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INTRODUCTION

10.1 For the purposes of this EIAR, the area within the red line boundary on EIAR Figure 1.1 is referred to as 'the application area' and the wider landholding, including the manufacturing and ancillary quarry areas (within the blue line boundary as per EIAR Figure 1.1), is referred to as 'the overall site' or 'Rossmore Quarry'.

10.2 The development consists of continuance of use of the existing permitted quarry. A description of the development is provided in EIAR Chapter 2.

Scope of Work

10.3 The noise impact assessment presented herein describes and assesses the existing noise baseline characteristics of the local area. The anticipated effects of activity at the quarry are then applied to these baseline conditions and the resulting noise impacts assessed. Mitigation (existing and proposed) measures are identified where necessary to eliminate or minimise adverse impacts, insofar as practical. The assessment also includes a noise assessment for the proposed out of hours operation of the ready-mix concrete plant.

10.4 Rossmore Quarry is an existing operation. Existing measured noise conditions associated with overall site activities (including ancillary activities) were applied to assess the potential noise and impacts at sensitive receptors and identification of potential impacts.

10.5 The following issues are addressed separately:

- methodology used to assess the potential noise impacts at properties (dwellings) and businesses and sensitive ecological receptors, caused by overall site activities;
- existing noise conditions pertaining to noise levels around the overall site;
- noise impact evaluation criteria;
- prediction of the noise levels and identification of potential impacts;
- description of mitigation measures incorporated into the design and operation of the overall site to eliminate or minimise the potential for noise impacts.

10.6 Ground vibration and air overpressure are measured for each blast carried out at Rossmore Quarry. A review of blast monitoring results from locations at Rossmore Quarry indicates compliance with the threshold limit for groundborne vibration of 8 mm/sec (peak particle velocity) set out in condition 37 of planning permission ref. 03/4570. An operational vibration assessment has been undertaken as part of this report.

10.7 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.

Contributors/Author(s)

10.8 SLR Consulting Ireland undertook the impact assessment presented in this chapter on behalf of Kilsaran. The lead consultant for the study was Aldona Binchy MSc. Eng PIEMA Environmental Engineering. BHP carried out the noise monitoring on the overall site and Irish Industrial Explosives Ltd. carried out the blast monitoring on behalf of Kilsaran.

Limitations /Difficulties Encountered

10.9 This assessment was compiled on the basis of published regional and local data, guidance documents, and site-specific field surveys. No difficulties were encountered in compiling the required information.

REGULATORY BACKGROUND

Technical Standards

Guidelines for Noise Impact Assessment (IEMA)

10.10 The *Guidelines for Noise Impact Assessment,* produced by the Institute of Environmental Management and Assessment (IEMA), are current good practice standards for scope, content, and methodology of noise impact assessment.

10.11 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 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} (positive or negative) 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

10.12 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.

10.13 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 receptor of great sensitivity to noise
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 receptor of great sensitivity to noise
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 2.9 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 are of negligible sensitivity to noise or marginal to the zone of the influence of the proposals

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

Table 10- 3
Relationship between noise impact (magnitude) and noise effect (magnitude and sensitivity), including the evaluation of effect 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

British Standard 5228: 2009+A1:2014

10.15 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.

10.16 The noise levels generated by the overall 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 overall site, generally expressed as a sound power level;
- the periods of operation of the plant at the overall 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 such as walls.

British Standard 6472:2008

10.17 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.

10.18 BS6472 gives details of the maximum satisfactory magnitudes of vibration for residential properties which is shown in Table 10-4. This table relates to the magnitude of vibration below which the probability of adverse comment is low.

Table 10- 4
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

10.19 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.

10.20 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 10-5 below.

10.21 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.

Table 10- 5
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.

Guidelines

Quarries and Ancillary Activities

10.22 EPA Guidance on Quarries and Ancillary Activities contain a discussion of the primary sources of noise associated with quarrying and offers guidance in relation to the correct approach to be followed in respect of assessment and mitigation. Suggested noise limit values are 55dB LAeq,1hr and 45dB LAeq,1hr for daytime and night-time respectively; although, it suggests that more onerous values may be considered appropriate in areas with low levels of pre-existing background noise.

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

10.24 DoEHLG (2004) contains advice on noise from temporary activities from mineral extraction sites. The recommended derivation of free-field criteria for normal daytime operations, and the absolute criterion of 70dB $_{LAeq,1hr}$ for temporary operations.

AQTAG09 - Guidance on the Effects of Industrial Noise on Wildlife

10.25 AQTAG09 (Air Quality Technical Advisory Group 09) guidance provides guidance to assist planning officers involved with Pollution Prevention and Control applications for installations with relevant noise emissions and relate these to the requirements of the Habitats Regulations.

