Air Quality Assessment

Proposed Mineral Extraction and Processing Operations, Land at White Cross Farm, Wallingford, Oxfordshire

GREENFIELD ASSOCIATES

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REPORT DETAILS

Client	Greenfield Associates
Report Title	Air Quality Assessment - Proposed Mineral Extraction and Processing Operations
Site Address	Land at White Cross Farm, Wallingford, Oxfordshire
Report Ref.	R21.11174/2/AG
Vibrock Contact	vibrock@vibrock.com

QUALITY ASSURANCE

Issue No.	Issue Date	Comments	Author	Technical Review
1	20/07/2021	n/a		
			A Gutteridge Consultant	J Mape Senior Consultant
2	04/08/2021	Updating phasing and restoration plans, following client review		
			A Gutteridge Consultant	J Mape Senior Consultant

Vibrock Limited
Shanakiel
Ilkeston Road, Heanor
Derbyshire, DE75 7DR
Tel: +44 (0) 1773 711211
Fax: +44 (0) 1773 711311
Email: vibrock@vibrock.com
Web: www.vibrock.com

NON-TECHNICAL SUMMARY

1. The proposed development has the potential to generate dust and other airborne pollutants in the immediate vicinity of the operations. The likelihood of problems caused by such pollutants will be largely influenced by the effectiveness of on site environmental control.

2. Hence potential dust sources have been identified and best practice dust control measures recommended in order to minimise any such disturbance at nearby sensitive locations.

3. The current dust climate has been measured at the site boundary and shown to be typical of a rural area.

4. Climatic conditions local to the site have been accessed and analysed to give an indication of how often the site could be susceptible to fugitive dust events. Such occasions are relatively few.

5. A full PM_{10} assessment in line with the latest guidance has been undertaken and this clearly shows that the Air Quality Objectives are not expected to be exceeded.

6. Given the intended dust control measures, it is considered that the site can be operated with minimal impact on nearby boundary locations.

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1.0 INTRODUCTION

1.1 Greenfield Associates are submitting a revised proposal for mineral extraction and processing operations on land at White Cross Farm, Wallingford, Oxfordshire. The key revision to the scheme is the removal of the marina end-use with the restoration of the site proposed to be back to a mix of mainly agricultural land and biodiversity. Vibrock Limited was commissioned to undertake an air quality assessment of the proposals.

1.2 The proposed development area is located within 1km to the south of Wallingford. The application site is approximately 18.8 ha with 15.5 ha assumed for extraction as shown on the proposed phasing plan (Figure 1). The development area is divided into the extraction area, fixed processing plant, lagoon, stockpile area and weighbridge which are also shown on Figure 1.

1.3 Mineral from the proposed development will be won by one excavator and transported to the processing plant and stockpile area. It is estimated that there will be <100 HGV movements per day (entering / leaving site), including inert material being brought into the site for back fill operations. This report considers the potential dust impacts from the preparation, extraction, movement of material and restoration activities within the site.

1.4 The revised submission proposes no change to the mineral extraction scheme but does involve an increase in the amount of imported restoration materials from approximately 150,000 m^3 to around 290,000 m^3. It is understood that the rate of importation will remain the same but will continue for a greater proportion of time within the 5 year development period. A conceptual restoration plan is provided in Figure 2.

1.5 The closest residential receptors to the site are identified within Figure 3. There are no Sites of Special Scientific Interest (SSSI) within 1km of the development site; the closest identified ecological receptor is Moulsford Downs some 5km south of the development site and will therefore not be included in the assessment.

1.6 Two Special Areas of Conservation (SAC) have been identified located in Wallingford and Winterbrook; Winterbrook being the closer of the two located north of the development area. Following IAQM guidance an ecological receptor refers to a sensitive habitat that can potentially be affected by dust deposition. This includes direct impact on vegetation or aquatic ecosystems, and indirect impacts on fauna. As Winterbrook SAC is related to special architectural and historic merit, it will therefore not be included in this assessment.

2.0 LEGISLATION, POLICY AND GUIDANCE

2.1 This Air Quality Assessment adheres to the following policies, legislation and guidance. Further studies and guidance used are detailed throughout the assessment.

2.2 Legislation

Air Quality Standards Regulations, June 2010

2.2.1 In line with the EU Ambient Air Quality Directive, 2008, the Air Quality Standards Regulations made this EU directive law in England. These regulations detail various Air Quality Limit Values for various pollutants including particulate matter with aerodynamic diameter less than 2.5µm and 10µm, and nitrogen dioxide amongst others. The regulations also state targets for ozone along with other pollutants.

Environmental Act, 1995

2.2.2 This act established the body known as the Environment Agency and aims to control pollution, conserve natural resources, and conserve and enhance the environment.

2.2.3 Part IV Air Quality, of the Environmental Act orders the UK government to prepare an Air Quality Strategy outlining pollution control functions. The act further instructs local authorities to regularly review whether or not air quality standards and objectives are being achieved in their area.

2.3 National Policy

National Planning Policy Framework (NPPF), July 2021

2.3.1 The NPPF was first published on 27 March 2012 and updated on 24 July 2018, 19 February 2019 and 20 July 2021. This sets out the government's planning policies for England and how these are expected to be applied.

2.3.2 Chapter 17, Facilitating the sustainable use of minerals; suggests it is important to provide a supply of minerals to aid infrastructure, buildings, energy and goods nationwide. Whilst outlining the fact that minerals are a finite resource and it is also important to protect their long-term preservation. The NPPF thus provides a planning policy framework for mineral developments.

Planning Practice Guidance, November 2019

2.3.3 This web-based resource, which accompanies the NNPF, giving guidance on numerous categories, with the air quality category (ID:32) and mineral category (ID:27) being relevant to this assessment.

2.3.4 Paragraph 001 of the Minerals section (ID: 27) of the PPG gives an overview as to why planning permission is required and details the following:

- minerals can only be worked (i.e. extracted) where they naturally occur, so location options for the economically viable and environmentally acceptable extraction of minerals may be limited. This means that it is necessary to consider protecting minerals from non-minerals development and has implications for the preparation of minerals plans and approving non-mineral development in defined mineral safeguarding areas;

- working is a temporary use of land, although it often takes place over a long period of time;

- working may have adverse and positive environmental effects, but some adverse effects can be effectively mitigated;

- since extraction of minerals is a continuous process of development, there is a requirement for routine monitoring, and if necessary, enforcement to secure compliance with conditions that are necessary to mitigate impacts of minerals working operations; and

- following working, land should be restored to make it suitable for beneficial after-use.

2.3.5 Paragraph 001 of the Air Quality section (ID: 32) of the PPG gives an overview what air quality considerations are need to be addressed. Referring to the 2008 Ambient Air Quality Directive, which is where the Air Quality Standards Regulations are derived. Reiterating the legally binding Air Quality Objectives and stating the UK's commitments to reducing emissions of 5 damaging air pollutants: fine particle matter, ammonia, nitrogen oxides, sulphur dioxide, and non-methane volatile organic compounds. This section also gives an overview of DEFRA's modelling and monitoring of air quality and discusses the local air quality management regime.

2.3.6 Paragraph 002 of the Air Quality section of the PPG advises that planning new developments needs to consider observed trends in local air quality, impact of the air pollution, cumulative impact including vehicle emissions, and mitigation measures.

2.3.7 Paragraph 005 suggests that air quality considerations are relevant to the development management process when a development may be located in a poor air quality area, or may have an adverse impact on sensitive receptors nearby, or if users of the development may experience poor health due to air quality emissions from the development.

2.3.8 Issues that need to be considered when assessing air quality impacts are detailed in paragraph 006. Vehicle emissions and their effects, introducing a new point source of air pollution, the exposing of air pollutants including dust, giving rise to potentially unacceptable impacts such as dust during the construction on nearby sensitive receptors and the potential adverse effect on biodiversity in the area.

