9.0 NOISE AND VIBRATION

9.1 INTRODUCTION

This chapter of the EIAR has been prepared by Byrne Environmental Consulting Ltd to identify and assess the potential noise and vibrational impacts associated with a proposed development at City Quay, Dublin during both the Construction and Operational Phases of the development.

This chapter includes a comprehensive description of the receiving ambient noise climate in the vicinity of the subject site; a description of how the construction and operational phases may impact the existing ambient noise climate, the mitigation measures that shall be implemented to control and minimise the impact that the development may have on existing ambient noise levels.

The mitigation measures designed for the development shall demonstrate how the development shall be constructed and operated in an environmentally sustainable manner in order to ensure its minimal impact on the receiving noise climate and at any existing or future receptors in the vicinity of the development site.

9.1.1 Statement of Authority

Ian Byrne MSc. Environmental Protection, Dip Environmental & Planning Law, Member of the Institute of Acoustics, is the Principal Environmental Consultant of Byrne Environmental Consulting Ltd and prepared all aspects of this EIAR Chapter. Ian Byrne has over 26 years' experience in the monitoring and assessment of noise and vibration impacts associated with construction and operation phases of residential, commercial and industrial developments may have on the receiving environment.

Based on academic qualifications and professional experience, Ian Byrne is defined as a "Competent Person" as defined in the EPA's 2016 Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).

9.2 STUDY METHODOLOGY

The general assessment methodology of the potential noise and vibrational impacts that the proposed development will have on the receiving environment has been prepared in accordance with:

- Environmental Impact Assessment of Projects: Guidance on the preparation of the
- Environmental Impact Assessment Report (European Commission, 2017); Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022); and
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018);
- BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration;
- BS 4142: 2014: Methods for Rating and Assessing Industrial and Commercial Sound;
- BS (2014). BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise;
- BS (2014). BS 5228-2:2009+A:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration;
- EPA (2020). EPA Maps [Online] Available from gis.epa.ie/EPA Maps;
- ISO (2016). ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures;
- UK Department of Transport (1998). Calculation of Road Traffic Noise;
- UKHA (2020). Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA111 Noise and Vibration Revision 2;
- DCC Good Practice Guide for Construction and Demolition.

The study has been undertaken with consideration of the following;

1. An environmental noise survey has been undertaken at the subject site in order to characterise the existing baseline noise environment.

2. A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development.

3. Predictive noise calculations have been performed at the nearest sensitive receptors to the development site.

4. A schedule of site-specific mitigation measures has been proposed to reduce the identified potential outward impacts relating to noise and vibration.

9.2.1 Noise Assessment Methodology

9.2.1.1 Baseline Environment

The baseline noise environment in the vicinity of the proposed development site has been defined by field surveys conducted during September 2024 at site boundaries adjacent to existing residential development. Sound level measurements were conducted in favourable weather conditions when there was no precipitation and when mean windspeeds were <5m/sec.

The existing ambient noise climate in the vicinity of the site has been characterised with information obtained from site specific baseline noise surveys conducted in the vicinity of the closest noise sensitive receptors to the subject site. Baseline noise surveys were conducted in accordance with *ISO 1996-1: 2017: Acoustics – Description, measurement and assessment of environmental noise.*

9.2.1.2 Impact Assessment Methodology

The impact of the proposed development has been determined through prediction of future noise levels associated with the scheme using established calculation techniques.

Construction noise and vibration impacts have been assessed in accordance with Transport Infrastructure Irelands (TII) guidance document Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014). Indicative construction noise calculations have been undertaken using the methodology set out in BS 5228 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise 2009+A1 2014.

Impacts associated with road traffic movements on the development when operational have been assessed with regard to the TII Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014). UK Department of Transport (Welsh Office) - Calculation of Road Traffic Noise [CRTN] and the Highways Agency Design Manual for Roads and Brides Part 7 HD 213/11 – Revision 1 Noise and Vibration.

9.2.2 Construction Noise Impact Assessment Methodology

The construction noise limits, which are presented in Table 9.1 represent a reasonable compromise between the practical limitations in a construction project, and the need to ensure an acceptable noise level for the nearby residents and other sensitive receptors including amenity space. Table 9.1 specifies the recommended Project Noise Limit Criteria in accordance with the ABC Method contained in *BS 5228 – 1:2009+A1 2014 Code of practice for noise and vibration control on open sites: Part 1 Noise*. Noise limit criteria are based on the noise measured at the external façade of a receptor.

9.2.2.1 BS 5228 ABC Method

This method defines how existing ambient noise levels at a noise sensitive receptor (NSR) is categorised (A, B or C) with regard to the existing ambient noise climate in the absence of construction noise. An associated noise limit value is then applied to the NSR. If the noise limit value is exceeded, there is a significant effect at the external façade of the NSR.

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 9.1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors.

Table 9.1. BS5228-2014 Construction Phase Noise Limit Criteria

Construction Phase	Noise Limit Criteria			
Period	**Time Period**	**Category A dB(A)**	**Category B dB(A)**	**Category C dB(A)**
Monday to Friday - Daytime	07:00hrs – 9:00hrs	65	70	75
Saturday - Daytime	07:00hrs – 3:00hrs	65	70	75
Evenings & Weekends - Daytime	19:00hrs – 3:00hrs	55	60	65
Nightime	23:00hrs – 7:00hrs	45	50	55

Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5 dB. If the construction noise exceeds the appropriate category value, then a significant effect is deemed to occur. It should be noted that this assessment method is only valid for residential properties and if applied to commercial premises without consideration of other factors may result in an excessively onerous thresholds being set.

