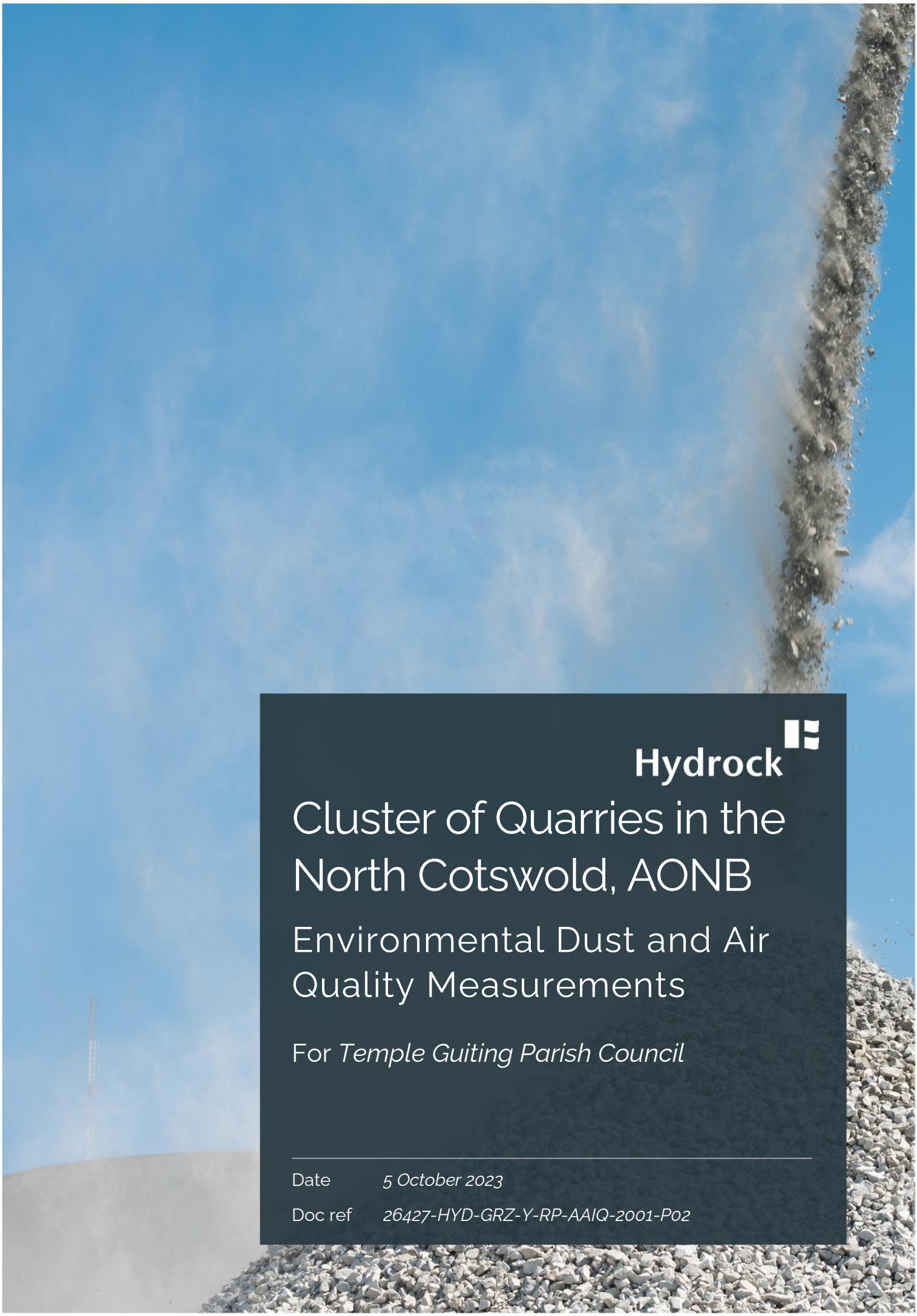

Hydrock

Cluster of Quarries in the North Cotswold, AONB

Environmental Dust and Air Quality Measurements

For *Temple Guiting Parish Council*

Date	*5 October 2023*
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1. Introduction

Hydrock Consultants Ltd (Hydrock) have been appointed by Temple Guiting Parish Council (TGPC) to undertake environmental dust and Particulate Matter (PM) monitoring and consultancy services in relation to concern over the potential impact Heavy Goods Vehicle (HGV) movements associated with local quarrying operations may be having on local air quality.

