CLIENT: Quarryplan / Lagan Materials Ltd., trading as Breedon Ireland.

PROJECT: Proposed extension to existing mineral extraction site at Aughnacliffe Quarry on lands directly to the south of the existing quarry, in the Townlands of Aghamore Upper and Derreenavoggy, County Longford.

Dust Impact Assessment Report.

Prepared by: AONA Environmental Consulting Ltd.

Date: May 2023

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10.0 DUST IMPACT ASSESSMENT

10.1 Author of the Report

This Dust Impact Assessment has been prepared by AONA Environmental Consulting Ltd. AONA Environmental Consulting Ltd.'s areas of professional expertise are in Noise Control & Acoustics and Air Quality & Odour consultancy, including impact assessment and mitigation design. AONA Environmental Consulting Ltd. is a full member of the Institute of Acoustics, the Institute of Environmental Sciences and the Institute of Air Quality Management. The report author, Mervyn Keegan, has a Bachelor of Science Degree (Applied Sciences), a Master of Science Degree (Environmental Science) and a Diploma in Acoustics in Noise Control. AONA Environmental Consulting Ltd. is an independent consultancy specialising in Environmental Impact Assessment and Licensing and has prepared in excess of ten Noise & Vibration and Dust impact assessments annually for quarry developments in the Republic of Ireland, Northern Ireland and the UK over the last 15 years and is an expert in the awareness and understanding of the relevant legislation and guidance that pertains to best practise in such assessments.

10.2 Introduction

This Dust Impact Assessment considers the potential impact of the proposed extension to existing mineral extraction site at Aughnacliffe Quarry at the nearest sensitive receiver locations in the Townlands of Aghamore Upper and Derreenavoggy, County Longford. A detailed Project Description of the proposed development is provided in Section 4 of the EIAR.

The proposed winning and working of the greywacke mineral resource, will be undertaken in a phased manner and will take place, as occurs at present, from 0700-1800 Monday to Friday and 0700-1300 Saturdays.

The Dust Impact Assessment has considered that all the winning and working of the greywacke mineral resource will be undertaken in a phased manner. The greywacke mineral resource will be extracted via drill and blast methodology as is the current, approved practice at the quarry. The mineral won will be processed at the quarry face

via the use of mobile crushing and screening plant to produce a range of single size aggregates. The aggregate products will be stockpiled on the quarry floor, prior to being transported off-site or used in the manufacturing plant on site.

There are a number of residential properties located sporadically throughout the local area within approximately 250m of the existing and proposed quarry boundary. The closest residential property is located c. 125m to the south of the proposed extension area at Aughnacliffe Quarry.

This assessment considers the potential air quality impacts arising from the proposed development. An assessment is presented which employs the Source - Pathway-Receptor Approach to evaluate the risk of dust impacts and effects. Specifically, this assessment considers the potential air quality impacts associated with dust arising from the quarry which has the potential to reduce amenity in the local community ('disamenity dust') and smaller dust particles which can remain airborne for longer, potentially increasing local ambient concentrations of particulate matter (e.g. PM_{10} and to a lesser extent $PM_{2.5}$), which is associated with a range of health effects.

This assessment also seeks to establish a current baseline level of air quality in the area surrounding the existing operational site.

The current potential sources of dust in the vicinity of the proposed site that are considered as part of the assessment are attributable to:

- Existing Mineral Extraction at Aughnacliffe Quarry;
- Existing Mineral Processing at Aughnacliffe Quarry;
- Agricultural practices in the area; and
- Road surfaces and traffic movements.

The amount of dust generated from a mineral working of this type is largely affected by:

- Mineral type;
- Climate/local meteorology;
- Topography;

- Type of operation (scale, activity, location, duration); and,
- Character and land use of the surrounding area.

At the proposed application site dust has the potential to be created by:

- Overburden Stripping;
- Drilling and blasting;
- Mineral Extraction;
- Loading operations;
- Storage of mineral;
- Transportation of material via dump truck/Heavy Goods Vehicle (HGV);
- Restoration and placement of out of specification materials.

The assessment addresses potential environmental impacts of the proposed quarry development in relation to health effects and disamenity dust nuisance. The following elements have been considered:

- The legislative context relating to dust and particle emissions;
- Establishing baseline conditions;
- Dust survey and results;
- Local meteorological factors;
- Local receptors;
- The principal activities which could give rise to dust emissions; and,
- Mitigation measures to minimise dust generation.

10.3 Methodology

10.3.1 Relevant Dust Assessment Guidelines

Guidance on the Assessment of Mineral Dust Impacts (Institute of Air Quality Management - IAQM)

The Institute of Air Quality Management (IAQM) guidance document entitled Guidance on the Assessment of Mineral Dust Impacts for Planning (2016 V1.1), outlines that "*emissions of dust to air from minerals sites can occur during the preparation of the*

land, extraction, processing, handling and transportation of extracted minerals. Emissions can vary substantially from day to day, depending on the level of activity, the specific operations being undertaken, and the weather conditions. The scale of these impacts depends on the dust suppression and other mitigation measures applied". This guidance provides advice on robust and consistent good-practice approaches that can be used to assess the operational-phase dust impacts for use in the planning process. The IAQM guidance document outlines a methodology by which it is possible to screen out the need for a detailed assessment based on the distance from a mineral site to potentially sensitive receptors and where the potential dust impact of a mineral site cannot be 'screened out', a more detailed dust assessment will be required.

The IAQM Guidance provides a flow chart to assess whether a detailed dust assessment should be undertaken. If there are no relevant receptors within 1 km of the operations, then a detailed dust assessment can be screened out. In such a case, it is considered that irrespective of the nature, size and operation of the site, the risk of an impact is likely to be "negligible" and any resulting effects are likely to be 'not significant'. In cases whereby receptors are located between 400m, or 250m (depending on the rock type) and 1km of operations, it would normally be assumed that a detailed disamenity dust impact assessment is not required. However, the decision on whether to assess should be made and justified on a site-specific basis by a suitably experienced air quality professional. If there are relevant human and/or ecological receptors within 250 m or 400 m (depending on the rock type) then a disamenity dust impact assessment will almost always be required, which means that assessments are required for most minerals development schemes. Therefore, in the case of the Aughnacliffe Quarry extension, as it is not possible for potential dust impact to be 'screened out', a more detailed dust assessment is required.

10.3.2 Dust Standards & Guideline Values

Statutory standards exist for concentrations of suspended particulate matter (both PM_{10} and the $PM_{2.5}$) under The Air Quality Standards Regulations 2010.

Table 10.1: Relevant Air Quality Standards Regulations (Ireland).

Pollutant	Air Quality Objective	
	Measured as	**Concentration**
Particles (PM_{10})	Annual mean	40 µg/m^3
	24 hour mean	50 µg/m^3, not to be exceeded > 35 times a year
Particles ($PM_{2.5}$)	Annual mean	25 µg/m^3

New World Health Organisation (WHO) Global Air Quality Guidelines (AQGs) were released in September 2021, and these provide clear evidence of the damage air pollution inflicts on human health, at even lower concentrations than previously understood. The guidelines recommend new air quality levels to protect the health of populations, by reducing levels of key air pollutants, some of which also contribute to climate change.

