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INTRODUCTION

Background

8.1 This Chapter of the Environmental Impact Assessment Report (EIAR), prepared by SLR Consulting Ireland, addresses the potential air quality impacts of the proposed backfilling of an existing hard rock quarry by way of an inert landfill and the operation of a construction and demolition (C&D) waste recovery facilities at Ballinclare Quarry, near Kilbride, Co. Wicklow

8.2 The proposed development provides for backfilling of the quarry to its original ground level using imported inert waste, principally soil and stone, generated by construction and development projects in Counties Wicklow, Dublin and Wexford and its long-term restoration to a heathland / grassland habitat, similar to that which existed prior to quarry development.

8.3 The application site at Ballinclare Quarry is located approximately 2.5km to the north-west of a small settlement at Kilbride, 2.5km south of the village of Glenealy and 6km south west of Wicklow Town. The M11 Dublin to Wexford Motorway runs less than 0.5km to the east of the site. The proposed development provides for the following:

- Backfilling of the existing void at Ballinclare Quarry to original ground level by developing and operating an inert waste landfill facility with a total intake capacity of approximately 6,165,000 tonnes of inert soil and stone waste and (non-waste) soil and stone by-product and its progressive restoration to long-term scrub / grassland habitat thereafter;
- Continued use of existing site infrastructure and services including, site / weighbridge office, staff welfare facilities, wastewater treatment system, outbound weighbridge, garage / workshop, wheelwash, hardstand areas, fuel and water storage tanks to service the proposed development;
- Installation of a new weighbridge along the inbound lane of the quarry access road;
- Decommissioning of any remaining fixed plant and infrastructure associated with former rock extraction activities or with aggregate, concrete and asphalt production activities at the application site;
- Off-site removal of any materials or bulky wastes associated with the former quarrying and production activities;
- Construction of an industrial shed (portal frame structure) at the paved blockyard area to house crushing and screening equipment and to process / recycle inert C&D waste (principally concrete, bricks, ceramics and solid bituminous waste mixtures);
- Use of any external paved area surrounding the C&D waste processing shed as a hardstanding area for the external handling and storage of both unprocessed and processed C&D wastes;
- Separation of any intermixed C&D wastes (principally metal, timber, PVC pipes and plastic) prior to its removal off-site to authorised waste disposal or recovery facilities;
- Installation and operation of a soil washing plant at the former concrete / asphalt production yard to recover sand and gravel and secondary aggregates from soil waste for subsequent use in the production of construction materials
- Construction of an on-site (passive) wetland treatment system and attendant drainage infrastructure to treat surface water run-off / groundwater collecting in the sump / floor of the quarry area during landfilling operations and any surface water run-off from the C&D waste recovery area prior to its discharge off-site;

- Re-use of an existing storage shed as a dedicated waste inspection and quarantine facility to inspect and store suspect waste consignments as required;
- Upgrading and ongoing maintenance of established internal haul roads across the application site;
- Temporary stockpiling of topsoil pending re-use as cover material for phased and/or final restoration of the inert landfill / backfilled quarry; and
- Environmental monitoring of noise, dust, surface water and groundwater for the duration of the landfilling and restoration works and C&D waste recovery activities, and for a short period thereafter.

8.4 All traffic to and from the proposed waste facility at Ballinclare Quarry will be routed along the L1157 Local Road, amending the previous one-way system that routed inbound traffic along the L1113 Local Road and outbound traffic along the L1157.

8.5 The proposed maximum intake rate of inert soil and stone waste for landfilling / soil washing is 750,000 tonnes per annum. The maximum intake rate of C&D for waste recovery is 50,000 tonnes per annum. Assuming that the maximum combined inert waste / C&D waste intake of 800,000 tonnes / year is sourced entirely from construction and development projects at off-site locations, and assuming 50 working weeks per year, 5.5 working days per week and 20 tonne loads per Heavy Goods Vehicle (HGV), the proposed waste activities will generate up to 150 HGV return trips (300 movements) each working day, or approximately 15 HGV return trips (30 movements) per hour.

8.6 This rate of importation is generally consistent with existing / previously permitted HGV traffic levels for former aggregate / concrete / asphalt production activities at the quarry. It is proposed to use a backloading system to avoid generating any increase in HGV traffic when exporting recycled aggregates (from C&D processing and/or soil washing) off-site.

8.7 The proposed development therefore will not therefore give rise to any change in approved traffic levels other than to have HGVs fully laden on the inbound as opposed to on the outbound journey.

8.8 Further details on the proposed development (site infrastructure, operations, environmental management systems, and controls etc.) are provided in Chapter 2 of this EIAR.

8.9 The proposed clay lined inert landfill facility and C&D waste recovery facility activities will have the potential to generate fugitive particulate matter, including visible dust which may impact local air quality. Combustion emissions (principally finer particulates (PM_{10} and oxides of nitrogen) from vehicle exhaust emissions associated with the handling and transportation of materials will also have a potential impact.

8.10 As the backfilling and restoration of a quarry void with imported inert materials and the recovery of construction and demolition waste are designated as waste activities, they also require a waste licence from the Environmental Protection Agency (EPA).

8.11 It is envisaged that weekday working hours will be in line with those in the existing extractive planning permission (Ref. 14/2118), between 08:00 hours and 18:00 hours Monday to Friday, and between 08.00 hours and 14.00 hours on Saturday (but limited to 10 No. occasions in any given year). The facility will be closed on Sundays and Public / Bank Holidays.

Scope of Work

8.12 The main focus of this assessment is the potential impact on local amenity associated with potential increased fugitive dust emissions generated by the proposed inert landfill and waste recovery facility at Ballinclare, Kilbride, Co. Wicklow.

8.13 The principal air quality impact associated with the proposed development will be potential fugitive dust emission. Dust emissions are likely to arise in the course of the following activities:

- decommissioning of infrastructure associated with former rock extraction and aggregate, concrete and asphalt production activities at the site;
- site preparation works including clearance / construction at the wetland treatment area, construction of the C&D waste recovery shed, installation of surface water drainage infrastructure and upgrading of internal access roads;
- trafficking by heavy goods vehicles (HGVs) over paved / unpaved surfaces;
- end-tipping, handling and stockpiling of inert materials (principally soil and stone);
- end-tipping, handling, processing / crushing and stockpiling of C&D waste at the recovery facility ;
- end-tipping, handling and stockpiling of soils / claybound C&D wastes at and around the soil washing plant;
- ongoing placement of small quantities of aggregate for internal haul road construction across the landfilled soils.

8.14 With respect to the potential for air quality impacts, the key objective at the application site is to manage activities in order to ensure that air emissions are prevented where possible and the effects of any residual emissions or releases are minimised.

8.15 This Chapter describes and assesses the existing air quality baseline characteristics of the area in and around Ballinclare Quarry, based on site specific surveys and EPA data. Air emissions arising from the proposed development activities are then applied to these baseline conditions and the resulting air quality impacts assessed. Mitigation measures are identified where required, to eliminate and reduce these impacts insofar as practical.

8.16 The following sections of this Chapter describe the potential air quality impacts associated with activities at the planned development. The following issues are addressed separately:

- relevant legislation, standards and guidance;
- baseline conditions pertaining to the measured (or estimated) existing air quality levels around the facility;
- methodology used to assess the potential impacts of the activities at the proposed development on air quality at local properties;
- assessment of the impacts;
- description of mitigation measures that are incorporated into the construction, design and operation of the proposed facility to eliminate or reduce the potential for increased air quality impacts (if required);
- summary of any residual impacts and reinstatement;
- summary of cumulative impacts;
- monitoring proposals.

Consultations / Consultees

8.17 A pre-planning consultation meeting was held between officials of Wicklow County Council and representatives of Kilsaran Concrete and SLR Consulting Ireland on 7th February 2019 at the offices of Wicklow County Council in Wicklow Town. Staff from the roads, water and environment services departments of Wicklow County Council were also in attendance.

8.18 Details of the proposed development were presented at the meeting and issues of potential concern to the Planning Authority were identified and discussed. Although no specific concerns in respect of air quality were raised, there was a concern to ensure that any related environmental impacts, including air quality (dust) impacts would be fully assessed.

8.19 Following a review of published development plans and site mapping / surveys, it was considered that there was no requirement for any further formal external consultations to be carried out in respect of air quality for the purposes of this assessment. There was however significant consultation with other specialist contributors.

8.20 As this development constitutes Strategic Infrastructure Development (SID), a formal consultation exercise was also undertaken with statutory consultees and nearby residents / members of the general public between October and December 2020. Details of these consultations and the feedback obtained therefrom is provided in a separate report submitted in support of the SID application to An Bord Pleanála. Any specific feedback provided in respect of air quality is considered and addressed as appropriate in drafting this Chapter of the EIAR.

Contributors / Author(s)

8.21 The air quality impact assessment presented in this Chapter was prepared by SLR Consulting Ireland. The lead consultant for the assessment is Aldona Binchy MSc. Eng PIEMA Environmental Engineering. Baseline dust monitoring for the purposes of this assessment was undertaken by BHP Laboratories.

Limitations / Difficulties Encountered

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

REGULATORY BACKGROUND

8.23 The following sections describe the main legislative policy requirements in respect of air quality associated with the proposed development.

