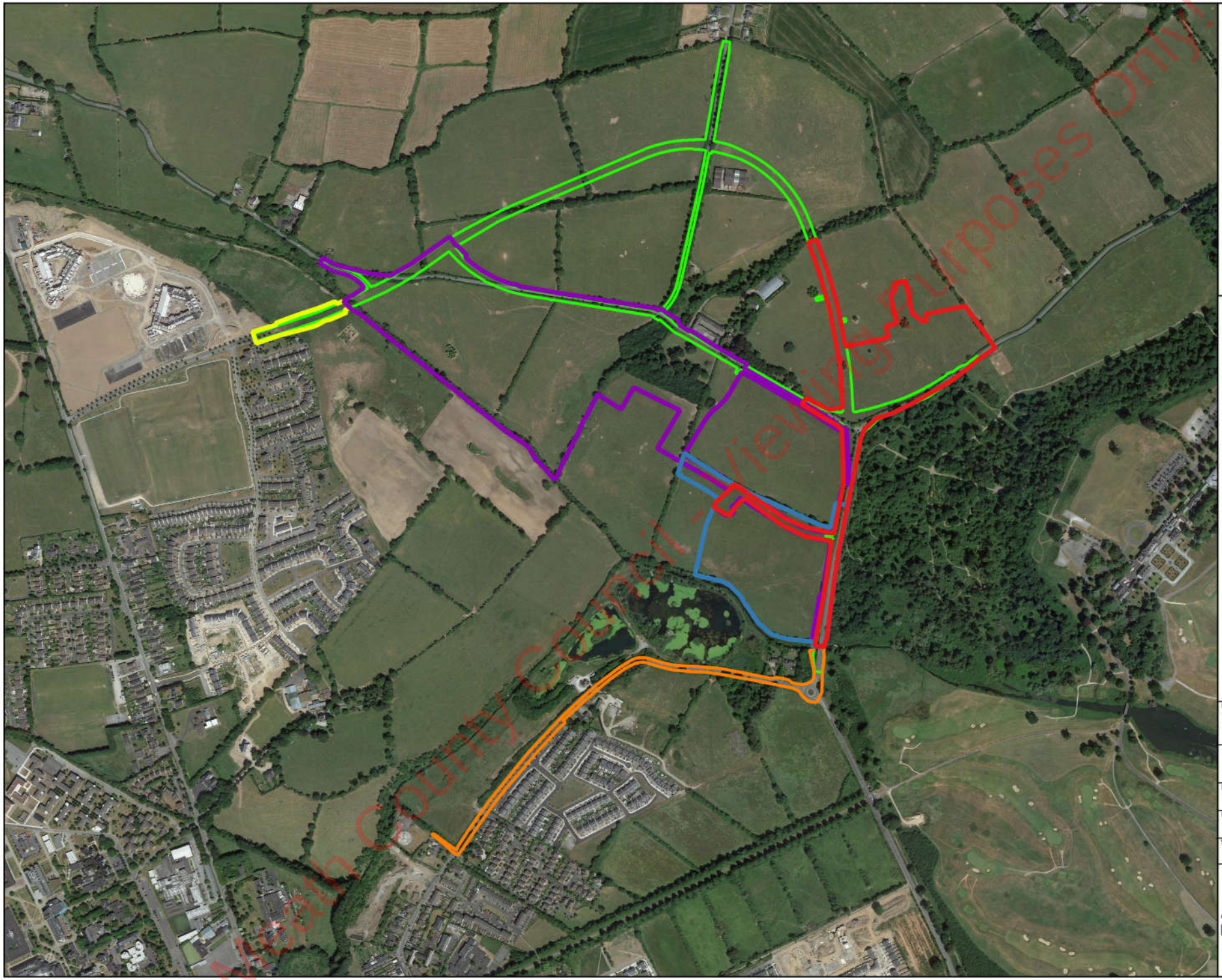
- A Strategic Employment Zone (hereafter referred to as Site A) which consists of three office block buildings, public road widening, and road realignment works along the existing R157 Regional Road and L2214-3 Local Road, the delivery of approximately 365m of new public access road under the Maynooth Outer Orbital Road (MOOR) scheme, internal access road and associated car parking;
- Healthcare Facilities (hereafter referred to as Site B) which includes a nursing home and primary care centre as well public road widening and road realignment works along the existing R157 Regional Road, internal access road and associated car parking, and all associated infrastructure;
- The Strategic Housing Development (hereafter referred to as Site C) will consist of 360 no. residential homes, a creche facility, scout den, public park, internal access roads, approximately 500m of distributor road, approximately 670m of pedestrian and cycle improvements, two pedestrian and cycle bridges over the Blackhall Little and, shared communal and private open space and all associated site development works.
- The Maynooth Outer Orbital Road (hereafter referred to as the MOOR) which consists of approximately 1.7km of distributor road, a single span bridge over the River Rive Water and a single span bridge over the Blackhall Little Stream, pedestrian and cycle improvement measures, a pedestrian and cycle bridge adjacent to the Kildare bridge, upgrade works to an existing road and all associated utilities.
- The Kildare Bridge works (hereafter referred to as Kildare Bridge) planning application includes road upgrade works to the existing R157 Regional Road, a proposed pedestrian / cycle bridge adjacent to the existing Kildare Bridge, as well as a proposed wastewater connection to the Maynooth Municipal Wastewater Pumping Station to the southeast of the Proposed Development in County Kildare.
- The Moyglare Bridge (hereafter referred to as Moyglare Bridge) planning application includes for the provision of an integral single span bridge over the River Rye Water with associated flood plain works and embankments, as well as services and utilities connections.

For the purposes of this EIAR, where the 'Proposed Development' is referred to, this relates to all the project components described in detail in Chapter 4 of this EIAR (and listed above).

A comprehensive masterplan for the entire Moygaddy area has being developed, setting out proposals for buildings, spaces and a movement and land-use strategy. The '**Moygaddy Masterplan'** comprises four main parcels of land, currently intended to be developed as follows:

- **Site A: Strategic Employment Zone**, as per Meath County Development Plan (CDP, 2021-2027) and Maynooth Environs Local Area Plan (LAP, see Section 3 of Scoping Document for further details). Proposed to be developed as an Office / Technology Business Park. The initial planning application in this area will be for 3 No. standalone office buildings, to be submitted to Meath County Council.
- **Site B: Healthcare Facilities**, as per Meath CDP (2021-2027) and Maynooth Environs LAP. It is envisaged that the initial planning application within this area will comprise a Nursing Home and Primary Care Centre, to be submitted to Meath County Council. A separate, future planning application is also envisaged for a new public hospital on an adjoining site to the north in collaboration with the HSE and Slaintecare.
- **Site C: Strategic Housing Development**, as per Meath CDP (2021-2027) and Maynooth Environs LAP. It is intended that a Strategic Housing Development planning application will be submitted to An Bord Pleanála for the first phase of residential development within this area. A creche/childcare facility, scout den, public park and playground will also be included as part of the SHD application.
- **Site D: Tourism / Community /Amenity Use,** as per as per Meath CDP (2021-2027) and Maynooth Environs LAP. It is intended that a hotel, sport and leisure facilities, retail and a cultural heritage centre will be delivered on this site, to be submitted to Meath County Council in the future.
- **(MOOR) Maynooth Outer Orbital Road**, as per Meath CDP (2021-2027) and Maynooth Environs LAP. The MOOR consists of approximately 1.7km of a new distributor road linking the existing R157 Regional Road in the east to the Moyglare Hall road in Mariavilla to the southwest of the Masterplan area. This planning application will be submitted to Meath County Council.

Sites A, B and C and the MOOR are addressed in this EIAR. Site D will be developed at a later date in the future. The EIAR study area for the Proposed Development, in context of the overall Moygaddy Masterplan area is shown in Figure 10-1.



## 10.1.2 Methodology

Typical ambient noise levels across the local area were measured, and these were used to identify appropriate construction phase noise criteria. Likely construction plant were identified, and their noise emissions data used to predict likely noise levels at surrounding receptors. Predicted levels were assessed in the context of identified criteria, and mitigation measures identified where required. Potential sources of vibration during the construction phase were identified, and impacts assessed by reference to commonly applied criteria.

Noise sources associated with the operational phase of the Proposed Development were reviewed, and potential impacts assessed. Such impacts relate chiefly to traffic. An assessment of inward noise impacts was undertaken, and the requirement for enhanced façade treatments was assessed. Although this is typically only relevant to residential developments, it is also of benefit to the healthcare and office settings, particularly given that the proposed nursing home will accommodate elderly persons

The assessment was undertaken having regard to guidance set out in *Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Environmental Protection Agency, 2022)*.

## 10.1.3 Documents consulted

The following documents were consulted during the preparation of this chapter:

- Report RI 8507: Structural Response And Damage Produced By Ground Vibration From Surface Mines Blasting (US Bureau Of Mines, 1980).
- British Standard BS 7385-2:1993 Evaluation And Measurement For Vibration In Buildings – Part 2: Guide To Damage Levels From Groundborne Vibration (1993).
- Guidelines On Community Noise (World Health Organisation, 1999).
- Directive 2002/49/EC Of The European Parliament And Of The Council Relating To The Assessment And Management Of Environmental Noise (2002), Transposed Into Irish Law By The European Communities (Environmental Noise) Regulations 2018 (SI No. 549/2018).
- NANR116: Open/Closed Window Research – Sound Insulation Through Ventilated Domestic Windows (prepared by the Napier University Building Performance Centre for DEFRA, 2007).
- Guidance Note For Noise Action Planning (Environmental Protection Agency, 2009).
- Night Noise Guidelines For Europe (World Health Organisation, 2009).
- Design Manual For Roads And Bridges (UK Highways Agency, 2011).
- Measurement And Assessment Of Groundborne Noise And Vibration (Association Of Noise Consultants (2012).
- Specialist Services Health Technical Memorandum 08-01: Acoustics (UK Department of Health, 2013).
- British Standard BS 4142:2014 Methods For Rating And Assessing Industrial And Commercial Sound (2014).
- British Standard BS 5228-1:2009+A1:2014 Code Of Practice For Noise And Vibration Control On Construction And Open Sites – Part 1: Noise (2014).
- British Standard BS 5228-2:2009+A1:2014 Code Of Practice For Noise And Vibration Control On Construction And Open Sites – Part 2: Vibration (2014).
- British Standard BS 8233:2014 Guidance On Sound Insulation And Noise Reduction For Buildings (2014).
- Good Practice Guidance For The Treatment Of Noise During The Planning Of National Road Schemes (National Roads Authority (Now Transport Infrastructure Ireland), 2014).
- Technical Guidance Document TGD-021-5: Acoustic Performance In New Primary & Post Primary School Buildings (Department of Education & Skills, 2015).

- NG4 Guidance Note For Noise: Licence Applications, Surveys And Assessments In Relation To Scheduled Activities (Environmental Protection Agency, 2016).
- ProPg Planning & Noise: Professional Practice Guidance On Planning & Noise – New Residential Development (Association Of Noise Consultants, Institute Of Acoustics & Chartered Institute Of Environmental Health, 2017).
- Environmental Noise Guidelines For The European Region (World Health Organisation, 2018).
- County Meath Noise Action Plan (Meath County Council, 2019).
- Third Noise Action Plan 2019-2023 (Kildare County Council, 2019).
- Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Environmental Protection Agency, 2022).
- Meath County Development Plan
- Kildare County Development Plan

A baseline noise survey was undertaken in accordance with International Standard ISO 1996-2:2017 *Acoustics – Description, Measurement and Assessment of Environmental Noise, Part 2: Determination of Environmental Noise Levels (2017)*. Predictive modelling was carried out using International Standard ISO 9613-2:1996 *Acoustics: Attenuation of Sound During Propagation Outdoors – Part 2 General Method of Calculation (1996)*.

### 10.1.4 Competence of assessor

The noise and vibration assessment was undertaken by Damian Brosnan of Damian Brosnan Acoustics who has over 20 years' experience in scoping and carrying out such impact assessments. His qualifications are as follows:

- BSc (Honours) 1993 (University College Cork).
- Diploma in Acoustics & Noise Control 2009 (Institute of Acoustics).
- MSc (Distinction) in Applied Acoustics 2015 (University of Derby).
- Member of Institute of Acoustics (MIOA) & secretary of Irish branch.
- Founding member of Association of Acoustic Consultants of Ireland (AACI).
- Member of Engineers Ireland (MIEI).
- Lead author of Environmental Noise Guidance For Local Authority Planning & Enforcement Departments (AACI, 2019).
- 1996-2001: Noise Officer with Cork County Council.
- 2001-2014: Partner with Dixon Brosnan Environmental Consultants, specialising in EIA.
- 2015–: Principal at Damian Brosnan Acoustics.

### 10.1.5 Difficulties in compiling information

No difficulties were encountered in preparing this chapter.

## 10.2 Guidance and criteria

### 10.2.1 Construction phase noise

There are no national mandatory noise limits relating to the construction phases of projects. In granting planning permission, a local authority may stipulate construction phase noise limits applicable to daytime, evening, night-time and weekend hours as appropriate. There are no national guidelines available regarding the selection of such limits. Many local authorities chose to apply a 65 dB $L_{Aeq\ T}$ limit.

The chief noise guidance document applied in Ireland and the UK in construction phase noise assessments is British Standard BS 5228:2009+A1:2014 *Code Of Practice For Noise And Vibration*

*Control On Construction And Open Sites Part 1: Noise (2014)*[1]. Annex E of the document sets out several methods to draw up suitable noise criteria applicable to the construction phase of a project. The most appropriate method here is the 'ABC method', which provides for the selection of criteria based on existing ambient noise data. On the basis of noise data recorded locally, as discussed below, a daytime $L_{Aeq\ 1\ h}$ criterion of 65 dB is identified. This criterion is identical to that typically applied by local authorities and is thus applied in this assessment. The $L_{Aeq\ 1\ h}$ parameter describes the total noise emissions from all construction sources occurring during any 1 h period, averaged over that hour.

BS 5228:2009+A1:2014 states that the 65 dB criterion is applicable to the periods Monday-Friday 0700-1900 h and Saturday 0700-1300 h. Construction operations will not be undertaken during evening or night-time hours, or on Sundays or Bank holidays. This assessment therefore applies the 65 dB criterion in respect of all construction works.

The 65 dB criterion is considered applicable to surrounding receptors, in their immediate curtilage. In this regard, the Environmental Protection Agency (EPA) document *NG4 Guidance Note For Noise: Licence Applications, Surveys And Assessments In Relation To Scheduled Activities (2016)*[2] defines a noise sensitive locations as:

> *'Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.'*

As construction projects tend to be relatively short, and as construction works areas are usually localised and mobile, the 65 dB limit is usually not subject to any additional criteria such as tone and impulse restrictions.

With respect to construction of the proposed Maynooth Outer Orbital Road (MOOR), reference may be made to *The Good Practice Guidance for The Treatment Of Noise During The Planning Of National Road Schemes (National Roads Authority, now Transport Infrastructure Ireland, 2014)*[3]. This document recommends an $L_{Aeq\ 1\ h}$ limit of 70 dB at receptors, and a $L_{ASmax}$ limit of 80 dB with respect to short term events.

### 10.2.2 Construction Phase Vibration

As with noise, there are no national limits relating to ground borne vibration, and reference is usually made to guidance set out in British Standard BS 5228-2:2009+A1:2014 *Code Of Practice For Noise And Vibration Control On Construction And Open Sites – Part 2: Vibration (2014)*.[4] Table 10-1 presents guidance included in the document with respect to human perception of peak particle velocity (PPV), the most commonly applied descriptor of ground borne vibration.



[1] *Code Of Practice For Noise And Vibration Control On Construction And Open Sites Part 1: Noise (2014)*[1].
[2] *NG4 Guidance Note For Noise: Licence Applications, Surveys And Assessments In Relation To Scheduled Activities (2016)*
[3] *The Good Practice Guidance for The Treatment Of Noise During The Planning Of National Road Schemes (National Roads Authority, now Transport Infrastructure Ireland, 2014)*
[4] *Code Of Practice For Noise And Vibration Control On Construction And Open Sites – Part 2: Vibration (2014)*

*Table 10-1 Human perception of vibration, from BS 5228-2:2009+A1:2014*

| PPV | Effect |
|---|---|
| 0.14 mm/s | Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration. |
| 0.3 mm/s | Vibration might be just perceptible in residential environments. |
| 1.0 mm/s | It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents. |
| 10.0 mm/s | Vibration is likely to be intolerable for any more than a very brief exposure to this level. |

During construction projects, reference is usually made to criteria relevant to buildings, in order to avoid potential cosmetic or structural damage. The National Roads Authority document identified above has seen increasing application to non-road projects due to the absence of any other Irish guidance. National Transport Authority criteria, listed in Table 10-2, are informed by documents such as British Standard BS 7385-2:1993 *Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Ground borne Vibration (1993)*.[5] The criteria apply to the closest part of any relevant building or structure.

*Table 10-2 Building vibration criteria, from the National Roads Authority (2014)*

| Frequency | <10 Hz | 10-50 Hz | >50 Hz |
|---|---|---|---|
| PPV | 8 mm/s | 12.5 mm/s | 20 mm/s |

Limits set out above are considerably lower than criteria presented in Table 10-3. The criteria presented are those below which cosmetic damage (hairline cracking, etc.) to buildings is unlikely to occur. Limits relating to structural damage are significantly higher.

*Table 10-3 Recommended vibration limits*

| Structure | Lower frequencies | Higher frequencies | Source |
|---|---|---|---|
| Modern dwellings | <40 Hz: 19 mm/s | >40 Hz: 51 mm/s | 1 |
| Older dwellings | <40 Hz: 12.7 mm/s | >40 Hz: 51 mm/s | 1 |
| Industrial & heavy commercial | 4-15 Hz: 50 mm/s | >15 Hz: 50 mm/s | 2&3 |
| Residential & light commercial | 4-15 Hz: 15-20 mm/s | >15 Hz: 20-50 mm/s | 2&3 |



[5] *Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Ground borne Vibration (1993)*

## 10.2.3 Operational Phase Noise

### 10.2.3.1 General

There are no national mandatory noise limits applicable to operational developments. Two elements of the commissioned development may give rise to noise emissions (outside of those associated with external residential activities such as children playing and grass cutting): specifically the proposed non-residential elements (termed 'commercial' for the purposes of this assessment), and traffic. These are typically assessed differently.

### 10.2.3.2 Traffic Emissions

Local offsite receptors are currently subject to existing traffic noise levels on the surrounding road network. The Proposed Development will increase traffic volumes locally, with a consequent increase in traffic noise levels. *The Design Manual for Roads and Bridges (UK Highway Agency, 2011)* notes that the resulting noise impact is linked to the magnitude of the noise increase. Table 10-4 sets out the DMRB guidance. Included in the table are impact categories listed by the EPA in their 2022 document *Guidelines on The Information to be Contained in Environmental Impact Assessment Reports.*

*Table 10-4 DMRB assessment guidance*

| Noise level increase | Subjective reaction | DMRB impact | EPA impact |
|---|---|---|---|
| 0 dB | None | No change | Neutral |
| 0-3 dB | Imperceptible | Negligible | Imperceptible to not significant |
| 3-5 dB | Perceptible | Minor | Not significant to slight |
| 5-10 dB | Up to a doubling of loudness | Moderate | Slight to moderate |
| >10 dB | Doubling of loudness or greater | Major | Significant to profound |

### 10.2.3.3 Commercial Emissions

Most environmental noise guidance documents issued across Europe ultimately derive limits from guidance issued by the World Health Organisation (WHO). The WHO document *Guidelines on Community Noise (1999)* sets out guideline values considered necessary to protect communities from environmental noise. With respect to residential settings, the document notes that an outdoor $L_{Aeq\ 16\ h}$ level of 55 dB is an indicator of serious annoyance during daytime and evening hours, with 50 dB being an indicator of moderate annoyance. The 55 dB criterion was first suggested by the WHO in their 1980 document Environmental Health Criteria 12.

Since 1980, the 55 dB criterion has become the *de facto* daytime limit applied by most Irish regulatory authorities to commercial and industrial operators. Although the WHO criterion applies to daytime periods of 16 hours, authorities typically specify shorter periods, and thus limits as $L_{Aeq\ 15\ min}$, $L_{Aeq\ 30\ min}$ and $L_{Aeq\ 1\ h}$ are variously applied. In issuing licences to industrial facilities, the EPA typically specifies a daytime $L_{Aeq\ T}$ limit of 55 dB at receptors. The EPA currently considers daytime to refer to 0700-1900 h. A similar daytime limit is usually included in noise conditions attached to planning permission issued by local authorities.

The WHO's 1999 guidance document recommends an external night-time criterion of 45 dB to prevent sleep disturbance. Although the WHO document Night Noise Guidelines For Europe (2009) makes reference to a 40 dB night-time criterion, this relates to the $L_{night,outside}$ parameter, which is the long term average measured throughout a whole year. The 45 dB criterion is considered more appropriate to short term measurement intervals. As before, $L_{Aeq\ 15\ min}$, $L_{Aeq\ 30\ min}$ and $L_{Aeq\ 1\ h}$ intervals are variously applied by regulatory authorities, rather than the 8-hour period to which the WHO's 45 dB criterion applies. The EPA considers that night-time refers to 2300-0700 h.

Neither of the WHO documents identified above makes reference to evening periods, and indeed their 1999 document assumes that daytime extends to 2300 h. However, a trend towards the separate assessment of evening impacts is currently evident, partly driven by EPA document *NG4 Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (2016)*. The original 2012 version of the document introduced the evening period 1900-2300 h. The NG4 document recommends an evening criterion of 50 dB, applicable externally at receptors.

Many authorities require that a penalty be added to measured noise levels where emissions are tonal and/or impulsive. NG4 specifies the addition of a 5 dB penalty to site specific $L_{Aeq\ T}$ levels measured during daytime or evening hours. During night-time hours, the EPA prohibits tones and impulses entirely, stating that such characteristics should not be 'clearly audible or measurable'. With respect to short term impulsive sources, the WHO recommends a night-time $L_{Amax}$ limit of 60 dB outside bedroom windows during night-time hours. No $L_{Amax}$ limit is recommended for daytime periods.

The above criteria, summarised in Table 10-5, are considered relevant to commercial sources at the Proposed Development. A measurement interval of 15 minutes is considered appropriate. Rather than allowing daytime and evening levels to be rated for tonal or impulsive features, the table assumes that such features are avoided at all times. Criteria apply externally at receptors.

*Table 10-5 Noise criteria appropriate to commercial emissions*

| Period | Parameter | Limit |
|---|---|---|
| 0700-1900 h | $L_{Aeq\ 15\ min}$ | 55 dB |
| 1900-2300 h | $L_{Aeq\ 15\ min}$ | 50 dB |
| 2300-0700 h | $L_{Aeq\ 15\ min}$ | 45 dB |
| 2300-0700 h | $L_{AFmax}$ | 60 dB |

The WHO document *Environmental Noise Guidelines for The European Region (2018)* updates their guidance with respect to certain sources. Of relevance here are updated guidelines in relation to traffic. In this regard, the document states:

> *'For average noise exposure, the GDG (Guideline Development Group) strongly recommends reducing noise levels produced by road traffic below 53 decibels (dB) $L_{den}$, as road traffic noise above this level is associated with adverse health effects.*
>
> *For night noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic during night-time below 45 dB $L_{night}$, as night-time road traffic noise above this level is associated with adverse effects on sleep.'*

It is noted that the 53 $L_{den}$ and 45 dB $L_{night}$ criteria recommended in the 2018 document are lower than criteria set out in other documents. In this regard, the 2018 guidelines are considered aspirational, and are likely to form the basis of national and local policy over the next two decades.