National Planning Policy for Waste, October 2014

2.3.9 Planning development considerations will include the proximity of sensitive receptors, including ecological as well as human receptors, and the extent to which adverse emissions can be controlled through the use of appropriate and well-maintained and managed equipment and vehicles.

Air Quality Strategy, 2007

2.3.10 This document produced by DEFRA discloses air quality objectives and concludes how to further improve air quality in the UK, as per the Environment Act.

2.3.11 Chapter 2 of the Air Quality Strategy describes various pollutants and the potential effects on health and the environment. This chapter also charts a number of pollutants and the limits and targets associated with them. Below are the limits and targets for PM_{10}, $PM_{2.5}$, NO_x, and Ozone:

National Air Quality Objectives Limit and Target Values for the Protection of Human Health

Pollutant	Averaging Period	Objective/Limit Value	Max Allowable Exceedances	Target Date	New or Existing
PM_{10}	24 hours	50 µg/m^3	35 times per calendar year	31 Dec. 2004	Retain Existing
	Annual	40 µg/m^3	-		
$PM_{2.5}$	Annual	Target of 15% reduction in concentrations at urban background locations	-	Between 2010 and 2020	New (European obligations still under negotiation)
		25 µg/m^3	-	2020	
Nitrogen dioxide	1- hour	200 µg/m^3	18 times per calendar year	31 Dec. 2005	Retain Existing
	Annual	40 µg/m^3			
Ozone	8 hours	100 µg/m^3	10 times per calendar year	31 Dec. 2010	Retain Existing

2.4 Local Policy

South Oxfordshire Local Plan 2035

Policy TRANS2: Promoting Sustainable Transport and Accessibility

2.4.1 Development proposals should promote and support improvements to the transport network which increase safety, improve air quality, encourage use of sustainable modes of transport and/or make our towns and villages more attractive.

Policy ENV12: Pollution - Impact of Development on Human Health, the Natural Environment and/or Local Amenity (Potential Sources of Pollution)

2.4.2 Development proposals should be located in sustainable locations and should be designed to ensure that they will not result in significant adverse impacts on human health, the natural environment and/or the amenity of neighbouring uses.

2.4.3 The individual and cumulative impacts of development on human health, the natural environment and/or local amenity will be considered when assessing development proposals.

2.4.4 The consideration of the merits of development proposals will be balanced against the adverse impact on human health, the natural environment and/or local amenity, including the following factors:

- noise or vibration;
- smell, dust, odour, artificial light, gases and other emissions;
- air pollution, contamination of the site or its surroundings and hazardous substances nearby;
- land instability; and
- any other relevant types of pollution.

Policy EP1: Air Quality

2.4.5 In order to protect public health from the impacts of poor air quality:

i) development must have regard to the measures laid out in the Council's Developer Guidance Document and the associated Air Quality Action Plan, as well as the national air quality guidance and any Local Transport Plans;
ii) where sensitive development is proposed in areas of existing poor air quality and/or where significant development is proposed, an Air Quality Assessment will be required;
iii) all development proposals should include measures to minimise air pollution at the design stage and incorporate best practice in the design, construction and operation of the development;

iv) where a development has a negative impact on air quality, including cumulative impact, developers should identify mitigation measures that will sufficiently minimise emissions from the development. Where mitigation is not sufficient the impacts should be offset through planning obligations; and

v) development will only be permitted where it does not exceed air pollution levels set by European and UK regulations.

Policy DES6: Residential Amenity

2.4.6 Development proposals should demonstrate that they will not result in significant adverse impacts on the amenity of neighbouring uses, when considering both individual and cumulative impacts, in relation to the following factors: i) loss of privacy, daylight or sunlight; ii) dominance or visual intrusion; iii) noise or vibration; iv) smell, dust, heat, odour, gases or other emissions; v) pollution, contamination or the use of/or storage of hazardous substances; and vi) external lighting.

Oxfordshire Minerals and Waste Local Plan – Part 1 Core Strategy, 2017

Policy C5: Local environment, amenity and economy

2.4.7 Proposals for minerals and waste development shall demonstrate that they will not have an unacceptable adverse impact on:

- the local environment;
- human health and safety;
- residential amenity and other sensitive receptors; and
- the local economy;

including from:

- noise;
- dust;
- visual intrusion;
- light pollution;
- traffic;
- air quality;
- odour;
- vermin;
- birds;
- litter;
- mud on the road;
- vibration; surface or ground contamination;
- tip and quarry-slope stability;
- differential settlement of quarry backfill;
- subsidence; and
- the cumulative impact of development.

2.4.8 Where necessary, appropriate separation distances or buffer zones between minerals and waste developments and occupied residential property or other sensitive receptors and/or other mitigation measures will be required, as determined on a site-specific, case-by-case basis.

Policy C10: Transport

2.4.9 Minerals and waste development will be expected to make provision for safe and suitable access to the advisory lorry routes shown on the Oxfordshire Lorry Route Maps in ways that maintain and, if possible, lead to improvements in:

- the safety of all road users including pedestrians;
- the efficiency and quality of the road network; and
- residential and environmental amenity, including air quality.

2.4.10 Where development leads to a need for improvement to the transport network to achieve this, developers will be expected to provide such improvement or make an appropriate financial contribution.

2.4.11 Where practicable minerals and waste developments should be located, designed and operated to enable the transport of minerals and/or waste by rail, water, pipeline or conveyor.

2.4.12 Where minerals and/or waste will be transported by road:

a) mineral workings should as far as practicable be in locations that minimise the road distance to locations of demand for the mineral, using roads suitable for lorries, taking into account the distribution of potentially workable mineral resources; and

b) waste management and recycled aggregate facilities should as far as practicable be in locations that minimise the road distance from the main source(s) of waste, using roads suitable for lorries, taking into account that some facilities are not economic or practical below a certain size and may need to serve a wider than local area.

2.4.13 Proposals for minerals and waste development that would generate significant amounts of traffic will be expected to be supported by a transport assessment or transport statement, as appropriate, including mitigation measures where applicable.

2.5 Guidance

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

2.5.1 IAQM Guidance is applied throughout this assessment to provide a robust and consistent good practice approach in assessing the dust impact from the proposed development site, with such guidance being utilised for planning purposes.

2.6 Health Impact Studies

2.6.1 The following studies are used to establish a history and background into the need for air quality assessment and the need to manage dust from mineral sites.

2.6.2 Medical studies have consistently failed to find any link between dust arising from mineral working and public health. A local doctor who claimed that a nearby site produced demonstrable adverse medical effects upon his patients presented evidence to the Derlwyn Public Inquiry in South Wales. However, that evidence has since been discredited and shown, as an epidemiological study to be fundamentally flawed (British Medical Journal 305, 1992).

2.6.3 In 1992 the Institute of Occupational Medicine (IOM) concluded a three-year epidemiological study of the respiratory health of some one thousand two hundred and forty nine opencast mine employees working over nine sites selected by the IOM (Institute of Occupational Medicine Ltd 1992).

2.6.4 The main conclusions of that study were that dust exposures were low for most occupational occurrences and that neither asthma nor chronic bronchitis is related to exposure to dust in any part of opencast workings. It is only for those workers exposed for 10 years or more in the dustiest of opencast jobs that a small risk of pneumoconiosis was demonstrated.

2.6.5 The Health and Safety Executive have set the occupational exposure limit for dust at 10 mg/m^3 as an 8 hour time weighted average. As previously mentioned such a figure may have significance within a site if workers are immediately adjacent to a particular operation prone to high dust emissions. However, due to dilution and dispersion it is extremely unlikely that any residential property around a site would ever experience concentrations of dust as high as this, with environmental dust levels some 100 times less being the norm.

2.6.6 In 1999 the then DETR published the results of a relevant research project by the University of Newcastle upon Tyne under the title “Do particulates from opencast coal mining impair children’s respiratory health?”

