CHAPTER 10

NOISE AND VIBRATION

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INTRODUCTION

Background

10.1 This chapter of the Environmental Impact Assessment Report (EIAR), prepared by SLR Consulting Ireland, provides supporting information to accompany a Planning Application to Sligo County Council by Lagan Materials Ltd. It assesses the levels of noise and vibration at the site associated with the planning application area and the wider quarry development at Aghamore Near, Aghamore Far and Carrownamaddoo townlands, Co. Sligo.

10.2 The quarry operations comprise extraction of limestone using blasting techniques; processing (crushing and screening) of the fragmented rock to produce aggregates for road construction, site development works and in the production of asphalt materials.

10.3 Further information on the site infrastructure, operations, environmental management systems, and controls at the established quarry site is provided in the Chapter 2 of this EIAR.

10.4 The proposed development provides for extraction in line with previously permitted levels, i.e. up to 300,000 tonnes of rock per year. However, it is expected that extraction rates will vary from 150,000 to 300,000 tonnes per annum, depending on market demand. The quarry will use the existing established access and traffic routes.

10.5 Ancillary manufacturing facilities at the site, located adjacent to the processing area, include an asphalt plant.

10.6 Based on a 50-week year, 5.5 days per week, cumulative operations at the site will result in an average of maximum of 164 daily HGV return trips (82 HGVs inward and 82 HGVs outward) generated by the proposed development and the existing asphalt plant.

10.7 The noise impact assessment presented herein describes and assesses the existing noise baseline characteristics of the local area. The anticipated effects of the proposed development are then applied to these baseline conditions and the resulting noise impacts assessed. Mitigation measures are identified where necessary to eliminate or minimise adverse impacts, insofar as practical.

10.8 An operational vibration assessment has been undertaken; vibration assessment is based on existing vibration monitoring at the quarry.

10.9 In order to assist the understanding of acoustic terminology and the relative change in noise, a glossary of terms and phrases, which specifically relate to this chapter, is provided in Appendix 10-A.

Scope of Work

10.10 The following sections of this EIAR Chapter describe the potential noise impacts associated with the proposed development, and in order to assess the cumulative impact the existing asphalt plant has been included in the assessment. The following issues are addressed separately:

- methodology used to assess potential impacts from activities at properties (dwellings and farms) and sensitive ecological receptors;
- baseline conditions pertaining to existing background and ambient noise levels around the project site;
- existing vibration levels;

- noise and vibrations impact evaluation criteria;
- prediction of the noise and vibrations levels and identification of potential impacts;
- assessment of severity of impacts, with reference to the evaluation criteria;
- description of mitigation measures that will be incorporated into the design and operation of the scheme to eliminate or minimise the potential for noise and vibrations impact;
- a summary of any residual impacts; and
- monitoring proposals.

Consultations / Consultees

10.11 A number of pre-planning consultation meetings have been held between officials of Sligo County Council and representatives of SLR Consulting Ireland and Lagan Materials Limited.

10.12 At the meetings, details of the proposed development were presented and issues likely to be of interest or concern were identified and discussed.

10.13 Following a review of published development plans and the site survey, it was considered that there was no requirement for any further formal consultations to be carried out in respect of noise and vibrations for the purposes of this assessment.

Contributors / Author(s)

10.14 SLR Consulting Ireland undertook the impact assessment presented in this chapter on behalf of Lagan Ltd. The lead consultant for the study was Aldona Binchy MSc. Eng PIEMA Environmental Engineering.

Limitations / Difficulties Encountered

10.15 This assessment is compiled on the basis of published guidance documents, and site-specific field surveys. No difficulties were encountered in compiling the required information.

ADDITIONAL INFORMATION

10.16 As outlined in Chapter 1, a planning application was submitted to Sligo County Council (Plan File Ref. No. 18/345 / ABP Ref. 305821-19) in August 2018 for similar development to that proposed as part of this application. In October 2019 Sligo County Council granted planning permission for the development (subject to 23 no. conditions). 2 no. third party appeals of the decision by Sligo County Council to grant permission for the proposed quarry development were made to An Bord Pleanala (ABP-305821-19). An Bord Pleanala refused permission for the proposed development on the 30th June 2020 for the 2 no. reasons – refer to Chapter 1 for further details.

10.17 In order to comprehensively address the reasons for refusal, and further comments contained within the An Bord Pleanala Inspectors Report a number of additional surveys / site investigations, field work and assessments have been carried out.

10.18 This Chapter 10 of the EIAR has been updated as follows:

- Additional baseline noise monitoring has been undertaken at the application site;

- This assessment takes account of the revised planning application area and considers all activities associated with the revised application area, such as the recommencement of aggregate processing activities;
- The locations of local receptors have been updated to take account of any new sensitive receptors in the vicinity of the application site since the last application;
- The assessment takes account of cumulative impacts associated with the existing asphalt plant on-site.

REGULATORY BACKGROUND

Noise

10.19 The following sections describe the main legislative policy requirements in respect of noise associated with the proposed development.

10.20 Currently, there is no national or regional legislation which specifically addresses noise and vibrations for the mineral extraction and production of aggregates. However, there are a number of guidance documents that are relevant in the context of noise and vibrations action planning.

Planning Policy and Development Control

National Spatial Strategy (NSS) / National Planning Framework – Project Ireland 2040

10.21 The National Spatial Strategy (NSS) 2002-2020 (published in November 2002) was a 20-year coherent national planning framework for Ireland. It aimed to achieve a better balance of social, economic, and physical development across Ireland, supported by more effective and integrated planning. The strategy emphasised continued strong growth in the Greater Dublin Area (GDA), but with significant improvement in other regions to achieve more balanced regional development. The NSS provided the policy framework for all regional and local plans.

10.22 The National Planning Framework 2040 (published in February 2018) is a national planning framework for Ireland. The framework provides the policies for all regional and local plans. In the framework, the extractive industries are recognised as important for the supply of aggregates and construction materials to variety of sectors. It emphases that the planning process will play a key role in realising the potential of the extractive industries and protecting reserves of aggregates and minerals. Aggregates and minerals will continue to be enabled where this is compatible with protection of the environments.

10.23 The Project Ireland 2040 National Planning Framework does make reference to noise in general terms under section 9.4 *Creating a Clean Environment for a Healthy Society* in acknowledging that noise is unwanted sound but is an inevitable consequence of everyday life and it becomes a problem when it occurs in the incorrect place or at the incorrect time or on a frequent or recurring basis. The National Planning Framework aims to support the following measures:

- ***Noise Management and Action Planning***

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

- ***Noise, Amenity and Privacy***

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

- ***Quiet Areas***

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

10.24 National Planning Framework Objective 65 on noise states:

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

10.25 There are no specific policies relating to air emissions in the National Planning Framework for extractive industry or related production activities.

10.26 There are no specific policies in relation to noise emissions in NPF for construction aggregates. The general objective is to facilitate the development while at the same time protect the environment.

Local Planning Policy - Sligo County Development Plan 2017-2023

10.27 Sligo County Development Plan 2017-2023 P-NC-1 states that;

"When assessing proposals for activities that are likely to generate significant levels of noise, seek to protect the amenity of dwellings, community facilities and other noise-sensitive developments by ensuring that all new (and where possible existing) developments incorporate appropriate measures to minimise noise nuisance."

Guidelines

British Standard 5228: 2009+A1:2014

10.28 British Standard 5228-1:2009+A:2014 Noise and vibration control on construction and open sites, Part 1: Noise (BS5228) sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities. It can be used to predict noise levels arising from the operations of proposed minerals extraction sites. BS5228 also sets out tables of sound power levels generated by a wide variety of mobile equipment.