Air Quality Standards

8.24 The principal set of regulations for air quality in Ireland are the *Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011)*. The Air Quality Standards (AQS) Regulations transposed the EU CAFE Directive[1] into Irish law and replaced the former *Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002)*, the *Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004)* and the *EPA Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999 (S.I. No. 33 of 1999)*. The 4th Daughter Directive was subsequently transposed into Irish law by the *Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I.no. 58 of 2009)*.

8.25 The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in Ireland. It sets standards and objectives for ten priority pollutants. Standards establish concentrations of pollutants in the atmosphere which can broadly be taken to provide a certain level of environmental quality. Objectives are policy targets, often expressed as maximum concentrations, not to be exceeded (either without exception, or with a limited number of exceedances within a specified timescale).

8.26 Under the AQS, the following pollutants are monitored and controlled :

- nitrogen oxides;
- sulphur dioxide;
- carbon monoxide;

[1] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (CAFÉ Directive)

- ozone;
- particulate matter (PM_{10}, $PM_{2.5}$ and black smoke);
- benzene and volatile organic compounds;
- heavy metals and
- polycyclic aromatic hydrocarbons.

8.27 These pollutants are monitored at 32 stations across the country and together they form the national ambient air quality network. A summary of relevant air quality limit values in relation to human health are presented in Table 8-1 overleaf. Air quality limit values in relation to vegetation protection are presented separately in Table 8-2.

8.28 The air quality monitoring network is coordinated and managed by the EPA, as the National Reference Laboratory for air quality. The results of the monitoring are compared to limit values set out in EU and national legislation on ambient air quality. As was recommended in the 2011 Review of the Environmental Protection Agency, map-based assessments are prepared and published by the EPA.

Table 8-1
Relevant Air Quality Limit Values for Protection of Human Health

HUMAN HEALTH	LIMIT OR TARGET VALUE			INFORMATION AND ALERT THRESHOLDS (WHERE APPLICABLE)		LONG TERM OBJECTIVE
POLLUTANT	AVERAGING PERIOD	VALUE	MAXIMUM NUMBER OF ALLOWED OCCURRENCES	PERIOD	THRESHOLD VALUE	
Nitrogen Dioxide (NO_2)	Hour Year	200 µg/m^3 40 µg/m^3	18 0	1 hour alert	400 µg/m^3 Exceeded for 3 consecutive hours	
Sulphur Dioxide (SO_2)	Hour Day	350 µg/m^3 125 µg/m^3	24 3	1 hour alert	500 µg/m^3 Exceeded for 3 consecutive hours	
Particulate matter with aerodynamic diameter of less than 10µm (PM_{10})	Day Year	50 µg/m^3 40 µg/m^3	35 0			
Particulate matter with aerodynamic diameter of less than 2.5µm ($PM_{2.5}$)	Year	25 µg/m^3 20 µg/m^3 (ECO)				0 8.5 to 18 µg/m^3

Table 8-2
Summary of Air Quality Limit Values : Protection of Vegetation

VEGETATION		CRITICAL LEVEL OR TARGET VALUE	LONG-TERM OBJECTIVE	
POLLUTANT	AVERAGING PERIOD	VALUE	VALUE	DATE
Nitrogen dioxide (NOx)	Calendar year	30 µg/m3		
Sulphur Dioxide (SO2)	Calendar year and winter (October to March)	20 µg/m^3		

National Planning Policy

8.29 The National Planning Framework 2040 (published in February 2018) is a national planning framework for Ireland. The framework provides the policies for all regional and local plans. In the framework, the extractive industries are recognised as important for the supply of aggregates and construction materials to variety of sectors. There are no specific policies in relation to air emissions in NPF for extraction or associated backfilling and restoration activities or for materials recovery activity. The stated general development objective is to facilitate development while at the same time protecting the environment.

Local Planning Policy- Wicklow County Development Plan

8.30 The current Wicklow County Development Plan which was adopted in 2016 includes a number policies and objectives for the planning and sustainable development of the County from 2017 to 2022.

8.31 Policy 9.3.4 Emissions to Air states:

'The Environmental Protection Agency holds overall responsibility for the co-ordination and monitoring of air quality in accordance with EU air quality directives. Damaging emissions to air can take the form of pollutant gases (for example from car exhausts) and air borne particulars (such as dust).'

8.32 Air Emissions Objectives set out in the Wicklow CDP are as follows :

WE9: To regulate and control activities likely to give rise to emissions to air (other than those activities which are regulated by the EPA).

WE10: To require proposals for new developments with the potential for the accidental release of chemicals or dust generation, to submit and have approved by the Local Authority construction and/or operation management plans to control such emissions.

WE11: To require activities likely to give rise to air emissions to implement measures to control such emissions, to undertake air quality monitoring and to provide an annual air quality audit.'

Extractive Industry Relevant Guidelines

8.33 The proposed development at Ballinclare Quarry provides for the backfilling and restoration of the existing quarry void by way of an inert landfill and no further extraction or processing of rock is proposed at the quarry. Related relevant extractive industry guidance in relation to dust deposition is presented below for information and reference.

8.34 In 1996, the Irish Concrete Federation (ICF), the trade body representing the interests of quarry operators and producers of construction materials, published the ICF Environmental Code which provided guidance for its members on best practice in the environmental management of quarries. The document was subsequently updated in 2005.

8.35 Section 261 of the Planning and Development Act 2000 (as amended), which regulated a significant proportion of established extractive development, came into effect in April 2004. The Department of Environment planning guidelines for the extractive industries '*Quarries and Ancillary Activities – Guidelines for Planning Authorities*' (DoEHLG 2004) were published around the same time.

8.36 Separately, in 2006, the EPA published its *Environmental Management Guidelines for Environmental Management in the Extractive Industry (Non-Scheduled Minerals)*.

Specific Guidance Relating to Air Quality / Dust Nuisance

8.37 Fractions of dust greater than 10µm (micrometres) in diameter are not covered within the Air Quality Standards and typically relate to nuisance effects.

8.38 A range of monitoring techniques exists for dust deposition rates (i.e. Bergerhoff and Frisbee gauges). There are currently no Irish, European Union (EU) or World Health Organisation (WHO) statutory standards or limits appropriate for the assessment of deposited dust and its propensity to generate annoyance.

8.39 Industry standard criteria levels for the gravimetric assessment of dust deposition which are generally used across extractive industry in Ireland include the DoEHLG (2004) planning guidelines for the extractive industry, the ICF Guidelines (2005) and EPA (2006) Environmental Management Guidelines.

8.40 Each of these Guidelines recommend the use of the Bergerhoff method for measuring dust deposition. In line with this approach, the guidelines recommend the TA Luft dust deposition limit value of 350mg/m2/day (total dust deposition averaged over a 30 day period), measured at site boundaries

8.41 When the rate of accumulation of this coarser fraction of dust (referred to as deposited dust) is sufficiently rapid to cause fouling or discolouration, then it is generally considered to introduce a nuisance. The point at which an individual perceives dust deposition as a nuisance and causes a complaint is highly subjective.

8.42 The colour and type of dust can influence the perception of nuisance and what is considered tolerable, for example, black coal dust may have a high contrast with its background.

8.43 The action of wind over dry ground will carry dust particles into the air. Although large emissions of dust occur naturally, man-made dust events are caused by a range of activities including agriculture, road traffic, construction works (including the handling and storage of soils) and by vehicles using paved and unpaved haul roads.

8.44 For operations involving the mechanical break up of solids, the most common concern regarding dust emissions is the potential nuisance effect from the larger fractions of dust.

Guidance on Assessment of Mineral Dust Impacts for Planning

8.45 Guidance on the assessment of the impacts of extractive operations on air quality has been prepared by the Institute of Air Quality Management (IAQM, 2016). This guidance uses a simple distance-based screening process to identify those operations where the dust impacts are unlikely to be significant and therefore require no further assessment. Where more detailed assessment is required, a basic assessment framework is presented which employs the Source-Pathway-Receptor approach to evaluate risk of impacts and effects.

Air Quality and Ecological Receptors

8.46 A majority of the research on the effects of particulate matter on vegetation has focussed on the chemical effects of alkaline dusts. A summary of a review of available research on behalf of the UK's Department for the Environment Transport and Regions (DETR) concluded that:

"the issue of dust on ecological receptors is largely confined to the associated chemical effect of dust, and particularly the effect of acidic or alkaline dust influencing vegetation through soils."

8.47 An Interim Advice Note (IAN) prepared as a supplement for Volume 11, Section 3, part 1 of the UK DMRB (Design Manual for Roads and Bridges) and now incorporated into HA207/07, suggests that only dust deposition levels above 1,000mg/m^2/day are likely to affect sensitive ecological receptors. This level of dust deposition is approximately five times greater than the level at which most dust deposition may start to cause a perceptible nuisance to humans. It states that most species appear to be unaffected until dust deposition rates are at levels considerably higher than this.

Assessment of Air Quality Impacts on Designated Nature Conservation Areas

8.48 Guidance on the assessment of the air quality impacts of development on designated nature conservation sites prepared by the Institute of Air Quality Management (IAQM, 2019). This guidance is also useful to evaluate the effects of air pollution on habitats and species using air quality assessment.

8.49 The predicted scale of dust effects may be classified as either 'significant', or not 'significant'. Where effects are predicted to be 'significant', further mitigation is likely required before the proposals are likely to be acceptable under planning policy.