Hydrock's scope of work includes the provision of:

- Short-term baseline dust monitoring at locations identified by TGPC within Ford (within the boundary of Cotswold District Council), and Upper Coscombe (within the boundary of Tewksbury Borough Council);
- Following collation of Dust and PM measurements, undertake subsequent analysis and reporting to ascertain:
  - Do measurements taken of the current activity exceed acceptable thresholds?
  - If yes, what reduction in HGV movements or other mitigation methods would be needed to achieve an acceptable level? and,
  - If the number of HGVs were to increase by 10% or 20% above the levels at the time of measurement, would they exceed acceptable thresholds?

This report is technical in nature; therefore, a glossary of dust and particulate terminology is provided in **Appendix A** to assist in understanding this report.

2. Background

Project background, as provided by TGPC:

'The North Cotswold AONB currently has a cluster of eight quarries centred in the parish of Temple Guiting (TG). The Minerals Planning Authority responsible for the area is Gloucestershire County Council (GCC) but, of the quarries in the cluster in the north Cotswolds, its Minerals Local Plan 2018 -2032 only includes Naunton quarry and there is no mention of the cluster as a whole. This is because the Plan is only designed to address production of 'strategic' minerals, which includes aggregates, but not building stone. Historically the area has been important for production of Cotswold stone which has, for many years, been used for buildings and dry-stone walls. However, production across the cluster of quarries now includes a significant proportion of aggregates (including crushed stone and agricultural lime).'

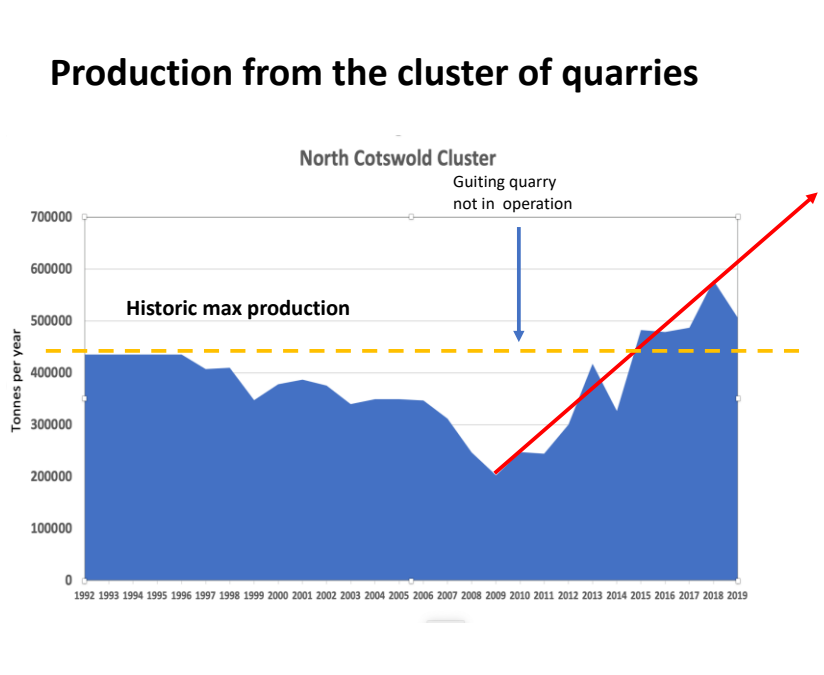

Figure 1: Production from the cluster of quarries – (Figure provided by GCC Minerals Planning Authority)

'Access to the cluster of quarries is primarily via the B4077 through Toddington and Ford (running west to east) and along Buckle Street from the A45 to the A465 at Bourton on the Water (running north to south).

Historic production figures provided by the Minerals Planning Authority show that since 2000 production has progressively increased taking current production to a historic high (See Figure 1).

This increase excludes applications currently under consideration, which will push the figure much higher. These naturally translate into a historically high number of HGVs on local roads. Some of these roads are single track with passing places. Although some of the increase has been mitigated through the increased size of vehicles, the number of HGVs is growing not only as a result of higher production levels across the cluster, but also because of the need to import materials for reinstatement. '

Traffic counts for September 2019 and March 2022 show that there has already been a 14% increase in HGV movements through the village of Ford. Higher levels are anticipated in September each year when production peaks. This, combined with current applications, is likely to raise the increase by a further 10 to 20%. In terms of movements, 550 HGV movements were recorded to the west of Guiting quarry (at Upper Coscombe) in March 2022. Approximately 475 HGV movements

were recorded in the village of Ford. HGVs made up approximately 20% of vehicle movements on the local road network in March 2022.

