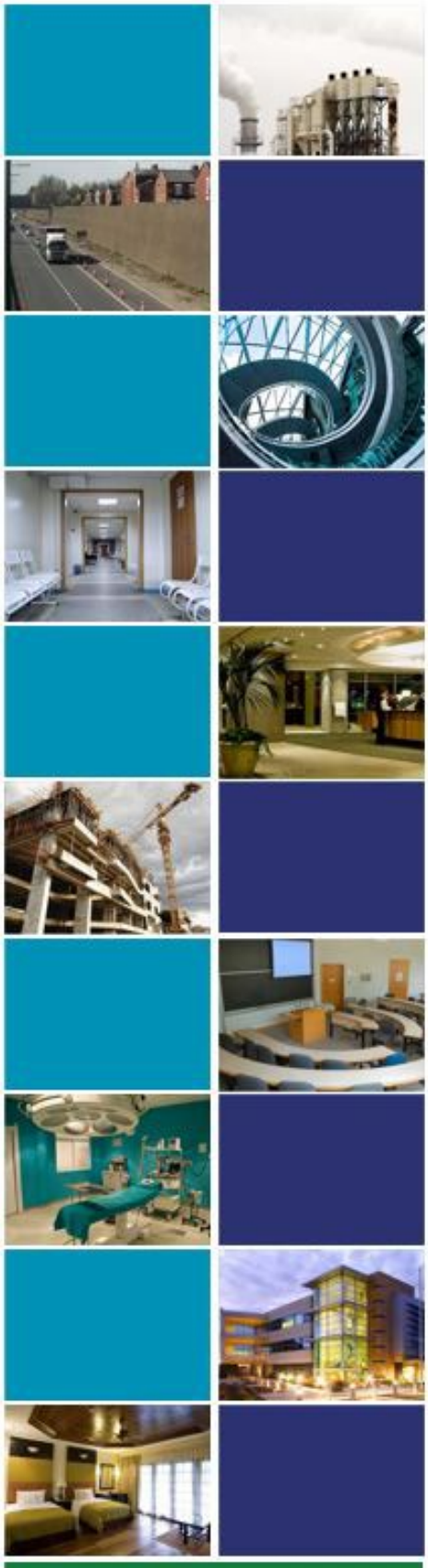

MILLER GOODALL

ACOUSTICS - AIR QUALITY - LIGHTING

AIR QUALITYAND DUST ASSESSMENT

on behalf of

SILKSTONE ENVIRONMENTAL LTD.

for

BROMLEY FARM QUARRY, UPPER CUMBERWORTH

REPORT DATE: 3RD OCTOBER 2023

REPORT NUMBER: 102882-2

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Summary

This air quality and dust assessment has been prepared to accompany a planning application for a proposed eastern extension at Bromley Farm Quarry, Upper Cumberworth. It assesses the potential air quality changes arising from vehicle emission and disamenity dust during the operational phase, and whether these potential changes would significantly alter air quality.

An assessment of disamenity dust and particulate matter generation has been completed for each individual dust-generating operations during all five phases and restoration of the operational phase. The assessment has been undertaken in accordance with the source-pathway-receptor methodology recommended for assessment of mineral dust by the Institute of Air Quality Management. The potential timeframes of when receptors might be downwind of dust-generating operations has been calculated and assessed for potential impact. The assessment concludes that there is a negligible risk of dust effects associated with the operations proposed for the extension at Bromley Farm Quarry.

Bromley Farm Quarry is worked to an existing dust management plan. This document has been reviewed and is concluded to be sufficient for the extension. This document will be updated by the Applicant as per requirements. With the implementation of the dust mitigation, the effects of the development would be not significant to the environment and surrounding sensitive receptors.

The potential air quality effects of emissions from vehicle haulage have been assessed. The extension will be worked with existing vehicles and will utilise the same number of permitted traffic movements, therefore, there is no discernible change in regard to vehicular emissions. At the request of the Environmental Health Officer, a detailed air quality assessment to assess vehicle traffic as new generation has been completed. Air quality changes arising from 120 in/out heavy-duty vehicle movements are concluded to be negligible and below relevant air quality objectives and target levels. The potential air quality effects can be concluded as not significant.

The proposed development is not expected to have a significant impact on local air quality.

There is, therefore, no reason for this application to be refused on the grounds of air quality.

Prepared By	Unam Ejaz	Reviewed By	Philip Walton
Signed		Signed	
Date	3rd October 2023	Date	3rd October 2023

Record of changes

Version	Date	Change	Initials
1	17th January 2023	First issue	UE
2	3rd October 2023	Updated the reference to a new quarry operation as requested by the Environmental Health Officer Inclusion of a detailed air quality modelling assessment	UE

Contents

1 Introduction

1.1 Miller Goodall Ltd. has been instructed to prepare an air quality and dust assessment to accompany a planning application for a proposed quarry operation at Bromley Farm Quarry, Upper Cumberworth. The site lies within the administrative boundary of Kirklees Council (KC).

1.2 The potential impacts associated with disamenity dust and particulate matter are assessed at existing sensitive receptors in the vicinity of the extension. The assessment considers the risk from dust-generating operations during the working of the extension. The assessment utilises the source-pathway-receptor methodology and is assessed following the IAQM Mineral Guidance[1].

1.3 A review of the existing dust control and dust management plan has been undertaken to determine whether the plan is sufficient to reflect the new working locations of the quarry, and to recommend further mitigation if necessary.

1.4 The report also assesses the potential impact of the proposed development on local air quality following Local Air Quality Management Technical Guidance and EPUK and IAQM guidance[2].

1.5 The report provides an assessment of the potential air quality impacts associated with the operational phases of the proposed development. The potential air quality changes at existing sensitive receptors adjacent to the site and roads subject to increased vehicle generation from the development are assessed.

1.6 The main pollutants of health concern from road traffic exhaust releases are nitrogen dioxide (NO_2) and fine particulates, normally assessed as the fraction of airborne particles of mean aerodynamic diameter less than ten micrometres (PM_{10}) and 2.5 micrometres ($PM_{2.5}$) since these pollutants are most likely to approach their respective air quality objectives in proximity to major roads and congested areas. This assessment has therefore focused on the impact of the proposed development on concentrations of NO_2, PM_{10} and $PM_{2.5}$.

[1] Institute of Air Quality Management (2016). Guidance on the Assessment of Mineral Dust Impacts for Planning

[2] EPUK and IAQM (January 2017) Land Use Planning and Development Control: Planning for Air Quality (v1.2)

2 Site Description

2.1 The extension is located approximately 100 m to the north of Bromley Farm Quarry which ceased working mineral in 2014 and has since been restored by the importation of inert waste. The site was fully restored in early 2022 and is now in agricultural use for sheep grazing.

2.2 Cumberworth Lane borders the northern boundary of the site, with Lane Side Farm and open land beyond. Open land borders the site to the east, with residential dwellings at Top Road and Bluehills Lane. The former Bromley Farm Quarry is to the south. To the west there is Bromley Farm recycling centre and open space. Additionally, there are existing residential dwellings located to the north west of the proposed extension.

2.3 Taken from the red line boundary, there are two areas located within 250 m of this new quarry:

- Lane Side Farm is located approximately 50 m to the northwest;
- Residential dwellings at Bluehills Lane located approximately 215 m of the south-east; and

2.4 The site location is shown in **Appendix A**.

3 Proposed Development

3.1 The proposed development is for proposed 8.4-hectare easterly mineral extraction to the former Bromley Farm Quarry. The site is allocated as a preferred area for mineral extraction, Ref. MAS3 in the adopted Kirklees Local plan.

3.2 The proposed quarry area is to be worked for fireclay and shale. Backfill of the quarry void is proposed to be with inferior quality mineral and shale overburden and imported inert materials (subject to an Environmental Permit with the Environment Agency) to enable the site to be restored to original ground levels and agricultural grassland with areas of species rich grassland, shrub and tree planting.

3.3 The quarry area is be worked is proposed from west to east in five, approximately 30 metre wide cuts, at base. The area within the red line boundary is approximately 8.4 Hectares which includes the overburden storage area, settlement lagoon and the access road. The reserves present have been calculated at approximately 760,000 tonnes. The extraction is proposed to take approximately 25 years supply with 30,000 tonnes per annum of clay extraction. The workings would be to an average depth of approximately 16 metres. The 25 year timeframe would include infill by inert waste of 690,000 tonnes for restoration.

3.4 It is not proposed to have any fixed plant operational as all extractive product would be taken from the working area to the processing works at Crow Edge for clay pipe manufacture (off-site). Crow Edge is located to the south west of the quarry. Vehicles will exit onto Barnsley Road (A635), travel westward to the junction with Lane Head Road (A629), onto Holmfirth Road and then southwards on Piper Well Lane toward Crow Edge. The haulage route will not alter during the quarry timespan, nor will the number of vehicles using this route.

3.5 The extraction of clay is not a continuous operation and is usually removed between March and September on a campaign basis to provide sufficient material to maintain the stockpiles for the year ahead. The assessment utilises annual datasets, therefore, a worst-case assessment has been completed to assess the potential dust risks.

4 Legislation, Guidance and Literature Review

4.1 Air Quality Objectives

4.1.1 The standards and objectives relevant to the LAQM framework have been prescribed through the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations 2002; the Air Quality Standards Regulations 2010 set out the combined Daughter Directive limit values and interim targets for Member State compliance.

4.1.2 The United Kingdom left the European Union on 31st January 2020 and is no longer a member state. However, the current framework of air quality legislation was converted into domestic law through the European Union (Withdrawal) Act 2018[3].

4.1.3 The relevant air quality standards and objectives, and the assessment they are relevant for, are presented in **Table 1**. Pollutant standards relate to ambient pollutant concentrations in air, set on

[3] UK Parliament (2018): http://www.legislation.gov.uk/ukpga/2018/16/contents/enacted

the basis of medical and scientific evidence of how each pollutant affects human health.

Table 1: Air Quality Strategy Objectives (England) for the Purposes of Local Air Quality Management

Pollutant	Air Quality Objective	
	Concentration	Measured As
Particles (PM_{10})	50 µg/m^3	24-hour mean not to be exceeded more than 35 per year
	40 µg/m^3	Annual mean

4.1.4 The IAQM Minerals Guidance[1] recognises that most suspended dust is typically in the coarse sub-fraction ($PM_{2.5-10}$) rather than the fine sub-fraction ($PM_{2.5}$). The assessment procedure outlined in the guidance concentrates on PM_{10}. $PM_{2.5}$ forms part of the total PM_{10} concentration, therefore, if PM_{10} is below the objectives, it is likely $PM_{2.5}$ is too.

4.2 West Yorkshire Low Emissions Strategy (WYLES)

4.2.1 KC is part of the West Yorkshire Low Emissions Strategy Group (WYLES) which has a technical guidance aimed to assist planning authorities deliver national air quality objectives. The technical guidance has a process to classify the proposed development, determine the type of assessment and mitigation needed for it using the following staged approach as shown in **Table 2** below.

Table 2: KC site classification assessment

Step	Proposed Outcome	Justification
Stage 1 – Development Type Classification	Major	The proposed development meets criteria for major as it has more than 100 two-way vehicle movements per day.
Stage 2 – Air Quality Impact Assessment	Required	proposed development does not meet the exposure criteria
Stage 3 – Mitigation	Not Required	Proposed development does not have additional parking. The trips associated with the proposed quarry are existing.