Air Quality and Health Effects

8.50 The main health effects of air pollution include stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma. These conditions can lead to sickness and ill health as well as premature mortality.

8.51 Two recent EPA reports, *Air Quality in Ireland 2015*[2] and *Ireland's Environment, An Assessment 2016* [3]detail the main air quality trends based on monitoring from the national ambient air quality network. There are monitored exceedances of the WHO guideline values for ozone, PM_{10} and $PM_{2.5}$ at a number of sites though there are no current exceedances of the lower (less protective) EU standards at the existing monitoring locations in Ireland.

8.52 The EPA report also highlights the main challenges of reducing air pollution from key sources such as particulate matter emissions from solid fuel burning (e.g. peat, coal and wood) in the residential sector and NOx emissions from vehicles in the transport sector. A summary of relevant Air Quality limit values in relation to human health was previously presented in Table 8-1.

[2] Environmental Protection Agency, 2016. Air Quality in Ireland 2015 - Key Indicators of Ambient Air Quality. Available at:https://www.epa.ie/pubs/reports/air/quality/Air%20Quality%20Report%202015.pdf

[3] Environmental Protection Agency, 2016. Ireland's Environment, An Assessment 2016. Available at: http://www.epa.ie/pubs/reports/indicators/SoE_Report_2016.pdf

RECEIVING ENVIRONMENT

Study Area

8.53 The application site and Kilsaran property holding at Ballinclare Quarry straddles two townlands, Ballinclare and Carrigmore. The overall landownership area is c.36 ha (89 acres). The application area for the purposes of this development is 32.5ha (78.3 acres) as it excludes a compound / yard area leased to Wicklow County Council in the north-western corner of the landholding.

8.54 The application area extends across all of the former quarry footprint and includes the former concrete / asphalt production area, the recently installed concrete block yard, established site buildings and infrastructure and the area around the existing system of settling ponds in the north-western corner.

8.55 The area surrounding the application site is typically rural in character and dominated by forestry and undulating agricultural land. Ground level in the vicinity generally lies between 60mOD and 70mOD. Potters River flows approximately 450m beyond the northern boundary of the application and then turns south-eastwards to flow approximately 250m to the east of the property. Thereafter it continues south-eastward and eventually discharges to the sea at Brittas Bay.

8.56 Residential property in the vicinity of the application site generally comprises farmsteads and isolated / one off houses along the local road network. The nearest dwellings to the landholding site boundary are those located to the south, west and north of the site, along the local county road network, and are identified in Figure 8-1. The lands surrounding the existing quarry comprise farm fields, forestry and existing quarry / industrial lands. The Kilmacurragh Botanic Gardens are located just under 1km to the south-west of the site.

8.57 Neither the application site nor any lands immediately adjoining are subject to any statutory or non-statutory nature conservation designation. Deputy's Pass Nature Reserve Special Area of Conservation (SAC, Site Code 000717) is located approximately 1.6km to the north-west of the application site, while Glenealy Woods proposed Natural Heritage Area (pNHA, Side Code 001756) is located approximately 1.0km to the north-west

Baseline Study Methodology

Baseline Dust Monitoring

8.58 Dust monitoring was undertaken at the application site by BHP Laboratories using the 'Bergerhoff method' referred to in the TA Luft Air Quality Standard in order to establish baseline emission levels relative to the prescribed 350mg/m^2/day emission limit.

8.59 The 'Bergerhoff' dust deposition gauge used in the survey comprises a plastic collection bottle with protective basket, mounted on a post and set at 1500mm above ground level. The input of atmospheric borne particular material into the collection bottle takes place over a pre-determined measurement period (usually one month) by exposing it to the environment. The total dust collected in the bottle is expressed as deposition of total particulate matter (mg/m^2/day) arising from human activity in the area surrounding the application site.

Sources of Information

8.60 A desk study undertaken to examine all relevant information relating to air quality conditions around the application site. Met Eireann, the National Meteorological Service, was consulted in relation to the climate / weather data in respect of the study area (http://www.met.ie). The EPA website was also accessed to obtain information on baseline air monitoring data around the application site (http://www.epa.ie/air/quality/data/).

8.61 Information published on its website by the National Parks and Wildlife Service (NPWS) (http://webgis.npws.ie/npwsviewer/), now part of the Department of Housing, Heritage and Local Government (DHHLG) in respect of designated ecological sites, protected habitats and species was also reviewed, together with Ordnance Survey Ireland (OSi) mapping and aerial photography (http://map.geohive.ie/mapviewer.html)

Field Survey / Monitoring

8.62 Dust deposition surveys were undertaken at and around the application site over the period April 2019 to November 2019. The dust deposition monitoring results recorded over this period are reviewed as part of this assessment. A survey of the extent of existing residential housing in the area of the proposed development was also undertaken.

8.63 The location of the dust deposition monitors at the application site are shown on Figure 8-1:

- D1 – at northern boundary;
- D2 – at south west of the site;
- D3 – at south eastern boundary.

8.64 The results of the dust deposition monitoring are presented in Table 8-3 below.

Table 8-3
Baseline Dust Deposition at Ballinclare

DATE	DUST DEPOSITION		
	D1 (mg/m^2/day)	D2 (mg/m^2/day)	D3 (mg/m2/day)
02/04/2019 - 07/05/2019	112	332	89
07/05/2019 – 10/06/2019	58	209	100
10/06/2019 – 04/07/2019	168	201	79
04/07/2019 - 07/08/2019	61	13	22
07/08/2019 – 04/09/2019	116	143	65
04/09/2019 – 03/10/2019	107	144	24
03/10/2019 - 04/11/2019	276	328	314

8.65 As it will be noted, the recorded baseline dust deposition rates at Ballinclare over the recent monitoring period are below the guideline emission limit value (ELV's) of 350mg/m^2/day.

Background Air Quality

8.66 The application site at Ballinclare Quarry lies in air quality Zone D-rural east. The closest air quality monitoring locations to the site, and in a similar rural setting (Zone D) is located at Kilkitt, Co. Monaghan.

8.67 The EPA monitoring stations continuously monitor concentrations of particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}). Recent annual mean concentrations monitored at Kilkitt (published on the EPA website[4]) are presented in Table 8-4 below.

[4] Secure Archive For Environmental Research Data – http://erc.epa.ie/safer/.

Table 8-4
Background PM_{10} Concentrations

YEAR	ANNUAL MEAN (µg/m³)	NUMBER OF DAYS >50µg/m³
2013	11	3
2014	9	2
2015	9	1
2016	8.1	0
2017	7.8	0
2018	9	0
2019	7	1

8.68 Table 8-4 indicates that representative PM_{10} concentrations monitored at the Kilkitt monitoring site are below the annual mean Air Quality Standards (AQS) of 40µg/m³ and comply with the requirement that a 24-hour mean of 50µg/m³ should not be exceeded more than 35 times in a calendar year.

8.69 For rural areas, such as those surrounding the application site, the primary source of PM_{10} would be residential solid fuel emissions and local agricultural or rural based activities for deposited dust.

Meteorology: Dispersion of Emissions

8.70 The most important climatological parameters governing the atmospheric dispersion of particles are as follows:

- wind direction: determines the broad transport of the emission and the sector of the compass into which the emission is dispersed; and
- wind speed will affect ground level emissions by increasing the initial dilution of particles in the emission. It will also affect the potential for dust entrainment.

8.71 Rainfall is also an important climatological parameter in the generation of dust; sufficient amounts of rainfall can suppress dust at the source and eliminate the pathway to the receptor. According to Arup (1995)[5] rainfall, greater than 0.2mm per day is sufficient to suppress dust emissions.

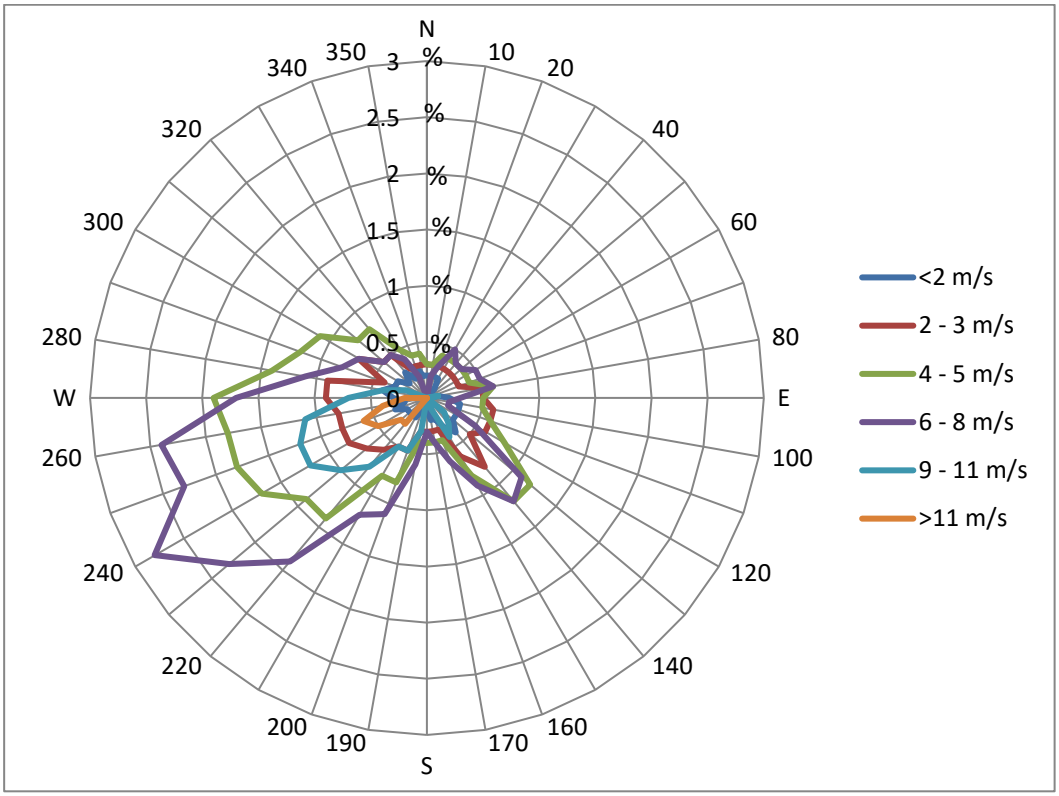
Local Wind Speed and Direction Data

8.72 The closest weather station with sufficient records of wind direction and wind speed likely to be representative of conditions experienced at the application site is at Baldonnell (Casement) Aerodrome Meteorological Station, located approximately 45km to the north-west.