9.2.2.2 Proposed Construction Noise Limit Value

The proposed construction noise limit value at local NSR's in proximity of the site has been determined to be 75dB(A) $L_{Aeq,\ 11\text{-}hr}$ based on the results of the baseline noise survey data and with regard to Table 9.1. This limit value is in accordance with Dublin City Council's *Air Quality and Noise Control Unit's Good Practice Guide for Construction and Demolition.*

9.2.2.3 Construction Traffic Noise Assessment Methodology

The *Design Manual for Rods and Bridges (DMRB)(UKHA 2020)* provides guidance on the likely effect of construction traffic noise as detailed in Table 9.2.

Table 9.2. Likely effect with change in noise level associated with construction traffic

Construction Traffic	Likely Effect
Magnitude of Impact	**Increase in Traffic Noise dB(A)**
Negligible	<1.0
Minor	1.0 – 3.0
Moderate	30. – 5.0
Major	>5.0

9.2.3 Construction Vibration Impact Assessment Methodology

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV) measured in in mm/sec.

Construction impacts have been assessed in accordance with *BS 7385-2:1993 – Evaluation and Measurement for Vibration in Buildings: Part 2 – Guide to Damage Levels from Groundborne Vibration* and *BS 5228 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration 2009+A1 2014.*

Table 9.3 details the limits above which cosmetic damage could occur for transient vibration. Minor damage is possible at vibration magnitudes which are greater than twice those shown in Table 9.3, and major damage to a building structure would only generally occur at values greater than four times the tabulated values. These values only relate to transient vibration. If there is a continuous vibration, the guide values shown in Table 9.3 shall be reduced by up to 50%

Table 9.3. Transient vibration guide values for cosmetic damage

Type of building	PPV (mm/s) in frequency range of predominant pulse	
	4-15Hz	15Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	15mm/s at 4Hz increasing to 20mm/s at 15Hz.	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above.

Table 9.4, reproduced from *BS 5228 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration 2009+A1 2014* outlines the vibration levels (in terms of PPV) from construction activities and their likely effect on humans.

Table 9.4. Guidance on the effect of construction vibration levels on humans

Vibration Level (PPV)	Effect
0.14mm/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.
0.30mm/s	Vibration might be just perceptible in residential environments.
1.0mm/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.
10mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

9.2.3.1 Proposed Construction Vibration Limit Value

Table 9.5 details the proposed construction phase vibration limit values

Table 9.5. Proposed vibration limit values

Construction Traffic	Likely Effect
Receptor	**PPV (mm/sec)**
City Quay School	1.0
All other receptors	7.5

9.2.4 Operational Phase Noise Impact Assessment Methodology

British Standard BS 4142 Methods for rating and assessing industrial and commercial sound (2014) is an appropriate standard to assess the impact of a new noise source. In this assessment the commercial aspect of the development has the potential to generate mechanical noise from mechanical plant including Air Handling Units and Compressors. BS4142 details the methodology for assessing the impact of a specific noise source with respect to the increase in the existing ambient noise climate at an NSR. The following definitions are detailed in BS4142:

“Specific sound level, LAeq, Tr” is equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T. This level has been determined with reference to manufacturers information for specific plant items.

“Rating level” LAr,Tr is the specific noise level plus adjustments for the character features of the sound (if any), and;

"Background noise level" is the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T. This level is expressed using the LA90 parameter. These levels were measured as part of the baseline survey.

The assessment procedure in BS4142: 2014 is as follows:

1. determine the specific noise level;
2. determine the rating level as appropriate;
3. determine the background noise level, and;
4. subtract the background noise level from the specific noise level in order to calculate the assessment level.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific source will have an adverse impact or a significant adverse impact. A difference of +10 dB or more is likely to be an indication of a significant adverse impact. A difference of around +5 dB is likely to be an indication of an adverse impact, dependent on the context. Where the rated plant noise level is equivalent to the background noise level, noise impacts are typically considered to be neutral.

9.2.5 Operational Phase Traffic Noise Impact Assessment Methodology

The impact assessment criteria associated with operational road traffic noise as defined in Design Manual for Rods and Bridges (DMRB)(UKHA 2020) is detailed Table 9.6 below. This guidance allows the assessment of the likely long-term operational traffic effects to be established.

Table 9.6. Likely Impact associated with change in traffic noise levels

Change in sound level (dBA)	Subjective reaction	Impact	EPA Glossary of Effects
0	None	No Change	Neutral
0.10 - 2.9	Imperceptible	Negligible	Imperceptible
3 – 4.9	Perceptible	Minor	Slight
5 – 9.9	Doubling of loudness	Moderate	Moderate
>10	Over a doubling of loudness	Major	Significant

9.3 THE EXISTING RECEIVING ENVIRONMENT (BASELINE SCENARIO)

9.3.1 Description of the existing receiving environment

The location of the proposed development is shown in Figure 8.1 below. The lands primarily comprise the former City Arts Centre Building and associated hard standing and is currently being used as a car-park. The site is bounded to the north by City Quay, to the west by Moss Street and the George's Quay office development, and to the south by Gloucester Street South. The City Quay National school, St. Mary's pre-school and Citytest Health Check building adjoin the eastern boundary of the site with the Immaculate heart of Mary church and the Grant Thornton office building located further east of the site. The Staycity Aparthotel is located south of the site off Moss Street.

The area is which the site is located is within Dublin City and the existing ambient noise climate is dominated by road traffic noise throughout the day and remains dominant during the nighttime period. There are no sources of industrial or commercial noise in proximity to the site.

Train movements on the Dublin Loop Line incorporating Tara Street Station c. 400m west of the site also contribute to the noise climate at the subject site.