HGV movements are observed on local roads very early in the morning; well before quarry opening times of 06.30 or in most cases 07.00. In an area that is otherwise known for peace and tranquility early morning HGV movements have a significant impact on local residents living along the B4077 and Buckle Street.

Despite repeated requests from local parish councils, Cotswold National Landscape Board and CPRE no formal assessment has been made of the cumulative impacts on local residents. Not surprisingly, residents have raised their concerns, but without a formal assessment and review by the Environmental Health Officers at Cotswold District Council (CDC) and Tewksbury Borough Council (TBC) there is no basis for discussions or evaluations of the situation.

In response to this omission, TGPC has taken the decision to commission independent environmental measurements. TGPC is coordinating the overall scope of work but is supported by other local parish councils (PCs) and local residents across the area. The assessments are being funded from multiple sources including County Councillors, local parish councils and residents.

3. Policy and guidance

The methodology followed for the dust and PM monitoring, and subsequent analysis and assessment is based on the following current policy and guidance documents:

- National Planning Policy Framework, 2021 (NPPF)[1];
- Planning Practice Guidance – Reference ID 32 Air Quality[2];
- Planning Practice Guidance – Minerals[3];
- Relevant Air Quality Regulations and Objectives[4, 5, 6, 7, 8, 9, 10, 11];
- Local Air Quality Management Legislation[12, 13];
- Relevant local planning policy[14, 15];
- Relevant policy from the Minerals and Waste Planning Authority[16];
- Defra's Local Air Quality Management Technical Guidance 2022 (LAQM.TG(22))[17];
- Environmental Protection UK & Institute of Air Quality Management (EPUK & IAQM) Land-use Planning & Development Control: Planning for Air Quality[18];
- IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning[19];

A full review of the relevant policy and air quality / dust guidance is found throughout this document and in **Appendix B.**

1 Ministry of Housing, Communities and Local Government, "National Planning Policy Framework," July 2021,

2 https://www.gov.uk/guidance/air-quality--3.

3 https://www.gov.uk/guidance/minerals

4 Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe Available at: https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32008L0050

5 https://www.gov.uk/government/publications/the-air-quality-strategy-for-england

6 The National Archives. "The Air Quality Standards Regulations 2010". Available at: http://www.legislation.gov.uk/uksi/2010/1001/contents/made

7 The National Archives (2016). "The Air Quality Standards (Amendment) Regulations 2016". Available at: https://www.legislation.gov.uk/uksi/2016/1184/contents/made

8 The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 (legislation.gov.uk). Available at: https://www.legislation.gov.uk/uksi/2019/74/contents/made

9 The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (legislation.gov.uk). Available at: https://www.legislation.gov.uk/uksi/2020/1313/contents/made

10 The National Archives. "The Air Quality (England) Regulations 2000". Available at: http://www.legislation.gov.uk/uksi/2000/928/contents/made

11 The National Archives. "The Air Quality (England) (Amended) Regulations 2002". Available at: http://www.legislation.gov.uk/uksi/2002/3043/contents

12 https://bills.parliament.uk/bills/2593/publications

13 http://www.legislation.gov.uk/ukpga/1995/25/contents

14 CDC, "COTSWOLD DISTRICT LOCAL PLAN 2011-2031", adopted 3 August 2018, https://www.cotswold.gov.uk/media/k2kjvq3b/cotswold-district-local-plan-2011-2031-adopted-3-august-2018-web-version.pdf

15 TBC, "Tewkesbury Borough Plan 2011-2031", adopted on 8 June 2022, https://tewkesburyborough-my.sharepoint.com/:b:/g/personal/website_tewkesburyborough_onmicrosoft_com/EdgcPhj0x0xDvFVLT4i-OAcBS3e9QXn1aqOGophbwS1PRQ?e=34SgvK

16 https://www.gloucestershire.gov.uk/media/2119865/section-10-to-11-development-management-and-mineral-restoration.pdf

17 Defra, "LAQM Technical Guidance (TG22)" (Department for Food, Environment and Rural Affairs (Defra), August 2022), https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

18 EPUK & IAQM, "Land-Use Planning & Development Control: Planning for Air Quality" (Institute for Air Quality Management (IAQM), January 2017), http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf.

