10 NOISE AND VIBRATION

10.1 Introduction

The subject site is located in the eastern part of Co. Meath in the townland of Bellewstown, approximately 3.5 km west Duleek and 6 km southwest of Julianstown (Figure 10.1). The site is located in the townlands of Bellewstown, Hilltown Little, Gafney Little and Hilltown Great, 1.5 kilometres west of Bellewstown Cross and 8 kilometres south of Drogheda. The quarry encompasses lands within Land Registry Folios 19959F, 40523F, MH24992 and MH20631F. Irish Transverse Mercator Grid Reference at the Quarry Entrance is E707898E, E767443.

Figure 10.1: Location of Subject Site. (Source: Google Earth.)

10.1.1 Statement of Authority

This chapter of the EIAR has been prepared by the following staff of AWN Consulting Ltd:

Mike Simms (Senior Acoustic Consultant) holds a BE and MEngSc in Mechanical Engineering, and is a member of the Institute of Acoustics and of the Institution of Engineering and Technology. Mike has worked in the field of acoustics for 20 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, wind energy, industrial, commercial and residential.

10.1.2 Description of the Subject Site and Existing Quarry

The proposed development seeks to extend the life of the current permitted quarry from 10 years to 25 years (as originally proposed 37L development) and proposes to develop a new dedicated quarry access road to facilitate an increase in the permitted number of HGV loads to and from the quarry from a maximum of 32 No. per day to an average of 81 No. per day (with +/-15% fluctuations in the number of loads to and from the quarry proposed to address

certain demands on the quarry as and when required, equating to a maximum of 93 No. loads per day).

Access to the quarry is currently provided from the local road (Mullagh Road) that runs in a north-south direction and bounds the eastern portion of the quarry site. In order overcome the Board's concerns regarding impacts on the local community, the subject development proposes the provision of a new private road, as well as new entry / exit points onto this new road, to serve the quarry. The existing quarry access / exit point will be relocated c. 25m southwards. The development will consist of the continued provision of the office, shed and car park area. In addition, to facilitate the development, it is proposed to remove existing the weighbridge and wheelwash and provide a new wheelwash closer to the new entrance to the quarry, as well as providing a new shipping office (21 sq m). An extra weighbridge will be provided, resulting in a total of 2 No. to serve the quarry. It is proposed to demolish the existing weighbridge office (29 sq m) and workshop (123 sq m). A new powerhouse (46 sq m) is proposed to facilitate a mains electricity supply for use by pumps, plant and machinery in the future. The bunded and covered fuel tanks, septic tank and percolation area permitted under the 37L development have not yet been implemented. The septic tank will be installed and commissioned to treat the wastewater from the toilet contained on the proposed new shipping office.

This new private road will reduce the impacts on the local community by redirecting the HGV traffic away from Bellewstown Village. The new road will cross the Mullagh Road and fields in a northeast direction away from the quarry. The road is approximately 1.7km long starting at the Mullagh Road and has a minimum width of c. 6m increasing to up to 9.25m wide on some internal bends. The new link road will also be used by the farmer whose lands it crosses to provided internal access to their farm for agricultural purposes. We refer to Chapter 12 of this EIAR for further detail. This road will allow an average number of 81 No. daily loads from the quarry to facilitate an extraction level of approximately 450,000 tonnes per annum. The total extraction period proposed is 25 years, with an additional year required to facilitate restoration works.

10.2 Methodology

The scope and methodology of this noise and vibration assessment was defined by the most relevant best practice and guidance documents. These primarily included:

- EPA Environmental Management Guidelines (2006*): Environmental Management in the Extractive Industry (Non-Scheduled Activities)*;
- IEMA *Guidelines for Environmental Noise Impact Assessment, 2014*;
- ISO 1996 – *Acoustics Description, Measurement and Assessment of Environmental Noise, Part 1 (2016) & Part 2 (2017)*;
- BS 5228: 2009 & A1 2014 – *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise*;
- BS 5228: 2009 & A1 2014 – *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration*; and
- EPA (2016) *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)*.

- *Guidelines on the information to be contained in Environmental Impact Assessment Reports, May 2022.*

In general, the following methodology was followed:

- Measurement of existing noise information and identification of nearest Noise-sensitive Receptors (NSRs).
- Identification of existing and proposed noise sources.
- Prediction of the likely impact on the nearest NSRs for the proposed phases.
- Rating of the predicted impact and comparison against relevant assessment criteria and,
- Recommendation of mitigation measures if required.

This outline methodology is described in more detail in the following sections.

10.3 Assessment Criteria

10.3.1 Construction Phase - Noise

There are no mandatory noise limits for construction noise in Ireland. Account must be taken of the technical feasibility of the proposed project, and the trade-off between the noise level, and the duration of the noise exposure when setting criteria for construction noise. The following guidance was consulted:

- Construction noise: *National Roads Authority Guidelines for the Treatment of Noise and Vibration in National Road Schemes, October 2004* (NRA Noise Guidelines).
- BS 5228-1&2:2009 & A1 2014 Parts 1 & 2, *Code of Practice for noise and vibration control construction and open sites* and,
- EPA Environmental Management Guidelines (2006): *Environmental Management in the Extractive Industry (Non-Scheduled Activities).*

These noise limit thresholds adopted for the purpose of this assessment are outlined BS5228 and presented in Table 10.1.

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A Note A	Category B Note B	Category C Note C
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends Note D	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

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

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

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

Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

Table 10.1: Threshold of Significant effect at Dwellings.

The table can be used as follows: for the appropriate period (night, evening/weekends or day), the ambient noise level is determined and rounded to the nearest 5 dB. This is then compared with the total noise level, including construction. If the total noise level exceeds the appropriate category value, then a significant effect is deemed to occur. It is considered appropriate to adopt the L_{Aeq} noise limit threshold value of 65dB(A) (Category A).

It should be noted that temporary works associated with the construction of earth berms and other 'construction' elements will be permitted to generate noise levels typically 10 to 15dB(A) above the standard operational noise limit due to their temporary nature and overall benefit gained by the works. This is acknowledged in the EPA Environmental Management Guidelines (2006): *Environmental Management in the Extractive Industry* where it states:

> *"It is also appropriate to permit higher noise ELV's (Environmental Limit Values) for short-term temporary activities such as construction of screening bunds, etc., where these activities will result in a considerable environmental benefit."*

10.3.2 Construction Phase – Vibration

There is no published Irish guidance relating to vibration during construction activities. Common practice in Ireland has been to use guidance from internationally recognised standards. Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, the magnitude of vibration is expressed in terms of Peak Particle Velocity (PPV) in millimetres per second (mm/s).

The National Roads Authority recommends that vibration from road construction activities be limited to the values set out in Table 10.2 in order to ensure that there is no potential for vibration damage during construction. These values have been derived through consideration of the various standards discussed above; compliance with this guidance should ensure that there is little to no risk of even cosmetic damage to buildings.

Allowable vibration velocity (Peak Particle Velocity) at the closest part of any sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50 Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Table 10.2: Allowable vibration in order to minimise the risk of building damage.

Vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes in the case of nominally continuous sources of vibration such as traffic. However, higher levels of vibration are typically tolerated for single events or events of short duration.

10.3.3 Operational Phase – Extraction

The EPA document notes the following in relation to recommended Emission Limit Values (ELVs) for quarry sites:

In relation to quarry developments and ancillary activities, it is recommended that noise from the activities on site shall not exceed the following ELVs at the nearest NSR.

Daytime *(08:00hrs to 20:00hrs)* *55dB $L_{Aeq,(1\ hour)}$*

Night-time *(20:00hrs to 08:00hrs)* *45dB $L_{Aeq,(1\ hour)}$*

This document also states that 95% of all noise levels shall comply with the specified limit value(s). No noise level shall exceed the limit value by more than 2 dB(A). This Guidance acknowledges the variability of operational intensity from time to time.

The existing facility operates under a grant of planning from An Bord Pleanála, Ref. 17.QD.0013 and Condition 9 of the permission relates to noise and states the following:

"9. During the operational phase of the proposed development the noise level from within the boundaries of the site, measured at noise-sensitive locations in the vicinity, shall not exceed:

(a) an L_{ArT} value of 55 dB(A) during 0700-1800 hours, The T value shall be one hour.

(b) an L_{Aeq} value of 45 dB(A) at any other time. The T value shall be 15 minutes.

Reason: In order to protect the residential amenities of property in the vicinity "

These limits are in line with that set out in EPA Guidelines.

The quarry development includes a new dedicated quarry access road to facilitate an increase in the permitted number of HGV loads to and from the quarry. The adopted criteria for the noise from HGVs using this access road are the same as those presented above for the quarry in general. Details of the assessment of the new access road are presented in Section 10.5.3.

