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INTRODUCTION

9.1 This chapter of the Environmental Impact Statement provides supporting information to accompany a Planning Application to the Planning Authority by Roadstone Wood Limited in respect of the continuance of use of the existing limestone quarry including continuance of use of all ancillary, processing and manufacturing facilities at the existing Huntstown Quarry Complex, North Road, Finglas, Co. Dublin, beyond October 2014 as permitted by the existing planning permission.

9.2 This section of the EIS deals with the issue of noise and vibration. It will determine the levels of both noise and vibration associated with the existing quarry, and assess the increase in these levels, if any, that will be generated by the continued operation and development of the quarry. Roadstone Wood Ltd. carried out the noise surveys and blast monitoring on the site and SLR Consulting Ireland carried out the subsequent impact assessment for this section.

9.3 The assessment of the potential noise impact has been undertaken with reference to EIA good practice, the EIA Regulations, British Standards and other guidance documents.

Regulatory Advice and Guidance

British Standard 5228:2009

9.4 British Standard 5228:2009 *Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1 Noise* and *Part 2: Vibration,* set out a methodology for predicting noise and vibration levels arising from a wide variety of construction and related activities. As such, it can be used to predict noise levels arising from the operations of proposed minerals extraction sites. BS5228-1:2009 also sets out tables of sound power levels generated by a wide variety of mobile equipment.

Quarries & Ancillary Activities: Guidelines for Planning Authorities (DoEHLG, 2004)

9.5 The published DoEHLG guidelines provide general advice and guidance in relation to emission limit values (ELV's) and planning conditions.

9.6 **Noise:** In relation to noise emissions the guidelines recommend that noise from activities on site shall not exceed the following noise emission limit values (ELVs) at the nearest noise sensitive receptor:

Daytime: 08:00 hrs – 20:00 hrs LAeq (1hr) = 55 dB(A)
Nigh time: 20:00 hrs – 08:00 hrs LAeq (15min) = 45 dB(A)

(Note: 95% of all noise levels shall comply with the specified limit value(s). No noise level shall exceed the limit value by more than 2 dB(A)).

9.7 **Blasting:** In relation to blasting activities the guidelines recommend that the following vibration and air overpressure ELVs are adopted and applied at the nearest vibration and air overpressure sensitive location (e.g. a residential property):

Ground-borne vibration: Peak particle velocity = 12 mm/s, measured in any of the three mutually orthogonal directions at the receiving location, when blasting occurs at a frequency of once per week or less.

Air overpressure: The guidelines recommend that Air Overpressure shall not exceed 125 dB (Lin) max. peak with a 95% confidence limit. No individual air overpressure value should exceed the limit value by more than 5 dB(Lin), i.e. 130dB(Lin).

9.8 Prevailing meteorological conditions at the time of a blast are a significant factor influencing the air overpressure experienced at distance from a blast. These meteorological conditions include wind speed and direction, temperature, cloud cover and humidity.

Existing Planning Conditions (Planning Reference No. F03A/1430)

9.9 Condition No.8 – Blasting

CONDITION NO. 8, AMENDED BY ORDER OF AN BÓRD PLEANÁLA DATED 31ST AUGUST 2004 -PL06F.206789 REFERS.

i. The air over pressure arising from any blast carried out at the quarry shall, when measured outside the nearest inhabited house and business/ industrial park unit, not exceed 125 dB (linear) pressure at frequencies of two Hertz or over.

ii. The transmitted ground vibrations arising from any blast carried out at the Western Quarry, when measured, at the foundations of the nearest dwellinghouse and industrial/business park unit to the site, shall not exceed a peak particle velocity of eight millimetres per second in any one of three mutually orthogonal planes.

iii. The transmitted ground vibrations arising from any blast carried our at the Northern, Central or Southern Quarries, when measured at the foundations of the nearest dwellinghouse and industrial/ business park unit to the site, shall not exceed a peak particle velocity of twelve millimetres per second in any one of three mutually orthogonal planes.

REASON: To protect the amenities of property in the vicinity of the site.

9.10 Condition No.9 – Noise

During the operation and restoration phase of the quarries, the noise level from the operations measured at the boundaries of the respective quarry shall not exceed

(a) an Laeq T value of 55dB(A) during the period of 0800hrs to 1800hrs Monday to Saturday;

(b) an Laeq T value of 45dB(A) at any other time.

All sound measurements shall be carried out in accordance to ISO Recommendations 1996 (assessment of noise with respect to community response) as amended by ISO Recommendations 1996/1, 2 and 3 (description and measurement of environmental noise) as appropriate.

All machinery an vehicles employed on the site shall be fitted with effective silencers of a tye appropriate to the specification and at all times the best available technology, not entailing excessive cost, shall be employed to prevent ot counteract the effects of noise emitted by vehicles, plant, machinery or otherwise arising from the quarrying activities.

REASON: To protect the amenities of properties in the vicinity of the site.

RECEIVING ENVIRONMENT

Outline of Baseline Study

9.11 The existing environment is characterised by undertaking baseline measurement surveys at a number of locations at and immediately beyond the application site.