4.3 National Planning Policy Framework & Planning Policy Guidance

4.3.1 Section 17 of the National Planning Policy Framework[4] is relevant to minerals. There is no specific mention of dust or air quality, however, Paragraph 210, point f) does state due consideration is needed to protect human health from adverse effects:

"set out criteria or requirements to ensure that permitted and proposed operations do not have unacceptable adverse impacts on the natural and historic environment or human health, taking into account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality"

4.3.2 The Mineral sub-section of the Planning Practice Guidance (PPG) includes an assessment procedure for dust[5]. Paragraphs 23 to 32 outline the approach required for dust assessments:

- Stage 1: establish baseline conditions of the existing dust climate around the site of the proposed operations;
- Stage 2: identify site activities that could lead to dust emission without mitigation;
- Stage 3: identify site parameters which may increase potential impacts from dust;
- Stage 4: recommend mitigation measures, including modification of site design

4.3.3 All four stages are assessed in this report.

4.3.4 Paragraph 32 provides a site assessment flow chart for PM_{10}, indicating PM_{10} should be assessed up to 1 km from the operation.

4.4 Disamenity Dust (10 to 75 µm)

4.4.1 Dust from a mineral operation has the potential to reduce amenity in the local community due to visible dust plumes and dust soiling onto property, which may lead to annoyance and complaint. The generally coarser dust (i.e. visible dust) that leads to these effects is referred to in the IAQM Mineral Guidance[1] as disamenity dust.

4.4.2 The Department of the Environmental Minerals Division[6] defines dust as organic and/or inorganic

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

[5] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government. Planning Practice Guidance, Minerals (https://www.gov.uk/guidance/minerals#Assessing-environmental-impacts-from-minerals-extraction)

[6] Arup Environmental / Ove Arup and Partners, on behalf of Department of the Environment (December 1995). The Environmental Effects of Dust from Surface Mineral Workings, HSMO, 1995.

particles in the size range of 1 to 75 µm. The IAQM Minerals Guidance also notes British Standard 6069 refers to dust up to particle size diameter of 75 µm. Particle sizes below 10 µm are defined in UK air quality legislation as particulate matter (PM_{10} and $PM_{2.5}$).

4.4.3 Guidance, research, and historic planning permission appeals have defined that most coarse dust entrained in the airflow will typically deposit within 100 m of the dust-generating source. The IAQM Minerals Guidance[1] provides quotations from the Bradley and Halton Lea Gate decisions (Appendix 1 of the guidance[1]), which both provided evidence on the basis that up to 95% of airborne dust will deposit within 100 m of the source. The IAQM Minerals Guidance[1] has produced a literature review (Appendix 2 of the guidance[3]) of known and recognised dust transportation distances for different quarry and mining sites across the UK.

4.4.4 These various information sources have informed the IAQM Minerals Guidance[1] screening methodology for assessment, which states an assessment of dust is required if there are sensitive receptors within 250 m of a soft-rock quarry or 400 m of a hard-rock quarry.

4.4.5 Dust may still be present in an airflow beyond these distance of the dust-generating source. However, it is unlikely that it exists in such volume to cause significant annoyance or complaint.

4.4.6 Dust complaint is usually associated with periods of peak deposition that can be exacerbated by meteorological conditions such as prevailing wind patterns and dried out surfaces. The airflow naturally contains dust; however, it is when this 'norm' is exceeded that disamenity dust may become recognisable and lead to complaint; as there may be annoyance caused by the obscuring of surfaces (such as vehicles or window ledges). Nuisance is subjective and what one individual may deem to be significant, another may not. The effect of dust to a community can be attributed to several factors:

- the location of the dust-generating source to the community i.e. prevailing wind directions and downwind orientations;
- duration of site activities that produce dust;
- meteorological conditions, such as dry weather (drying out of surfaces) and wind patterns;
- the frequency of the above three bullet points; and
- the effectiveness of the dust management and controls employed at the source.

4.4.7 Dust can be controlled and mitigated effectively with dust management techniques. A dust management plan is a standard mitigation inclusion on almost all UK land reclamation and earthworks sites, often being employed successfully even when sensitive uses are located within

100 m of the sources.

4.4.8 There are no statutory thresholds for dust deposition or annoyance. The Environment Agency often adopts a custom-and-practice deposition guideline value of 200 mg/m^2/day as a threshold for when complaints may begin to arise. This guideline value is used throughout the UK for mineral and permitted operations.

4.5 Particulate Matter (<10 µm)

4.5.1 Particulate matter is a sub-fraction of dust, comprising particle sizes below 10 µm diameter. UK air quality legislation recognises PM_{10} and $PM_{2.5}$, however, $PM_{2.5}$ is not usually considered in quarry dust assessments. This is due to limited information and research available for dust-related $PM_{2.5}$ emissions. The IAQM Minerals Guidance and PPG state the assessment should focus on PM_{10}. $PM_{2.5}$ is a fraction of PM_{10}, therefore, controlling emissions of PM_{10} will also control $PM_{2.5}$ emissions.

4.5.2 Research published by Vallack et al. (1998)[7] found that from construction-derived dust, only 10% to 15% (by weight) were in the $PM_{2.5}$ fraction size. Defra LAQM.TG (22) provides a methodology for calculating the potential $PM_{2.5}$ contribution of a total PM_{10} concentration. It found a relationship of 0.7 linked the two pollutants. Therefore, where PM_{10} impacts can be concluded as not significant, it is highly likely a similar conclusion can be made for $PM_{2.5}$ too.

4.5.3 Information on the PM_{10} process contribution (PC) from mineral extraction is limited. The IAQM Mineral Guidance[1] has compiled a list of known PC for PM_{10}:

- Local air quality management technical guidance LAQM.TG(03) – mathematical calculation and graphical plot outlined decreasing PM_{10} PC with distance. This is a simplistic mathematical approach and is not based on air quality monitoring evidence. The annual mean PC is classed as variable, up to 5 µg/m^3;
- The Newcastle Study[8] assessed PM_{10} contributions near opencast coal mining sites. This study comprised of long-term monitoring at various distances from the surface mine. A PM_{10} process contribution of 2 µg/m^3 was concluded from the study;
- Committee on Medical Effects of Air Pollutants (2002) – The research concluded that a +14% factor should be applied to the worst-case annual background concentration

4.5.4 H J Banks & Company Ltd has an extensive history of operating surface coal mines in North East

[7] Vallack, H.W. & Shillito, D.E. (1998) 'Suggested Guidelines for deposited ambient dust'. Atmospheric Environment, Vol 32, pp 2737 – 2744

[8] Pless-Mulloli, T. et.al, 2000. Living near opencast coal mining sites and children's respiratory health: Occup Environ Med 2000; Volume 57, pages 145-151 (http://oem.bmj.com/content/57/3/145.full)

England. A scientific study was commissioned by the firm for the former, now restored Shotton surface coal mine located in Northumberland. The King Study[9] included an extensive automatic air quality monitoring network during an operational period of Shotton surface mine. The research concluded that the process contribution was a +7% factor to the worst-case annual background concentration.

4.5.5 The IAQM Minerals Guidance[1] provides a methodology for the assessment of PM_{10}. The guidance states:

"*If the long-term background PM_{10} concentration is less than 17 $\mu g/m^3$ there is little risk that the Process Contribution (PC) would lead to an exceedance of the annual-mean objective and such a finding can be put forward qualitatively, without the need for further consideration, in most cases.*"

4.5.6 Further steps and assessment is required if the annual mean concentration is above 17 $\mu g/m^3$, which is described in the guidance. The IAQM Mineral Guidance[1] recommends the assessment focus on the annual mean objective, rather than short-term objective due to limited published data and evidence for short-term contributions.

5 Methodology

5.1 Data Sources

5.1.1 The air quality assessment has been undertaken and prepared with reference to information from several sources, as detailed in **Table 3**.

Table 3: Key Information Sources

Data Source	Reference
Kirklees Council (KC)	KC (2022) *2022 Air Quality Annual Status Report*
West Yorkshire	Air Quality & Emissions Technical Planning Guidance (Part of West Yorkshire Low Emissions Strategy)
Institute of Air Quality Management (IAQM)	IAQM (2016) *Guidance on the Assessment of Mineral*

[9] King A. M. (2010) Shotton (Revised) Surface Mine: Review of Dust Monitoring Strategy

Data Source	Reference
	Dust Impacts for Planning
Department for Environment Food and Rural Affairs (Defra)	Defra *Local Air Quality Management Technical Guidance TG (22), August 2022*
Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM)	EPUK and IAQM (January 2017) *Land Use Planning and Development Control: Planning for Air Quality (v1.2)*
Ministry of Housing, Communities & Local Government	Planning Practice Guidance: Air Quality, November 2019 National Planning Policy Framework (NPPF), September 2023
Defra's LAQM Support Tools	Local Air Quality Management 1 km x 1 km grid background pollutant maps NOx to NO_2 Calculator
Air Pollution Services	3-year averaged dry-day (<0.2 mm rainfall) meteorological data from Emley Moor for 2019 to 2021

5.2 Consultation

5.2.1 The proposed air quality assessment methodology was sent to KC[10]. It was agreed that an assessment will be completed as per the IAQM Minerals Guidance using the source-pathway-receptor methodology, and that a 250 m soft-rock screening criterion will be applied.

5.2.2 The response from KC Environmental Health (Pollution & Noise Control)[11] stated:

"We acknowledge the submission of an Air Quality and Dust Assessment by Miller Goodall (ref:102882) (dated: 17th January 2023) to support the application. Whilst we agree in principle with

[10] Email sent to KC by MGL on 12th January 2023 and from KC (Rebecca Muff) to MGL on 16th January 2023 and then on 3rd October 2023

[11] Consultation Response (Ref: WK/202328680) on 21st September 2023

the methodology of the Air Quality and Dust Assessment, we do not agree with the approach taken as it is based an extension to an existing quarry and not a new quarry operation as proposed. Therefore, before the application is determined we require an Air Quality and Dust Assessment that reflects all operations associated with a new quarry, which includes all anticipated daily HGV movements to and from the site."

5.2.3 Therefore, this revised assessment includes a detailed traffic emissions assessment. This was also confirmed by EHO.

5.3 Road Traffic Emissions Assessment

5.3.1 The proposed quarry operations could lead up to a maximum 60 loads per day. This would equate to 120 heavy-duty vehicle (HDV) two-way traffic movements to and from the quarry to Crow Edge.

5.3.2 The proposed development is outside of an AQMA and the HDV generation is more than 100 HDV AADT, therefore, a detailed modelling assessment has been completed to assess the potential for air quality changes arising from development traffic using the following methodology.

Air Dispersion Model

5.3.3 The validated Atmospheric Dispersion Modelling System for Roads (ADMS-Roads) v5.0.1.3 was used to assess the local air quality impact of development-generated vehicle exhaust emissions on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at existing receptors located adjacent to the assessed road network.

Assessment Scenarios

5.3.4 The assessment considered the following scenarios:

- Scenario 1: 2019 - base year;
- Scenario 2: 2024 - opening year 'without development'; and
- Scenario 3: 2024- opening year 'with development'.

Traffic Data

5.3.5 The spatial scope for the assessment focused on those routes affected by the proposed development. The traffic data used in the assessment and a map of the road network is provided in **Appendix B**.

5.3.6 Vehicles within the study area have been modelled at posted speed limits apart from the approach

to junctions where queuing traffic sections are included in the model at 5 to 20 kph where appropriate following Defra guidance.