In addition to the absolute criteria above, the impact of noise emissions from commercial sources may be assessed by reference to relative criteria. The most commonly applied standard here is British Standard BS 4142:2014 *Methods for Rating and Assessing Industrial and Commercial Sound (2014)*[6] which provides for the comparison of specific $L_{Aeq\ T}$ levels (i.e., noise levels attributable to the source in question) with background levels and provides an indication of impact depending on the difference. Specific levels may be rated to take tonal, impulsive and other characteristics into account. The standard notes that the background noise environment may include existing industrial emissions unrelated to the specific source.

BS 4142:2014 states that a difference between specific and background levels of 10 dB or more is indicative of a significant adverse impact. A difference of 5 dB suggests an adverse impact, with lower differences suggesting reduced impacts. The standard adds that the perception of impact will be increased or reduced depending on local context.

### 10.2.4 Inward Noise Impacts

### 10.2.5 Inward noise

The assessment of inward noise impacts on proposed residential developments is a relatively new feature in the Irish planning system, and no national guidance has been issued to date. In the absence of Irish guidance, assessments are typically undertaken in accordance with UK guidance. Most UK assessments are now carried out using *ProPg Planning & Noise: Professional Practice Guidance On Planning & Noise – New Residential Development* (2017[7]), jointly issued by the Association of Noise Consultants, the Institute of Acoustics and the Chartered Institute of Environmental Health. ProPG provides for good acoustic design through a five step process:

- Stage 1: Initial noise risk assessment of the proposed development site.
- Stage 2 element 1: Demonstrating a good acoustic design process.
- Stage 2 element 2: Observing internal noise level guidelines.
- Stage 2 element 3: Undertaking an external amenity area noise assessment.
- Stage 2 element 4: Consideration of other relevant issues.

Internal noise guidelines recommended by ProPG, drawn from *British Standard BS 8233:2014 Guidance On Sound Insulation And Noise Reduction For Buildings* (2014), are presented in Table 10-6.

*Table 10-6 Recommended internal criteria from BS 8233:2014 and ProPG*

| Activity | Location | 0700-2300 h | 2300-0700 h |
|---|---|---|---|
| Resting | Living room | $L_{Aeq\ 16\ h}$ 35 dB | - |
| Dining | Dining area | $L_{Aeq\ 16\ h}$ 40 dB | - |
| Sleeping or daytime resting | Bedroom | $L_{Aeq\ 16\ h}$ 35 dB | $L_{Aeq\ 8\ h}$ 30 dB |

BS 8233:2014 adds that:

> *'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*

[6] *Methods for Rating and Assessing Industrial and Commercial Sound (2014)*
[7] *ProPg Planning & Noise: Professional Practice Guidance On Planning & Noise – New Residential Development (2017)*

*character and number of events per night. Sporadic noise events could require separate values.'*

ProPG adds further advice here:

*'In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used to that individual noise events to not normally exceed 45 dB $L_{AmaxF}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events.'*

With respect to external amenity areas such as gardens in the curtilage of dwellings, BS 8233:2014 states:

*'For traditional external areas that are used for amenity space, such as gardens and patios, 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 a 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 noise levels in these external amenity spaces, but should not be prohibited.'*

With respect to the proposed creche, there are no specific creche criteria in force. Reference may be made to Technical Guidance Document TGD-021-5: Acoustic Performance In New Primary & Post Primary School Buildings (Department of Education & Skills, 2015). The document recommends an indoor ambient $L_{Aeq\ 30\ min}$ level of 35 dB. This criterion is applied in this assessment. The document adds that where the external $L_{Aeq\ 30\ min}$ level does not exceed 51-55 dB (range dependent on ventilation type) at the façade, opening windows and vents may be suitable.

BS 8233:2014 includes recommendations regarding noise levels in office buildings. An internal $L_{Aeq\ T}$ level of 45-50 dB is recommended with respect to open plan offices.

*Specialist Services Health Technical Memorandum 08-01: Acoustics*[8] (UK Department of Health, 2013) recommends several noise criteria for healthcare room types. The strictest daytime criterion is 40 dB $L_{Aeq\ 1\ h}$. The lowest night-time criterion is 35 dB $L_{Aeq\ 1\ h}$, with an $L_{AFmax}$ recommendation of 45 dB.

Achieving compliance with the above recommendations in internal spaces at the Proposed Development will require consideration at detailed design stage, particularly in relation to internal transmission between rooms. The chief consideration with respect to the planning application stage is to identify if external noise levels due to road traffic are elevated, thus indicating that enhanced building fabric treatments including glazing will be required.

### 10.2.6 Meath Noise Action Plan

The *County Meath Noise Action Plan* (Meath County Council, 2019) describes a strategic plan based on noise mapping undertaken in 2017 ('round 3' mapping). Preparation of the plan is a requirement of *Directive 2002/49/EC Of The European Parliament And Of The Council Relating To The Assessment And Management Of Environmental Noise* (2002)[9], transposed into Irish law by the *European*

[8] *Specialist Services Health Technical Memorandum 08-01: Acoustics*
[9] *Directive 2002/49/EC Of The European Parliament And Of The Council Relating To The Assessment And Management Of Environmental Noise (2002)*

*Communities (Environmental Noise) Regulations 2018* [10](SI No. 549/2018). The Directive requires preparation of noise plans for all roads with annual traffic volumes over 3 million vehicles. The nearest roads subject to mapping are the M4 motorway (2.5 km south of the proposed development site), and regional route R148 (850 m south of the site, in Kildare County Council's functional area). Larger rail lines are also subject to mapping, including the Dublin-Galway line 1 km south of the site. The R157 is not subject to mapping, although segments of the road have been mapped (see Figures 10-3 and 10-4 below).

The Noise Action Plan does not specify noise criteria to which future developments will be subject. The plan instead refers to criteria set out in *Guidance Note For Noise Action Planning* (EPA, 2009)[11], which recommends the following threshold values for the assessment of noise mitigation measures for road traffic noise (i.e. reduction of noise levels):

- 70 dB $L_{den}$.
- 57 dB $L_{night}$.

With respect to the assessment of noise preservation measures (i.e. protection of the future noise climate), the guidance document recommends the following thresholds:

- 55 dB $L_{den}$.
- 45 dB $L_{night}$.

### 10.2.7 Kildare Noise Action Plan

Like the Meath Noise Action Plan, the *Third Noise Action Plan 2019-2023* (Kildare County Council, 2019) refers to 'arbitrary threshold values' taken from *Guidance Note For Noise Action Planning* (EPA, 2009) as follows:

- 70 dB $L_{den}$.
- 57 dB $L_{night}$.

The plan also states:

> *'In the scenario where new residential properties or other noise sensitive premises are introduced into an existing climate of environmental noise, there is currently no clear national planning guidance on noise from the Department of Housing, Planning and Local Government. Kildare Local Authority may develop and publish its own set of guidance on noise assessment and control which would be applicable throughout the county. In the interim, Kildare Local Authority shall require quantifiable noise assessments to be carried where any part of the residential developments is located with 150m of a rail corridor or adjacent to the 'Major Roads' within the county. The quantifiable assessment of environmental noise shall include, inter alia, the situation internally with open windows and externally in the amenity areas of development.'*
>
> *Whilst the control of external levels of environmental noise constitutes one aspect of noise management within planning and aims to provide benefit to amenity spaces, the control of noise levels within residential properties and other noise sensitive premises also plays an important role. In the scenario where new noise sensitive premises are introduced to locations already exposed to significant levels of long-term environmental noise as set out in the Environmental Noise Regulations, i.e. 70 dB (A) Lden and 57 dB (A) Lnight, it is considered appropriate to consider aiming to achieve target internal noise levels within noise sensitive rooms, such as living rooms and bedrooms.'*

[10] *European Communities (Environmental Noise) Regulations 2018*
[11] *Guidance Note For Noise Action Planning (EPA, 2009)*

Given that the Proposed Development does not include any proposed residential elements in the functional area of Kildare County Council, the Kildare Noise Action Plan is not directly relevant to the Proposed Development.

### 10.2.8 Summary of Criteria

Noise and vibration criteria relevant to the construction phase are summarised in Table 10-7.

*Table 10-7 Summary of construction phase noise and vibration criteria*

| Type | Parameter | Criterion | Period | Comment |
|---|---|---|---|---|
| Noise | $L_{Aeq\ 1\ h}$ | General: 65 dB<br>MOOR: 70 dB | M-Sa working hours | Externally at offsite receptors |
| Vibration | PPV | <10 Hz: 8 mm/s<br>10-50 Hz: 12.5 mm/s<br>>50 Hz: 20 mm/s | Working hours | Offsite buildings & structures |

Noise criteria relevant to the operational development are listed in Table 10-8. Vibration criteria are not relevant as the Proposed Development once operational will not result in any increased vibration impacts.

*Table 10-8 Summary of operational phase noise criteria*

| Type | Parameter | Criterion | Period | Comment |
|---|---|---|---|---|
| Traffic | $L_{Aeq\ T}$ | Minimal increase over existing | All periods | Externally at offsite receptors |
| Inward | $L_{Aeq\ 16\ h}$ | 35 dB | 0700-2300 h | Internally in proposed living rooms |
| Inward | $L_{Aeq\ 16\ h}$ | 40 dB | 0700-2300 h | Internally in proposed dining areas |
| Inward | $L_{Aeq\ 16\ h}$ | 35 dB | 0700-2300 h | Internally in proposed bedrooms |
| Inward | $L_{Aeq\ 8\ h}$ | 30 dB | 2300-0700 h | Internally in proposed bedrooms |
| Inward | $L_{AFmax}$ | 45 dB | 2300-0700 h | Preferably <10 such events in proposed bedrooms at night |
| Inward | $L_{Aeq\ 16\ h}$ | 50-55 dB | 0700-2300 h | External amenity areas |
| Inward | $L_{Aeq\ 30\ min}$ | 35 dB | Daytime | Internal creche rooms |
| Inward | | 51-55 dB | Daytime | External creche facade |
| Inward | $L_{den}$ | 70 dB | 24 h | Noise action plan mitigation external criterion for road noise |
| Inward | $L_{night}$ | 57 dB | 2300-0700 h | Noise action plan mitigation external criterion for road noise |

| | | | | |
|---|---|---|---|---|
| Inward | $L_{Aeq\ 1\ h}$ | 45 dB | 0700-1900 h | Internally in proposed offices |
| Inward | $L_{Aeq\ 1\ h}$ | 40 dB | 0700-2300 h | Internally in proposed healthcare rooms |
| Inward | $L_{Aeq\ 1\ h}$ | 35 dB | 2300-0700 h | Internally in proposed healthcare rooms |
| Inward | $L_{AFmax}$ | 45 dB | 2300-0700 h | Internally in proposed healthcare rooms |
| Traffic | $L_{Aeq\ T}$ | Minimal increase over existing | All periods | Externally at offsite receptors |
| Commercial | $L_{Aeq\ 15\ min}$ | 55 dB | 0700-1900 h | Externally at offsite receptors |
| Commercial | $L_{Aeq\ 15\ min}$ | 50 dB | 1900-2300 h | Externally at offsite receptors |
| Commercial | $L_{Aeq\ 15\ min}$ | 45 dB | 2300-0700 h | Externally at offsite receptors |
| Commercial | $L_{AFmax}$ | 60 dB | 2300-0700 h | Externally at offsite receptors |
| Commercial | $L_{Aeq\ T}$ | Minimal increase over existing | All periods | Externally at offsite receptors |

## 10.3 Baseline

### 10.3.1 Location and land use

The Proposed Development site consists of 12 fields on the northeast fringes of Maynooth. The site is divided into two northern and southern halves by local roads L22143 and L6219 which runs through the site. The northern half is in turn divided into two by the L2214 which meets the L6219 near the site centre. Regional route R157 runs along the eastern boundary of the site. The southern boundary is formed by the River Rye Water watercourse, which also marks the boundary between counties Meath and Kildare. Residential development at Maynooth has pushed northeast towards the opposite bank of the Rye River watercourse in recent years. The western and norther sides of the site adjoin agricultural land.

The topography is relatively level across most of the site. Along the southern margins, the ground level falls quickly towards the River Rye Water watercourse. The site is currently under a mixture of pasture and hedgerows. An existing period dwelling, known as Moygaddy House and associated outbuildings and gardens lies at the site centre. The area to the north, northwest and northeast is also under pasture/tillage. To the southwest, the landscape quickly becomes urban. Carton Demesne lies to the east, on the opposite side of the R157.

### 10.3.2 Receptors

There are two dwellings on the development site. The first of these is Moygaddy House, a vacant period dwelling with extensive outbuildings located near the L2214-L6219 junction. This will be retained as part of the development. The second is a small dwelling located nearby, 90 m north of the junction. Although currently occupied, it is understood that the resident intends to vacate the dwelling

prior to the commencement of construction. Neither of the dwellings on the site is therefore a noise sensitive receptor.

Offsite, receptors exist in several directions as follows:

- To the north, one-off dwellings have proliferated along the L2214. A cluster of these lie immediately outside the northern boundary of the Moygaddy Masterplan area. Seven of these lie within 100 m of the site boundary, with a number of other dwellings continuing northwards.
- To the northeast, a dwelling alongside the R157 lies 180 m from the northeast corner of the site. Set back from the road, a period dwelling lies 480 m further northeast.
- At Carton Demesne to the east of the site, a large number of receptors have been constructed in recent years, including residential dwellings and a hotel. The nearest receptor here, the hotel, lies approximately 500 m from the site boundary.
- Two dwellings lies immediately outside the southeast corner of the site, on the opposite bank of the Rye river. Further south and southwest, ongoing residential developments at Maynooth at Mariavilla are gradually approaching this area, with the nearest development currently approximately 350 m from the boundary.
- Similarly, residential developments further west approach to within 120 m of the southwest side of the site.
- Four one-off dwellings lie along the L6219 in proximity to the western corner of the Moygaddy Masterplan area. One of these immediately adjoins the Moygaddy Masterplan site boundary.

The nearest offsite receptors are shown in Figure 10-2. Apart from the Carton House Hotel, all identified receptors within 500 m consist of residential dwellings. No other receptors such as creches, schools, care centres or nursing homes have been identified.

*Figure 10-2 Nearest offsite receptors to Moygaddy Masterplan boundary (shown red)*

## 10.3.3 Noise mapping

The Meath County Council and Kildare County Council noise action plans include maps relating to the road network in the vicinity of Maynooth (M4 motorway and regional routes R406, R148 and R157), as required by Directive 2002/49/EC Relating to The Assessment And Management Of Environmental Noise. Relevant traffic mapping is shown in Figures 10-3 and 10-4.

The maps indicate that $L_{den}$ levels along the R157 verge marginally exceed 60 dB. The 55 dB contour extends 100 m into the site, parallel to the R157. The 45 dB $L_{night}$ contour extends approximately 50 m into the Proposed Development site. Traffic volumes on the L2214 and L6219 are lower than mapping thresholds. Mapping undertaken by Iarnrod Eireann with respect to the national rail network does not extend to Maynooth.

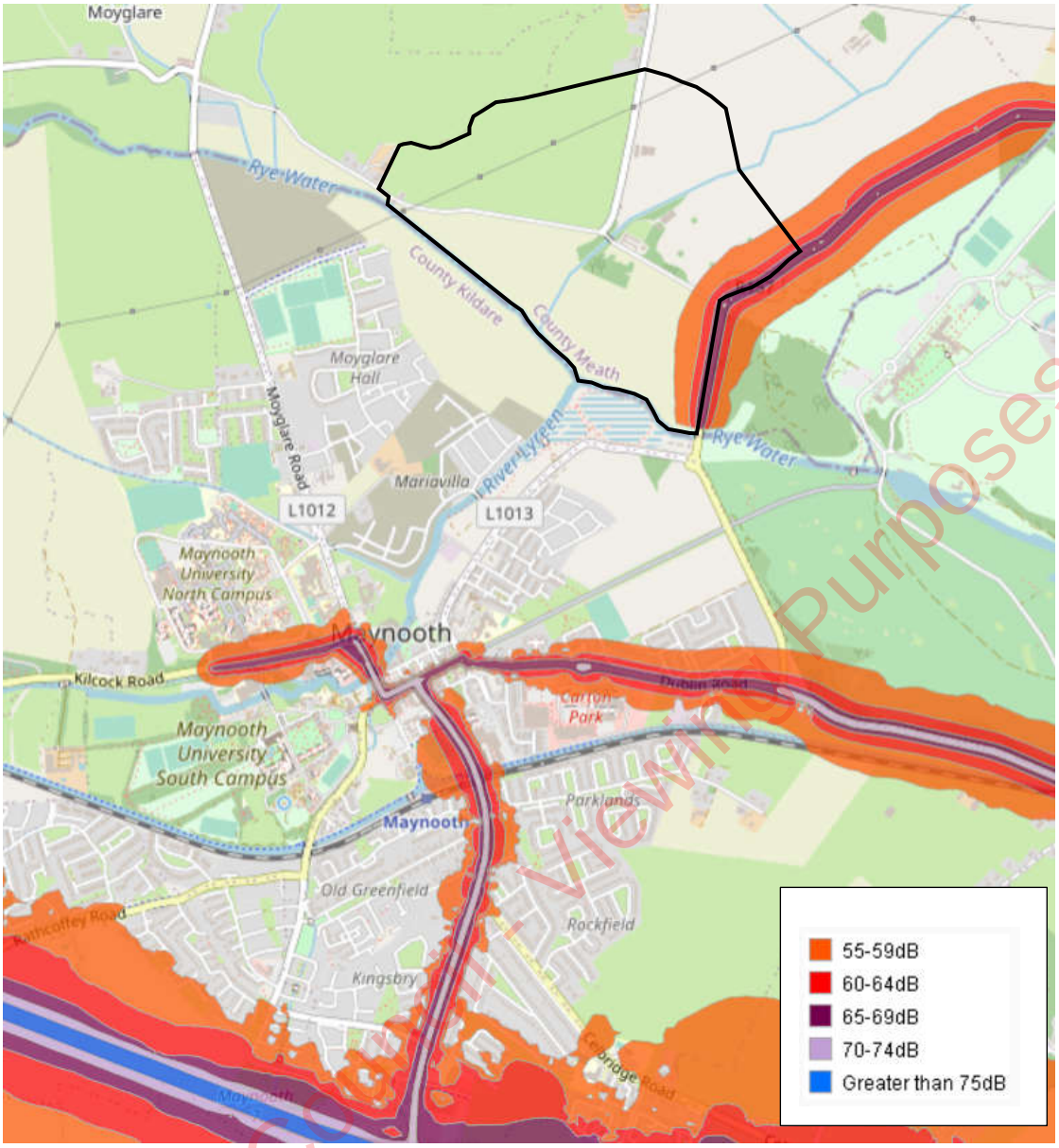



*Figure 10-3 Road traffic Lden contours, with Moygaddy Masterplan area delineated black*

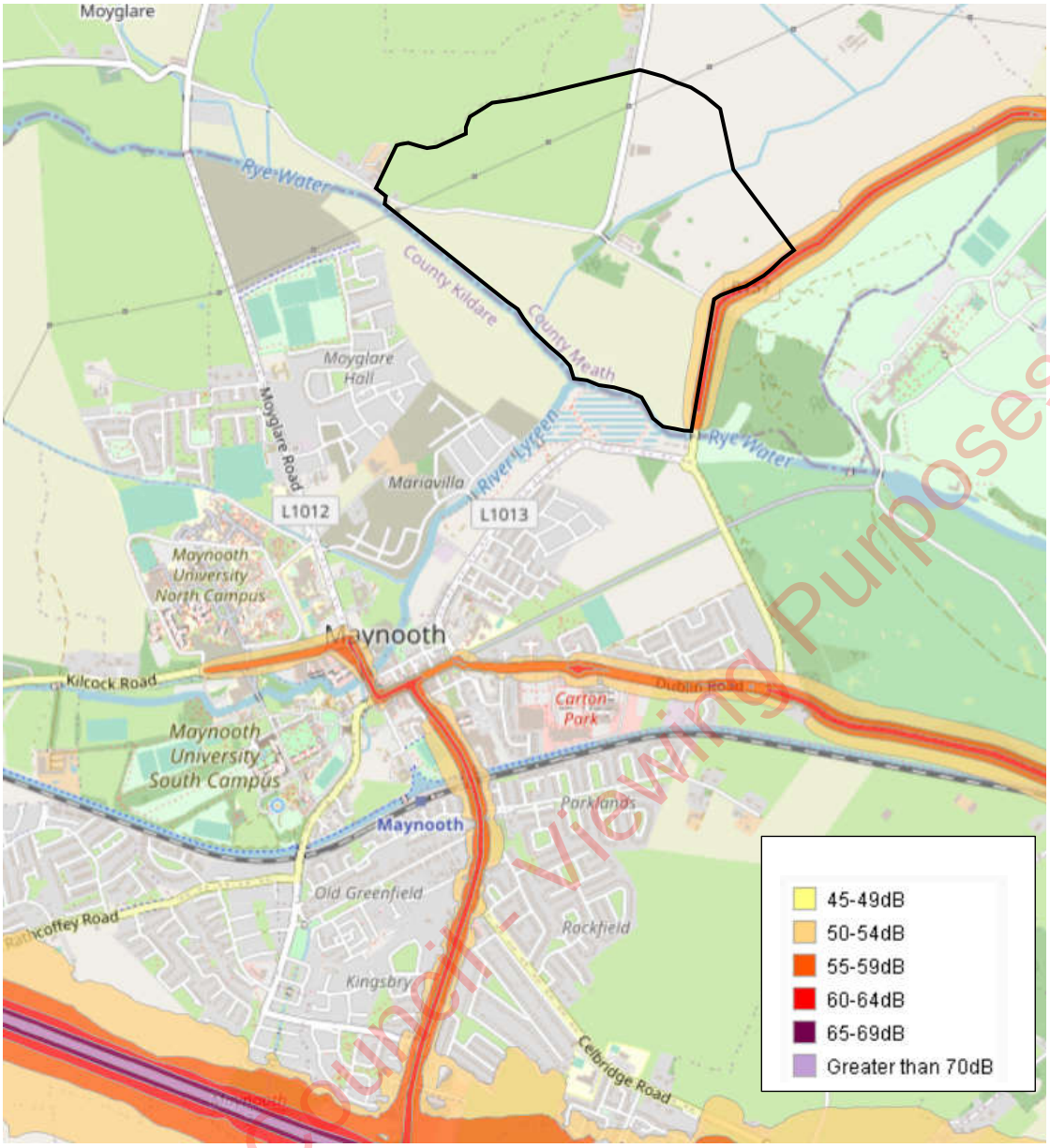



*Figure 10-4 Road traffic Lnight contours, with Moygaddy Masterplan area delineated black*

## 10.3.4 Noise survey

A baseline noise survey was carried out at the proposed development site over a 24 h period beginning Tuesday 20/07.21. The purpose of the survey was to provide up to date ambient noise data, and to allow subsequent calibration of the noise model. Monitoring was carried out at five onsite locations shown in Figure 10-5 and Plates 101 to 10-5, and described in Table 10-9. Survey methodology, equipment specifications and weather conditions are listed in Appendix 10-1. Recorded time history profiles are shown in Figures 10-6 to 10-10. Noise data are presented in Appendix 10-2, and summarised in Table 10-10.