9.12 The purpose of the baseline study is to assess the existing levels of noise and vibration at the site. This data was collected utilising:

- *noise monitoring surveys;*
- *blast monitoring records for previous blasts.*

This data was then analysed to determine the current noise and vibration conditions at the site.

Baseline Study Methodology

Noise

9.13 Noise surveys were undertaken on the 19th April 2010 and 9th June 2011 as part of the baseline study. Continuous noise monitoring was undertaken by Roadstone Wood Ltd in accordance with International Standard ISO 1996: *Acoustics Description and Measurement of Environmental Noise*. The noise measurements were obtained with a Norsonic Nor118 Sound Level Meter, which was calibrated using a Norsonic 1443.

Noise Measurement Parameters

9.14 During the noise survey, 3 environmental noise parameters were measured. These are defined below.

L_{Aeq} is the A-weighted equivalent continuous steady sound level during the sample period and effectively represents an “average” value.

L_{A10} is the A-weighted sound level that is exceeded for 10% of the sample period; this parameter is typically used to quantify traffic noise.

L_{A90} is the A-weighted sound level that is exceeded for 90% of the sample period; this parameter is typically used to quantify background noise.

9.15 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.

Vibration

9.16 Blasting operations at the existing quarry are monitored. Groundborne vibration and air overpressure levels are measured and recorded for each blast. The blasting results for 2011 have been reviewed as part of this assessment.

Existing Environment

Noise

9.17 The noise monitoring points used are described below and shown on Figure 9-1.

N1 Located at the eastern boundary of Roadstone Wood's landholding, opposite a residence along the R135 Regional Road (the former N2 National Primary Road). This location is at the former entrance to the Huntstown Quarry complex.

N2 Located at the south-eastern boundary of Roadstone Wood's landholding, adjacent to an existing residence.

N3 Located at the western boundary of Roadstone Wood's landholding, adjacent to the Millennium Business Park.

N4 Located at the western boundary of Roadstone Wood's landholding, adjacent to the back entrance to the quarry complex (off the Cappagh Road / Kilshane Road).

Vibration

9.18 Blasting operations at the existing quarry are monitored. Groundborne vibration and air overpressure levels are measured and recorded for each blast.

Results of Baseline Monitoring

Noise

9.19 The results of the noise monitoring surveys are detailed in Table 9-1 below.

Table 9-1
Noise Monitoring Results 2010-2011

Location	Date	Time	*Measured Noise Levels – dB(A)*		
			L_{Aeq}	L_{AF10}	L_{AF90}
N1	19/04/2010	16:21 – 17:21	56.1	56.0	49.6
N2	19/04/2010	12:26 – 13:26	44.8	45.0	41.3
N3	19/04/2010	14:03 – 15:03	42.2	43.3	39.4
N4	19/04/2010	15:12 – 16:12	48.5	49.1	40.9
N1	09/06/2011	10:58 – 11:58	61.0	63.3	50.0
N2	09/06/2011	12:05 – 13:05	54.0	55.5	44.9
N3	09/06/2011	13:12 – 14:12	54.1	54.7	44.3
N4	09/06/2011	14:16 – 15:16	61.4	62.7	47.4

Weather Conditions:

9.20 The weather conditions during the noise monitoring surveys were as follows:
19/04/10 Warm and sunny with a light breeze
09/06/11 Cloudy and breezy.

Discussion of Results:

9.21 The noise levels recorded at locations D5 and N1 were mainly due to external traffic on the adjoining national road network (the M50 Motorway, the N2 Dual Carriageway and North Road) as shown by the elevated L_{A10} readings. Noise levels at all locations were heavily influenced by aircraft regularly flying overhead.

9.22 Allowing for the external traffic noise and air traffic, the noise monitoring results show that the development complies with Condition No. 9 of P. Reg. Ref. No. F03A/1430, PL06F.206789 which states that:

'During the operation and restoration phase of the quarries, the noise level from the operations measured at the boundaries of the respective quarry shall not exceed

(a) an L_{Aeq} T value of 55dB(A) during the period of 0800hrs to 1800hrs Monday to Saturday;
(b) an L_{Aeq} T value of 45dB(A) at any other time'.

9.23 Noise monitoring data indicates that average ambient noise levels around the Huntstown Quarry Complex typically range between 42.2 dB(A) L_{Aeq} and 56.1 dB(A) L_{Aeq}. These noise levels are consistent with daytime noise levels which would be expected around suburban parts of the Greater Dublin Area and close to major road networks.

Vibration

9.24 Ground vibration and air overpressure are measured for each blast. The blast monitoring is currently carried out at 3 no. locations. The blast

monitoring locations are shown on Figure 9.1 (B1 is Byrne Residence, B2 is Coca Cola and B3 is Duffy Residence).

9.25 Blasting is carried out one to three times per month, depending on market demand. The duration of a blast in terms of noise is of short duration, similar to a clap of thunder.

9.26 Table 9-2 below details blast monitoring results for June 2011 – December 2011. No blasting operations were carried out at the Western and Central quarries during this period. The monitoring was carried out using a calibrated portable vibrograph unit.