10.26 Guidance on 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 10-6, 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- 6
Specific Noise Levels at Habitat / Nest Site

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

Rossmore Quarry Specific Emission Limit Values

Noise

10.27 Condition no. 33 of planning permission ref. 03/4570 states that:

Noise levels emanating from the proposed development when measured at the site boundaries shall not exceed 55dBA (15 minute Leq) between 07.00 hours and 19.00 hours, Monday to Saturday, and shall not exceed 45dBA (15 minute Leq) at any other time. Measurements shall be made in accordance with ISO Recommendations R.1996.1 "Acoustics – Description and Measurement of Environmental Noise, Part 1: Basic Quantities and Procedures.

Vibrations

10.28 Condition no. 37 of planning permission ref. 03/4570 states that:

All blasting events shall be carried out in a manner as to ensure compliance with the following requirements:

'a) Ground-borne vibration shall not exceed 8 mm per second peak particle velocity in any one of the three mutually orthogonal directions at any one point on the site boundary.

b) Air overpressure from any blast shall not exceed 125 d(B)(Linear) when measured at the nearest residence.

NOISE AND HUMAN HEALTH

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

RECEIVING ENVIRONMENT

Noise Measurements Methodology

10.30 Environmental noise surveys have been carried out at Rossmore by BHP and SLR Consulting. 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.

10.31 The locations of the noise monitoring points are indicated on Figure 10-1. Continuous noise monitoring is undertaken in accordance with the following standards:

- British Standard: BS 7445 Part 1: (ISO 1996-1: 1982) Description and Measurement of Environmental Noise. Part 1. Guide to quantities and procedures.
- British Standard: BS 7445 Part 2: (ISO 1996-2: 1987) Description and Measurement of Environmental Noise. Part 2. Guide to the acquisition of data pertinent to land use.
- British Standard: BS 7445 Part 3: (ISO 1996-3: 1987) Description and Measurement of Environmental Noise. Part 2. Guide to application to noise limits.

10.32 The measurements were carried out using a Type 1. The noise meters were calibrated at the start of the survey with a calibrator. The same calibrator was used to check the SLM at the end of the survey, to inspect the microphone drift. 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 24 months preceding the surveys.

10.33 At the measurement positions, the following noise level index was recorded:

- $L_{Aeq,T}$ is the A-weighted equivalent continuous noise level over the measurement period, effectively represents an “average” value.

10.34 Noise measurements were undertaken over one-hour periods during the daytime in accordance with the DoEHLG (2004) and EPA (2006) guidelines for the sector. 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).

10.35 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 20µPa.

Existing Noise Conditions

10.36 Noise monitoring has been carried out at seven locations at Rossmore Quarry complex. The monitoring locations are shown on Figure 10-1 and are described as follows:

- **N1 (Up to 2019)** – Northern boundary of the value-added manufacturing area (refer to Figure 10 - 1).

- **N1 (2019 to Present) –** At the resident's entrance to the north beside access lane (refer to Figure 10 - 1).
- **N2** - North-eastern boundary of the quarry extraction area (refer to Figure 10 - 1).
- **BN1 –** Residences located to the north- west of the quarry (refer to Figure 10 - 1).
- **BN2 -** Residences located to the north of the quarry (refer to Figure 10 - 1).
- **BN3** - Residences located to the north-east of the quarry (refer to Figure 10 - 1).
- **BN4 –** At the southern boundary (refer to Figure 10 - 1).

10.37 Daytime noise monitoring results from 2016 to 2020 are provided in Table 10-7 below:

Table 10- 7
Daytime Noise Monitoring Results 2016 to 2020

Year	Location	L(A)eq
2016		
04/05/2016	N1	53.0
02/11/2016	N1	56.5[1]
04/02/2016	N2	54.5
02/11/2016	N2	48.0
2017		
15/02/2017	N1	44.8
21/12/2017	N1	53.0
15/02/2017	N2	47.5
21/12/2017	N2	52.0
2018		
26/04/2018	N1	50.0
18/10/2018	N1	53.0
26/04/2018	N2	48.0
18/10/2018	N2	51.0

[1] Farm machinery in operation in adjacent field during the monitoring period.

Year	Location	L(A)eq
2019		
16/05/2019	N1	46.0
29/08/2019	N1	53.0
16/05/2019	N2	49.0
29/08/2019	N2	63.0[2]
2020		
20/02/2020	N1	48.0
23/07/2020	N1	42.0
20/02/2020	N2	52.0
23/07/2020	N2	48.0

10.38 The noise levels recorded at N1 and N2 comply with the noise threshold limits set out in condition 33 of planning permission ref. 03/4570.