10.3.4 Operational Phase – Additional Vehicular Activity on Public Roads

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. The proposed development includes a new private access road which is assessed against the quarry criteria as presented above. Traffic from the development will also make use of existing public roads already carrying traffic volumes, as such it is appropriate to assess the calculated change in traffic noise levels that will arise as a result of those vehicular movements. To assist with the interpretation of the noise associated with additional vehicular traffic on public roads, it is proposed to adopt guidance from the UK document Design Manual for Roads and Bridges (DMRB). Table 10.3 taken from Section 3.54 and 3.58 of DMRB presents guidance as to the likely impact associated with any long-term change in the traffic noise level (dB $L_{A10,18hr}$) at a noise-sensitive receiver. Table 10.4 shows how the significance is determined.

Long Term Noise Change dB $L_{A10,18hr}$	Long Term Magnitude
0	No Change
0.1 – 3.0	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
≥10	Major

Table 10.3: Likely Impacts Associated with Change in Traffic Noise Level (Source DMRB, 2019).

The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10 dB(A) change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.

Table 10.4 has previously presented the DMRB (2020) likely impacts associated with change in traffic noise level, the corresponding significance of impact presented in *the EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR),* May 2022 is presented in Table 9.9 for consistency in wording and terminology for the assessment of impact significance.

Change in Sound Level DMRB, 2019 (dB L_{A10})	Subjective Reaction	Impact Guidelines for Noise Impact Assessment Significance (DMRB)	Impact Guidelines on the Information to be contained in EIAR (EPA)
0	No change	Neutral	Imperceptible
0.1 – 2.9	Barely perceptible	Imperceptible	Not Significant
3.0 – 4.9	Noticeable	Minor	Slight
5.0 – 9.9	Up to a doubling or halving of loudness	Moderate	Significant
10.0 or more	More than a doubling or halving of loudness	Major	Very Significant

Table 10.4: Likely Impact Associated with a Long-Term Change in Traffic Noise Level.

10.3.5 Operational Phase – Vibration

Currently, blasting is undertaken periodically at the site within the extraction area. This practice will continue for the subsequent extraction phases. Blasting has the potential to generate ground and air borne vibrations, measured as peak particle velocity and air overpressure. Both are managed by setting vibration limits designed to minimise nuisance and prevent structural damage.

Peak Particle Velocity

Peak Particle Velocity is defined as a measure of the velocity of vibration displacement in terms of millimetres per second (mm/s). Under the quarry's current permission, a vibration limit of 12mm/s PPV at the nearest sensitive building applies to blasting. This limit is in line with that set out in the DoEHLG and EPA Guidelines.

The permission also notes that the above limit refers to blasting being carried out no more that once every seven days, and that if blasting is to be carried out more often, then the limit is to reduce to 8 mm/s PPV.

Air Overpressure

Air overpressure (AOP) is the pressure wave in the atmosphere produced by the detonation of explosives. This consists of both audible (noise) and inaudible (concussion) energy. It is generally expressed as dB (Lin). Under the quarry's current permission, an AOP limit of 125dB Lin at the nearest sensitive building applies to blasting. This limit is in line with that set out in in the DoEHLG and EPA Guidelines.

Current Planning Conditions (PL17.QD0013) in relation to Blasting and Vibration

Conditions 10 and 11 relates to blasting operations and is as follows:

10 (a) Blasting operations shall take place only between 1000 hours and 1700 hours. Monday to Friday and shall not take place on Saturdays, Sundays or public holidays. Monitoring of the noise and vibration and the frequency of such blasting shall be carried out at the developer's expense by an independent contractor who shall be agreed in writing with the planning authority.

(b) Prior to the firing of any blast, the developer shall give notice of his intention to the occupiers of all dwellings within 500 metres of the site. An audible alarm for a minimum period of one minute shall be sounded. This alarm shall be of sufficient power to be heard at all such dwellings.

Reason: in the interests of public safety and residential amenity.

11. Vibration levels from blasting shall not exceed a peak particle velocity of 12 millimetres/second, when measured in any of three mutually orthogonal directions at any sensitive location. The peak particle velocity relates to low frequency vibration of less than 40 hertz where blasting occurs no more than

once in seven continuous days. Where blasting operations are more frequent, the peak particle velocity limit is reduced to eight millimetres per second. Blasting shall not give rise to air overpressure values at sensitive locations which are in excess of 125 dB(Li) max peak with at 95% confidence limit. No individual air overpressure value shall exceed the limit value by more than 5 dB (Lin)

10.4 Existing Environment

The planning application boundary is shown in Figure 10.2. Examination of the area surrounding the site show that there are a number of private dwelling houses or noise-sensitive receptors (NSRs) in the vicinity. Baseline noise monitoring was carried out during representative daytime periods at selected NSRs in proximity to the development. Depending on the measurement location the noise levels were dominated by distant traffic along local roads, wind in nearby trees and birdsong.

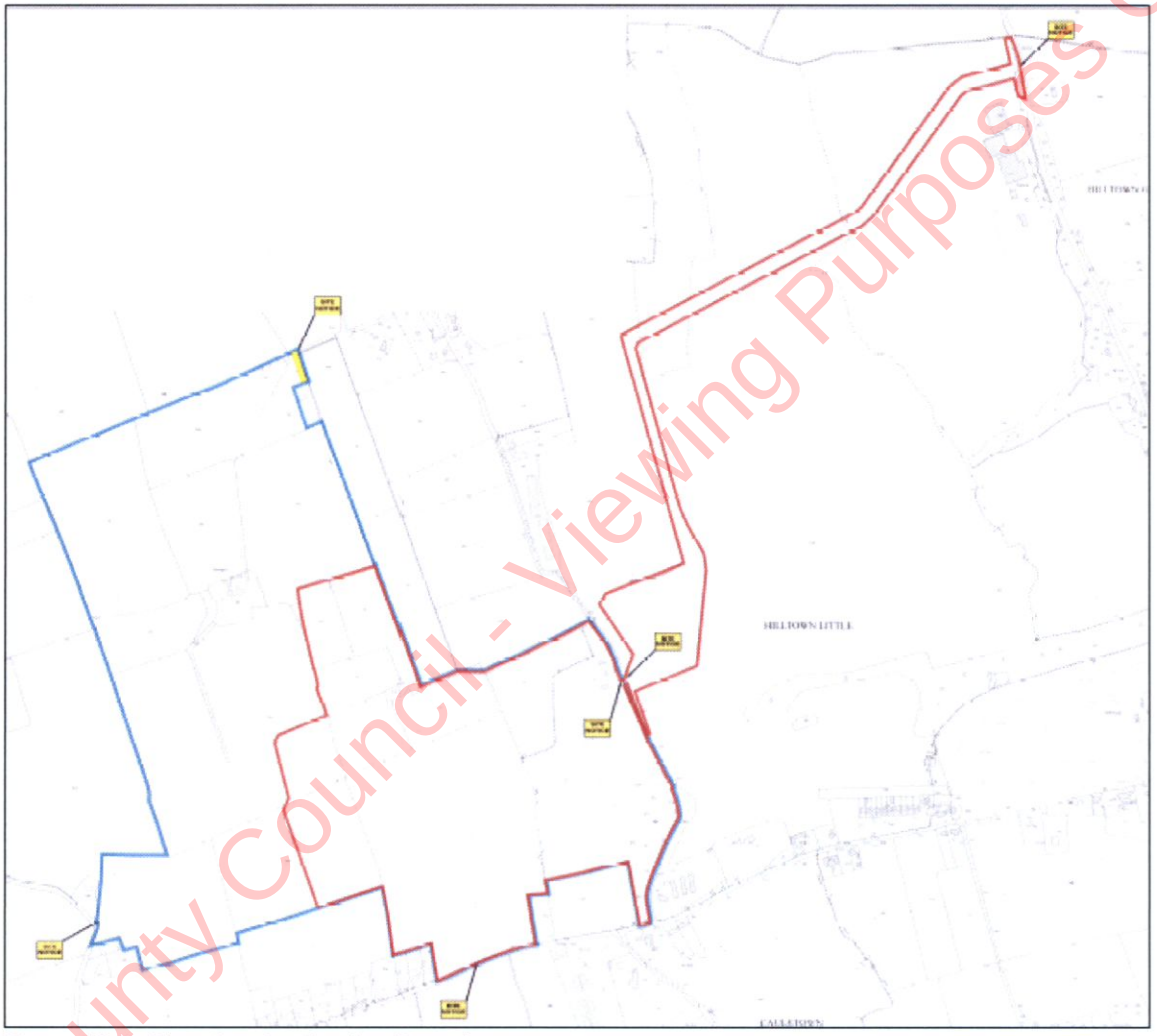

Figure 10.2: Planning Application Boundary.

10.4.1 Measurement Locations

Four measurement locations were selected in order to obtain a representative existing noise levels at noise-sensitive locations, in this case houses, in the vicinity of the site. A Figure showing the locations (Figure 10.2) and a table describing the measurement locations are provided below.