*Figure 10-5 Baseline noise stations*

*Plate 10-1 N1, looking east*

*Plate 10-2 N2, looking northwest.*

*Plate 10-3 N3, looking northeast.*

*Plate 10-4 N4, looking west.*

*Plate 10-5 N5, looking north.*

*Table 10-9 Baseline noise stations*

| Station | NGR | Reason for selection |
|---|---|---|
| N1 | 693698 739319 | To provide an indication of the soundscape in the vicinity of residential estates to the southwest, and to assess the impact of L6219 traffic noise |
| N2 | 693848 739422 | To quantify baseline noise levels in the vicinity of dwellings outside the western boundary of the Moygaddy Masterplan area, particularly back from the L6219 |
| N3 | 694440 739804 | To quantify baseline noise levels at dwellings along the L2214 outside the northern boundary of the Moygaddy Masterplan area |
| N4 | 694992 739213 | To provide an indication of baseline noise levels at the nearest receptor to the northeast adjacent to the R157 |
| N5 | 694654 738611 | To provide an indication of baseline noise levels at dwellings outside the southeast corner of the Proposed Development site |

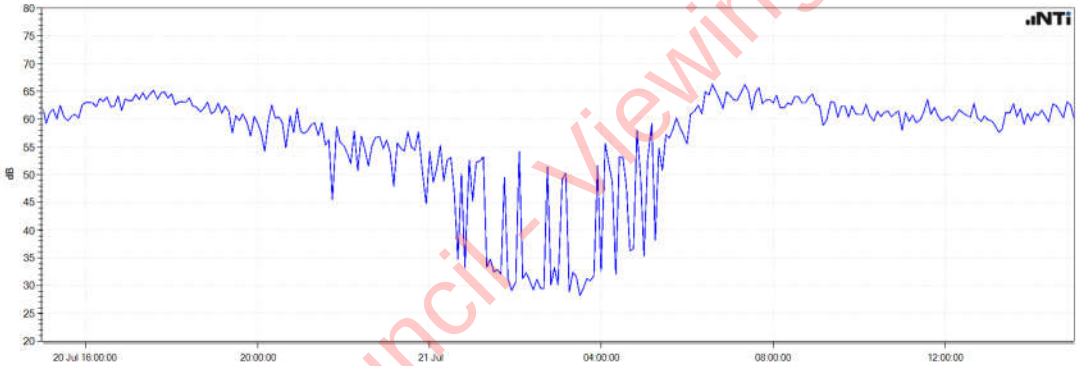



*Figure 10-6 LAeq 1 s profile at N1*

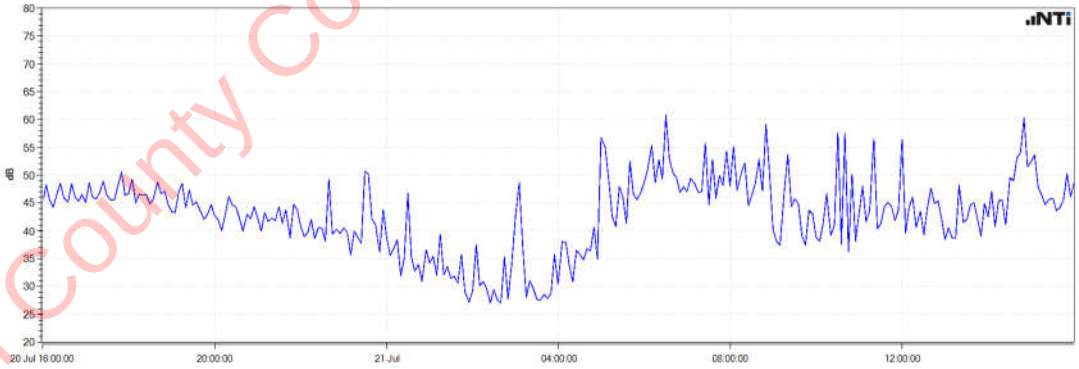



*Figure 10-7 LAeq 1 s profile at N2*

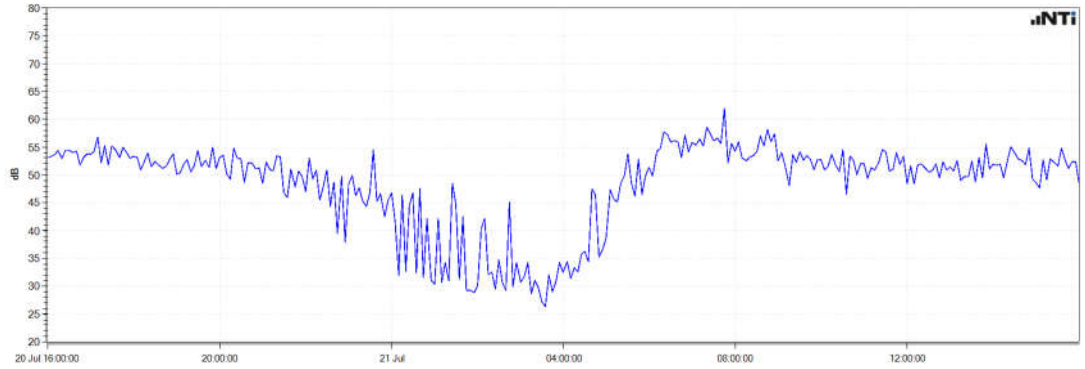



*Figure 10-8 LAeq 1 s profile at N3*

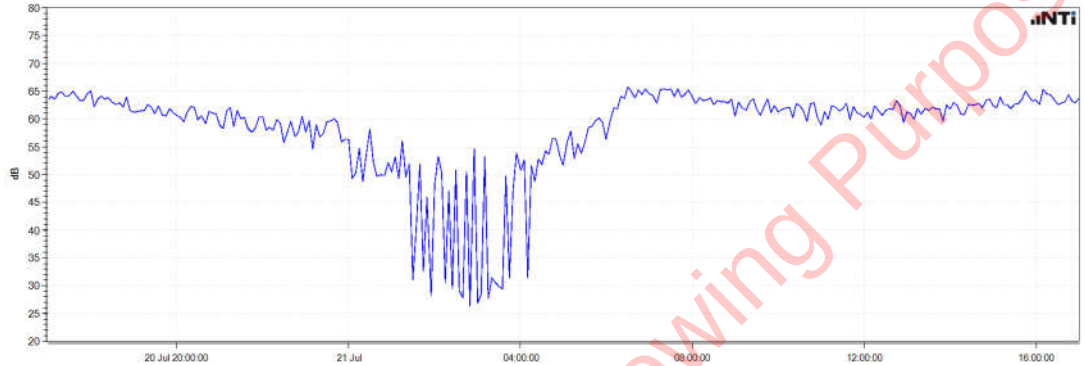



*Figure 10-9 LAeq 1 s profile at N4*

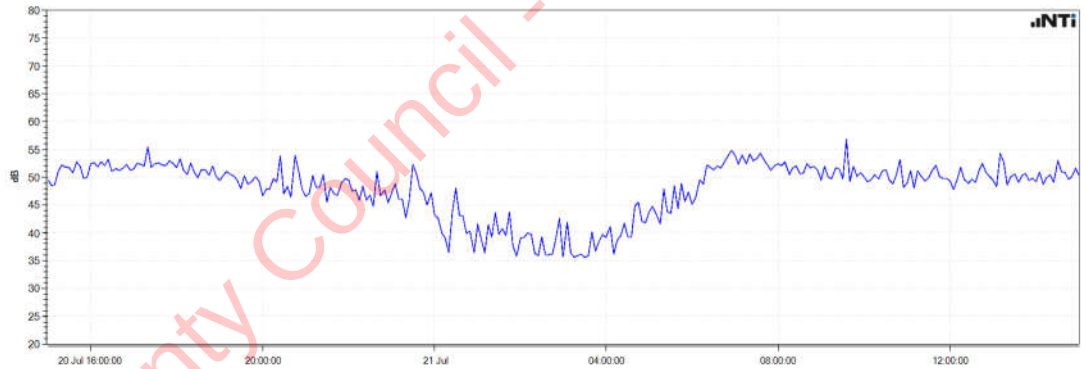



*Figure 10-10 LAeq 1 s profile at N5*

*Table 10-10 Noise data summary*

| Period | Parameter | N1 | N2 | N3 | N4 | N5 |
|---|---|---|---|---|---|---|
| 20/07/2021 15:00 | $L_{Aeq\ 1\ h}$ | 61 | - | - | - | 51 |
| 20/07/2021 16:00 | $L_{Aeq\ 1\ h}$ | 63 | 47 | 54 | - | 52 |
| 20/07/2021 17:00 | $L_{Aeq\ 1\ h}$ | 64 | 47 | 54 | 64 | 53 |
| 20/07/2021 18:00 | $L_{Aeq\ 1\ h}$ | 63 | 47 | 52 | 63 | 51 |
| 20/07/2021 19:00 | $L_{Aeq\ 1\ h}$ | 61 | 45 | 52 | 62 | 50 |
| 20/07/2021 20:00 | $L_{Aeq\ 1\ h}$ | 60 | 43 | 52 | 61 | 50 |
| 20/07/2021 21:00 | $L_{Aeq\ 1\ h}$ | 57 | 43 | 51 | 60 | 49 |
| 20/07/2021 22:00 | $L_{Aeq\ 1\ h}$ | 55 | 42 | 49 | 59 | 47 |
| 20/07/2021 23:00 | $L_{Aeq\ 1\ h}$ | 55 | 44 | 48 | 58 | 48 |
| 21/07/2021 | $L_{Aeq\ 1\ h}$ | 51 | 38 | 43 | 53 | 42 |
| 21/07/2021 01:00 | $L_{Aeq\ 1\ h}$ | 47 | 34 | 41 | 50 | 40 |
| 21/07/2021 02:00 | $L_{Aeq\ 1\ h}$ | 45 | 35 | 38 | 49 | 39 |
| 21/07/2021 03:00 | $L_{Aeq\ 1\ h}$ | 45 | 39 | 31 | 48 | 38 |
| 21/07/2021 04:00 | $L_{Aeq\ 1\ h}$ | 52 | 46 | 41 | 53 | 42 |
| 21/07/2021 05:00 | $L_{Aeq\ 1\ h}$ | 57 | 49 | 50 | 58 | 46 |
| 21/07/2021 06:00 | $L_{Aeq\ 1\ h}$ | 64 | 53 | 56 | 64 | 52 |
| 21/07/2021 07:00 | $L_{Aeq\ 1\ h}$ | 64 | 51 | 57 | 65 | 53 |
| 21/07/2021 08:00 | $L_{Aeq\ 1\ h}$ | 63 | 52 | 55 | 63 | 52 |
| 21/07/2021 09:00 | $L_{Aeq\ 1\ h}$ | 62 | 46 | 53 | 62 | 52 |
| 21/07/2021 10:00 | $L_{Aeq\ 1\ h}$ | 61 | 51 | 52 | 62 | 50 |
| 21/07/2021 11:00 | $L_{Aeq\ 1\ h}$ | 61 | 50 | 52 | 61 | 50 |
| 21/07/2021 12:00 | $L_{Aeq\ 1\ h}$ | 61 | 44 | 51 | 62 | 50 |
| 21/07/2021 13:00 | $L_{Aeq\ 1\ h}$ | 60 | 43 | 52 | 62 | 51 |
| 21/07/2021 14:00 | $L_{Aeq\ 1\ h}$ | 62 | 53 | 52 | 63 | 51 |
| 21/07/2021 15:00 | $L_{Aeq\ 1\ h}$ | - | 48 | 52 | 63 | - |
| 21/07/2021 16:00 | $L_{Aeq\ 1\ h}$ | - | - | - | 64 | - |
| 0700-1900 h | $L_{Aeq\ 15\ min}$ range | 59-65 | 39-57 | 50-59 | 61-65 | 49-54 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0700-1900 h | $L_{Aeq\ 15\ min}$ average | 62 | 47 | 53 | 63 | 51 |
| 0700-1900 h | $L_{AF90\ 15\ min}$ range | 34-48 | 32-44 | 32-44 | 33-48 | 37-46 |
| 0700-1900 h | $L_{AF90\ 15\ min}$ average | 40 | 37 | 36 | 41 | 40 |
| 1900-2300 h | $L_{Aeq\ 15\ min}$ range | 54-62 | 40-47 | 46-54 | 58-62 | 47-51 |
| 1900-2300 h | $L_{Aeq\ 15\ min}$ average | 58 | 43 | 51 | 60 | 49 |
| 1900-2300 h | $L_{AF90\ 15\ min}$ range | 35-40 | 34-38 | 34-39 | 32-41 | 37-41 |
| 1900-2300 h | $L_{AF90\ 15\ min}$ average | 38 | 36 | 36 | 37 | 38 |
| 2300-0700 h | $L_{Aeq\ 15\ min}$ range | 30-65 | 28-57 | 30-57 | 31-65 | 36-54 |
| 2300-0700 h | $L_{Aeq\ 15\ min}$ average | 49 | 40 | 42 | 53 | 43 |
| 2300-0700 h | $L_{AF90\ 15\ min}$ range | 26-45 | 24-44 | 25-45 | 25-49 | 35-44 |
| 2300-0700 h | $L_{AF90\ 15\ min}$ average | 32 | 31 | 31 | 31 | 37 |
| 24 h | $L_{den}$ | 64 | 53 | 56 | 65 | 54 |
| 0700-2300 h | $L_{Aeq\ 16\ h}$ | 62 | 48 | 53 | 62 | 51 |
| 2300-0700 h | $L_{night}$ | 58 | 47 | 49 | 57 | 46 |

The main noise source audible at all five stations was distant traffic on the wider road network, which was continuously audible at all times in the background throughout daytime, evening and night-time periods. Stations N1, N3, N4 and N5 were additionally affected by local traffic on adjacent roads. Other noise sources of significance were birdsong and aircraft.

Stations N4 and N5 are the only stations located adjacent to a public road (R157 Regional Road) which has been included in local authority strategic noise mapping (Meath Noise Action Plan). $L_{den}$ and $L_{night}$ levels determined at N4 are consistent with mapped levels shown in Figures 10-3 and 10-4. In contrast, levels determined at N5 are considerably lower than mapped levels. This discrepancy is most likely due to the elevation of the R157 above the southeast corner of Site B within the Proposed Development, resulting in attenuation of traffic noise at the measurement position. Measured data are considered more relevant than mapped data as an indicator of baseline noise levels at the dwellings outside the southeast corner of the site.

Measured data suggest that $L_{AFmax}$ levels due to passing traffic exceed 60 dB approximately 100 m into the EIAR site, and the number of such movements considerably exceeds 10 movements during night-time hours. As demonstrated through recorded noise levels at stations N4 and N5, $L_{AFmax}$ levels are likely to approach 80 dB for all onsite areas of the Proposed Development within 10 m of the existing R157 Regional Road.

### 10.3.5 Noise risk assessment

The ProPG document includes guidance on undertaking a risk assessment with respect to inward noise affecting a proposed development site. The ProPG risk assessment is based on Figure 10-11. Data presented in Table 10-10 suggest that the entire site is 'low risk', increasing to medium risk at N1 and

N4 i.e. the site is low risk in its entirety, apart from positions immediately adjacent to the L6219 and R157. In this regard, ProPG states that:

> *'...the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an acoustic design statement which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.'*

ProPG notes that the risk category of a particular site will be influenced by the number of $L_{AFmax}$ events which exceed 60 dB externally during night-time hours. Where the number of such events exceeds 10, mitigation may be required even where $L_{night}$ levels are below relevant criteria. Measured data suggest that $L_{AFmax}$ levels due to passing traffic exceed 60 dB approximately 100 m into the site, and the number of such movements considerably exceeds 10 during night-time hours. At positions immediately adjacent to roads, $L_{AFmax}$ levels approach 80 dB, within 10 m of the road network.

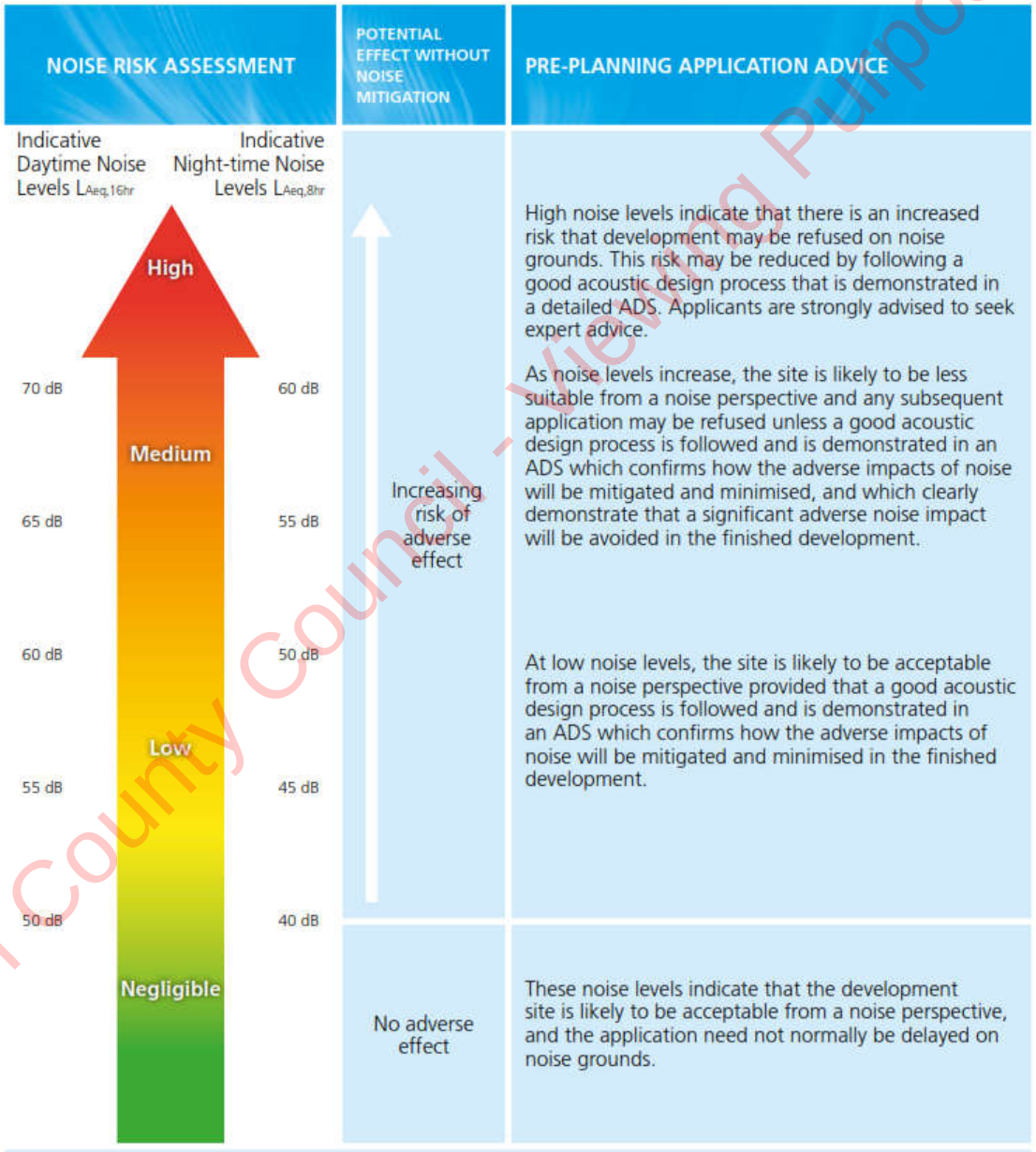



*Figure 10-11 ProPG risk assessment*

### 10.3.6 Future trends

EPA EIAR guidance recommends that a noise impact assessment should include a description of the likely evolution of the future receiving acoustic environment in the absence of the Proposed Development. The local noise environment is semi-urban in character, with the chief background noise sources being local and distant traffic. In the medium term, traffic noise levels are likely to increase across the study area, due to continuing development across Maynooth, and its ongoing expansion. While engine noise emissions will reduce due to increasing take-up of electric vehicles, it is noted that traffic noise above 40-50 km/h arises chiefly from tyre noise, and such tyre noise is unlikely to be less in electric vehicles. The planned development of a relief road around the northeast side of the town is likely to alter the soundscape considerably.

With respect to the development site itself, it is expected that, should the Proposed Development not proceed (the 'do nothing' scenario), no noise emissions are expected to arise other than those from land management practices, depending on how the site is used into the future.

## 10.4 Potential Effects and Associated Mitigation Measures

### 10.4.1 Do Nothing Scenario

Should the proposed development not proceed (the 'do nothing' scenario), no noise emissions are expected from within the site other than those associated with land management practices, depending on how the site is used into the future. If the Proposed Development were not to proceed, the potential for additional investment, employment and housing in the area in relation to the construction and operation of the Proposed Development would be lost. It is considered that the 'Do-Nothing' impact would be permanent, negative and slight as the Proposed Development lands are already zoned for Community Infrastructure and Strategic Employment and Housing.

### 10.4.2 Construction Phase

#### 10.4.2.1 Site A Strategic Employment Zone

##### Pre Mitigation Impact

Site A (Strategic Employment Zone) will consist of three office buildings, car parking, road realignment works, and approximately 365m of the MOOR.

Construction will be undertaken on a phased basis, beginning within six months of grant of planning permission, and will be managed from a temporary site compound. Construction will be confined to daytime hours Monday-Friday 07:00 to 19.000 and on Saturday 8:00 to 16.00. Full details are presented in Chapter 4 of the EIAR.

Construction works will include the following activities, undertaken variously throughout the construction phase and in different areas of the site:

- Soil stripping & temporary stockpiling.
- Installation of temporary site compound.
- Provision of hardcore stone on onsite roadways.
- Excavation of foundations.
- Excavation of ground services trenches.
- Installation of services including sewerage network.

- Steel frame erection.
- Pouring & floating of concrete floor slabs.
- Block work and roof work.
- Building finishing (windows, doors, etc.).
- Internal fit out in buildings.
- Laying of asphalt.
- Site landscaping.

During the construction phase, the chief source of noise emissions will be plant used onsite. Construction plant required onsite at various stages of the project are listed in Table 10-11. The table includes details of typical sound pressure levels, taken from BS 5228-1:2009+A1:2014.

*Table 10-11 Expected Site A construction plant (dB at 10 m)*

| Plant | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | 8 kHz | Total $L_{Aeq}$ |
|---|---|---|---|---|---|---|---|---|---|
| Asphalt paving machine with tipper truck | 78 | 77 | 72 | 72 | 71 | 69 | 62 | 56 | 75 |
| Discharging concrete mixer truck | 80 | 69 | 66 | 70 | 71 | 69 | 64 | 58 | 75 |
| Tracked excavator (22 t) | 80 | 83 | 76 | 73 | 72 | 70 | 69 | 66 | 78 |
| Wheeled backhoe loader (9 t) | 68 | 67 | 63 | 62 | 62 | 61 | 54 | 47 | 67 |
| Consaw | 73 | 67 | 70 | 68 | 73 | 78 | 78 | 77 | 84 |
| Lifting platform | 78 | 76 | 62 | 63 | 60 | 59 | 58 | 49 | 67 |
| Mobile generator | 78 | 71 | 66 | 62 | 59 | 55 | 56 | 49 | 65 |
| Mobile crane (35 t) | 80 | 76 | 71 | 63 | 64 | 63 | 56 | 50 | 70 |
| Dumper | 84 | 81 | 74 | 73 | 72 | 68 | 61 | 53 | 76 |
| Vibro-roller | 88 | 83 | 69 | 68 | 67 | 65 | 62 | 59 | 74 |
| Telescopic handler | 85 | 79 | 69 | 67 | 64 | 62 | 56 | 47 | 71 |
| Truck (driving) | 73 | 78 | 78 | 78 | 74 | 73 | 68 | 66 | 80 |

Noise emissions arising during the construction phase of the Proposed Development will vary considerably due to several reasons:

- The site is relatively large. Emissions will arise from plant operating across the site, and thus the site will not constitute a single point source.
- The large construction area will result in differing propagation conditions with respect to receptors at different locations.
- The construction phase will last several years. During this time, plant associated with different activities will relocate around the site as required.
- Different plant will be required at different times, and construction operations will vary on a daily basis. There may be extended periods during the construction phase with minimal noise emissions.