Table 9-2
Blast Monitoring Results

June 2011 – December 2011

Date	Location	*Peak Particles Velocity (mm/sec)*			*Air Over pressure* (dB(Lin)max.peak)
		Tran	*Vert*	*Long*	
21/06/11	Coca Cola	1	1.6	1.6	106
21/06/11	Mr. R. Duffy	5.9	5.3	4	130
25/08/11	Mr. R. Duffy	5.6	2	2.4	128
25/08/11	Mr. W. Byrne	1.9	1.3	1.9	116
15/09/11	Mr. R. Duffy	2.5	2.4	2.7	127
04/10/11	Coca Cola	2.3	3.8	2.1	111
04/10/11	Mr. R. Duffy	4.4	3.6	4.9	122
20/10/11	Mr. R. Duffy	2.3	1	2	125
15/11/11	Mr W. Byrne	2.5	1.8	3.3	112
15/11/11	Mr. R. Duffy	3.1	4	3.5	127
01/12/11	Mr W. Byrne	1.4	0.6	1.6	121
01/12/11	Mr. R. Duffy	2.9	2.7	4.1	127

9.27 A review of the blast monitoring results from June to December 2011 indicate compliance with the DoEHLG (2004) recommended threshold limits for groundborne vibration of 12 mm/sec (peak particle velocity) and Part (3) of Condition No. 8 of P. Reg. Ref. No. F03A/1430, PL06F.206789 which states that:

> *(3) The transmitted ground vibrations arising from any blast carried out at the Northern, Central of Southern Quarries, when measured at the foundations of the nearest dwelling house and industrial/business park unit to the site, shall not exceed a peak particle velocity of twelve millimetres per second in any one of three mutually orthogonal planes.'*

9.28 The blast monitoring results indicate that the recorded air overpressure exceeded the recommended threshold limit value of 125 dB(A) on a number of occasions.

9.29 Although air overpressure can be controlled to a great extent at source by careful attention to blast design and implementation, once detonation occurs the prevailing atmospheric conditions play a significant role in determining air overpressure values at distance from the blast site. Because air overpressure is transmitted through the atmosphere, meteorological conditions such as wind speed and direction, temperature, cloud cover and humidity will all affect the intensity of the air overpressure experienced at a distance from a blast.

9.30 All blasts 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 quarry.

9.31 Blasting 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.

ASSESSMENT OF IMPACTS

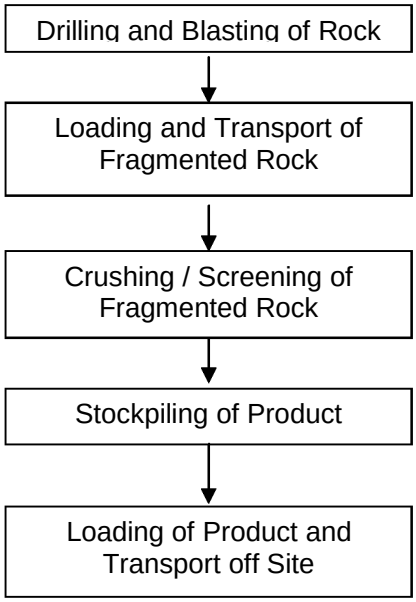
Direct Impacts

Noise

9.32 The principal noise sources generated by quarrying activities at Huntstown with respect to the nearest residences are machinery (excavators and loading shovels), the processing plant, loading and transport of aggregates and drilling of blast holes.

9.33 The flow chart below shows the main site activities at Huntstown Quarry. The continued operation and development of the quarry will involve the same activities.

Flow Chart 9-1
Operational Activities: Stone Extraction & Processing



9.34 The critical worst case scenario in terms of noise at sensitive receptors is when the stone extraction / processing is being carried out at the closest point to these receptors.

9.35 The principal noise sources under this worst case scenario will comprise:

- Machinery (excavators and loading shovels),
- Processing plant (crushing & screening),
- Stockpiling, handling and transport of aggregates,
- Drilling of blast holes (when required).

9.36 The processing plants and machines (loading shovels) will be fully screened by all or a combination of the following:

- Existing topography between the quarry & receptor.
- Screening berms
- The quarry faces

9.37 A percussive drill-rig will operate on an intermittent basis for the purposes of drilling holes for the blasting operations. Where drilling takes place at the upper level as the quarry develops, these operations will be fully screened by the perimeter berm.

Noise Impact Assessment

9.38 Based on the above, a noise prediction assessment has been undertaken by SLR Consulting Ireland, whereby the levels of noise arising from the development were calculated at the nearest noise sensitive receptors (residences R1 – R5 shown on Figure 9.2). Detailed noise assessment calculations are provided in Appendix 9-1.

9.39 The noise assessment methodology used was based on BS5228-2:2009 “Code of practice for noise and vibration control on construction and open sites.”

9.40 For the purposes of the assessment, a reduction of -20 dB(A) for full noise screening has been adopted (to take account of the high topographical features present between the activity on site and the receptors). In addition, for the purpose of this noise assessment, it is assumed that all of the noise sources are active for a 100% of the time at the receptor. On this basis it is considered that the noise assessment is conservative and represents a worst case scenario.