8.73 A windrose for the average conditions recorded at Baldonnell (Casement) Aerodrome over the ten-year period 2007-2016 is presented in Figure 8-2. The predominant wind direction is from the south-western quadrant. Moderate to high-speed winds (>2 m/s) occur for approximately 82.6% of the time.

[5] Arup Environmental, Ove Arup and Partners (1995) The Environmental Effects of Dust from Surface Mineral Workings, HMSO, London (ISBM 11 75 3186 3)

Figure 8-2
Windrose for Baldonnell (Casement) Aerodrome Meteorology Station



Rainfall Data

8.74 Relevant rainfall data applicable to the overall site has been obtained from the Irish Meteorological Service website for the Baldonnell (Casement) Aerodrome station (2007–2016). The annual average days with rainfall greater than 0.2mm is 186 days per year. Natural dust suppression (from rainfall) is therefore considered to be effective for 51% of the year.

Sensitive Receptors

Ecological Receptors

8.75 Based on the nature, size and scale of the planned development, it is considered that the maximum distance for which the project should be evaluated in terms of Natura 2000 and designated sites is 2km from the application site unless there are any potential source-pathway-receptor links between the proposed development at Ballinclare Quarry and any Natura 2000 designated site(s) beyond this distance. Designated sites within this range are identified in Table 8-5 below, and their location shown in Figure 8-1.

Table 8-5
Natura 2000 and Designated Sites within 2km of the Application Site

NATURA 2000 AND DESIGNATED SITES	SITE CODE	LOCATION AT CLOSEST POINT (M)
Deputy's Pass Nature Reserve SAC	000717	1600
Glenealy Woods pNHA	001756	1100

Human Receptors

8.76 Sensitive locations are those where people may be exposed to dust from the existing or planned activities. Locations with a high sensitivity to dust include hospitals and clinics, hi-tech industries, painting and furnishing and food processing. Locations classed as being moderately sensitive include schools, residential areas, and food retailers.

8.77 Residential receptors have been identified within 1km distance of the application site boundary at Ballinclare Quarry. These are listed in Table 8-6 below and their location shown in Figure 8-1. As residences are clustered in some areas, a single receptor has been identified at the nearest location to the application site boundary.

8.78 There are 33 sensitive receptors identified for assessment purposes within the 1km study area around the application site, comprising 31 residential properties, a forested area along the Potters River used for amenity / educational purposes to the north of the quarry and Kilmacurragh Arboretum.

Table 8-6
Sensitive Receptors Within 1km of Ballinclare Quarry

RECEPTOR REFERENCE	RECEPTOR	SENSITIVITY	DISTANCE (M) / DIRECTION FROM SITE ACTIVITIES (APPROX.)
R1	Residential	Medium	60 SW
R2	Residential	Medium	60 SW
R3	Residential	Medium	141 SW
R4	Residential	Medium	303 SW
R5	Residential	Medium	236 SW
R6	Residential	Medium	247 SW
R7	Residential	Medium	177 NW
R8	Residential	Medium	158 NW
R9	Residential	Medium	128 N
R10	Residential	Medium	202 N
R11	Residential	Medium	360 N
R12	Residential	Medium	363 SE
R13	Residential	Medium	235 SE
R14	Residential	Medium	800 SE
R15	Residential	Medium	790 SE
R16	Residential	Medium	850 SE
R17	Residential	Medium	950 S
R18	Residential	Medium	780 S
R19	Residential	Medium	1000 S
R20	Residential	Medium	720 SW
R21	Residential	Medium	850 SW

RECEPTOR REFERENCE	RECEPTOR	SENSITIVITY	DISTANCE (M) / DIRECTION FROM SITE ACTIVITIES (APPROX.)
R22	Residential	Medium	990 SW
R23	Residential	Medium	950 NW
R24	Residential	Medium	970 NW
R25	Residential	Medium	915 N
R26	Residential	Medium	930 NE
R27	Residential	Medium	750 NE
R28	Residential	Medium	730 NE
R29	Residential	Medium	680 NE
R30	Residential	Medium	700 SE
R31	Residential	Medium	745 SE
Forest to N	Amenity	Medium	50 N
Kilmacurragh Arboretum	Tourist / Amenity	Medium	800 SW

IMPACT ASSESSMENT- METHODOLOGY

Evaluation Methodology

8.79 Fugitive dust emissions and particulate matter arising from the inert landfilling and C&D waste recovery activities at the application site have the potential to affect existing sensitive receptors in the area due to a potential increase in airborne dust deposition.

8.80 Increased combustion emissions (primarily oxides of nitrogen) from vehicle exhaust emissions associated with the proposed site activities also have the potential to contribute to local air pollution.

8.81 The significance of impacts due to emissions from the application site are dependent upon the magnitude of the emissions, the prevailing meteorological conditions for the location, and the proximity of sensitive locations to the emission sources.

8.82 The impact assessment is based upon a comparison of the baseline situation (both current and projected without the development proposals) situation against the air quality impacts resulting from the 'with development' proposal scenario. The potential for 'in-combination' effects from other planned or proposed sources or air pollutants in the area has also been considered.

8.83 Each of the activities associated with proposed development have been assessed for potential air quality impacts including:

- emission from site preparation earthworks, construction and trackout;
- emission from stockpiling, material placement and restoration;
- PM_{10} contribution from operational activities;
- traffic exhaust emissions.

8.84 The methodology used in each assessment is presented in the sub-sections below which also provide an explanation of the significance criteria to describe the impacts of the proposed development on air quality.

8.85 For the purposes of environmental assessment of releases of dust from construction and mineral activities, the classifications of PM_{10} and 'deposited dust' are typically applied. The impacts associated with PM_{10} are related to potential health impacts while deposited dust is related to potential nuisance effects. The assessment of the potential impacts of each fraction has, therefore, been undertaken separately.

Significance Criteria

8.86 The following air quality specific significance criteria have been used to assess the significance of air quality impacts in preference to overall descriptors of significance.

8.87 To determine the significance of particulate matter effects associated with the development, an evaluation of the sensitivity of the surrounding area is required. Receptors can demonstrate different sensitivities to changes in environment and are classified as per Table 8-7 below (and IAQM 2014 Construction Dust Guidance[6]).

Table 8-7
Methodology for Defining Sensitivity to Dust and PM_{10} Effects

SENSITIVITY OF AREA	EXAMPLES	
	HUMAN RECEPTORS	ECOLOGICAL RECEPTORS(A)
Very High	Very densely populated area More than 100 dwellings within 20m Local annual mean PM_{10} concentrations exceed the Objective. Works continuing in one area of the site for more than 1-year	European Designated sites
High	Densely populated area. 10-100 dwellings within 20m of site. Local annual mean PM_{10} concentrations close to limit (36–40µg/m^3)	Nationally Designated sites
Medium	Suburban or edge of town Less than 10 receptors within 20m Local annual mean PM_{10} concentrations below limit (30 – 36µg/m^3)	Locally designated sites
Low	Rural area; industrial area No receptors within 20m Local annual mean PM_{10} concentrations well below limit (<30µg/m^3) Wooded area between site and receptors	No designations
Notes: (a)-Only applicable if ecological habitats are present which may be sensitive to dust effects.		

8.88 Table 8-8 illustrates how the interaction of magnitude and sensitivity results in the significance of an environmental effect, with the application of mitigation measures as per the IAQM Construction Dust Guidance.

[6] http://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

Table 8-8
Impact Significance Matrix – Dust Effects (With Mitigation)

SENSITIVITY OF SURROUNDING AREA	RISK OF SITE GIVING RISE TO DUST OR PM_{10} EFFECTS		
	HIGH	MEDIUM	LOW
Very High	Slight Adverse	Slight Adverse	Negligible
High	Slight Adverse	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

Construction Stage Dust Impacts - Methodology

8.89 The Institute of Air Quality Management (IAQM) assessment of risk at the construction stage is determined by considering the predicted change in conditions as a result of the proposed development. The risk category for potential effects arising from the preparatory site works is assessed for

- earthworks;
- construction;
- trackout.