19 IAQM, Guidance on the Assessment of Mineral Dust Impacts for Planning, May 2016 (v1.1)

4. Survey Methodology

4.1 Overview and Survey Objectives

A short-term environmental dust and PM survey has been undertaken at two locations, within Ford and Upper Coscombe with the aim of determining indicative baseline dust deposition / settlement and PM concentrations at these locations.

The Ford monitoring station was installed within the garden area of a residential property along the southern boundary line, Ford, GL54 5RU. The Ford monitoring was located approximately 2.5 m from the B4077 carriageway. Guiting Quarry is located approximately 1 km to the west, and Oathill quarry approximately 1.4 km to the east.

The Upper Coscombe monitoring station was installed on the north-eastern boundary line, within the garden area of a residential property; Pike Cottage, Upper Coscombe, GL54 5SB. The monitoring position was located approximately 2.5 m from the B4077 carriageway. This monitoring location was located approximately 170 m west of Guiting Quarry's western boundary.

The monitoring locations are shown in Figure 2:

Figure 2: Monitoring Locations

The dust and PM survey comprised of short-term, unattended measurements which were obtained to establish indicative ambient baseline PM concentrations during the monitoring period and better understand dust deposition / settlement rates through both continuous indicative monitoring of PM and static monitoring.

Full details of the survey including methodology, monitoring locations, equipment, weather conditions, and results are presented in the following sub-sections.

4.2 Static dust deposition / settlement

Hydrock attended two sites in the area, Upper Coscombe and Ford, to install DustScan DustDiscs (also known as sticky pads), at the locations shown in Figure 2.

The survey dates, dust parameters and observed weather conditions for each sample are shown below in Table 1. The DustDiscs at both monitoring locations were deployed by Hydrock, and subsequently changed over by TGCP. The sampling periods, which applied to both monitoring locations, are shown as Sample 1 and Sample 2 below.

Table 1: Dust Survey dates

Sample	Start Date	End Date	Length of Survey (Days)	Variables measured	Weather conditions[20]
1	03-May-23	20-May-23	17	Dust Deposition (Gravimetric Analysis) Dust Settlement (AAC% and EAC%)	Regular precipitation in first half of monitoring period (max 12mm on 12 May). Second half of monitoring period dry with little precipitation. Day time maximum temperatures ranging from 14°C to 18°C.
2	04-Jun-23	18-Jun-23	14	Dust Deposition (Gravimetric Analysis) Dust Settlement (AAC% and EAC%)	Warmer drier conditions. Little precipitation, with precipitation 4 of the 14 days. Day time maximum temperatures of 15°C to 28°C over period.

Once collected at the end date, the DustDiscs were sealed and sent to DustScan for laboratory analysis by TGPC. The variables returned from the laboratory analysis for each sample were as follows:

- Depositional data from gravimetric analysis:
  - The total mass of the dust released as solids over the sampling period in milligrams (mg);
  - The inferred rate of dust deposition at the monitoring location, given as milligrams per meter squared per day (mg/m^2/day).
- Dust settlement data:
  - Absolute Area Coverage (AAC%) – The "total" dust coverage on the sample surface, determined as pixels having a lower greyscale value than a reference value in a computer scanned image of a "sticky pad" sample as a % of total area;
  - Effective Area Coverage (EAC%) – "Dust soiling" determined by the loss of reflectance using a smoke stain reflectometer, or as a relative difference in greyscale of pixels in a computer-scanned image of a "sticky pad" sample.

20 https://www.visualcrossing.com/weather-history/ford,%20cheltenham/metric/

Due to the absence of any recognised limit values for the deposition of visible / nuisance dust, and the absence of data to produce a custom threshold, the widely used general threshold of 200 mg/m²/day is considered appropriate for interpreting the dust deposition results. Where this threshold is exceeded, it is inferred complaints could potentially occur. The limitations of this general threshold (200 mg/m²/day) are discussed in the Environment Agency M17 guidance[21].

The risk of dust annoyance can also be determined from the DustScan risk annoyance matrix. This is shown below in Table 2, and combines the %AAC and %EAC to determine the risk of dust annoyance at the sample location.