9.41 The results of this conservative assessment indicate that the cumulative noise levels arising from these quarry activities at each receptor are as follows:

Table 9-3
Noise Assessment Results

Quarry Operational Phase – General Activity 2 excavators, 3 loaders, 2 dump trucks & processing	
Receptor	***Combined Noise Level***
R1	**46 dB L_{Aeq}**
R2	**41 dB L_{Aeq}**
R3	**39 dB L_{Aeq}**
R4	**51 dB L_{Aeq}**
R5	**54 dB L_{Aeq}**

9.42 The predicted cumulative noise levels arising from quarrying / stone processing / loading activities comply with the daytime noise emission limit value of 55 dB(A), at sensitive locations, recommended in Section 4.7 (c) of the DoEHLG (2004) / EPA (2006) guidelines for the sector.

Table 9-4
Noise Assessment Results

Quarry Operational Phase – General Activity with Blast Hole Drill Rig at Nearest Point	
Receptor	***Combined Noise Level***
R1	**46 dB L_{Aeq}**
R2	**41 dB L_{Aeq}**
R3	**39 dB L_{Aeq}**
R4	**52 dB L_{Aeq}**
R5	**54 dB L_{Aeq}**

9.43 The predicted cumulative noise levels arising from quarrying / stone processing / loading activities / blast hole drill rig are within the daytime noise emission limit value of 55 dB(A), at sensitive locations, recommended in Section 4.7 (c) of the DoEHLG (2004) / EPA (2006) guidelines for the sector.

9.44 The predicted cumulative noise levels arising from quarrying operations are considerably lower than the existing background noise levels arising from traffic on the external road network.

9.45 The resultant noise levels identified above are considered to be very much a worst case scenario, as it assumes plant and machinery will be running for 100% of the time, rather than intermittently. In reality this will not occur and average ambient noise levels would be expected to be significantly below those predicted.

9.46 Notwithstanding this, it should be noted that the predicted noise levels are comparable or only very slightly elevated above the baseline noise levels recorded in the course of the recent baseline noise survey. Arising out of this assessment and considering recent land-usage at the site, the noise impact of the quarrying activities at surrounding residences is assessed as minor (barely perceptible) and negative.

9.47 The movement of HGV traffic along the M50 Motorway, N2 Dual Carriageway and North Road will generate an increase in traffic noise levels. However, given existing and historic levels of traffic generated noise along these major transport corridors, the resultant noise impact is assessed as short to medium term, minor and negative (barely perceptible). The predicted cumulative noise levels arising from quarrying operations are considerably lower than the existing background noise levels arising from traffic on the external road network.

Vibration

9.48 Blasting is carried out one to three times per month, depending on market demand. The duration of a blast in terms of noise is of short duration, similar to a clap of thunder.

9.49 Blasting-induced vibration is impulsive 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.

9.50 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.

9.51 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 9.5 gives examples of vibration levels routinely generated in a property.

Table 9-5
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

9.52 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

9.53 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.

9.54 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.

9.55 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 9.6 below:

Table 9-6
Transient Vibration Guide Values for Cosmetic Damage

	Type of Building	PPV (mm/sec) 4 to 15 Hz	PPV (mm/sec) 15 Hz and Above
1.	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/sec	50 mm/sec
2.	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.

Note: Definition of Cosmetic Damage - the formation of hairline cracks or the growth of existing cracks in plaster, dry wall surfaces or mortar joints.

9.56 BS7385-2 notes that the probability of damage tends towards zero at 12.5 mm/sec peak component particle velocity.

9.57 Existing blast monitoring results confirm that the blasting operations at Huntstown Quarry will comply with the DoEHLG (2004) and EPA (2006) recommended threshold limit values for groundborne vibration (12 mm/sec peak particle velocity). These limit values are within the range experienced during everyday activities and ensure that blasting operations will not result in damage to property / buildings.

Indirect Impacts

9.58 There are no indirect impacts associated with noise and/or vibration at the Huntstown Quarry site.

Interaction with Other Impacts

9.59 The noise resulting from operation will not adversely impact on the ecological environment in the vicinity of the site. There are no additional perceived interactions between noise and other impacts related to the extraction operations.

Long-Term Impacts

9.60 The nature of quarrying operations are such that there will be no long-term impacts in relation to noise / vibration. Once quarrying activity on the site is complete, there is likely to be significantly less operational and/or traffic noise generated across the application site.

9.61 The associated reduction in traffic levels along the internal haul roads and over public roads, coupled with the reduction in extractive activity at the application site will result in average ambient noise levels falling back to existing levels, with negligible long-term impact on the local environment.

MITIGATION

Noise

9.62 The noise assessment indicates that, with implementation of the existing mitigation measures described below, the development can comply with the daytime noise threshold limit of 55 dB(A), measured at *'sensitive locations'* recommended in the DoEHLG (2004) planning guidelines and the environmental management guidelines for the sector (EPA, 2006).

9.63 The predicted cumulative noise levels arising from the quarrying operations are considerably lower than the background noise levels arising from traffic on the external road network.

9.64 The noise assessments are conservative and represents a worst case scenario. A reduction of -20 dB(A) for full screening has been adopted (to take account of the high topographical features present between the activity on site and the receptors).