Table 10.2: WHO Air quality guideline values (September 2021)

Pollutant	Air Quality Objective	
	Measured as	**Concentration**
Particles (PM_{10})	Annual mean	15 µg/m^3
	24 hour mean	45 µg/m^3
Particles ($PM_{2.5}$)	Annual mean	5 µg/m^3
	24 hour mean	15 µg/m^3 not to be exceeded more than 3-4 times a year

No statutory air quality criterion has been set at a European, National or World Health Organisation (WHO) level, although a range of national 'yardstick' criteria from many countries is found in literature.

For the sensitivity of people to the health effects of PM_{10}, the IAQM recommends that the air quality practitioner assumes that there are three sensitivities based on whether or not the receptor is likely to be exposed to elevated concentrations over a 24-hour period.

High sensitivity receptor -

- locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant

location would be one where individuals may be exposed for eight hours or more in a day)

- indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.

Medium sensitivity receptor -

- locations where people are occupationally exposed over a full working day.
- indicative examples include offices, warehouses and industrial units.

Low sensitivity receptor -

- locations where human exposure is transient.
- Indicative examples public footpaths, playing fields, parks and shopping streets.

In terms of the protection of the sensitive ecological habitats, the *Guidance on the Assessment of Mineral Dust Impacts for Planning* contained within the IAQM guidance states that professional judgement is required to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the likely effect and the value of the ecological asset. A habitat may be highly valuable but not sensitive, alternatively it may be less valuable but more sensitive to dust deposition. For the sensitivity of ecosystems to dust deposition the IAQM recommends that an ecologist is consulted to determine the potential effects on plant communities.

The IAQM guidance defines high, medium and low sensitivity ecological receptors as follows;

High sensitivity receptor –

- locations with an international designation and the designated features may be affected by dust soiling.
- locations where there is a community of a particular dust sensitive species such as vascular species.
- an indicative example is a Special Area of Conservation (SAC) designated for acid heathlands adjacent to a minerals development releasing alkaline dusts.

Medium sensitivity receptor –

- locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown;
- nationally designated site and the designated features may be affected by dust deposition; or indicative examples include Sites of Special Scientific Interest (SSSIs) or a local wildlife site with very specific sensitivities.

Low sensitivity receptor –

- locations with a local designation where the features may be affected by dust deposition.
- an indicative example is a local Nature Reserve with dust sensitive features.

In 2005, the UK Highways Agency released an Interim Advice Note 61/05 '*Guidance for Undertaking Environmental Assessment of Air Quality for Sensitive Ecosystems in Internationally Designated Nature Conservation Sites and SSSIs*' as a supplement to the Design Manual for Roads and Bridges (DMRB) Guidelines. This interim guidance states that dust or particles falling onto plants can physically smother the leaves affecting photosynthesis, respiration and transpiration. The literature suggests that the most sensitive species appear to be affected by dust deposition at levels above 1,000 $mg/m^2/day$ which is higher than the level at which most dust deposition may start to cause a perceptible nuisance to humans. As such, once dust deposition rates are maintained within the guidelines for human nuisance the impact of dust deposition on sensitive ecosystems is considered negligible.

Therefore, the following dust limits should be used in the assessment of dust levels from the proposed quarry extension;

- PM_{10} 24 Hour Mean concentration limit = 50 $\mu g/m^3$ not to be exceeded more than 35 times a calendar year
- PM_{10} Annual Mean concentration limit = 40 $\mu g/m^3$
- $PM_{2.5}$ Annual Mean concentration limit = 25 $\mu g/m^3$
- Dust Deposition Rate limit affecting sensitive ecological receptors = 1,000 $mg/m^2/day$ using a Bergerhoff gauge. (Ref. The Highways Agency, Design Manual for Roads and Bridges)

Dust Deposition Impact Assessment

In quarries, dust typically becomes airborne due to the action of wind on material stockpiles and other dusty surfaces, or when thrown up by mechanical action, for example the movement of tyres on a dusty road or activities such as blasting, drilling, screening, etc. There are many types of particulate matter (PM) that are included in the definition of dust, including variations in terms of size and chemical composition.

A basic classification of particles may be made into those that are easily deposited and those that remain suspended in the air for long periods. This division is useful as deposited dust is usually the coarse fraction of particulates that causes dust annoyance, whereas suspended particulate matter is implicated more in exposure impacts.

Airborne particles have a large range of diameters, from nano-particles and ultrafine particles (diameters less than 0.1µm) to the very large particles with diameters up towards 100µm. There is no clear dividing line between the sizes of suspended particulates and deposited particulates, although particles with diameters >50 µm tend to be deposited quickly and particles of diameter <10 µm have an extremely low deposition rate in comparison. Therefore, the size of suspended and deposited dust particles affects their distribution and as such requires two very different approaches to sampling these fractions.

Large particles (100 µm diameter) are likely to settle within 5-10m of their source under a typical mean wind speed of 4-5 m/s, and particles between 30-100 µm diameter are likely to settle within 100m of the source. Smaller particles, particularly those <10 µm in diameter, have a greater potential to have their settling rate impeded by atmospheric turbulence and to be transported further from their source. Dust emissions are exacerbated by dry weather and high wind speeds. Therefore, the dust deposition impact depends on the wind direction and the relative location of the dust source and receptor.

PM_{10} is the fraction of airborne (suspended) PM which contains particles of diameter less than 10µm. PM_{10} includes all particles, of different sizes and types, which are

relevant for potential health effects. PM_{10} can penetrate deep into the respiratory system increasing the risk of respiratory and cardiovascular disorders.

Dust emissions can arise as a result of operational activities, and /or wind erosion of exposed surfaces. The amount of dust that is raised is highly dependent upon a number of interrelated factors, which include:

- The nature of the material;
- The prevailing meteorological conditions;
- The activities being undertaken;
- The influence of any on site mitigation measures.

The prevailing meteorological conditions are the most significant issue which will affect the rate of dust deposition outside of the boundary of a quarry and its associated activities. Therefore, it can be assumed that during the drier months of the year, there is the potential for dust deposition rates to be higher than the annual average dust deposition rate.

The Mineral Industry Research Organisation (MIRO) *Good practice guide: control and measurement of nuisance dust and PM_{10} from the extractive industries* (2011) has classified typical monthly dustfall rates into three categories to represent 'open country', 'residential areas and the outskirts of towns' and 'commercial town centres' as outlined in Table 10.3. Therefore, as the proposed quarry extension is located within an area that could be characterised as 'Open Country' and is also surrounded by agricultural activity, this area is likely to have a monthly background dust deposition rate of 140 mg/m^2/day as a 95th percentile according to the MIRO guidance.

Table 10.3: 5-year means of the annual percentiles of monthly dustfall rates (mg/m^2/day insoluble deposits determined using a dry Frisbee (foam) gauge).

Location	**Median (50th percentile)**	**90th percentile**	**95th percentile**
Open Country	38	103	140
Residential Areas and the outskirts of towns	56	146	203
Commercial centres of towns	90	199	261

10.4 Assessment of Baseline Conditions

The background air quality in the area of Aughnacliffe Quarry development is influenced by other potentially significant air pollutant sources other than the existing Aughnacliffe Quarry and associated Processing Plant. Baseline conditions have been established in the following manner:

- Analysis of dust deposition monitoring results in the vicinity of the site;
- Analysis of background PM_{10} concentrations from the EPA;
- Analysis of relevant meteorological data; and,
- Identification of sensitive receptor locations.