Table 2: DustScan Risk Annoyance Matrix

		AAC: dust coverage				
		Level 0: <80%/interval	Level 1: 80 to <95%/interval	Level 2: 95 to <99%/interval	Level 3: 99 to <100%/interval	Level 4: 100%/interval
EAC: dust soiling	Level 0: <0.5%/day	Very Low	Very Low	Very Low	Low	Medium
	Level 1: 0.5 to <0.7%/day	Low	Low	Low	Medium	High
	Level 2: 0.7 to <2.0%/day	Medium	Medium	Medium	High	High
	Level 3: 2.0 to <5.0%/day	High	High	High	High	Very High
	Level 4: >5%/day	Very High	Very High	Very High	Very High	Very High

In addition to the above, the EA M17 guidance[21] provides the following thresholds for likelihood for complaints from dust deposition/settlement:

- 0.2%EAC per day: noticeable;
- 0.5%EAC per day: possible complaints;
- 0.7%EAC per day: objectionable;
- 2.0%EAC per day: probable complaints; and,
- 5.0%EAC per day: serious complaints.

These thresholds are given within the EA M17 guidance which is aimed at monitoring PM around waste facilities. Therefore, it should be noted that while this does not reference or directly apply to mineral extraction sites, they have been adopted in this assessment in the absence of other specific thresholds for EAC%.

21 Environment Agency, "Technical Guidance Note (Monitoring) M17: Monitoring Particulate Matter in Ambient Air around Waste Facilities, July 2013.

4.3 Continuous PM_{10} Measurements

Hydrock attended the Upper Coscombe monitoring location to install a continuous indicative PM_{10} sensor. The survey dates are shown below in Table 3:

Table 3: Continuous PM monitoring dates

Monitoring Location	Start Date and Time	End Date and Time	Length of Survey (Days)
Upper Coscombe	03/05/2023 13:00	02/08/2023 08:45	91

4.3.1 Post Processing Data Analysis

Short Term Trends

The PM_{10} data has been analysed for short term trends in the data. The maximum 15-minute average concentrations and maximum 1-hour average concentrations for each day of the sampling period have been calculated.

The timeseries data has also been plotted to visualise any short-term trend in the PM_{10} concentrations. In addition to this the daily average profile of the PM_{10} data has been calculated. This shows the average daily variation in the PM_{10} data over the sampling period, which enable comparison against HGV traffic flow provided by TGPC.

Annualisation

The results from the PM survey have been annualised in accordance with the steps in Box 7.9 – Example: Annualising Continuous Monitoring Data in Defra's LAQM.TG(22). The automatic urban background sites, from the automatic urban and rural network (AURN), used for the annualisation process were:

- Cardiff Central;
- Newport; and,
- Bristol St Pauls.

As the monitoring was undertaken during 2023, annual mean data for the above AURN sites was not available for 2023. As such, the calculations have been carried out based on the ratio to 2022 mean data, in accordance with Defra's LAQM.TG(22) guidance. Hourly sequential data from 01/01/22 to 31/12/22 were used for the annualisation. The data capture for all background sites was >85%. An annualisation factor of 1.19 for PM_{10} was applied to the results to calculate the annual mean.

4.4 Traffic data

Traffic count data across the cluster of quarries from several sources has been provided by TGPC which give an indication of traffic movements and the number of HGVs using the B4077. Data sources include:

- Visual traffic count in Ford on 24 October 2022 carried out by residents; and,
- Planning applications for Oathill Quarry September 2019 (14/0101/CWMAJM dated Dec 2019) and from March 2022 (21/0050/CWS73M dated May 2022).

This collection of this traffic data has not been undertaken by Hydrock.

4.5 Uncertainties and Limitations

The indicative PM_{10} monitor installed was the EarthSense Zephyr, which is compliant with MCERTS Performance Standards as an Indicative Ambient Particulate Monitor. Defra's LAQM.TG (22)[17] acknowledges that such 'low-cost' sensors are useful for identifying short-term trends:

> *"These instruments are useful for identifying short-term pollution events at construction, demolition or waste transfer sites and are suitable for short, local campaigns."*

Defra's LAQM.TG(22) also states that:

> *"These instruments are not suitable for measuring PM_{10} or $PM_{2.5}$ annual mean or the number of exceedances as they are not accurate enough to meet the expanded uncertainty requirements of equivalent instruments."*

Therefore, in line with Defra's guidance, the data obtained is not suitable for direct comparison to established annual thresholds or assessment of compliance with the Air Quality Assessment Levels (AQALs) for PM_{10} given in **Appendix B**.