- Each machine item may operate under different loading conditions or be in varying states of repair.
- Construction works may be concentrated for certain periods, followed by periods of inactivity. Localised works may require several hours of intense activity.
- During later stages of the construction phase, emissions from some operations will be screened by previously completed buildings.
- As buildings near completion, activity will gradually relocate indoors.
- A number of different construction firms are likely to be contracted, each using different plant.
- With respect to particular plant, the models selected will change depending on requirements. The method of construction may be modified shortly before commencement, resulting in the need to import different equipment. Construction projects tend to be fluid in nature, with plant requirements changing as the site is progressed and circumstances change on the ground. The need for specific plant may often be established only following the start of a project.

From the foregoing, it is clear that construction phase noise emissions will vary in time and location, and it is not possible to determine a single overall noise output figure for the construction phase. The most appropriate approach here is to assess a worst case scenario emission. An extreme worst case scenario consists of construction activity simultaneously occurring at the nearest points to offsite receptors, involving plant with the greatest noise output. In this scenario, operations may occur simultaneously at the northwest, northeast and southeast corners of Site A.

For the purposes of modelling, it is assumed that operations at each of the three zones will involve a tracked excavator, discharging mixer truck, consaw, dumper and telescopic handler in simultaneous use, at the nearest point of the works zone, and all positioned within a 100 m wide operations area. Such a scenario is unlikely to arise, but is applied here to represent an extreme worst case scenario.

Noise emissions from the above were modelled using DGMR iNoise v2022 software. Input parameters were as follows:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation Of Sound During Propagation Outdoors – Part 2 General Method Of Calculation* (1996).
- Hard ground assumed throughout (bare and compacted).
- No screening.
- Receiver height: 4 m.
- Plant output data taken from Table 10-11.
- 31.5 Hz levels (not provided in BS 5228) assumed to be same as 63 Hz levels.
- Plant on-times per hour: excavator (80 %), mixer truck (50 %), consaw (10 %).
- Dumper and handler movements continuous

The model output is shown in Figure 10-12. $L_{Aeq\ 1\ h}$ levels predicted at the nearest receptors, close to their facades, will be 49 dB at the dwelling to the northeast. Levels at all other receptors, including Carton House Hotel, will be markedly lower. Predicted noise levels are much lower than construction phase noise limit criteria of 65 dB discussed above.

Throughout the construction phase, vehicles will arrive at, and depart from, the site during the working day. Vehicle movements will be associated with workers' arrival and departure, and delivery of materials. The approximate numbers of workers employed onsite over the entire construction period will fluctuate depending on schedules.

Personnel and deliveries will access the Proposed Development site via the surrounding road network, with the majority of vehicles expected to access the site via the R157. Construction traffic volumes presented in the Traffic Impact Assessment indicate that construction traffic volumes will be inconsequential in the context of existing traffic volumes. Thus, construction phase traffic noise impacts will be imperceptible.

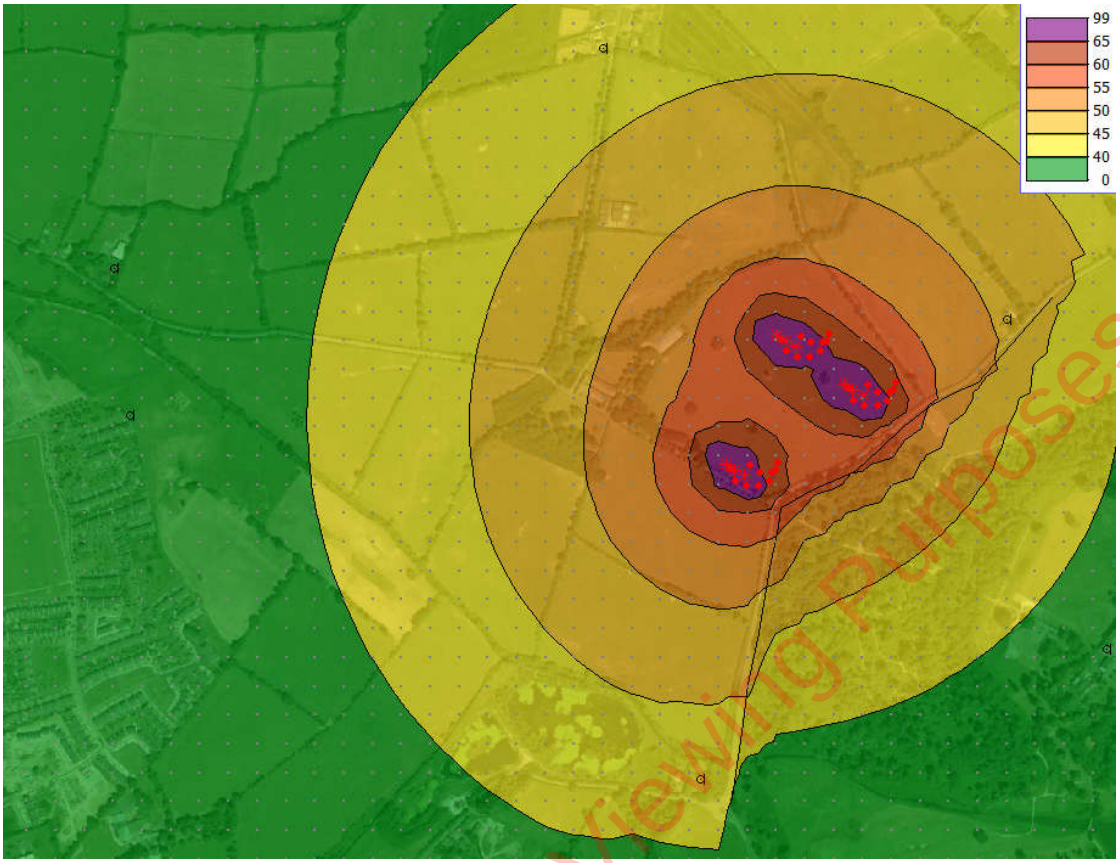



*Figure 10-12 Predicted Site A construction phase LAeq 1 h*

Potential sources of ground borne vibration during the construction phase are as follows:

- Delivery truck movements: Trucks may give rise to vibration at positions adjacent to the road. However, such emissions are typically imperceptible beyond 10 m, and are highly unlikely to be perceptible at dwellings alongside site access routes.
- Plant movements: The movement of plant onsite is not considered to constitute a source of ground borne vibration and is not listed in typical vibration documents such as BS 5228-2:2009. In addition, plant machinery used onsite is likely to be small to mid-sized, and similar to those used on other urban construction projects.
- Ground works: Excavation of trenches and pits for foundation and services will be required. These activities are not typically associated with offsite ground-borne vibration impacts. It is noted that piling is not proposed. In addition, rock breaking is unlikely to be required.

On the basis of the above, no construction vibration impacts are expected at offsite receptors.

## Proposed Mitigation Measures

Construction phase $L_{Aeq\ 1\ h}$ levels will not exceed the 65 dB criterion recommended by BS 5228-1:2009+A1:2014 with respect to construction activity, and the 70 dB National Roads Authority criterion relevant to the road construction. At most offsite receptors, $L_{Aeq\ 1\ h}$ levels will be markedly lower than 45 dB.

Although construction phase noise emissions will be short term, and will not exceed construction phase criteria, the applicant nonetheless proposes to apply the following mitigation measures throughout the construction phase:

- Construction operations will in general be confined to the period Monday-Friday 0700-1900 h, and Saturday 0800-1600 h.
- Where it is proposed to operate plant during the period 0700-0800 h at locations within 100 m of offsite receptors, standard 'beeper' reversing alarms will be replaced with flat spectrum alarms.
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant used onsite during the construction phase will be maintained in a satisfactory condition and in accordance with manufacturer recommendations. In particular, exhaust silencers will be fitted and operating correctly at all times. Defective silencers will be immediately replaced.
- Queuing of trucks near offsite receptors will be prohibited.
- Machinery not in active use will be shut down.
- A site representative will be appointed as a liaison officer with the local community.
- Where evening or night-time operations are required, local residents will be notified through the liaison officer.
- All complaints of noise received during the construction phase will be logged in a register and investigated immediately. Details of follow-up action will be included in the register.
- Where it is proposed to import potentially noisy plant to the site, the potential impact of noise emissions will be assessed in advance.
- Guidance set out in British Standard BS 5228-1:2009+A1:2014 with respect to noise control will be applied throughout the construction phase.

#### Residual Impact

Noise impacts will be short term and imperceptible to not significant. No vibration impacts are expected.

### 10.4.2.2 Site B Healthcare Facilities

#### Pre Mitigation Impact

Site B (Healthcare Facilities) will consist of a nursing home and primary care centre as well as road realignment works and car parking. Construction will begin within six months of grant of planning permission, and will be managed from a temporary site compound. Construction will be confined to daytime hours Monday-Friday, with some additional works on Saturday. Full details are presented in Chapter 4 of the EIAR.

Construction works will include the following activities, undertaken variously throughout the construction phase and in different areas of the site:

- Soil stripping & temporary stockpiling.
- Installation of temporary site compound.
- Provision of hardcore stone on onsite roadways.
- Excavation of foundations.
- Excavation of ground services trenches.
- Installation of services including sewerage network.
- Steel frame erection.
- Pouring & floating of concrete floor slabs.
- Block work and roof work.
- Building finishing (windows, doors, etc.).
- Internal fit out in buildings.
- Laying of asphalt.

- Site landscaping.

During the construction phase, the chief source of noise emissions will be plant used onsite. Construction plant required onsite at various stages of the project are listed in Table 10-12. The table includes details of typical sound pressure levels, taken from BS 5228-1:2009+A1:2014.

*Table 10-12 Expected Site B construction plant (dB at 10 m)*

| Plant | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | 8 kHz | Total $L_{Aeq}$ |
|---|---|---|---|---|---|---|---|---|---|
| Asphalt paving machine with tipper truck | 78 | 77 | 72 | 72 | 71 | 69 | 62 | 56 | 75 |
| Discharging concrete mixer truck | 80 | 69 | 66 | 70 | 71 | 69 | 64 | 58 | 75 |
| Tracked excavator (22 t) | 80 | 83 | 76 | 73 | 72 | 70 | 69 | 66 | 78 |
| Wheeled backhoe loader (9 t) | 68 | 67 | 63 | 62 | 62 | 61 | 54 | 47 | 67 |
| Consaw | 73 | 67 | 70 | 68 | 73 | 78 | 78 | 77 | 84 |
| Lifting platform | 78 | 76 | 62 | 63 | 60 | 59 | 58 | 49 | 67 |
| Mobile generator | 78 | 71 | 66 | 62 | 59 | 55 | 56 | 49 | 65 |
| Mobile crane (35 t) | 80 | 76 | 71 | 63 | 64 | 63 | 56 | 50 | 70 |
| Dumper | 84 | 81 | 74 | 73 | 72 | 68 | 61 | 53 | 76 |
| Vibro-roller | 88 | 83 | 69 | 68 | 67 | 65 | 62 | 59 | 74 |
| Telescopic handler | 85 | 79 | 69 | 67 | 64 | 62 | 56 | 47 | 71 |
| Truck (driving) | 73 | 78 | 78 | 78 | 74 | 73 | 68 | 66 | 80 |

Noise emissions arising during the construction phase of the Proposed Development will vary considerably due to several reasons:

- The site will not constitute a single point source.
- The construction area will result in differing propagation conditions with respect to receptors at different locations.
- The construction phase will last several years. During this time, plant associated with different activities will relocate around the site as required.
- Different plant will be required at different times, and construction operations will vary on a daily basis. There may be extended periods during the construction phase with minimal noise emissions.
- Each machine item may operate under different loading conditions or be in varying states of repair.
- Construction works may be concentrated for certain periods, followed by periods of inactivity. Localised works may require several hours of intense activity.
- As buildings near completion, activity will gradually relocate indoors.
- With respect to particular plant, the models selected will change depending on requirements. The method of construction may be modified shortly before

commencement, resulting in the need to import different equipment. Construction projects tend to be fluid in nature, with plant requirements changing as the site is progressed and circumstances change on the ground. The need for specific plant may often be established only following the start of a project.

From the foregoing, it is clear that construction phase noise emissions will vary in time and location, and it is not possible to determine a single overall noise output figure for the construction phase. The most appropriate approach here is to assess a worst case scenario emission. An extreme worst case scenario consists of construction activity simultaneously occurring at the northeast and southeast corners of the site, involving plant with the greatest noise output. For the purposes of modelling, it is assumed that works in these zones will involve a tracked excavator, discharging mixer truck, consaw, dumper and telescopic handler in simultaneous use, at the nearest point of the works zone, and all positioned within a 100 m wide operations area. Such a scenario is unlikely to arise, but is applied here to represent an extreme worst case scenario.

Noise emissions from the above were modelled using DGMR iNoise v2022 software. Input parameters were as follows:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation Of Sound During Propagation Outdoors – Part 2 General Method Of Calculation* (1996).
- Hard ground assumed throughout (bare and compacted).
- No screening.
- Receiver height: 4 m.
- Plant output data taken from Table 10-11.
- 31.5 Hz levels (not provided in BS 5228) assumed to be same as 63 Hz levels.
- Plant on-times per hour: excavator (80 %), mixer truck (50 %), consaw (10 %).
- Dumper and handler movements continuous

The model output is shown in Figure 10-13. $L_{Aeq\ 1\ h}$ levels predicted at the nearest receptors outside the southeast corner will be 58 dB. Levels at all other receptors, including Carton House Hotel, will be markedly lower. Predicted noise levels are much lower than construction phase noise limit criteria of 65 dB discussed above.

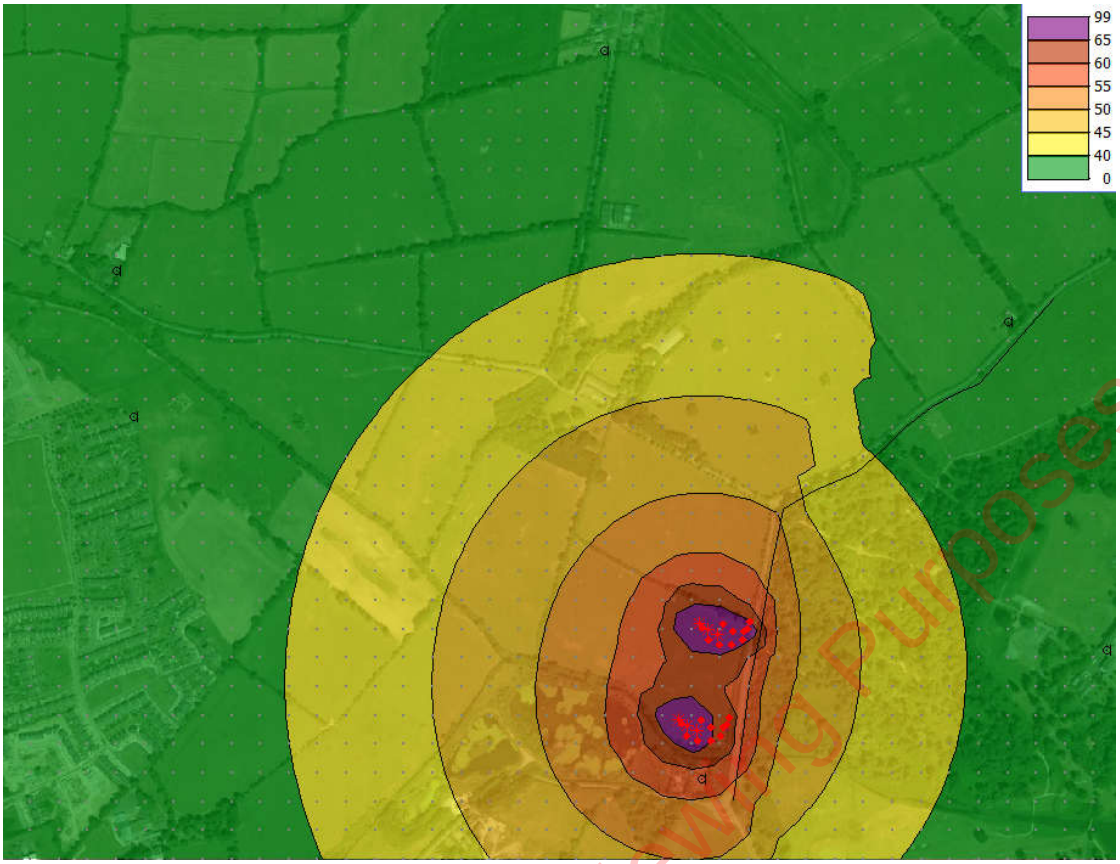



*Figure 10-13 Predicted Site B construction phase LAeq 1 h*

Throughout the construction phase, vehicles will arrive at, and depart from, the site during the working day. Vehicle movements will be associated with workers' arrival and departure, and delivery of materials. The approximate numbers of workers employed onsite over the entire construction period will fluctuate depending on schedules.

Personnel and deliveries will access the Proposed Development site via the surrounding road network, with the majority of vehicles expected to access the site via the R157. Construction traffic volumes presented in the Traffic Impact Assessment indicate that construction traffic volumes will be inconsequential in the context of existing traffic volumes. Thus, construction phase traffic noise impacts will be imperceptible.

Potential sources of ground borne vibration during the Site B construction phase are as follows:

- Delivery truck movements: Trucks may give rise to vibration at positions adjacent to the road. However, such emissions are typically imperceptible beyond 10 m, and are highly unlikely to be perceptible at dwellings alongside site access routes.
- Plant movements: The movement of plant onsite is not considered to constitute a source of ground borne vibration and is not listed in typical vibration documents such as BS 5228-2:2009. In addition, plant machinery used onsite is likely to be small to mid-sized, and similar to those used on other urban construction projects.
- Ground works: Excavation of trenches and pits for foundation and services will be required. These activities are not typically associated with offsite ground-borne vibration impacts. It is noted that piling is not proposed. In addition, rock breaking is unlikely to be required.

On the basis of the above, no construction vibration impacts are expected at offsite receptors.

### Proposed Mitigation Measures

Construction phase $L_{Aeq\ 1\ h}$ levels will not exceed the 65 dB criterion recommended by BS 5228-1:2009+A1:2014 with respect to construction activity, and the 70 dB National Roads Authority criterion relevant to the road construction. At most offsite receptors, $L_{Aeq\ 1\ h}$ levels will be markedly lower than 45 dB.

Although construction phase noise emissions will be short term, and will not exceed construction phase criteria, the applicant nonetheless proposes to apply the following mitigation measures throughout the construction phase:

- Construction operations will in general be confined to the period Monday-Friday 0700-1900 h, and Saturday 0800-1600 h.
- Where it is proposed to operate plant during the period 0700-0800 h at locations within 100 m of offsite receptors, standard 'beeper' reversing alarms will be replaced with flat spectrum alarms.
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant used onsite during the construction phase will be maintained in a satisfactory condition and in accordance with manufacturer recommendations. In particular, exhaust silencers will be fitted and operating correctly at all times. Defective silencers will be immediately replaced.
- Queuing of trucks near offsite receptors will be prohibited.
- Machinery not in active use will be shut down.
- A site representative will be appointed as a liaison officer with the local community.
- Where evening or night-time operations are required, local residents will be notified through the liaison officer.
- All complaints of noise received during the construction phase will be logged in a register and investigated immediately. Details of follow-up action will be included in the register.
- Where it is proposed to import potentially noisy plant to the site, the potential impact of noise emissions will be assessed in advance.
- Guidance set out in British Standard BS 5228-1:2009+A1:2014 with respect to noise control will be applied throughout the construction phase.

### Residual Impact

Noise impacts will be short term and imperceptible to slight. No vibration impacts are expected.

## 10.4.2.3 Site C Strategic Housing Development

### Pre Mitigation Impact

Site C (Strategic Housing Development) will consist of 360 residential homes across a mix of dwelling types, a creche and roadways. Construction will be undertaken on a phased basis, beginning within six months of grant of planning permission, and will be managed from a temporary site compound. Construction will be confined to daytime hours Monday-Friday, with some additional works on Saturday. Full details are presented in Chapter 4 of the EIAR.

Construction works will include the following activities, undertaken variously throughout the construction phase and in different areas of the site:

- Soil stripping & temporary stockpiling.
- Installation of temporary site compound.
- Provision of hardcore stone on onsite roadways.
- Excavation of foundations.

- Excavation of ground services trenches.
- Installation of services including sewerage network.
- Steel frame erection in larger buildings.
- Pouring & floating of concrete floor slabs.
- Block work and roof work.
- Building finishing (windows, doors, etc.).
- Internal fit out in buildings.
- Laying of asphalt.
- Site landscaping.

During the construction phase, the chief source of noise emissions will be plant used onsite. Construction plant required onsite at various stages of the project are listed in Table 10-13. The table includes details of typical sound pressure levels, taken from BS 5228-1:2009+A1:2014.

*Table 10-13 Expected Site C construction plant (dB at 10 m)*

| Plant | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | 8 kHz | Total $L_{Aeq}$ |
|---|---|---|---|---|---|---|---|---|---|
| Asphalt paving machine with tipper truck | 78 | 77 | 72 | 72 | 71 | 69 | 62 | 56 | 75 |
| Discharging concrete mixer truck | 80 | 69 | 66 | 70 | 71 | 69 | 64 | 58 | 75 |
| Tracked excavator (22 t) | 80 | 83 | 76 | 73 | 72 | 70 | 69 | 66 | 78 |
| Wheeled backhoe loader (9 t) | 68 | 67 | 63 | 62 | 62 | 61 | 54 | 47 | 67 |
| Consaw | 73 | 67 | 70 | 68 | 73 | 78 | 78 | 77 | 84 |
| Lifting platform | 78 | 76 | 62 | 63 | 60 | 59 | 58 | 49 | 67 |
| Mobile generator | 78 | 71 | 66 | 62 | 59 | 55 | 56 | 49 | 65 |
| Mobile crane (35 t) | 80 | 76 | 71 | 63 | 64 | 63 | 56 | 50 | 70 |
| Dumper | 84 | 81 | 74 | 73 | 72 | 68 | 61 | 53 | 76 |
| Vibro-roller | 88 | 83 | 69 | 68 | 67 | 65 | 62 | 59 | 74 |
| Telescopic handler | 85 | 79 | 69 | 67 | 64 | 62 | 56 | 47 | 71 |
| Truck (driving) | 73 | 78 | 78 | 78 | 74 | 73 | 68 | 66 | 80 |

Noise emissions arising during the construction phase of the Proposed Development will vary considerably due to several reasons:

- The site is relatively large. Emissions will arise from plant operating across the site, and thus the site will not constitute a single point source.
- The large construction area will result in differing propagation conditions with respect to receptors at different locations.
- The construction phase will last several years. During this time, plant associated with different activities will relocate around the site as required.

- Different plant will be required at different times, and construction operations will vary on a daily basis. There may be extended periods during the construction phase with minimal noise emissions.
- Each machine item may operate under different loading conditions or be in varying states of repair.
- Construction works may be concentrated for certain periods, followed by periods of inactivity. Localised works may require several hours of intense activity.
- During later stages of the construction phase, emissions from some operations will be screened by previously completed buildings.
- As buildings near completion, activity will gradually relocate indoors.
- A number of different construction firms are likely to be contracted, each using different plant.
- With respect to particular plant, the models selected will change depending on requirements. The method of construction may be modified shortly before commencement, resulting in the need to import different equipment. Construction projects tend to be fluid in nature, with plant requirements changing as the site is progressed and circumstances change on the ground. The need for specific plant may often be established only following the start of a project.

From the foregoing, it is clear that construction phase noise emissions will vary in time and location, and it is not possible to determine a single overall noise output figure for the construction phase. The most appropriate approach here is to assess a worst case scenario emission. An extreme worst case scenario consists of construction activity simultaneously occurring at the nearest points to offsite receptors, involving plant with the greatest noise output. In this scenario, operations may occur simultaneously at the western extremity, the eastern extremity, and midway along the southern boundary.