10.4.1 Baseline Dust Survey

Existing ambient conditions are measured by positioning four Bergerhoff glass deposition gauges at strategic locations near to the boundaries of the existing site for periods of 30 +/- 2 days. This monitoring is undertaken quarterly and analysed by TMS Environment Ltd. This report considers the results of the dust deposition monitoring during the period between May 2021 to December 2022.

The dust deposition monitoring locations have been selected following consideration of the requirements of German Standard Method VDI 2119 – 'Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method) German Institute)'. Bergerhoff gauges were located following consideration of buildings and other obstructions, height above ground and sample collection and analysis procedures. The monitoring locations are shown in Figure 10.1. The results of the dust deposition monitoring survey are compared against the industry standard dust deposition limit value of 350 mg/m^2/day and that which is stated within the extant planning permission at the site.

After each exposure period, the Bergerhoff gauges were removed from the site and transported to an accredited laboratory under a chain of custody for analysis. The

samples were evaporated down and the dry residue, and the total dust content determined gravimetrically, and the result reported in mg/sample. Results are expressed as a dust deposition rate in mg/m^2/day in accordance with the relevant standard.

There are no Irish or EU air quality standards with which levels of dust deposition can be compared. However, a figure of 350 mg/m^2/day (measured using Bergerhoff type dust deposit gauges as per German Standard Method for determination of dust deposition rate, VDI 2119) is commonly applied to ensure that no nuisance effects will occur. This guideline limit value of 350 mg/m^2/day is obtained from the commonly applied German TA Luft Air Quality Standard emission limit value which was established to protect significant nuisance or significant disadvantage due to dustfall (deposition). The use of this limit value is generally considered appropriate by both Local Authorities and the EPA (see previously referenced guidance) to minimise the impact of airborne dust levels on the receiving environment beyond site boundaries. The German TA Luft criteria for 'possible nuisance' and 'very likely nuisance' are 350mg/m$^{2/}$day and 650mg/m^2/day, respectively. The German TA Luft Air Quality Standard also specifies emissions limit values for certain trace metals and their inorganic compounds.

The Environmental Management Guidelines for the Extractive Industry (Non-Scheduled Minerals) (EPA 2006) present a summary of current environmental management practices for surface workings within the extractive industry. They are based on a review of current environmental management practice in Ireland, the UK and Europe. The published guidelines are intended to provide general advice and guidance in relation to environmental issues to practitioners involved in the planning, design, development, operation and restoration of surface extractive industry developments and ancillary facilities in Ireland. In relation to surface extractive industry developments and ancillary activities, the guidelines recommend that total dust deposition (soluble and insoluble) from activities on site shall not exceed a dust emission limit value (ELV) at site boundaries of '350mg/m^2/day (when averaged over a 30-day period)'.

The DoEHLG Planning Guidelines on Quarries and Ancillary Activities are primarily addressed to statutory planning bodies. The guidelines provide an overview of environmental issues and best practice / possible mitigation measures associated with surface working of aggregates and associated ancillary activities. The guidelines are routinely referred to by practitioners involved in the planning, design, development, operation and restoration of surface workings and ancillary facilities in Ireland.

The Irish Concrete Federation (ICF) Environmental Code was first published in 1996, and subsequently revised in 2005, as an Extractive Industry Code of Practice for the promotion of and guidance in achieving the following principal objectives amongst extractive industry operators:

a) To operate in line with the principles of Sustainable Development

b) To operate to those standards required by law and good industry practice

c) To ensure employees and contractors are environmentally responsible in their performance of their duties

d) To respect the legitimate concerns and interests of the community

e) To adopt the Environmental Management Guidelines detailed in the Code

In terms of dust limits the ICF Environmental Code states that 'dust deposition from the activity beyond the site boundary should not exceed 350mg/m^2/day monthly mean in accordance with TA Luft VDI Method 2119 (Bergerhoff Gauge)'.

Table 10.4 shows the dust deposition rates of the samples collected from the monitoring locations during the period between 31st May 2021 to 2nd December 2022. The average dust deposition rate at each monitoring location along the site boundary is well below the assessment limit for ambient dust impact of 350 mg/m$^{2/}$day.

Figure 10.1: Dust monitoring locations (as extracted from TMS Environment Ltd Reports)

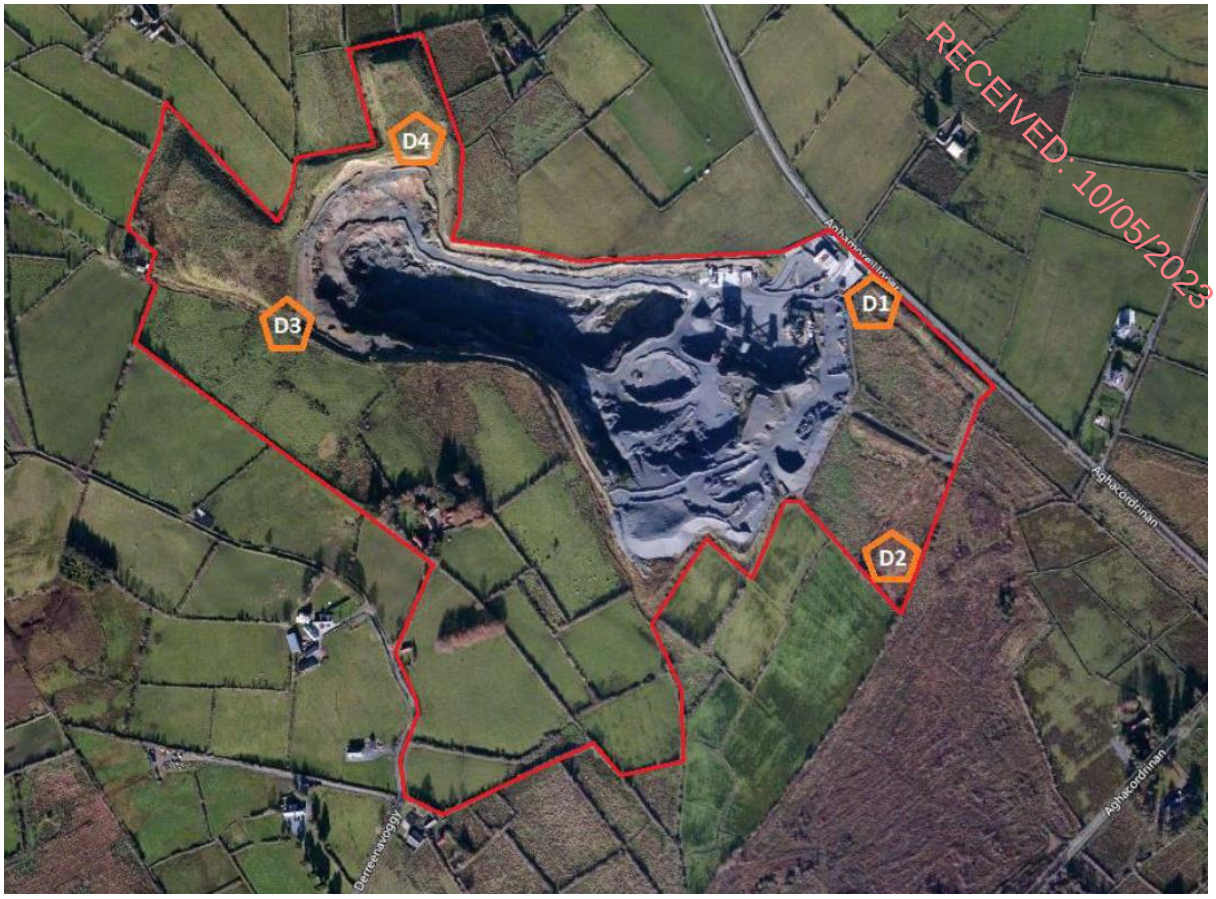


Table 10.4: Dust deposition rate at site boundary locations during periods between 31st May 2021 to 2nd December 2022