Based on the scale and nature of the works including their overall area, the underlying soils and the planned works / operations at the application site, a dust emission class is defined for each of the proposed activities.

8.90 These dust emission classes are then used to determine the risk categories presented below. These risk categories determine the potential risk of dust soiling effects, assuming no mitigation measures are applied.

8.91 Table 8-9 illustrates how the interaction of distance to the nearest receptor and the dust emission class results in the determination of risk category from ***earthworks activities***.

Table 8-9
Determination of Risk Category from Earthworks Activities

DISTANCE TO NEAREST RECEPTOR		DUST EMISSION CLASS		
HUMAN	ECOLOGICAL	LARGE	MEDIUM	SMALL
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 – 50	-	High Risk Site	Medium Risk Site	Low Risk Site
50 – 100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100 – 200	20 – 40	Medium Risk Site	Low Risk Site	Negligible
200 – 350	40 – 100	Low Risk Site	Low Risk Site	Negligible

8.92 Table 8-10 illustrates how the interaction of distance to the nearest receptor and the dust emission class results in the determination of risk category from ***construction activities***.

Table 8-10
Determination of Risk Category from Construction Activities

DISTANCE TO NEAREST RECEPTOR		DUST EMISSION CLASS		
HUMAN	ECOLOGICAL	LARGE	MEDIUM	SMALL
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 – 50	-	High Risk Site	Medium Risk Site	Low Risk Site
50 – 100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100 – 200	20 – 40	Medium Risk Site	Low Risk Site	Negligible
200 – 350	40 – 100	Low Risk Site	Low Risk Site	Negligible

8.93 Table 8-11 illustrates how the interaction of distance to the nearest receptor and the dust emission class results in the determination of risk category from ***trackout movements***.

Table 8-11
Determination of Risk Category from Trackout Movements

DISTANCE TO NEAREST RECEPTOR		DUST EMISSION CLASS		
HUMAN	ECOLOGICAL	LARGE	MEDIUM	SMALL
<20	-	High Risk Site	Medium Risk Site	Medium Risk Site
20 – 50	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
50 – 100	20 – 100	Low Risk Site	Low Risk Site	Negligible

8.94 Mitigation measures are recommended based on the evaluation of risk in accordance with the IAQM Dust and Air Emissions Mitigation Measures Guidance, 2012[7].

Operational Stage Impacts - Methodology

8.95 A staged approach has been adopted to the assessment of operation stage impacts from the handling, placement and/or stockpiling of inert materials (soil and stone). This ensures that the approach taken for the assessment of risk is proportional to the risk of an unacceptable impact being caused. As such, where a simple review of the situation shows that risk of a health or nuisance impact is negligible, this will be sufficient. In cases where the risk cannot be regarded as insignificant, a more detailed assessment may be required, such as a quantitative screening assessment or an advanced dispersion modelling exercise as appropriate.

8.96 Guidance on the assessment of the impacts of extractive based operations on air quality has been prepared by the Institute of Air Quality Management (IAQM, 2016). This guidance uses a simple distance-based screening process to identify those operations where the dust impacts are unlikely to be significant and therefore require no further assessment. Where assessment that is more detailed is required, a basic assessment framework is presented which employs the Source-Pathway-Receptor approach to evaluate risk of impacts and effects.

[7] http://www.iaqm.co.uk/text/guidance/iaqm_mitigation_measures_2012.pdf

8.97 The predicted scale of dust effects may be classified as either 'significant', or not 'significant'. Where effects are predicted to be 'significant', further mitigation is likely required before the proposals are to be acceptable under planning policy.

8.98 A semi-quantitative assessment has been undertaken of fugitive dust emissions associated with the proposed inert backfilling / landfilling and C&D waste recovery activities at Ballinclare Quarry. The assessment has been undertaken by constructing a conceptual model that takes into consideration the potential sources, surrounding receptors, and the pathway between source and receptor in order to assess the likely magnitude of risk of impact on local receptors and/or amenities.

8.99 The distance from the source to the sensitive receptor is crucial. The initial risk screening stage (Tier 1) focuses upon the potential for dust generation at the application site and the distance between source and receptors. In Tier 1 of the assessment, a representative selection of dust sensitive receptors in each direction of the application site is identified within the 1km study area.

8.100 Further assessment is considered to be required for those receptors within 500m of any potential dust generating activities. The receptors within 500m of dust generating processes progress onto a Tier 2 assessment.

8.101 Tier 2 involves identifying source-pathway-receptor linkages and a semi-quantitative assessment of the likelihood and magnitude of any effects that could be associated with each pollutant linkage. This assessment takes account of:

- wind direction and speed data (to estimate frequency of exposure);
- proximity to source (to estimate magnitude of exposure);
- sensitivity of receptor; and
- occurrence of natural dust suppression (rainfall patterns).

8.102 This information is used to inform a semi-quantitative assessment of the likely magnitude of impact and is based upon professional experience of the assessor as the issue of dust nuisance on local receptors is a subjective issue, where public perception on what constitutes 'acceptable' levels varies from one person to the next. Assigning significance to nuisance impacts is qualitative and involves a judgement based on the likely magnitude, frequency, duration and reversibility (or recovery) of the impact. In this context, significant impact is taken to mean what is generally not publicly acceptable and desirable.

8.103 Note that the Tier 2 risk screening assessment **does not take into account mitigation measures** implemented at the proposed development. In light of the results of the initial risk assessment, mitigation measures are identified and the residual impact assessed. A detailed description of the methodology used in the risk screening assessment is presented in Appendix 8-A.

PM_{10} Contribution from Activities - Methodology

8.104 In terms of whether the PM_{10} concentration in the local area is likely to exceed the AQS, the following information has been reviewed:

- existing PM_{10} concentrations; and
- expected additional contribution of PM_{10} from site operations.

8.105 In terms of estimating the potential magnitude of impact from site operations, a UK edition of the LAQM Technical Guidance (LAQM.TG(03)) stated that fugitive dust from stockpiles and earthworks operations can potentially contribute up to 5µg/m^3 towards annual mean background concentrations of the coarse fraction (2.5 – 10µm diameters) of particulates in the immediate area.

8.106 Given the nature and scale of proposed site activities, it is considered that the potential PM_{10} impact of soil and stone / C&D intake is likely to be similar. To ensure a robust assessment of

potential PM_{10} impacts, the upper limit of 5µg/m^3 has been applied to represent the development contribution to annual ambient PM_{10} concentrations. This value has then been added to existing background levels to assess whether the Air Quality Standards objective for PM_{10} is likely to be exceeded.

Traffic Emissions - Methodology

8.107 Atmospheric emissions related to site proposals are primarily associated with the exhaust emissions from heavy duty vehicles (HDVs). The decision as to whether an assessment of potential impact is required is based upon the criteria set out in the DMRB.

8.108 The criterion for assessment of air quality contained within the latest DMRB guidance (LA 105) focuses on roads with relatively high changes in flows or high proportion of HDV / HGV traffic.

8.109 The following traffic scoping criteria are used to determine whether the air quality impacts of a project can be scoped out or require an assessment based on the changes between the do something traffic scenario (ie. with the project) compared to the do minimum traffic scenario (ie. without the project) in the opening year:

- annual average daily traffic (AADT) ≥ 1,000; or
- heavy duty vehicle (HDV) AADT ≥ 200; or
- a change in speed band; or
- a change in carriageway alignment by ≥ 5m

ASSESSMENT OF IMPACTS

Construction Stage Dust Impacts - Assessment

8.110 An overview of the sources and processes associated with the proposed site preparation / site establishment activities at Ballinclare Quarry, and their respective potential for dust deposition (both dust and smaller particles), is presented below in Table 8-12.

Table 8-12
Site Activities: Sources of Dust Emissions

ACTIVITY	SOURCE	EMISSION POTENTIAL	COMMENTS
Earthworks, Construction and Trackout	Dozers / HGV	High - dry or fine materials during strong windy weather	Temporary, variable from day to day depending on prevailing meteorological conditions, level, and location of activity. Soils placed directly in progressive works.
		Low – coarse or wet materials during conditions of low wind speed	

8.111 During the site preparatory works, activities will be largely confined within the application site. In light of this and the separation distance to sensitive receptors, the IAQM Construction Dust Guidelines indicates that the dust risk category would be considered to be 'low risk' to 'negligible'. A summary of the assessed risk category for proposed site operations is presented in Table 8-13 below.

Table 8-13
Site Activities: Risk of Dust Emissions

SOURCE	RISK OF DUST SOILING EFFECTS	ECOLOGICAL EFFECTS
Earthworks	Negligible	Negligible
Construction	Negligible	Negligible
Trackout	Negligible	Negligible

8.112 While the overall risk category has been assessed as 'negligible, if the trackout activities were not mitigated, the effects of dust during dry and windy conditions could possibly lead to occasional increases in nuisance dust immediately surrounding the application area. However, these are not considered to be significant given the limited duration of such meteorological conditions and the limited change in the extent and scale of proposed activities.

Operational Stage Dust Impact - Assessment

8.113 An overview of the sources and processes associated with the proposed quarry backfilling / landfilling, C&D waste processing and soil washing activities, and their respective potential for dust deposition, is presented in Table 8-14 below.