For the purposes of modelling, it is assumed that operations in each of the three zones will involve a tracked excavator, discharging mixer truck, consaw, dumper and telescopic handler in simultaneous use, at the nearest point of the works zone, and all positioned within a 100 m wide operations area. Such a scenario is unlikely to arise, but is applied here to represent an extreme worst case scenario.

Noise emissions from the above were modelled using DGMR iNoise v2022 software. Input parameters were as follows:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation Of Sound During Propagation Outdoors – Part 2 General Method Of Calculation* (1996).
- Hard ground assumed throughout (bare and compacted).
- No screening.
- Receiver height: 4 m.
- Plant output data taken from Table 10-11.
- 31.5 Hz levels (not provided in BS 5228) assumed to be same as 63 Hz levels.
- Plant on-times per hour: excavator (80 %), mixer truck (50 %), consaw (10 %).
- Dumper and handler movements continuous

The model output is shown in Figure 10-14. $L_{Aeq\ 1\ h}$ levels predicted at the nearest receptors, close to their facades, will be 53-54 dB. Levels at all other receptors will be lower. Predicted noise levels are much lower than construction phase noise limit criteria of 65 dB discussed above.

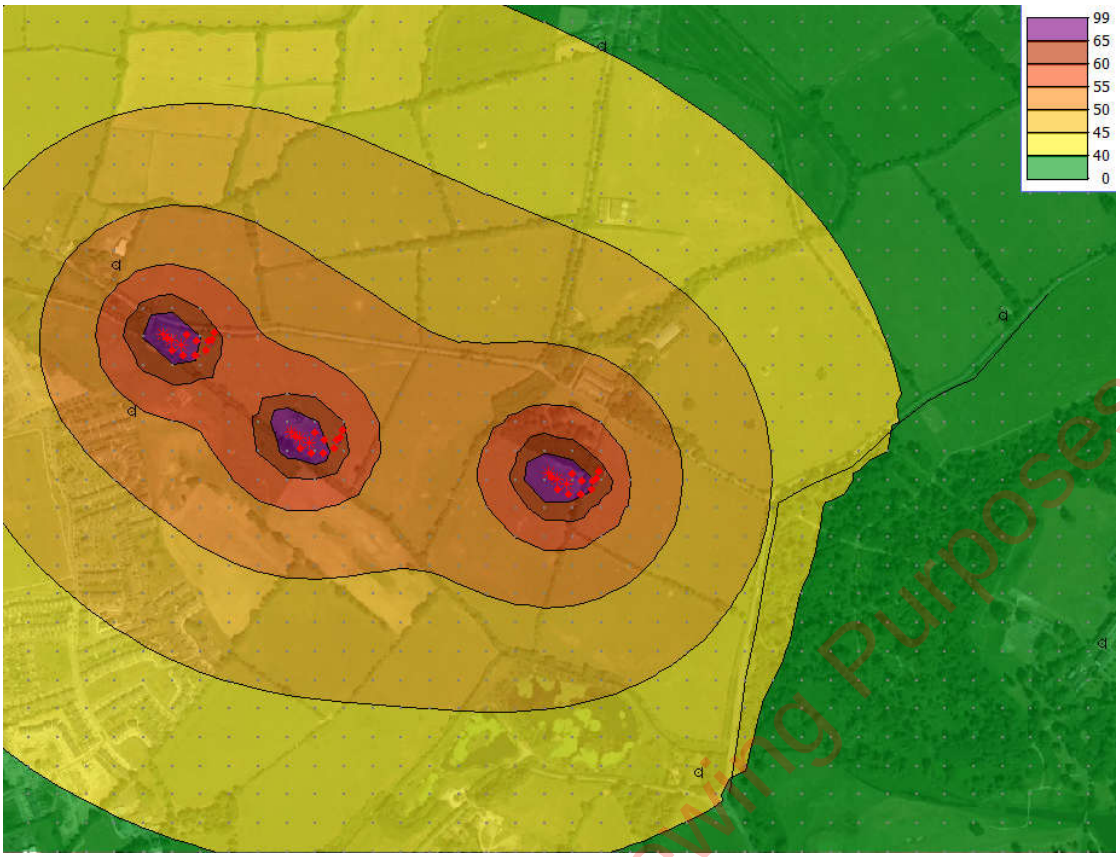



*Figure 10-14 Predicted Site C construction phase LAeq 1 h*

Throughout the construction phase, vehicles will arrive at, and depart from, the site during the working day. Vehicle movements will be associated with workers' arrival and departure, and delivery of materials. The approximate numbers of workers employed onsite over the entire construction period will fluctuate depending on schedules.

Personnel and deliveries will access the Proposed Development site via the surrounding road network, with the majority of vehicles expected to access the site via the R157. Construction traffic volumes presented in the Traffic Impact Assessment indicate that construction traffic volumes will be inconsequential in the context of existing traffic volumes. Thus, construction phase traffic noise impacts will be imperceptible.

Potential sources of ground borne vibration during the Site C construction phase are as follows:

- Delivery truck movements: Trucks may give rise to vibration at positions adjacent to the road. However, such emissions are typically imperceptible beyond 10 m, and are highly unlikely to be perceptible at dwellings alongside site access routes.
- Plant movements: The movement of plant onsite is not considered to constitute a source of ground borne vibration and is not listed in typical vibration documents such as BS 5228-2:2009. In addition, plant machinery used onsite is likely to be small to mid-sized, and similar to those used on other urban construction projects.
- Ground works: Excavation of trenches and pits for foundation and services will be required. These activities are not typically associated with offsite ground-borne vibration impacts. It is noted that piling is not proposed. In addition, rock breaking is unlikely to be required in relation to Sites A, B or C.

On the basis of the above, no construction vibration impacts are expected at offsite receptors.

### Proposed Mitigation Measures

Construction phase $L_{Aeq\ 1\ h}$ levels will not exceed the 65 dB criterion recommended by BS 5228-1:2009+A1:2014 with respect to construction activity, and the 70 dB National Roads Authority criterion relevant to the road construction. At most offsite receptors, $L_{Aeq\ 1\ h}$ levels will be markedly lower than 45 dB.

Although construction phase noise emissions will be short term, and will not exceed construction phase criteria, the applicant nonetheless proposes to apply the following mitigation measures throughout the construction phase:

- Construction operations will in general be confined to the period Monday-Friday 0700-1900 h, and Saturday 0800-1600 h.
- Where it is proposed to operate plant during the period 0700-0800 h at locations within 100 m of offsite receptors, standard 'beeper' reversing alarms will be replaced with flat spectrum alarms.
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant used onsite during the construction phase will be maintained in a satisfactory condition and in accordance with manufacturer recommendations. In particular, exhaust silencers will be fitted and operating correctly at all times. Defective silencers will be immediately replaced.
- Queuing of trucks near offsite receptors will be prohibited.
- Machinery not in active use will be shut down.
- A site representative will be appointed as a liaison officer with the local community.
- Where evening or night-time operations are required, local residents will be notified through the liaison officer.
- All complaints of noise received during the construction phase will be logged in a register and investigated immediately. Details of follow-up action will be included in the register.
- Where it is proposed to import potentially noisy plant to the site, the potential impact of noise emissions will be assessed in advance.
- Guidance set out in British Standard BS 5228-1:2009+A1:2014 with respect to noise control will be applied throughout the construction phase.

### Residual Impact

Noise impacts will be short term and imperceptible to not significant. No vibration impacts are expected.

## 10.4.2.4 MOOR

### Pre Mitigation Impact

The proposed MOOR will consist of a 1.5 km distributor road linking the R157 to the Moyglare Hall road. The MOOR will run through the site in a curve, connecting the R157 to a partially constructed road at Poundhill to the southwest. The MOOR will intercept the L2214 in the northern half of the site, The MOOR will also intercept the L6219. Here, however, the former will be given priority, and the L6219 will be realigned. The proposed development site will be served by a network of onsite roads connecting to the existing road network and the proposed MOOR.

Construction will be confined to daytime hours Monday-Friday, with some additional works on Saturday. Full details are presented in Chapter 4 of the EIAR. Construction of the proposed MOOR

will most likely require plant listed in Table 10-14. Plant noise levels are taken from BS 5228-1:2009+A1:2014.

*Table 10-14 Expected MOOR construction plant (dB at 10 m)*

| Plant | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | 8 kHz | Total $L_{Aeq}$ |
|---|---|---|---|---|---|---|---|---|---|
| Asphalt paving machine with tipper truck | 78 | 77 | 72 | 72 | 71 | 69 | 62 | 56 | 75 |
| Dozer | 83 | 81 | 76 | 77 | 82 | 70 | 65 | 58 | 83 |
| Tracked excavator (22 t) | 80 | 83 | 76 | 73 | 72 | 70 | 69 | 66 | 78 |
| Hydraulic breaker | 86 | 80 | 78 | 77 | 81 | 83 | 82 | 81 | 88 |
| Dump truck | 88 | 90 | 80 | 79 | 76 | 71 | 65 | 61 | 81 |
| Vibro-roller | 90 | 84 | 77 | 81 | 73 | 68 | 65 | 61 | 80 |
| Roller | 87 | 85 | 75 | 73 | 75 | 73 | 69 | 63 | 80 |
| Truck (driving) | 73 | 78 | 78 | 78 | 74 | 73 | 68 | 66 | 80 |

During the road construction phase, operations will initially consist of civil engineering works along the road route, followed by placement of hardcore and services, asphalt laying, and final landscaping. Works will occur over a narrow corridor. With respect to surrounding noise sensitive receptors, worst case scenario emissions will arise when localised works are undertaken close to their respective boundaries.

Construction noise emissions will vary in time and location, and it is not possible to determine a single overall noise output figure for the entire road construction project. The simplest approach is to assess worst case scenario noise emissions at the northern, eastern and western extents of the MOOR, as these locations are closest to offsite receptors. An extreme worst case scenario consists of simultaneous operation of the loudest plant at these three positions. For the purposes of modelling, the loudest plant likely to operate simultaneous are a dozer, excavator and breaker, and the model assumes that this cluster of plant will operate at the same time at the northern, eastern and western extents. In addition, the model assumes that several 6x6 dump trucks will track back and forth along the road corridor.

Noise emissions were modelled using DGMR iNoise v2022 software. Input parameters were as follows:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation Of Sound During Propagation Outdoors – Part 2 General Method Of Calculation* (1996).
- Hard ground assumed throughout (bare and compacted).
- No screening.
- Receiver height: 4 m.
- Plant output data taken from Table 10-12.
- 31.5 Hz levels (not provided in BS 5228) assumed to be same as 63 Hz levels.
- Plant on-times per hour: 100%.

The model output is shown in Figure 10-15. $L_{Aeq\ 1\ h}$ levels predicted at surrounding receptors (close to their respective facades) will be highest at the dwellings outside the northern boundary adjacent to the L2214, where $L_{Aeq\ 1\ h}$ levels will reach 59 dB. Levels at the dwellings near the southwest corner will reach 58 dB. Levels at all other receptors, including Carton House Hotel, will be considerably lower.

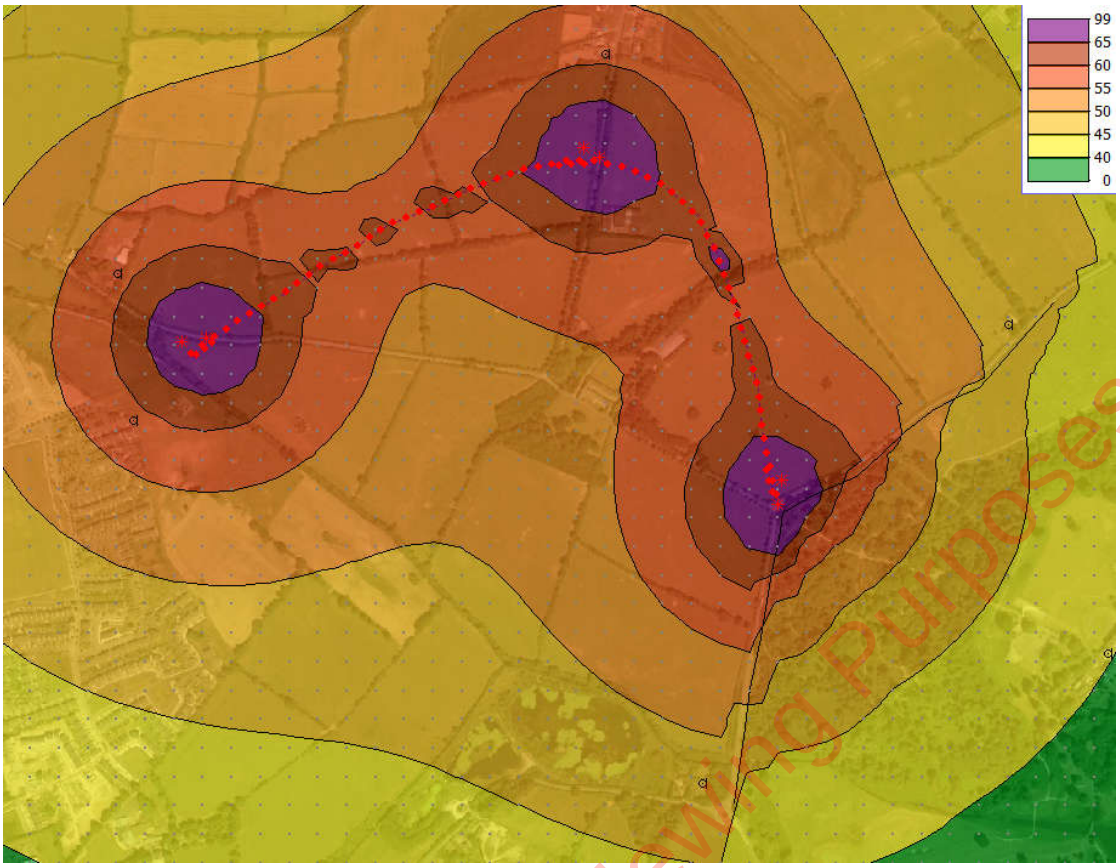



*Figure 10-15 Predicted MOOR construction phase LAeq 1 h*

During the road construction phase, a number of trucks will arrive regularly at the site, used to import stone and asphalt. The number of truck movements will be inconsequential in the context of existing traffic volumes, and it follows that impacts will be minimal at offsite receptors.

Construction of the road is not expected to give rise to measurable ground borne vibration beyond 50 m from the road corridor. The road will not run through any cuttings, and thus blasting will not be required. Plant movements along the corridor during construction are highly unlikely to give rise to vibration outside the corridor. While the vibro-roller will generate high levels of vibration at the point of operation, experience at other sites indicates that such vibration is typically immeasurable beyond 50 m.

At certain locations, chiefly where the proposed road will tie in to the existing network, breaking of rock and asphalt may be required. This will be carried out using a hydraulic breaker mounted on a tracked excavator. Breaking may give rise to vibration close to the breaking zone. The vibration tends to contain relatively little energy in the lower frequencies at which buildings and occupants are most vulnerable. In addition, higher frequencies attenuate more rapidly than low frequencies, thus minimising the impact zone. For this reason, most vibration guidance documents such as BS 5228-2:2009 ignore breaking vibration. Table 10-15 lists PPV levels measured at sites where hydraulic rock breaking has been undertaken. The range in levels noted reflects variations in equipment power and rock type.

*Table 10-15 Previously measured rock breaking PPV levels*

| Distance | 5 m | 10 m | 20 m | 50 m |
|---|---|---|---|---|
| PPV | 0.2-4.5 mm/s | 0.06-3.0 mm/s | 0.02-1.5 mm/s | 0.1-0.3 mm/s |

Breaking vibration levels quoted above are significantly lower than criteria listed in Tables 10-1, 10-2 and 10-3. Thus breaking, if required, is unlikely to give rise perceptible ground borne vibration at offsite receptors. It follows that road construction operations are unlikely to be perceptible offsite, or to cause cosmetic or structural damage to buildings.

## Proposed Mitigation Measures

Construction phase $L_{Aeq\ 1\ h}$ levels will not exceed the 65 dB criterion recommended by BS 5228-1:2009+A1:2014 with respect to construction activity, and the 70 dB National Roads Authority criterion relevant to the road construction of the section of the MOOR. At most offsite receptors, $L_{Aeq\ 1\ h}$ levels will be markedly lower than 55 dB.

Although construction phase noise emissions will be short term, and will not exceed construction phase criteria, the applicant nonetheless proposes to apply the following mitigation measures throughout the construction phase:

- Construction operations will in general be confined to the period Monday-Friday 0700-1900 h, and Saturday 0800-1600 h.
- Where it is proposed to operate plant during the period 0700-0800 h at locations within 100 m of offsite receptors, standard 'beeper' reversing alarms will be replaced with flat spectrum alarms.
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant used onsite during the construction phase will be maintained in a satisfactory condition and in accordance with manufacturer recommendations. In particular, exhaust silencers will be fitted and operating correctly at all times. Defective silencers will be immediately replaced.
- Queuing of trucks near offsite receptors will be prohibited.
- Machinery not in active use will be shut down.
- A site representative will be appointed as a liaison officer with the local community.
- Where evening or night-time operations are required, local residents will be notified through the liaison officer.
- All complaints of noise received during the construction phase will be logged in a register and investigated immediately. Details of follow-up action will be included in the register.
- Where it is proposed to import potentially noisy plant to the site, the potential impact of noise emissions will be assessed in advance.
- Where generators or compressors are required within 100 m of offsite receptors, or previously completed receptors onsite, these will be fitted with manufacturers' acoustic enclosures, or alternatively will be screened by a local acoustic screen or subsoil stockpile.
- Guidance set out in British Standard BS 5228-1:2009+A1:2014 with respect to noise control will be applied throughout the construction phase.

## Residual Impact

Construction phase activities associated with MOOR construction are not expected to give rise to perceptible ground borne vibration at offsite receptors. Construction traffic volumes are likely to be negligible in the context of existing traffic volumes on the surrounding road network.

Construction phase noise levels at all receptors due to onsite construction works will be considerably lower than the 65 dB criterion recommended by BS 5228-1:2009+A1:2014. Noise impacts will be imperceptible to not significant, and temporary.

### 10.4.2.5 Kildare Bridge

#### Pre Mitigation Impact

The proposed Kildare Bridge works will be located at the southeast corner of the Moygaddy Masterplan area. Construction will be confined to daytime hours Monday-Friday, with some additional works on Saturday. Full details are presented in Chapter 4 of the EIAR.

Bridge construction will most likely require plant listed in Table 10-16. Plant noise levels are taken from BS 5228-1:2009+A1:2014.

*Table 10-16 Expected Kildare Bridge construction plant (dB at 10 m)*

| Plant | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | 8 kHz | Total $L_{Aeq}$ |
|---|---|---|---|---|---|---|---|---|---|
| Asphalt paving machine with tipper truck | 78 | 77 | 72 | 72 | 71 | 69 | 62 | 56 | 75 |
| Discharging concrete mixer truck | 80 | 69 | 66 | 70 | 71 | 69 | 64 | 58 | 75 |
| Tracked excavator (22 t) | 80 | 83 | 76 | 73 | 72 | 70 | 69 | 66 | 78 |
| Consaw | 73 | 67 | 70 | 68 | 73 | 78 | 78 | 77 | 84 |
| Hydraulic breaker | 86 | 80 | 78 | 77 | 81 | 83 | 82 | 81 | 88 |
| Dump truck | 88 | 90 | 80 | 79 | 76 | 71 | 65 | 61 | 81 |
| Mobile crane (35 t) | 80 | 76 | 71 | 63 | 64 | 63 | 56 | 50 | 70 |
| Vibro-roller | 90 | 84 | 77 | 81 | 73 | 68 | 65 | 61 | 80 |
| Roller | 87 | 85 | 75 | 73 | 75 | 73 | 69 | 63 | 80 |
| Truck (driving) | 73 | 78 | 78 | 78 | 74 | 73 | 68 | 66 | 80 |

Two dwellings are located in proximity to these works, both located to the immediate west of the works zone. Modelling was undertaken in relation to bridge construction works involving simultaneous use of a tracked excavator, breaker and dump truck in a confined area near the bridge, these being the loudest sources likely to operate simultaneously.

Noise emissions were modelled using DGMR iNoise v2022 software. Input parameters were as follows:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation Of Sound During Propagation Outdoors – Part 2 General Method Of Calculation* (1996).
- Hard ground assumed throughout (bare and compacted).
- No screening.
- Receiver height: 4 m.
- Plant output data taken from Table 10-14.

- 31.5 Hz levels (not provided in BS 5228) assumed to be same as 63 Hz levels.
- Plant on-times per hour: 80%.

The model output is shown in Figure 10-16. $L_{Aeq\ 1\ h}$ levels predicted at the nearby dwellings will be 65-70 dB, being higher at the more easterly dwelling. Levels will not exceed the 70 dB criterion recommended in the National Roads Authority document *Good practice guidance for the treatment of noise during the planning of national road schemes* (2014) with respect to road projects.

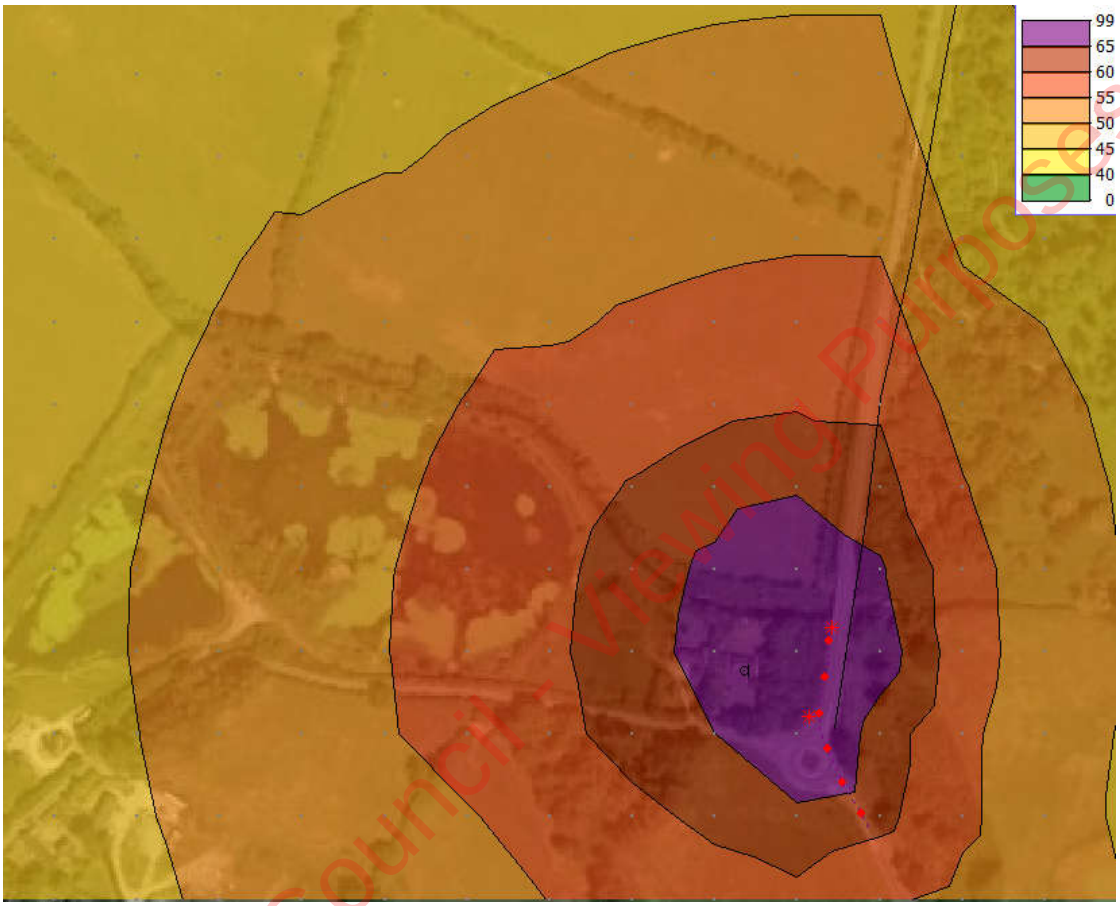



*Figure 10-16 Predicted Kildare Bridge construction phase LAeq 1 h*

Instillation of the proposed rising main will require road trenching works over a total distance of approximately 1 km. The route will directly pass several dwellings located adjacent to the public road, as well as residential estates to the southwest. Plant involved will include an excavator or backhoe loader, and a truck. A consaw will be required to cut the trench surface. A small roller will be required to consolidate backfill.