9.3.2 Baseline Noise Survey Results

Baseline noise measurements were conducted on 23rd September 2024 at four locations as shown in Figure 9.1 below and as described in Table 9.7 below. Noise monitoring surveys were conducted under free-field conditions at a height of approximately 1.5m above ground and approximately 3.5m away from reflecting surfaces for a period of 1-hour during the daytime (0700hrs-19:00hrs) and for 15-minute periods during the nighttime period (23:00hrs – 07:oohrs) at each location in order to obtain detailed noise data and assess the existing noise climate at closest noise sensitive receptors to the proposed development site. The results of the baseline noise measurements are detailed in Table 9.8.

Table 9.7. Baseline noise measurement locations

Baseline Noise	Measurement Locations
Receptor	**Location**
City Quay National School	Adjacent eastern site boundary
St. Mary's Pre-School	Adjacent northeastern site boundary
Staycity Apart Hotel	Opposite southern site boundary
Georges Quay Office Block	Opposite western site boundary

Figure 9.1. Image showing baseline noise measurement locations

Table 9.8. Baseline Noise Measurement Results

Location/Time	LAeq	LA90	LA10	LAFmax	Observed Noise
N1 Day 08:15	66	61	68	79	Road & Rail Noise
N1 Night 11:25	63	59	66	77	Road & Rail Noise
N2 Day 10:10	72	68	73	85	Road & Rail Noise
N2 Night 11:55	68	65	70	79	Road & Rail Noise
N3 Day 11:30	70	66	72	88	Road & Rail Noise
N3 Night 12:35	67	64	70	81	Road & Rail Noise
N4 Day 12:45	69	65	71	87	Road & Rail Noise
N4 Night 01:05	66	63	68	84	Road & Rail Noise

The results of the daytime and nighttime baseline noise survey indicate the relatively high levels of ambient noise at the closest receptors to the subject site with the primary noise sources observed to be road and rail traffic and with occasional contributions from emergency vehicle sirens.

The noise levels are typical of a city location and the EPA's Round 4 noise mapping (2024) as presented in Figures 9.2-9.5 show the Lden and Lnight noise levels associated with both road and rail traffic in the subject area.

Glossary of Acoustic parameters

LAeq: The equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.
LA10: The sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.
LA90: The sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.
LAmax: The instantaneous maximum sound level measured during the sample period.
Lden Day-evening-night level. It is a descriptor of noise level based on energy equivalent noise level (Leq) over a whole day with a penalty of 10 dB(A) for night time noise (23.00-7.00) and an additional penalty of 5 dB(A) for evening noise (i.e. 19.00-23.00).
Lnight, 8-hr is the equivalent continuous sound level between23:00hrs – 07:00hrs