5.3.7 LAQM.TG (22) recommends temporal variations to be considered within air quality modelling. Therefore, a 7-day profile based on the Department for Transport's statistics was used within the model.

Meteorological Data

5.3.8 Meteorological data for 2019 from the Emley Moor recording station was used in the ADMS-Roads model. This is the most representative recording station for the development site.

5.3.9 The wind rose for 2019 from Emley Moor recording station is provided in **Appendix B**. Dispersion values for the site and meteorological station have been used. The factors applied for surface roughness (m) and the minimum monin-obukhov length (m) are outlined in **Appendix B**.

Sensitive Receptors

5.3.10 Four existing vehicle sensitive receptor (EVSR) locations were selected based on their proximity to road links affected by the proposed development's HDV movements, where the potential effect of development-related traffic emissions on local air pollution would be most significant.

5.3.11 Predicted changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations, as a result of development-generated traffic, were calculated at these locations. The EVSR receptor locations are detailed in **Table 4** and shown in **Appendix A**.

Table 4: Existing Sensitive Receptor Locations

Receptor	Grid Ref	
EVSR1	421288	408522
EVSR2	421304	408491
EVSR3	421215	408538
EVSR4	421143	408590

Conversion of NOx to NO_2

5.3.12 Oxides of nitrogen (NO_x) concentrations were predicted using the ADMS-Roads model. The modelled road contribution of NO_x at the identified receptor locations was then converted to NO_2

using the NO_x to NO_2 calculator (v8.1, 2020)[12] following Defra guidance.

Emission Factors

5.3.13 Defra's Emission Factor Toolkit (EFT)[13] (V11.0, 2021) was used within the ADMS-Roads model to predict emissions from road vehicles for all scenarios.

Background Concentrations

5.3.14 The ADMS model requires the derivation of background pollutant concentration data that are factored to the year of assessment, to which the contributions from the assessed roads are added.

5.3.15 There are no background monitoring locations in the vicinity of the proposed development and receptor locations, therefore background NO_x, NO_2, PM_{10} and $PM_{2.5}$ concentrations were obtained from the Defra LAQM support tools for the 1 km x 1 km grid squares covering the proposed development site and receptor locations for the years of assessment (2019 and 2024).

Model Verification

5.3.16 Model verification is the process of adjusting model outputs to improve the consistency of modelling results with respect to available monitored data.

5.3.17 Verification has been undertaken for NO_2. The verification procedure considers diffusion tube of K85. The location of this air quality monitoring site is shown in **Appendix A**. The verification procedure and derived factor is provided in **Appendix B.**

5.3.18 There is no PM_{10} or $PM_{2.5}$ monitoring undertaken within the study area, therefore it was not possible to undertake verification for particulate matter concentrations.

Assessment Significance Criteria

5.3.19 Guidance is provided by EPUK and IAQM[2] on criteria for determining the significance of a development's impact on local air quality. **Table 5** details the impact descriptors used for individual receptors in relation to annual mean pollutant concentrations. The overall significance of impacts was determined using professional judgement. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.

[12] Background maps. Tools. Local Air Quality Management Support - Defra, UK

[13] Emissions Factors Toolkit (defra.gov.uk)

Table 5: Impact descriptors for individual receptors

Long term average Concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)*			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

*AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'

5.4 IAQM Minerals Guidance Methodology

5.4.1 The IAQM has produced guidance[1] on the assessment of air quality impacts from dust associated with mineral excavation activities and provides a methodology by which to complete such assessments.

5.4.2 The first stage of the guidance is to determine the scale of assessment needed by reviewing whether there are sensitive receptors within distances of either 250 m of soft-rock extraction or 400 m of hard-rock extraction. This distance should be drawn from a dust-generating sources, rather than the site boundary.

5.4.3 Clay will be extracted at the extension which is a soft-rock so a distance of 250 m is used. There are sensitive receptors located within 250 m of the dust-generating activities. Further assessment is required as it is not possible to screen out effects.

5.4.4 The potential air quality impacts of disamenity dust and particulate matter during the extraction timeframe have been assessed using the source-pathway-receptor methodology of the IAQM Minerals Guidance[1].

5.4.5 The source for various activities is calculated as either small, medium or large depending on the scale of the activities. The IAQM Minerals Guidance[1] includes various parameters to consider in the

selection of the risk. Residential receptors are classed as highly sensitive.

5.4.6 The pathway has been assessed by calculating the amount of time sensitive receptors may be downwind of each dust-generating operation, across all Phases of working for the various operations. A semi-quantitative meterological assessment has been completed using a dry-day wind dataset (<0.2 mm rainfall) for Emley Moor Meteorological Station to calculate the pathway effectiveness when receptors would be downwind during the working hours of the quarry. Dust will not be generated during damp conditions or rainfall, neither will there be significant dust generation when operations cease.

5.4.7 The source-pathway-receptor are combined to calculate the risk of dust effects. It should be noted that quarries will often always deploy mitigation regardless of the risk and impact; often in the form of a dust management plan. The matrixes listed in the guidance are used to classify the risk.

5.4.8 The IAQM Minerals Guidance[1] advises calculating the pathway effectiveness above 5 m/s only, which often dismisses a significant proportion of the overall wind dataset. For the Emley Moor dataset used in this study, 46% of the dataset is in the <5 m/s category.

5.4.9 Wind speeds above 5 m/s can raise dust from the surfaces and contribute to eroding of a surface, whereas winds below 5 m/s are usually incapable of raising dust from a surface. However, dust raised into the air (such as vehicle movements or unloading) can be carried by winds below 5 m/s. Often the inclusion of mitigation (such as wheel washes and low drop height unloading) will reduce the risk of dust being raised into the air. The percentage of winds below 5 m/s is shown for reference in this assessment.

5.4.10 The methodology for the assessment is shown in **Appendix C.** The findings of the source-pathway-receptor assessment are detailed in Section 7 of this report.

Sensitive Receptors

5.4.11 Sensitive receptors are located within 250 m of a potential dust-generating operation at the extension. These two sensitive receptors located to the north west (Lane Side Farm) and south east (Bluehills Lane) of the extension.

5.4.12 There are residential receptors to the north east at Top Road as well west at Cumberworth Lane, however the distances of these are above 250 m so these have been screened out from the assessment.

5.4.13 Existing Dust Sensitive Receptor (EDSR) locations are detailed in **Table 6** and shown in **Appendix A**.

Table 6: Existing Sensitive Receptor Locations

Receptor	Grid Ref (x, y)		Sensitivity	Distance to Site Boundary
EDSR 1 (Lane Side Farm)	421486	409108	High	40 m
EDSR 2 (Lane Side Farm)	421448	409057	High	100 m
EDSR 3 (Bluehills Lane)	422293	408952	High	215 m
EDSR 4 (Bluehills Lane)	422293	408983	High	210 m
EDSR 5* (Cumberworth Lane)	421326	408904	High	292 m

*included for the on-site trackout risk assessment only, as the access route is within 250 m of this receptor

6 Baseline Environment

6.1 Local Air Quality

6.1.1 Bromley Farm Quarry is located in a rural area, on the outskirts of Bromley Farm Quarry. The quarry and local area are surrounded by arable farming. There are no major sources of pollution, urban areas or areas where vehicle congestion will occur near the quarry. Baseline air quality concentrations are expected to be similar to the background concentrations, detailed in Section 6.2.

6.1.2 KC operates an air quality monitoring network, however, it is located in urban areas where the risk of air pollution exceedances is greatest. The nearest air quality monitor from the quarry is 5.5 km to the north of the quarry. There is no air quality monitoring data near the site, however, as discussed concentrations are unlikely to be elevated due to the site's rural location.

6.2 Background Concentrations

6.2.1 There are no background monitoring locations in the vicinity of the proposed development site. The PM_{10} concentration has been obtained from the background concentration maps provided by Defra[14] for the grid square covering the sensitive receptors and quarry. The background

[14] http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

concentration is shown in **Table 7**.

Table 7: Background Pollutant Concentrations Obtained for the 1km x 1km Grid Squares Covering the Site and Receptor Locations*

Grid Square	Pollutant	2019 ($\mu g/m^3$)	2024 ($\mu g/m^3$)
419500, 409500	NO_2	8.22	6.91
	PM_{10}	9.84	9.26
	$PM_{2.5}$	6.34	5.90
421500, 408500	NO_2	7.59	6.36
	PM_{10}	11.65	10.93
	$PM_{2.5}$	6.41	5.96

** Background concentrations obtained from the latest 2018-based background maps*

6.3 Meteorological Data

6.3.1 To provide quantification of how sensitive receptors might be affected by dust deposition caused by local weather conditions, a 3-year averaged dry-day wind frequency dataset for 2019 to 2021 (<0.2 mm hourly rainfall) has been obtained from Air Pollution Services for the Emley Moor meteorological station. This dataset excludes rainfall, as dampened and wet surfaces are unlikely to raise significant levels of dust. This station is considered to be the most representative of the site.

6.3.2 Wind speeds below 0.5 m/s (i.e. calm) are not expected to hold or raise significant levels of dust, therefore, these are excluded from the calculation. The Beaufort Scale specifies intensity value 4 ('moderate breeze') as being able to raise loose dust from an exposed surface[15] which is defined as approximately 5.5 m/s to 8 m/s. Wind speeds above 17 m/s are generally considered to be capable of eroding a surface and may generate significant levels of dust into the airflow.

6.3.3 Whilst wind speeds above 5 m/s are considered capable to raise dust from a surface, wind speeds below 5 m/s are still an important consideration as they may carry dust that is already entrained or lifted into an airflow above the surface; for example, dust generated from unloading activities, or breaking of the rock face with the excavator. The effects of this can often be mitigated by reducing the level of dust raised from the operation.

6.3.4 To calculate the pathway, the dust analysis includes two wind speed categories and 12 compass directions (wind direction indicates the direction wind has originated from):

[15] Royal Meteorological Society, 2018. https://www.rmets.org/resource/beaufort-scale

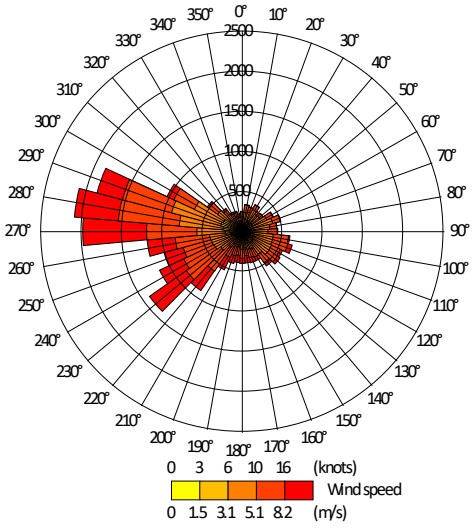
- < 5 m/s wind speed: movement of dust in the airflow; and
- > 5 m/s wind speed: some and/or potentially significant erosion and lifting of dust from a surface.