The rising main installation procedure will involve localised works moving linearly along the proposed route, with a typical progression rate of 100-200 m per day. Noise emissions will be localised to the active trenching area, and will move gradually along the route. Experience at other sites indicates that sound pressure levels within 20 m of the works zone will typically reach 65-70 dB at their highest, this being the typical separation distance to roadside receptors. These emissions will be audible at each receptor for several hours as the trenching operation moves past. Levels are highly unlikely to exceed the 70 dB criterion recommended by the NRA in relation to road projects.

The proposed realignment works and rising main installation may give rise to local ground borne vibration. Significant sources of construction vibration such as blasting and pile driving will not be required.

Experience with other construction projects suggests that PPV levels during road trenching works are highly unlikely to exceed 1 mm/s at a distance beyond 20 m. PPV levels will almost certainly be less than 1 mm/s at the nearest receptors to the proposed works zones. Such levels are likely to be undetectable, and will not damage buildings or structures.

### Proposed Mitigation Measures

Bridge construction phase $L_{Aeq\ 1\ h}$ levels will reach 65-70 dB at their highest at the nearest two dwellings. Levels will not exceed the 70 dB National Roads Authority criterion relevant to road construction.

Although construction phase noise emissions will be short term, and will not exceed the 70 dB criterion, the applicant nonetheless proposes to apply the following mitigation measures throughout the construction phase:

- Construction operations will in general be confined to the period Monday-Friday 0700-1900 h, and Saturday 0800-1600 h.
- Where it is proposed to operate plant during the period 0700-0800 h at locations within 100 m of offsite receptors, standard 'beeper' reversing alarms will be replaced with flat spectrum alarms.
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant used onsite during the construction phase will be maintained in a satisfactory condition and in accordance with manufacturer recommendations. In particular, exhaust silencers will be fitted and operating correctly at all times. Defective silencers will be immediately replaced.
- Queuing of trucks near offsite receptors will be prohibited.
- Machinery not in active use will be shut down.
- A site representative will be appointed as a liaison officer with the local community.
- Where evening or night-time operations are required, local residents will be notified through the liaison officer.
- All complaints of noise received during the construction phase will be logged in a register and investigated immediately. Details of follow-up action will be included in the register.
- Where it is proposed to import potentially noisy plant to the site, the potential impact of noise emissions will be assessed in advance.
- Where generators or compressors are required within 100 m of offsite receptors, or previously completed receptors onsite, these will be fitted with manufacturers' acoustic enclosures, or alternatively will be screened by a local acoustic screen or subsoil stockpile.
- Guidance set out in British Standard BS 5228-1:2009+A1:2014 with respect to noise control will be applied throughout the construction phase.

### Residual Impact

Noise impacts associated with bridge construction and road trenching are likely to be slight to moderate at nearby receptors. Impacts will be temporary. No vibration impacts are expected.

## 10.4.2.6 Moyglare Bridge

### Pre Mitigation Impact

The proposed Moyglare Bridge and Moyglare Hall road will be located at the southwest corner of the Moygaddy Masterplan area. Construction will be confined to daytime hours Monday-Friday, with some

additional works on Saturday. Full details are presented in Chapter 4 of the EIAR. Construction will most likely require plant listed in Table 10-17. Plant noise levels are taken from BS 5228-1:2009+A1:2014.

*Table 10-17 Expected Moyglare Bridge construction plant (dB at 10 m)*

| Plant | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | 8 kHz | Total $L_{Aeq}$ |
|---|---|---|---|---|---|---|---|---|---|
| Asphalt paving machine with tipper truck | 78 | 77 | 72 | 72 | 71 | 69 | 62 | 56 | 75 |
| Tracked excavator (22 t) | 80 | 83 | 76 | 73 | 72 | 70 | 69 | 66 | 78 |
| Discharging concrete mixer truck | 80 | 69 | 66 | 70 | 71 | 69 | 64 | 58 | 75 |
| Consaw | 73 | 67 | 70 | 68 | 73 | 78 | 78 | 77 | 84 |
| Hydraulic breaker | 86 | 80 | 78 | 77 | 81 | 83 | 82 | 81 | 88 |
| Dump truck | 88 | 90 | 80 | 79 | 76 | 71 | 65 | 61 | 81 |
| Mobile crane (35 t) | 80 | 76 | 71 | 63 | 64 | 63 | 56 | 50 | 70 |
| Vibro-roller | 90 | 84 | 77 | 81 | 73 | 68 | 65 | 61 | 80 |
| Roller | 87 | 85 | 75 | 73 | 75 | 73 | 69 | 63 | 80 |
| Truck (driving) | 73 | 78 | 78 | 78 | 74 | 73 | 68 | 66 | 80 |

Modelling was undertaken in relation to a likely worst case scenario involving simultaneous operation of a tracked excavator, discharging mixer truck, consaw and dumper in simultaneous use at the works zone. Noise emissions were modelled using DGMR iNoise v2022 software. Input parameters were as follows:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation Of Sound During Propagation Outdoors – Part 2 General Method Of Calculation* (1996).
- Hard ground assumed throughout (bare and compacted).
- No screening.
- Receiver height: 4 m.
- Plant output data taken from Table 10-11.
- 31.5 Hz levels (not provided in BS 5228) assumed to be same as 63 Hz levels.
- Plant on-times per hour: excavator (80 %), mixer truck (50 %), consaw (10 %).
- Dumper movements continuous

The model output is shown in Figure 10-17. $L_{Aeq\ 1\ h}$ levels predicted at the nearby dwellings will be 57 dB at dwellings to the northwest, and will reach 61 dB at the nearest dwellings across the river. Levels will not exceed the 70 dB criterion recommended in the National Roads Authority document *Good practice guidance for the treatment of noise during the planning of national road schemes* (2014) with respect to road projects.

Throughout the construction phase, vehicles will arrive at, and depart from, the site during the working day. Vehicle movements will be associated with workers' arrival and departure, and delivery of

materials. The approximate numbers of workers employed onsite over the entire construction period will fluctuate depending on schedules.

Personnel and deliveries will access the Proposed Development site via the surrounding road network, with the majority of vehicles expected to access the site via the R157. Construction traffic volumes presented in the Traffic Impact Assessment indicate that construction traffic volumes will be inconsequential in the context of existing traffic volumes. Thus, construction phase traffic noise impacts will be imperceptible.

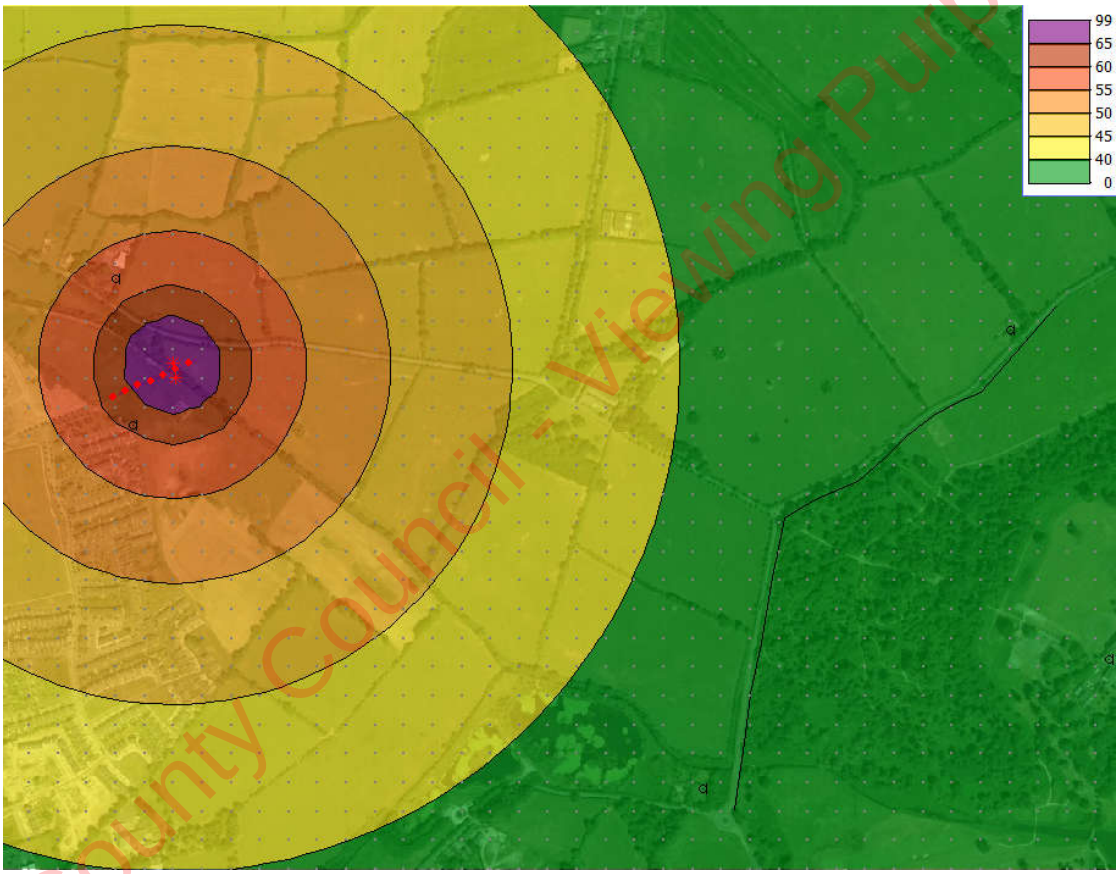



*Figure 10-17 Predicted Moyglare Bridge construction phase LAeq 1 h*

Potential sources of ground borne vibration during the Moyglare Bridge construction phase are as follows:

- Delivery truck movements: Trucks may give rise to vibration at positions adjacent to the road. However, such emissions are typically imperceptible beyond 10 m, and are highly unlikely to be perceptible at dwellings alongside site access routes.
- Plant movements: The movement of plant onsite is not considered to constitute a source of ground borne vibration and is not listed in typical vibration documents such as BS 5228-2:2009. In addition, plant machinery used onsite is likely to be small to mid-sized, and similar to those used on other urban construction projects.

- Ground works: Excavation of trenches and pits for foundation and services will be required. These activities are not typically associated with offsite ground-borne vibration impacts. It is noted that piling is not proposed. In addition, rock breaking is unlikely to be required in relation to Sites A, B or C.

On the basis of the above, no construction vibration impacts are expected at offsite receptors.

## Proposed Mitigation Measures

Bridge construction phase $L_{Aeq\ 1\ h}$ levels will reach 61 dB at their highest at the nearest dwellings. Levels will not exceed the 70 dB National Roads Authority criterion relevant to road construction.

Although construction phase noise emissions will be short term, and will not exceed the 70 dB criterion, the applicant nonetheless proposes to apply the following mitigation measures throughout the construction phase:

- Construction operations will in general be confined to the period Monday-Friday 0700-1900 h, and Saturday 0800-1600 h.
- Where it is proposed to operate plant during the period 0700-0800 h at locations within 100 m of offsite receptors, standard 'beeper' reversing alarms will be replaced with flat spectrum alarms.
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant used onsite during the construction phase will be maintained in a satisfactory condition and in accordance with manufacturer recommendations. In particular, exhaust silencers will be fitted and operating correctly at all times. Defective silencers will be immediately replaced.
- Queuing of trucks near offsite receptors will be prohibited.
- Machinery not in active use will be shut down.
- A site representative will be appointed as a liaison officer with the local community.
- Where evening or night-time operations are required, local residents will be notified through the liaison officer.
- All complaints of noise received during the construction phase will be logged in a register and investigated immediately. Details of follow-up action will be included in the register.
- Where it is proposed to import potentially noisy plant to the site, the potential impact of noise emissions will be assessed in advance.
- Where generators or compressors are required within 100 m of offsite receptors, or previously completed receptors onsite, these will be fitted with manufacturers' acoustic enclosures, or alternatively will be screened by a local acoustic screen or subsoil stockpile.
- Guidance set out in British Standard BS 5228-1:2009+A1:2014 with respect to noise control will be applied throughout the construction phase.

## Residual Impact

Noise impacts associated with bridge and Moyglare Hall road construction are likely to be imperceptible to slight at nearby receptors. Impacts will be temporary. No vibration impacts are expected.

## 10.4.3 Operational Phase

### 10.4.3.1 Site A Strategic Employment Zone

#### Pre Mitigation Impact

At the strategic employment zone, buildings will be used to provide office space, and thus all noise emissions will be internal. External noise emissions may arise from air handling units (AHUs) such as fans, vents and air conditioning cassettes installed on external walls. Emissions from these are highly unlikely to be audible beyond 20 m, and emissions will therefore be negligible.

External emissions will arise from vans and trucks associated with deliveries, and waste collection trucks. All such emissions are highly unlikely to be significant onsite or offsite. Onsite traffic speeds will be low, thus minimising tyre noise.

On the basis of the foregoing, it is highly unlikely that noise emissions from onsite sources will be audible beyond the site boundaries. It follows that these sources will not be audible at receptors in the surrounding area, and thus noise levels are likely to be considerably lower than criteria identified in Table 10-5. Given that emissions are highly unlikely to be audible at offsite receptors, no increase in baseline noise levels is expected, and thus impacts when assessed using BS 4142:2014 and EPA guidance will be imperceptible.

The proposed site layout will incorporate open spaces which will be grassed and planted with trees. It is likely that a maintenance contract will be awarded to one or more local landscaping companies. Maintenance activities undertaken at the proposed site will chiefly include regular mowing of open green areas. While mower emissions are likely to be audible at the nearest receptors, such emissions will blend into the urban soundscape, particularly during the summer when the daytime/evening noise environment in any urban area tends to include at least one mower audible in the distance at any time.

The Proposed Development once operational will give rise to increased traffic on the local road network. Noise impacts at offsite receptors attributable to car movements on roadways within Site A are expected to be imperceptible due to a combination of low traffic speeds, relatively low numbers of movements, screening by buildings and separation distance.

While impacts may arise at offsite dwellings due to increased traffic on public roads in the vicinity, the increase (652 daily movements) will be negligible in the context of existing and future offsite traffic road volumes.

#### Proposed Mitigation Measures

No mitigation measures are required in relation to the operational Site A.

#### Residual Impact

Noise impacts associated with onsite emissions including onsite traffic will be imperceptible at offsite receptors.

### 10.4.3.2 Site B Healthcare Facilities

#### Pre Mitigation Impact

Noise emissions at the healthcare zone will be chiefly internal, with external sources most likely consisting of AHUs. Emissions from these are highly unlikely to be audible beyond 20 m, and

emissions will therefore be negligible. External emissions will arise from vans and trucks associated with deliveries, and waste collection trucks. All such emissions are highly unlikely to be significant onsite or offsite. Onsite traffic speeds will be low, thus minimising tyre noise.

On the basis of the foregoing, it is highly unlikely that noise emissions from onsite sources will be audible beyond the site boundaries. It follows that these sources will not be audible at receptors in the surrounding area, and thus noise levels are likely to be considerably lower than criteria identified in Table 10-5. Given that emissions are highly unlikely to be audible at offsite receptors, no increase in baseline noise levels is expected, and thus impacts when assessed using BS 4142:2014 and EPA guidance will be imperceptible.

The proposed site layout will incorporate open spaces which will be grassed and planted with trees. It is likely that a maintenance contract will be awarded to one or more local landscaping companies. Maintenance activities undertaken at the proposed site will chiefly include regular mowing of open green areas. While mower emissions are likely to be audible at the nearest receptors, such emissions will blend into the urban soundscape, particularly during the summer when the daytime/evening noise environment in any urban area tends to include at least one mower audible in the distance at any time.

The Proposed Development once operational will give rise to increased traffic on the local road network. Noise impacts at offsite receptors attributable to car movements on roadways within Site B are expected to be imperceptible due to a combination of low traffic speeds, relatively low numbers of movements, screening by buildings and separation distance.

While impacts may arise at offsite dwellings due to increased traffic on public roads in the vicinity, the increase (803 daily movements) will be negligible in the context of existing and future offsite traffic road volumes.

#### Proposed Mitigation Measures

No mitigation measures are required in relation to the operational Site B.

#### Residual Impact

Noise impacts associated with onsite emissions including onsite traffic will be imperceptible at offsite receptors.

### 10.4.3.3 Site C Strategic Housing Development

#### Pre Mitigation Impact

Across Site C, noise emissions will consist of typical residential estate sources such as playing children, lawnmowers, heat pumps where installed, and car movements. Emissions will also arise from vans associated with deliveries, and waste collection trucks. All such emissions are highly unlikely to be significant onsite or offsite. Onsite traffic speeds will be low, thus minimising tyre noise. There will be no commercial emissions.

The proposed site layout will incorporate open spaces which will be grassed and planted with trees. It is likely that a maintenance contract will be awarded to one or more local landscaping companies. Maintenance activities undertaken at the proposed site will chiefly include regular mowing of open green areas. While mower emissions are likely to be audible at the nearest receptors, such emissions will blend into the urban soundscape, particularly during the summer when the daytime/evening noise environment in any urban area tends to include at least one mower audible in the distance at any time.

Noise impacts at offsite receptors attributable to car movements on roadways within the completed site are expected to be imperceptible due to a combination of low traffic speeds, relatively low numbers of movements, screening by buildings and separation distance. However, impacts may arise at offsite dwellings due to increased traffic on public roads in the vicinity. Dwellings most vulnerable here are located outside the western end of Site C.

A review of the traffic impact assessment report indicates that the number of daily vehicle movements generated by the fully completed development will be 1048 from residential areas. These will be dispersed across the day, and will arrive/depart to/from the site using different roads. The traffic assessment suggests that the Proposed Development will result in a minor increase in traffic volumes. As a worst cases scenario, it is likely that the project will result in a doubling of traffic volumes on some local roads in the vicinity of offsite receptors. Such a doubling will result in an increase of 3 dB in traffic noise levels. A 3 dB increase is generally considered to be the smallest change perceptible by the human ear. From Table 10-4 above, such increases will be borderline perceptible, and the resulting impact will be not significant.

An inward noise impact assessment is presented separately in Section 10.4.4.

#### Proposed Mitigation Measures

No mitigation measures are required in relation to the completed Site C, apart from those relating to inward noise impacts as discussed in Section 10.4.4 below.

#### Residual Impact

Noise impacts associated with onsite emissions including onsite traffic will be imperceptible at offsite receptors.

### 10.4.3.4 MOOR

#### Pre Mitigation Impact

Traffic volumes will be altered locally as a result of completion of the proposed MOOR, which will serve as a bypass around the northeastern side of Maynooth. Most traffic arising on the MOOR will consist of through traffic from the R148 and R157 on the eastern and southeastern side of the site, and Moyglare Road to the west side. Impacts may arise at offsite dwellings due to increased traffic on public roads in the vicinity. Dwellings most vulnerable here are a cluster located along the L2214 outside the northern tip of the Moygaddy Masterplan area, dwellings located outside the western end of Site C, a dwelling located adjacent to the R157 approximately 180m northeast of Site A, and two dwellings close to the southeast corner of Site B, on the opposing riverbank.

Although completion of the MOOR will result in an increase in local traffic, the MOOR will not reach full capacity until completion of Moyglare Bridge at its western end, addressed separately below. Prior to completion of Moyglare Bridge, and Kildare Bridge at its eastern end, MOOR traffic is likely to relocate from the existing L2214 and L6219. Increases in local traffic volumes are unlikely to be significant. Given that a doubling of traffic volumes is required before increased traffic noise is perceptible to the human ear, it is not expected that any changes in local traffic noise levels due to MOOR completion will be perceptible at the nearest receptors.

#### Proposed Mitigation Measures

No mitigation measures are warranted with respect to the completed MOOR in isolation.

### Residual Impact

Impacts associated with MOOR traffic noise will be imperceptible to not significant.

## 10.4.3.5 Kildare Bridge

### Pre Mitigation Impact

Completion of Kildare Bridge works in isolation is unlikely to result in any increases of significance in local road traffic volumes, or traffic noise levels affecting the nearest receptors. In addition, there will be no noise emissions from the completed pipeline.

### Proposed Mitigation Measures

No mitigation measures are required in relation to the bridge or the pipeline.

### Residual Impact

Given that the proposed pedestrian and cycle bridge is unlikely to result in any changes in traffic volumes, noise impacts will be imperceptible. Impacts associated with the completed pipeline will also be imperceptible.

## 10.4.3.6 Moyglare Bridge

### Pre Mitigation Impact

Completion of Moyglare Bridge will result in the introduction of traffic noise close to the northwest corner of Moyglare residential estate, 120 m from the nearest dwellings. However, the resulting increase in traffic noise levels will be minimal for two reasons:

- This area is currently subject to traffic noise from the L6219, which runs within 50 m of the proposed bridge.
- Noise emissions from the proposed bridge, in isolation, will be minimal, given its short span.

It follows that noise emissions from the proposed bridge will be negligible in the context of surrounding traffic noise levels.

### Proposed Mitigation Measures

No mitigation measures are required in relation to the proposed bridge.

### Residual Impact

Given that noise emissions associated with the proposed bridge will be negligible in the context of surrounding traffic noise, noise impacts will be imperceptible.

## 10.4.4 Cumulative Effects Resulting from Interactions between Various Elements of the Proposed Development

### Construction Phase

Construction phase noise emissions will vary, and it is not possible or practical to calculate a single sound power output figure for the entire site. With respect to surrounding noise sensitive receptors, worst case scenario emissions will arise when localised works are undertaken close to their respective boundaries. An extreme worst case scenario consists of construction activity simultaneously occurring at the nearest points to offsite receptors, involving plant with the greatest noise output. In this scenario, operations may occur simultaneously in six zones:

- Site A: At the western extremity, eastern extremity, and southern boundary.
- Site B: At the northeast and southeast corners.
- Site C: At the northern, eastern and southern corners.
- MOOR: Works along the route, concentrated near the L2214 & L2214-3.
- Kildare Bridge.
- Moyglare Bridge

For the purposes of modelling, it is assumed that works at Sites A, B and C will involve a tracked excavator, discharging mixer truck, consaw, dumper and telescopic handler in simultaneous use, at the nearest point of the works zone, and all positioned within a 100 m wide operations area. It is assumed that bridge works will involve simultaneous use of a tracked excavator, breaker and dump truck in a confined area near the bridges. MOOR works will involve dump trucks tracking back and forth, in addition to a tracked excavator. Such a scenario is unlikely to arise, but is applied here to represent an extreme worst case scenario.