10.39 Night-time baseline monitoring provided in Table 10-8.

Table 10- 8
Night-time Noise Monitoring Results 2021

Date	Time	Location	L(A)eq	L10	L90
26/02/21	01:10 - 01:25	BN1	41	44	36
26/02/21	03:03 - 03:19	BN1	37	44	38
26/02/21	01:33 - 01:48	BN2	44	41	36
26/02/21	03:23 - 03:38	BN2	43	40	35
26/02/21	01:55 - 02:10	BN3	37	39	33
26/02/21	03:46 - 04:02	BN3	38	41	33
26/02/21	00:34 - 00:50	BN4	39	39	28
26/02/21	02:32 - 02:47	BN4	35	36	27

[2] Machinery working close to monitoring location on a temporary basis during monitoring period.

Vibration Conditions at Rossmore Quarry

10.40 Groundborne vibration and air overpressure has been measured for each blast carried out at Rossmore Quarry. The blast monitoring locations are shown on Figure 10-1

10.41 Table 10-9 below details historical blast monitoring results at the site. The monitoring was carried out using calibrated vibrograph units at these locations.

Table 10- 9
Blast Monitoring Results

Location	Date	Air Over Pressure <125 d(B)(Lin)$_{max\ peak}$	Vibration Horizontal <8 mm/sec	Transverse <8 mm/sec	Vertical <8 mm/sec
B2	10/01/2017	118.2	1.08	1.40	0.76
B4	10/01/2017	<125	<0.5	<0.5	<0.5
B2	24/01/2017	114.2	2.3	1.40	1.02
B4	24/01/2017	113.3	0.6	0.51	0.25
B2	06/03/2017	122.9	0.76	0.76	0.25
B4	06/03/2017	<125	<0.5	<0.5	<0.5
B2	04/04/2017	114.0	0.89	1.14	1.02
B4	04/04/2017	<125	<0.5	<0.5	<0.5
B2	25/04/2017	116.4	1.14	1.08	0.51
B4	25/04/2017	<125	<0.5	<0.5	<0.5
B2	23/05/2017	111.5	1.91	1.27	0.76
B4	23/05/2017	No reading	Equipment	Stolen	
B2	05/07/2017	116.6	1.91	1.40	1.14
B2	02/08/2017	119.8	1.27	1.91	0.64
B2	13/09/2017	117.9	1.14	0.64	0.64
B2	02/10/2017	118.5	0.76	1.14	0.76
B2	25/10/2107	116.9	2.10	0.89	0.70
B2	07/11/2017	120.6	0.95	1.08	0.64
B2	22/11/2017	119.6	2.22	1.33	1.02
B2	06/12/2017	117.4	2.03	1.08	1.14
B2	10/01/2018	114.2	1.91	1.52	0.95
B2	29/01/2018	117.2	1.02	0.89	0.83
B2	14/02/2018	110.0	1.39	1.90	1.01
B2	13/03/2018	114.0	2.50	1.77	1.27
B2	27/03/2018	119.0	1.14	0.76	1.27
B2	17/04/2018	113.5	1.46	1.46	0.83
B2	23/05/2018	114.4	1.07	0.88	0.88
B2	06/06/2018	112.0	3.04	1.71	1.90
B2	21/06/2018	112.3	5.10	2.70	3.00
B2	17/07/2018	115.0	1.01	1.01	2.03
B2	22/08/2018	116.0	3.17	2.85	2.03
B2	10/10/2018	<90	2.70	2.50	2.00
B2	06/11/2018	115.0	2.35	2.00	1.90

Location	Date	Air Over Pressure <125 d(B)(Lin)$_{max\ peak}$	Vibration Horizontal <8 mm/sec	Transverse <8 mm/sec	Vertical <8 mm/sec
B2	04/12/2018	116.0	0.82	0.76	0.76
B2	08/01/2019	119.7	2.41	1.14	1.14
B2	08/02/2019	115.6	2.30	1.60	1.80
B2	08/03/2019	118.7	4.32	1.91	3.05
B2	05/04/2019	108.8	0.76	0.76	0.64
B2	30/04/2019	115.9	3.68	2.29	1.78
B2	20/05/2019	115.6	1.78	1.65	1.21
B2	06/06/2019	112.0	3.04	1.71	1.90
B2	03/07/2019	101.0	3.30	2.29	4.83
B2	19/07/2019	119.1	3.30	5.33	1.59
B2	16/08/2019	96.0	2.54	2.41	3.05
B2	11/09/2019	103.0	2.92	3.04	3.30
B2	09/10/2019	115.4	3.81	2.22	2.28
B2	10/10/2019	105.0	3.37	2.54	3.43
B2	24/10/2019	82.0	3.30	1.59	1.78
B2	20/11/2019	114.0	0.70	0.95	0.83
B2	21/01/2020	123.3	0.82	0.57	0.95

10.42 A review of blast monitoring results the period 2017 to 2020 indicates compliance with the groundborne vibration limit value of 8mm/sec (peak particle velocity) and the air overpressure limit value of 125 dB(linear) stated in condition 37 of planning permission ref. 03/4570.