6.3.5 The percentages of wind from the Emley Moor dry-day 2019 to 2021 dataset are shown in **Table 8**.

Table 8: Wind Frequency Percentage (<0.2 mm Rainfall) for Emley Moor

Degree Arc	Compass Direction	<5 m/s	> 5m/s	Total Percentage of Wind
Incomplete/Missing Data/Calm Winds (<0.5 m/s)	-	-	-	5.56%
348.75°- 11.25°	N	2.23%	0.85%	3.08%
11.25°- 33.75°	NNE	2.10%	0.54%	2.64%
33.75°- 56.25°	NE	2.08%	0.44%	2.53%
56.25°- 78.75°	ENE	2.75%	0.95%	3.69%
78.75°- 101.25°	E	4.01%	1.96%	5.97%
101.25°- 123.75°	ESE	3.09%	1.69%	4.78%
123.75°- 146.25°	SE	2.88%	1.45%	4.33%
146.25° - 168.75°	SSE	1.87%	1.36%	3.23%
168.75° - 191.25°	S	2.40%	2.29%	4.69%
191.25° - 213.75°	SSW	1.48%	2.31%	3.79%
213.75° - 236.25°	SW	2.06%	7.08%	9.14%
236.25° - 258.75°	WSW	2.95%	5.56%	8.51%
258.75° - 281.25°	W	6.70%	14.21%	20.91%
281.25° - 303.75°	WNW	6.08%	5.54%	11.62%
303.75° - 326.25°	NW	2.41%	1.07%	3.48%
326.25° - 348.75°	NNW	1.41%	0.65%	2.06%
Totals		**46.50%**	**47.94%**	**100.00%**

Figure 1: Dry-data (<0.2 mm) Wind Rose for Emley Moor



6.3.6 The dominant wind direction is from the west and south-west.

6.3.7 The sensitive receptors are located to the north, east, south-east and west of the extension.

7 Operational Phase Assessment – Disamenity Dust and Particulate Matter

7.1.1 The assessment has been assessed to the source-pathway-receptor methodology.

Source

7.1.2 The main activities and sources of dust at UK quarrying sites are similar. The IAQM Minerals Guidance[1] groups these activities as:

- site preparation/restoration;
- mineral extraction;
- material handling;
- on- and off-site transportation (haul roads, site access routes, public highway road network);
- mineral processing (e.g. mobile screening plant); and
- stockpiling/exposed surfaces.

7.1.3 Site preparation includes the removal of the top soil layers, which is similar to restoration as both can be likened to earthwork activities. All these activities will be carried out at the extension except any mineral processing. There is no mineral processing (mobile screening etc.) to be carried out at the quarry as all extracted material will be sent to Crow Edge for clay pipe manufacture.

7.1.4 The activities may involve the use of different equipment in different areas of the quarry, however, it is recognised that several activities will often overlap. For example, the top surface layer is removed (site preparation), the mineral is extracted at the rock face (mineral extraction) and is then deposited into dumper trucks (material handling). These activities are carried out in the same location, therefore, producing a similar or identical pathway calculation.

7.1.5 The scale of each source is calculated and assigned as either small, medium or large, using the methodology outlined in the IAQM Minerals Guidance[1].

7.1.6 A summary of each source risk is shown in **Table 9**. The reasoning for each risk rating is described in **Appendix D**, as well as further site-specific details of where, when and why each activity may occur.

Table 9: Summary of Activity Source Risks

Activity	Risk
Site preparation/restoration	Small
Mineral extraction	Small
Material handling	Small
On-site transportation	Small
Off-site transportation	N/A*
Mineral processing	N/A
Stockpiling/exposed surfaces	Small

* off-site transportation does not alter from the existing baseline and does not require further assessment.

Pathway

7.1.7 The pathway effectiveness considers the time sensitive receptors that may be exposed to dust emissions from each source and in each phase of the development, using a semi-quantitative meteorological assessment. This calculation procedure considers the operational hours, as outside of this period there is unlikely to be significant levels of dust raised. It also assumes annual working for ease of the annual meteorological dataset calculations and to produce a worst-case assessment. In reality, the quarry is only expected to be worked between March to September on a campaign basis. The reduced working schedule will also lower the overall risk associated with dust generation.

7.1.8 Operating hours will be the same as the previous quarry as below:

- Monday to Friday – 07:30 to 18:00
- Saturday – 07:00 to 13:00
- No working on Sundays or bank holidays.

7.1.9 The quarry is operational for 2,990 hours per year.

7.1.10 By the process of a pro-rata calculation, the number of operational hours in each wind category and compass direction at Emley Moor (determined from **Table 8**) can be calculated to determine the number of hours when dry winds may blow from each direction for a typical operational year, as shown in **Table 10**.

Table 10: Dry Day Wind Frequency Analysis - Working Hours per Year

Degree Arc	Compass Direction	Operational Hours		
		Hours <5 m/s	Hours > 5m/s	Total Hours (per year)
348.75°- 11.25°	N	67	25	92
11.25°- 33.75°	NNE	63	16	79
33.75°- 56.25°	NE	62	13	76
56.25°- 78.75°	ENE	82	28	110
78.75°- 101.25°	E	120	59	179
101.25°- 123.75°	ESE	92	51	143
123.75°- 146.25°	SE	86	43	129
146.25° - 168.75°	SSE	56	41	96
168.75° - 191.25°	S	72	68	140
191.25° - 213.75°	SSW	44	69	113
213.75° - 236.25°	SW	62	212	273
236.25° - 258.75°	WSW	88	166	254
258.75° - 281.25°	W	200	425	625
281.25° - 303.75°	WNW	182	166	347
303.75° - 326.25°	NW	72	32	104
326.25° - 348.75°	NNW	42	19	62
Total Hours		**1,390**	**1,433**	**2,824 ***

*Total hours do not equal 2,990 due to the exclusion of the calm winds and missing/incomplete data (that account for 5.56% of the dataset, Table 5).

7.1.11 Sensitive receptors will be downwind of a source in a specific orientation and direction, this can be termed a degree arc. This is the degree angle when the source and sensitive receptor align. Outside of this degree arc, the winds would transport dust away from the sensitive receptor location (taken as 360° with north at 0° reference). In accordance with the IAQM Minerals Guidance[1], only dust-generating operations within 250 m of the sensitive receptor require assessment.

7.1.12 The on-site transportation haul route enters the extension in the southwest, travels northwards along the western boundary (bordering Phase 1), and then makes a 90° clockwise turn (adjacent to the bund) in the northern part of the extension. For each subsequent Phase, the haul route extends eastwards from this 90° turn and enters the void of each Phase from the north.

7.1.13 Several activities can be grouped as they overlap and will work the same locations. The quarry will be worked west to east and follows a broadly straight line for each successive phase. Consequently, the degree arcs between the different phases are very similar. The assessment

considers the entirety of the quarry and all phases as a single assessment.

7.1.14 The degree arcs between the EDSR and each source to be assessed are shown in **Table 11.**

Table 11: Degree Arcs to Sensitive Receptors

Receptor	Site Preparation/Extraction /Restoration	On-site Transportation
EDSR 1	59 - 122°	60 - 220°
EDSR 2	55 - 101°	60 - 220°
EDSR 3	266 - 279°	N/A
EDSR 4	272 - 288°	N/A
EDSR 5	N/A	45 - 138°

N/A indicates the dust source is located more than 250 m from the sensitive receptor

7.1.15 The percentage of time-sensitive receptors that would be downwind of the sources for a typical operational year has been calculated.

7.1.16 The degree arcs cover the maximum boundaries of the different sources. This assumes, for example, that the entire void of each Phase is being worked, which would not occur during the day-to-day working of the extension, given the quarry is to be worked over a 25 year timespan.

7.1.17 The result does not equate to actual periods of time when a sensitive receptor would be impacted, but merely the maximum amount of time-based on the recorded 3-year average meteorological statistics of the Emley Moor meteorological station. The calculation is based on the probability of the specific dry-day wind direction occurring for a constant period of time, which is not likely to occur in the real world.

7.1.18 The results of the pathway effectiveness are shown in **Table 12.** The dust effect has been assessed using the IAQM Minerals Guidance matrixes, as outlined in **Appendix C** of this report.

Table 12: Pathway Effectiveness Calculations

Receptor	Degree Arc (°)	Distance to Source (m) and IAQM Category	Percentage (%) of dry-wind <5 m/s	Percentage (%) of dry-wind >5 m/s	Number of Days Per Month When Winds Blow from Source to	Frequency	Pathway Effectiveness	Dust Impact Risk*	Magnitude of Dust Effects**
Site Preparation / Restoration/Extraction All Phases									
EDSR 1	59 - 122°	70 (Close)	10%	5%	1.50	Infrequent	Ineffective	Negligible risk	**Negligible effect**
EDSR 2	55 - 101°	115 (Intermediate)	7%	3%	1.00	Infrequent	Ineffective	Negligible risk	**Negligible effect**
EDSR 3	266 - 279°	235 (Distant)	7%	14%	2.17	Frequent	Moderately Effective	Negligible risk	**Negligible effect**
EDSR 4	272 - 288°	235 (Distant)	13%	20%	3.38	Frequent	Moderately Effective	Negligible risk	**Negligible effect**
On-Site Trackout									
EDSR 1 & EDSR 2	60 - 220°	30 (Close)	21%	19%	4.11	Frequent	Highly Effective	Low risk	**Slight adverse effect**
EDSR 5	45 - 138°	40 (Close)	15%	6%	2.21	Moderately Frequent	Moderately Effective	Negligible risk	**Negligible effect**

*Calculated by combining the pathway effectiveness and the source risk (Table B5, Appendix C)

**Calculated by combining the dust impact risk and receptor sensitivity (Table B6, Appendix C)

The number of days statistic is the time period when winds may blow in the degree arc for an average operational month for all wind speeds >0.5 m/s.

7.1.19 It should be noted that vehicles using the haul route are transient, but have been assessed as a continuous source of emission in the above risk assessment. This would not be the case, as the vehicles would quickly leave the area, and mitigation will also be employed to reduce the risk of dust generation along the trackout route.

7.1.20 It is important to recognise that the pathway calculation is a worst-case exposure calculation. Several factors will reduce the potential for dust generation during the day-to-day working of the extension:

- Mineral extraction will be carried out in the quarry void. Wind speed and patterns will be disrupted by the presence of the void and void walls, which will ultimately assist to reduce the amount of dust leaving the void.
- Continuous working in a single location. Per day and hourly, the operations will move and activities will alter. For example, activities may be carried out beyond 250 m for variable periods of the day, or even years given the campaign extraction activities. As the Phases progress, the activities will move further away from sensitive receptors.
- Transient use of the on-site routes. This includes transient use, vehicles only taking minutes to travel the route and extended periods when no vehicle is using the haul route. The pathway calculation considers the entire route (degree arc) as a continuous dust emission source, which is an overestimation.
- Daily wind pattern variations. The assessment assumes one continuous directional movement for a prolonged period. Wind directions will alter over minutes and hours, reducing the overall likelihood of prolonged dust transportation in any single direction.
- Obstructions such as trees can act as a blockage to wind, causing the wind speed to lower and the obstructions themselves causing the winds to divert into different directions. This may be sufficient to cause some of the airborne dust to deposit out of the airflow and/or limit the dust being raised in the first place. Trees and vegetation occupy the land between the extension and EDSRs 3 and 4.
- The calculation assumes dust may freely travel based on no mitigation being employed. Mitigation, particularly dampening, will significantly reduce the likelihood of dust being available to travel beyond the site boundaries. Daily visual dust inspections will monitor the situation and inform mitigation during day-to-day operations.

7.1.21 The potential dust effects derived from the calculation indicate that all source activities at each sensitive receptor will have a **negligible dust effect**. On-site transport, for EDSR 1 and 2, is concluded to meet a slight adverse effect. However, as described above the risk from this activity will be negligible due to the transient use of the dust source.