10.29 Noise levels generated by site operations and experienced at local receptors will depend upon a number of variables, the most significant of which are:

- the amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;
- the periods of operation of the plant at the development site, known as the "on-time";

- the distance between the noise source and the receptor, known as the "stand-off";
- the attenuation due to ground absorption or barrier screening effects; and
- any reflections of noise due to the presence of hard vertical faces (ie. walls).

Guidelines for Noise Impact Assessment (IEMA)

10.30 The Guidelines for Noise Impact Assessment produced by the Institute of Environmental Management and Assessment (IEMA) are generally recognised as established good practice standards for scope, content, and methodology of noise impact assessment.

10.31 These guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. These guidelines state that for any assessment, the noise level threshold and significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise. An example impact scale offered by the IEMA guidelines is shown in Table 10-1.

Table 10 - 1
Example Impact Scale from the Change in Sound Levels (IEMA)

Long-term Impact Classification	Short-term Impact Classification	Sound Level Change dB L_{pAeqT} (+ive or -ive) T = either 16hr day or 8hr night
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥ 1 dB and < 3 dB
Minor	Moderate	≥ 3.0 dB and < 5 dB
Moderate	Major	≥ 5.0 dB and < 10 dB
Major		≥ 10.0

10.32 The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3dB is generally considered to be the smallest change in environmental noise that is perceptible to the human ear under most normal conditions. A 10dB 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.

10.33 To determine the overall noise impact, the magnitude and sensitivity Noise Effects Descriptors are presented in Table 10-2.

Table 10 - 2
Noise Effects Descriptors (IEMA)

Very Substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a highly sensitive noise receptor
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9 dB L_{Aeq} change in sound level at a highly sensitive noise receptor
Moderate	A 3 to 4.9 dB L_{Aeq} change in a sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB L_{Aeq} change in sound level at a receptor of some sensitivity

Slight	A 3 to 4.9 dB L_{Aeq} change in a sound level at a receptor of some sensitivity
None / Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors of negligible sensitivity to noise or marginal to the zone of the influence of the proposed development

10.34 As recognised in the IEMA guidance, there are however many factors which affect people's perception and their responses to noise. Guidance on assessment of the magnitude of noise impact and the significance of the effects are presented in Table 10-3.

Table 10 - 3
Relationship between Noise Impact, Effect and Significance (IEMA)

Magnitude (Nature Of Impact)		Description Of Effect (On A Specific Sensitive Receptor)	Significance
Substantial	Beneficial	Receptor Perception = Marked Change Causes a material change in behaviour and/ or attitude, e.g. individuals begin to engage in activities previously avoided due to preceding environmental noise conditions. Quality of life enhanced due to change in character of the area.	More Likely to be Significant (Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a non-significant effect) ↕ (Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a significant effect) Less Likely to be Significant
Moderate		Receptor Perception = Noticeable Improvement Improved noise climate resulting in small change in behaviour and/or attitude, e.g. turning down volume of television; speaking more quietly; opening windows. Affects the character of the area such that there is a perceived change in the quality of life.	
Slight		Receptor Perception = Just Noticeable Improvement Noise impact can be heard, but does not result in any change in behaviour or attitude. Can slightly affect character of the area but not such that there is a perceived change in quality of life.	
Negligible		N/A = no discernible effect on receptor	Not Significant
Slight	Adverse	Receptor Perception = Non-intrusive Noise impact can be heard, but does not cause change in behaviour or attitude, e.g. turning up volume of television, speaking more loudly; closing windows. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life.	Less Likely to be Significant Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a significant effect) ↕ Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a non-significant effect) More Likely to be Significant
Moderate		Receptor Perception = Intrusive Noise impact can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows. Potential for non-awaking sleep disturbance. Affects the character of area such that there is a perceived change in the quality of life.	
Substantial		Receptor perception = Disruptive Causes material change in behaviour and /or attitude, e.g. avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in getting to sleep, premature awakening, and difficulty in getting back to sleep. Quality of life diminished due to change in character of area.	
Severe		Receptor Perception = Physically Harmful Significant Changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or psychological effects, e.g. regular sleep deprivation / awakening ; loss of appetite, significant , medically definable harm, e.g. auditory and non-auditory.	Significant

Design Manual for Roads and Bridges

10.35 The Design Manual for Roads and Bridges (DMRB) considers the following criterion to determine 'affected roads' which have the potential to impact at surrounding receptors:

- road alignment will change by 5m or more;

- daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) or more;
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more;
- daily average speed will change by 10km/hour or more; or
- peak hour speed will change by 20km/hour or more.

AQTAG09 - Guidance on Effects of Industrial Noise on Wildlife

10.36 AQTAG09 (Air Quality Technical Advisory Group 09) guidance provides guidance to assist planning and/or licensing officials handling pollution prevention and control applications for industrial installations on relevant noise emissions and relates these to the requirements of the Habitats Regulations.

10.37 The Habitats Directive (92/43/EEC) specifies that, where specific noise from industry, measured at the habitat / nest site is below the levels in Table 10-4, it is considered unlikely that it will have an adverse impact on designated species. Where noise levels are exceeded further, assessment that is more detailed will be required.

Table 10 - 4
Specific Noise Levels at Habitat / Nest Site

Parameter	Noise Level, DB
$L_{Amax,F}$	80
$L_{Aeq,1hr}$	55

Noise and Human Health

10.38 Environmental noise exposure response relationships and thresholds for health endpoints for industry are not available at European or Irish level in legislation or guidelines.

10.39 The proposed quarry operations noise would differ significantly from what is considered “environmental noise” in the WHO guidelines and quarry operations noise would not be considered to be continuous long-term exposure as most of the proposed operations are intermittent and daytime only.

WHO Environmental Noise Guidelines

10.40 World Health Organisation (WHO) Europe have produced the WHO Environmental Noise Guidelines 2018 for the European Region as a regional update to the WHO Community Noise Guidelines. The Guidelines include a review of evidence on the health effects of environmental noise to incorporate significant research carried out in recent years. The guidelines provide recommendation for protecting human health from exposure to environmental noise from various sources. The guidelines assess several environmental noise sources such as aircraft, rail, road, wind turbines and leisure noise.

10.41 The 2002 EU Directive introduced annual average indicators of noise exposure (Lden and Lnight) as long-term exposure indicators, which differ from those used in the earlier WHO Guidelines for Community Noise (1999).

Vibrations

10.42 Currently, there is no regional or local legislation relating to the extraction of rock and vibrations. There are a number of guidance documents that are relevant in the context of vibration action planning and these are outlined below.

Quarries and Ancillary Activities

10.43 EPA Guidance on Quarries and Ancillary Activities suggest limit values for groundborne vibrations and air overpressure:

Groundborne vibration

Peak particle velocity = 12 mm per second, measured in any of the three mutually orthogonal directions at the receiving location (for vibration with a frequency of less than 40 hertz).

Air overpressure

125 dB (Linear maximum peak value), with a 95 % confidence limit. Any blasting will be restricted to normal hours (e.g. 11:00 -17:00 hrs Monday to Friday). Advance notification of blasting will be provided to nearby residents within 600m through use of written notes, signage at site entrance, telephone, or warning sirens or a combination of these methods.

10.44 The DoEHLG (2004) Guidelines for Planning Authorities (Quarries and Ancillary Activities: Guidelines for Planning Authorities, DoEHLG 2004) suggest similar limit values.

British Standard 6472:2008

10.45 British Standard 6472:2008 Guide to Evaluation of Human Exposure to Vibration in Buildings gives guidance on human exposure to blasting induced vibration in buildings. It is applicable to blasting associated with rock extraction.