9.65 The following mitigation measures are / will be put in place at the quarry and are in accordance with the '*best practice / mitigation'* measures described in Section 3.2 of the DoEHLG planning guidelines and Section 3.5 of the EPA Environmental Management Guidelines.

- Provision of landscaped screening berms provides acoustic as well as visual screening.
- Regular maintenance of all plant and haulage vehicles is an integral part of site management and is important in helping to minimise noise impact. All Plant and equipment conform to noise emission limits set out in Statutory Instrument No. 320 of 1998 European Communities Construction Plant and Equipment-Permissible Noise Levels (Regulations, 1998) and amendment set out in Statutory Instrument No. 359 of 1996.
- Stripping of topsoil / overburden materials only takes place during quarry operating hours.
- Preservation of existing external hedgerows and site topography provides acoustic as well as visual screening.

- Internal haul roads and access roads have as low a gradient as possible to reduce engine / brake noise from heavy goods vehicles, and the access road from the site entrance to the weighbridge office is paved.
- Use of mobile processing plant enables the processing activities to be carried out within the quarry excavation area, where the quarry faces will provide additional acoustic screening.
- Enclosing plant / machinery where possible.

Vibration

9.66 Existing blast monitoring results indicate that the groundborne vibration levels (i.e. Peak Particle Velocity) comply with the DoEHLG (2004) recommended threshold limit values and the limit stated in Condition No.8 of the existing planning permission. The blast design and blasting methodology for the quarry operations at Huntstown Quarry, is optimised to ensure that the levels are within the recommended limits for the duration of the quarry life

9.67 The following measures have been / will be implemented at Huntstown 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.

- Blasting is 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. 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. In exceptional circumstances, due to unforeseen circumstances (e.g. late delivery or security) a blast may be delayed or brought forward.).
- There is no blasting carried out on Saturdays, Sundays or public holidays.
- Inhabited dwellings within 500 metres of a blast will be given advance notice when blasting operations are due to take place.
- All blasting operations are carried out by a certified 'shotfirer'.
- The optimum blast ratio will be maintained and the maximum instantaneous charge will be optimised.

9.68 To avoid any risk of damage to properties in the vicinity of the quarry, the groundborne vibration levels from blasting will not exceed a peak particle velocity of 12 mm/sec, measured at the nearest inhabited dwelling.

MONITORING

Noise

9.69 There is an existing noise monitoring programme in place at the site. Noise monitoring will continue to be carried out on an annual basis at four locations. The noise monitoring locations are shown on Figure 9.1. As the quarry develops these monitoring locations will be reviewed and revised where necessary.

9.70 Noise monitoring will be undertaken in accordance with International Standard ISO 1996: *Acoustics Description and Measurement of Environmental Noise*.

9.71 The results of the noise monitoring will be submitted to Fingal County Council on a regular basis for record purposes.

9.72 The scope of the noise monitoring will be reviewed annually, and subject to agreement of Fingal Co. Council, it may be amended in the light of previous monitoring results.

Blasting

9.73 Monitoring of blasts (both for groundborne vibration and air overpressure) will continue to be carried out at the nearest inhabited dwelling (subject to permission).

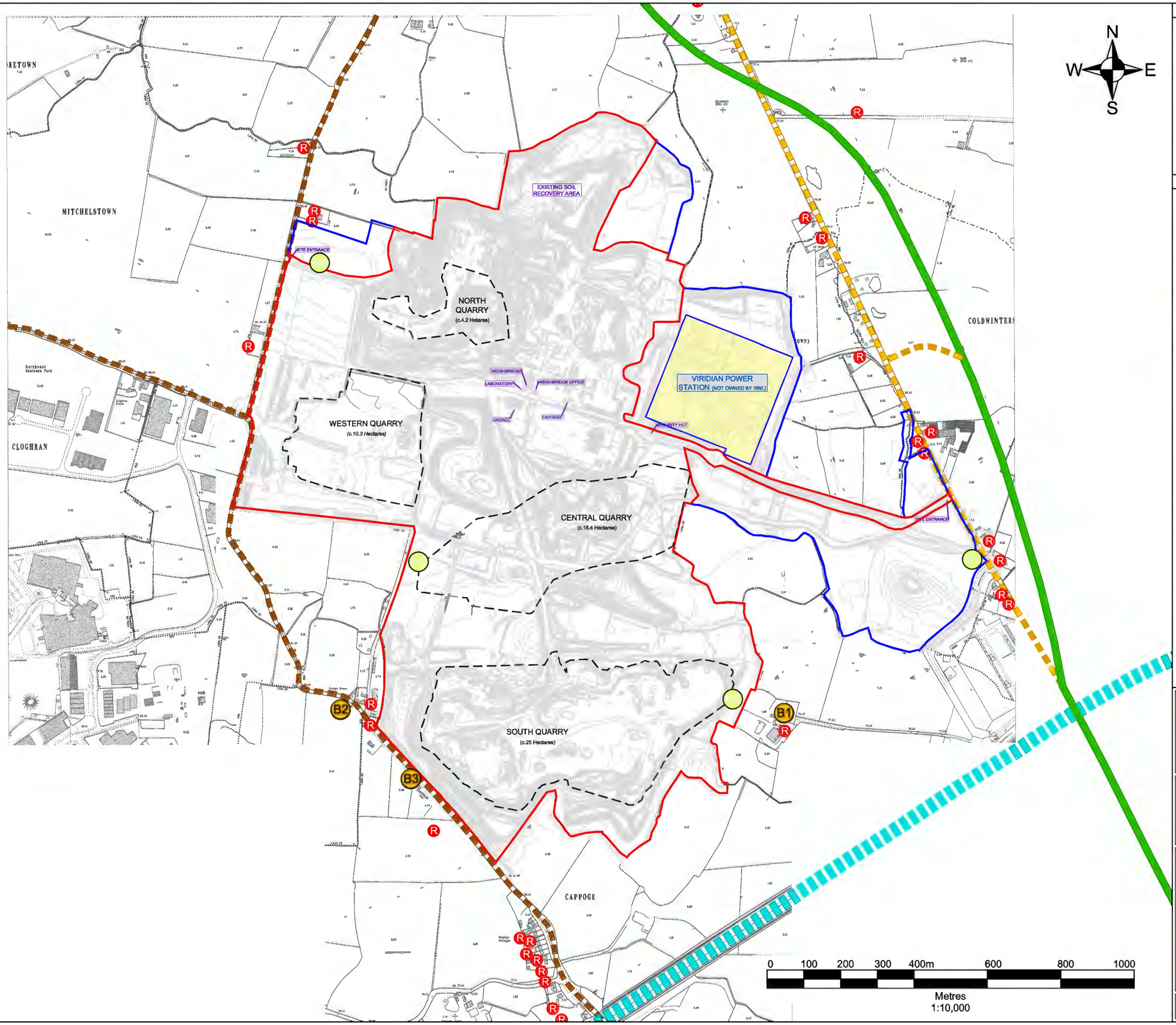
9.74 The blast monitoring results will be submitted on a regular basis to Fingal County Council for record purposes.