10.43 All blasts have been and are monitored, with records kept detailing the results of vibration, air over pressure, and the blast design as part of the Environmental Management System (EMS) implemented at the site.

10.44 Blasting has been and is carried out by a qualified “shotfirer”. The blast design is reviewed on a regular basis and modified where necessary to ensure future compliance with groundborne vibration limits.

IMPACT ASSESSMENT

Noise

Noise – Residential Dwellings

10.45 To determine the noise impact from the activities within the application site, SLR Consulting Ireland carried out a noise prediction assessment, using the existing measured noise levels within the overall quarry site (including manufacturing and ancillary plant operational noise).

10.46 The site activity noise levels measured at the Rossmore Quarry site boundary were used to assess the noise levels at residences due to quarry operations and to assess where the noise emissions are in compliance with daytime noise limits at residences.

10.47 The EPA 2006 Guidance on Quarries and Ancillary Activities suggest noise limit values are 55dB LAeq, 1hr for daytime operations.

10.48 Noise levels (arising from site activities) at the residences have been calculated using the methodology set out in British Standard 5228:2009+A1:2014 Code of Practice for noise and vibration control on construction and open sites, Part 1: Noise (BS5228). This methodology includes provision for:

- Attenuation with distance between the source and receptor (K= - 20 log R/10 dB(A), for hard ground R=distance from source in metres).
- Adjustment for reflection from the building facade of +3 dB(A).
- Adjustment for tonal / impulsive component +5 dB(A) at each receptor.
- Adjustment has been made for partial screening between the site and residences of -5 dB(A) by existing banks has been adopted.

10.49 The residence locations and distances to Rossmore Quarry are shown on Figure 10-2.

10.50 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 quarry.

10.51 On this basis, it is considered that the noise assessment is very conservative and represents a worst-case scenario. The distances to the receptors are calculated from the noise measurement location and/or activity boundary. The highest level of noise arising / measured from the existing operations within the overall site (including the application site) was used in the assessment. Detailed noise assessment calculations are provided in Appendix 10-B1.

10.52 The highest L_{Aeq} values of the measured noise levels from 2016 to 2018 for N1 (from 2019 noise monitoring was relocated to the noise sensitive location) and 2016 to 2020 for location N2 (used in this assessment) with corresponding receptors are provided in Table 10-10.

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

Location	Receptors	Period	L_{Aeq}
N1	R1, R2, R3	Daytime	53
N2	R4, R5, R6, R7	Daytime	63

10.53 The operational $L_{Ar, 1hr}$ noise calculations at each receptor location are presented in Table 10-11 below. The table also shows the comparison between the calculated operational $L_{Ar, 1hr}$ noise level and the noise limit at each receptor.

Table 10- 11
Operational Noise Levels – All Operations

Location	Receptors	Period	Criterion	Specific* $L_{Ar, 1hr}$ dB(A)	Difference
N1	R1	Daytime	55	36	-19
N1	R2	Daytime	55	40	-15
N1	R3	Daytime	55	35	-20
N2	R4	Daytime	55	38	-17
N2	R5	Daytime	55	39	-16
N2	R6	Daytime	55	39	-16
N2	R7	Daytime	55	38	-17

*Specific Noise Level= Predicted Noise Level (activity LAeq dB(A)) – refer to Appendix 10-B1, plus 5 dB penalty for any impulsive/ tonal noise.

10.54 With regards to the potential impact of the existing activities within the overall site (including the application site), the predicted specific LAr, 1hr dB(A) are below the noise criterion limits for daytime at all the nearest noise sensitive locations.

10.55 There will be no operational changes of noise associated with the existing activities in the application site and the likely noise levels that would be generated by the manufacturing and ancillary plant operations at the overall site will not change.

10.56 The measured levels at the N1 after relocation in 2019 show that LAeq, 1hr dB(A) are below the noise criterion limits for daytime at the nearest noise sensitive locations.

10.57 In view of the above, further mitigation measures to reduce the noise impacts of operations associated with the continued use of the existing permitted quarry within the existing extraction area considered unnecessary.