10.46 BS6472 gives details of the maximum satisfactory magnitudes of vibration for residential properties which is shown in Table 10-5. This table relates to the magnitude of vibration below which the probability of adverse comment is low.

Table 10 - 5
Maximum Satisfactory Magnitudes of Vibration with Respect to Human Response for Up to Three Blasting Events per Day

Place	Time	Satisfactory magnitude (peak particle velocity, mm/sec)
Residential	Day (08.00 – 18.00 M to F) (08.00 – 13.00 Sat) Night Other Times	6.0 to 10.0 2.0 4.5
Offices	Any Time	14.0
Workshops	Any Time	14.0

British Standard 7385-2:1990

10.47 British Standard 7385-2:1990 Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Groundborne Vibration gives guidance on vibration limits to prevent building damage. It is applicable to blasting associated with rock extraction.

10.48 The damage threshold criteria provided in BS7385 are based on systematic studies using a carefully controlled vibration source in the vicinity of buildings. Vibration limits for transient vibrations (such as those associated with blasting operations) above which cosmetic damage could occur are provided in Table 10-6 below.

Table 10 - 6
Transient Vibration Guide Values for Cosmetic Damage

Type of Building	PPV (mm/Sec) 4 To 15 Hz	PPV (mm/Sec) 15 Hz And Above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/sec	50 mm/sec
Unreinforced or light framed structures Residential or light commercial buildings.	15 mm/sec at 4Hz increasing to 20 mm/sec at 15 Hz	20 mm/sec at 15Hz increasing to 50 mm/sec at 40 Hz and above.

10.49 The definition of "cosmetic damage" is the formation of hairline cracks or the growth of existing cracks in plaster, dry wall surfaces, or mortar joints. BS7385-2 notes that the probability of damage tends towards zero at 12.5mm/sec peak component particle velocity.

RECEIVING ENVIRONMENT

Study Area

10.50 The application site is located in the townlands of Aghamore Near, Aghamore Far and Carrownamaddoo, County Sligo approximately 3.5km south of Sligo and 1.5km east of the N4 Road.

10.51 The application area forms the existing quarry area, along with the associated processing area located on the eastern site of the local road that bisects the application site. Material extracted from the quarry area will be processed within the quarry void using mobile processing plant and transported to the processing area for further processing using mobile plant and stockpiling, pending transport off-site.

10.52 The quarry area is surrounded by agricultural lands. The application site is not subject to any statutory or non-statutory nature conservation designations. Dwellings in the vicinity of application site are generally located along the local road network, both as isolated farmhouse structures or in small clusters. The nearest dwellings to the landholding site boundary are identified on Figure 10-1.

Baseline Study Methodology

Noise

10.53 Environmental noise surveys were carried out to capture typical background noise levels at the noise-sensitive receptors closest to the application site. The methodology of the surveys and the results are set out below. The weather conditions during the survey periods were acceptable for noise monitoring, being generally dry with little or no wind. The baseline noise surveys were carried out by SLR.

10.54 The baseline noise measurements were taken using a Type 1 sound level meter (Larson Davis 831 SLM). The sound level meter was calibrated before the measurements, and its calibration checked

after by the operator. No calibration drifts were found to have occurred during surveys. All noise equipment had been calibrated to a traceable standard by UKAS (United Kingdom Accreditation Service) accredited laboratories within 12 months preceding the surveys.

10.55 At the measurement positions, the following noise level indices were recorded:

- LAeq,T is the A-weighted equivalent continuous noise level over the measurement period, and effectively represents an "average" value.
- LA90,T is the A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe the background noise.
- LA10,T is the A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe traffic noise.

10.56 Environmental baseline noise surveys were undertaken by SLR staff at the nearest noise sensitive receptors to the application site on 26th February 2018, 26th August 2020 and 29th September 2020. The weather conditions were favourable, with no winds (<5m/s). Noise measurements were undertaken over four, non-consecutive, 15-minute periods and over 1 hr periods during the daytime (07:00 to 19:00). The monitoring periods chosen are considered to give representative daytime noise levels at each noise sensitive location.

10.57 During the surveys, the sound level meter was located in free-field conditions (i.e. at least 3.5m from the nearest vertical reflecting surface, with the microphone approximately 1.5m above ground level).

10.58 All noise levels are recorded in 'A-weighted' decibels, dB(A). A-weighting is the process by which noise levels are corrected to account for the non-linear frequency response of the human ear. All noise levels are quoted in dB(A) relative to a sound pressure of 20 Pa.

Vibrations

10.59 At the quarry vibration monitoring was previously carried out at each blasting event.

10.60 During each blasting event at the quarry both Ground Vibration and Air Blast (Air Overpressure) were monitored at a minimum at one sensitive location (i.e. the location nearest to the blast).

Sources of Information

10.61 Baseline information was gathered through a combination of desk-based study, site visit, and technical assessments consistent with current standard methodologies and published best practice guidelines, in order to provide relevant data to allow an assessment of likely significant effects of the proposed development on sensitive receptors within the zone of influence.

Field Survey / Monitoring

Noise

10.62 The noise monitoring locations used for the purposes of the baseline noise survey, shown in Figure 10-1, comprise the following:

- BN1 at residences closest to the south eastern boundary;
- BN2 at the residences closest to north eastern boundary;

- BN3 at the residences closest to northern boundary;
- BN4 at the residences closest to western boundary;
- BN5 at the residences closest to south western boundary;
- BN6 at the residences to north east of the processing yard.

10.63 Noise monitoring results for the baseline survey on are provided in Table 10-8; logarithmic average LAeq values are provided in Table 10-9.

10.64 The following observations are made in respect of the baseline noise monitoring undertaken around the application site:

- Measured baseline noise levels at monitoring point BN1 were mainly dominated by road traffic noise on the adjoining local road, sheep noises when traffic abated;
- Measured baseline noise levels at BN2 were mainly dominated by road traffic noise on the adjoining local road, traffic on the R287 and vans pulling in and out of an ESB office;
- Measured baseline noise levels at BN3 were mainly dominated by heavy road traffic noise along the R287;
- Measured baseline noise levels at BN4 were mainly dominated by road traffic noise along the R284, dogs barking at residence and children playing;
- Measured baseline noise levels at monitoring point BN5 were mainly dominated by road traffic noise on the adjoining local road.
- Measured baseline noise levels at monitoring point BN6 were mainly dominated by road traffic noise on the adjoining local road.

Table 10 - 7
Summary of Measured Noise Levels, Free Field dB

Date	Location	$L_{Aeq,T}$(dB)	$L_{A10,T}$(dB)	$L_{A90,T}$(dB)
26/02/2018	BN1	49	42	31
26/02/2018	BN1	56	49	32
26/02/2018	BN1	51	44	30
26/02/2018	BN1	54	45	29
26/02/2018	BN2	56	51	40
26/02/2018	BN2	56	48	39
26/02/2018	BN2	53	47	38
26/02/2018	BN2	54	45	37
26/02/2018	BN3	73	75	42
26/02/2018	BN3	70	70	40
26/02/2018	BN3	74	76	43
26/02/2018	BN3	74	77	44
26/02/2018	BN4	48	45	37
26/02/2018	BN4	49	44	36
26/02/2018	BN4	42	44	35
26/02/2018	BN4	57	51	33
26/02/2018	BN5	59	49	37

Date	Location	$L_{Aeq,T}$(dB)	$L_{A10,T}$(dB)	$L_{A90,T}$(dB)
26/02/2018	BN5	58	50	37
26/02/2018	BN5	63	57	33
26/02/2018	BN5	63	51	27
26/08/2020	BN1	54	45	35
29/09/2020	BN2	59	54	38
26/08/2020	BN3	69	69	43
29/09/2020	BN4	49	49	41
26/08/2020	BN5	59	57	33
29/09/2020	BN6	64	61	35

Table 10 - 8
Summary of Measured Noise Levels, Free Field dB (Average Values)

Location	Receptors effected	Period	$L_{AeqAVGE}$
BN1	R Group 1, R Group 9	Daytime	53
BN2	R Group 2, R Group 7	Daytime	56
BN3	R Group 3, R Group 6	Daytime	72
BN4	R Group 4	Daytime	51
BN5	R5, R10, R11, R12	Daytime	60
BN6	R Group 8	Daytime	64

10.65 Table 10-8 provides detail of the closest receptors affected by the noise emissions from the activities around at the application site in relation to the noise monitoring locations.