Figure 9.2. Image showing Lden 65-69dB Road Traffic

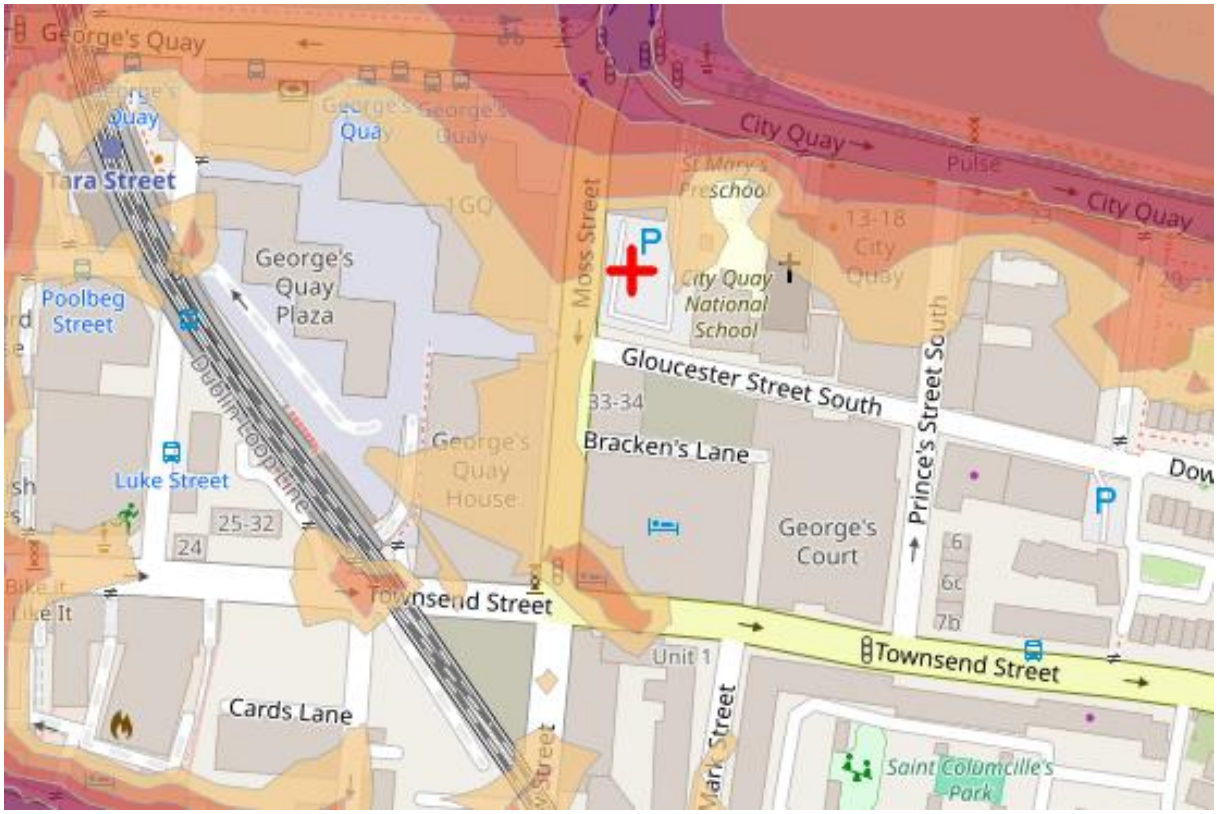


Figure 9.3. Image showing Lnight 60-64dB Road Traffic

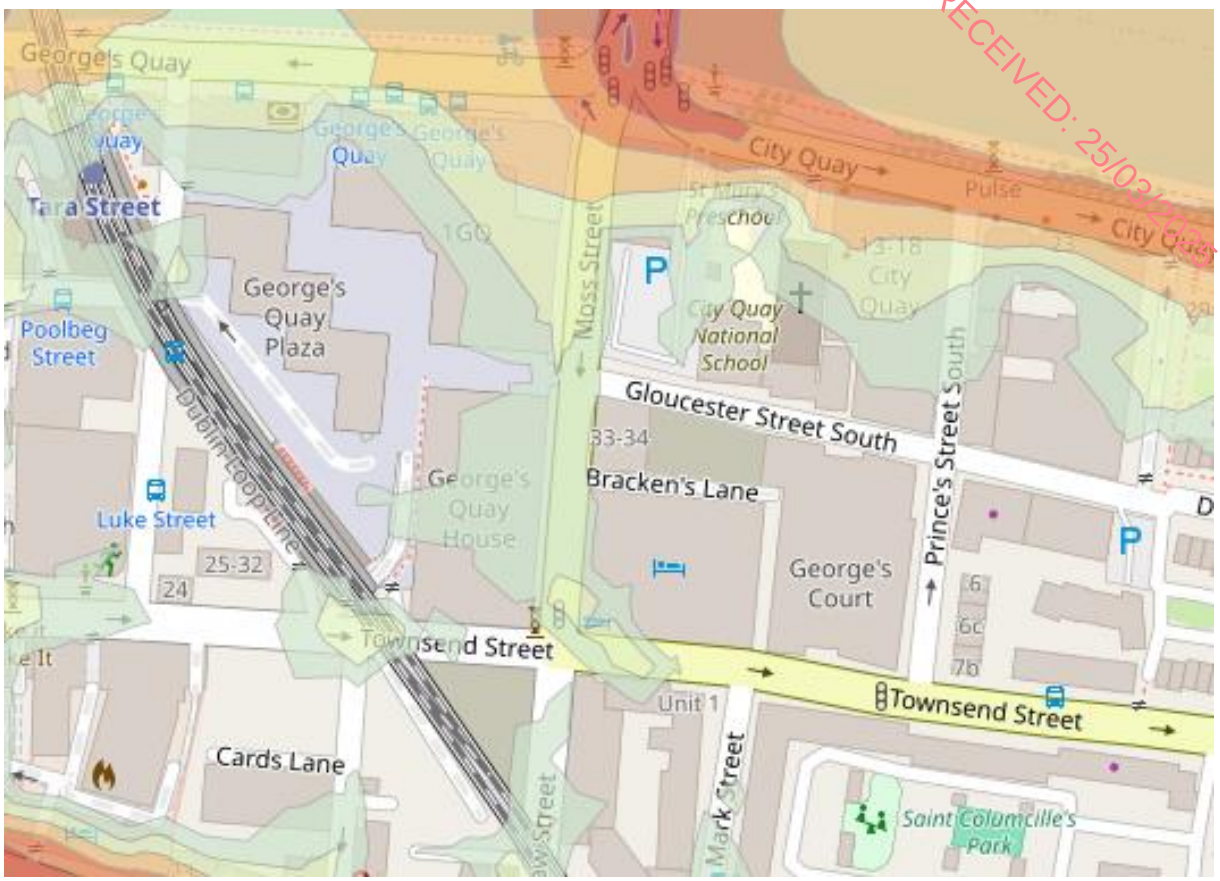


Figure 9.4. Image showing Lden 65-69dB Rail Traffic

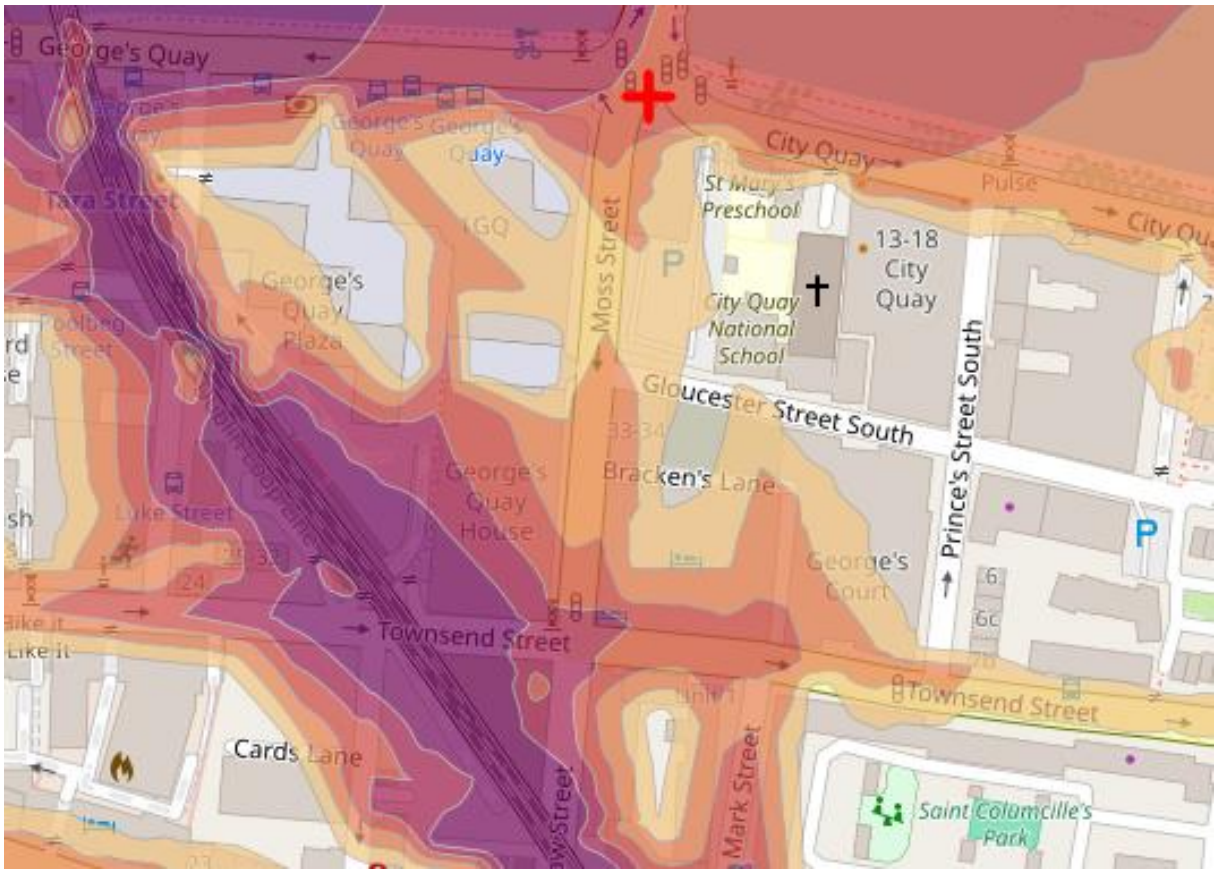
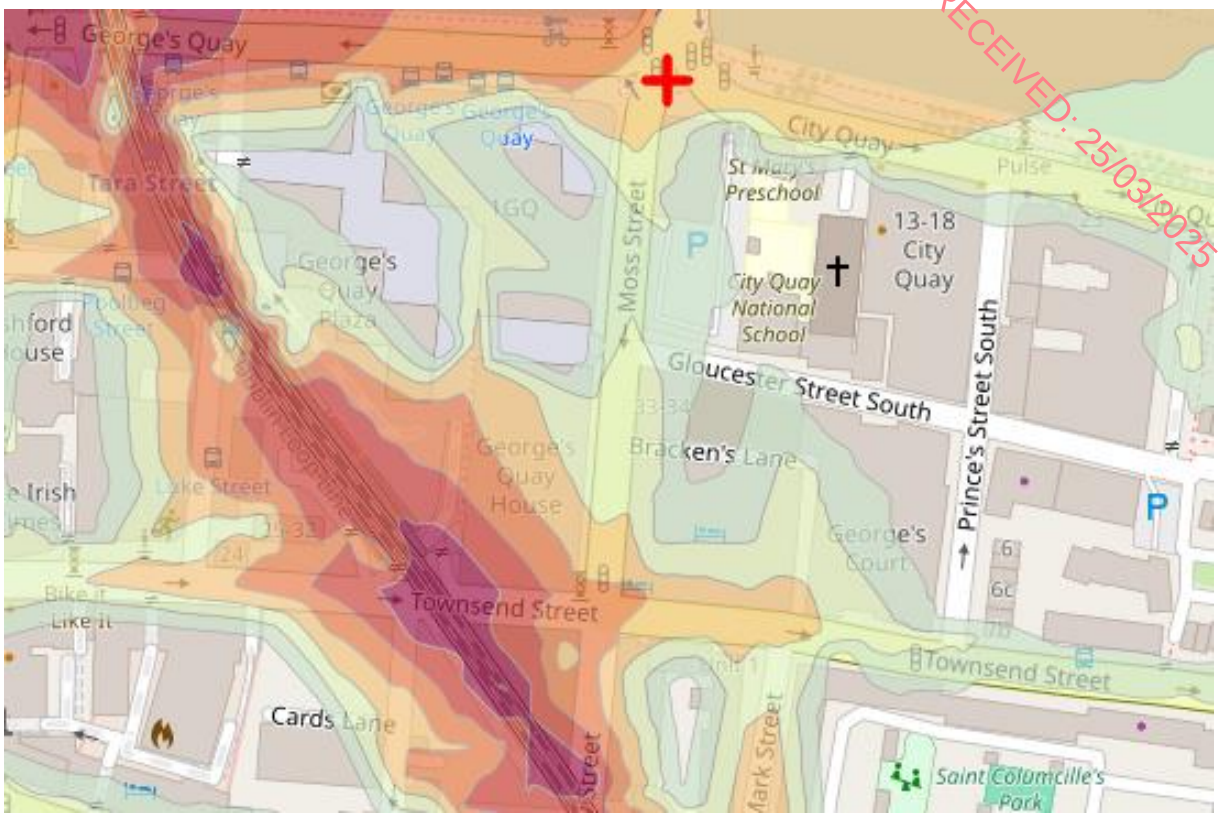


Figure 9.5. Image showing Lnight 55-59dB Rail Traffic



9.4 DO NOTHING SCENARIO

If the site remains undeveloped it shall continue to have an insignificant noise or vibrational impact on the receiving environment. However, it is likely that even if the proposed development does not proceed it is likely that the site will be developed for a commercial building in the future and have a similar noise and vibration impact to that described in this Chapter of the EIAR,

9.5 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed development is provided in Chapter 2 of this Environmental Impact Assessment Report (EIAR). When considering a development of this nature, the potential impacts of noise and vibration must be considered for each distinct stage: the short-term (1-7 years) impact of the construction phase and the ongoing long term (15-60+years) impact of the operational phase. It is important that there is no unacceptable increase over existing ambient noise levels during the construction phases and during the operational phase of the development.