Out of hours operations for Ready-mix Plant

10.58 To determine the noise impact generated by the proposed out of hours operation of the ready-mix concrete plant , SLR Consulting Ireland carried out a noise prediction assessment, whereby the levels of noise were calculated at the nearest noise sensitive receptors (residences), as identified in Figure 10-1.

10.59 Operational noise rating ($L_{Ar, 1hr}$) predictions at each receptor location are based on the methodology set out in BS5228: Part 1 (2009)+ A1:2014 "*Code of Practice for Noise and Vibration Control on Construction and Open Sites*''

10.60 A reduction of -15dB (A) has been adopted for full noise screening by existing screening / topography in assessing noise impacts for Ready-mix activities.

10.61 For the purposes of the assessment, it is assumed that all potential operational noise sources are active and arise continuously and simultaneously during assessment hours and that the attenuation distance to the selected receptors is calculated from the noise source (as indicated in Figure 10-1).

10.62 The following noise sources have been considered in the night-time noise assessment:

- Ready-mix plant;
- Concrete lorry (HDV *Heavy Duty Vehicle)*.

10.63 The averages L_{Aeq} values of the measured night-time noise levels with corresponding receptors are provided in Table 10-12.

Table 10- 12
Summary of Measured Noise Levels, Free Field dB (Highest Measured Values)

Location	Receptors	Period	L_{Aeq}
BN1	R1, R2, R3	Night-time	39
BN2	R4, R5,	Night-time	43
BN3	R6, R7, R8, R9, R10	Night-time	37
BN4	SAC &SPA	Night-time	37

10.64 On the basis of the methodology outlined above, it is considered that the noise impact assessment presented herein is sufficiently robust and conservative and represents a worst-case scenario. Detailed noise assessment calculations are provided in Appendix 10-B.

10.65 The EPA (2006) Environmental Management Guidelines for Quarries and Ancillary Activities and the DoEHLG (2004) Guidelines for Planning Authorities both recommend a noise emission limit, applied to the nearest noise-sensitive receptors, of 45dB $L_{Aeq, 1hr}$ during night-time working hours (defined as 07:00 to 18:00 hours).

10.66 The operational $L_{Ar, 1hr}$ noise calculations at each receptor location are presented in Table 10-13 below. The table also shows the comparison between the calculated operational $L_{Ar, 1hr}$ noise level and the noise limit at each receptor.

Table 10- 13
Night-time Operational Noise Levels: Concrete Plant

Location	Receptors	Period	Criterion	Specific* $L_{Ar, 1hr}$ dB(A)	Difference
BN1	R1	Night-time	45	39	-6
BN1	R2	Night-time	45	38	-7
BN1	R3	Night-time	45	40	-5
BN2	R4	Night-time	45	37	-8
BN2	R5	Night-time	45	36	-9
BN3	R6	Night-time	45	35	-10
BN3	R7	Night-time	45	35	-10
BN3	R8	Night-time	45	35	-10
BN3	R9	Night-time	45	34	-11
BN3	R10	Night-time	45	33	-12
BN4	SAC & SPA	Night-time	55	48	-7

*Specific Noise Level= Predicted Noise Level (activity LAeq dB(A)) refer to Appendix 10-B2.

10.67 To identify the potential impact of nigh-time site activities 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 10-14 below.

Table 10- 14
Cumulative Operational Noise Levels Night-time Operations – Concrete Plant (Without Mitigation)

Receptors	Existing Baseline $L_{Aeq,T}$ dB(A)	Operational $L_{Ar,\ 1hr}$ dB(A)*	Cumulative $L_{Aeq,\ T}$ dB(A)*	Difference	Short term Impact	Long term Impact
R1	39	39	42	3	Moderate	Minor
R2	39	38	42	2	Minor	Negligible
R3	39	40	43	3	Moderate	Minor
R4	43	37	44	0	Negligible	Negligible
R5	43	36	44	0	Negligible	Negligible
R6	37	35	39	2	Minor	Negligible
R7	37	35	39	2	Minor	Negligible
R8	37	35	39	2	Minor	Negligible
R9	37	34	39	1	Minor	Negligible
R10	37	33	38	1	Minor	Negligible

10.68 With reference to the Guidelines for Noise Impact Assessment produced by the Institute of Environmental Management and Assessment (IEMA), the cumulative short-term noise impact from the proposed development (without mitigation) is determined to be negligible at R5, R6, moderate at R1 and R3 and minor at all other receptors.

10.69 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 (without mitigation) is determined to be minor at R1, R2 and negligible at all receptors.

10.70 In view of the above, further mitigation measures to reduce the noise impacts of the out of hours operation of the ready-mix concrete plant are recommended (refer to Section 10.86 for mitigation measures and Section 10.90 for the residual impact assessment).