2.6.7 The Committee on the Medical Effects of Air Pollutants considered the content of this study, finding that is was “…of a high standard”.

2.6.8 The Committee agreed with the findings of the authors of the report that:

i) Opencast coal mining was associated with a small increase in the mean concentration of airborne particle measured as PM_{10} in areas close to opencast sites. This was due to an increased concentration of shale.

ii) The respiratory health of children living in communities close to opencast coal sites was very similar to that of children living in communities distant from such sites.

2.6.9 Overall, the number of consultations made to general practitioners was similar for children who lived close to opencast sites compared to those who did not.

2.6.10 The Committee noted that the increase in particle concentrations close to opencast sites was not due to the release of coal particles but was more likely due to earth moving and excavation. Such levels of exposure to these materials, as may occur in local communities as a result of any opencast mining, are most unlikely to have any detectable effects on health.

2.6.11 They concluded that from what is known of the long term effects of coal mining on the health of opencast coal miners, that it is most unlikely that opencast sites would have any long term effects on the health of local communities.

2.6.12 The study noted that the differences between opencast areas and the control communities studied during the research was some 2.0 µg/m³ in terms of the gravimetric mean of daily differences in measured PM_{10} values.

2.6.13 Of significance, however, was their finding that the differences between opencast and control communities were not found to be greater under conditions when the contribution of site related PM_{10} dust had been expected to be raised. In such circumstances as when the wind was blowing from the site to the community monitor or during permitted site working hours.

2.6.14 Further guidance with regard to the assessment of PM_{10} is given within the Planning Practice Guidance documentation to the National Planning Policy Framework.

2.6.15 The general basis of this guidance is that dust should as far as possible be controlled, mitigated or removed at source. The document further confirms, with minor refinements, the assessment methodology of the University of Newcastle upon Tyne study.

2.7 Local Air Quality Management Review

Air Quality Annual Status Report, June 2020

2.7.1 During the LAQM review and assessment process the local authorities in which the development area falls; South Oxfordshire District Council, have not designated any Air Quality Management Areas (AQMA) in relation to PM_{10}. AQMAs have been declared for Nitrogen Dioxide, in Henley, Watlington, and Wallingford because of high levels of traffic fume. The closest AQMA is Wallingford, which is greater than 1km north of the development site.

3.0 EXISTING ENVIRONMENT

3.1 Introduction

Windspeed and Direction

3.1.1 The generation and dispersal of dust is highly dependent upon meteorological conditions prevalent at the time. The Met Office has advised that wind speed and direction data are recorded at Benson, Oxfordshire approximately 4km north north east of the development area.

3.1.2 The Met Office considers that the data recorded at Benson, Oxfordshire over the period January 2006 to December 2015 would be representative of the conditions experienced in the vicinity of the development area. From our site inspection we consider that this data is not likely to be significantly affected by the site topography. Observations of the wind speed and direction recorded over this ten year period, comprising some 87,188 hourly observations, have been used to compile the relevant wind rose shown in Appendix 1.

Rainfall Data

3.1.3 An indication of the long term average annual number of dry days (i.e. less than 0.2 mm) for the quarry has also been taken from records collected at Benson, Oxfordshire (Appendix 2) and indicates that there is an average of 188.5 days per year with rainfall less than 0.2 mm, i.e. about 52 % of the year.

3.2 Existing Air Quality

Deposited Dust

3.2.1 Existing levels of dust deposition will typically be of the order of 56 mg/m²/day (milligrams per square metre per day) annual median, for a general deposit in residential areas and town outskirts, MIRO February 2011. Dust levels vary on a daily basis, particularly during dry weather but also because of local industry. Median (50th percentile) levels of 38 mg/m²/day for open country, and 90 mg/m²/day for commercial town centres are also stated as shown in the table below.

Location	Median (50th percentile) mg/m²/day	90th percentile mg/m²/day	95th percentile mg/m²/day
Open Country	38	103	140
Residential Areas and Town Outskirts	56	146	203
Commercial Town Centres	90	199	261

3.2.2 Within the area around the site the existing deposited dust levels are influenced mainly by farming activity and vehicle movements on the local road network. The area is considered to be residential and town outskirts.

PM_{10} and $PM_{2.5}$ Particulates

3.2.3 Particulate matter is generally categorised on the basis of the size of the particles. PM_{10} particles are those with a mean aerodynamic diameter less than 10 micrometres (microns), with the smaller $PM_{2.5}$ particles being defined as those with a mean aerodynamic diameter less than 2.5 microns.

3.2.4 Particulate matter is made up of a wide range of materials and arises from a variety of sources. Concentrations of particulate matter comprise primary particles emitted directly into the atmosphere from combustion sources and secondary particles formed by chemical reactions in the air. Particulate matter derives from both human activity and natural sources (such as sea spray and Saharan dust). In the UK the biggest human activity sources are stationary fuel combustion and transport.

3.2.5 As an indication of the likely level of PM_{10} and $PM_{2.5}$ particulates at the site, data has been accessed for the relevant 1km squares of the Automatic Urban and Rural Network (AURN), by way of using the Local Air Quality Management Background Mapping Data Tool available on the DEFRA website under the UK Air Information Resources. This resource currently uses projections based on the 2018 AURN dataset. Please be aware DEFRA notes that these assumptions were made before the Covid-19 outbreak and do not reflect any behavioural changes caused by this. The levels for the grid squares which contain the closest residential and ecological receptors to the quarry are detailed. The data presented is for projected concentrations for years 2021, 2026 and 2030.

Grid Square 459500, 187500:
Containing: Meadow Farm, Elizabeth House, Waterside Court, Whitecross House

Year	PM_{10} Annual Mean $\mu g/m^3$	$PM_{2.5}$ Annual Mean $\mu g/m^3$
2021	12.98	8.58
2026	12.36	8.07
2030	12.33	8.05

Grid Square 460500, 187500:
Containing: Founders House – Carmel College, Mansion House – Carmel College

Year	PM_{10} Annual Mean $\mu g/m^3$	$PM_{2.5}$ Annual Mean $\mu g/m^3$
2021	13.14	8.72
2026	12.49	8.20
2030	12.47	8.18

Grid Square 459500, 186500:
Containing: Windward House / Mead Furlong

Year	PM_{10} Annual Mean $\mu g/m^3$	$PM_{2.5}$ Annual Mean $\mu g/m^3$
2021	13.95	8.95
2026	13.32	8.44
2030	12.30	8.42

3.2.6 Within the area around the site the PM_{10} and $PM_{2.5}$ levels would be influenced by farming activity and vehicle movements on the local road network. Additionally global PM_{10} and $PM_{2.5}$ emissions will also have a considerable influence.

3.3 Deposited Dust

3.3.1 Dust in the community is normally perceived as an accumulated deposit on surfaces such as washing, window ledges, paintwork and other light coloured horizontal surfaces, e.g. car roofs. When the rate of accumulation is sufficiently rapid to cause noticeable fouling, discoloration or staining (and thus decrease the periods between cleaning) then the dust is generally considered to be a nuisance. The point at which an individual makes a complaint regarding dust is highly subjective.

3.3.2 In the UK and Europe there are no definitive standards for deposited particulates, however, criteria and guidelines have been developed in many other countries. Studies undertaken in Australia, for example, have resulted in the adoption of a deposited dust criteria linked to the onset of loss of amenity of about 133 mg/m^2/day, averaged over one month. In the UK, long term deposited dust nuisance criteria have been suggested for urban/semi-rural areas at, typically 200 mg/m^2/day, averaged over a monthly period.

3.3.3 Custom and practise at quarries, coal, construction and demolition sites have used the figure of 200 mg/m²/day as a nuisance threshold for sites in the UK.

3.4 Significance of Existing Air Quality

3.4.1 The comparison between existing levels of deposited dust is shown in the table below. The monitoring locations are displayed in Figure 3. The dust levels were monitored using sticky pads with analysis in effective area coverage per day. This has been calculated into mg/m^2/day for comparison with nuisance criteria.