Table 8-14
Sources of Particulate Emissions

ACTIVITY	SOURCE	EMISSION POTENTIAL	COMMENTS
Material transfer on site	Onsite vehicle, Dry loose material.	High when dry materials are handled in strong windy weather. High - on un paved road surfaces	Emissions due to prevailing meteorological conditions and amount of dry loose material. Emissions due to re-suspension of loose material on surfaces.
Material storage	Dry loose material in stockpiles	High when dry material are stockpiled in strong windy weather	Emissions due to prevailing meteorological conditions (high winds).
Traffic (transfer to the site)	HGV / Road vehicles	Low - on paved road surfaces	Dependant on the amount of loose material on road surface available for re-suspension and track out.
C&D / Soil Stockpiling	Front Loader / Stockpiles	High – for dry or fine materials in strong windy weather	Temporary, variable from day to day depending on prevailing meteorological conditions, level, and location of activity
		Low – for coarse or wet materials in conditions of low wind speed	
Soil Washing Plant	Front Loader / Soil Washing Plant	Low – intake materials wet during processing; processing system also partially enclosed. Recycled product damp	Low emissions due to partially enclosed system and wet process.

ACTIVITY	SOURCE	EMISSION POTENTIAL	COMMENTS
C&D Processing Activities	Front Loader / Processing Plant	Low if C&D processing carried out under cover (in shed)	Temporary, variable from day to day depending on prevailing meteorological conditions, level, and location of activity.
		High – for dry or fine stockpiled materials in strong windy weather	
		Low – for coarse or wet stockpiled materials in conditions of low wind speed	

Human Receptors

8.114 There were 33 receptors identified for dust impact assessment within the 1km study area around the application site. Using the tiered assessment methodology, receptors located within 500m have progressed to a Tier 2 screening risk assessment as they are considered to have a greater risk of dust impact. More distant amenity sites and ecological sites were also included in the Tier 2 assessment for completeness.

8.115 Each receptor is assessed against the frequency of exposure and the distance from the source to the receptor (i.e. the pathway) in accordance with the methodology described in Appendix 8-A. The frequency of exposure of each receptor is based upon the frequency of winds capable of carrying dust particles blowing in the direction, from the source to the receptor, on days when rainfall does not inhibit dust from becoming airborne. Representative data on the local wind climate is therefore required for this section of the assessment.

8.116 A wind-rose for the site is presented in Figure 8-2 for Baldonnell Meteorological Station and illustrates the predominant wind directions from the south-west. The potential for the generation of airborne dust will increase with wind speed, with winds greater than 3m/s capable of carrying airborne dust[8].

8.117 A wind rose showing the frequency of winds at wind speeds of greater than 2m/s is presented in Figure 8-2 with the individual frequencies for each 10-degree compass sector used within the assessment. In this assessment, wind speeds over 2m/s were used; as this is how the data on percentage occurrence of wind frequency and wind speed is calculated and presented by Met Eireann. For this reason, the impact assessment presented below is deemed to be conservative.

8.118 A summary of the risk assessment of dust impacts from activities and potential emission sources within the proposed development is presented in Table 8-15 below.

[8] Department of the Environment, Transport and the Regions, 1995. *The Environmental Effects of Dust from Surface Mineral Workings* – Volume 2. Technical Report. December 1995.

Table 8- 15
Dust Risk Assessment Screening (Without Mitigation Measures)

RECEPTOR REFERENCE	DISTANCE FROM OPERATIONS (m)	RELEVANT. WIND DIRECTION [a]	POTENTIAL EXPOSURE DURATION [b]	RELATIVE WIND / DISTANCE RANK [c]	RISK EVALUATION
R1	60 SW	50-90	4.557	2/8	Slight Adverse
R2	60 SW	60-90	4.067	2/8	Slight Adverse
R3	141 SW	60-90	4.067	2/5	Acceptable
R4	303 SW	60-80	3.381	2/3	Insignificant
R5	236 SW	60-90	4.067	2/4	Acceptable
R6	247 SW	70-100	4.067	2/4	Acceptable
R7	177 NW	110-140	1.617	1/5	Acceptable
R8	158 NW	120-150	1.372	1/5	Acceptable
R9	128 N	120-170	2.352	1/5	Acceptable
R10	202 N	150-220	16.268	6/4	Moderate Adverse
R11	360 N	150-220	16.268	6/3	Slightly Adverse
R12	363 SE	270-300	2.842	1/3	Insignificant
R13	235 SE	300-330	1.225	1/4	Insignificant
Forest to N	50 N	120-250	26.95	6/8	Moderate Adverse
Kilmacurragh Arboretum	800 SW	10-40	1.372	1/1	Insignificant
Deputy's Pass SAC	1600 NW	120-150	1.372	1/1	Insignificant
Glenealy Woods pNHA	1100 NW	120-150	1.372	1/1	Insignificant

Table Note: *Refer to **Figure 8-1** for Receptor Locations*

(A) – relevant wind direction based on upwind sector which would potentially convey from site towards the receptor.

*(B) – Potential duration of exposure based on frequency of moderate to high wind speed (adjusted for dry days only) as described in the methodology in **Appendix 8-A**.*

*(C) – Ranking as per methodology in **Appendix 8-A***

8.119 From Table 8-16, it is observed that the risk of impact from dust emissions associated with the proposed development at Ballinclare Quarry (without any mitigation measures in place) generally varies from Insignificant at R4, R12, R13; Acceptable at R3, R5, R6, R7, R8, R9; Slight Adverse at R1, R2, R11 to Moderate Adverse at residential property R10 and the forest / amenity area to the north of the application site.

8.120 Having regard to the screening effect of intervening high ground (hill) and the nature of the forest / river amenity area to the north, it is considered that only the edge of the forest could be impacted to any degree by potential fugitive dust emissions arising from the proposed inert waste activities at Ballinclare Quarry. It is anticipated that perimeter planting and/or dense gorse vegetation will act as a wind break to further screen any fugitive dust and prevent it from being carried any significant distance into the forested area.

8.121 Using the screening assessment tool, the Air Quality Assessment indicates that there is generally an insignificant to moderate adverse risk that dust may cause an impact at sensitive receptors within 500m of the source of the dust generating activities.

8.122 Note that the risk assessment above *does not take into account implementation of mitigation measures* within the proposed development that includes retention of perimeter screening and dust suppression measures outlined in the Mitigation Measures section. The assessment presented above is considered to be conservative on the basis that the reference wind speed for the risk evaluation was less than that required to carry airborne dust.

Post-Closure Phase

8.123 The post-closure phase will entail decommissioning and removal of plant and equipment following cessation of inert waste disposal and recovery activities and the final restoration of the application site to grassland / scrub habitat thereafter. Potential air quality impacts associated with this phase of development will be negligible.

Ecological Receptors

8.124 The application site is not subject to any statutory nature conservation designation. The nearest protected site is located to the north of the application site boundary.

Table 8- 16
Dust Risk Assessment Screening (Without Mitigation Measures) Ecological Receptors

RECEPTOR REFERENCE	DISTANCE FROM OPERATIONS (m)	RELEVANT. WIND DIRECTION [a]	POTENTIAL EXPOSURE DURATION [b]	RELATIVE WIND / DISTANCE RANK [c]	RISK EVALUATION
Deputy's Pass SAC	1600 NW	120-150	1.372	1/1	Insignificant
Glenealy Woods pNHA	1100 NW	120-150	1.372	1/1	Insignificant

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

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

8.127 Studies have indicated that fugitive dust is typically deposited within 100m to 200m of the source, the greatest proportion of which, comprising larger particles (greater than 30 microns) is deposited within 100m. Where large amounts of dust are deposited on vegetation over a long time-scale (a full growing season for example) there may be some adverse effects upon plants restricting photosynthesis, respiration, and transpiration.

8.128 Baseline dust deposition monitoring indicates that dust levels of at the application site are low and well below the level of 1000 mg/m^2/day, where it is considered that dust could be likely to have a significant effect on sensitive ecosystems.

8.129 Using a screening assessment tool, the Air Quality Assessment (outlined in Appendix 8-A) suggests that there is generally an insignificant to moderate adverse risk that dust may cause an impact at sensitive ecological receptors within 500m of the source of the dust generating activities.

8.130 Based on the assessment above, it is concluded that the planned development will have an insignificant dust deposition impact on the Deputy's Pass Nature Reserve SAC and the Glenealy Woods pNHA ecological sites, and it is considered that both sites can be screened out from any further dust impact assessment.

Traffic Emissions - Assessment

8.131 For the purposes of assessment, the projected traffic movements associated with the development based on a 50-week year, 5.5 days per week, and 20 tonne loads, will result in up to 145 HGV movements per day, with no significant changes to either road alignment or speed.

8.132 This is consistent with existing / previously permitted HGV traffic levels of 150 trucks per day for extractive and related aggregate / concrete / asphalt production activities. From an air quality perspective therefore, the proposed development therefore will not generate a significant change in traffic, other than to have HGVs fully laden on the way in as opposed to on the way out.

8.133 As none of the roads in the surrounding local road network meet any of the traffic / alignment criteria set out in LA 105, then the impact of the scheme can be considered to be 'negligible' in terms of local air quality and no further air quality assessment is deemed necessary.