9.5.1 Construction Phase

Short term elevated noise levels during the construction phase must be managed and controlled to acceptable levels. There are a number of existing noise sensitive receptors located in proximity to the development site boundaries. It is fundamental that the proposed development or any aspect of the proposed development must not adversely impact the existing noise levels experienced at these receptors over the shoer-term construction phase.

9.5.2 Operational Phase

The operational phase of the proposed development will generate noise levels associated with vehicle movements and the operation of mechanical plant including heat pumps and Air Handling Units which need to be maintained so as not to cause an adverse noise impact on local noise sensitive receptors for the long-term life of the development.

9.6 POTENTIAL IMPACTS/EFFECTS OF THE PROPOSED DEVELOPMENT

Various elements of both the construction and operational phases of the proposed development have the potential to impact on the receiving on the local receiving noise environment, on adjacent residential properties and on human health. The likely potential impacts for both construction and operation of the proposed development prior to mitigation are described in this chapter of the EIAR.

9.6.1 Construction Phase

9.6.1.1 Demolition Works

Works activities associated with the demolition phase will be undertaken prior to construction works commencing. The demolition of existing buildings and hard-standing areas will utilise a variety of plant and machinery and will include excavators, dump trucks, compressors and generators. The operation of these items of plant has the potential to generate short term elevated noise levels and ground vibration. Demolition works will occur for an approximate 2–4-week period.

9.6.1.2 Construction Works

Works activities associated with the 'Site set up' will be undertaken prior to construction works commencing. The setting up of the site shall involve the construction of site security hoarding and site compounds, site offices, materials and waste storage areas and staff welfare facilities. These short-term activities will have a minimal potential to generate excessive noise levels. The proposed development involves the ground clearance of the existing site to facilitate the proposed development including buildings, internal roads and hard standing areas, services and landscaped areas.

Site clearance, levelling and an element of ground excavation shall also occur at this stage. A variety of items of plant will be in use during site clearance and ground excavation. These will include excavators, dump trucks, compressors and generators and the use of pneumatic breakers where rock or boulders are encountered. The operation of these items of plant has the potential to generate short term elevated noise levels beyond the site boundary. During the site clearance works and the basement bulk dig, the movement of trucks to and from the site shall result in an increase in the volume of HGV's within the immediate area and along the proposed haul routes which will generate additional noise levels.

During the construction phase, there will be extensive site works, involving construction machinery, construction activities on site, and construction traffic, which will all generate noise. The highest noise levels will be generated during the general construction activities. The construction noise levels will be of relatively short-term duration and will only occur during daytime hours which will serve to minimise the noise impacts at local existing receptors.

There is potential that the construction phases shall result in a short-term moderate increase in noise levels in the immediate area as well as introducing tonal and impulsive noise as a result of typical construction activities.

The predicted construction noise levels that will be experienced at the nearest existing residential receptors as a result of construction activities have been calculated using the activity LAeq method outlined in *BS 5228 1:2009+A1 2014 – Code of Practice for noise and vibration control on construction and open sites – Part 1 Noise.*

Table 9.9 details the plant items during the key phases of construction with the associated source reference from BS 5228: 2009+A1 2014 and the predicted noise levels at the closest receptors to the site.

Table 9.9. Predicted construction plant noise levels

Plant Item	BS 5228 Reference	Calculated sound pressure levels L_{Aeq} dB at receptors				
		LAeq @10m	N1	N2	N3	N4
Auger Piling	C.3 Ref. 21	79	74	74	67	70
Dumper Truck	C.4 Ref.2	78				
Tracked Excavator	C.2 Ref 21	71				
Teleporter	C.4 Ref 55	70				
Tower Crane	C.4 Ref. 48	76				
Concrete Pumping	C.4 Ref 26	75				

The results of the assessment have indicated that the construction daytime noise limit of 75dB $L_{Aeq, 11hr}$ can be complied with during both demolition and construction works. It is also important to note that the impact due to construction activities will be transient in nature and the noise levels detailed in Table 9.8 represent a worst-case scenario when all items of plant are operating simultaneously.

The vibration impact associated with construction works will result in a negative, moderate, and short-term effect at the closest receptors during the construction phase.

9.6.1.3 Construction Traffic Noise

Based on the assumption of up to 120 HGV movements per day based on material deliveries and waste collections on routes to and from the site along public roads, the resulting average predicted traffic noise level at the closest receptors is calculated as follows:

The predicted noise levels at any receptor located within 5m of the haul route road has been calculated using a standard international acoustical formula as described below.

LAeq, T = SEL + 10log10(N) - 10log10(T) + 20log10(r1/r2) dB

where LAeq, T is the equivalent continuous sound level over time period (T) (3600 sec);
SEL is the A weighted Sound Exposure Level of the noise event (77dB);
N is the number of events over the time period T (40);
r1 is the distance at which SEL is assessed (5m)
r2 is the closest distance to the receptor from the road (10m)

The calculations assumed a maximum scenario of 12 truck movements per hour based on a 10-hour working day a maximum Sound Exposure Level of 77dBA for the trucks and the minimum distance between the local road passing by each of the nearest noise sensitive receptors to the public road (5m). No attenuation, above geometric spreading, has been considered within these calculations may be considered the worst-case scenario.