Measured Air Quality – July 2016 – September 2016

Location	Deposited Dust (Approximation) mg/m^2/day
A – North West Site Boundary	50
B – South East Site Boundary	43

4.0 POTENTIAL EMISSIONS

4.1 Introduction

4.1.1 The operations involved in the extraction and movement of aggregate have the potential to generate dust emissions. The development area is divided into the extraction area, fixed plant, lagoon, stockpile and weighbridge area; which will be progressively worked and restored throughout the life of the site.

4.2 Soil Stripping (including bund construction and removal)

4.2.1 Soil stripping and bund formation will be conducted intermittently throughout the timeframe of the proposed development. Top and subsoil bunds will be 2m or 5m in height and will be established as identified on the plans accompanying this application. The bunds will be seeded as soon as is practicable in order to prevent the potential for wind blow from this source. Overburden stores will also be seeded, and wet suppression system employed. Wet suppression will be utilised if required during out of hours working.

4.2.2 Soil stripping and bund formation will be conducted in such a way as to minimise the handling of material. Drop heights will be minimised when handling overburden to prevent dust generation.

4.2.3 A site speed limit of 10 mph will be implemented within the extraction area to minimise dust generation.

4.3 Mineral Extraction and Transportation Operations

4.3.1 The extraction of mineral will be conducted with a tracked excavator and will be transported to the fixed plant located in the north east area of the site via two articulated dump trucks.

4.3.2 The sand and gravel to be extracted from the proposed extraction area will have a relatively high moisture content which will reduce the potential for dust emission when handling the material. Notwithstanding this, the dust suppression measures detailed within this chapter and within Appendix 3 will be implemented to reduce the potential for dust emission from the site.

4.3.3 The drop height from the excavator bucket to the dump truck and from the dump truck to the fixed plant will be minimised, the on site speed limit of 10 mph will be adopted and the use of a water bowser will help to minimise dust emissions from the operation.

4.3.4 Internal haul roads will consist of compacted material and will be regularly maintained by grading in order to minimise dust generation.

4.3.5 Mobile plant exhausts and cooling fans will be discharged away from the ground to prevent dust mobilisation.

4.3.6 All mobile plant will be regularly maintained.

4.4 Progressive Restoration

4.4.1 A process of progressive restoration will be adopted at the site. The plant complement for such activity will consist of an excavator, bulldozer and dump truck.

4.4.2 The dust mitigation measures discussed previously including the minimisation of drop heights, the control of vehicle speeds and regular maintenance of vehicles will help to minimise dust emissions from this source. Restored areas will be seeded as soon as is practicable.

4.4.3 The progressive restoration of the site will help to reduce the area of land exposed to wind blow.

4.4.4 Imported inert material will be used to restore land to agriculture with biodiversity enhancements including a small lake and wetland areas.

4.4.5 The restored area will be utilised for agricultural land and soft-end uses.

4.5 Mineral Processing Plant

4.5.1 Mineral processing for sand and gravel is a wet operation. Mineral from the extraction area is processed through a feed hopper. The mineral is then processed via primary and secondary screens before being stockpiled. Water is used throughout the process, helping to minimise dust emissions.

4.5.2 Mineral which has been processed is, when possible, shielded from the prevailing wind.

4.5.3 The ground surface comprises of hard standing with water applied as required. A site speed limit of 10 mph will apply around the processing plant.

4.5.4 All lorries (HDVs) leaving site with aggregate will continue to be sheeted and will be required to pass through the site wheel wash.

4.5.5 Air Quality Management Areas have been declared for Nitrogen Dioxide in Henley, Watlington, and Wallingford; the closet being Wallingford greater than 1km north of the development site. HDV operators will be required to seek alternate routes both to and from the site in order to circumvent the declared AQMA.

4.5.6 A roadsweeper will be deployed on the local road network.

4.6 Potential Emission Magnitude

4.6.1 Guidance from the Institute of Air Quality Management " Guidance on the Assessment of Mineral Dust Impacts for Planning, 2016" suggests that the magnitude of potential dust emission should be classified on a scale of impact as small, medium or large based upon the judgement of the assessor. In determining the potential emissions of importance to this application, the following sources are considered:

- Site Preparation and Restoration
- Mineral Extraction
- Materials Handling
- On-site Transportation
- Mineral Processing
- Stockpiles/Exposed Surfaces
- Off-site Transportation

Site Preparation and Restoration

4.6.2 Short term operations at the site will consist of soil stripping and bund construction/removal, a working area in excess of 10 ha will be in operation comprising of restoration being conducted with 290,000 m^3 of inert material being imported over the life of the project. This will be progressively imported over five years with the maximum of 63,000 tpa of material being imported.

4.6.3 Bunds around the site will be 2m or 5m in height, which the IAQM assesses as having a high dust potential at 5m. Overburden and soil movement for material across the whole site will be in excess of 100,000 m^3, the threshold which the IAQM states as having a high dust potential although this will be phased in operation across the sites lifespan. The number of mobile plant items simultaneously active will be <5, which is classed as a small impact. The screening bunds will be seeded, and of a low moisture content classifying site preparation and restoration as having a **small** dust raising potential.

Mineral Extraction

4.6.4 The maximum size of the mineral extraction area to be worked at is 15.5 ha during which a hydraulic excavator will be handling mineral of a high moisture content. The IAQM classes such scale of operations as having a small dust raising potential. The mineral extraction rate is less than the 1,000,000 tpa, which would be classed as a high potential for dust emission, whereas below the 200,000 tpa is classed as having a low potential for dust generation.

4.6.5 The overall scale of potential emission is therefore classed as **small** for mineral extraction.

Materials Handling

4.6.6 The IAQM suggest that <5 loading plant, transferring material of a low dust potential and high moisture content within the quarry void or clean hard standing surface should be classified as a small potential dust impact.

4.6.7 The mineral to be extracted at the site will involve <5 plant items operating simultaneously in the extraction area, taking place at closest approach within 100m from the site boundary. Overburden will be transported over a consolidated bare surface, transferring material of low moisture content. The impact from this activity is judged to be of **small** impact.

On-site Transportation

4.6.8 Two articulated dump trucks will be utilised for the transportation of mineral to the mineral processing plant at an estimated six per hour. Vehicle movements to the feed hopper will be across an unpaved but compacted and graded haul route of length no more than 500m from the furthest point of the extraction site.

4.6.9 The IAQM suggests that transportation movements on unpaved haul roads could result in a large dust impact. However the low dust potential and high moisture content of the mineral to be worked, well maintained haul roads, adequate speed controls, and vehicle movements at <100 per day, combine such that the on site mineral transportation is judged to have a **small** scale of impact.

Mineral Processing

4.6.10 The development site will employ a fixed processing plant consisting of a feed hopper, primary and secondary screens and silt pump. Production is estimated to be at 140,000 tpa of raw material with low dust potential and high moisture content.

4.6.11 The IAQM classifies a small potential dust magnitude which may include a site with fixed screening plant with effective design in dust control, processing of <200,000 tpa of material with low dust potential / or high moisture content e.g wet sand and gravel, therefore the impact from this activity is judged to be of **small** impact.

Stockpiles/Exposed Surfaces

4.6.12 For stockpiling and exposed surface the IAQM states a small potential dust magnitude may include stockpile duration of <1 month with total area <2.5 ha in an area of low wind speeds, located >100m from the site boundary. Weekly transfers of material with a low dust potential and/or high moisture content, with quarry production <200,000 tpa.