Additional limitations of this assessment include:

- Due to budgetary constraints limiting the scope of this assessment – only one real time indicative PM monitor was installed at the Upper Coscombe monitoring site. No real time data is available for Ford;
- TGPC were responsible for swapping out the dust discs. These were located within the gardens of local residential properties and therefore have not been isolated from the influence of potential tampering;
- The monitoring period for DustDisc Sample 1 exceeds 14 days, the recommended maximum sampling interval. Therefore, the calculation of the dust risk impact, in line with DustScan's risk matrix, is for informative purposes only; and,
- It is not known whether the HGV counts, as provided by TGPC. are directly comparable to AADT format. It is also not stated whether the changes in HGV traffic between the traffic count dates can be directly and solely attributed to HGV traffic from the cluster of quarries, or whether other HGV traffic sources would reasonably be expected. Therefore, the level of analysis that can be undertaken is limited. However, TGPC have stated:

  > *"The traffic count [provided by TGPC] included both quarry and non-quarry related HGV movements but the vast majority of movements are related to quarrying activities; the others being associated with local farming activities and the occasional deliver truck."*

5. Dust and PM Survey Results

This section presents the results of the dust and PM surveys. The traffic survey results provided by TGPC are also presented.

5.1 Dust Deposition Results

The results of the dust survey are shown below for the dust deposition in Table 4:

Table 4: Dust Deposition Results

Location	Deposition Threshold (mg/m²/day)	Sample 1 (May)		Sample 2 (June)	
		Mass of dust (mg) as released solids	Inferred deposition rate (mg/m²/day)	Mass of dust (mg) as released solids	Inferred deposition rate (mg/m²/day)
Upper Coscombe	200	26.21	**364.9**	15.81	**267.2**
Ford	200	5.8	80.8	5.99	101.2

Note: **BOLD** values denote an exceedance of the threshold (200 mg/m²/day).

The data above show that the inferred dust deposition rate at the Upper Coscombe monitoring site exceeds the threshold of 200 mg/m²/day for both samples. In Sample 1 (May) the threshold was exceeded by 82.5% and in Sample 2 (June) by 33.6%. Therefore, the dust deposition rate could indicate a possibility of complaints.

At the Ford monitoring site, both samples were below the threshold. In Sample 1 (May) the deposition was below the threshold by 59.6% and in Sample 2 (June) by 49.4%.

The Upper Coscombe location is approximately 170 m west of Guiting Quarry's western boundary. Guiting Quarry is an active quarry, and therefore operations such as site preparation, minerals extraction, mineral handling, on-site transportation / haulage, mineral processing, stockpiles and exposed surfaces are all potential sources of dust emissions in addition to HGV movements form the quarry. Due to the proximity, this monitoring location is more likely to be affected by these additional sources of dust compared to the Ford location.

5.2 Dust Settlement Results

The results of the dust survey are shown for the dust settlement in Table 5:

*Table 5: **SAMPLE 1 (MAY)** Dust Settlement Results*

Location	Interval (days of sampling)	AAC% / interval	EAC% / interval	AAC% / day	EAC% / day	DustScan Dust Impact Risk (see notes)
Upper Coscombe	17	100	20.4	5.9	1.2	High
Ford	17	100	10.8	5.9	0.6	High

Note: sampling interval exceeded 14 days - Dust Impact Risk values have been calculated but should be used for informative purposes only

The Sample 1 (May) dust settlement results are shown above. The dust impact risk was calculated as 'High', but it is noted this is for informative purposes only as the interval (sampling period) exceeded 14 days.

As the defined risk of impact is for informative purposes only, the %EAC per day values have been compared to EA M17 guidance thresholds for likelihood of complaints:

» The EAC% per day was 1.2 at Upper Coscombe which exceeds the 'objectionable' threshold of 0.7%EAC / day, with reference to EA M17 guidance thresholds;

» The EAC% per day was 0.6 at Ford, which exceeds the 'possible complaints' threshold of 0.5%EAC / day, with reference to EA M17 guidance thresholds.

*Table 6: **SAMPLE 2 (JUNE)** Dust Settlement Results*

Location	Interval (days of sampling)	AAC% / interval	EAC% / interval	AAC% / day	EAC% / day	DustScan Dust Impact Risk
Upper Coscombe	14	100	16	7.1	1.1	High
Ford	14	100	11.6	7.1	0.8	High

The Sample 2 (June) dust settlement results are shown above. The Dust Impact risk during this sampling period at both monitoring sites was 'High'. Therefore, during this monitoring period there was a high risk of adverse disamenity dust impacts at the monitoring locations.

In addition, the %EAC per day values have been compared to EA M17 guidance thresholds for likelihood of complaints:

» The EAC% per day was 1.1 at Upper Coscombe which exceed the 'objectionable' threshold of 0.7%EAC / day, with reference to EA M17 guidance thresholds;

» The EAC% per day was 0.8 at Ford which exceed the 'objectionable' threshold of 0.7%EAC / day, with reference to EA M17 guidance thresholds.