Time Period	Location and Deposited Dust Rate (mg/m²/Day)			
	D1	D2	D3	D4
31st May 2021 - 30th June 2021	82	57	84	102
14th July 2021 - 13th August 2021	50	Note 1	39	19
4th October 2021 - 8th November 2021	97	150	71	68
27th January 2022 - 24th February 2022	275	58	105	170
5th April 2022 - 9th May 2022	207	121	68	57
9th June 2022 - 11th July 2022	Note 2	338	28	Note 1
8th August 2022 - 5th September 2022	52	28	184	104
5th September 2022 – 3rd October 2022	128	117	132	224
3rd October 2022 - 4th November 2022	102	117	37	347
4th November 2022 – 2nd December 2022	51	39	131	37
AVERAGE	**116**	**113**	**88**	**125**
Dust Deposition Limit = 350 mg/m²/day				

Note 1: Not reported due to the presence of organic matter in the collection vessel.

Note 2: The collection vessel. was missing upon collection and consequently there is no result reported.

10.4.2 Existing Air Quality

In order to reduce the risk to human health and to the environment from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. The Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) establish the limit values in Ireland for particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), carbon monoxide (CO) and benzene. These Regulations implement Directive 2008/50/EC on ambient air quality and cleaner air for Europe. The Environmental Protection Agency (EPA) is the competent authority for the purpose of Directive 2008/50/EC and these Regulations.

Under the Clean Air for Europe Directive, EU member states must designate "Zones" for the purpose of managing air quality. For Ireland, four zones were defined in the Air Quality Standards Regulations (2011). The zones were amended on 1st January 2013 to take account of population counts from the 2011 CSO Census and to align with the coal restricted areas in the 2012 Regulations (S.I. No. 326 of 2012). Zone A

is Dublin, Zone B is Cork City and Zone C includes 24 large towns and Zone D is the remainder of the State. The Aughnacliffe Quarry site is within Zone D. The air quality in Zone D is well within the limits outlined in the Air Quality Standards Regulations 2011.

The EPA manages the National Ambient Air Quality Network. The closest ambient air quality monitoring station to Aughnacliffe Quarry site is in Longford Town, which is ~15km southwest of the development site. The air quality station in Longford was commissioned in May 2010. Automated results are available for PM_{10} and $PM_{2.5}$. Table 10.5 outlines the average values for Particulate Matter (PM_{10} and $PM_{2.5}$) for 2022.

As shown in Table 10.5, the annual mean PM_{10} and $PM_{2.5}$ background concentrations were significantly below the AQO standards of 40 µg/m^3 and 25 µg/m^3 respectively.

Table 10.5: Air Quality Levels at Longford Town Monitoring Station (Jan - Dec 2022)

Station	**PM_{10} (ug/m^3)**	**$PM_{2.5}$ (ug/m^3)**
Longford Town	16.05	10.90
Limit Value	40 ug/m^3 (Note 1)	25 ug/m^3 (Note 1)

Note 1: Annual Mean for Protection of Human Health

10.4.3 Prevailing Meteorological Conditions

Meteorological conditions such as rainfall, wind speed and wind direction have the greatest impact on potential dust deposition impacts in proximity to the Aughnacliffe Quarry site.

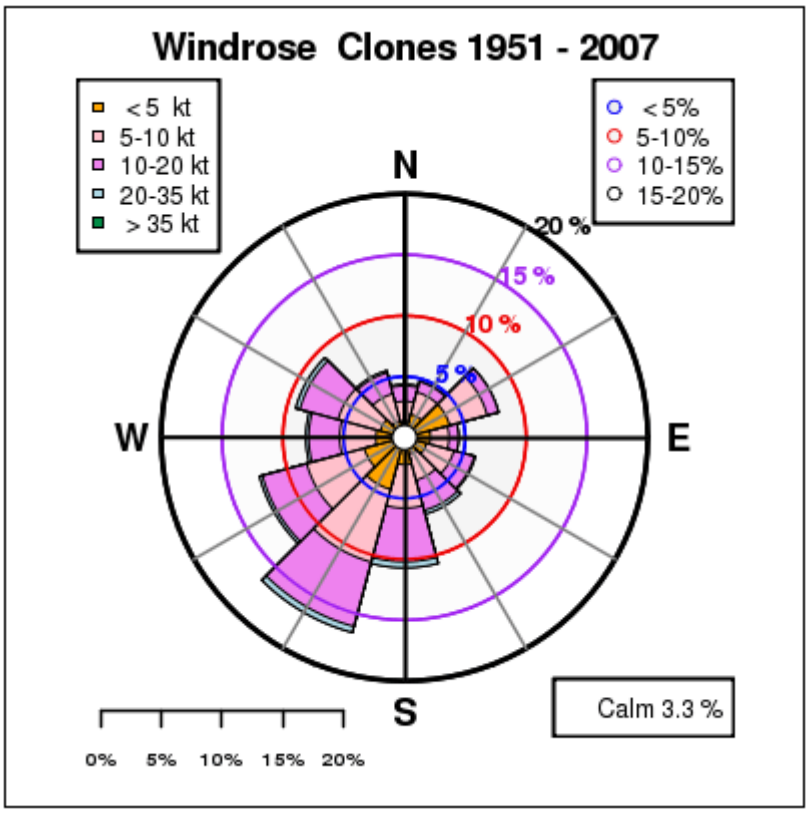
The closest representative Met Eireann weather station data to Aughnacliffe Quarry is located at Mount Dillon. This weather station is located ~25km SSW of Aughnacliffe Quarry. Mount Dillon meteorological station records temperature and rainfall. Table 10.6 summarises the monthly rainfall values from January 2020 to February 2023. This data exhibits a relatively high rainfall level throughout the year (Long Term Average 74.2 mm in June - 111.8 mm in October), which acts as a significant natural dust suppressant on site.

Table 10.6: Monthly rainfall values for Mount Dillon from January 2020 to February 2023.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2023	102.9	16.4											119.3
2022	52.4	140.0	33.5	59.4	76.9	103.7	33.7	66.3	85.9	182.8	122.1	104.6	1061.3
2021	129.0	88.3	102.0	24.2	105.1	25.7	57.8	96.9	78.0	143.0	49.6	116.4	1016.0
2020	91.6	225.3	80.6	41.5	23.2	103.0	110.0	112.7	73.8	159.7	110.2	116.8	1257.5
LTA	130.4	77.7	88.2	66.6	70.5	74.2	73.1	88.3	79.4	111.8	102.4	109.8	1047.1

Wind direction is primarily from a south-westerly direction, which is represented in the windrose from Clones shown in Figure 10.2 [Note: the windrose indicates the wind 'Blowing To' direction]. This weather station is located ~55km NE of Aughnacliffe Quarry.