4.6.13 Stockpiles and exposed surfaces at White Cross Farm, Wallingford will have a stock pile duration >12 months and with 100m of the site boundary, the sand and gravel stockpile is proposed to be approximately 6m in height, in turn reducing through material processing; IAQM suggest this to be a large potential dust magnitude. The stockpile/exposed surface however will be <2.5 ha, and contain material with low dust potential and high moisture content, quarry production is <200,000 tpa. Overall Individual impacts combine such that the onsite stockpiling and exposed surfaces are judged to have a **small** scale of impact.

Off-site Transportation

4.6.14 IAQM advises a large potential dust magnitude from off-site transportation could include total HDV >200 movements in any one day on unsurfaced site access road <20m in length with no HDV cleaning facilities. No road sweeper available. A small potential magnitude may include <25 HDV movements per day, paved surfaced site access road >50m in length, with effective HDV cleaning facilities and procedures, the employment of an effective road sweeper.

4.6.15 For off-site transportation on the development site an estimated <100 HDV movements will take place per day. It is estimated that there will be 6 movements per hour of HDVs transporting mineral, and 4 movements per hour of HDVs transporting imported inert material; this on a surfaced road >50m in length with effective HDV cleaning and road sweeper employed. Although the number of HDV movements is >25 for that of a small dust magnitude, it is <200 movements for a large magnitude, combined with the classification of the other off-site transportation impacts, overall this is judged to have a **small** scale of impact.

Residual Source Emission Classification

Activity	Residual Source Emissions
Site Preparation and Restoration	**Small**
Mineral Extraction	**Small**
Materials Handling	**Small**
On-site Transportation	**Small**
Mineral Processing	**Small**
Stockpiles/Exposed Surfaces	**Small**
Off-site Transportation	**Small**

5.0 CLIMATIC CONDITIONS

5.1 The frequency of use and the effectiveness of the control measures outlined in Appendix 3 will largely depend upon climatic conditions together with the separation distances involved between any potential dust source and residential locations.

5.2 The highest potential for dust dispersal and deposition occurs on dry windy days and the risk of dust deposition at a particular location is determined by the frequency of these dry winds blowing towards them from a dust generating activity.

5.3 In the guidance 'The Environmental Effects of Dust from Surface Mineral Workings' published in 1995 by the DoE (now part of DEFRA) together with guidance in the former MPS2, it is generally accepted that wind blow of dust does not occur on days when rainfall is above 0.2mm.

5.4 The meteorological data from Benson, Oxfordshire has been analysed in order to quantify the number of dry working days in which the wind direction is in a particular sector.

5.5 Information provided by the Met Office as monitored at Benson, Oxfordshire is detailed below:-

Wind Direction	Frequency of Occurrence %
North	7.7
North North East	8.7
East North East	4.2
East	4.1
East South East	5.2
South South East	8.8
South	17.8
South South West	14.2
West South West	10.7
West	7.3
West North West	5.5
North North West	5.8
Calm/Variable	0.1

Rainfall less than 0.2 mm

188.5 days per year (Appendix 2).

The information adapted to allow for working days only, i.e. 5½ days per week, 47 weeks per year, is 133.5 working days per year with rainfall less than 0.2mm.

5.6 Combined with the prevailing wind directions, the number of dry working days each year can be represented as follows:

Wind Direction	No. of Dry Working Days
North	10.3
North North East	11.6
East North East	5.6
East	5.5
East South East	6.9
South South East	11.7
South	23.8
South South West	19.0
West South West	14.3
West	9.7
West North West	7.3
North North West	7.7
Calm/Variable	0.1

5.7 Considering that dust is not likely to be carried by winds of less than 5.6 ms^{-1} (i.e. less than 11 knots), an assessment of the likelihood of a dust occurrence is presented below:

Wind Direction	No. of Dry Windy Working Days	Dry Windy Working Days as % of the total Number of Dry Working Days per Year (133.5)
North	4.9	3.7
North North East	7.7	5.8
East North East	2.9	2.2
East	2.9	2.2
East South East	4.5	3.4
South South East	7.5	5.6
South	16.0	12
South South West	14.3	10.7
West South West	10.9	8.2
West	6.1	4.6
West North West	3.5	2.6
North North West	3.3	2.5

5.8 This value of 5.6 ms^{-1} derives from the Beaufort Wind Scale and is very much in line with the value of 5.4 ms^{-1} as used by the United States Environmental Protection Agency in their dust emission calculations. The value is also below the 5.8 ms^{-1} stated within guidance from MIRO and the Department of the Environment for the initiation of dust emission for disturbed pebbly soils.

6.0 DISCUSSION

6.1 The proposed methods of dust suppression are based on Vibrock Ltd's experience of handling potentially dusty materials over many years in a wide variety of situations. These tried and tested methods of dust suppression have been successfully used at numerous minerals sites. The proposed dust control measures are recognised as industry best practice and are summarised in Appendix 3.

6.2 A dust event will only occur if the necessary conditions are present. It is necessary to have a fine material available which is able to be picked up, carried and then deposited by the wind. Such materials are more readily available if dry and physically disturbed. Thus not all site operations are dusty because of the lack of physical disturbance.

6.3 There must also be a wind of sufficient strength to transport fine particles, and for a particular property to be at risk the wind must blow in that particular direction from the source. The critical wind speed at which a particle becomes airborne depends on many factors including particle size, shape and density. For most mineral dusts the critical wind speed is about 5.6 ms^{-1} (12 mph - 11kts - Force 4 on Beaufort Scale).

6.4 For a dust event to occur there must also be a failure of dust control measures. Particles greater than 30µm make up the greatest proportion of dust emitted from mineral processing and largely deposit within 100m of sources. Particles between 10 and 30µm are likely to travel from 250 to 400m, while sub 10µm particles, which make up a small proportion of dust emitted from most mineral processing operations, may travel up to 1km from sources.

6.5 In considering the climatic conditions, it is clear the winds will predominate from the south and south-south-west and west-south-west quadrants with an analysis of the number of dry windy working days giving a maximum of some 25 such days likely in a south west direction in any one year.

6.6 The IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning presents the following categorisation of frequency of potentially dusty winds and categorises receptor distance from source as distant, intermediate or close as displayed below.

Categorisation of Frequency of Potentially Dusty Winds

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

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

6.7 The assessment locations are identified on Figure 3.

Meadow Farm

6.8 Meadow Farm is located approximately 65m west of the development site at the closet approach to the extraction operations.

6.9 Winds from the north-north-east, east-north-east, east, east-south-east, and south-south-east would blow from the site towards the residential property. The property is shielded from the proposed site by the tree line along Reading Road.

6.10 A total of 25.5 dry windy working days are calculated from the above quadrants; representing between 12% to 20% of all dry windy working days from the direction of the dust source. Meadow Farm is therefore classed as close from the source of dust and with the potential for dusty winds classed as frequent.

Elizabeth House

6.11 Elizabeth House is located approximately 73m west of the development site at the closet approach to the extraction operations.

6.12 Winds from the north-north-east, east-north-east, east, east-south-east, and south-south-east would blow from the site towards the residential property. The property is shielded from the proposed site by the tree line along Reading Road.

6.13 A total of 25.5 dry windy working days are calculated from the above quadrants, representing between 12% to 20% of all dry windy working days from the direction of the dust source. Elizabeth House is therefore classed as close from the source of dust and with the potential for dusty winds classed as frequent.

Waterside Court

6.14 Waterside Court is located 85m north west of the development site.

6.15 Winds from the east-south-east, south-south-east and south would blow from the extraction area and processing plant towards the residential property. The care home is located the opposite side of the A4130 roundabout south of Wallingford. Waterside Court is provided with shielding from the tree line that runs along the A4130 Nosworthy Way and the treeline surrounding the southern part of the residential property.

6.16 A total of 28 dry windy working days are calculated from the above quadrants, representing 21% of all dry windy working days from the direction of the dust source. Waterside Court is described as close from the source of dust and with the potential for dusty winds classed as very frequent.