Location Ref.	Description
Location A	Within the site, near the southern eastern boundary with a set of dwelling houses along the L5618.
Location B	In the site of a house under construction near the southern western boundary of the site along the L5618
Location C	By a house to the north of the site along the L56172. The house is at a distance of 270 m from the proposed access road.
Location D	Within am industrial yard near the proposed entrance of the new access road onto the L1615. This location is a proxy for a private dwelling house.

Table 10.5: Noise Monitoring Locations.

Figure 10.3: Noise Survey Locations. (Background Imagery: Google Earth.)

10.4.2 Survey Periods

An attended noise survey was undertaken to obtain typical existing noise levels at noise-sensitive locations surrounding the site on the 4 June 2021. Measurements were carried out on a cyclical basis with measurement durations of 15 minutes over two rotations.

10.4.3 Instrumentation Setup

The measurements were made using a Bruel and Kjaer Integrating Sound Level Meter. This instrument is a Class 1 instrument in accordance with IEC 61672-1:2013. The Time Weighting used was Fast and the Frequency Weighting was A-weighted as per IEC 61672-1:2013.

The instrument was calibrated with a Brüel & Kjaer Type 4231 calibrator prior to and after the measurement period. The microphone was protected using a proprietary Rion windshield. The sound level meter was mounted on a tripod approximately 1.5 metres above ground level and at least 3 metres away from any reflective surfaces.

Factory calibration certificates for the noise level meter and acoustic calibrator, detailing equipment serial numbers are presented in Appendix 10.1 of this report. The survey results were noted onto a Survey Record Sheet immediately following each sample and were also saved to the instrument memory for later analysis. Survey personnel noted the primary sources contributing to noise build-up during each period.

10.4.4 Measurement Parameters

Several parameters were measured in order to interpret the noise levels. These included the following;

- L_{Aeq} This is the equivalent continuous A weighted sound pressure level. It is an average of the total sound energy (noise) measured over a specified time period.
- L_{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level).
- L_{A10} Noise level exceeded for 10 % of measurement period. It is typically a descriptor of traffic noise.
- L_{Amax} Maximum A weighted noise level measured.
- L_{Amin} Minimum A weighted noise level measured.

The "A" suffix denotes that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. The "F" suffix denotes that the parameter has been measured with 'Fast' time-weighting applied. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pascal (Pa). A glossary of noise related terms is presented in Appendix 10.2.

10.4.5 Meteorological Conditions

Meteorological conditions during the survey period were dry with varying cloud cover. Wind speeds were moderate; however they were not considered to have had a detrimental effect on the noise measurements

10.4.6 Noise Monitoring Location A

Table 10.6 presents a summary of the existing noise levels measured at Location A.

Start Time	Duration minutes	Measured Noise Levels [dB re. $2x10^{-5}$ Pa]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
11:02	15	49	79	52	40
12:53		42	66	44	37

Table 10.6: Noise Survey Results at Location A.

At this location, the audible sources included birdsong, cattle in the field and distant traffic. Noise from operations at the quarry site was not audible. The measured noise levels were in the range 42 to 49 dB L_{Aeq}. The background noise levels ranged from 37 to 40dB L_{A90}.

10.4.7 Noise Monitoring Location B

Table 10.7 presents a summary of the existing noise levels measured at Location B.

Start Time	Duration minutes	Measured Noise Levels [dB re. $2x10^{-5}$ Pa]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
11:25	15	48	61	51	44
13:17		46	70	48	41

Table 10.7: Noise Survey Results at Location B.

At this location, the dominant audible source of noise was birdsong and a degree of wind-generated noise in nearby foliage. Reversing alarms from the quarry were audible during the first measurement period. The measured noise levels were in the range 46 to 48 dB L_{Aeq}. The background noise levels ranged from 41 to 44 dB L_{A90}.

10.4.8 Noise Monitoring Location C

Table 10.8 presents a summary of the existing noise levels measured at Location C.

Start Time	Duration minutes	Measured Noise Levels [dB re. $2x10^{-5}$ Pa]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
10:11	15	48	73	42	33
12:03		50	76	47	36
13:37		43	65	43	33

Table 10.8: Noise Survey Results at Location C.

At Location 3, the main contributors to noise levels were birdsong and distant traffic. Occasional car pass-by also affected noise level measurements during the second measurement period. Site noise was not audible at this location. The measured noise levels were in the range 43 to 50 dB L_{Aeq}. The background noise levels were in the range 33 to 36 dB L_{A90}.

10.4.9 Noise Monitoring Location D

Table 10.9 presents a summary of the existing noise levels measured at Location D.

Start Time	Duration minutes	Measured Noise Levels [dB re. $2x10^{-5}$ Pa]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
11:40	15	59	86	61	41
12:50		46	63	49	40

Table 10.9: Noise Survey Results at Location D.

At Location 4, the main contributors to noise levels were birdsong and distant traffic. Occasional car pass-by also affected noise level measurements. During the second measurement period, a forklift was in operation near the measurement position. However, site noise was not audible at this location. The measured noise levels were in range 46 to 59 dB L_{Aeq}. The background noise level was of in the range 40 to 41 dB L_{A90}.

10.4.10 Historical Compliance Noise Surveys

Kilsaran Concrete has undertaken periodic noise surveys at two locations near Bellewstown Quarry. The relevant conditions of the existing planning permission place a daytime noise limit of 55dB(A) at the nearest sensitive receptors. Noise monitoring is required for a period of 1 hour at each of two locations.

Results of previous surveys have been provided by Kilsaran for information purposes and the results of a selection of historic surveys from 2006 to 2012 and from 2012 to 2020 are presented in Figures 10.3 and 10.4 below. The noise survey locations are shown in Appendix 10.2

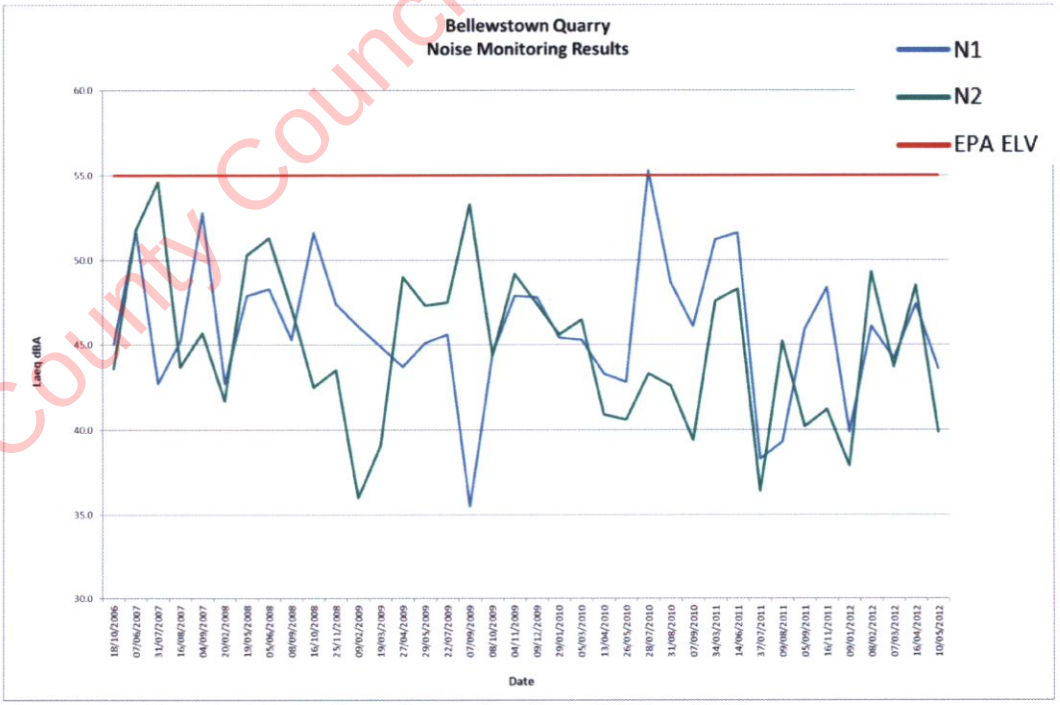

Figure 10.4: Historical Noise Compliance data from 2006 to 2012.