9.75 The scope of the blast monitoring will be reviewed annually, and subject to agreement of Fingal Co. Council, it may be amended in the light of previous monitoring results.

REFERENCES

- **British Standards Institute. 2009.** *BS5228: Part 1 (2009) Code of practice for noise and vibration control on construction and open sites*. British Standards Institute (BSi).
- **Department of Environment, Heritage & Local Government. 2004**. *Quarries & Ancillary Activities: Guidelines for Planning Authorities.* Government of Ireland.
- **EPA, 2000** *Ireland's Environment: A Millennium Report. Wexford.*
- **EPA, 2006** *Environmental Management in the Extractive Industry*. Wexford.
- **International Standards Organisation, 1996.** *Acoustics – Description and measurement of environmental noise – Part 2: Acquisition of data pertinent to land use.* ISO.

FIGURES



NOTES

1. EXTRACT FROM 1:2,500 ORDNANCE SURVEY DIGITAL SHEET NO'S. 3062-A, 3062-B, 3062-C, 3062-D, 3063-A, 3063-C, 3130-A & 3130-B

2. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000712 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

3. TOPOGRAPHIC SURVEY PREPARED BY FUGRO BKS BASED ON MAY 2009 AERIAL PHOTOGRAPHY

LEGEND

- ROADSTONE WOOD LTD. LANDHOLDING (c. 211 ha)
- PLANNING APPLICATION AREA (c. 167.5 ha)
- NOISE MONITORING LOCATION
- BLAST MONITORING LOCATIONS
- M50 MOTORWAY
- N2 DUAL CARRIAGEWAY
- NORTH ROAD (R135)
- LOCAL ROAD