Whitecross House

6.17 Whitecross House is located north of the development site, some 125m. Winds from the south-south-east, south, and south-south-west would blow towards the receptor. Whitecross House is provided with shielding from the tree line that runs along the A4130 Nosworthy Way.

6.18 A total of 37.8 dry windy working days are calculated from the above quadrants, representing 28.3% of all dry windy working days from the direction of the dust source. Whitecross House is therefore classed as an intermediate distance from the source of dust and with the potential for dusty winds classed as very frequent.

Founders House, Carmel College

6.19 Founders House, Carmel College is located approximately 140m east of the development site across the River Thames. Winds from the west-south-west, west, and west-north-west would blow towards the receptor. Founders House, Carmel College is provided with shielding from vegetation running along the bank of the River Thames.

6.20 A total of 20.5 dry windy working days are calculated from the above quadrants, representing between 12% and 20% of all dry windy working days from the direction of the dust source. This receptor is therefore classed as an intermediate distance from the source of dust, and with the potential for dusty winds classed as frequent.

Mansion House, Carmel College

6.21 Mansion House, Carmel College is located around 125m east of the development site across the River Thames. Winds from the north-north-west, west-north-west, west, and west-south-west would blow towards the receptors. Mansion House, Carmel College is provided with shielding from vegetation running along the bank of the River Thames.

6.22 A total of 23.8 dry windy working days are calculated from the above quadrants, representing between 12% and 20% of all dry windy working days from the direction of the dust source. Spence Pavilion is therefore classed as an intermediate distance from the source of dust and with the potential for dusty winds classed as frequent.

Windward House / Mead Furlong

6.23 Windward House and Mead Furlong are located south of the development site, both some 85m. Winds from the north-north-west, north, and north-north-east would blow towards the receptors. Both Windward House and Mead Furlong are provided with shielding from vegetation north of the properties between the development site.

6.24 A total of 15.9 dry windy working days are calculated from the above quadrants, representing between 5% and 12% of all dry windy working days from the direction of the dust source. Both Winward House and Mead Furlong are therefore classed as close from the source of dust and with the potential for dusty winds classed as moderately frequent.

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

6.25 In order to determine pathway effectiveness from the IAQM guidance, the receptor distance category and frequency of potentially dusty winds are combined, the results of which are presented for each receptor location below.

Receptor	Pathway Effectiveness
Meadow Farm	Highly Effective
Elizabeth House	Highly Effective
Waterside Court	Highly Effective
Whitecross House	Highly Effective
Founders House, Carmel College	Moderately Effective
Mansion House, Carmel College	Moderately Effective
Winward House / Mead Furlong	Moderately Effective

6.26 An estimation of dust risk is established for each location based on the pathway effectiveness of dust transmission and the worst case categorisation of residual dust source emission as detailed within Section 4.

Estimation of Dust Impact Risk

		Residual Source Emissions		
		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

Receptor	Estimation of Dust Impact Risk
Meadow Farm	Low Risk
Elizabeth House	Low Risk
Waterside Court	Low Risk
Whitecross House	Low Risk
Founders House, Carmel College	Negligible Risk
Mansion House, Carmel College	Negligible Risk
Winward House / Mead Furlong	Negligible Risk

6.27 For the purpose of identifying receptor sensitivity, the IAQM 2016 guidance suggests that residential dwellings should be classed as a high sensitivity receptor.

Descriptors for Magnitude of Dust Effects

		Receptor Sensitivity		
		Low	**Medium**	**High**
Dust Impact Risk	**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

6.28 An assessment of the magnitude of dust effect is presented for each of the receptor locations below:

Receptor	Magnitude of Dust Effect
Meadow Farm	Slight Adverse Effect
Elizabeth House	Slight Adverse Effect
Waterside Court	Slight Adverse Effect
Whitecross House	Slight Adverse Effect
Founders House, Carmel College	Negligible Effect
Mansion House, Carmel College	Negligible Effect
Winward House / Mead Furlong	Negligible Effect

General

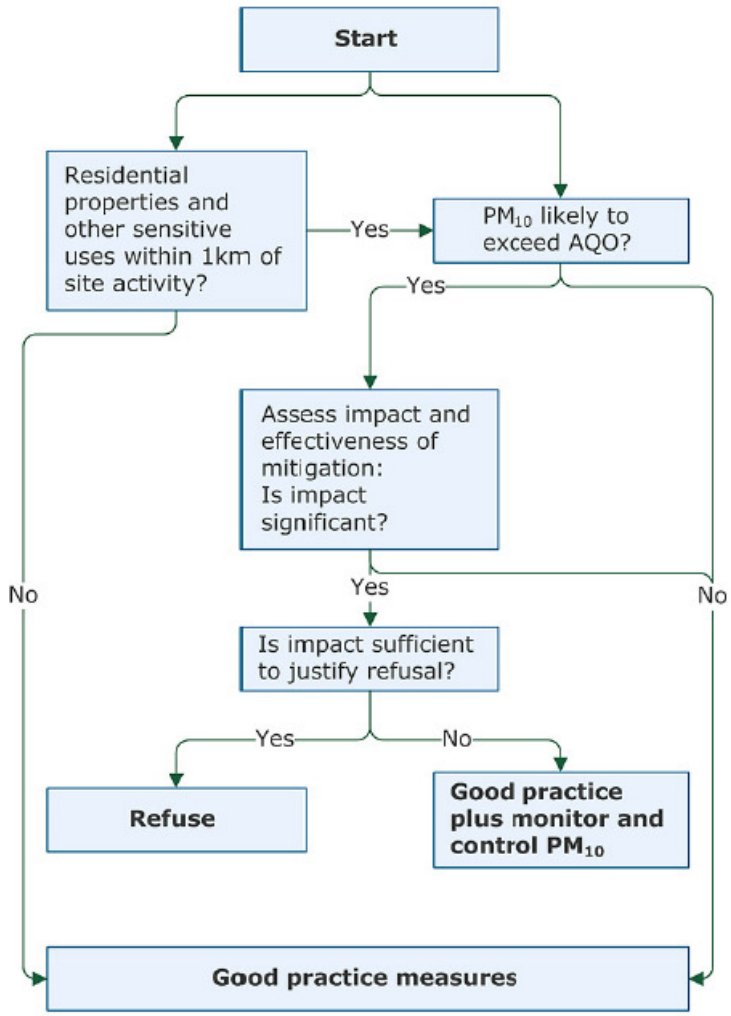
6.29 When conditions for dry windy working days do occur, the implementation of the dust suppression measures discussed in Section 4 and Appendix 3, will ensure that dust emissions are minimised. The use of such best practice measures, which have been implemented at mineral extraction sites throughout the United Kingdom, suggest that such measures will be effective.

7.0 PM_{10} ASSESSMENT

7.1 The 1999 DETR publication "Do particulates from opencast coal mining impair children's respiratory health?" recommends an assessment framework with respect to PM_{10} particulates.

7.2 The framework takes a step by step approach to PM_{10} looking at various factors in time via a scheme of straightforward questions set out in a "Proposed Site Assessment Flowchart". If the site is not likely to have a significant impact then best practice measures are recommended. If, however, its impact is significant, either a refusal should follow or additional monitoring and control.

7.3 The Planning Practice Guidance to the National Planning Policy Framework contains an amended version of the assessment framework (shown below).



7.4 To follow the framework the first step is to assess whether the site has a community or particularly sensitive users / premises within 1000m of the site boundary.

7.5 The second step is then to assess whether the extra burden of PM_{10} particulates from the site is likely to exceed the National Air Quality Objectives (AQO).

7.6 To undertake this assessment it is recommended that Automatic Urban and Rural Network (AURN) data be accessed.

7.7 If the AURN data indicates that the additional load attributable to site operations, [to be taken as 1 µg/m³ for the scope of this assessment], as discussed below, would bring the area above the AQO, then this would indicate that there may be a need for monitoring and control mechanisms. These would be required to be put into place in order to reduce the potential to create PM_{10} dust from the site on those days that exceed the standard.