Figure 10.2: Met Eireann windrose for Clones (wind 'Blowing From' direction, i.e. prevailing south-westerly wind direction) (Source - https://www.met.ie/climate/what-we-measure/wind#).



10.5 Assessment of Impacts

The assessment to consider the dust impact that can be expected to occur in the future as a result of the proposed development at the Aughnacliffe Quarry site including extraction of greywacke using conventional drilling and blasting techniques and extraction using mobile excavator and haul truck movements is outlined below. This considers the potential significant effects, or impacts, that can reasonably be expected to occur as a result of quarrying. It is reasonable to suggest that there will be no change anticipated from the continuation of the associated asphalt plant operations at the quarry, i.e. existing potential dust sources which are highly controlled will remain the same. It is envisaged that the proposed continuation of use of the mobile processing plant together with the further deepening of the quarry development, in line with the environmental parameters previously assessed, will continue to be undertaken and will be environmentally acceptable.

10.5.1 Dust Sensitive Receptors

The magnitude of the potential impact was assessed for all receptors. This assessment was based on the following:

- Sensitive receptors are naturally screened by existing hedgerows and trees and surrounding topography;
- The previous and proposed development of the quarry, includes the establishment of significant perimeter earth berms and quarry faces which reduce the potential for wind-blown dusts off site;
- The continued development of the quarry method of working into the quarry faces will continue to create a barrier for potential dust migration to nearby receptors; and
- Existing dust management methods employed on site will be maintained.

Figure 10.3 and Table 10.8 indicates that there are no properties within 250m to the north-east of the proposed quarry extension area, i.e. downwind of the prevailing wind

direction. Beyond 250m it is highly unlikely that any receptors will experience a dust nuisance.

Figure 10.3: Nearest Sensitive Receptors (NSR) in proximity to Aughnacliffe Quarry

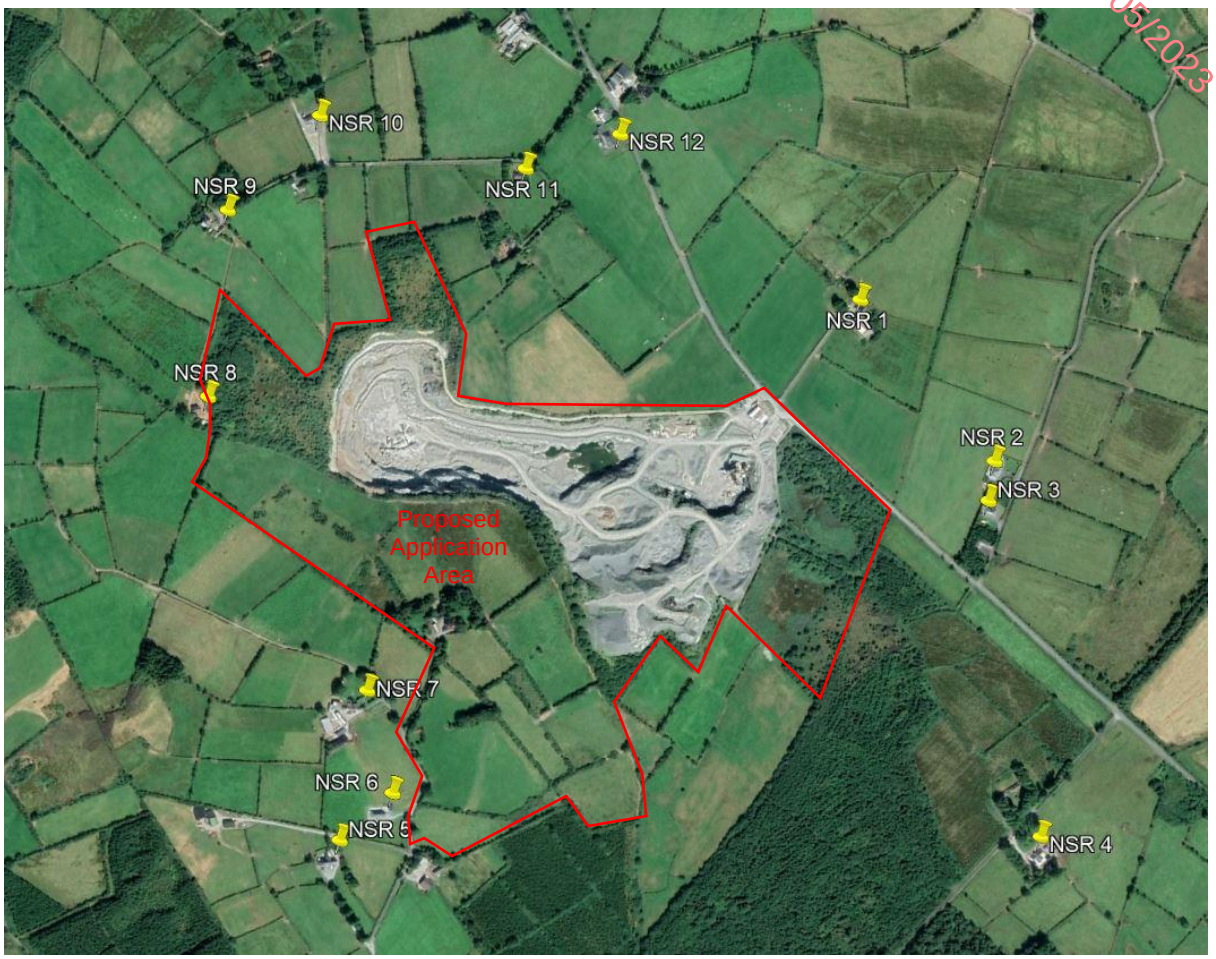


Table 10.7: *Nearest sensitive receiver locations.*

Reference	Address	Grid Coordinates		Distance to dust source (Mineral extraction)
NSR 1	L5081, Aghamore Upper	224388	286169	~320 m
NSR 2	L5087, Aghacordrinan	224570	285952	~475 m
NSR 3	L5087, Aghacordrinan	224562	285899	~465 m
NSR 4	L5090, Aghacordrinan	224632	285449	~655 m
NSR 5	Derreenavoggy	223690	285439	~295 m
NSR 6	Derreenavoggy	223761	285503	~205 m
NSR 7	Derreenavoggy	223727	285641	~125 m
NSR 8	L50813, Aghamore Upper	223508	286033	~185 m
NSR 9	L50813, Aghamore Upper	223530	286286	~275 m
NSR 10	L50813, Aghamore Upper	223655	286415	~300 m
NSR 11	L50813, Aghamore Upper	223935	286342	~250 m
NSR 12	L50813, Aghamore Upper	224062	286389	~360 m

Table 10.7 provides a list of the 12 nearest sensitive receptor properties surrounding the planning application area, of which 9 are located within 400m of existing and proposed quarry operations. The nearest sensitive receptor property is located within ~125m of the proposed quarry operations. The dust impact assessment is based upon nearest sensitive receptor proximity to the proposed development site. Each receptor chosen is considered to illustrate the worst-case scenario relative to the wind direction and proximity to proposed workings. Three residential receptors located in excess of 400m from the quarry (NSR 2,3 and 4) have been screened out from detailed consideration due to their distance to existing and proposed workings.