Noise emissions from the above were modelled using DGMR iNoise v2022 software. Input parameters were as follows:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation Of Sound During Propagation Outdoors – Part 2 General Method Of Calculation* (1996).
- Hard ground assumed throughout (bare and compacted).
- No screening.
- Receiver height: 4 m.
- Plant on-times per hour: excavator (80 %), mixer truck (50 %), consaw (10 %).
- Dumper and handler movements continuous

The model output is shown in Figure 10-18. The highest $L_{Aeq\ 1\ h}$ levels during this worst case scenario will arise at the dwellings adjacent to Kildare Bridge, where levels will reach 70 dB at the easterly dwelling. Levels will reach 61 dB at the nearest dwellings at Moyglare Hall. Levels associated with road and bridge construction works will not exceed the 70 dB criterion recommended in the National Roads Authority document *Good practice guidance for the treatment of noise during the planning of national road schemes* (2014) with respect to road projects. Impacts associated with these works are likely to be slight to moderate, although temporary, and decreasing to imperceptible at more distant receptors. Impacts will be offset by improvements to local infrastructure.

Levels associated with Site A, Site B and Site C works will be lower than the construction phase noise criterion of 65 dB discussed above.

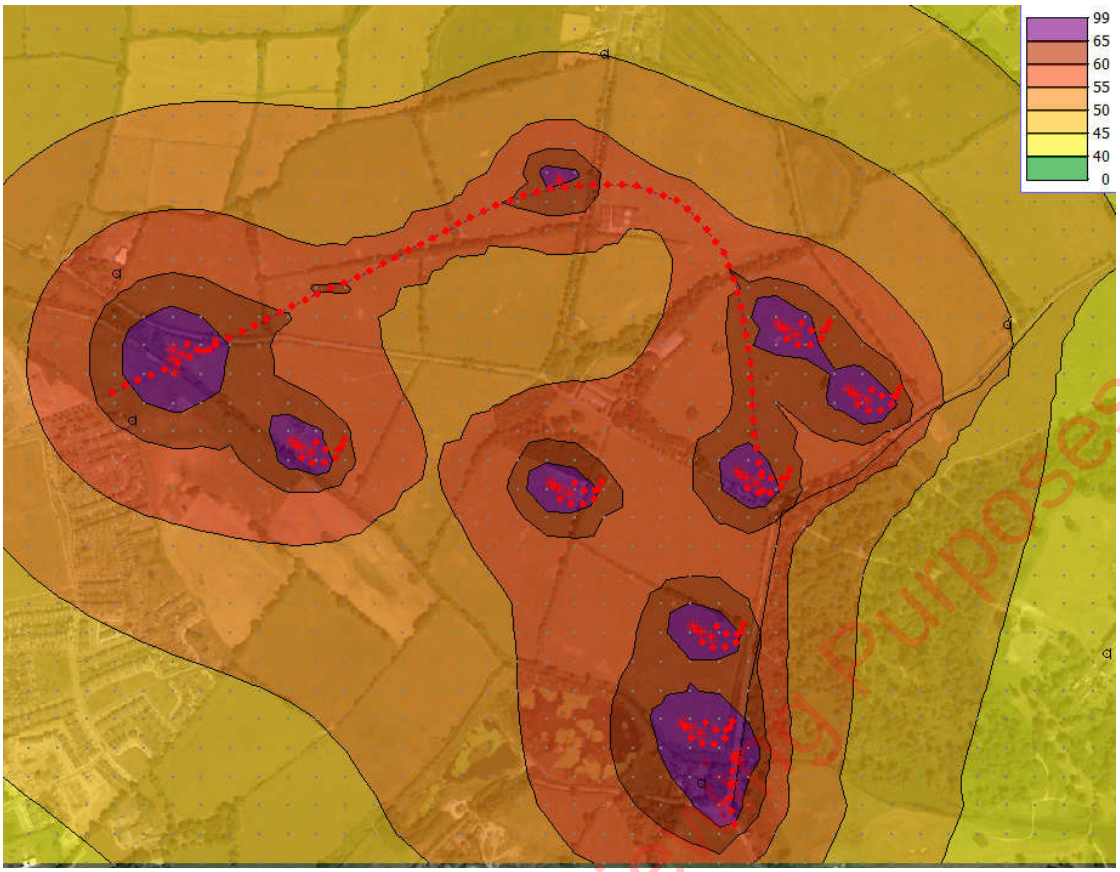



*Figure 10-18 Predicted cumulative construction phase LAeq 1 h*

With respect to rising main installation, impacts at local receptors will be significant, albeit on a particularly temporary basis, likely to last for several hours at most in proximity to any particular receptor. Levels will not exceed the 70 dB NRA criterion.

Throughout the construction phase, vehicles will arrive at, and depart from, the site during the working day. Vehicle movements will be associated with workers' arrival and departure, and delivery of materials. The approximate numbers of workers employed onsite over the entire construction period will fluctuate depending on schedules.

Personnel and deliveries will access the Proposed Development site via the surrounding road network, with the majority of vehicles expected to access the site via the R157. Construction traffic volumes presented in the Traffic Impact Assessment indicate that construction traffic volumes will be inconsequential in the context of existing traffic volumes. Thus, construction phase traffic noise impacts will be imperceptible.

Potential sources of ground borne vibration during the cumulative construction phase are as follows:

- Delivery truck movements: Trucks may give rise to vibration at positions adjacent to the road. However, such emissions are typically imperceptible beyond 10 m, and are highly unlikely to be perceptible at dwellings alongside site access routes.
- Plant movements: The movement of plant onsite is not considered to constitute a source of ground borne vibration and is not listed in typical vibration documents such as BS 5228-2:2009. In addition, plant machinery used onsite is likely to be small to mid-sized, and similar to those used on other urban construction projects.
- Ground works: Excavation of trenches and pits for foundation and services will be required. These activities are not typically associated with offsite ground-borne vibration

impacts. It is noted that piling is not proposed. In addition, rock breaking is unlikely to be required in relation to Sites A, B or C.

On the basis of the above, no construction vibration impacts are expected at offsite receptors.

### Operational Phase

No cumulative impacts are expected in relation to noise emissions from the completed Sites A, B and C. Noise emissions from these sites will be negligible. In contrast, cumulative emissions will arise from traffic using the completed MOOR and proposed bridges.

The Proposed Development once operational will give rise to increased traffic on the local road network. Traffic volumes will additionally be altered as a result of completion of the proposed MOOR, which will serve as a bypass around the northeastern side of Maynooth. Most traffic arising on the MOOR will consist of through traffic from the R148 and R157 on the eastern and southeastern side of the site, and Moyglare Road to the west side.

Noise impacts at offsite receptors attributable to car movements on roadways within the completed site are expected to be imperceptible due to a combination of low traffic speeds, relatively low numbers of movements, screening by buildings and separation distance. However, impacts may arise at offsite dwellings due to increased traffic on public roads in the vicinity. Dwellings most vulnerable here are a cluster located along the L2214 outside the northern tip of the Moygaddy Masterplan area, dwellings located outside the western end of Site C, a dwelling located adjacent to the R157 approximately 180m northeast of the proposed strategic employment zone, and two dwellings close to the southeast corner of the healthcare zone, on the opposing riverbank.

A review of the traffic impact assessment report indicates that the number of daily vehicle movements generated by the fully completed development will be 1048 from Site C, 803 from Site B and 652 from the Site A, totalling 2,503 daily traffic movements for the Proposed Development once operational.

While traffic noise levels at receptors across the surrounding area are likely to increase following completion of the project, much of this increase will be associated with traffic movements on the MOOR not related to the proposed development i.e. through traffic bypassing Maynooth centre. In addition, increases will arise due to continuing expansion of Maynooth, including ongoing residential developments such as Mariavilla to the southwest, as well as expansion at primary and secondary schools on Moyglare Road.

While the finished project will generate 2,503 vehicle movements each day, these will be dispersed across the wider site, and will arrive/depart to/from the site using different roads. Thus a proportion of the proposed traffic will use Moyglare Road, while other users are likely to use the R148 or R157. These roads will see increases by the design year 2039 regardless of whether the proposed development proceeds.

The traffic assessment suggests that the proposed development itself will result in a minor increase in traffic volumes, outside of increases unrelated to the project. This increase will be offset by reduced traffic speeds due to road realignment and speed restrictions. Moreover, certain road segments will see a reduction in traffic following completion of the MOOR road. As a worst cases scenario, it is likely that the project will result in a doubling of traffic volumes on some local roads in the vicinity of offsite receptors. Such a doubling will result in an increase of 3 dB in traffic noise levels. A 3 dB increase is generally considered to be the smallest change perceptible by the human ear. From Table 10-4 above, such increases will be borderline perceptible, and the resulting impact will be not significant.

## Inward impacts

Inward impacts relate to noise emissions received at a receptor due to emissions emitted by one or more sources. Emerging best practice provides for the design of new developments such that the occupants of residential elements are not subject to high internal noise due to existing (and potential future) external noise sources. Such sources usually consist of transport (road, rail and aircraft), and industry. Internal and external criteria considered appropriate to new residential developments are identified below. Impacts at the proposed creche are also assessed.

It is also considered prudent here to briefly assess potential inward impacts on the proposed office buildings and healthcare buildings. The objective here is to ensure that offsite road traffic noise levels do not render the development site unsuitable for the uses proposed, and that internal criteria in the proposed buildings can be readily achieved. These criteria are:

- Strategic Employment Zone: Daytime internal $L_{Aeq\ T}$ level of 45 dB.
- Healthcare Facilities: Daytime internal $L_{Aeq\ 1\ h}$ of 40 dB, and night-time $L_{Aeq\ 1\ h}$ level of 35 dB $L_{Aeq\ 1\ h}$, with night-time $L_{AFmax}$ recommendation of 45 dB.

At the Proposed Development site, inward noise will arise from the following sources:

- Onsite vehicle movements associated with residents at Site C, employees at Site A, and staff and visitors at Site B. Noise emissions from these will be relatively low at onsite receptors due to low traffic speeds. Inward noise impacts are typically associated with rolling noise at higher speeds, and such emissions are unlikely to arise onsite.
- Noise from delivery vehicles across the site and from waste management vehicles will be similarly low due to low speed.
- The nearest road of significance is the R157 which runs along the eastern side of the proposed development site. This road sees traffic throughout the day, evening and night.
- Local road L6219 runs through the site centre. This road will be realigned in the western margins of the site.
- Local road L2214 runs north from the L6219.
- Dillow's Road runs close near the southeast corner of the site over a short section before turning away from the site.
- The proposed MOOR road will run in a curve through the northern side of the site, connecting the R157 to Moyglare Hall, intercepting the L2214. The L6219 will be realigned to provide a staggered junction where it meets the MOOR.
- Inward traffic noise also arises from distant roads, including the R148, the M4, and roads around Maynooth.

All sources of inward noise are road traffic. Rail noise is not audible at the site. Aircraft noise is also not a major contributor. There are no industrial or commercial sources of significance locally.

Noise levels measured at the site indicate that $L_{den}$ levels close to the R157 and L6219 rise to 64-65 dB, with $L_{night}$ levels reaching 57-58 dB. Levels falls with increasing distance from surrounding roads, with $L_{den}$ and $L_{night}$ levels falling below 54 and 48 dB respectively in quieter parts. $L_{den}$ and $L_{night}$ levels across the site are currently lower than Noise Action Plan thresholds. While the $L_{night}$ level adjacent to the R6219 marginally exceeds the threshold, the level is likely to reduce following the proposed road realignment. The ProPG risk assessment concludes that the proposed development site is low risk across almost all areas, increasing to medium risk at positions immediately adjacent to the L6219 and R157. It is also concluded that night-time $L_{AFmax}$ levels require consideration at positions within approximately 100 m of public roads.

In order to quantify noise levels across the site, predictive modelling was undertaken using DGMR iNoise v2022 software. The following input parameters were applied:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation Of Sound During Propagation Outdoors – Part 2 General Method Of Calculation* (1996).
- Contours taken from mapping.
- Modelled heights: 2 m to allow comparison with measured values.
- Road traffic volumes taken from the traffic count data provided by the design team. The count measured daytime data only (0700-1900 h). Additional evening (1900-2300 h ) and night-time (2300-0700 h) flows of 10 % each were assumed.
- Light vehicle and HGV noise emissions taken from CNOSSUS-EU database.
- Traffic speeds 60-80 km/h, depending on road (adjusted where required to improve accuracy).

The model output is shown in Figures 10-19 and 10-20. Table 10-18 presents a comparison between modelled and measured $L_{den}$ and $L_{night}$ levels. Modelled levels at four measurement positions are within 2 dB of measured levels. At N5, the slightly larger discrepancy (2-3 dB) is most likely a result of the complicated topography in this area. The model is considered reasonably valid for the purposes of this assessment.

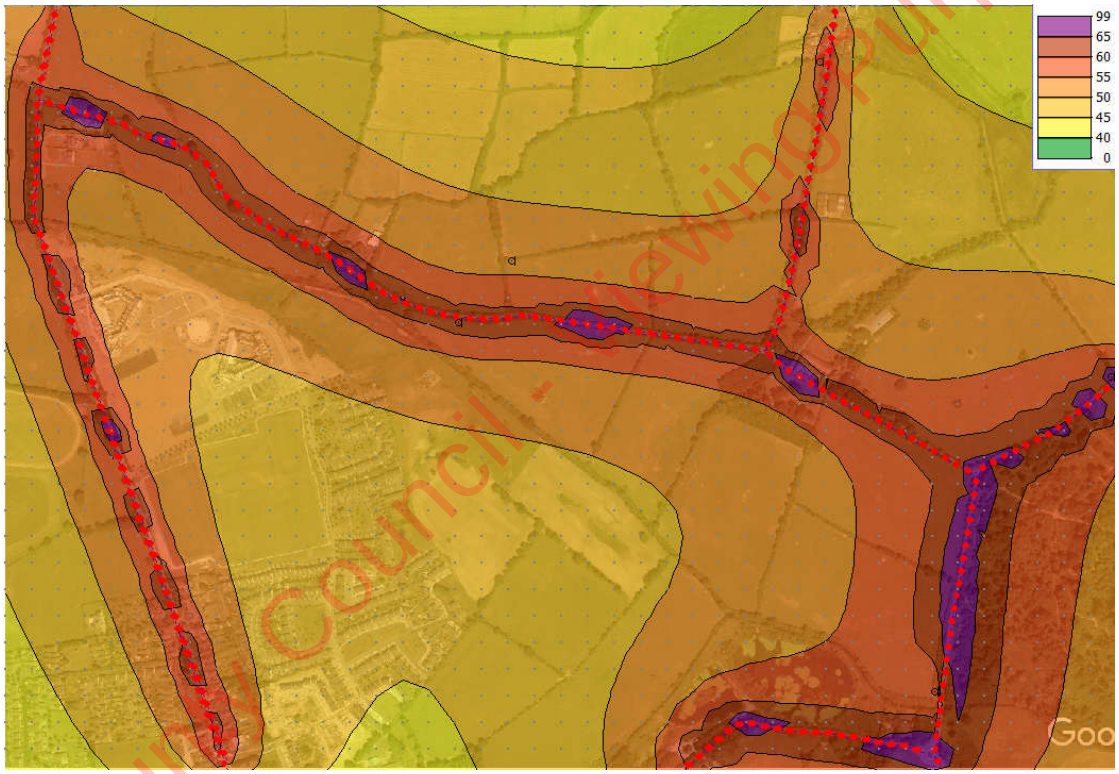



*Figure 10-19 Baseline Lden levels at 2 m*


*Figure 10-20 Baseline Lnight levels at 2 m*

*Table 10-18 Modelled and measured baseline Lden and Lnight levels.*

| Parameter | | N1 | N2 | N3 | N4 | N5 |
|---|---|---|---|---|---|---|
| $L_{den}$ | Measured | 64 | 53 | 56 | 65 | 54 |
| | Modelled | 65 | 54 | 55 | 65 | 57 |
| $L_{night}$ | Measured | 58 | 47 | 49 | 57 | 46 |
| | Modelled | 57 | 46 | 47 | 57 | 48 |

In order to provide for future increases in noise levels, the model was modified to include future traffic volumes (overall road traffic across the local area) predicted by the project traffic team with respect to the design year 2038/2039. Proposed buildings at Sites A, B and C were added to the model, as well as traffic on the proposed MOOR and bridges as completed. The model was run at a height of 4 m, to provide an indication of future traffic noise levels at upper floors of the proposed buildings. The model output is shown in Figures 10-21 to 10-25. Parameters modelled are $L_{Aeq\ 16\ h}$, $L_{night}$, $L_{den}$, daytime $L_{Aeq\ 1\ h}$ and night-time $L_{Aeq\ 1\ h}$, as these relate to identified criteria.


*Figure 10-21 Design year 2039 LAeq 16 h levels at 4 m*


*Figure 10-22 Design year 2039 Lnight levels at 4 m*


*Figure 10-23 Design year 2039 Lden levels at 4 m*

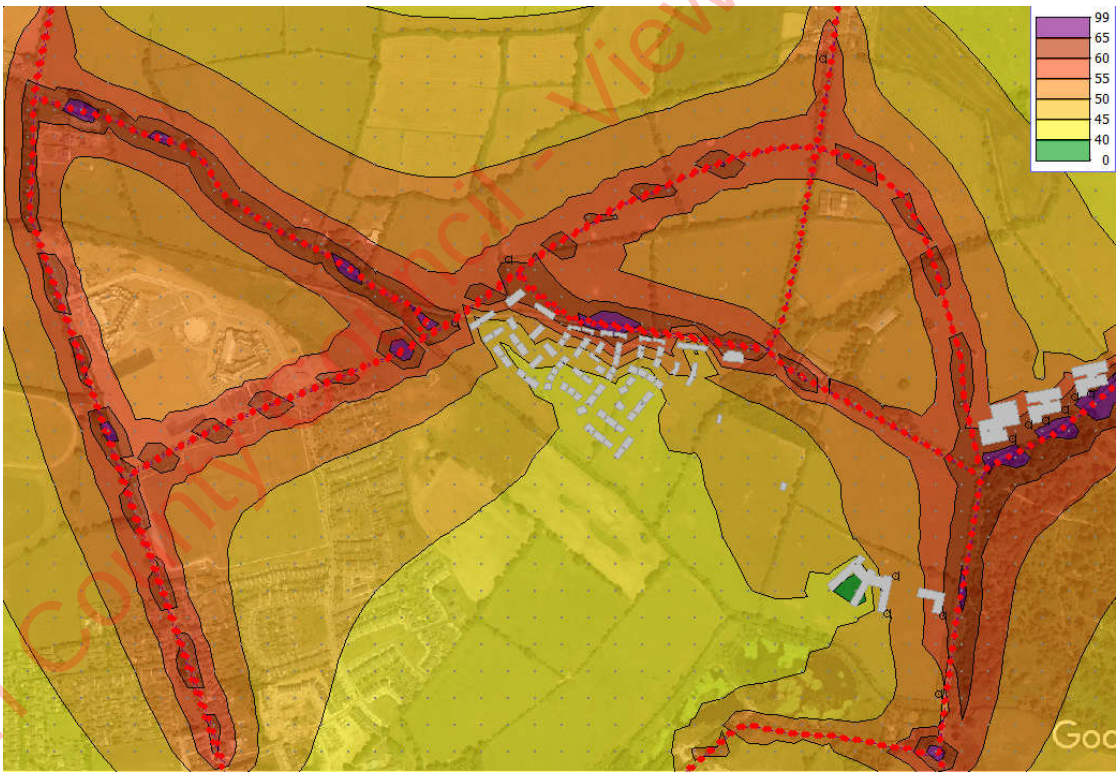



*Figure 10-24 Design year 2039 daytime LAeq 1 h levels at 4 m*


*Figure 10-25 Design year 2039 night-time LAeq 1 h levels at 4 m*

Noise levels predicted externally may be used to predict likely internal noise levels with offices and rooms at the proposed Strategic Employment Zone and the Healthcare Facilities. Calculations are presented in Table 10-19. The calculations assume a likely noise reduction of 25 dB through building glazing, which is expected to be the weakest façade element. The 25 dB attenuation factor is the minimum provided by standard thermal glazing. Calculations relate to a windows-closed scenario, as whole-building ventilation will be provided by mechanical units across the development. The strictest criteria relevant to the buildings are applied.

*Table 10-19 Likely internal LAeq 1 h levels at road-facing facades.*

| Building | | Incident $L_{Aeq\ 1\ h}$ | Minimum glazing Rw | Internal $L_{Aeq\ 1\ h}$ | Criterion $L_{Aeq\ 1\ h}$ | Achieved |
|---|---|---|---|---|---|---|
| SEZ – W building | Daytime | 62-64 | 25 | 37-39 | 45 | Yes |
| | Night-time | 54-55 | 25 | 29-30 | - | N/A |
| SEZ – central building | Daytime | 62-64 | 25 | 37-39 | 45 | Yes |
| | Night-time | 55-57 | 25 | 30-32 | - | N/A |
| SEZ – E building | Daytime | 65-68 | 25 | 40-43 | 45 | Yes |
| | Night-time | 55-61 | 25 | 30-36 | - | N/A |
| Nursing home | Daytime | 47-51 | 25 | 22-26 | 40 | Yes |
| | Night-time | 40-46 | 25 | 15-21 | 35 | Yes |
| | Daytime | 55-62 | 25 | 30-37 | 40 | Yes |

| | | | | | | |
|---|---|---|---|---|---|---|
| Primary care centre | Night-time | 48-54 | 25 | 23-29 | 35 | Yes |

On the basis of Table 10-19, it is evident that internal noise criteria in the proposed employment zone and healthcare zone will be readily achieved using standard thermal glazing, and that no additional noise treatment is required.

*Specialist Services Health Technical Memorandum 08-01: Acoustics* (UK Department of Health, 2013) recommends an internal $L_{AFmax}$ limit of 45 dB during night-time hours. Measured data suggest that external $L_{AFmax}$ levels due to passing traffic exceed 60 dB approximately 100 m into the site, and approach 80 dB within 10 m of the road network. This is of relevance solely to the proposed primary care centre which will lie within 30 m of the R157. The separation distance to the proposed nursing home will allow $L_{AFmax}$ levels to attenuate before reaching the façade.

Data indicate that typical external $L_{AFmax}$ levels at the road-facing façade of the primary care centre building will be approximately 72 dB. In order to reduce internal $L_{AFmax}$ levels below 45 dB at this façade, a minimum attenuation of 27 dB will be required. A minimum of 30 dB is recommended. At detailed design stage, it will be necessary to factor such an attenuation into glazing specifications. It will be prudent to extend this consideration to the north-facing façade as well as the south-facing façade of the southern wing. Standard glazing will provide sufficient attenuation at other facades, as well as facades on the western building.

### Site C Pro-PG Stage 1: Risk assessment

The model indicates that future noise levels, based on increased traffic and the introduction of MOOR traffic, will result in incident $L_{Aeq\ 16\ h}$ levels which reach 65-65 dB at units facing the L6219, and 59-61 dB at units facing the MOOR. Levels across the majority of the residential area will be lower.

$L_{night}$ levels across most of the residential area will be lower than 45 dB. Levels will be higher at facades close to the road network, reaching 60 dB at units facing the L6219. Units facing the MOOR road will receive $L_{night}$ levels approaching 55 dB. Most of the residential area will continue to be 'low risk' into the future, with risk increasing to 'medium' at units fronting the MOOR and the L6219.

ProPG notes that the risk category will be influenced by the number of $L_{AFmax}$ events which exceed 60 dB externally during night-time hours. Measured data suggest that $L_{AFmax}$ levels due to passing traffic exceed 60 dB approximately 100 m into the site, and the number of such movements considerably exceeds 10 during night-time hours. It follows that, bedrooms on façades which face the MOOR and the L6219 (eastern and western segments) are likely to receive more than 10 $L_{AFmax}$ events above 60 dB during night-time hours. Bedrooms of facades which are less than 90 degrees to these roads are likely to be similarly exposed. Such $L_{AFmax}$ events require consideration in the design of glazing requirements.