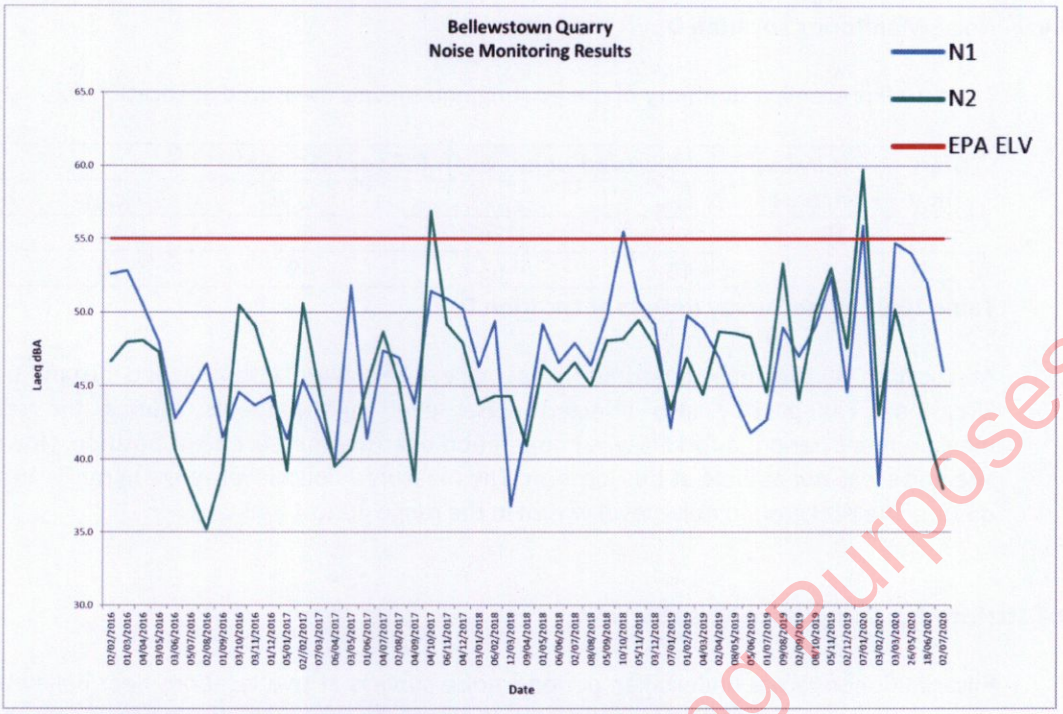

Figure 10.5: Historical Noise Compliance data from 2012 to 2020.

There is some variability across the measured noise levels. This reflects the variability of noise emissions from the site. The discussion within all compliance reports concluded that the quarry was operating within the relevant daytime conditions. On review of the small number of measurements that exceed the conditions, the reports indicate that noise measurements were dominated by activity unrelated to the quarry.

10.5 Predicted Impacts of the Proposed Development

10.5.1 Construction Phase

The elements of the quarry which will be constructed as part of the proposed development include the following:

- a new site entrance;
- an access road of approximately 1.7 km in length leading from the Mullagh Road to the L1615 with associated entrances;
- a new shipping office;
- the removal of the existing weighbridge and the provision of two new weighbridges;
- a new wheelwash facility, and
- a powerhouse.

It is also proposed to demolish the existing weighbridge / shipping office and workshop.

A variety of items of plant will be in use for the construction of these elements. There will be vehicular movements to and from the site that will make use of existing roads. Due to the

nature of these activities, there is potential for generation of significant levels of noise. These are discussed in the following paragraphs.

The predicted noise levels referred to in this section are indicative only and are intended to demonstrate that it will be possible for the contractor to comply with current best practice guidance. It should also be noted that the predicted "worst case" levels are expected to occur for only short periods of time at a very limited number of properties. Construction noise levels will be lower than these levels for most of the time at most properties in the vicinity of the Proposed Development.

New Access Road

It is proposed to construct a new access road as part of the development, to divert HGV traffic away from Bellewstown Village. Review of the proposed road layout has identified that the nearest noise-sensitive locations to any point along the proposed road is the house at noise survey location C at a distance of approximately 270m, along with the house near noise survey location D which is on the east side of the local road onto which the proposed road opens.

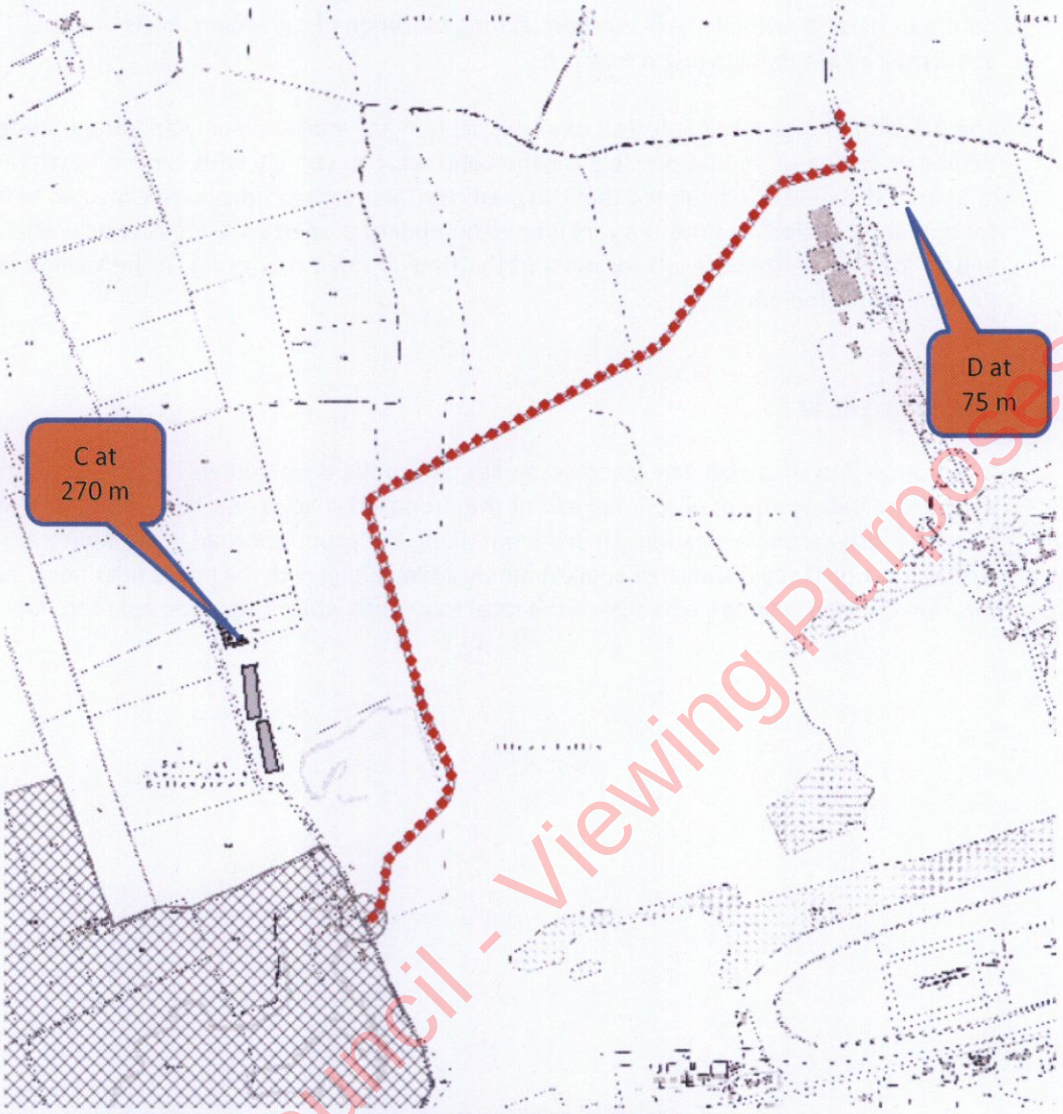

Figure 10.6: Nearest noise-sensitive locations to new access road.

Table 10.10 outlines the typical construction noise levels associated with the proposed works for this element of the construction. Calculations have assumed an on-time of 66% for each item of plant.

Item (BS 5228 Ref.)	Plant Noise Level at 10m Distance (dB $L_{Aeq,T}$)]	Highest Predicted Noise Level at Stated Distance from Edge of Works (dB $L_{Aeq,T}$)	
		75 m	250 m
HGV Movement (C.2.30)	79	54	40
Tracked Excavator (C.4.64)	77	52	38
Dumper Truck (C.4.4)	76	51	37
Excavator Mounted Rock Breaker (C9.12)	85	60	46
Vibrating Rollers (D.8.29)	77	54	38
Total Road Construction Noise		62	49

Table 10.10: Plant Items for construction of new access road.

The predicted noise levels are within the criteria in Section 10.3.1, and therefore the noise effects of the construction of the new access road are negative, not significant and temporary.

Landscape Bunds

The proposed development includes construction of landscape bunding along the western and northern boundaries of the extended quarry area, to provide visual and acoustic screening. This will typically involve heavy earth moving machinery such as a track machine and/or a back-hoe loader and material transport trucks. Noise levels from such machinery operating simultaneously is typically 81dB(A) at 10m, which extrapolates out to 50dB(A) at 360m which is the closest distance between a berm and dwelling. This is a worst-case scenario, as it assumes direct line of site to the receiver over hard ground and that all plant will be in operation simultaneously for 100% of the time, which would not be the case as all plant items will not operate continuously over a full working day. Therefore, predicted typical construction noise levels are unlikely to exceed the threshold values set out in Table 10.2.