8.134 On this basis, the impact of the proposed inert landfill and waste recovery facility from the change of HGVs traffic can be screened out and combustion emissions (primarily oxides of nitrogen) from vehicle exhaust emissions associated with the transportation of materials does not have the potential to contribute to local air pollution.

PM_{10} Contribution : Inert Landfill and Waste Recovery Activities - Assessment

8.135 In terms of PM_{10}, the maximum annual mean measured baseline background concentration was 11µg/m³ in 2013 at Kilkitt, Co. Monaghan monitoring station and is adopted as typical of the rural environment surrounding the application site. Therefore, the potential contribution up of 5µg/m^3 towards annual mean background concentrations of the coarse fraction (2.5 – 10µm diameters) of particulates (in the immediate area of the site) is considered to be insignificant and well below the annual objective of 40µg/m³.

8.136 Therefore, the potential impacts in relation to increase in ambient PM_{10} concentrations can be classified as 'negligible', when the limited duration of conditions and the magnitude of change in the extent and scale of activities are considered to significantly reduce the generation of airborne PM_{10} beyond the site development boundary.

Unplanned Events (i.e. Accidents)

8.137 Accidents, malfunctions and unplanned events refer to events or upset conditions that are not part of any activity or normal operation of the planned development. Even with the best planning and the implementation of preventative measures, the potential exists for accidents, malfunctions or unplanned events to occur during the proposed inert landfill and waste recovery activities.

8.138 Many accidents, malfunctions and unplanned events are, however, preventable and can be readily addressed or prevented by good planning, design, emergency response planning, and mitigation. In terms of air quality impact, the following unplanned events could have an effect on the local area:

- equipment malfunction;
- vehicle collision;

- dry and windy weather conditions with dust suppression equipment malfunction;
- accidental material spillages during transport.

8.139 In relation to air quality, the impacts of any unplanned events are considered to be negligible. If unplanned events were not mitigated, the effects of dust during dry and windy conditions could possibly lead to occasional increases in nuisance dust and 24-hour mean PM_{10} concentration immediately surrounding the existing pit and local road access. However, these are not considered to be significant given the limited duration of such meteorological conditions and the likely limited scale of any incident.

Interaction with Other Impacts (if any)

8.140 The potential impact of the proposed development on air quality at sensitive receptors including sensitive ecological receptors and people living in the area has been fully assessed in this Chapter. The overall impact of the project on these receptors is further considered in Chapter 4 (Population and Human Health) and Chapter 5 (Biodiversity).

MITIGATION MEASURES

8.141 A large range of mitigation measures can be applied in respect of the proposed development at Ballinclare Quarry. The principal factors which will reduce and mitigate emissions from the planned inert landfill and waste recovery facility will be the placement of the imported waste materials within the existing quarry void, behind the quarry faces and below surrounding ground level. Existing perimeter berms along the site boundary and intervening vegetation / forestry within and beyond the application site boundary will effectively inhibit and limit dispersion of fugitive dust.

Site Specific Mitigation Measures

8.142 In addition to these key factors however, a number of additional dust control measures will be implemented at the planned waste facility as necessary to further reduce or mitigate potential dust impacts and to ensure dust emission are controlled within specified limits. Mitigation measures to be implemented are set out in Table 8-17 below.

Table 8- 17
Particulate Emission Mitigation Measures

SOURCE	EMISSION POTENTIAL	RECOMMENDED MITIGATION MEASURES	EFFECTIVENESS
Excavator / HGV	High – dry or fine particulate matter in strong windy weather	Minimise drop heights when handling materials. Minimise work in adverse / windy conditions.	High
	Low – wet particulate matter in conditions of low wind speed	Minimise drop heights when handling materials, protection from wind where possible.	High
Onsite Vehicles	High when travelling over un-surfaced and dry site roads.	Minimise distances of onsite haul routes.	High
		Use of water sprays / tractor and bowser to moisten surfaces during dry weather.	High
		Restrict vehicle speeds through signage / staff training.	High
		Locate haul routes away from sensitive receptors.	High

SOURCE	EMISSION POTENTIAL	RECOMMENDED MITIGATION MEASURES	EFFECTIVENESS
Road Vehicles (transfer to the site)	Low / Moderate on paved road surfaces	All HGVs exiting the facility to be routed through the wheelwash facility.	High
		Use of road sweeper to reduce the amount of available material for re-suspension.	Moderate / High
		Consider paving additional length of access road leading to the recovery facility (if required to achieve emission limits).	High
Stockpiles (soil/stone, C&D waste or recycled aggregate)	High when dry or fine material being stored or handled during strong windy weather	Minimise mechanical disturbance.	High
		Consider installation of fixed sprinkler system where materials consistently stockpiled (if required to achieve emission limits).	
C&D Waste Processing	Low	C&D processing activities carried out within the proposed waste processing shed.	High
Slight Adverse Risk Receptors	High – during dry and strong windy weather	Retention of existing perimeter berms	High
		Retention of planting along / within perimeter	High
		Increase dust suppression activity (sprinklers / water sprays from tractor & bowser).	High
		Minimise work in adverse weather conditions	High
Moderate Adverse Risk Receptors	High – during dry and strong windy weather	Retention of existing perimeter berms	High
		Retention of planting along / inside perimeter	High
		Increase dust suppression activity (sprinklers / water sprays from tractor & bowser).	High
		Minimise work in adverse weather conditions	High

Good Practice Mitigation Measures

8.143 Effective site management practices are critical to demonstrate the willingness of the facility operator to control dust emissions. Monitoring of dust deposition and recording of any complaints shall be carried out to take appropriate measures to reduce emissions in a timely manner.

8.144 Training on dust mitigation measures shall be provided to staff. Training should also cover an 'emergency preparedness plan' to react quickly in case of any failure of dust mitigation strategies or measures.

8.145 When adverse conditions apply, sprayed water from a bowser should be used to dampen down particulate materials from operations and/or stockpiles as and when required, principally in windy periods during extended dry spells.

8.146 As noted above, should it be necessary, an automated sprinkler system could also be installed around the facility to systematically dampen down stockpiled materials :

8.147 The following additional measures can also be implemented when required to achieve compliance with dust emission limits :

- Covering every load on vehicles delivering waste materials to the site;

- Protecting / reinforcing perimeter vegetation screening around the application site;
- Undertaking regular plant and vehicle maintenance (cleaning);
- Undertaking regular monitoring and inspection of access and haul roads to identify and attend to accidental spillages (of particulate waste materials) and any structural defects (i.e. potholes) to minimise shearing and break-up of road materials;
- considering meteorological conditions (wind speed and wind direction) when deciding where to site / locate material stockpiles.

Trackout

8.148 When adverse conditions apply (dry, windy weather), water from a bowser will be sprayed on dry unpaved road surfaces in order to minimize dust rise. Paved road surfaces around the site infrastructure area and the access road leading out of the site will also be sprayed as required.

8.149 All heavy goods vehicles leaving the application site will be routed through the wheelwash facility in order to remove and / or dampen any dust / clay material attaching to the undercarriage and to prevent transport of fine particulates off-site, onto the local public road network.

Cumulative / Synergistic Impacts

8.150 In essence, cumulative impacts are those which result from incremental changes caused by past or pre-existing development or actions, together with those generated by the proposed development plus any other reasonably foreseeable development / actions. Therefore the proposed development cannot be considered in isolation but must be considered in addition to impacts already extant and/or arising from existing or planned future development.

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

8.152 This dust impact assessment shows that, in light of the topographical setting, surrounding vegetation and forestry cover and with mitigation measures in place, the proposed inert landfill and waste recovery activities at Ballinclare will not adversely impact local air quality by way of increased dust emissions.

8.153 There is no other major planned development in the vicinity of the existing quarry at Ballinclare. Notwithstanding this, this assessment indicates that the long-term air quality impacts arising from the proposed backfilling and waste recovery activities are insignificant / acceptable at all potentially sensitive receptors. As such dust and PM_{10} levels arising from the planned waste activities do not have the potential to increase or adversely impact dust levels or PM_{10} concentrations in the local area, either on their own or in combination with other development.

RESIDUAL IMPACT ASSESSMENT

8.154 With the range of mitigation measures to be implemented and design measures to be incorporated into the working scheme, it is considered that the risk of dust impact arising at nearby receptors as a result the proposed site activities will be considerably reduced.

8.155 Following assessment of potential adverse effects produced by the development, it is concluded that there will be no significant adverse air quality effects for both human and ecological receptors (screened out) which cumulatively would not hinder the application site or the surrounding area. Overall the effects of the proposed development on air quality at nearby receptors are classified as negligible or acceptable.

8.156 A summary of the residual dust risk impact assessment is provided in Table 8-18 below.

Table 8- 18
Residual Dust Risk Assessment (With Mitigation Measures)

RECEPTOR REFERENCE	RISK EVALUATION
R1	Acceptable
R2	Acceptable
R3	Insignificant
R4	Insignificant
R5	Insignificant
R6	Insignificant
R7	Insignificant
R8	Insignificant
R9	Insignificant
R10	Acceptable
R11	Acceptable
R12	Insignificant
R13	Insignificant
Forest to N	Insignificant
Kilmacurragh Arboretum	Insignificant
Deputy's Pass SAC	Insignificant
Glenealy Woods pNHA	Insignificant

8.157 On the basis of the assessment presented above, it is concluded that the proposed development, with the range of mitigation measures to be implemented and design measures incorporated into the working scheme, will not have any adverse or unacceptable dust deposition impact on any nearby sensitive receptors.