Roadstone WOOD
The Right Choice

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ROADSTONE WOOD LTD.
ENVIRONMENTAL IMPACT STATEMENT

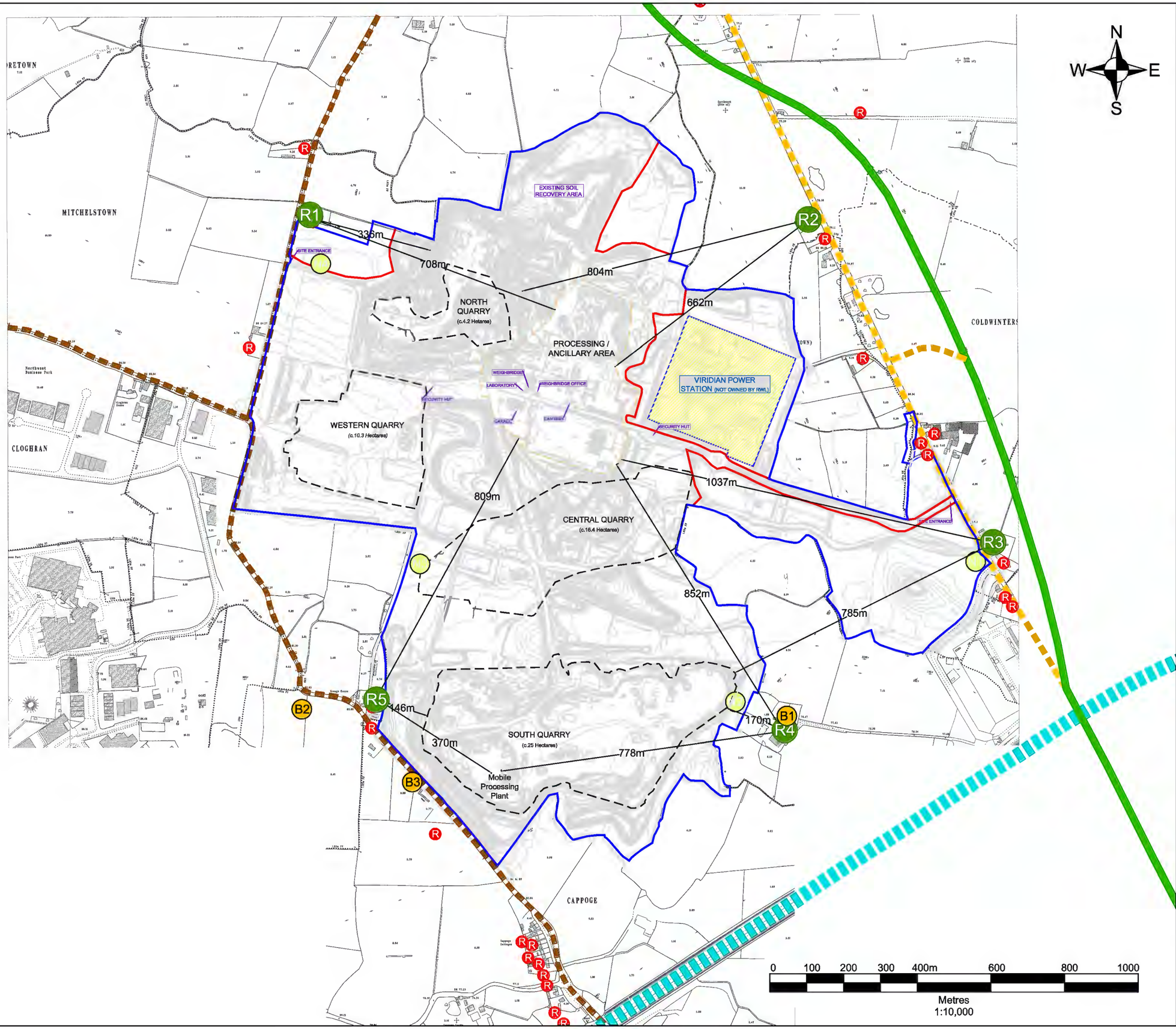
CONTINUANCE OF USE
HUNTSTOWN QUARRY,
NORTH ROAD, FINGLAS, DUBLIN 11

NOISE MONITORING LOCATIONS

FIGURE 9-1

Scale	Date
1:10,000	FEBRUARY 2012

00180.00015.18.9-1.R0.NOISE MONITORING LOCATIONS.dwg



NOTES

1. EXTRACT FROM 1:2,500 ORDNANCE SURVEY DIGITAL SHEET NO'S. 3062-A, 3062-B, 3062-C, 3062-D, 3063-A, 3063-C, 3130-A & 3130-B

2. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000712 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

3. TOPOGRAPHIC SURVEY PREPARED BY FUGRO BKS BASED ON MAY 2009 AERIAL PHOTOGRAPHY

LEGEND

- ROADSTONE WOOD LTD. LANDHOLDING (c. 211 ha)
- PLANNING APPLICATION AREA (c.167.5 ha)
- PROPOSED OVERALL EXTRACTION AREAS (55.9 HECTARES)
- NOISE MONITORING LOCATION
- RECEPTOR LOCATION
- LOCATION OF NEAREST RESIDENCES
- BLAST MONITORING LOCATIONS
- M50 MOTORWAY
- N2 DUAL CARRIAGEWAY
- NORTH ROAD (R135)

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ROADSTONE WOOD LTD.
ENVIRONMENTAL IMPACT STATEMENT

CONTINUANCE OF USE
HUNTSTOWN QUARRY,
NORTH ROAD, FINGLAS, DUBLIN 11

NOISE ASSESSMENT LOCATIONS

FIGURE 9-2

Scale	Date
1:10,000	FEBRUARY 2012

00180.00015.18.9-2.R0.NOISE ASSESSMENT LOCATIONS.dwg

APPENDICES

APPENDIX 9-1

DETAILED NOISE ASSESSMENT

Appendix 9-1 – Noise Assessment (Refer to Figure 9-2)

Table (iii) Quarry: Operational Phase General (Including Loading)

Plant Type	Average L_{Aeq} at 10m (dB(A))	Screening (dB(A))			Reflection (dB(A)			Activity Distance (m)			Attenuation with Distance (dB(A))			Activity L_{Aeq} (dB(A))		
		R1	R2	R3	R1	R2	R3	R1	R2	R3	R1	R2	R3	R1	R2	R3
Front Loader 1	75	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	27	22	20
Front Loader 2	75	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	27	22	20
Front Loader 3	75	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	27	22	20
Excavator	80	-20	-20	-20	+3	+3	+3	336	804	785	31	38	38	32	25	25
Excavator	80	-20	-20	-20	+3	+3	+3	336	804	785	31	38	38	32	25	25
Dump Truck	89	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	41	36	34
Dump Truck	90	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	42	37	35
Processing Area: Crushing / Screening / Washing Plant	85	-20	-20	-20	+3	+3	+3	708	662	1037	37	36	40	31	32	28