7.8 If the AURN data indicates that the additional load attributable to site operations alone [of 1 µg/m³] would not cause any breach of the AQO, this would indicate that there would be no justification for any additional monitoring and controls over and above best practice measures.

7.9 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2003 suggests that quarrying and construction work are thought to account for less than 1 µg/m³ of PM_{10} levels. It could therefore be considered that a loading of 1 µg/m³ is a worst case calculation. The Newcastle Study discussed within Section 3 of this report was based upon an assessment of opencast coal operations and considered a loading of 2 µg/m³ as a process contribution. Opencast coal sites in general move far greater volumes of overburden and have a larger plant compliment than many sand and gravel and hard rock quarry operations. This lower dust generating potential for other types of mineral sites is acknowledged in the IAQM Minerals Dust Guidance.

7.10 This study has accessed air quality data from the DEFRA website for the relevant grid squares which contain the closest residential receptors.

7.11 Along with the loading of 1 µg/m³ for the White Cross Farm development, another 1 µg/m³ loading will be applied (totalling 2 µg/m³) taking into consideration the proposed development at the New Barn Farm site located south west of Winterbrook opposite the A4130 and Wallingford Road.

Grid Square 459500, 187500:
Containing: Meadow Farm, Elizabeth House, Waterside Court, Whitecross House

Year	Projected PM_{10} Burden	
	Number of Exceedances of 50 µg/m³	Annual Mean µg/m³
2021	<1	12.98
2026	<1	12.36
2030	<1	12.33

7.12 For Grid Square 459500, 187500 the highest annual mean when combined with both site attributable loads totalling 2 µg/m³ is for the year 2021 and gives a projected burden of 14.98 µg/m³. Such an annual mean is calculated to produce <1 daily exceedances of 50 µg/m³.

Grid Square 460500, 187500:
Containing: Founders House – Carmel College, Mansion House – Carmel College

Year	Projected PM_{10} Burden	
	Number of Exceedances of 50 µg/m³	Annual Mean µg/m³
2021	<1	13.14
2026	<1	12.49
2030	<1	12.47

7.13 For Grid Square 460500, 187500 the highest annual mean when combined with both sites attributable load totalling 2 µg/m³ is for the year 2021 and gives a projected burden of 15.14 µg/m³. Such an annual mean is calculated to produce <1 daily exceedance of 50 µg/m³.

Grid Square 459500, 186500:
Containing: Winward House / Mead Furlong

Year	Projected PM_{10} Burden	
	Number of Exceedances of 50 µg/m³	Annual Mean µg/m³
2021	<1	13.95
2026	<1	13.32
2030	<1	12.30

7.14 For Grid Square 459500, 186500 the highest annual mean when combined with both sites attributable load totalling 2 µg/m³ is for the year 2021 and gives a projected burden of 15.95 µg/m³. Such an annual mean is calculated to produce 1 daily exceedances of 50 µg/m³.

7.15 Hence the mineral extraction operations at White Cross Farm, Wallingford would satisfy the UK Air Quality Objectives for PM_{10} of no more than 35 exceedances per year of a 24 hour mean of 50µg/m³ and an annual mean of 40 µg/m³.

7.16 This procedure clearly indicates that the PM_{10} from this proposal is not likely to exceed the Air Quality Objectives and it is considered that the best practice measures proposed for dust control are appropriate and in proportion to the potential for dust emission.

7.17 As previously noted within this report, sub 10µm particles, which make up a small proportion of dust emitted from most mineral operations, may travel up to 1km from sources. Of the total PM_{10} dust fraction there will be a percentage of the smaller $PM_{2.5}$ particulate matter.

7.18 In the May 2016 publication by the Institute of Air Quality Management "Guidance on the Assessment of Mineral Dust Impacts for Planning" it is stated that:

"The other potential air quality impact is the increase in ambient suspended particulate matter (PM) concentrations local to the site. As noted earlier, the PM_{10} fraction is relevant to health outcomes. For quarries most of this suspended dust will be in the coarse sub-fraction ($PM_{2.5-10}$), rather than in the fine ($PM_{2.5}$) fraction."

7.19 On the basis of the above comment and the nationally derived ratio of $PM_{2.5}/PM_{10}$; 0.7, it is considered an additional burden of 0.5 μgm^{-3} $PM_{2.5}$ to the annual mean would represent a worst case.

7.20 The application of a 0.5 $\mu g/m^3$ loading to the highest $PM_{2.5}$ concentration considered in this assessment of 8.95 $\mu g/m^3$ for the year 2021 at grid square 459500, 186500 gives a projected $PM_{2.5}$ burden with the addition of quarry operations of 9.45 $\mu g/m^3$ for the grid square containing Winward House and Mead Furlong. The worst case projected concentration therefore complies with the $PM_{2.5}$ 2015 annual mean criterion of 25 $\mu g/m^3$.

7.21 If the development is permitted, an increase in the annual mean concentration of PM_{10} and $PM_{2.5}$ would not exceed the Air Quality Objectives.

8.0 DUST MANAGEMENT

8.1 The table below presents an assessment of dust effects in accordance with the guidance contained in the IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning.

Magnitude of Dust Effect

Receptor	Location Relative to Dust Source	Worst Case Residual Source Emissions	Pathway Effectiveness	Dust Impact Risk	Receptor Sensitivity	Magnitude of Dust Effect
Meadow Farm	West some 65m	Small	Highly Ineffective	Low Risk	High	Slight Adverse Effect
Elizabeth House	West some 73m	Small	Highly Ineffective	Low Risk	High	Slight Adverse Effect
Waterside Court	North West some 85m	Small	Highly Ineffective	Low Risk	High	Slight Adverse Effect
Whitecross House	North some 125m	Small	Highly Ineffective	Low Risk	High	Slight Adverse Effect
Founders House, Carmel College	East some 140m	Small	Moderately Effective	Negligible Risk	High	Negligible Effect
Mansion House, Carmel College	East some 125m	Small	Moderately Effective	Negligible Risk	High	Negligible Effect
Winward House / Mead Furlong	South some 85m	Small	Moderately Effective	Negligible Risk	High	Negligible Effect

8.2 As shown above, the impact on air quality from potential dust emissions is expected to be a slight adverse effect for Meadow Farm, Elizabeth House, Waterside Court and Whitecross House; and a negligible effect at all other receptors.

8.3 The following actions (8.4 – 8.9) will be taken to ensure that the dust control measures identified in Section 4.0 and Appendix 3 are effectively implemented. The implementation of appropriate dust control will effectively mitigate any potential dust impact.

8.4 Prior to the commencement of the development a dust monitoring strategy will be produced. Baseline levels will be established before extractive operations commence; passive monitoring of dust deposition rates by way of Frisbee Dust gauge. Monitoring would then continue during the winning of material at specific identified sensitive receptors.

8.5 The quarry operator will comply with any conditions which may be specified in the planning conditions imposed by the Mineral Planning Authority relating to dust. The operator will refer to the planning conditions and determine an appropriate response, taking into account current and forecast weather conditions.

8.6 All site personnel will be trained as to the potential sources and effective mitigation of dust.

8.7 Regular visual inspections will be conducted within the site and on the local road network by the site personnel, as deemed necessary and especially during dry windy conditions to ensure that any dust sources are identified and dealt with promptly.

8.8 A complaints log will be held on site. In the event of receiving a dust complaint, the name and location of the complainant, the nature of the dust related complaint, the site activity and prevailing weather conditions at the time of the complaint will be noted. The site foreman will investigate the complaint and take any remedial action which is deemed appropriate. The site will maintain good communication with the surrounding community and organise regular, accessible liaison arrangements to help alleviate potential anxieties.

8.9 In the event of a failure of dust mitigation measures, for example in extreme weather conditions, the dust generating activity will be temporarily suspended, until appropriate dust mitigation is implemented or until a change in weather condition occurs.