Quarry Machinery

It is proposed to remove the weighbridge and wheelwash and provide two new weighbridges and a new wheelwash, all of which will be closer to the new entrance to the quarry, as well as providing a new shipping office beside the new weighbridges. A new powerhouse is proposed to facilitate a mains electricity supply for use by pumps, plant and machinery. Similarly to the construction of the landscape bunds, as the distances to noise-sensitive locations are greater again, the noise levels for construction activity for these elements of the proposed development will also be within the threshold values set out in Table 10.2.

10.5.2 Operational Phase - Introduction

This section describes and assesses the potential noise and vibration impact from the operation of the quarry development. The main noise sources associated with the proposed extraction activities are identified and their impact at the nearest residential properties is assessed. The noise emission values are compared against existing noise levels and the noise limit criteria as described in Section 10.3.

Over the course of the different excavation phases, the location of on-site activities will vary resulting in a range of noise levels at the nearest NSR around the site. At the start of each extraction area, noise levels are expected to be highest. As the excavation area is extracted further towards the quarry floor, the activities of the extraction plant (dozer, HGV and mobile crusher) will be further shielded from adjacent properties by the quarry face. Therefore, the existing scenario has the highest noise emission levels at NSRs. The fixed machinery including the crushers, screeners and associated diesel generator are located towards the south of the site, maximising the distance between this plant and the noise-sensitive receptors.

In order to assess the combined potential noise impacts associated with the continued permitted quarry operation and the proposed new access road, a noise model of the site has been developed. The model has been developed using DGMR acoustic modelling software (iNoise, version 2021). This is a quality-assured acoustic modelling package for computing noise levels in the vicinity of different types of noise sources. For the quarry model, the calculation standard used is the ISO 9613 (1996) Standard Acoustics: *Attenuation of Sound during Propagation Outdoors. Part 2: General Method of Calculation*.

The model takes account of the various factors affecting the propagation of sound in accordance with the standard, including:

- The magnitude of the noise source in terms of sound power;
- The distance between the source and receiver;
- The presence of obstacles such as screens or barriers in the propagation path;
- The presence of reflecting surfaces;
- The hardness of the ground between the source and receiver; and,
- The attenuation due to atmospheric absorption; Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400m).

Source data for operating quarry plant items have been obtained from on-site measurements and BS 5228: *Part 1 (Noise)*, supplemented with noise levels previously measured by AWN for similar equipment. BS5228 provides sound power data per octave band which can be used for individual source items. Table 10.9 summarises the noise source data used in the model with all source data is corrected to 10m. The dominant noise sources identified on site were used for modelling purposes.

Description	A-weighted Sound Power Level re 10^{-12} W at Octave Band Centre Frequency (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Primary Crusher	95	98	105	106	103	100	95	86	111
Secondary Crusher	95	98	105	106	103	100	95	86	111
Rock Breaker	81	87	94	99	105	106	104	97	111
Tracked Excavator	76	92	99	98	97	95	89	79	104
Loading shovels (each of 2 no.)	93	106	113	111	114	112	106	96	119
Dump truck	85	96	95	105	99	100	92	87	109
Wheel Wash	90	85	90	97	103	107	98	92	109
Diesel Generator	**81**	**91**	**103**	**109**	**109**	**104**	**98**	**89**	**113**

Table 10.11: Sound Power Levels of Plant Items.

The modelling of quarry noise emissions is complex. There are fixed and mobile noise sources. The intensity of quarry operations can vary depending on demand. There are varying contours, elevations and landform screening across the site. There are numerous buildings of varying height which can act as barriers to the propagation of sound in some directions. Aggregate stockpiles which can also act as barriers to noise propagation shift and move over time.

The model takes account of the 'on-time' of equipment over a typical operational day, as a worst case assessment, each item of equipment operating on the quarry floor is assumed to be operational for 80% of the working day.

A noise model for the proposed development has been developed using OS mapping, ground contour data and source data. A total of 32 noise-sensitive receptors (NSRs) have been modelled. These are illustrated in Figure 10.7. These NSRs represent the closest noise-sensitive receptors to the extraction area and are residential dwellings. In all instances, the NSR has been assumed at a height of 4m, which corresponds to the height of a typical first-floor window.

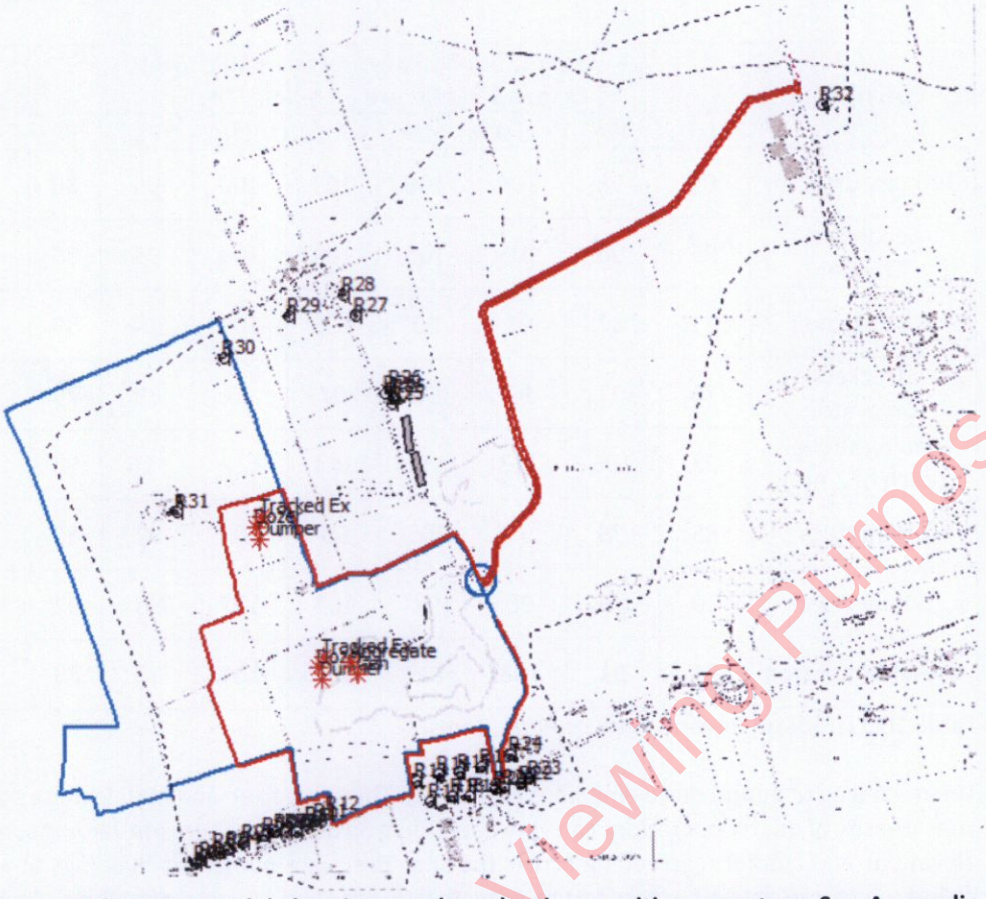

Figure 10.7: Noise model showing numbered noise-sensitive receptors. See Appendix 10.3 for details of the noise-senstiive location coordinates and additional Figures.

10.5.3 Operational Phase – New Access Road

The movement of HGVs leaving and returning to the site is using the proposed new access road is included in the noise models and respective results for each of the three extraction phases in the following sections. The noise level for a HGV drive-by is taken from BS5228 as shown in Table 10.12.

Description	A-weighted Sound Power Level re 10^{-12} W at Octave Band Centre Frequency (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
HGV / Lorry (Full)	98	98	105	103	103	102	105	95	82

Table 10.12: Sound Power Level of HGV from BS5228 Table C6 item 21.

Based on information in Chapters 3 and 12, the highest number of HGV loads leaving the site in any 11-hour day is 93, leading to 186 HGV movements per day along the new site access road. Noise levels due to HGV movements along the preoposed new road are included in the values presented in Tables 10.13, 10.14 and 10.15 in the following sections.

10.5.4 Operational Phase – Extraction at Current Depth

In this phase, it is assumed that the noise sources in Table 10.11 are operating in the current extraction area nearest the southern part of the site at a void depth of 131m AOD. Simultaneously, 1 no. excavator, 1 no rock breaker, and 1 no. dump truck are depositing overburden in the northern part of the site. Table 10.13 shows the predicted noise levels.

NSR	Predicted Noise Level, dB $L_{Aeq\ 1hr}$
R01	32
R02	33
R03	33
R04	41
R05	45
R06	45
R07	45
R08	45
R09	44
R10	44
R11	44
R12	44
R13	44
R14	45
R15	45
R16	45
R17	42
R18	42
R19	43
R20	43
R21	41
R22	42
R23	42
R24	44
R25	50
R26	51
R27	50
R28	49
R29	50
R30	51
R31	56
R32	53

Table 10.13: Predicted noise levels during Extraction at Current Depth.