Bedrooms on other facades, and across the wider residential area, are likely to be satisfactory in this context, with any $L_{AFmax}$ events likely to be entirely due to traffic movements within the development site.

### Site C Pro-PG Stage 2 element 1: Good acoustic design process

In designing the overall site layout, the following principles of good acoustic design have been applied:

- The majority of the proposed residential units are located deep within the residential area, away from the public road network. A small proportion of facades will face the public road network.
- The proposed L6219 realignment where it meets the MOOR road will reduce traffic speeds and thus traffic noise.

- The proposed residential area incorporates several green spaces, in addition to large open expanses in the wider development.

### Site C Pro-PG Stage 2 element 2: Internal noise level guidelines

Internal noise criteria are discussed above. Assuming a 15 dB reduction through an open window (the conventionally accepted value, identified in *NANR116: Open/Closed Window Research – Sound Insulation Through Ventilated Domestic Windows* (prepared by the Napier University Building Performance Centre for DEFRA, 2007)), the following conclusions are drawn:

- Recommended internal daytime $L_{Aeq\ 16\ h}$ criteria are 35-40 dB. These criteria will be met with open windows where incident levels do not exceed 50-55 dB. The criteria will be met across most of the residential area with windows open.
- At dwellings and apartments fronting the L6219 and the MOOR, standard thermal glazing is likely to allow compliance with criteria with windows closed. However, it will be prudent to install marginally enhanced windows ($R_W$ value of 33) in living rooms, dining rooms and bedrooms which face the L6219 and the MOOR, or are within 90 degrees.
- The recommended $L_{night}$ criterion in bedroom is 30 dB. As before, this criterion will be met across most of the residential area with windows open. Installation of the marginally enhanced glazing identified in the previous paragraph will allow internal night-time criteria to be achieved at bedrooms facing the L6219 and the MOOR.
- Facades within 100 m of the L6129 and the MOOR will be exposed to more than 10 $L_{AFmax}$ events at night which exceed 60 dB. The World Health Organisation (1999) recommends that $L_{AFmax}$ levels in bedrooms should not exceed 45 dB to prevent sleep disturbance. Where the number of events exceeds 10 per night, the objective is thus to ensure than internal $L_{AFmax}$ levels with windows closed remain below 45 dB. Standard thermal glazing will reduce internal $L_{AFmax}$ levels below 45 dB at almost all bedrooms across the site, including most units within the 100 m corridor along the L6219 and the MOOR. At units directly fronting these roads, external $L_{AFmax}$ levels may reach 80 dB, and standard thermal glazing will be insufficient. Morover, the $R_W$ 33 dB recommendation above will also be insufficient, and it will be necessary to further increase $R_W$ values here. A conservative $R_W$ value of 38 dB is recommended at bedrooms within 20 m of the L6219 and the MOOR. Standard thermal glazing will be sufficient at other facades.

At site C, operational phase mitigation required onsite relates solely to inward impacts associated with L6219 and MOOR traffic noise. Internal $L_{Aeq\ T}$ criteria will be met at most residential units using standard thermal glazing. However, certain facades will require enhanced glazing to meet ProPG and BS 8233:2014 criteria. The facades in question are shown in Figure 10-26. At these façades, it is proposed to install glazing with a minimum $R_W$ value of 33 dB in living rooms and dining rooms, and 38 dB on bedrooms. Standard glazing will suffice in kitchens, bathrooms, hallways and stairwells. Table 10-20 shows recommended glazing specifications, along with ventilation requirements.

Table 10-20 specifications are readily achievable, and a number of suppliers offer suitable products. It is necessary that the glazing $R_W$ value is guaranteed by the window supplier rather than by the individual glazing and frame manufacturers. Potential suppliers should be advised that levels in each octave band should be achieved as a minimum. Compliance with the overall $R_W$ value should only be assessed by reference to the $R_W+C_{tr}$ value, typically 4-5 dB higher than the $R_W$ value alone.

*Table 10-20 Site C glazing and ventilation requirements at facades shown in Figure 10-26*

| Band | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz | Total |
|---|---|---|---|---|---|---|---|---|---|
| Dining & living glazing | 15 dB | 17 dB | 21 dB | 30 dB | 38 dB | 36 dB | 35 dB | 35 dB | 33 dB $R_W$ |
| Dining & living trickle vent | 36 dB | 36 dB | 34 dB | 31 dB | 34 dB | 38 dB | 38 dB | 38 dB | 35 dB Dn,e |
| Bedroom glazing | 25 dB | 28 dB | 28 dB | 34 dB | 40 dB | 41 dB | 43 dB | 45 dB | 38 dB |
| Bedroom trickle vent | 35 dB | 40 dB | 38 dB | 32 dB | 47 dB | 53 dB | 53 dB | 53 dB | 38 dB Dn,e |

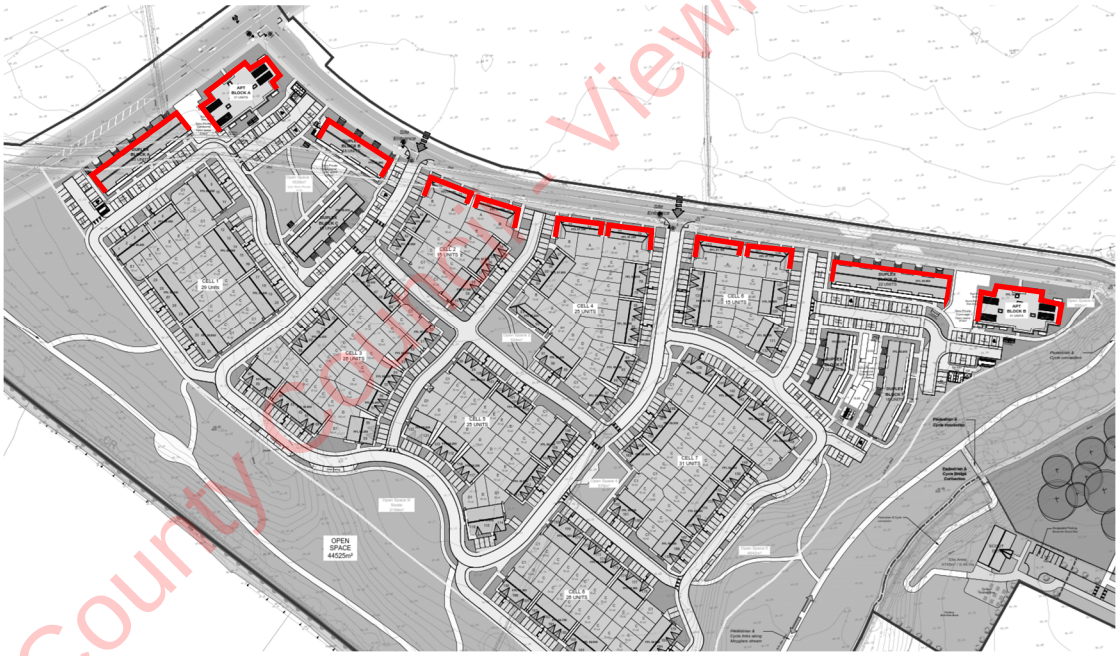


*Figure 10-26 Site C facades requiring enhanced glazing (shown red)*

External amenity areas will be satisfactory in the context of WHO and ProPG criteria. At the proposed creche, received $L_{Aeq\ 16\ h}$ levels will be satisfactory in the context of Technical Guidance Document TGD-021-5, and specific mitigation measures are not required. Standard thermal glazing is expected to be sufficient to meet an internal ambient $L_{Aeq\ 30\ min}$ criterion of 35 dB.

At Sites A and B, operational phase mitigation required onsite relates to road-facing facades of the proposed primary care centre, where moderately enhanced glazing will be required to reduce internal $L_{AFmax}$ levels (with windows closed) below 45 dB. The facades in question are shown in Figure 10-27. At these façades, it will be necessary to install glazing with a minimum $R_W$ value of 33 dB in rooms

which will see night-time use (other than common areas such as canteens, bathrooms, hallways and stairwells.

The $R_W$ 33 dB specification is readily achievable, and a number of suppliers offer suitable products. It is necessary that the glazing $R_W$ value is guaranteed by the window supplier rather than by the individual glazing and frame manufacturers. Compliance with the overall $R_W$ value should only be assessed by reference to the $R_W+C_{tr}$ value, typically 4-5 dB higher than the $R_W$ value alone.

*Figure 10-27 Primary care centre facades requiring enhanced glazing (shown red)*

## Site C Pro-PG Stage 2 element 3: External amenity area noise assessment

BS 8233:2014 recommends that $L_{Aeq\ 16\ h}$ levels should ideally not exceed 50-55 dB in external amenity areas. This criterion will be met in rear gardens of all housing units. The criterion will be exceeded at the balconies of both proposed apartment buildings, where $L_{Aeq\ 16\ h}$ levels will reach 62 dB at balconies overlooking the MOOR and L6219.

Where $L_{Aeq\ 16\ h}$ levels in amenity areas exceed 50-55 dB, BS 8233:2014 states that:

> *'These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited.'*

In this regard, ProPG adds:

> *'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, protected, publically 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 residential area will incorporate a number of onsite open green spaces, all within several minutes' walk. The spaces will include a large riverside area extending along the entire southern side of the residential area, as well as a landscaped public part at the eastern end of the area. Furthermore, the public part will extend northeast into the amenity and tourism element of the Moygaddy Masterplan area. These areas will be contiguous, and will be linked by a network of paths. Residents of all units,

including apartment buildings, will therefore benefit from provision of an extensive open, accessible and quiet onsite realm. On this basis, noise levels in amenity areas including apartment balconies will be satisfactory.

### Site C Pro-PG Stage 2 element 4: Assessment of other relevant issues

Other issues assessed, as recommended by ProPG, include the following:

- Compliance with relevant national and local policy: The most relevant policies are those set out in the County Meath Noise Action Plan. The plan proposes that mitigation will be applied where $L_{den}$ levels exceed 70 dB, and $L_{night}$ levels exceed 57 dB. Onsite $L_{den}$ noise levels do not exceed the 70 dB criteria, and are not expected to exceed them in the future. $L_{night}$ levels are also lower than the 57 dB criterion across most of the site, although will marginally exceed this limit along the L6219 in the future. The local authority may consider mitigation measures with respect to the L6219 in the future, including measures to reduce traffic speed.
- Magnitude and extend of compliance with ProPG: $L_{Aeq\ 16\ h}$ and $L_{night}$ levels in almost all proposed units will meet identified criteria without specific acoustic mitigation measures. Measures required relate solely to units fronting the L6219 and the MOOR, and are discussed below.
- Likely occupants of the development: The proposed development is expected to be occupied by a typical sample of the population, and is unlikely to see a predominance of one particularly sensitive group.
- Acoustic design versus unintended adverse consequences: No adverse consequences have been identified.
- Acoustic design versus wider planning objectives: No issues have been identified.

At the proposed creche, incident $L_{Aeq\ 16\ h}$ levels will be considerably lower than the 51-55 dB range suggested by Technical Guidance Document TGD-021-5.

## 10.4.5 Cumulative In-Combination Effects (Proposed Development & developments located within the area)

### Construction Phase

Potential cumulative noise impacts may arise during the construction phase due to possible overlap of onsite construction activity with the construction phase of offsite residential developments to the west and south.

$L_{Aeq\ 1\ h}$ levels at offsite dwellings near the western and southern boundaries of the Proposed Development site will be lower than the identified 65 dB criterion during onsite construction. Levels at two dwellings near Kildare Bridge will not exceed the 70 dB NRA criterion applicable to road projects.

In the event that other construction projects are undertaken in the surrounding area while construction at the Proposed Development site is underway, offsite receptors may be simultaneously subject to noise emissions from all concurrent projects. An entirely worst-case scenario would result in a doubling of noise levels at receptors where construction activities are underway at more than one local site. Although such a scenario and such an increase is unlikely, this assumption provides an entirely worst-case scenario which simplifies assessment. In this scenario, a doubling of noise levels would result $L_{Aeq\ 1\ h}$ levels which remain lower at all times than 65 dB at all receptors apart from the two dwellings

adjacent to Kildare Bridge. On this basis, it is concluded that cumulative $L_{Aeq\ 1\ h}$ levels due to concurrent construction activities across the surrounding area including the Proposed Development site are highly likely to remain below the 65 dB criterion recommended by BS 5228-1:2014.

At the dwellings adjacent to Kildare Bridge, $L_{Aeq\ 1\ h}$ levels due to bridge works may approach 70 dB, and these works are likely to dominate the local soundscape when present. Where other works are undertaken in the local area, $L_{Aeq\ 1\ h}$ levels attributable to same would be required to exceed 60 dB before combined levels would exceed 70 dB. It is highly unlikely that any works would arise in the local area which would give rise to $L_{Aeq\ 1\ h}$ levels over 60 dB at the two dwellings adjacent to Kildare Bridge, and thus cumulative levels include bridge works would be highly unlikely to increase over the 70 dB NRA criterion.

### Operational Phase

With respect to potential cumulative impacts associated with the operational phase of the Proposed Development, such impacts relate only to traffic noise. Cumulative impacts may arise from road traffic associated with the proposed Strategic Housing Development, Strone and Healthcare Facilities, as well as the complete delivery of the MOOR and developments across the remainder of the Moygaddy Masterplan area subject to separate future planning applications. Increases in road traffic on the surrounding road network due to other developments in the local area will also contribute to cumulative noise impacts.

A review of the traffic impact assessment report indicates that the number of daily vehicle movements generated by the fully completed Moygaddy Masterplan developments, as envisaged, will be 803 from Site B, 652 from Site A, 1048 from Site C, as well as an additional 7400 movements from the remainder of the proposed Masterplan area in the design year 2038-2039. Only a small proportion of these will arise from the Proposed Development subject to the current planning applications considered within this EIAR.

While traffic noise levels at receptors across the surrounding area are likely to increase following completion of the project, much of this increase will be associated with traffic movements on the MOOR not related to the Proposed Development i.e., through traffic bypassing Maynooth centre. In addition, increases will arise due to continuing expansion of Maynooth, including ongoing residential developments such as Mariavilla to the southwest, as well as expansion at primary and secondary schools on Moyglare Road.

While the finished Masterplan project will generate 9,913 vehicle movements each day, these will be dispersed across the wider site, and will arrive/depart to/from the site using different roads. Thus, a proportion of the proposed traffic will use Moyglare Road, while other users are likely to use the existing R148 or R157. These roads will see increases by the design year 2038-2039 regardless of whether the Proposed Development proceeds or not.

The overall Moygaddy Masterplan will result in a doubling of traffic volumes on the road network in the vicinity of offsite receptors in the local area. Such a doubling will result in an increase of 3 dB in traffic noise levels. A 3 dB increase is generally considered to be the smallest change perceptible by the human ear (see Table 10-4 above). Such increases will be imperceptible, and the resulting impact will be an imperceptible to not significant negative impact.

## 10.5 Residual Impacts

### 10.5.1 Population & Human Health

The assessment of impacts on human health is typically undertaken by reference to WHO guidance, which has been revised over the last four decades according as noise and health studies have been published. The WHO currently recommends the following:

- In residential settings, a daytime/evening $L_{Aeq\ 16\ h}$ level of 50 dB is an indicator of moderate annoyance.
- A night-time $L_{Aeq\ 8\ h}$ level of 45 dB is recommended to prevent sleep disturbance.
- With respect to short term impulsive sources, the WHO recommends a night-time $L_{Amax}$ limit of 60 dB outside bedroom windows during night-time hours.

Impacts assessed above may be reviewed in light of the WHO recommendations, as follows:

- Following completion and occupation of the completed development, daytime and night-time WHO criteria are not expected to be exceeded at any offsite receptor as a result of onsite emissions.
- Traffic noise arising from public roads in the vicinity will increase slightly as a result of the proposed development. Increases will also arise due to completion of the MOOR, which will be used by traffic bypassing Maynooth. The increase will be slight, and unlikely to be higher than 3 dB at local receptors outside the site boundary.
- With respect to inward impacts, external noise levels will be generally satisfactory in the context of WHO. However, residential units close to the L6219 and the MOOR will be exposed to $L_{Aeq\ 16\ h}$ and $L_{Aeq\ 8\ h}$ levels which exceed WHO criteria. Nonetheless, internal noise levels at these units will be satisfactory, subject to installation of marginally enhanced glazing required to attenuate $L_{Aeq\ 16\ h}$, $L_{Aeq\ 8\ h}$ as well as $L_{AFmax}$ events.
- At the primary care centre, noise levels will be satisfactory in the context of WHO criteria, subject to installation of marginally enhanced glazing required to attenuate $L_{Amax}$ events at road-facing facades.

On this basis, it is considered that there will be no adverse noise impact on the local population or on human health.

### 10.5.2 Overall Residual Impacts

Following completion, noise emissions arising within the completed development will be identical in character to emissions arising across the nearby fringes of Maynooth. Emissions will be urban-residential in character, and will not give rise to offsite impacts.

Noise impacts at offsite receptors attributable to vehicle movements on roadways within the completed site will be imperceptible. While increases in traffic on the surrounding road network will arise as a result of the development, much of the increase will be attributable to traffic using the proposed MOOR which will benefit the wider town. Increases associated with onsite traffic directly will be less than 2 dB, resulting in noise impacts at nearby receptors which are imperceptible. Increases associated with the MOOR will be approximately 3 dB at most, resulting in noise impacts at nearby receptors which are imperceptible to not significant.

At the completed development, inward noise emissions will arise from the surrounding road network, including the MOOR. The future noise risk is low across most of the site when assessed using ProPG guidance, increasing to medium at units directly fronting the MOOR road and the L6219. These properties will benefit from moderately enhanced glazing on units facing these roads. Road-facing

facades at the primary care centre will also benefit from moderately enhanced glazing in order to attenuate night-time $L_{AFmax}$ levels.

Noise levels in amenity areas and at the proposed creche will be lower than relevant criteria. Apartment residents will benefit from onsite green spaces, thus offsetting traffic noise levels on balconies facing roadways.

EPA document *Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports* (2022) sets out a scheme by which environmental noise impacts may be assessed. Operational phase environmental impacts are assessed in this regard in Table 10.21. This assessment scheme is not applicable to inward noise impacts, which are assessed separately through the ProPG procedure set out above.

*Table 10-21 Assessment of offsite noise impacts from completed development*

| Criterion | Impact at offsite receptors |
|---|---|
| Quality of effects | Activities within the development: Neutral effects<br><br>Onsite traffic: Imperceptible effects<br><br>MOOR & bridge traffic: Negative effects |
| Significance of effects | Activities within the development: Imperceptible effects<br><br>Onsite traffic: Imperceptible effects<br><br>MOOR & bridge traffic: Imperceptible to not significant effects |
| Extent & context of effects | Activities within the development: Minimal extent, as almost all onsite sources will be inaudible offsite. Effects will conform with baseline environment which is urban-fringe in character.<br><br>Onsite traffic: Extent extends throughout surrounding area. Effects will conform with baseline soundscape which is dominated by road traffic.<br><br>MOOR & bridge traffic: Extent extends throughout surrounding area. Effects will conform with baseline soundscape which is dominated by road traffic. |
| Probability of effects | Activities within the development: Effects likely to occur<br><br>Onsite traffic: Effects likely to occur<br><br>MOOR & bridge traffic: Effects likely to occur |
| Duration & frequency of effects | Activities within the development: Permanent, irreversible, daily<br><br>Onsite traffic: Permanent, irreversible, daily<br><br>MOOR & bridge traffic: Permanent, irreversible, daily |
| Types of effects | Indirect effects: None identified at offsite receptors<br><br>Cumulative effects: Discussed below |

| | |
|---|---|
| | Do-nothing effects: None identified at offsite receptors<br>Worst case effects: None identified at offsite receptors<br>Indeterminable effects: None identified at offsite receptors<br>Irreversible effects: Effects will be irreversible<br>Residual effects: None identified at offsite receptors<br>Synergistic effects: None identified at offsite receptors |

### 10.5.3 Monitoring

It is not considered necessary to undertake environmental noise or vibration monitoring during the construction phase or post-completion at offsite receptors. However, it is considered prudent to undertake vibration monitoring at Moygaddy House and the ancillary stone buildings during periods when ground works are being undertaken within 100 m. Monitoring will be undertaken by reference to British Standard BS 5228-2:2009+A1:2014 Code Of Practice For Noise And Vibration Control On Construction And Open Sites – Part 2: Vibration (2014) and Measurement And Assessment Of Ground borne Noise And Vibration (Association Of Noise Consultants (2012). The purpose of this monitoring will be to ensure that PPV levels at the structures do not exceed criteria set out in Tables 10-2 and 10-3 above.

## 10.6 Glossary

Ambient: Total noise environment at a location, including all sounds present.

A-weighting: Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq\ T}$, $L_{AF10\ T}$, etc.

Background level: A-weighted sound pressure level of residual noise exceeded for 90 % of time interval T. Denoted $L_{AF90\ T}$.

Broadband: Noise which contains roughly equal energy across frequency spectrum. Does not contain tones, and is generally less annoying than tonal noise.

Decibel (dB): Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub. Throughout this report noise levels are presented as decibels relative to 20 µPa.

$D_{n,e}$ (dB): Insulation value provided by trickle vent.

Effect: Consequence of an impact.

Emissions: Noise originating from source under consideration, spreading spherically, hemispherically or otherwise into surrounding environment.

Fast response: 0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10\ T}$, $L_{AF90\ T}$, etc.

Free field: Measurement position removed from acoustically reflective surfaces other than ground.

Frequency: Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.

Hertz (Hz): Unit of frequency measurement.

Immissions: Inward noise received at receptor, whether from all sources (ambient) or source under consideration (specific).

Impact: Change resulting from an action, such as implementation of a project.

Impulse: Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.

Incident level: Noise level at façade or other structure which would arise if façade was absent. Thus ignores façade reflections. May be measured directly, or calculated from measurements at specified distance from façade.

Interval: Time period T over which noise parameters are measured at position. Denoted by T in $L_{Aeq\ T}$, $L_{AF90\ T}$, etc.

$L_{Aeq\ T}$: Equivalent continuous sound pressure level during interval T, effectively representing average A-weighted noise level of ambient noise environment.

$L_{AF90\ T}$: Sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.

$L_{AFmax}$: Maximum A-weighted sound pressure level occurring during measurement interval.

$L_{day}$: The A-weighted long term average incident sound pressure level determined over all the daytime periods of a year, where the daytime period is typically 0700-1900 h.

$L_{den}$: Day-evening-night noise level. Calculated from separate $L_{day}$, $L_{evening}$ and $L_{night}$ levels using formula specified in EU Directive 2002/49/EC.

$L_{evening}$: The A-weighted long term average incident sound pressure level determined over all the evening periods of a year, where the evening period is typically 1900-2300 h.

$L_{night}$: The A-weighted long term average incident sound pressure level determined over all the night-time periods of a year, where the night-time period is typically 2300-0700 h.

Noise sensitive location: Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.

Octave band: Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit.

Peak particle velocity (PPV): Rate of change of displacement of particles in solid medium due to vibration, measured as mm/s. Usually used to assess vibration in relation to activities such as blasting as correlates well with human perception of vibration and property damage.

Residual level: Noise level remaining when specific source is absent or does not contribute to ambient.

$R_w$: Overall sound reduction index provided across a range of frequencies, determined from laboratory measured sound insulating properties of material or building element in each frequency band.

Sound pressure: Deviation over ambient atmospheric pressure due to passing sound wave. Human ear is sound pressure detector, and thus acoustic parameters ultimately relate to sound pressure. Sound pressure level is ratio of measured sound pressure to reference value.

Soundscape: Acoustic environment as perceived, experienced or understood by listeners, taking context into account.

Specific level: $L_{Aeq\ T}$ level produced by specific noise source under consideration during interval T, measured directly or by estimation or calculation.

Tone: Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.