7.1.22 The inclusion of dust mitigation is sufficient to ensure negligible effects are achieved throughout the working of the extension at Bromley Farm Quarry. The inclusion of a dust management plan is a standard mitigation strategy for mineral development proposals. A Dust Mitigation Plan is provided in **Appendix E**.

Particulate Matter Impact from Mineral Working

7.1.23 The IAQM Minerals Guidance[1] provides a methodology for the assessment of PM_{10} from mineral working operations. PPG requires an assessment up to 1 km from the development. PM_{10} background concentrations have been obtained for the local area, as outlined in **Table 7**.

7.1.24 The IAQM Minerals Guidance provides a 5-step procedure for the assessment of particulate matter and process contribution. The guidance specifies the focus should be on PM_{10} and the annual mean only, due to insufficient research and data to inform the short-term objective or $PM_{2.5}$.

7.1.25 Step 1 of the methodology is a screening assessment. A detailed assessment, and continuation to steps 2 to 5, are only required if the background PM_{10} annual mean is above 17 µg/m^3.

7.1.26 The 2022 annual mean is less 12 µg/m^3, and therefore does not require further assessment. It should be noted that Bromley Farm Quarry was operational when the Defra background maps were prepared in 2018 and it is likely a quarrying contribution was included for the 1km*1km grid square where the quarry resides.

8 Road Traffic Assessment

8.1 Baseline Assessment

8.1.1 The ADMS-Roads model was used to estimate contributions of vehicle exhaust emissions to annual NO_2, PM_{10} and $PM_{2.5}$ concentrations for the '*baseline*' and '*without development*' scenarios considered in the assessment.

8.1.2 The 24-hour AADT flows used in the assessment are detailed in **Appendix E**. **Table 13** details the results of the baseline assessment.

Table 13: Predicted Baseline NO_2, PM_{10} and $PM_{2.5}$ Annual Mean Concentrations (µg/m³) at Existing Sensitive Receptor Locations

Receptor	Receptor Height above Ground Level (m)	Scenario 1: Base Year (2019)			Scenario 2: Without Development (2024)		
		NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
EVSR 1	1.5	9.87	11.92	6.56	7.74	11.20	6.11
EVSR 2	1.5	10.12	11.94	6.58	7.88	11.23	6.12
EVSR 3	1.5	10.11	11.94	6.58	7.88	11.22	6.12
EVSR 4	1.5	10.89	12.04	6.63	8.35	11.32	6.17
		Annual Mean NO_2 & PM_{10} Air Quality Objective				**40 (µg/m³)**	
		Annual Mean $PM_{2.5}$ Target Level Objective				**25 (µg/m³)**	

8.1.3 The baseline air quality assessment for the base year (2019) and opening year *'without development'* (2024) scenarios indicate that concentrations of NO_2, and PM_{10} are below the respective annual mean air quality objectives and the $PM_{2.5}$ annual mean target at all sensitive receptors assessed.

8.2 Impact Assessment

Existing Vehicle Sensitive Receptors

8.2.1 Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations for the opening year (2024) 'with development' scenario at four ESR locations are detailed in **Table 14, Table 15 and Table 16**. The predicted change in NO_2, PM_{10} and $PM_{2.5}$ concentrations at existing sensitive receptors between the 'without development' and 'with development' scenarios were compared to the significance criteria detailed in EPUK and IAQM guidance2 and contained within **Table 5**.

Table 14: NO_2 Dispersion Modelling Results and Significance of Development for the Opening Year (2024) Scenario at Existing Receptor Locations

Receptor	Without Development µg/m³	Concentration with Development µg/m³	Impact µg/m³	% of AQAL with Development	% Change relative to AQAL	Impact Descriptor
EVSR 1	7.74	7.78	0.04	19.45%	0.10%	**Negligible**

Receptor	Without Development µg/m³	Concentration with Development µg/m³	Impact µg/m³	% of AQAL with Development	% Change relative to AQAL	Impact Descriptor
EVSR 2	7.88	7.93	0.05	19.83%	0.13%	**Negligible**
EVSR 3	7.88	7.93	0.05	19.83%	0.13%	**Negligible**
EVSR 4	8.35	8.41	0.06	21.03%	0.15%	**Negligible**
			Annual Mean NO_2 Air Quality Objective		**40 (µg/m³)**	

Table 15: PM_{10} Dispersion Modelling Results and Significance of Development for the Opening Year (2024) Scenario at Existing Receptor Locations

Receptor	Without Development µg/m³	Concentration with Development µg/m³	Impact µg/m³	% of AQAL with Development	% Change relative to AQAL	Impact Descriptor
EVSR1	11.20	11.21	0.01	28.03%	0.03%	**Negligible**
EVSR2	11.23	11.24	0.01	28.10%	0.02%	**Negligible**
EVSR3	11.22	11.24	0.02	28.10%	0.05%	**Negligible**
EVSR4	11.32	11.34	0.02	28.34%	0.05%	**Negligible**
			Annual Mean PM_{10} Air Quality Objective		**40 (µg/m³)**	

Table 16: $PM_{2.5}$ Dispersion Modelling Results and Significance of Development for the Opening Year (2024) Scenario at Existing Receptor Locations

Receptor	Without Development µg/m³	Concentration with Development µg/m³	Impact µg/m³	% of AQAL with Development	% Change relative to AQAL	Impact Descriptor
EVSR1	6.11	6.12	0.01	24.46%	0.04%	**Negligible**
EVSR2	6.12	6.13	0.01	24.53%	0.04%	**Negligible**
EVSR3	6.12	6.13	0.01	24.53%	0.04%	**Negligible**

Receptor	Without Development µg/m³	Concentration with Development µg/m³	Impact µg/m³	% of AQAL with Development	% Change relative to AQAL	Impact Descriptor
EVSR4	6.17	6.18	0.01	24.74%	0.04%	**Negligible**
			Annual Mean $PM_{2.5}$ Target Level Objective		**25 (µg/m³)**	

8.2.2 The results of the ADMS-Roads modelling assessment for 2024 indicate that annual mean concentrations of NO_2 and PM_{10} would be below the respective annual objectives as well as the $PM_{2.5}$ annual mean target in 2024, at all existing sensitive receptor locations within the study area, for both 'with' and 'without' the development.

8.2.3 Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ are expected to have an increase of less than 0.15% at all existing sensitive receptors assessed. It is likely that concentrations predicted at individual receptor locations are also representative of worst-case exposure as they are close to the main junctions used by development traffic. The proposed development is therefore predicted to have a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2024.

9 Summary of Impacts and Conclusion

9.1 This air quality and dust report assesses the potential changes in air quality due to the working of the extension at Bromley Farm Quarry and whether these potential changes would significantly alter air quality.

9.2 A semi-quantitative meteorological assessment for disamenity dust using the source-pathway-receptor methodology has concluded there are negligible and not significant effects at five existing dust-sensitive receptors that are located within 250 m of the extension.

9.3 An assessment of particulate matter increases from the extension has been undertaken. It is concluded there is minimal risk of PM_{10} impacts associated with the working of the extension.

9.4 The existing dust management plan that is used for Bromley Farm Quarry is considered suitable and sufficient to control dust generation at the extension. The document will be updated with general details to reflect the new working location; however, the dust control and management are considered to be sufficient to ensure dust is controlled during the working of the extension.

9.5 Concentrations of NO2 and PM10 are likely to be below their respective long and short-term objectives at the proposed development site which is therefore considered suitable for residential/ commercial use with regards to air quality. Concentrations of PM2.5 are expected to be below the annual mean target.

9.6 The proposed development is not expected to have a significant impact on local air quality.

9.7 There is, therefore, no reason for this application to be refused on the grounds of air quality or dust.

APPENDICES

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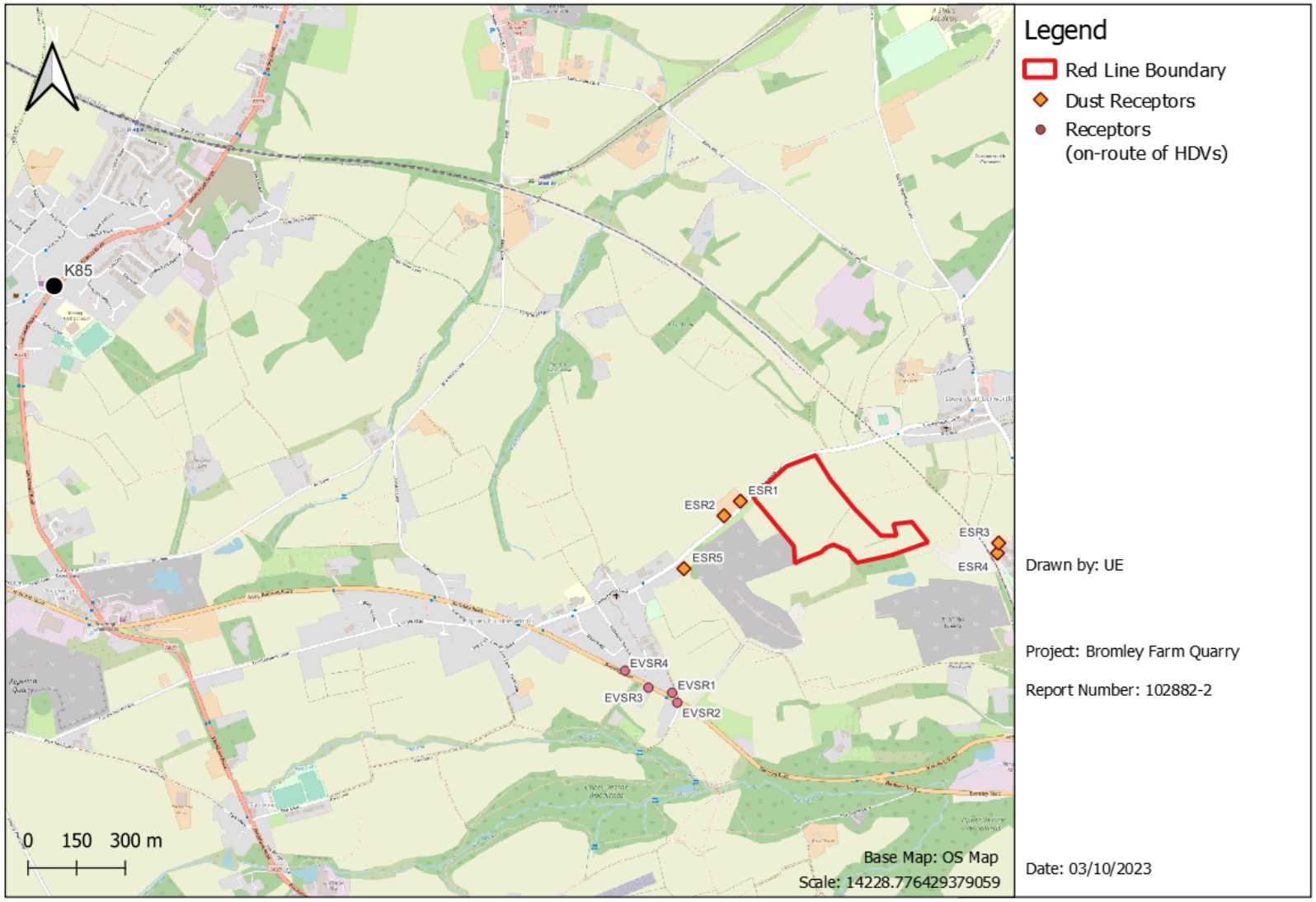
Appendix A: Site Location, Monitoring Location and Receptors



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Appendix B: Assessment and Model Inputs

This appendix outlines the inputs used in the road traffic emissions assessment.