Combined Noise Level at R1 = 46 dB L_{Aeq}, Combined Noise Level at R2 = 41 dB L_{Aeq}, Combined Noise Level at R3 = 39 dB L_{Aeq}

Table (iv) Quarry: Operational Phase General (Including Loading)

Plant Type	Average L_{Aeq} at 10m (dB(A))	Screening (dB(A))		Reflection (dB(A))		Activity Distance (m)		Attenuation with Distance (dB(A))		Activity L_{Aeq} (dB(A))	
		R4	R5	R4	R5	R4	R5	R4	R5	R4	R5
Front Loader 1	75	-20	-20	+3	+3	170	146	25	23	33	35
Front Loader 2	75	-20	-20	+3	+3	170	146	25	23	33	35
Front Loader 3	75	-20	-20	+3	+3	170	146	25	23	33	35
Excavator	80	-20	-20	+3	+3	170	146	25	23	38	40
Excavator	80	-20	-20	+3	+3	170	146	25	23	38	40
Dump Truck	89	-20	-20	+3	+3	170	146	25	23	47	49
Dump Truck	90	-20	-20	+3	+3	170	146	25	23	48	50
Processing Area: Crushing / Screening / Washing Plant	85	-20	-20	+3	+3	778	370	38	31	30	37

Combined Noise Level at R4 = 51 dB L_{Aeq}, Combined Noise Level at R5 = 54 dB L_{Aeq}

The predicted cumulative noise levels arising from quarrying / stone processing / loading activities are within the daytime noise threshold limit value of 55 dB(A), at sensitive locations, recommended in Section 4.7 (c) of the DoEHLG (2004) planning guidelines.

Table (v) Quarry: Operational Phase Worst Case (Including Drill Rig)

Plant Type	Average L_{Aeq} at 10m (dB(A))	Screening (dB(A))			Reflection (dB(A)			Activity Distance (m)			Attenuation with Distance (dB(A))			Activity L_{Aeq} (dB(A))		
		R1	R2	R3	R1	R2	R3	R1	R2	R3	R1	R2	R3	R1	R2	R3
Front Loader 1	75	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	27	22	20
Front Loader 2	75	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	27	22	20
Front Loader 3	75	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	27	22	20
Excavator	80	-20	-20	-20	+3	+3	+3	336	804	785	31	38	38	32	25	25
Excavator	80	-20	-20	-20	+3	+3	+3	336	804	785	31	38	38	32	25	25
Dump Truck	89	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	41	36	34
Dump Truck	90	-20	-20	-20	+3	+3	+3	336	662	785	31	36	38	42	37	35
Processing Area: Crushing / Screening / Washing Plant	85	-20	-20	-20	+3	+3	+3	708	662	1037	37	36	40	31	32	28
Drill Rig (Blast Holes)	83*	-20	-20	-20	+3	+3	+3	336	804	785	31	38	38	35	28	28

Note: * Noise measurement at 10m from Ingersoll-Rand Drill Rig (26th November 2008).

Combined Noise Level at R1 = 46 dB L_{Aeq}, Combined Noise Level at R2 = 41 dB L_{Aeq}, Combined Noise Level at R3 = 39 dB L_{Aeq}

Table (vi) Quarry: Operational Phase Worst Case (Including Drill Rig)

Plant Type	Average L_{Aeq} at 10m (dB(A))	Screening (dB(A))		Reflection (dB(A))		Activity Distance (m)		Attenuation with Distance (dB(A))		Activity L_{Aeq} (dB(A))	
		R4	R5	R4	R5	R4	R5	R4	R5	R4	R5
Front Loader 1	75	-20	-20	+3	+3	170	146	25	23	33	35
Front Loader 2	75	-20	-20	+3	+3	170	146	25	23	33	35
Front Loader 3	75	-20	-20	+3	+3	170	146	25	23	33	35
Excavator	80	-20	-20	+3	+3	170	146	25	23	38	40
Excavator	80	-20	-20	+3	+3	170	146	25	23	38	40
Dump Truck	89	-20	-20	+3	+3	170	146	25	23	47	49
Dump Truck	90	-20	-20	+3	+3	170	146	25	23	48	50
Processing Area: Crushing / Screening / Washing Plant	85	-20	-20	+3	+3	778	370	38	31	30	37
Drill Rig (Blast Holes)	83*	-10	-10	+3	+3	170	146	25	23	41	43

Combined Noise Level at R4 = 52 dB L_{Aeq}, Combined Noise Level at R5 = 54 dB L_{Aeq}

The predicted cumulative noise levels for the worst case scenario i.e. assuming that all of the noise sources (including the drilling rig for the blastholes) are active for a 100% of the time at the nearest receptor distance from the activity, are calculated to be within the recommended threshold limit value of 55 dB(A) at sensitive locations, recommended in Section 4.7 (c) of the DoEHLG (2004) planning guidelines.