Vibrations

10.66 Historical blasting operations at the Aghamore Quarry have been monitored at neighbouring residences.

10.67 Blast monitoring results for Aghamore Quarry are provided in Table 10-9.

Table 10 - 9
Blast Monitoring Results

Date	Location	PPV (mm/sec)	Air Overpressure (dBL)
15/03/2010	Rooney	0.9	119
15/03/2010	Moran	1.9	-
28/04/2010	Rooney	0.6	123
28/04/2010	Moran	1.6	112
17/05/2010	Rooney	0.51	121
17/05/2010	Scanlons	<0.5	<125
08/06/2010	Rooney	2.4	112
08/06/2010	Hughes	0.3	114
08/06/2010	Moran	1	114
06/08/2010	Kelly	1.08	112
06/08/2010	Rooney	1.4	115
08/09/2010	House at Crossroads	2.15	107
08/09/2010	Mullanes	1.5	109
08/09/2010	Rooney	1.5	119
13/10/2010	Rooney	1.46	118

Date	Location	PPV (mm/sec)	Air Overpressure (dBL)
24/11/2010	Rooney	3.7	115
24/11/2010	Moran	0.6	121
23/01/2012	Location 1	4.57	124
23/01/2012	Location 2	<0.5	<125
15/06/2012	Location 1	4.7	125
15/06/2012	Location 2	5.5	108
06/07/2012	Location 1	2.7	122
06/07/2012	Location 2	1.4	116
13/08/2012	Location 1	2.3	114
13/08/2012	Location 2	0.5	101
31/08/2012	Location 1	0.7	109
31/08/2012	Location 2	5.72	125.8
26/10/2012	Location 1	1.2	122
26/10/2012	Location 2	1.5	111
29/01/2013	Location 1	<0.5	<125
27/02/2013	Location 1	4.3	111
27/02/2013	Location 2	1.3	114
14/03/2013	Location 1	1.8	118
14/03/2013	Location 2	1.3	117
24/04/2013	Location 1	3.4	112
24/04/2013	Location 2	3.8	106
02/10/2013	Location 1	5.3	118
02/10/2013	Location 2	1.7	111
14/01/2014	Location 1	7.3	123
14/01/2014	Location 2	3.2	118
10/03/2014	Location 1	2.9	114.4
10/03/2014	Location 2	6.3	116.7

10.68 All the levels recorded are within the threshold limits.

Sensitive Receptors

Human

10.69 Sensitive locations are those where people may be exposed to noise from the existing or planned activities. The closest receptors to the application site have been identified (refer to Figure 10-1). This is a cautious approach, as noise generating activities are located at greater distances within the site. The relevant receptors are listed in Table 10-10 and their locations are shown in Figure 10-1.

10.70 There are 12 sensitive receptors identified within the 500 m study area of the application site. A summary of the closest sensitive receptors in each direction surrounding the planning application area and their respective proximity to the nearest noise generating activity within the site is presented in Table 10-10 below.

Table 10 - 10
Noise Sensitive Receptors within 500m

Receptor Reference	Receptor	Sensitivity	Distance (m) / Direction from quarry activities	Distance (m) / Direction from yard activities
R Group 1	Residential	Medium	105(SE)	170(SW)
R Group 2	Residential	Medium	280(NE)	180(NE)
R Group 3	Residential	Medium	174(N)	650(NW)
R Group 4	Residential	Medium	215(W)	1000(W)
R5	Residential	Medium	154(S)	600(SW)
R Group 6	Residential	Medium	378(NW)	1010(NW)
R Group 7	Residential	Medium	170(NE)	450(N)
R Group 8	Residential/ Farm	Medium	177(E)	190(N)
R Group 9	Residential	Medium	346(SE)	285(S)
R10	Residential	Medium	404 (SW)	760(SW)
R11	Residential	Medium	507 (S)	1000(SW)
R12	Residential	Medium	483(S)	1000(SW)

Ecological

10.71 The application site is not subject to any statutory nature conservation designation. Ecological receptors of concern are those areas designated under EU Habitats Directive (92/43/EEC).

10.72 Based on the nature, size and scale of the planned operations, it is considered that the maximum distance for which the project should be evaluated in terms of Natura 2000 sites is up to a maximum radius of 2km from the application site, unless, there are any potential source-pathway-receptor links between it and any Natura 2000 site(s) beyond this distance.

10.73 There is one Natura 2000 site within a 2km radius of the project site at Aghamore, this site is listed in Table 10-11.

Table 10 - 11
Natura 2000 Site within a 2km of the Proposed Project Site

Natura 2000 site	Site code	Location at closest point to project site (m)
Lough Gill SAC	001976	365

10.74 At a distance of 365m, Lough Gill SAC lies within the potential zone of influence of the proposed development. They have therefore deemed as relevant and have been screened-in as part of this assessment.

IMPACT ASSESSMENT

Noise

10.75 To determine the noise impact at the site, SLR Consulting Ireland carried out a noise prediction assessment, whereby the levels of noise were calculated at the nearest noise sensitive receptors (residences) shown on Figure 10-1. The operational LAr, 1hr noise predictions at each receptor location are based on the prediction noise assessment methodology used was based on BS5228:

Part 1 (2009) + A1:2014 "Code of Practice for Noise and Vibration Control on Construction and Open Sites''.

10.76 For the purposes of this impact assessment, no reduction has been adopted for noise screening around the application site for the soil stripping berms construction and pit restoration.

10.77 A reduction of -15dB(A) has been adopted for full noise screening by constructed perimeter berms around the application site. In all likelihood, the actual reduction will be greater and further noise attenuation will be provided by the high quarry pit faces and proposed vegetation planting.

10.78 On the basis of EPA (2006) Guidance on Quarries and Ancillary Activities and DoEHLG (2004) Guidelines for Planning Authorities noise limit, applied to the nearest noise-sensitive receptors, an absolute limit of 55dB LAeq,1hr during the daytime (07:00 to 18:00 hours) have been adopted for the normal daytime operations. The limit of 70dB LAeq, 1hr for periods of up to eight weeks in any working year at the noise-sensitive receptors have been adopted for the temporary site set up activities of temporary works with long term environmental benefits.

10.79 For the purposes of this assessment, it is assumed that all of the noise sources are active for 100% of the time, at the distances stated during the working hours of the development and the attenuation distance to the selected receptors is calculated from the operational plant area. In addition, in order to assess the cumulative impact from the development the existing asphalt plant has been taken into account in the assessment.

10.80 On this basis, it is considered that the noise impact assessment presented herein is conservative and represents a worst-case scenario. Detailed noise assessment calculations are provided in Appendix 10-B.