The maximum predicted LAeq, period values as a result of the HGV traffic movements at the nearest noise sensitive receptors located along the haul route roads is predicted to be 56 dBA, LAeq, period.

It is not expected that the predicted short-term increase in HGV movements associated with the construction phase of the development will have an adverse impact on the existing noise climate of the wider area or on local receptors.

The noise impact associated with construction traffic on public roads will result in a negative, not significant and short-term effect at the closest receptors during the construction phase.

9.6.1.4 Construction Vibration

The most significant potential sources of ground borne vibrations that may be generated during the construction phase of the development will be generated by the following practices:

- Ground preparation excavation activities that require the use of pneumatic rock breakers
- Movement of site vehicles bulldozers, tracked excavators and dump trucks on ground surfaces
- Hard core surfaces and haul road compaction with vibro-rolling vehicles
- Road construction surface vibro-rolling

Vibration impacts have been considered from any particular plant items that have the potential to generate perceptible levels of vibration.

The nearest receptors will be c. 10m from construction works. Depending on the methods of construction, there is the possibility of construction related vibration impacts on human beings as a result of ground preparation and concrete foundation activities. However, such sources of vibration shall be temporary and intermittent.

It is highly unlikely that any construction generated vibrations at buildings 10m from the proposed development would result in cosmetic damage. Experience of similar construction projects has shown that beyond this distance there is no risk of cosmetic damage occurring within buildings.

The vibration impact associated with construction works will result in a negative, not-significant and short-term effect at the closest receptors during the construction phase.

9.6.2 Operational Phase

9.6.2.1 Mechanical Plant

With regard to the nature of the proposed development, there will be minimal noise sources associated with its operation that may cause nuisance at local receptors. Mechanical roof plant to be located at 7th floor level when maintained on a routine basis will not generate audible noise at any receptor. The operation of the proposed development will not generate ground vibrations.

9.6.2.2 Traffic

There are only 9 no. car spaces proposed for the development resulting in c. 18 no. trips per day. This very small volume of traffic will not have a noise or vibrational impact on the receiving environment or on local receptors.

9.7 'WORST CASE' SCENARIO

9.7.1 Construction Phase

A worst-case scenario will arise if the proposed mitigation measures are not implemented throughout the demolition and construction phase where noise sources are not mitigated or controlled in accordance with the specific measures included in Section 9.8 of the Chapter of the EIAR.

9.7.2 Operational Phase

A worst-case scenario will arise if mechanical plant is not maintained which could result in elevated noise levels that could be audible at the closest receptors.

9.8 AVOIDANCE, REMEDIAL AND MITIGATION MEASURES

9.8.1 Construction Phase

Construction & Demolition Phases Noise & Vibration Mitigation

Implementation of the best practice noise and vibration mitigation measures specified in DCC's *Air Quality Monitoring & Noise Control Units Good Practice Guide for Construction and Demolition*

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before works commence on site. Community engagement includes explaining the nature and duration of the works to local residents and businesses.
- The name and contact details of a person to contact regarding noise and vibration issues shall be displayed on the site boundary, this notice board will also include head/regional office contact details.
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with noise and vibration concerns, together with details of any remedial actions carried out.

Site Monitoring

- A programme of continuous live noise and vibration monitoring shall be implemented for the duration of the construction phase.

Construction & Demolition Works Mitigation

Site-Specific mitigation measures will include:

- A strictly enforced noise management programme shall be implemented at the site from the outset of construction activities.
- Noisy stationary equipment shall be sited away from sensitive site boundaries as far as practicable.
- Where reasonable, practicable, noisy plant or activities shall be replaced by less noisy alternatives if noise breaches and/or complaints occur.
- Proper use of plant with respect to minimising noise emissions and regular maintenance will be required.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and will be maintained in good efficient order
- Where noisy plant is required to operate in works areas next to residential houses low noise plant options will be used wherever practicable.
- Dumpers and any plant used for moving materials around the site will have high performance exhaust silencers.
- Selected use of rubber-tyred equipment over steel track equipment where practicable.
- The use of inherently quiet plant is required where appropriate – all compressors and generators will be “sound reduced” or “super silent” models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers.
- All compressors, generators and pumps shall be silenced models fitted with properly lined and sealed acoustic covers or enclosures, which will be kept closed whenever the machines are in use.
- All pneumatic percussive tools such as pneumatic hammers shall be fitted with dampers, mufflers or silencers of the type recommended by the manufacturer.
- Fixed items of plant shall be electrically powered in preference to being diesel or petrol driven.
- Vehicles and mechanical plant utilised on site for any activity associated with the works shall be fitted with effective exhaust silencers and shall be maintained in good working order and operated in a manner such that noise emissions are controlled and limited as far as reasonably practicable.
- Any plant, equipment or items fitted with noise control equipment found to be defective in shall not be operated until repaired / replaced.
- Machines in intermittent use shall be shut down in the intervening periods between works or throttled down to a minimum during periods when not in use.
- Static noise emitting equipment operating continuously shall be housed within suitable acoustic enclosure, where appropriate.
- All excavator mounted pneumatic breakers used for demolition and ground breaking activities shall be fitted with effective dampeners and /or enclosed within a noise adsorbing blanket structure to minimise noise emissions.
- Site activities shall be staggered when working in proximity to any receptor, that is concrete cutting and rock breaking should where possible. This proposed method of working will provide effective noise management of site activities to ensure that any receptor is not exposed to unacceptably high levels of noise over extended periods.
- Excessive reviving of all vehicles shall be avoided.