All predicted noise levels are within the criterion of 55dB $L_{Aeq,1hr}$, with the exception of R31 which is within the applicant's lands and not occupied. Noise contours are shown for this scenario in Figure 10.8.

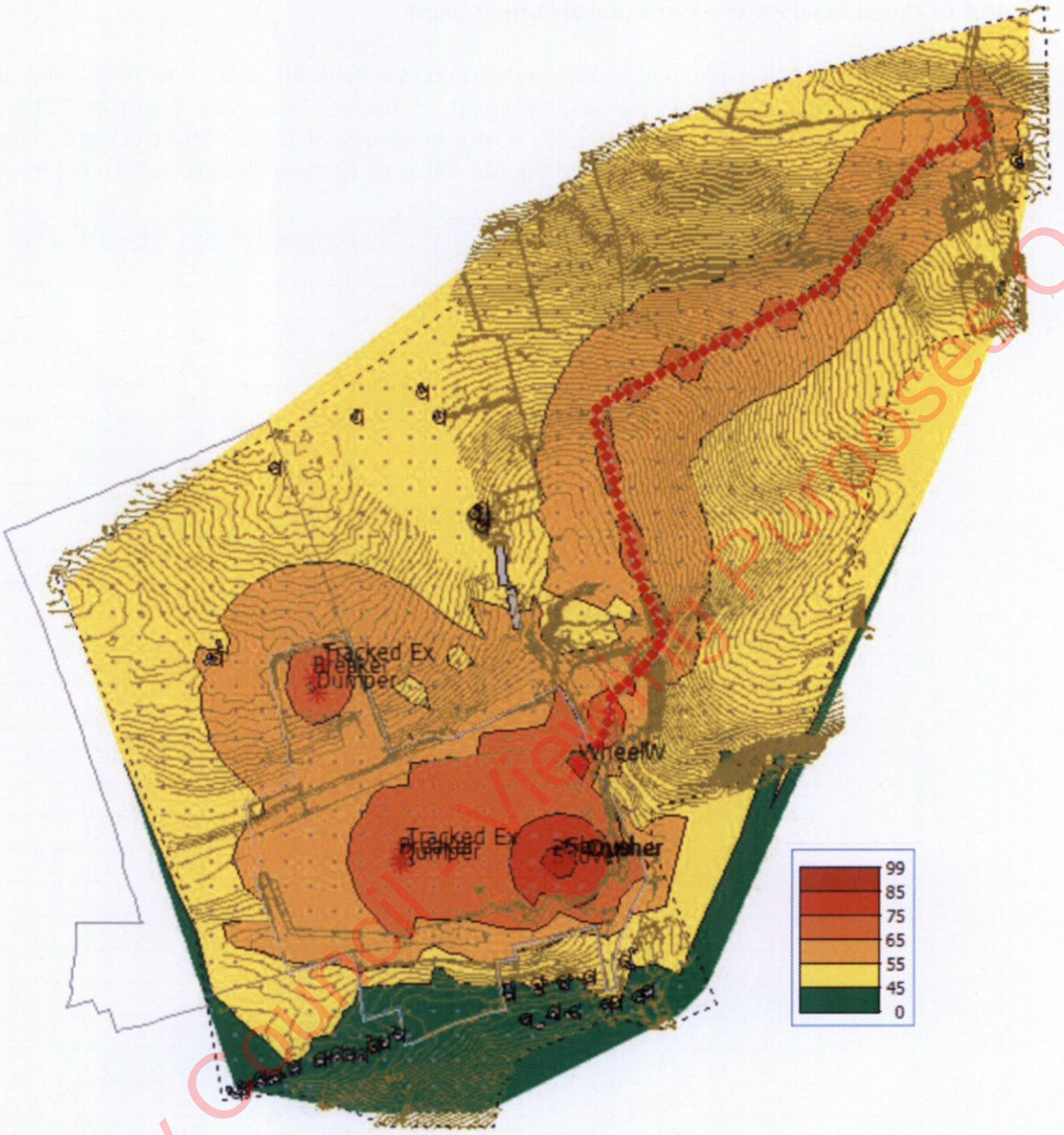

Figure 10.8: Noise Contours during exctraction at current depth.

10.5.5 Operational Phase – Extraction at First Bench Level

In this phase, it is assumed that the noise sources in Table 10.11 are operating in the central part of the main void at a level of 116m AOD. Simultaneously, 1 no. excavator, 1 no rock breaker, and 1 no. dump truck are depositing overburden in the northern part of the site. Table 10.14 shows the predicted noise levels.

NSR	Predicted Noise Level, dB $L_{Aeq\ 1hr}$
R01	33
R02	33
R03	33
R04	42
R05	45
R06	45
R07	45
R08	46
R09	45
R10	44
R11	44
R12	45
R13	45
R14	46
R15	45
R16	46
R17	43
R18	43
R19	43
R20	43
R21	42
R22	43
R23	44
R24	45
R25	53
R26	53
R27	52
R28	52
R29	52
R30	53
R31	57
R32	54

Table 10.14: Predicted noise levels during Extraction at First Bench Level.

All predicted noise levels are within the criterion of 55dB $L_{Aeq,1hr}$, with the exception of R31 which is within the applicant's lands and not occupied. Noise contours are shown for this scenario in Figure 10.9.

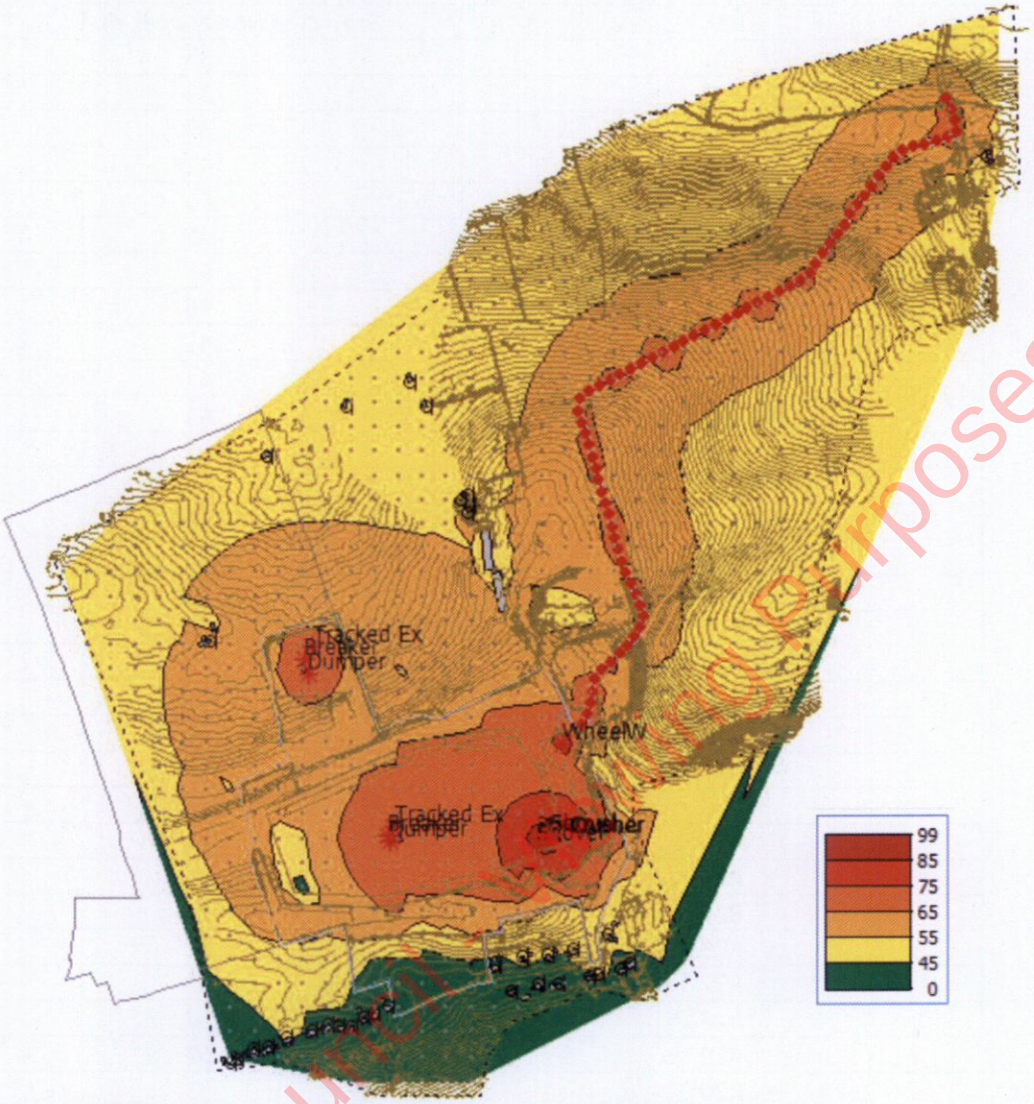

Figure 10.9: Noise Contours during Extraction at First Bench Level.