10.81 The noise sources listed in Table 10-12 have been considered in the noise assessment for the proposed operations:

Table 10 - 12
Noise Sources

Plant	Octave Band Sound Pressure Levels @ 10m, Hz								LAeq@10m
	63	125	250	500	1k	2k	4k	8k	
Excavator	82	82	71	73	69	67	66	58	76
Crusher	91	91	88	87	85	83	78	68	90
HGV	77	77	76	72	71	69	64	54	76
Drill Rig	79	75	73	74	77	77	75	70	83
Asphalt Plant	79	75	73	74	77	77	75	70	83

10.82 The plant and equipment used at the quarry will not generate impulsive or tonal noise; no penalty was added to the predicted operational $L_{Ar,\ 1hr}$ noise level for presence of tonal or impulsive elements or prediction of resultant noise level at each receptor.

Impact Assessment

10.83 The noise prediction / assessment was undertaken to calculate the level of noise arising from the site activity at the nearest sensitive receptors shown on Figure 10-1. Detailed noise assessment calculations are provided in Appendix 10-B.

10.84 Within the planning application boundary, an area of 10.9 hectares has been used for the extraction of limestone and therefore has been completely stripped of overburden and topsoil material.

10.85 No further stripping of topsoil or overburden materials will be carried out within the application area.

10.86 The application area forms the existing quarry area, along with the associated processing area located on the eastern site of the local road that bisects the application site. Material extracted from the quarry area will be processed within the quarry void using mobile processing plant and transported to the processing area for further processing using mobile plant and stockpiling, pending transport off-site.

Stone Extraction, Processing & Ancillary Manufacturing Activities

10.87 The following noise sources have been considered in the noise assessment for the facility operations:

- Excavator;
- Crusher;
- HGV;
- Drilling Rig;
- Asphalt Plant.

10.88 For the purposes of the noise assessment, it is assumed that all the equipment will be used continuously on-site at all time during working hours.

10.89 It is considered that the noise assessment presented herein is very conservative and represents a worst-case scenario.

10.90 A noise prediction assessment was undertaken to calculate the level of noise arising from the proposed activities at the nearest sensitive receptors, shown on Figure 10-1. Detailed noise assessment calculations are provided in Appendix 10-B.

10.91 The operational LAr, 1hr noise prediction for each receptor location is presented in Table 10-14 below. The table also shows the comparison between the predicted operational LAr, 1hr noise level and the noise limit at each receptor during each time-period.

Table 10 - 13
Operational Noise Levels

Activity	Receptors	Period	Noise Limit $L_{Aeq, 1hr}$ dB(A)	Operational $L_{Aeq, 1hr}$ dB(A)*	Difference
Stone Extraction and Processing Activities, including ancillary asphalt plant	R Group 1	Daytime	55.0	54	-1
	R Group 2	Daytime	55.0	52	-3
	R Group 3	Daytime	55.0	54	-1
	R Group 4	Daytime	55.0	52	-3
	R5	Daytime	55.0	55	0
	R Group 6	Daytime	55.0	48	-7
	R Group 7	Daytime	55.0	55	0
	R Group 8	Daytime	55.0	55	0
	R Group 9	Daytime	55.0	50	-5
	R10	Daytime	55.0	47	-8
	R11	Daytime	55.0	45	-10
	R12	Daytime	55.0	46	-9

*Operational Noise Level = Predicted Noise Level without a 5 dB penalty

10.92 It can be seen from the above figures that the daytime noise criterion limits arising specifically from site operations at the sensitive receptors are comfortably met at all noise sensitive locations during site operations.

10.93 To identify the potential impact of continuous (full-time) site activities, activity at the proposed development, predicted specific LAeq, 1hr dB(A) noise levels have been logarithmically added to existing ambient noise levels. The cumulative levels have been compared to the existing ambient noise levels at each of the noise sensitive locations for each time-period. The cumulative assessment is shown in Table 10-15 below.

Table 10 - 14
Cumulative Operational Noise Levels

Activity	Receptors	Period	Existing Baseline $L_{Aeq,T}$ dB(A)	Operational $L_{Ar,\ 1hr}$ dB(A)*	Cumulative $L_{Aeq,\ T}$ dB(A)*	Difference		
Stone Extraction and Processing Activities, including ancillary asphalt plant	R Group 1	Daytime	53	54	57	+4	Moderate	Minor
	R Group 2	Daytime	56	52	57	+1	Minor	Negligible
	R Group 3	Daytime	72	54	72	0	Negligible	Negligible
	R Group 4	Daytime	51.0	52	55	+4	Moderate	Minor
	R5	Daytime	60.0	55	61	+1	Minor	Negligible
	R Group 6	Daytime	72.0	48	72	0	Negligible	Negligible
	R Group 7	Daytime	56.0	55	58	+2	Minor	Negligible
	R Group 8	Daytime	60	55	61	+1	Minor	Negligible
	R Group 9	Daytime	53.0	50	55	+2	Minor	Negligible
	R10	Daytime	60.0	47	60	0	Negligible	Negligible
	R11	Daytime	60.0	45	60	0	Negligible	Negligible
	R12	Daytime	60.0	46	60	0	Negligible	Negligible

10.94 With reference to the Guidelines for Noise Impact Assessment produced by the Institute of Environmental Management and Assessment (IEMA), the cumulative long term noise impact from the proposed development are assessed to be MINOR at Group 1 receptors and Group 4 receptors; at all other receptors is determined to be NEGLIGIBLE. Short term impact are assessed to be MODERATE at Group 1 and Group 4, MINOR at Group 2, R5, Group 7, Group 8, Group 9, at all other receptors is determined to be NEGLIGIBLE.

10.95 In view of the above findings, it is considered that mitigation measures to reduce the noise impacts of plant associated with the planned development are necessary.

Ecological Receptors

10.96 Ecological receptors of concern are those areas designated under EU Habitats Directive (92/43/EEC).

10.97 The application site is not subject to any statutory nature conservation designation, the nearest protected site is located 365m from the application area.

10.98 Based on the nature, size and scale of the planned development / intensification, it is considered that the maximum distance for which the project should be evaluated in terms of Natura 2000 sites is up to a maximum radius of 2km from the application site unless there are any potential source-pathway-receptor links between the facility at Aghamore and any Natura 2000 site(s) beyond this distance.

10.99 At a distance greater than 2km, and in the absence of any potential source-pathway-receptor link, it is considered that no Natura 2000 sites would be affected by any direct loss of habitat or impacted upon by the effects of noise.

10.100 The operational $L_{Ar,\ 1hr}$ noise prediction for ecological receptor location is presented in Table 10-16 below. Table 10-16 also shows the comparison between the predicted operational $L_{Ar,\ 1hr}$ noise level and the prescribed noise limit for protection of wildlife.

Table 10 - 15
Operational Noise Levels at Ecological Receptors at Aghamore

Receptors	Period	Noise limit $L_{AEQ,\ 1HR}$ DB(A)	Operational* $L_{AEQ,\ 1HR}$ DB(A)	Difference
Lough Gill SAC 001976	Daytime	55.0	48	-7

*Operational Noise Level = Predicted Noise Level without the 5 dB penalty

10.101 As can be seen from the above figures the noise criterion limits for protection of wildlife arising specifically from proposed activity and the existing asphalt manufacturing plant at Aghamore are comfortably met at all nearby ecological noise sensitive locations.

Traffic

10.102 The criterion for assessment of "affected roads" contained within the latest DMRB guidance focuses on roads with relatively high changes in flows or high proportion of HDV / HGV traffic. Affected roads are defined as those that meet any of the following criteria:

- road alignment will change by 5m or more; or
- daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) movements or more; or
- HDV / HGV flows will change by 200 AADT or more; or
- daily average speed will change by 10 km/hr or more; or
- peak hour speed will change by 20km/hr or more.