5.3 Indicative Ambient PM_{10} Results

The results of the indicative PM_{10} monitoring from the continuous survey are shown below.

5.3.1 Short-term Trends

The maximum daily 15-minunte and 1-hour mean PM_{10} have been calculated for each day of sampling. This data is shown in full in **Appendix C**. The lowest 15-minute PM_{10} recorded was 2.2 µg/m^3 on 15/07/2023 at 14:30 and the highest was 41.3 µg/m^3 on 04/05/2023 at 02:30. The lowest 1-Hour PM_{10} recorded was 2.2 µg/m^3 on 15/07/2023 at 14:00 and the highest was 38.4 µg/m^3 on 18/06/2023 06:00.

The full timeseries PM_{10} data, of the 91-day sampling period, has been plotted below in Figure 3. This shows that the PM_{10} data consists of short-term spikes of high PM_{10} concentrations. There was also an elevated concentration of PM_{10} in early to mid-June, with lower concentrations in July to August.

The meteorological conditions in the area during the 2023 continuous survey are summarised below[22]:

- The conditions in May to June were typical for the time of year with 41 mm of precipitation (typical range for May is 38 mm to 46 mm), and temperature of 4.1°C to 21°C for nightly minimum and daily maximum temperature respectively (typical range for May is approximately 7.5°C to 16.5°C);
- The conditions in June to July were typical in terms of total precipitations with 39 mm of precipitation (the typical range for June is 39 mm to 46 mm). The temperatures of 5.1°C to 28°C for nightly minimum and daily maximum temperature respectively were not typical for June. Whilst the nightly minimum was lower than typical for June, the daily maximum of 28°C was well above average, and the majority of days in June were above the average of 20°C (typical range for June is 9°C to 20°C).
- The conditions in July to August were not typical. The typical range of precipitation in July is 38 mm to 41 mm, whereas there was a total of 101 mm of precipitation, which is over double the typical amount. The temperatures of 7.6°C to 27°C for nightly minimum and daily maximum temperature respectively were also not typical for July (typical range for July is 12°C to 22°C

The low PM_{10} concentrations in July could potentially be due to increased precipitation increasing the wet deposition of PM_{10} leading to lower ambient concentrations during this period. In addition to this, higher precipitation could dampen down local sources of dust.

Without further data and monitoring, such as directional dust monitoring, further laboratory analysis of dust samples, and additional continuous monitoring of PM_{10} at a regionally representative background site, it is not possible to attribute the short-term spikes of high PM_{10} concentrations to specific sources of PM_{10}. Recommendations for further work are given in full detail at Section 6.1.4.

5.3.2 *Annual Mean PM_{10}*

The indicative annual mean PM_{10} concentration is shown below in Table 7:

Table 7: Monitored PM_{10} Concentrations

Monitoring Site	Annual Mean AQAL (µg/m³)	Annual Mean Concentration (µg/m³)
		2023
Upper Coscombe	40	10.9

As shown above, the indicative annual mean concentration calculated from the monitoring data is 10.9 µg/m³. This has been calculated from the 91 days of monitoring data, in line with LAQM.TG (22) guidance. However, it is worth noting that there is uncertainty in calculating an annual mean from a short-term survey, and 91 days (approximately 3 months) equates to the minimum period and therefore significant uncertainty lies within the data and no direct comparison can be made to the annual mean AQAL owing to the monitoring method.