10.5.2 Potential Dust Impact from Activities

The following aspects of the proposed development have been identified that could possibly give rise to an impact on the air quality environment of the surrounding area:

- Excavation, drilling / blasting of mineral and processing;
- Loading and despatch of vehicles;
- On-site transportation of material; and,
- Overburden Stripping, material placement and Restoration.

The inherent mitigation factors have also been examined in the following sections.

- **Excavation, drilling / blasting of mineral and processing**

The operational methodology within the proposed extension will follow previously approved methodology which is ongoing within the existing quarry. The extraction of greywacke using conventional drilling and blasting techniques, as required, and extraction using mobile excavator with associated HGV traffic movements as per the current rates of extraction (will result in similar dust deposition rates in proximity to the quarry site).

As is the current, approved practice at the quarry, the blasted rock will be processed on the quarry floor using mobile crushing and screening plant to produce a range of aggregate sizes. This plant is fully mobile and able to operate on any standard bench; thus, removing the requirement for the blast rock to be hauled elsewhere within the quarry, or off-site for processing. The modern mobile plant is fitted with dust suppression units and enclosures of all potential emission points. As the quarry deepens, the quarry faces will provide additional attenuation in terms of dust generated by the processing plant. Processed material will be stockpiled on the quarry floor prior to being loaded into HGV's for dispatch off-site or use in the manufacturing plant on site.

It is proposed that the rock will be extracted at a similar rate per annum to that which presently occurs on site. 270,000 tpa is the permitted extraction rate.

Mineral extraction at the quarry to date has extended to a depth c.141m AOD and the quarry sump in the eastern part of the quarry void has a water level of c.140m AOD. Mineral extraction at the site is ongoing in the western part of the void in accordance with the extant planning permission for the site. Workings to date have resulted in 2 faces, split by a bench at c.155m AOD.

The first phase of extraction will also see the north-western part of the quarry deepened by an additional bench, to a depth of c.128m AOD. The quarry benches will

be accessed via ramps excavated from the bedrock along the northern faces of the quarry void. Mineral extraction will then progress southwards, with the eastern part of the extension area extended southwards to approximately align with the current extent of permitted workings in the western part of the quarry void. This lateral extension of works will see void extended southwards to a depth matching that of the current quarry floor (c.141m AOD).

The second phase of the quarry development will see the quarry extend laterally to the south. The various quarry benches will continue to be accessed via the ramps along the northern faces and additional ramping along the western faces.

The third phase of the quarry development will see the quarry extend laterally to the south and the quarry floor deepened to result in a maximum quarry floor depth of 114mAOD in the southwestern part of the quarry void. The various quarry benches will continue to be accessed via the ramps along the northern faces and additional ramping along the western faces.

Phase 4 will see the quarry extension area extend to its maximum eastern lateral extents. The faces developed in Phases 2 and 3 will be extended eastwards and the deepest sinking at 114m AOD created in Phase 3 will also be extended eastwards. By the end of this phase the quarry extension will have reached its full proposed lateral extents. Phase 5 will see the deepest sinking of the quarry floor extended eastwards. The development will result in a quarry floor at 114m AOD which will be accessed via the ramping system established in the previous phases of the development.

- **Loading and despatch of vehicles; and onsite transportation of material**

There is no requirement to alter the existing mobile plant utilised at Aughnacliffe Quarry. Material will be liberated at the face via drill and blast technology. Material in the blast pile will be loaded into the mobile processing equipment via a tracked face excavator, crushed and screened before being transported from the quarry via HGV or hauled to the manufacturing plant area by dump truck.. Existing mobile plant on site includes excavators, crushers and screeners, trucks and wheeled loading shovels.

There will be a maximum of 20 movements per hour from the area of extraction and processing to and from the site access area and the asphalt/ approved batching plant on site. The weight of vehicles, their speed and the number of wheels in contact with the ground can all affect the resuspension of dust deposits on road surfaces. Strict site speed limits will continue to be enforced (10kph) to minimise dust generation. Dust control measures will continue to be implemented on site for the control of dust during prolonged dry periods and will be reflected in the Dust Management Plan. This includes for the dampening of the haul routes using a water bowser as necessary. The implementation of such mitigation measures is in accordance with best practice as currently takes place at the existing Aughnacliffe Quarry site.

- **Overburden Stripping, Material Placement and Restoration**

Overburden from the lateral extension area will be stripped via the use of hydraulic excavator and transported via dump truck to the areas of material deposition. Rather than stripping overburden from all of the lateral extension area at the outset, the extension area will be stripped in phases, on a campaign basis, in advance of extraction as it progresses from north to south.

Non-commercially viable and out of specification material resultant from the processing of the mineral will be placed in lands to the west and south of the quarry void. The area for material deposition will gradually extending closer to the quarry void as the development progresses over time. The material will be hauled from the area of working to the area of deposition via dump truck and will be placed and graded via the use of hydraulic excavator and dozer, to create a shallow outer slope.

Overburden will be stripped on a campaign basis and will be placed on top of the previously placed out of specification material and planted with the prescribed woodland mix.

Following the completion of mineral extraction, the site will be restored in accordance with the submitted restoration concept to create a waterbody and a range of biodiverse habitats. Details of the proposed planting ratios are detailed on the restoration

scheme, with the aim of allowing the site to assimilate back into the local landscape as well as delivering biodiversity improvements.

Following the cessation of operations at the site, all vehicles, plant and equipment related to the proposed development will be removed.

Following the cessation of mineral extraction at the site and the associated management of water via de-watering, groundwater levels will rebound to see a water body (lake) formed within the quarry void following the exhaustion of permitted reserves.

10.5.3 Dust Impact on Ecological Receptors

The ecological effects resulting from the predicted dust impact must be assessed. An 'ecological receptor' refers to any sensitive habitat affected by dust deposition. This includes the direct impacts on vegetation or aquatic ecosystems, and the indirect impacts on fauna (e.g. on foraging habitats). For locations with a statutory designation, e.g. Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs), consideration should be given as to whether the particular site is sensitive to dust and this will depend on why it has been designated. Some non-statutory sites (i.e. local wildlife sites) and/or locations with very specific sensitivities may also be considered if appropriate.

If there are relevant ecological receptors within 250 m or 400 m (depending on the rock type) then an assessment of the ecological effects resulting from the predicted dust impact is required. There are no sensitive habitats in close proximity to the quarry. The nearest sensitive habitat to Aughnacliffe Quarry is Lough Gowna, which is a proposed Natural Heritage Area (pNHA) located ~3.6 km to the east. Therefore, due to the significant separation distance between the site and the nearest sensitive habitat, any further assessment of the ecological effects resulting from the predicted dust impact is not required in this instance.

10.5.4 Assessment of Potential Dust Impacts

The IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning gives an illustrative example of a dust risk assessment for a minerals site based on the underlying IAQM assessment procedure set out in Section 5.1 of the guidance in Appendix 3. The example provides a series of assessment matrices which are used to estimate the Dust Impact Risk, the Pathway Effectiveness and the Likely Magnitude of Disamenity Effects at each receptor. The latter is used to determine whether overall there is likely to be a significant effect or not on the surrounding area.