MONITORING

8.158 Dust deposition monitoring will be undertaken at the application site. Dust monitoring locations shall be reviewed and revised where and as/when necessary. The results of the dust monitoring shall be submitted to Wicklow County Council on a regular basis for review and record purposes as required.

FIGURES

Figure 8-1
Dust Monitoring and Receptor Locations

POTTERS RIVER

BALLINCLARE STREAM

EXISTING SITE ENTRANCE

L1157 LOCAL ROAD

R772 REGIONAL ROAD

M11 MOTORW

KILMACURRAGH ARBORETUM

BARNDARRIG GAA

QUARRY

D1 WICKLOW CO. CO. COMPOUND

D2

D3

1000m

500m

1 km

Metres 1:10,000

0 100 200 300 400m 600 800 1000

N

NOTES

1. EXTRACT FROM ORDNANCE SURVEY 1:2,500 / 1:5,000 MAP SERIES: 4077-D, 4078, 4078-D, 4079-C, 4136, 4137, 4137-B, 4137-D, 4138-A & 4138-C

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

LEGEND

- LANDHOLDING BOUNDARY (c. 36 Ha. / 89 acres)
- PLANNING APPLICATION AREA (c. 32.5 Ha.)
- INERT WASTE LANDFILL FOOTPRINT (c. 17.0 Ha.)
- C&D WASTE RECOVERY FACILITY AREA
- PROPOSED WASHING PLANT
- 500m & 1km DISTANCE OFFSETS FROM BOUNDARY
- RESIDENTIAL RECEPTORS
- COMMERCIAL RECEPTORS
- 002274 - DEPUTY'S PASS NATURE RESERVE SAC
- 001756 - GLENEALY WOODS pNHA
- R772 REGIONAL ROAD
- LOCAL ROAD NETWORK
- ACCESS TRACKS
- 220kV ELECTRIC OVERHEAD LINE
- RIVER / STREAMS
- D1 DUST MONITORING LOCATIONS

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KILSARAN CONCRETE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

BALLINCLARE QUARRY RESTORATION & INERT WASTE & C+D WASTE RECOVERY FACILITY KILBRIDE (N11), CO. WICKLOW

DUST MONITORING LOCATIONS & LAND USE RECEPTORS

FIGURE 8-1

Scale 1:10,000 @ A3

Date MARCH 2021

00036.00080.0.16.FIG 8-1.0.Dust Monitoring & Land-Use.V1.dwg

APPENDIX 8–A
DUST RISK SCREENING ASSESSMENT METHODOLOGY

APPENDIX 8-A
DUST RISK SCREENING ASSESSMENT METHODOLOGY

The methodology applied in the assessment is a semi-quantitative risk assessment methodology, in which the probability of an impact occurring and the magnitude of the impact, if it were to occur, are considered. This methodology is the Tier 2 assessment of the dust assessment methodology. In the event that identified dust sensitive receptors are not screened out within Tier 1, this approach provides a mechanism for identifying the areas where mitigation measures are required, and for identifying mitigation measures appropriate to the risk presented by the development, (i.e. the assessment does not take account of existing mitigation in place at the facility).

The magnitude of the potential risk at each receptor is classified depending on the frequency of exposure and the distance from the site to the receptor. Frequency of exposure is represented by the percentage of moderate to high winds (over 3m/s) from the direction of the site.

The screening assessment tool assesses the significance of the distance from site and the frequency of exposure of each receptor by assigning a ranked number. Receptors with a higher potential for dust impacts would therefore result in a higher value whilst receptors with lower potential would expect to carry a lower value. The value corresponding to an evaluation of risk is a product of the significance of the distance and frequency of exposure, each is assigned a value representing its significance. The multiplication of the two values assigned gives a total, which is then corresponded to a qualitative term of risk magnitude.

Frequency of Exposure Criterion

The potential for any site to emit dust is greatly influenced by weather. Increased wind speed increases the potential for the generation of airborne dust due to the suspension and entrainment of particles in airflow. A worst-case situation would be strong, warm, drying winds which increase the rate at which dust is lifted from an untreated surface and emitted into the air. Wind can also have the effect of spreading dust over a large area. Conversely, rainfall decreases dust emissions, due to both surface wetting and increasing the rate at which airborne dust is removed from air. Guidance published by the IAQM on the assessment of dust impacts from mineral related development[9] indicates that rainfall of greater than 0.2mm per day is considered sufficient to effectively suppress windblown dust emissions.

The frequency of exposure to dust emissions represents the percentage of time that wind speeds capable of carrying airborne dust (greater than 3m/s) are blowing from the site to the direction of the receptor. Frequencies are calculated based on meteorological data. For screening assessment wind speeds greater than 2m/s were considered as this is how data on percentage occurrence of wind frequency and wind speed is calculated and presented by Met Eireann. For this reason, the assessment is considered to be conservative.

For screening assessment purposes, a value of 0.2mm would be used as the criterion to classify days as ‘dry’ or ‘wet’ using annual average rainfall data. The average number of days when rainfall exceeds 0.2mm would be provided for each month, and calculated over the year to provide an average.

The resulting frequency of moderate to high wind speeds with the potential for carrying airborne dust towards receptors would then be classified into the criteria in Table 8 A-1 with the respective rank value assigned.

[9] Institute of Air Quality Management (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning, IAQM, May

Table 8 A- 1
Frequency of Exposure – Risk Classification

RISK CATEGORY	CRITERIA
1	Frequency of winds (>2 m/s) from the direction of the dust source on dry days are less than 3%
2	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 3% and 6%
3	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 6% and 9%
4	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 9% and 12%
5	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 12% and 15%
6	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are greater than 15%

Distance to Source Criterion

In assessing dust impacts, the distance from the source to the sensitive location is crucial, as airborne and deposited dust tend to settle out close to the emission source. Smaller dust particles remain airborne for longer, dispersing widely and depositing more slowly over a wider area.

Guidance indicates that larger dust particles (greater than 30µm) will largely deposit within 100m of sources. Smaller particles (less than 10µm) are only deposited slowly. Concentrations decrease rapidly on moving away from the source, due to dispersion and dilution.

To allow for this effect of distance, buffer zones are often defined by mineral planning authorities around potentially dusty activities to ensure that sufficient protection is provided. They have not been established in any rigorous scientific way, but usually range from 50m to 200m. The 1995 UK DoE Guidance on dust from surface mineral working's, however, recommends a stand-off distance of 100-200m from significant dust sources (excluding short-term sources), although it is recognised that these distances can be reduced if effective mitigation measures are identified and implemented. In terms of identifying sensitive locations therefore, and to represent an extreme worst-case scenario, consideration only needs to be given to sensitive receptors within 500m of the site boundary. Receptors at a distance greater than 500m have therefore been screened out in Tier 1 of the assessment.

The criteria for classifying the distance from receptor to source and thus assigning a rank value has therefore been based on the various references to dust behaviour described above. The rank classifications are presented below in Table 8 A-2. A risk category is maintained for receptors in excess of 500m for circumstances where although a receptor is beyond 500m from the dust source, its sensitivity for example is sufficient for it to be taken onto a Tier 2 assessment.

Table 8 A- 2
Distance to Source – Risk Classification

RISK CATEGORY	CRITERIA
1	Receptor is more than 500m from the dust source
2	Receptor is between 400m and 500m from the dust source
3	Receptor is between 300m and 400m from the dust source
4	Receptor is between 200m and 300m from the dust source
5	Receptor is between 100m and 200m from the dust source
8	Receptor is less than 100m from the dust source

Sensitivity of Receptors

Sensitive locations are those where the public may be exposed to dust from the site. Locations with a high sensitivity to dust include hospitals and clinics, hi-tech industries, painting and furnishing and food processing. Locations classed as being moderately sensitive include schools, residential areas and food retailers. Table 8 A-3 below[10] shows examples of dust sensitive facilities.

Table 8 A- 3
Examples of Dust Sensitive Facilities

HIGH SENSITIVITY	MEDIUM SENSITIVITY	LOW SENSITIVITY
Hospitals and clinics	Schools and residential areas	Farms
Retirement homes	Food retailers	Light and heavy industry
Hi-tech industries	Greenhouses and nurseries	Outdoor storage
Painting and furnishing	Horticultural land	
Food processing	Offices	

Evaluation of Risk

Once a rank value has been assigned to the frequency of exposure and distance to source, an overall risk can be evaluated by combining the two risk categories, along with consideration of the sensitivity of the receptor. For low sensitivity receptors the risk of dust impact are considered to be significantly lower than for medium and high sensitive receptors. Therefore, a factor of 0.5 would be applied to the final risk evaluation ranking.

For each receptor, the relative magnitude of risk is given by identifying which of the score categories in Table 8 A-4 it falls into. This final evaluation represents the risk of dust impacts prior to control and mitigation measures being employed on site.

[10] Ireland M. (1992) "Dust : Does the EPA go far enough?", Quarry Management, pp23-24.

Table 8 A- 4
Risk Evaluation Ranking (Without Mitigation)

MAGNITUDE OF RISK	SCORE
Insignificant	7 or less
Acceptable	8 to 14
Slight Adverse	15 to 24
Moderate Adverse	24 or more