Noise - Impact on the Natura 2000 or Designated Sites

10.71 Ecological receptors of concern are those areas designated under EU Habitats Directive (92/43/EEC). There is one Natura 2000 and one designated site within the vicinity of the application site. These sites are listed Table 10-15.

Table 10- 15
Natura 2000 or Designated Sites within 15km of Project

Natura 2000 or Designated Site	Site Code	Location at Closest Point to Project Site
Great Island Channel SAC	001058	Immediately adjacent to southern boundary
Cork Harbour SPA	004030	Immediately adjacent to southern boundary

10.72 The noise criterion recommended by AQTAG09 has been adopted for the assessment and used to define two noise impact categories:

- 'negligible impact' is implied when average noise emission levels are below LAeq 55dB and maximum noise emission levels are below LAmax 80dB;
- 'possible adverse impact' is implied when average noise emission levels are above LAeq 55dB or maximum noise emission levels are above LAmax 80dB.

10.73 Noise levels measured at the Rossmore site boundary (N1 and N2) from all quarry operations do not and will not exceed the AQTAG09 noise guidance limits of LAeq 55dB and maximum noise emission levels are below LAmax 80dB therefore there will be a negligible noise impact on the Natura 2000 or designated site (refer to Section

10.74 The predicted noise levels from the proposed out of hours operation of the readymix concrete plant will not exceed the AQTAG09 noise guidance limits of LAeq 55dB and maximum noise emission levels are below LAmax 80dB therefore there will be a negligible noise impact on the Natura 2000 or designated sites (refer to Section

Vibrations

10.75 The number of blasts carried out at the quarry has depended on market demand for construction materials. The duration of a blast in terms of noise is of short duration, similar to a clap of thunder.

10.76 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.

10.77 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.

10.78 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. Table 10-16 gives examples of vibration levels routinely generated in a property.

Table 10- 16
Vibration Levels Generated by Everyday Activities

Activity	V 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

10.79 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. In particular, 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

10.80 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.

10.81 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.

10.82 The damage threshold criteria provided in BS7385 are based on systematic studies using carefully controlled vibration sources in the vicinity of buildings. BS7385-2 notes that the probability of damage tends towards zero at 12.5 mm/sec peak component particle velocity.

10.83 On the basis of the existing blast monitoring results as presented in Table 10-8 confirm the groundborne vibration levels from blasting are well below a peak component particle velocity of 12.5 mm/sec, it is concluded that blasting operations at the proposed development area will have no significant impact on any sensitive receptors.

MITIGATION MEASURES

Noise

10.85 A number of measures are in place at the overall site to minimise the generation / migration of noise to ensure that the activities at Rossmore Quarry comply with the threshold values described above during the prescribed quarry working hours. These mitigation measures are in accordance with the 'best practice / mitigation' measures described in Section 3.2 of the DoEHLG (2004) guidelines and Section 3.5 of the Environmental Management Guidelines (EPA, 2006).

10.86 Quarries and ancillary activities / facilities, by their nature, generate noise due to the use of heavy equipment and machinery. The operations in the site incorporate a range of measures that provide mitigation against potential noise nuisance. These features include, but are not necessarily limited to:

- Provision of screening berms and boundary walls / screen planting around the southern, western, and northern boundaries to act as acoustic barriers.
- Quarry haul roads are 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.
- Heavy goods vehicles (HGV's) entering the overall site are required to have their tailgates securely fastened.
- All mobile plant used at the overall site has noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments.
- Processing plant is operated in a proper manner with respect to minimising noise emissions, e.g. minimisation of drop heights, no unnecessary revving of engines, and plant used intermittently is not left idling.
- Concrete mixing occurs in enclosed mixing pans within the enclosed ready-mix concrete batching house buildings (Provision of acoustic screening at noise source)
- Plant is subject to regular maintenance, i.e. all moving parts are kept well lubricated, all cutting edges are kept sharpened, the integrity of silencers and acoustic hoods is maintained.
- All plant at the overall site is fitted with effective exhaust silencers which are maintained in good working order to meet manufacturers' noise rating levels. Defective silencers are replaced immediately.
- Speed limits on internal roads are controlled by speed ramps and signage.

Vibrations

10.87 Blast monitoring results indicate that the air overpressure levels and the groundborne vibration levels comply with the threshold limit values set out in condition no. 37 of the planning permission ref. 03/4570.

10.88 The following measures have been and are implemented at the quarry to minimise disturbances due to blasting operations. These mitigation measures are in accordance with the *'best practice / mitigation'* measures described in Section 3.2 of the DoEHLG (2004) guidelines.