- **Estimation of Dust Impact Risk**

Estimation of Residual Source Emissions

The Dust Impact Risk was determined for each of the main operational activities:

a. Site preparation and restoration; (Overburden Stripping & Restoration)
b. Mineral extraction;
c. Materials handling;
d. On-site transportation;
e. Mineral processing;
f. Stockpiles and other exposed surfaces;
g. Off-site transportation (track-out).

More than one of these activities may occur at any one time, and this was taken into consideration in the assessment. Owing to the long-term nature of this mineral's development, the site was divided into 'zones' for the dust risk assessment, considering the proposed phases of extraction and the mitigation measures that are applied on site. The Residual Source Emissions was based on the scale of the anticipated operations and was classified as Small, Medium, or Large for each relevant operational activity in each phase, taking into account the designed-in mitigation. The Residual Source Emissions for each activity are presented in Table 10.9.

Table 10.9. Residual Source Emissions Classification

Activity	Residual Source Emissions	Notes

Site preparation and restoration	Large	Site Preparation - The Application Site is c. 36.8ha in size, with c.22ha of the site comprised of the existing quarry and associated overburden storage and landscaping areas. Perimeter noise bunds to be put in place along southern boundary, >100,000m³ material movement
Mineral extraction	Medium	New Working area = c. 14.8ha / Existing Working area = c. 22ha. Drilling and blasting on a monthly basis, hydraulic excavator, coarse material, 270,000 tpa as per permitted extraction rate
Materials handling	Medium	>5 plant, within 50 m from site boundary within the quarry on hard standing haul roads
On-site transportation	Medium	~20 haul truck movements per hour - ~200 movements per day, haul roads >500m in length
Mineral processing	Medium	Mobile crusher and screener processing – at a maximum of 270,000 tpa of material.
Stockpiles and other exposed surfaces	Medium	Stockpile duration of >1 month with a total area >1 ha
Off-site transportation	N/A	As per current rate from existing processing area.

On the basis of the fact that 'mineral extraction' and 'on-site transportation' will be the main potential continuous dust sources on site, a **medium** Residual Source Emission Classification for each of the phases has been selected.

Estimation of Pathway Effectiveness

The site-specific factors considered to determine the Effectiveness of the Pathway were the distance and direction of receptors relative to the prevailing wind directions. There are nine receptors identified within 400m of the site (See Table 10.6) and therefore each receptor was considered separately. For each receptor within 400 m of the site boundary the wind direction from the proposed dust source was considered. The frequencies of wind in each direction were then calculated based on meteorological wind direction data for a representative meteorological station as shown in Figure 10.2. The resulting frequency of moderate to high wind speeds (>5 m/s) with the potential of carrying airborne dust towards receptors were then assigned to the categories in Table 10.10 based on 12 x 30° wind direction sectors.

Table 10.10. Categorisation of Frequency of Potentially Dusty Winds

Frequency Category	Criteria
Infrequent	Frequency of winds (>5 m/s) from the direction of the dust source on dry days are less than 5%
Moderately frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 5% and 12%
Frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 12% and 20%
Very frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are greater than 20%

The categorisation shown in Table 10.10 was applied to the distance from each receptor to source.

Table 10.11. Categorisation of Receptor Distance from Source

Category	Criteria
Distant	Receptor is between 200 m and 400 m from the dust source
Intermediate	Receptor is between 100 m and 200 m from the dust source
Close	Receptor is less than 100 m from the dust source

The pathway effectiveness was classified using the Frequency of Potentially Dusty Winds from Table 10.10 and the Receptor Distance from Source from Table 10.11, as shown in Table 10.12.

Table 10.11. Pathway Effectiveness

		Frequency of potentially dusty winds			
		Infrequent	**Moderately frequent**	**Frequent**	**Very frequent**
Receptor Distance Category	Close	Ineffective	Moderately Effective	Highly Effective	Highly Effective
	Intermediate	Ineffective	Moderately Effective	Moderately Effective	Highly Effective
	Distant	Ineffective	Ineffective	Moderately Effective	Moderately Effective

Estimation of Dust Impact Risk

The Residual Source Emissions and the Pathway effectiveness were combined to predict the Dust Impact Risk as shown in Table 10.13.

Table 10.12. Descriptors for Magnitude of Dust Effects

		Residual Source Emission		
		Small	**Medium**	**Large**
Pathway Effectiveness	Highly Effective Pathway	Low Risk	Medium Risk	High Risk
	Moderately Effective Pathway	Negligible Risk	Low Risk	Medium Risk
	Ineffective Pathway	Negligible Risk	Negligible Risk	Low Risk

Estimate Likely Magnitude of Disamenity Effects

The likely disamenity effect at each receptor was determined from the Dust Impact Risk (Table 10.12) and the Receptor Sensitivity, as shown in Table 10.13.

Table 10.13. Dust Disamenity Effects at Specific Representative Receptors

Level of Risk	**Receptor Sensitivity**		
	Low	**Medium**	**Large**
High Risk	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium Risk	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low Risk	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible Risk	Negligible Effect	Negligible Effect	Negligible Effect

The dust disamenity effects predicted at each receptor around the proposed minerals extraction development is summarised in Table 10.14, setting out the risks of impacts for each activity being assessed.

Table 10.14. Dust Disamenity Effects at Specific Representative Receptors

Ref. (See Fig. 10.3)	**Location relative to nearest dust source**	**Residual Source Emissions**	**Pathway Effectiveness**	**Dust Impact Risk**	**Receptor Sensitivity**	**Magnitude of Dust Effect**
DSR 1 Note 1	~320m "downwind" of mineral extraction	Medium	Moderately Effective (Very Frequent & Distant)	Low Risk	High	Slight Adverse Effect
DSR 5 Note 2	~295m "upnwind" of mineral extraction	Medium	Moderately Effective (Frequent & Distant)	Low Risk	High	Slight Adverse Effect
DSR 6Note 3	~205m "upwind" of mineral extraction	Medium	Moderately Effective (Frequent & Distant)	Low Risk	High	Slight Adverse Effect

DSR 7[Note 4]	~125m "upwind" of mineral extraction	Medium	Moderately Effective (Frequent & Intermediate)	Low Risk	High	Slight Adverse Effect
DSR 8[Note 5]	~185m "crosswind" of mineral extraction	Medium	Moderately Effective (Frequent & Intermediate)	Low Risk	High	Slight Adverse Effect
DSR 9[Note 6]	~275m "crosswind" of mineral extraction	Medium	Moderately Effective (Frequent & Distant)	Low Risk	High	Slight Adverse Effect
DSR 10[Note 7]	~300m "crosswind" of mineral extraction	Medium	Moderately Effective (Frequent & Distant)	Low Risk	High	Slight Adverse Effect
DSR 11[Note 8]	~255m "downwind" of mineral extraction	Medium	Moderately Effective (Frequent & Distant)	Low Risk	High	Slight Adverse Effect
DSR 12[Note 9]	~360m "downwind" of mineral extraction	Medium	Moderately Effective (Very frequent & Distant))	Low Risk	High	Slight Adverse Effect