Traffic Data

The ADMS-Roads model requires the inclusion of detailed road traffic data for the routes to be affected by the proposed development.

Traffic data has been taken from the Department for Traffic[16] which have been converted provided as 24-hour Annual Average Daily Traffic (AADT) and heavy-duty vehicle percentages (HGV%). No average speed traffic survey information was available, therefore, posted speed limits have been utilised in the model. Areas of congestion, queuing and junction locations have been modelled at reduced speeds of 5 to 20 km/h. A Tempro growth factor was calculated for the opening year (1.0259 from 2019 to 2024) to account for future expected increase in traffic generation.

The HDVs are proposed to go to and from Crows Edge. The haulage route is shown in **Figure B1**.

The traffic data used in the assessment is detailed in **Table B1** and presented in **Figure B1**.

Table B1: Traffic Data used in the Assessment

Link Number	Road	Speed (km/h)	2019 Base Year/Verification		2024 Base Year		2024 With Development	
			AADT LDV	AADT HDV	AADT LDV	AADT HDV	AADT LDV	AADT HDV
1	A635	64	7,685	4.3%	7,884	4.3%	8,004	4.3%

[16] https://roadtraffic.dft.gov.uk

2	A629	48	10,117	4.6%	10,379	4.6%	10,379	4.6%
3	Station Road	48	1,891	0.6%	1,940	0.6%	1,940	0.6%
4	Quarry Access (Private Road)	5			N/A		0	120

Figure B1: HDVs Haulage Route

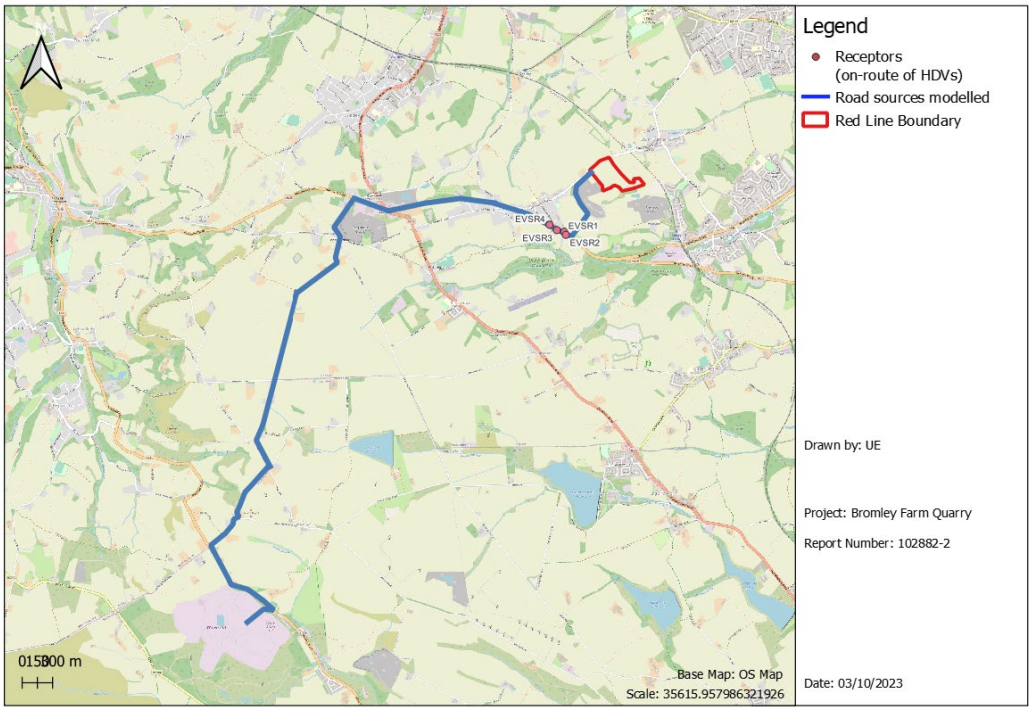


Figure B2: Spatial modelling scope including verification site and the receptors

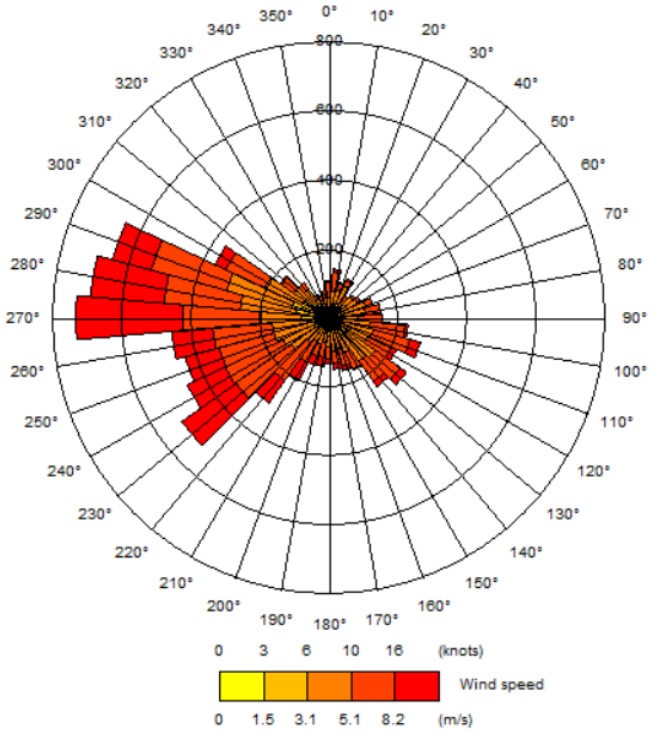
Meteorological Data

The air quality assessment includes the use of the 2019 Emley Moor meteorological recording station.

The Emley Moor recording station is located approximately 5 km to the north of the quarry site and is considered to be the most representative of the site conditions in terms of altitude and distance.

The 2019 wind rose for Emley Moor recording station is provided in **Figure B3**.

Figure B3: Wind Rose



Dispersion and Meteorological Site Characteristics

The air dispersion characteristics for the site and meteorological recording station differ, therefore, these have been adjusted accordingly within ADMS-Roads. **Table B2** details the adjustments made.

Table B2: Dispersion and Meteorological Site Characteristics

Parameter	Dispersion Site	Meteorological Site
Surface Roughness	0.2 m	0.2 m
Surface Albedo	0.23	0.23
Minimum Monin-Obukov Length	30 m	30 m
Priestley-Taylor Parameter	1	1

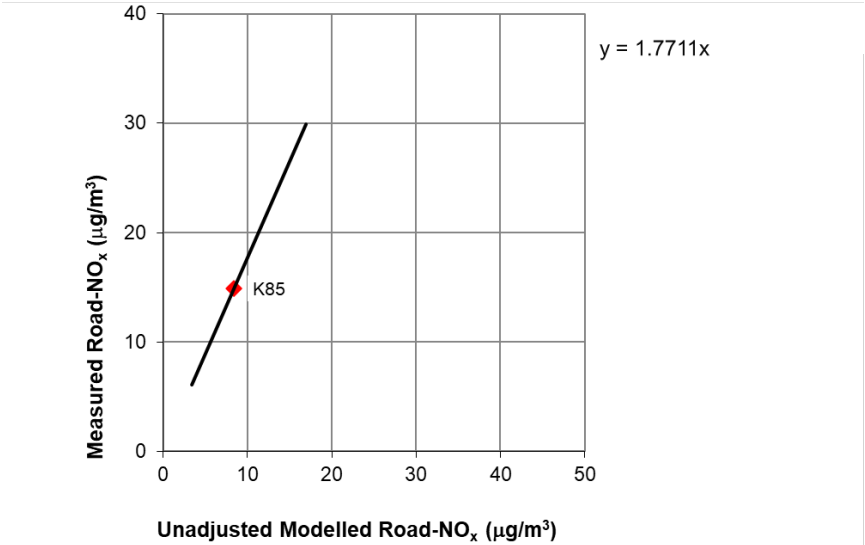
Model Verification

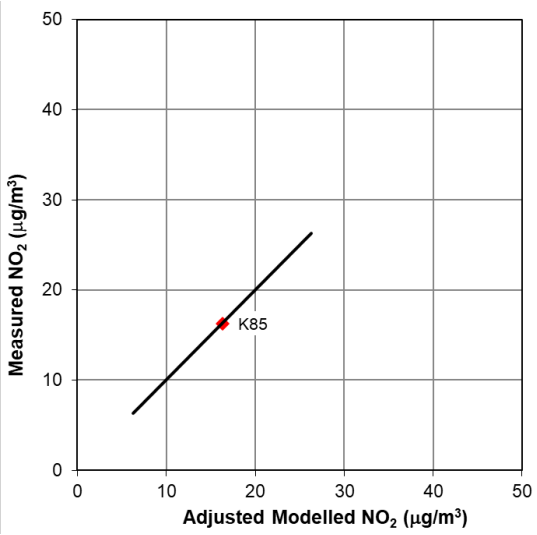
Model verification is undertaken by KC at one monitoring site within the study area using diffusion tube K85 as shown in Appendix A. Concentrations of NO_2 at this site was predicted using ADMS for use in the verification process as detailed in **Table B3**.

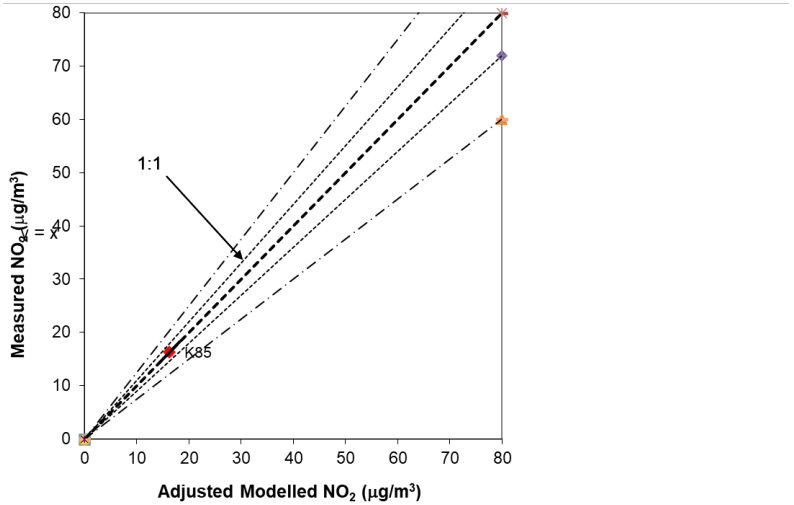
All modelled road NOx concentrations were adjusted by a factor of 1.7711. There is no PM_{10} nor $PM_{2.5}$ monitoring undertaken within the study area, therefore it was not possible to undertake verification of PM_{10} or $PM_{2.5}$ concentrations.