10.103 Based on a 50-week year, 5.5 days per week, all above operations will result in an average of maximum of 164 daily HGV return trips (82 HGVs inward and 82 HGVs outward) generated by the proposed development and existing asphalt plant.

10.104 The HDV / HGV flows, including the cumulative levels from the ancillary asphalt plant, will be below the assessment criteria.

Vibrations

10.105 Stone extraction at Aghamore Quarry will be carried out by blasting.

10.106 Drilling of holes for blasting will involve the use of a mobile rig to drill holes through the upper rock surface parallel to the active face. The duration of drilling prior to each blast will vary with the number and depth of charge holes required. Drilling of holes will be carried out during permitted operational hours.

10.107 The closest vibrations sensitive receptors (within 500m) to the blasting activities within the application area are detailed in Table 10-17. Vibration attenuation increases with distance; thus, vibration impacts at any receptors located further away from the site boundary would be lesser.

Table 10 - 16
Vibration Sensitive Receptors

Receptor Reference	Receptor
R Group 1	Residential
R Group 2	Residential
R Group 3	Residential
R Group 4	Residential
R5	Residential
R Group 6	Residential
R Group 7	Residential
R Group 8	Residential/ Farm
R Group 9	Residential
R10	Residential
R11	Residential
R12	Residential

10.108 The number of blasts carried out at the quarry depends on the amount of rock that needs to be cleared out. The duration of a blast in terms of noise is of short duration, similar to a clap of thunder.

10.109 Blasting-induced vibration is of short duration and transient in nature. A typical blast consists of a number of drilled holes into which are placed explosive charges. The charged holes are detonated individually by use of detonators each with different delays.

Residences

10.110 The main reason for complaints from blast-induced vibration is usually attributed to the fear of damage and/or nuisance rather than actual damage or nuisance itself. The human body is very sensitive to vibration; this can result in concerns being raised at vibration levels well below the threshold of cosmetic damage to buildings or the levels stated in the existing planning conditions.

10.111 In general terms a person will become aware of blast-induced vibration at levels of around 0.3 mm/second peak particle velocity (ppv). However, people are very poor at determining relative magnitudes of vibration, for example, the difference between 4.0 mm/sec ppv and 6.0 mm/sec ppv is unlikely to be distinguishable by an individual person. Even though vibration levels between 0.6 mm/sec ppv and 50.0 mm/sec ppv are routinely experienced in everyday life within a property and are considered wholly safe, when similar levels are experienced through blasting operations, it is not unusual for such a level to give rise to subjective concern.

10.112 Table 10-18 gives examples of vibration levels routinely generated in a property.

Table 10 - 17
Vibration Levels Generated by Everyday Activities

Activity	Vibration Level (Peak Particle Velocity, mm/sec)
Walking, measured on a wooden floor	1.0 to 2.5
Door slam, measured on a wooden floor	2.0 to 5.0
Door slam, measured over the doorway	12.0 to 35.0
Foot stamps, measured on a wooden floor	5.0 to 50.0

10.113 With regard to physical damage to properties, extensive research has been carried out around the world, the most prominent being undertaken by the United States Bureau of Mines (USBM). Damage to a structure could occur if the dynamic stresses induced in a structure exceed the allowable design stress for the specific building material. Classifications of building damage range from very fine plaster cracking up to major cracking of structural elements.

10.114 When defining damage to buildings, the following classification is used:

- Cosmetic – the formation of hairline cracks or the growth of existing cracks in plaster, dry wall surfaces, or mortar joints.
- Minor – the formation of large cracks or loosening or falling of plaster on dry wall surfaces, or cracks through bricks/concrete blocks.
- Major or Structural – damage to structural elements of the building

10.115 Studies by USBM concluded that vibration levels in excess of 50 mm/sec ppv are required to cause structural damage. The onset of cosmetic damage can be associated with lower levels. Vibration levels between 19 mm/sec ppv and 50 mm/sec ppv are generally considered safe. It should be noted that these limits are for the worst-case structure conditions and that they are independent of the number of blasting events and their durations.

10.116 British Standard 7385-2:1990 Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Groundborne Vibration gives guidance on vibration limits to prevent building damage. It is applicable to blasting associated with mineral extraction.

10.117 The damage threshold criteria provided in BS7385 are based on systematic studies using carefully controlled vibration sources in the vicinity of buildings. Vibration limits for transient vibrations (such as those associated with blasting operations) above which cosmetic damage could occur are provided in Table 10-7. BS7385-2 notes that the probability of damage tends towards zero at 12.5 mm/sec peak component particle velocity.

10.118 Historical blast monitoring results at Aghamore Quarry confirm that the blasting operations at the quarry have complied with the DoEHLG (2004) and EPA (2006) recommended threshold limit values for groundborne vibration (12 mm/sec peak particle velocity) and air overpressure (125 dBL Linear max peak with a 95% confidence limit).

10.119 The comprehensive environmental monitoring programme implemented at the quarry confirms that the quarry has operated within the recommended blasting emission limit values set out in the best practice guidelines for the sector.

10.120 Based on the above, it is concluded that blasting operations within the planning application area at Aghamore Quarry will not have a significant impact on any sensitive receptors.

Ecological Receptors

10.121 The impact from blasting activities for ecological receptors would consist of disturbance (including noise, vibration, and visual disturbance).

10.122 Increases in human disturbance including noise and visual disturbance from human activity can have a range of impacts depending upon the sensitivity of the ecological receptor, the nature, and duration of the disturbance and its timing.

10.123 The response of individual species to increased levels of human disturbance will depend upon a number of factors including the sensitivity, reproductive status, previous exposure to human disturbance, behaviour during the event, species tolerance to disturbance, location in relation to the source, availability of alternative nearby habitat, and environmental factors (i.e. topography, vegetation and atmospheric conditions which can influence noise levels).

10.124 The level of disturbance will also be dependent upon the existing ambient noise levels and maximum noise levels.

10.125 Any blasting operations at the quarry extension will be carried out in accordance with emission limit values recommend by the EPA and DoEHLG of 12mm/second (peak particle velocity) and for air overpressure of 125dB with a 95% confidence limit with any ground vibration limited in its extent around the quarry site.

10.126 At a distance of 365m at its closest point, the Lough Gill SAC is considered to be of sufficient distance from the Aghamore Quarry that no changes in baseline disturbance levels are predicted from an extension of quarrying operations within the defined boundaries of this SAC where there would be any effects on any of the Annex II qualifying species.

10.127 No likely exposure to hazard and no effects predicted on any qualifying Annex II species, or on the integrity of the Lough Gill SAC.

Cumulative Impacts

10.128 Cumulative noise impacts arising from the application site have been assessed, the cumulative assessment was based on measured noise levels of current activities on site and off site in the quarry area. Local existing and planned developments were reviewed as part of this assessment

10.129 This noise impact assessment shows that the long-term cumulative noise impact from the proposed operations at local receptors is determined to be MINOR to NEGLIGIBLE.

10.130 Noise levels arising from proposed activities will not have the potential to increase the existing ambient noise levels in the vicinity of the proposed development of the quarry and aggregate processing yard at Aghamore.

10.131 A search of the myplan.ie and An Bord Pleanála online planning portal searches was carried out to determine if there were any other planned developments in the vicinity (c. 1km radius) of the application site that have recently been granted permission or are currently under consideration and which have the potential to have a significant adverse cumulative impacts on the local environment.

10.132 There is existing soil facility to the south west of the application area.

10.133 Soil facility traffic will use the same road as the quarry's main traffic route, the relatively small activity associated with the soil facility is not expected to have any likely significant adverse impact on traffic volumes on the local road network.