Note 1 – DSR 1 represents the property to the northeast of the proposed development. The windrose in Figure 10.2 indicates that the wind may blow towards this property at >5m/s for approximately 40% of the time.
Note 2 – DSR 5 represents the property to the to the northeast of the proposed development. (The windrose in Figure 10.2 indicates that the wind may blow towards this property at >5m/s for approximately 15% of the time.
Note 3 – DSR 6 represents the property to the southwest of the proposed development. The windrose in Figure 10.2 indicates that the wind may blow towards these properties at >5m/s for 15% of the time.
Note 4 - DSR 7 represents the property to the southwest of the proposed development. The windrose in Figure 10.2 indicates that the wind may blow towards these properties at >5m/s for 15% of the time.
Note 5 - DSR 8 represents the property to the southwest of the proposed development. The windrose in Figure 10.2 indicates that the wind may blow towards these properties at >5m/s for 20% of the time.
Note 6 - DSR 9 represents the property to the southwest of the proposed development. The windrose in Figure 10.2 indicates that the wind may blow towards these properties at >5m/s for 20% of the time.
Note 7 - DSR 10 represents the property to the southwest of the proposed development. The windrose in Figure 10.2 indicates that the wind may blow towards these properties at >5m/s for 20% of the time.
Note 8 - DSR 11 represents the property to the southwest of the proposed development. The windrose in Figure 10.2 indicates that the wind may blow towards these properties at >5m/s for 20% of the time.
Note 9 - DSR 12 represents the property to the southwest of the proposed development. The windrose in Figure 10.2 indicates that the wind may blow towards these properties at >5m/s for 40% of the time.

Overall, the proposed development is considered to have the potential to cause a 'Slight Adverse Effect' at the residential receptors in the surrounding area. Therefore, the overall effect is considered to be 'not significant'. This is based on a consideration of the different magnitude of effects at individual receptors, and the number of

receptors that would experience these different effects. The existing site dust management practices are considered to be appropriate to mitigate the potential impacts.

10.6 Proposed Mitigation Measures

The following best practice dust mitigation measures will continue to be employed at Aughnacliffe Quarry to minimise operational impacts.

10.6.1 Operational Activities

The site manager has overall responsibility for ensuring that operations within Aughnacliffe Quarry site comply with the requirements of relevant planning authorisations. The quarry extension application area is located to the south of the existing quarry. No new plant and equipment is proposed for this development. The processing area including the manufacturing plant within the existing quarry already benefits from planning permission and is an established land use within the existing quarry.

The relevant planning authorisations specifies control measures such as water sprays to control dust emissions from haul roads, crushers and processing, regular inspections and good maintenance of the entrances to the site. The plant will continue to be operated in accordance with the same. The following dust control measures will continue to be employed at the mineral processing site:

- Site staff to undertake regular visual inspections of dust conditions, determined on a daily basis in accordance with prevailing conditions;
- Site management will give attention to advance weather forecasts and organise Dust management requirements accordingly;
    - Use of fixed water sprays at crushers/screeners/transfer points.
    - Use of modern dust suppression equipment.
    - Stockpile profiles shall be maintained below the level of the surrounding bunds

10.6.2 Access Roads, Site Roads and Vehicles Loading Activities & Movements:

The objective of these procedures is to minimise the creation and release of dust generated by transportation activities carried out during both access to and movements within the site. This includes minimising dust from transport vehicles entering and leaving the facility.

- Regular attention is paid to cleaning dust material from all roadways, hard surfaced areas and working areas of the facility. Dust from clean-up is re-incorporated into stockpiles / processing plant. This is done during every lull in operations and at the end of each working period.
- Roadways and other areas where vehicles are regularly moving are kept clean, by sweeping or by wetting;
- Designate stockpiles and associated loading areas within the quarry void away from prevailing winds;
- Stockpiles to be dampened during prolonged dry periods
- When loading vehicles, the following procedures are adhered to:
    - No overloading of vehicles or containers resulting in either peaks of cargo or overspill onto the working areas or roadways.
    - Keep fall heights of the material into the transport vehicles to a minimum.
- Strictly applied, suitable on-site speed limits are set, displayed and observed for the movement of all vehicles (10 kph).
- A suitable underbody and wheel wash is provided. This is surrounded by a smooth hard surface extending to the site exit. All vehicles pass through and spend sufficient time for effective cleaning in the washing facility before leaving the site. Supervision is provided to ensure that this is carried out effectively.
- All vehicles used for the movement of material on site shall be fitted with exhausts pointing away from the ground.

10.6.3 Material Storage

The following points are considered essential to ensure effective control of dust during material storage at this site:

- Minimise the duration of activity
- Avoid soils handling during adverse weather conditions, i.e. dry and windy weather
- Material storage mounds graded to minimise wind-blown dust and seeded on completion of construction
- Siting of storage mounds to take advantage of shelter from wind
- Double handling of materials will be minimised wherever possible.
- Stockpiles to be located at the furthest distance from sensitive receptors.

10.6.4 Mineral Extraction

The following points are considered essential to ensure effective control of dust from the extraction of mineral at this site:

- Drill rigs to be fitted with dust suppression / filtration system.
- Drill rigs not to be operated in adverse weather conditions
- Controlled use of fixed short haul roads.
- Water to be sprayed using a bowser during prolonged dry periods or as required.
- Speed controls to be implemented and monitored on all internal haul roads.
- All vehicles checked for overloading to reduce spillage.

10.6.5 Monitoring & Reporting

The following administration points are considered essential to ensure effective control of dust at the site:

- A high standard of housekeeping to be maintained on site.
- Appropriate systems for monitoring processes and responding to and reporting pollution incidents put in place. This information should be kept in a logbook, together with information regarding equipment failure, periods of significant dust emissions off-site and the inspection of roadways, together with any remedial action taken.
- Any complaints received from neighbouring properties to be logged and appropriate actions taken to reduce the potential for further complaint.

- The existing dust deposition monitoring surveys will continue to be undertaken and reported by management.

10.7 Conclusions

The potential for any dust arising from the proposed extended extraction area using conventional drilling and blasting techniques and mineral removal using excavators with associated HGV traffic movements as per the current rates of extraction at the Aughnacliffe Quarry site has been assessed.

The dust deposition monitoring results at the quarry indicate dust deposition levels in accordance with the relevant dust deposition limit values at four monitoring locations in proximity to the existing site boundary. Therefore, it is considered reasonable to predict that the future quarrying at the same, approved extraction rate using existing dust mitigation practices will continue to comply with the relevant dust deposition limits.

It is considered that the potential for dust nuisance impact has been, and is limited to, the immediate vicinity of the existing activities because of the quarried materials predominantly coarse nature, with dust suppression measures in operation, as required. Overall, the proposed extraction area is considered to have the potential to cause a 'Slight Adverse Effect' at the residential receptors in the surrounding area and, the overall effect of the proposed development below existing extraction levels is considered to be 'not significant' and will result in a 'Negligible Effect' at the nearest residential properties.

Any residual dust deposition impacts resulting from the future de-commissioning and restoration of the quarry will be of a short duration and all potential dust impacts from the Aughnacliffe Quarry site are considered to be reversible i.e. the risk of impact will cease on completion of quarrying and restoration of the site.

The existing quarrying activities have been continuously reported to be in compliance with the dust deposition limit value of 350 mg/m^2/day at all monitoring locations and there is no significant potential for increased dust deposition impact.