10.5.6 Operational Phase – Extraction at Quarry Floor Level

In this phase, it is assumed that the noise sources in Table 10.11 are operating in the central part of the main void at a level of 98m AOD. Simultaneously, 1 no. excavator, 1 no rock breaker, and 1 no. dump truck are depositing overburden in the northern part of the site. Table 10.15 shows the predicted noise levels.

NSR	Predicted Noise Level, dB $L_{Aeq\ 1hr}$
R01	33
R02	33
R03	33
R04	41
R05	43
R06	43
R07	43
R08	43
R09	43
R10	42
R11	42
R12	43
R13	43
R14	45
R15	44
R16	44
R17	42
R18	42
R19	42
R20	42
R21	41
R22	43
R23	43
R24	44
R25	50
R26	51
R27	50
R28	50
R29	51
R30	52
R31	56
R32	53

Table 10.15: Predicted noise levels during Extraction at Quarry Floor Level.

All predicted noise levels are within the criterion of 55dB $L_{Aeq,1hr}$, with the exception of R31 which is within the applicant's lands and not occupied. Noise contours are shown for this scenario in Figure 10.10.

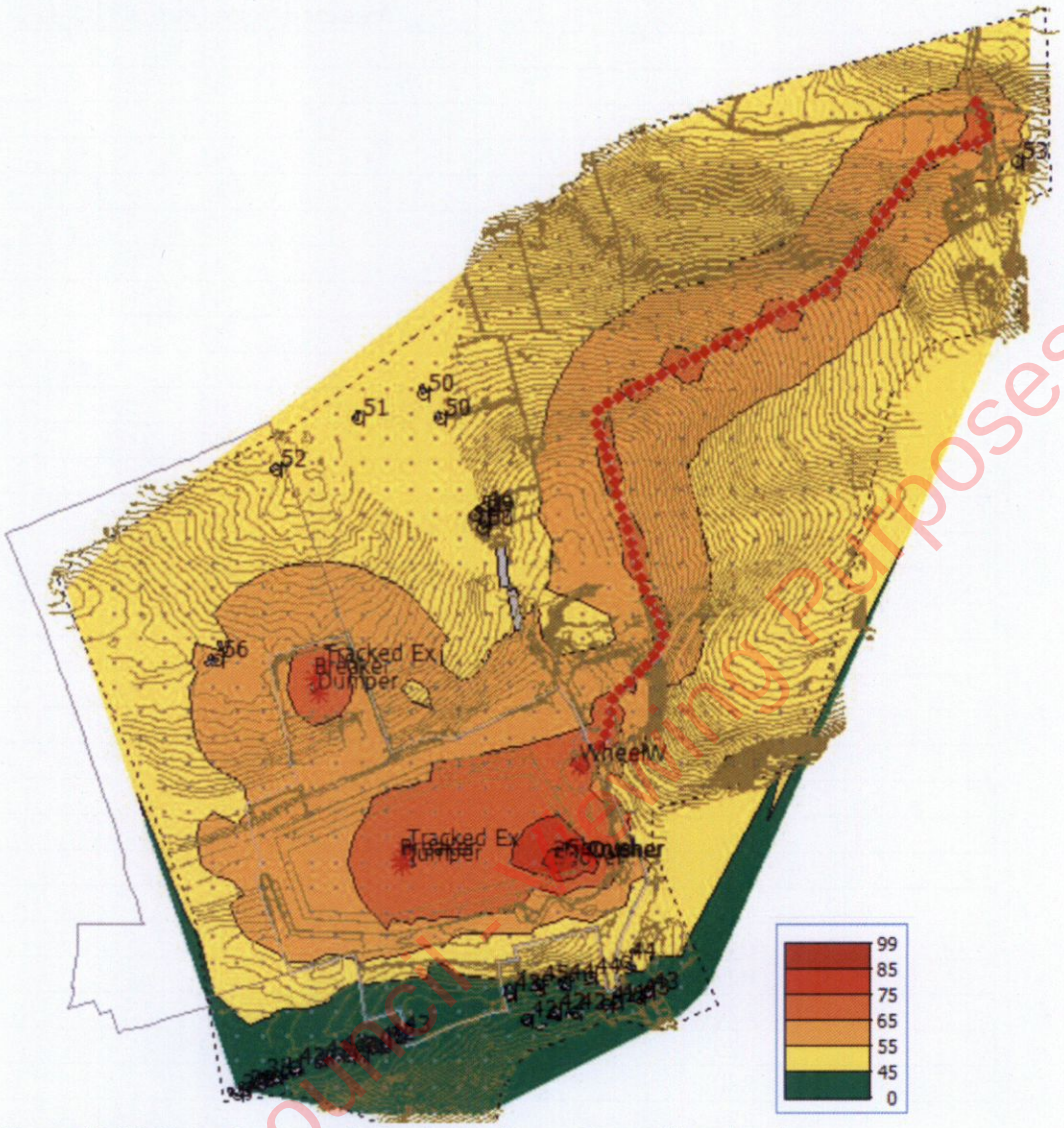

Figure 10.10: Noise Contours during Extraction at Quarry Floor Level.

10.5.7 Operational Phase – Quarry Activity Summary

As the noise predicted noise levels in all scenarios are within the criterion of 55dB $L_{Aeq,1hr,}$ the combined impact of the permitted quarry operation and the proposed new access road is considered to be negative, not significant and long-term.

10.5.8 Operational Phase – Wheel Wash

The wheel washing station will be relocated closer to the proposed new entrance to the quarry located along the site road at approximately 50m from the site entrance. Noise levels measured previously at wheel washing stations indicate that the noise level at a distance of 10m is of the order of 81dB L_{Aeq}. The nearest houses to the wheel washing station are labelled 5 and 6 in Figure 10.4. The residents at these receptors are involved in the development and are not considered noise-sensitive in this context. Considering the distance to noise-sensitive

location, the expected noise level at the nearest noise-sensitive receptors is 52dB $L_{Aeq,1hr}$, which is within the criterion of 55dB $L_{Aeq\ 1hr}$.

In conclusion, the noise impact of the wheel washing is considered to be negative, not significant and long-term.

10.5.9 Operational Phase – Powerhouse

A new powerhouse (56 sq m) is proposed to facilitate a mains electricity supply for use by pumps, plant and machinery in the future.

The nearest noise-sensitive locations are the houses along the road to the south of the site. At detailed design stage, the selection of the generator and the building envelope will be designed so that the total noise level of the site remains within the adopted criteria for daytime periods, at all noise-sensitive locations.

The noise impact of the powerhouse is considered to be negative, not significant and long-term.

10.5.10 Operational Phase – Additional Vehicular traffic on Public Roads

In this context, 'Do Nothing' represents the scenario where current quarry operations continue until the end of the existing planning permission i.e., until October 2028. 'Do Something' represents the scenario where planning permission for the new access road (and ancillary items) is granted and quarry operations continue. It should be noted that the number of non-HGV vehicle trips generated by the quarry as a result of the proposed development is the same as for current operations.

Please refer to Chapter 12 for full details in relation the traffic assessments prepared for the development. Based on traffic flow values presented therein for the Existing Development and Proposed Development scenarios, the changes in traffic noise levels have been calculated for the opening year 2021, and the design year 2031 and are shown in Table 10.16. Traffic noise levels are predicted in accordance with guidance set out in Calculation of Road Traffic Noise (CRTN).

Link	Do Nothing		Do Something		Change in Noise Level
	LV	HV	LV	HV	
L56172 (North)	57	8	57	8	0.0
L56172 (South)	46	66	46	8	-3.2
L5618 (West)	516	65	516	33	-0.2
L5618 (Central)	612	67	612	40	-0.2
L5618 (East)	748	74	748	62	-0.1
Stamullen Road	841	73	841	62	-0.1
L1615 (South)	1120	58	1120	54	0.0
L1615 (North)	1195	55	1195	213	0.5
R150 (West)	4233	443	4233	601	0.1
R150 (East)	3833	443	3833	443	0.0

Table 10.16: Summary of Noise Level Changes Due to Traffic for Year 2022.

Link	Do Nothing		Do Something		Change in Noise Level
	LV	HV	LV	HV	
L56172 (North)	49	12	65	12	1.0
L56172 (South)	45	10	53	12	0.7
L5618 (West)	627	50	631	50	0.0
L5618 (Central)	744	60	748	60	0.0
L5618 (East)	916	94	916	94	0.0
Stamullen Road	1028	94	1030	94	0.0
L1615 (South)	1369	81	1371	81	0.0
L1615 (North)	1461	77	1463	239	0.4
R150 (West)	5185	666	5187	828	0.1
R150 (East)	4697	672	4697	672	0.0

Table 10.17: Summary of Noise Level Changes Due to Traffic for Year 2037.

The resulting changes in traffic noise level are less than +2dB. With reference to the criteria in Table 10.5 the resulting impact is negative, not significant and long-term.