Table B3: NO_2 Model Verification Procedure

Monitor	Total Monitored NO_2	Monitored	NO_2 Background	NO_X Background	Monitored Road Contribution NO2 (total - background)	Modelled Road Contribution NOx (excludes background)	Ratio of Monitored Road Contribution NOX / Modelled Road Contribution	Adjustment Factor	Adjusted Road Contribution NO_x	Adjusted Modelled Total Nox (including background NO_X)	Modelled Total NO2 (based on empirical NOX / NO2 relationship)
K85	16.30	14.9	8.22	10.62	8.08	8.41	**1.7711**	**1.7711**	14.90	25.52	16.3






1:1
y = x
R85
Measured NO2 (µg/m3)
Adjusted Modelled NO2 (µg/m3)
0
10
20
30
40
50
60
70
80

Appendix C: IAQM Dust Risk Assessment Methodology

The following section outlines criteria developed by the IAQM for the assessment of disamenity dust from mineral extraction operations:

Screen the Need for a Detailed Assessment

The distance to a dust-generating source is screened to distances of 250 m for a soft-rock quarry and 400 m for a hard-rock quarry.

Source-pathway-receptor Methodology

If a detailed assessment is met, then an assessment of dust effects is required which utilises the source-pathway-receptor methodology. The example provided in the guidance is illustrative only, and other methods are acceptable so long as they adopt the core principle of the source-pathway-receptor methodology.

Source

The source is concluded as either small, medium or large and is dependent on the scale of operations occurring for each source. The IAQM Minerals Guidance[3] defines seven activities, which occur on almost all mineral extraction sites:

- site preparation/restoration;
- mineral extraction;
- material handling;
- on-site transportation (haul roads, site access routes);
- off-site transportation (public highway road network);
- mineral processing (e.g. mobile screening plant); and

- stockpiling/exposed surfaces.

Appendix 4 of the guidance outlines a variety of situations to conclude the source risk, which should be selected based on the site parameters, working situations and professional judgement. Reference to the appendix is made in determining the source. The relevant factors that may be used to determine the risks of the seven sources are outlined in **Table C1**. Each source has relevant examples and descriptions. For ease of reporting, the list of factors to review is provided, but not the full descriptions, which can instead be found in Appendix 4 of the IAQM Minerals Guidance.

Table C1: Source Risk Examples

Large	Small
Large working area	Small working area
High bunds	Low bunds
High volume of material movement	Low volume of material movement
High no. heavy plant	Low no. heavy plant
Minimal seeding/sealing of bund surface	bunds seeded/sealed immediately
Material of high dust potential	Material of low dust potential
High energy extraction methods	Low energy extraction methods
Potential high extraction rate (example given of >100 ha and 1,00,000 tpa)	Low extraction rate (example given of <20 ha and <200,000 tpa)
Unconsolidated/bare surface	Hard standing surface
Activities close to site boundary	Activities within quarry void
Use of unconsolidated haul roads	Use of conveyors
High no. HDV movements	Low no. HDV movements

Large	Small
High total length of haul roads	Low total length of haul roads
Uncontrolled vehicle speed	Controlled (low) vehicle speed
Raw/end product of high dust potential	Raw/end product of low dust potential
Complex or combination of processes	Single process
High volume material processed	Low volume material processed
Long term stockpile	Short term stockpile
Frequent material transfers	Infrequent material transfers
Stockpiles close to site boundary	Stockpiles well within quarry void
Large areas of exposed surfaces	Small areas of exposed surfaces
High wind speeds/low dust threshold	Low wind speeds/high dust threshold
Limited/no vehicle cleaning facilities	Extensive vehicle cleaning facilities

Pathway Effectiveness

The pathway effectiveness is calculated by calculating the amount of time-sensitive receptors that would be downwind of wind speeds > 5 m/s.

The first step is to calculate frequency, completed by means of a semi-quantitative meteorological assessment. The second step is to categorise the distance of the receptor from the source. These are then combined to produce the pathway effectiveness. **Tables C2 to C4** outline this procedure.

Table C2: Categorisation of Frequency of Potentially Dusty Winds

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

Table C3: Categorisation of Receptor Distance from Source

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

Table C4: 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
	Distance	Ineffective	Ineffective	Moderately Effective	Moderately Effective

Dust Impact Risk

The dust impact risk is calculated by combining the pathway effectiveness and source, outlined in **Table C5**.

Table C5: Estimation of Dust Impact Risk

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

Dust Effect

The overall dust effect is then calculated by combining the dust impact risk and receptor sensitivity. Receptor sensitivity is either low, medium or high. High sensitivity is classed as residential use, medium is classed as places of work and low is class as short term or transient uses such as a footpath. It should be stated that a footpath is not directly impacted by dust deposition, but extensive deposition along the route may deter users from using the footpath. The Dust Effect is shown in **Table C6**.

Table C6: 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

Appendix D: Source Risk Description

This appendix outlines the description and reasoning for the selection of source risks. The summary of each source risk is outlined in **Table 9** of the main report.

The source activities that would be associated with the working of the extension are discussed below.

Site Preparation / Restoration

Site preparation includes the removal of the upper soil surfaces, which often uses similar processes and procedures that are used in earthwork-type activities:

- ground excavation;
- stripping and stockpiling of topsoil / subsoil;
- levelling ground and movement of material (often using a dozer);
- road construction; and
- tipping and spreading of material.

The restoration of a site will often involve the same procedures and processes as the site preparation but in reverse order. This is true of the extension, therefore, the same source risk is applicable for both site preparation and restoration.

The site preparation activities required at the extension will primarily involve the stripping of the top soil layers to expose the rock to be worked. Topsoil will only be removed with each successive phase of working, therefore, the soil stripping activities will be of short duration (weeks to months). The activities will be similar to those listed in the bullet points above.

The internal haul route in each Phase will be constructed and the topsoil will be taken to the baffle mound locations at the perimeter of the quarry for long-term storage.

The site preparation occupies the same area to be worked for the mineral extraction, for each relevant Phase. Therefore, the pathway effectiveness calculation is identical to the mineral extraction.

In accordance with the relevant parameter selections of Appendix 4 of the IAQM Minerals Guidance, the site preparation source risk is concluded to be **small**. A small risk has been selected as less than 5 plant will be used, with low levels of material handling and limited levels of stockpiling and ground excavation.

Mineral Extraction

The extraction of mineral is usually the main source of potential dust escape from an active mineral quarry, due to the mechanical action of separating the material from the rock face using the equipment. This process releases fugitive dust which can become entrained in an airflow, either by being carried on the wind or lifted from the exposed surfaces.

The extension will be worked over five phases. Phase 1 will commence in the west and each successive phase will continue eastwards. The average void depth will be 16 m.

The mineral will be recovered by mechanical means using one excavator. Extracted material will be deposited into dumper trucks and transported for processing works at Crow Edge for clay pipe manufacture. Overburden will be transported to the overburden area to the east of Phase 5, in the eastern part of the extension.

No blasting will occur at the extension.

In accordance with the relevant parameter selections of Appendix 4 of the IAQM Minerals Guidance, the mineral extraction source risk is concluded to be **small**. A small risk has been selected as tonnes per annum is less than 200,000 tonnes, small working areas and low energy recovery methods.

Material Handling

Material handling can include many activities, some of which crossover with other sources assessed as part of the IAQM methodology procedure. Material handling activities may include handling of material, movement of material, mobile plant, plant equipment use such as dozers and tippers, loading and unloading and the drop heights used.

At the extension material handling will occur in the void, near the active mineral extraction location. Primarily, this will be the loading of dumper trucks with the material. As this activity is located in the same position as mineral extraction, an identical pathway is calculated.

The action of material handling will naturally be prone to dust generation due to the movement and handling of the material, however, various factors are important in how much or little dust is raised, such as moisture content and wind patterns of the time, particle size and material handled, drop heights and if the drop occurs in an obstructed location (e.g. inside of the trailer walls) and equipment seal effectiveness and maintenance. Double handling can also increase the dust risk, which will be avoided at the extension as the material is to be directly deposited into haulage to Crow Edge.

Material handling can often be suitably controlled by the use of common dust control techniques and mitigation, such as reduced drop heights, dampening of surfaces and material, covered lorries, avoidance of double handling and the number of plant required.

In accordance with the relevant parameter selections of Appendix 4 of the IAQM Minerals Guidance, the material handling source risk is concluded to be **small**. A small risk has been selected as there is less than 5 plant handling material and the handling areas are more than 100 m from sensitive receptor locations.

On- and Off-site Transportation

The action of wheels on a road surface is capable of causing dust lying on the surface to be wind whipped, raised and then carried in an airflow. Excessive mud and debris on a road surface may also dry and lead to further issues of dust either through erosion or further action of wheels churning the mud and debris into dust when the material has dried out.

The lifting of the road surface dust is dependent on particle size and meteorological conditions. The erosive potential of a road surface depends on several factors such as the number and size of wheels, how often the surface is travelled on, the type of surface, vehicle speeds and the moisture content of the surface material.

There is no proposed increase in extraction rates of vehicle numbers. Off-site transportation does not alter from the existing baseline. The measures to control dust, mud and debris that are listed in the existing dust management plan will continue to be employed during the working of the extension.

The internal haul route includes access from the southwest corner of the extension. The haul route traverses northwards, adjacent to the western boundary and Phase 1. The route takes a 90° clockwise turn and traverses eastwards along the northern boundary (behind the baffle mounds) to access the later Phases.

Vehicles accessing the overburden mound will use the existing main access route to the quarry. This is tarmacked and a low risk for dust generation. The existing dust management plan includes measures to ensure the road is kept clean and maintained.

The haul route will not always be in use and vehicles using the route will be intermittent. It is, therefore, not a continuous dust source throughout a typical working day.

In accordance with the relevant parameter selections of Appendix 4 of the IAQM Minerals Guidance, the on-site transportation is concluded to be **small**. A small risk has been selected as consolidated surfaces

would be travelled on, vehicle speed limits will be enforced, and the haul route to be travelled on will mostly be less than 500 m (and beyond 400 m distance in locations that exceed 500 m lengths). The route between the extension entry and the overburden mound is part of the main access route for the quarry and is well maintained and tarmacked.

Mineral processing

There is no mineral processing proposed at the extension and therefore this activity is concluded as a negligible risk.

Stockpiling / Exposed Surfaces

The main source of dust from stockpiling is in the initial stage when the material is tipped and formed into the stockpile, and when the surface is unsealed. Short-term stockpiles are most prone to generate dust as long-term stockpiles are often seeded with grass or compacted. Long-term stockpiles include boundary bunds, as the topsoil is used for future restoration.

Short term stockpiles may be more prone to dust generation due to material handling, tipping of material, movement of material to create the stockpiles or during the handling to 'tidy' them and reduce spillage and overspill. The exposed surfaces may be prone to wind whipping and subsequently carried in an airflow. Dust generation from stockpiles can be limited by compacting the surface, dampening the surfaces and not storing stockpiles at excessive heights.

The topsoil is proposed to be stored in bunds along the northern boundary of the extension. These will be for long-term storage and will be seeded with grass to seal the surface and provide screening. Consequently, there is a limited timeframe for these exposed surfaces to be prone to dust generation.

Overburden will be stored in a mound to the east of the extension area.

In accordance with the relevant parameter selections of Appendix 4 of the IAQM Minerals Guidance, the material handling source risk is concluded to be **small**. A small risk has been selected as the bunds occupy less than 2.5 ha, exposed surfaces will be short term and the bund locations are more than 100 m from sensitive receptors.

Appendix E Dust Management Plan

BROMLEY FARM EXTENSION

DUST MANAGEMENT PLAN

Prepared by

SILKSTONE ENVIRONMENTAL LTD.

On behalf of

WAVIN LTD

January 2023

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DUST MANAGEMENT PLAN

1.0 INTRODUCTION

1.1 This Dust Management Plan has been produced for the proposed 8.4 Hectare extension to Bromley Farm Quarry

1.2 As set out in the National Planning Policy Framework (NPPF), minerals planning authorities are expected to ensure that plan proposals do not have an unacceptable adverse effect on the natural or historic environment or human health.