10.134 It is considered in light of the available assessments that the proposed development will not have any significant adverse cumulative effect on noise and vibrations

10.135 Noise levels arising from proposed activities will not have the potential to increase the existing ambient noise levels in the vicinity of Aghamore Quarry.

'Do-nothing Scenario'

10.136 At present, the noise environment within the study area is dominated by road traffic noise emanating from the local roads, natural sounds such as farmyard animals or barking dogs are also audible.

10.137 Over time, it is anticipated that the volume of road traffic in general, will increase as economic activity increases and that this in turn is likely to lead to an increase in ambient and background noise levels.

Interaction with Other Impacts

10.138 The potential impact of noise generated by the proposed development on sensitive receptors including sensitive ecological receptors and people living in the area has been assessed in this chapter of the EIAR. The impact of the proposed development activity on these receptors is further considered in Chapter 4 'Population and Human Health' and Chapter 5 'Biodiversity'.

MITIGATION MEASURES

Noise

10.139 Where necessary, the three established strategies for impact mitigation are avoidance, reduction and remedy. Where it is not possible or practical to mitigate all impacts, then the residual impacts must be clearly described in accordance with the system for impact description set out in the EPA Guidelines. The adoption of Best Practicable Means is generally considered to be the most effective means of controlling noise emissions.

10.140 Notwithstanding the findings of the impact assessment presented above, which determined that the proposed activities at Aghamore Quarry will have negligible noise impact, and in line with practice, the following best practice measures will be implemented wherever practicable at the proposed site to minimise the potential noise impact of on-site activities:

Screening:-

- screening berms will be erected to act as acoustic barriers adjacent to the closest residences along the eastern boundary;
- existing perimeter hedge planting will be retained;
- berms will be inspected on a regular basis and maintained as necessary.

Plant:-

- all mobile plant used at the development will have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments;
- all plant items will be properly and regularly maintained and operated according to the manufacturers' recommendations, in such a manner as to avoid causing excessive noise (i.e. all

moving parts are kept well lubricated, all cutting edges are kept sharpened, the integrity of silencers and acoustic hoods are maintained);

- all plant will be fitted with effective exhaust silencers which are maintained in good working order to meet manufacturers' noise rating levels. Any defective silencers will be replaced immediately.

Traffic:-

- any deliveries will be programmed to arrive during daytime hours only;
- care will be taken when unloading vehicles to reduce or minimise potential disturbance to local residents;
- access / internal haul roads will be kept clean and maintained in a good state of repair, i.e. any potholes are filled, and large bumps removed, to avoid unwanted rattle and "body-slap" from heavy goods vehicles;
- vehicles waiting within the pit will be prohibited from leaving their engines running and there should be no unnecessary revving of engines.

10.141 Experience from other sites has shown that by implementing these measures, typical noise levels from construction works can bring about a reduction of 5dB(A) or more in ambient noise levels.

Vibrations

10.142 Historical blast monitoring results indicate that the air overpressure levels and the groundborne vibration levels (i.e. Peak Particle Velocity) complied with the DoEHLG (2004) / EPA (2006) limit values.

10.143 The blast design and blasting methodology for the site operations carried out within the planning application area have been and will be optimised to ensure that the levels have been and are within these recommended limits.

10.144 The following measures shall be implemented at the planning application area to minimise disturbances due to any future blasting operations. These mitigation measures are in accordance with the 'best practice / mitigation' measures described in Section 3.2 of the DoEHLG (2004) guidelines:

- Blasting will be carried out between the hours of 09:00 hrs to 18:00 hrs from Monday to Friday (except in emergencies or for health and safety reasons beyond the control of the operator).
- Blasting shall not be carried out on Saturdays, Sundays or public holidays;
- Notification of each blast shall be given in writing 48 hours in advance of each blast to all residences within 500m radius of the quarry;
- Blast notifications shall be provided by pre and post siren warnings;
- All blasting operations shall be carried out by a certified 'shotfirer' in accordance with the relevant health and safety regulations;
- The optimum blast ratio shall be maintained, and the maximum instantaneous charge shall be optimised.
- The blast design and blasting methodology uses the monitoring results to optimise and ensure consistent blast designs.

10.145 Efficient blasts use as much of the explosive energy as possible for rock fragmentation, and by implication ground vibration and air overpressure is inefficient use of this energy. Therefore, optimisation of the blast design is economically beneficial to the company (through improved rock fragmentation), and also minimises the potential environmental impacts.

10.146 To avoid any risk of damage to properties in the vicinity of the site, the groundborne vibration levels from blasting shall not exceed a peak particle velocity of 12 mm/sec. To minimise impact on local residences Blasting Protocol shall be implemented for the site. The Blasting Protocol shall include 'best practice / mitigation' measures described in Section 3.2 of the DoEHLG (2004) guidelines and Health & Safety guidelines.

RESIDUAL IMPACT ASSESSMENT

Noise

10.147 The worst-case scenario noise assessment has shown that in accordance with the scale in the Guidelines for Noise Impact Assessment produced by the Institute of Environmental Management and Assessment (IEMA) the cumulative noise impact from plant associated with the development at all receptors is NEGLIGIBLE.

10.148 Table 10-19 summarise the impacts, mitigation measures and residual impact for operational plant noise at each of the noise sensitive receptor considered.

Table 10 - 18
Operational Noise Summary Table

Receptors	Increase in operational noise $I_{aeq, 1hr}$ db(a)	Impact without mitigation measures		Mitigation	Reduction in noise from mitigation $I_{aeq, 1hr}$ db(a)	Increase in operational noise $I_{aeq, 1hr}$db(a)	Residual Short-term impact	Residual Long-term impact
		Short Term	Long Term					
R Group 1	+4	Moderate	Minor	Required	-5	0	Negligible	Negligible
R Group 2	+1	Minor	Negligible	Short term Required	-5	0	Negligible	Negligible
R Group 3	0	Negligible	Negligible	Not Required	-5	0	Negligible	Negligible
R Group 4	+4	Moderate	Minor	Required	-5	0	Negligible	Negligible
R5	+1	Minor	Negligible	Short term Required	-5	0	Negligible	Negligible
R Group 6	0	Negligible	Negligible	Not Required	-5	0	Negligible	Negligible
R Group 7	+2	Minor	Negligible	Short term Required	-5	0	Negligible	Negligible
R Group 8	+1	Minor	Negligible	Short term Required	-5	0	Negligible	Negligible
R Group 9	+2	Minor	Negligible	Short term Required	-5	0	Negligible	Negligible
R10	0	Negligible	Negligible	Not Required	-5	0	Negligible	Negligible
R11	0	Negligible	Negligible	Not Required	-5	0	Negligible	Negligible
R12	0	Negligible	Negligible	Not Required	-5	0	Negligible	Negligible

10.149 Based on the historical blasting results, it is concluded that blasting operations carried out within the application area will not have residual impact on any sensitive receptors.