- In accordance with condition 10 of planning permission ref. 03/4570 blasting is carried out between the hours of 11:00 hrs to 17:00 hrs from Monday to Friday. A blast must be carried out on site on the specified day, as concerns over security does not allow for explosives to be stored on site.
- There is no blasting carried out on Saturdays, Sundays or public holidays.
- Advance notification of blasting operations is provided to residents of dwellings within 500 metres of the blast location.
- Blast notification is also provided by pre and post siren warnings.
- All blasting operations are carried out by a certified 'shotfirer' in accordance with the relevant health and safety regulations.
- The optimum blast ratio is maintained, and the maximum instantaneous charge is optimised.

10.89 To avoid any risk of damage to properties in the vicinity of the site, the groundborne vibration levels from blasting does not exceed a peak particle velocity of 8 mm/sec, in accordance with condition 37.

RESIDUAL IMPACT ASSESSMENT

10.90 Table 10-17 summarises the potential noise impact (without mitigation), mitigation measures and residual noise impact for the proposed out of hours operation of the ready-mix concrete plant at each of the noise sensitive receptor considered.

Table 10- 17
Night-Time Operations Residual Noise Summary Table Concrete Plant (Including Mitigation)

RECEPTORS	INCREASE IN OPERATIONAL NOISE $L_{Aeq, 1hr}$ dB(A)	IMPACT WITHOUT MITIGATION MEASURES		MITIGATION	REDUCTION IN NOISE FROM MITIGATION – ACCOUSTIC SCREENING AT SOURCE $L_{AEQ,}$	RESIDUAL INCREASE IN OPERATIONAL NOISE $L_{AEQ,}$ 1HRdB(A)	RESIDUAL SHORT-TERM IMPACT	RESIDUAL LONG-TERM IMPACT
		SHORT TERM	LONG TERM					
R1	3	Moderate	Minor	Required	-5	0	Negligible	Negligible
R2	2	Minor	Negligible	Short-term Required	-5	0	Negligible	Negligible
R3	3	Moderate	Minor	Required	-5	0	Negligible	Negligible
R4	0	Negligible	Negligible	Not Required	-5	0	Negligible	Negligible
R5	0	Negligible	Negligible	Not Required	-5	0	Negligible	Negligible
R6	2	Minor	Negligible	Short-term Required	-5	0	Negligible	Negligible
R7	2	Minor	Negligible	Short-term Required	-5	0	Negligible	Negligible
R8	2	Minor	Negligible	Short-term Required	-5	0	Negligible	Negligible
R9	1	Minor	Negligible	Short-term Required	-5	0	Negligible	Negligible
R10	1	Minor	Negligible	Short-term Required	-5	0	Negligible	Negligible

MONITORING

10.91 The scope of the noise and blast monitoring have been and continue to be reviewed annually, and subject to agreement of Cork County Council, it may be amended in the light of previous monitoring results.