1.3 A summary of the operations on site are as follows:

- The proposed 8.4 Hectare extension area consists of three fields in agricultural use lie within a larger allocated mineral site, Ref MAS3 in the Kirklees Development Plan (2019).
- Extraction of fireclay and shales which is transported approximately 5km to the Wavin Hazelhead Works factory for stockpiling prior to being used for manufacture of clay pipes.
- A small volume of coal is estimated to be encountered of varying quality, estimated at approximately 10,000 tonnes. Inferior coal will be backfilled in the void. Any coal suitable for industrial use will be exported off site. This coal seam is classed as alienated by the Coal Authority and therefore not subject to royalty payments.
- Backfill of the quarry void with inferior quality mineral and shale overburden and imported inert materials (subject to an Environmental Permit with the Environment Agency) to enable the site to be restored back close to original ground levels for restoration of the site back to agricultural grassland with areas of species rich grassland, shrub and tree planting
- The extension area would be worked to an average depth of approximately 16 metres.
- The reserves present have been calculated at approximately 760,000 tonnes which would equate to approximately 20 years supply. The 20 years would include infill by inert waste for restoration which could commence when extraction commences in Phase 3.
- Anticipated rates of extraction would be an average of 35,000 tonnes per annum, but would fluctuate subject to market demand. The mineral would be extracted on a campaign basis, typically between March to September.
- The clays and shales would lifted using a 360 hydraulic excavator and no blasting would be required. A dozer would also be utilised for the reinstatement of topsoil for restoration.
- The proposed operations would be an extension to a former quarry which is now fully restored. A new access into the extension area is proposed with the first 50m hard surfaced with concrete.

1.4 This document has been produced as controlled surface mining operations have the potential to generate levels of airborne dust that could be perceived by the public as a nuisance. The operators already have a range of measures in place so that dust emissions should, as far as possible be controlled, removed or mitigated at source. For this reason, the predicted impacts on the communities near to the extension area are considered to be low.

1.5 The greatest potential for dust nuisance would be from the soil and overburden removal in dry and/or windy conditions. The dust control measures proposed and detailed below at the site would mitigate these effects to satisfactory levels.

1.6 With regard to 'nuisance' dust and the proximity of neighboring receptors to the site, dust particles typically associated with nuisance are generally accepted to deposit within 100 m of sources. Residential properties are located along Cumberworth Lane, approximately 350 metres to the west and 400 metres to the North East. The closest property, Lane Side Farm is located 100 metres to the northern site boundary.

1.7 The objectives of the dust management plan is to define operational requirements for:

i) dust control and mitigation measures
ii) dust monitoring
iii) corrective actions in the event of a release
iv) record management

1.8 Notwithstanding the above, the following measures detailed below in a Dust Management Scheme will be implemented on site to minimise the potential for dust nuisance occurrence for the continued operations at the extension area should planning permission be granted.

2.0 DUST MANAGEMENT PLAN (DMP)

2.1 Introduction

2.1.1 There are potential for dust emissions to occur at various stages of the quarrying operations, but these can generally be controlled by good practice. Dust emissions can occur at a number of stages during the working life of the site but these can generally be controlled by best practice measures such as:

- Appropriate design and layout of the site and working procedures
- Using and properly maintaining carefully selected equipment
- Understanding the potential for dust emissions to occur
- Training and supervising site staff in dust control
- Applying appropriate mitigation measures

2.1.2 A range of dust control and mitigation measures are set out below, including dust containment, where dust emissions are minimised through use of appropriate equipment and systems; dust suppression, where dust emissions are controlled by the use of water sprays and wheel washes etc. and dust management, where the potential for dust emissions to occur are reduced through effective site management.

2.2 Dust sources

2.2.1 The quantity and size range of dust likely to be generated at a minerals site depends on the type of material being worked and the processes applied.

2.3.2 Dust emissions can arise from a range of processes at mineral sites. These include overburden removal, mineral extraction, loading and unloading, on-site transfer of dusty materials, stockpiles and roadways, including haulage roads.

2.3 Site management controls

2.3.1 There are a number of processes that might lead to unacceptable dust emissions at the site without proper mitigation.

2.3.2 As set out below, the site manager will be responsible for maintaining good standards and reduce unacceptable dust emissions at the site by ensuring that routine checks are carried out and that regular staff training is provided. This will be facilitated by the processes and procedures set out in Tables 1 to 3 in Appendix A which set out specific areas to enable the site manager to review and assess site dust management on a routine basis.

2.3.3 The actions in the tables in Appendix A will be reviewed and revised as appropriate during the operational life of the site, including within a review of the DMP.

Visible dust emissions

2.3.4 The site manager will be responsible for a daily inspection for visible dust emissions across the site boundary to be carried out. Inspections will take place along the site access road and at the relevant extraction area according to the working phase of the site. The results of the visual inspections will be recorded and kept with results of other environmental monitoring carried out at the site.

2.3.5 The table below will be used to assess whether there is potential for dust movement during operations.

Wind speed (m/s)	Description
Below 0.5 essentially calm	very low potential for dust movement
0.5 – 2 low wind speeds	low potential for dust movement
2 – 6 'average' wind speeds	moderate potential for dust movement
6 – 10 high wind speeds	reasonable potential for dust movement
Above 10 very high wind speeds	significant potential for dust movement

Site engineering controls

2.3.6 The site manager will be responsible for ensuring that unacceptable dust emissions do not arise from operations at the site by evaluating the planned site activities and dust mitigation measures in place and modifying them as appropriate.

2.3.7 Procedures to address specific processes that might lead to unacceptable dust emissions are set out below. All dust control equipment will be maintained and operated in accordance with the manufacturer's instructions.

3.0 QUARRYING OPERATIONS & MITIGATION MEASURES

3.1 The operations involved in the extraction and movement of clay have the potential to generate dust emissions. The extension area will be split into 5 phases of working.

Soil Stripping & Overburden Removal (including bund construction and removal)

3.2 Topsoil and subsoil will be stripped and placed in screening bunds which will be constructed along the northern and eastern perimeter of the workings. The screening bunds will be approximately 5 metres in height The bunds shall be seeded as soon as is practicable in order to prevent the potential for wind blow from this source. Overburden would be moved to the allocated storage area constantly where encountered.

3.3 The maximum amount of heavy plant used in the movement of overburden within the quarry void will be a 360 Excavator and 1 dump truck.

3.4 Soil stripping, overburden and bund formation shall 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.

Mineral Extraction and Transportation Operations

3.5 A hydraulic 360 excavator will be used to extract mineral which will be exported directly off site.

3.6 The maximum amount of heavy plant used within the quarry extension will be 1 hydraulic 360 excavator and 1 dump trucks.

3.7 The material being extracted will have a high moisture content. Notwithstanding this, the dust suppression measures detailed within Appendix A of this DMP will be implemented to reduce the potential for dust emission from the site.

3.8 The drop height from the hydraulic 360 excavator bucket to the dump truck will be minimised. The on site speed limit will be 10 mph and the use of a water bowser will help to minimise dust emissions from the operation.

3.9 Internal haul roads will consist of compacted material and shall be regularly maintained by grading in order to minimise dust generation. Mobile plant exhausts and cooling fans will be discharged away from the ground to prevent dust mobilisation.

Waste Importation for Restoration

3.10 Inert waste is proposed to be imported to enable the site to be restored close back to original ground levels. This is not predicted to commence until Phase 3 of the mineral extraction operations which could be approximately 8 to 10 years.

3.11 Prior to commencement of waste import, this document will be reviewed and updated as required.

4.0 DUST MONITORING

4.1 Dust Monitoring Programme

4.1.1 If the control measures listed in this DMP are adhered to for the duration of the operations, complaints should be unlikely.

4.1.2 Should any complaints be made regarding dust nuisance during extractive operations, the applicant is prepared to carry out dust monitoring for the remaining life of the site if required by Kirklees Council's (KC) Environmental Health Officer (EHO).

4.1.3 If required, dust can be measured by sticky pad samplers which would be strategically located to measure both dust dispersion at the site boundary towards neighbouring receptors.

4.1.4 Dust monitors in the form of sticky pad samplers (as seen below in Fig 1) will be installed and maintained around the site in locations to be agreed by the EHO. These locations may be amended or supplemented by agreement with the EHO dependent on the results recorded. Dust monitors will be changed weekly and inspected at intervals as deemed necessary. The sticky pads are retained for the duration of site activities.

Fig 1 – Sticky Pad Dust Sampler

4.2 Site records and reporting

4.2.1 The results of dust management and monitoring procedures at the site will be recorded and kept with results of other environmental monitoring carried out at the site. As noted above, a daily record of environmental dust will be kept at the Site Office.

4.3 Complaints procedure

4.3.1 In the event of a complaint from a member of the public regarding dust emissions from the site, a record will be kept at the Site Office and made available to KC as required.

4.3.2 The Site Manager will be ultimately responsible for addressing all complaints and notifying Kirklees Council accordingly. All complaints will be investigated as

soon as possible by the site manager and the complainant kept informed throughout the investigation. KC will be informed within the 2 working days that a complaint is received and will be kept informed regarding the progression of any subsequent investigation.

4.4 Dust mitigation measures

4.4.1 A water bowser will be available at all times and will be used to wet haul roads *etc*. as necessary. The site operator will ensure that appropriate environmental awareness training is conducted to ensure that all staff appreciate acceptable and unacceptable airborne dust levels.

4.5 Review and assessment

4.5.1 The results of environmental monitoring at the site will be considered in relation to baseline monitoring data, weather data and site activities during the assessment period and with reference to changes in national and local air quality guidance. The type and extent of dust monitoring that takes place after the review will be decided following consultation between the site operator and KC.

4.5.2 The DMP will be reviewed and revised if required during the working life of the site until restoration is complete. It may be reviewed at the reasonable request of KC at any time during the working life of the site.

Silkstone Environmental Ltd
January 2023

APPENDIX A

Table 1 – Maintenance Items

Description	Frequency
Water bowser – Check operating correctly and rectify any problems as necessary	Weekly
Access road – Check for surface wear and rectify when necessary	Monthly
Unmade haul roads – Check for surface wear and rectify as necessary	Weekly

Table 2 – Procedural Items

Item	Description
1	Regular environmental awareness training will be conducted to ensure all staff appreciate what are acceptable and unacceptable airborne dust levels
2	All staff to be aware of site dust complaints procedure
3	Material drop heights during loading of vehicles will be minimised by good operator awareness
4	Water bowser operation to be reviewed at the start of the day and in adverse conditions its operation will be reviewed regularly throughout the day
5	The site speed limit will be enforced, particularly in dry and windy conditions
6	The site manager (or appointed person) will assess the risk of dust emissions from exposed surfaces in dry and windy weather and appropriate action will be taken to avoid risk of wind-whip from exposed stockpiles (for example by wetting as required)

Table 3 – Monitoring Items

Description	Frequency
Site conditions and potential for fugitive dust emissions to be reviewed at the start of operations. Inspections will be made at the coal processing site, the site access road and at the relevant extraction area according to the working phase of the site	Daily
Visible dust propagation will be observed as well as weather conditions and other mitigating or contributory factors and recorded daily	Daily
Track-out onto Church Lane and the will be kept to a minimum by ensuring that the site access road is kept clean by wetting and sweeping regularly	Daily