10.6 Mitigation Measures

10.6.1 Construction Phase Noise

Typical construction noise thresholds are not expected to be exceeded therefore no specific mitigation measures are proposed. However, best practice in accordance with BS 5228 should be adhered to.

10.6.2 Construction Phase Vibration

There will be no significant vibration from the construction site, i.e. from the removal of topsoil, therefore no mitigation measures are required.

10.6.3 Operational Phase Noise

This noise impact assessment has been carried out using worst case scenario assumptions. As mentioned earlier the noise emissions from the quarry will vary depending on the intensity of quarry operations and there will be times when the noise emissions predicted herein will be lower. The construction of an earth berm on the west and northern sides of the excavation area will serve to reduce noise emissions to the surrounding area.

The calculated noise levels at the nearest noise-sensitive receptors to the quarry for the two phases do not exceed the recommended operational criterion adopted for the quarry. Notwithstanding this, best practice noise mitigation measures will form part of site management practices to ensure noise from on-site operations do not cause a noise nuisance at the nearest NSR, the following measures are recommended:

- Regular maintenance of items of plant to ensure that they are operating efficiently;

- Location of noisy items of plant at the lowest part of the working quarry floor and as close to the quarry face as possible to provide optimum noise screening;
- Design of internal haul roads with as low a gradient as possible to minimise excessive revving of vehicle engines travelling on-site.
- Regular maintenance of haul routes to avoid potholes and uneven surfaces;
- Avoiding unnecessary revving of engines, reducing speed of vehicle movement and keeping lorry tailgates closed where possible;
- All mobile equipment is throttled down or switched off when not in use;
- Use of rubber linings in chutes, dumpers, transfer points etc. to reduce the noise of rock falling on metal surfaces;
- Using rubber mats around screening and crushing plants;
- Enclosing pumps, covering conveyors, cladding the plant and keeping noise control hoods closed when machines are in use;
- Within the constraints of efficient production, limiting the use of particularly noisy plant, limiting the number of items in use at any one time, starting plants one-by-one and switching off when not in use, and;
- Pointing directional noise away from sensitive areas where possible.

10.7 Residual Impacts

It is concluded that noise levels associated with the proposed development will not contribute any significant noise impact to at noise-sensitive locations.

10.8 Cumulative Impacts

A review of the Meath County Council Online Planning Search did not show any permitted development that could be considered to have a cumulative noise or vibration impact.

As described in Chapter 3 Section 3.4.6.1, public road improvements along the L1615 are required to facilitate the proposed development. In terms of construction noise, the assessment presented in Section 10.5.3 also applies to the public road improvements. Similarly, the noise effects of the construction of the new access road are negative, not significant and temporary.

10.9 References

BS 5228: 2009 & A1 2014 – *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise*.

BS 5228: 2014 & A1 2014 – *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration*.

EPA (2016) *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).*

EPA Environmental Management Guidelines (2006): *Environmental Management in the Extractive Industry (Non-Scheduled Activities).*

IEMA *Guidelines for Environmental Noise Impact Assessment, 2014.*

ISO 1996: 2003 – *Acoustics Description, Measurement and Assessment of Environmental Noise.*

Guidelines on the information to be contained in Environmental Impact Assessment Reports May 2022.

Manual for Roads and Bridges (DMRB), Highways England, Transport Scotland, The Welsh Government and The Department of Infrastructure 2019.

Calculation of Road Traffic Noise: UK Department of Transport, Welsh Office, 1988., London: HMSO.

IEC 61672-1:2013 *Electroacoustics - Sound level meters - Part 1: Specifications*

APPENDIX 10.1: CALIBRATION CERTIFICATES

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

ilac-MRA UKAS CALIBRATION 0653

Date of Issue: 10 December 2019

Certificate Number: UCRT19/2336

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

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Approved Signatory

B. Giles

CUSTOMER	AWN Consulting Limited The Tecpro Building IDA Business And Technology Park Clonshaugh Dublin 17
ORDER No	DOD/19/Cal015
Job No	UKAS19/12797
DATE OF RECEIPT	06 December 2019
PROCEDURE	Procedure TP 9 - Calibration of Filters

IDENTIFICATION	*Manufacturer*	*Model*	*Serial No*
Filters in sound level meter	Brüel & Kjær	2250	2818080

CALIBRATED ON 10 December 2019

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

Certificate N° UCRT19/2336

The sound level meter was calibrated in accordance with the manufacturer's instructions, using an appropriate sound level calibrator, prior to measurements being carried out on the filters. The sound level meter has also undergone a full verification procedure, see certificate UCRT19/2334 issued by this laboratory. The manufacturer claims that the filters were designed in accordance with the Class 0 third octave requirements of IEC 61260:1995, and these tolerances are given with the results in this certificate. Base 10 test frequencies have been used throughout the filter calibration, in accordance with manufacturers' information.

Inter-band level accuracy test

The meter was set to the single measurement range and the 1 kHz third octave filter was selected. A 1 kHz sinusoidal signal was then injected and adjusted to give a reading of 94.0 dB. Following this each filter band was selected in turn, the signal frequency was adjusted to the centre-frequency of the filter, and the sound level meter reading relative to that for the 1 kHz band was noted. A similar test was carried out for the Z setting using a 1 kHz signal.

As the tolerance at the centre frequency in each band is ± 0.15 dB , it is expected (but not explicitly required in IEC 61260:1995), that the relative levels at each centre frequency shall lie within this spread. Not all bands tested met this expectation. Points where this is the case are marked by a red cross immediately to the right of the result in the tables which follow.

Filter shape test

Using the same measurement range as above, the 1 kHz third octave filter was again selected. A sinusoidal signal at the centre frequency of 1 kHz was injected, and its level adjusted to give a reading of 134.0 dB. The frequency of the input signal was then changed to each of the values shown in the table of results in turn, and the new meter reading was noted. Twenty nine further third octave bands (as shown) were then selected and tested in the same manner, with the signal level being set at the new centre frequency in each case.

All bands tested met the requirements of the standard, which are shown with the results.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

Certificate N° UCRT19/2336

Uncertainties

The laboratories expanded measurement uncertainties are estimated as ± 0.16 dB at the centre frequency & at other frequencies within the pass-band of the filter, and ± 0.20 dB for frequencies outside the pass-band. **The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k*=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.**

NOTES

1 The attenuation figures given in the table(s) of filter shapes refer to the meter reading at the given frequency relative to that at the centre frequency in question. The required value is denoted as Δ in the column showing attenuation limits.

2 Since the tests carried out cover only a limited subset of the content of IEC 61260:1995, the results obtained do not confer compliance with the full requirements of that standard, and are applicable only to those filter bands tested.

3 Any linearity errors which the sound level meter may exhibit are included in the filter errors shown in this certificate. Since the meter errors may vary with frequency, it cannot be assumed that they are the same as those given in certificate number UCRT19/2334.

4 The following firmware was in use at the time of the testing:

Identification	Version
BZ 7223	4.7.5

The results on this certificate only relate to the items calibrated as identified above.

APPENDIX 10.2: GLOSSARY OF NOISE AND VIBRATION TERMINOLOGY.

Ambient noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
Background noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T (LAF90,T).
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 µPa).
dB(A)	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Hertz (Hz)	The unit of sound frequency in cycles per second.
$L_{Aeq,T}$	This is 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 (T).The closer the LAeq value is to either the LAF10 or LAF90 value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.
L_{AFN}	The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.
L_{AF90}	Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.
L_{AF10}	Refers to those A-weighted noise levels in the upper 10 percentile of the sampling interval; it is the level which is exceeded for 10% of the measurement period. It is typically representative of traffic noise levels. Measured using the "Fast" time weighting.
L_{AFmax}	is the instantaneous fast time weighted maximum sound level measured during the sample period.
L_{AFmin}	is the instantaneous fast time weighted minimum sound level measured during the sample period.

APPENDIX 10.3: NOISE-SENSITIVE LOCATION DETAILS.

Table A10-3.1 Noise-sensitive location coordinates

Ref	Easting	Northing
R01	707197	766737
R02	707213	766743
R03	707247	766769
R04	707278	766771
R05	707317	766788
R06	707369	766805
R07	707401	766815
R08	707427	766814
R09	707452	766814
R10	707478	766830
R11	707496	766840
R12	707528	766856
R13	707751	766938
R14	707807	766956
R15	707860	766960
R16	707913	766971
R17	707785	766886
R18	707840	766900
R19	707883	766901
R20	707947	766916
R21	707968	766920
R22	708013	766930
R23	708032	766943
R24	707987	767000
R25	707698	767889
R25	707693	767910
R26	707607	768090
R26	707575	768142
R27	707440	768090
R28	707275	767988
R29	707157	767608
R30	708777	768607
R31	707197	766737
R32	707213	766743

Figure A10-3.1 Noise-sensitive locations R01 to R024

Figure A10-3.2 Noise-sensitive locations R25 to R32