9.0 CONCLUSIONS

9.1 It is unlikely that any significant decrease in local air quality will occur due to the proposed mineral extraction and processing at White Cross Farm, Wallingford.

9.2 Any dust occurrence event will be limited and of short duration and will be minimised by implementation of the dust control recommendations.

9.3 With regard to PM_{10} and $PM_{2.5}$ dust levels from the site, analysis has been made of the air quality data. The conclusion of the analysis was that AQO will not be exceeded.

9.4 The proposed development meets the air quality and dust requirements of national and local policy and guidance.

9.5 Overall the effect on air quality of this development with the implementation of suitable dust mitigation measures is considered to be not significant.

9.6 A dust monitoring strategy should be adopted and routine monitoring undertaken.

10.0 REFERENCES

1. The Environmental Effects of Dust from Surface Mineral Workings, DOE, 1995.

2. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2003.

3. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007.

4. National Planning Policy Framework, Ministry of Housing, Communities & Local Government, July 2021.

5. Planning Practice Guidance – Minerals, Department for Communities and Local Government, October 2014.

6. Planning Practice Guidance – Air Quality, Department for Communities and Local Government, November 2019.

7. Air Quality Standards Regulations, June 2010.

8. Part IV, Environmental Act, 1995.

9. Land-Use Planning and Development Control: Planning for Air Quality: Environmental Protection UK and IAQM, January 2017.

10. Good Practice Guide: control and measurement of nuisance dust and PM_{10} from the extractive industries. Mineral Industry Research Organisation, February 2011.

11. Minerals Policy Statement 2. Controlling and mitigating the environmental effects of minerals extraction in England. Annex 1: Dust, Office of the Deputy Prime Minister, 2005.

12. Her Majesty's Inspectorate of Pollution, Technical Guidance Note (Dispersion) D1, HMSO, June 1993.

13. Guidance on the Assessment of Mineral Dust Impacts for Planning, IAQM, May 2016.

14. Local Air Quality Management Technical Guidance (TG16), DEFRA April 2021.

15. Oxfordshire Minerals and Waste Local Plan - Core Strategy. Adopted September 2017.

16. South Oxfordshire Local Plan 2035. Adopted December 2020.

17. South Oxfordshire District Council 2020 Air Quality Annual Status Report, June 2020.

FIGURE 1

Phasing Plan

FIGURE 2

Conceptual Restoration

FIGURE 3

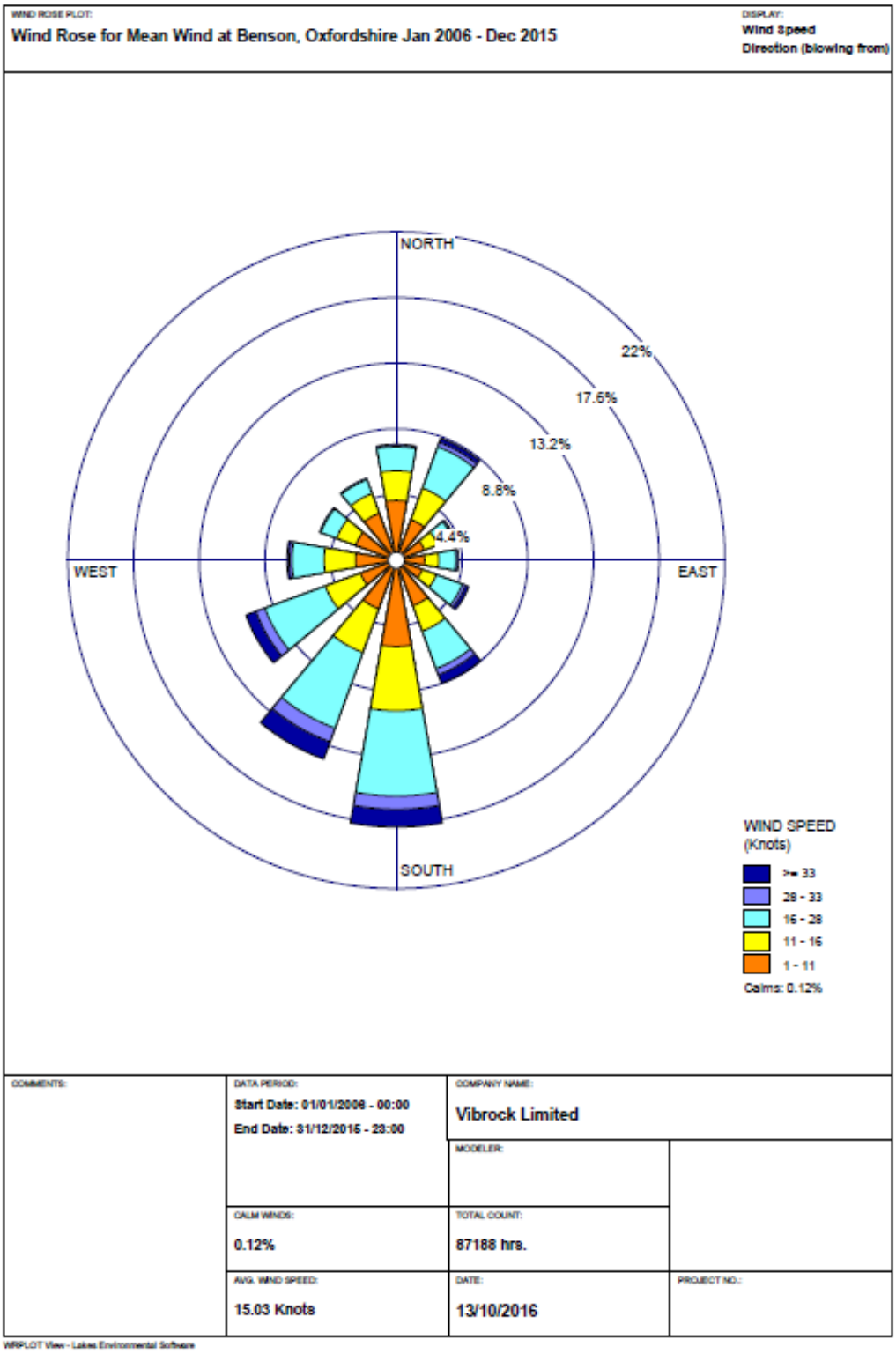
Monitoring and Prediction Locations

1. Meadow Farm
2. Elizabeth House
3. Waterside Court
4. Whitecross House
5. Founders House, Carmel College
6. Mansion House, Carmel College
7. Windward House / Mead Furlong

L	Dust Monitoring Location
#	Sensitive Receptor

APPENDIX 1

Wind Rose



APPENDIX 2

Mean Number of Days with Rainfall Less Than 0.2mm

Site: Benson, Oxfordshire
10 year period from 2006 to 2015

Month	No of days
January	15.0
February	15.7
March	16.1
April	16.0
May	17.3
June	19.4
July	17.1
August	16.4
September	17.2
October	12.8
November	11.3
December	14.2
Annual	**188.5**

APPENDIX 3

Summary of Dust Control Measures

Site Operation	Dust Control Measures
Site Preparation and Restoration Mineral Extraction Materials Handling On-site Transportation Mineral Processing Stockpiles/Exposed Surfaces Off-site Transportation	• Bunds and overburden stores to be seeded • Controlled use of fixed short haul routes • Haul routes to be regularly maintained by grading to minimise dust generation • Water to be used as required via site water bowser • Speed controls to be implemented on all haul routes 10 mph • Road sweeper to be utilised on local road network • Drop heights to be minimised • Mobile plant exhausts and cooling fans to point away from ground • All plant to be regularly maintained • Water suppression system to be used on stockpiles and haul roads • HDVs to be instructed for alternative routes around local AQMA • Site to produce a dust monitoring scheme prior to the commencement of works and cater for both normal and out of hours working.