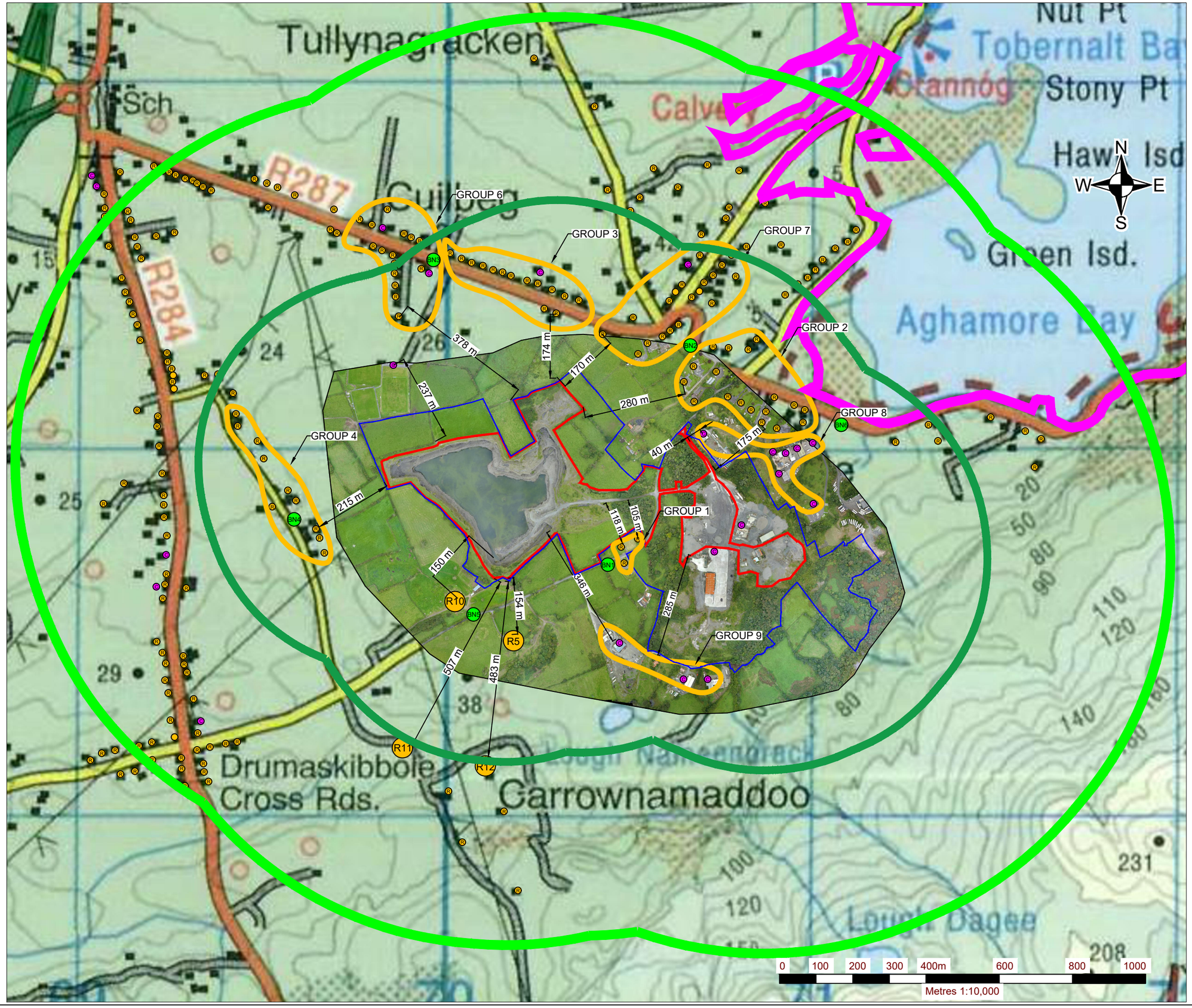
MONITORING

10.150 Noise monitoring shall be undertaken around the application site. Noise monitoring locations shall be reviewed and revised where and as/when necessary. The results of the noise monitoring shall be submitted to the Sligo County Council on a regular basis for review and record purposes.

10.151 All blasts carried out at the quarry at Aghamore shall be monitored to ensure compliance with planning conditions.

10.152 The blast monitoring results shall be submitted on a regular basis to Sligo County Council for record purposes.

FIGURES



NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY IRELAND / GOVERNMENT OF IRELAND
2. AERIAL PHOTOGRAPHY CARRIED OUT BY SLR CONSULTING SEPTEMBER 2020

LEGEND

- APPLICATION AREA
- RESIDENCE
- COMMERCIAL
- 1 KM OFFSET
- 500 M OFFSET
- GROUPS OF RECEPTORS
- BASELINE NOISE MONITORING LOCATION (SLR)
- LOUGH GILL SAC

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LOCAL RECEPTORS AND MONITORING LOCATIONS

FIGURE 10.1

Scale	Date
1:10,000 @ A3	MAY 2021

501.00584.00019.Sligo EIAR Figure 10.1.Rev.0.dwg

APPENDIX 10-A

GLOSSARY OF TERMINOLOGY

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale, is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 10.A
Noise Levels Commonly Found In the Environment

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at one metre away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Acoustic Terminology

dB (decibel) The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$ Pa).

dB(A) A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

L_{Aeq} L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

L_{10} & L_{90} If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.

L_{Amax} L_{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

APPENDIX 10-B NOISE ASSESSMENT

Extraction/ Processing / Asphalt (Cumulative)

Activity	Receptor	Activity L_{Aeq} (dB) at 10m Distance							Reflection dB(A)	Screening dB(A)	Activity Distance (m)							Noise Attenuated with Distance dB(A)							Activity L_{Aeq} (dB)							Operational Noise Levels dB(A)
		Drilling Rig	Mobile Crusher	Excavator	Loading Shovel	HGV	Asphalt Plant				Drilling Rig	Mobile Crusher	Excavator	Loading Shovel	HGV	Asphalt Plant		Excavator	Mobile Crusher	Mobile Screener	Loading Shovel	HGV	Asphalt		Excavator	Mobile Crusher	Mobile Screener	Loading Shovel	HGV	Asphalt		
Proposed Quarry Extraction and Processing Activities	**Group 1**	83	90	76	80	76	83		3	-15	200	200	200	170	200	170		-26	-26	-26	-25	-26	-25		45	52	38	43	38	46		54
	Group 2	83	90	76	80	76	83		3	-15	280	280	280	180	280	180		-29	-29	-29	-25	-29	-25		42	49	35	43	35	46		52
	Group 3	83	90	76	80	76	83		3	-15	174	174	174	650	174	650		-25	-25	-25	-36	-25	-36		46	53	39	32	39	35		54
	Group 4	83	90	76	80	76	83		3	-15	215	215	215	1000	215	1000		-27	-27	-27	-40	-27	-40		44	51	37	28	37	31		52
	R5	83	90	76	80	76	83		3	-15	154	154	154	600	154	600		-24	-24	-24	-36	-24	-36		47	54	40	32	40	35		55
	Group 6	83	90	76	80	76	83		3	-15	378	378	378	1010	378	1010		-32	-32	-32	-40	-32	-40		39	46	32	28	32	31		48
	Group 7	83	90	76	80	76	83		3	-15	170	170	170	450	170	450		-25	-25	-25	-33	-25	-33		46	53	39	35	39	38		55
	Group 8	83	90	76	80	76	83		3	-15	177	177	177	190	177	190		-25	-25	-25	-26	-25	-26		46	53	39	42	39	45		55
	Group 9	83	90	76	80	76	83		3	-15	346	346	346	285	346	285		-31	-31	-31	-29	-31	-29		40	47	33	39	33	42		50
	R10	83	90	76	80	76	83		3	-15	404	404	404	760	404	760		-32	-32	-32	-38	-32	-38		39	46	32	30	32	33		47
	R11	83	90	76	80	76	83		3	-15	507	507	507	1000	507	1000		-34	-34	-34	-40	-34	-40		37	44	30	28	30	31		45
	R12	83	90	76	80	76	83		3	-15	483	483	483	1000	483	1000		-34	-34	-34	-40	-34	-40		37	44	30	28	30	31		46
	SAC	83	90	76	80	76	83		3	-15	765	365	365	365	365	365		-38	-31	-31	-31	-31	-31		33	47	33	37	33	40		48