- Unnecessary dropping of heavy items onto ground surfaces shall be banned.
- The use of an excavator bucket to break up slabs of concrete or tarmacadam shall not be permitted.
- The dragging of materials such as steel covers, plant or excavated materials along ground surfaces shall not be permitted.
- Plant Reversing Alarms: Where reasonably practicable and deemed safe by risk assessment, taking into account onsite hazards and working environment, the tonal reversing alarms of mobile plant shall be replaced with broadband alarms.

9.8.2 Operational Phase

All building services plant associated with the building shall be assessed during its commissioning in accordance with *British Standard BS 4142, "Rating Industrial Noise Affecting Mixed Residential and Industrial Areas",* which sets out a methodology which can be used to establish acceptable levels of services noise once the development is operational.

9.9 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

The predicted noise and vibration impacts are described below and consider the implementation of all mitigation measures detailed in Section 9.8 of this Chapter of the EIAR.

9.9.1 Construction Phase

Construction phase noise and vibration emissions will be temporary and transient and will be mitigated with best practice measures so as to reduce the risk on the health of the existing local population.

The predicted noise impact with mitigation in place will result in a **negative, slight and short-term effect.**

9.9.2 Operational Phase

Operation phase noise associated with mechanical plant will be mitigated by routine plant maintenance so as to reduce the risk on the health of the existing local population.

The predicted noise impact with mitigation in place will result in a **negative, imperceptible and long-term effect.**

Operation phase noise associated with traffic and the 9 no. car spaces included in the development will result in a **neutral, imperceptible and long-term effect.**

9.10 MONITORING

Noise and vibration monitoring during the construction phase and noise monitoring during the operational phase will verify the effectiveness of the proposed mitigation measures.

9.10.1 Construction Phase

Noise Monitoring

On commencement of the site construction activities, live noise monitoring systems shall be installed at site boundary locations to measures and assess the impact that site activities may have on ambient noise levels at local receptors and to assess compliance with the proposed noise limit value of 75dB(A) $L_{Aeq, 11hr.}$ The noise monitoring systems will have the functionality to issue text and email alerts to site construction staff in the event the noise limit is exceeded. This will allow for works to be reviewed and the specific high noise activity to be identified.

The environmental noise measurements will be completed in accordance with the requirements of *ISO 1996-1: 2017: Acoustics – Description, measurement and assessment of environmental noise*. The measurement parameters to be recorded include wind speed, temperature, LAeq, LA90, LA10 and LAmax, 1/3 Octave Frequency analysis and impact noise analysis.

The results of noise monitoring surveys will be made available to Dublin City Council on request.

Vibration Monitoring

On commencement of the site construction activities, live vibration monitoring systems shall be installed on neighbouring properties (pending permission) or at site boundary locations to measures and assess vibration levels generated by site activities and to assess compliance with the proposed vibration limit values of 1mm/sec PPV at the adjacent pre-school and National school and 7.5mm/sec PPV at any other building.

The vibration monitoring systems will have the functionality to issue text and email alerts to site construction staff in the event the vibration limits are exceeded. This will allow for works to be reviewed and the specific vibration generating activities to be identified.

The vibration measurements will be completed in accordance with *BS 7385-2:1993 – Evaluation and Measurement for Vibration in Buildings: Part 2 – Guide to Damage Levels from Groundborne Vibration.*

The results of vibration monitoring surveys will be made available to Dublin City Council on request.

9.10.2 Operational Phase

Following the completion of the proposed development a noise assessment will be conducted in accordance with *BS 4142 Methods for rating and assessing industrial and commercial sound (2014).* Should it be determined that operational noise has an adverse impact, the specific noise sources will be identified, and appropriate noise mitigation measures will be implemented to reduce the operational noise level.

9.11 REINSTATEMENT

Reinstatement issues are not relevant to this Chapter of the EIAR, with reference to the construction and operational phases.

9.12 CUMULATIVE IMPACT ASSESSMENT

The city centre area in which the subject development is located has a number of existing and permitted developments which may have the potential for cumulative short-term negative construction phase noise impact and a long-term operational phase noise impact.

Should other local sites be constructed at the same time during the construction phase of the subject site, there will be an increase in construction noise levels in the local area and operational phase noise levels of all operating development may increase ambient noise levels in the long-term.

It should be noted that all future developments would be obliged to comply with constructional and operational noise and vibration levels that would be included in any Grants of Permission for these other developments.

9.13 INTERACTIONS

Chapter 4 (Population & Human Health): Elevated noise levels during the construction and operational phases have the potential to result in nuisance / disturbance to the local population and / or human health impacts, as assessed in this Chapter.

9.14 DIFFICULTIES ENCOUNTERED IN COMPILING

There were no difficulties encountered in this Chapter.

9.15 REFERENCES

- **Environmental Protection Agency, 2022.** *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*.
- **Environmental Protection Agency, 2020.** EPA Maps [Online] Available from gis.epa.ie/EPA Maps;

- **European Commission, 2017.** *Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report*.
- **Department of Housing, Planning & Local Government, 2018.** *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.*
- **BSI, 1993.** *BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*;
- **BS 4142: 2014.** *Methods for Rating and Assessing Industrial and Commercial Sound*;
- **BS, 2014.** *BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise*;
- **BS, 2014.** *BS 5228-2:2009+A:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration*;
- **ISO, 2016.** *ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures*;
- **UK Department of Transport, 1998.** *Calculation of Road Traffic Noise*;
- **UKHA, 2020.** *Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA111 Noise and Vibration Revision 2*;
- **Dublin City Council**. *Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition*.