Noise

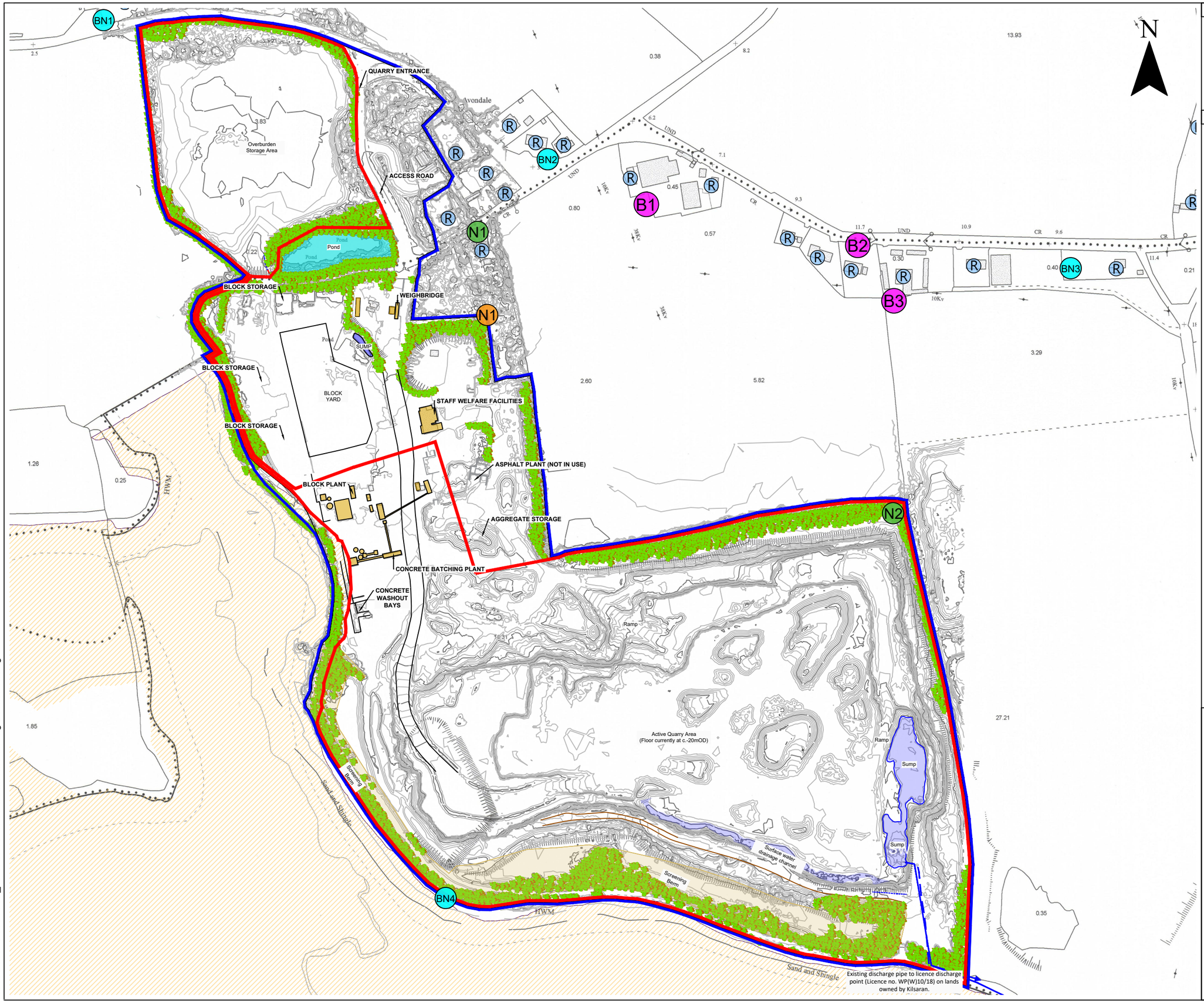
10.92 There is an existing noise monitoring programme in place at the site. The results of the noise monitoring are submitted to Cork County Council on a regular basis for record purposes.

Blasting

10.93 Monitoring of blasts (both for groundborne vibration and air overpressure) have been and continue to be carried out at the site.

10.94 The blast monitoring results have been and continue to be submitted on a regular basis to Cork County Council for record purposes.

10.95 The scope of the noise and blast monitoring have been and continue to be reviewed annually, and subject to agreement of Cork County Council, it may be amended in the light of previous monitoring results.



NOTES

1. BASED ON EXTRACT FROM 1:2500 O.S.I MAP NO. 6386A 6386B 6386C AND 6386D.

2. ORDNANCE SURVEY IRELAND LICENCE NO. **CYAL50167032** (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND.

LEGEND

- APPLICANTS LAND INTEREST
- PLANNING APPLICATION AREA (c.24.7 ha)
- RESIDENTIAL PROPERTY LOCATION
- N1 NOISE MONITORING LOCATION (UP TO 2019)
- N1 NOISE MONITORING LOCATION (2019 TO PRESENT)
- N2 NOISE MONITORING LOCATION
- NIGHT-TIME NOISE MONITORING LOCATIONS
- BLAST MONITORING LOCATIONS
- SPECIAL AREA OF CONSERVATION (SAC)

NOTE:
The SAC / SPA boundaries have been downloaded from the NPWS mapping webviewer database as a dxf data-set.

The NPWS mapping data was digitised on the old 6 inch (1841 and revised 1929-1930) mapping system in Irish Grid which has resulted in discrepancies when overlaid on the more updated 2500 scale mapping.

*'Orthomosaic produced from Aerial Photography flown **MAY 2018** by SLR Consulting Ireland (IAA Permit No. 150052) www.slrconsulting.com Tel. +353-1-2964667.*

Orthomosaic produced using Ground Control Points; Related to Irish Transverse Mercator Coordinate System and OS Malin Head Level Datum.

The accuracy of the orthomosaics and the digital elevation models (DEM) strongly depends on the flight height, lighting conditions, availability of textures, image quality, overlap, and type of terrain. Contours / 3D data relates to the surface model and not terrain levels. Typical accuracies: E: 0.05 m; N:0.05 m; Levels: 0.30 m.
All Dimensions and Levels are to be checked on site.

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KILSARAN CONCRETE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

ROSSMORE QUARRY,
CARRIGTOHILL, CO. CORK

NOISE & BLAST MONITORING LOCATIONS

FIGURE 10-1

Scale	Date
NTS @ A3	JUNE 2021

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