22 Historical / typical weather taken from https://weatherspark.com/

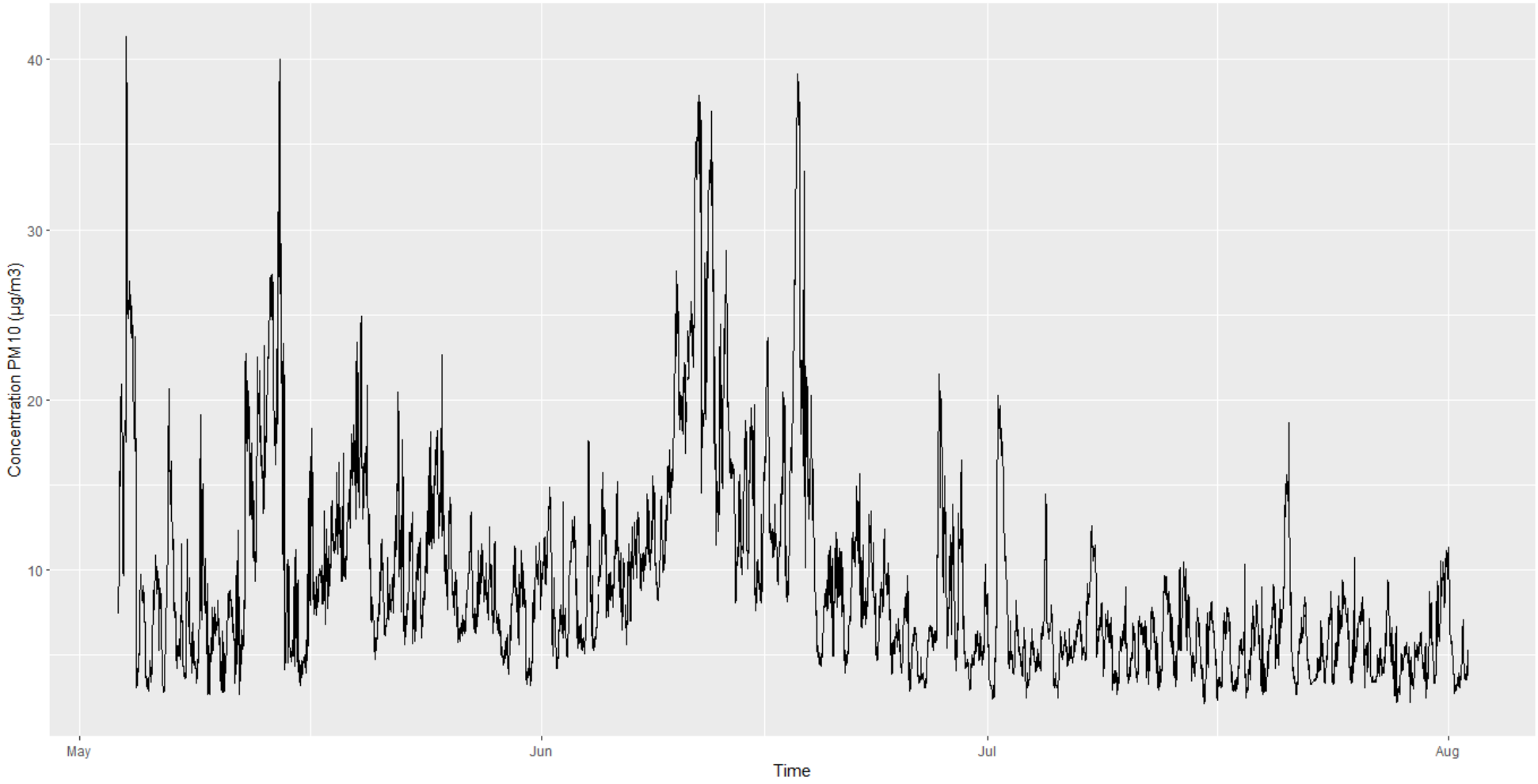

Figure 3: Timeseries of 15-Minute average PM_{10} Concentration

5.4 Traffic Flows

The traffic count data, as provided by TGPC is summarised in Table 8. These figures include the total HGV movements observed (i.e., the sum of both directions). The figures for September 2019 and March 2022 are reported to be a weekday average figure. The full traffic counts undertaken by residents on 24 October 2022 are shown in **Appendix D**.

Table 8: Recorded HGV movements (daily two-way movements)

Measurement Date	*Ford*	*Upper Coscombe*
August 2019	*439*	*393*
September 2019	*418*	*480*
March 2022	*474*	*550*
14 October 2022	*130*	*Not available*
24 October 2022	*190*	*Not available*
17 May 2023	*130*	*Not available*
6 June 2023	*149*	*Not available*

It is noted that the traffic counts in Ford, from October 2022 to June 2023 inclusive, show that HGV numbers were lower than March 2022. The PM_{10} and dust monitoring were undertaken during this period of lower HGV numbers.

Average PM_{10} over an average day has been compared to the HGV traffic counts from Ford for 6 June 2023. The daily averaged profile of the PM_{10} concentrations over the sampling period are shown below in Figure 4. This shows the average PM_{10} measured for every 10-minute period of the day. Also shown is the profile of HGV traffic from the traffic count undertaken in Ford as provided by TGPC. Whilst the continuous monitoring was in Upper Coscombe, it is considered appropriate to compare to traffic counts in Ford due to the lack of more representative data.

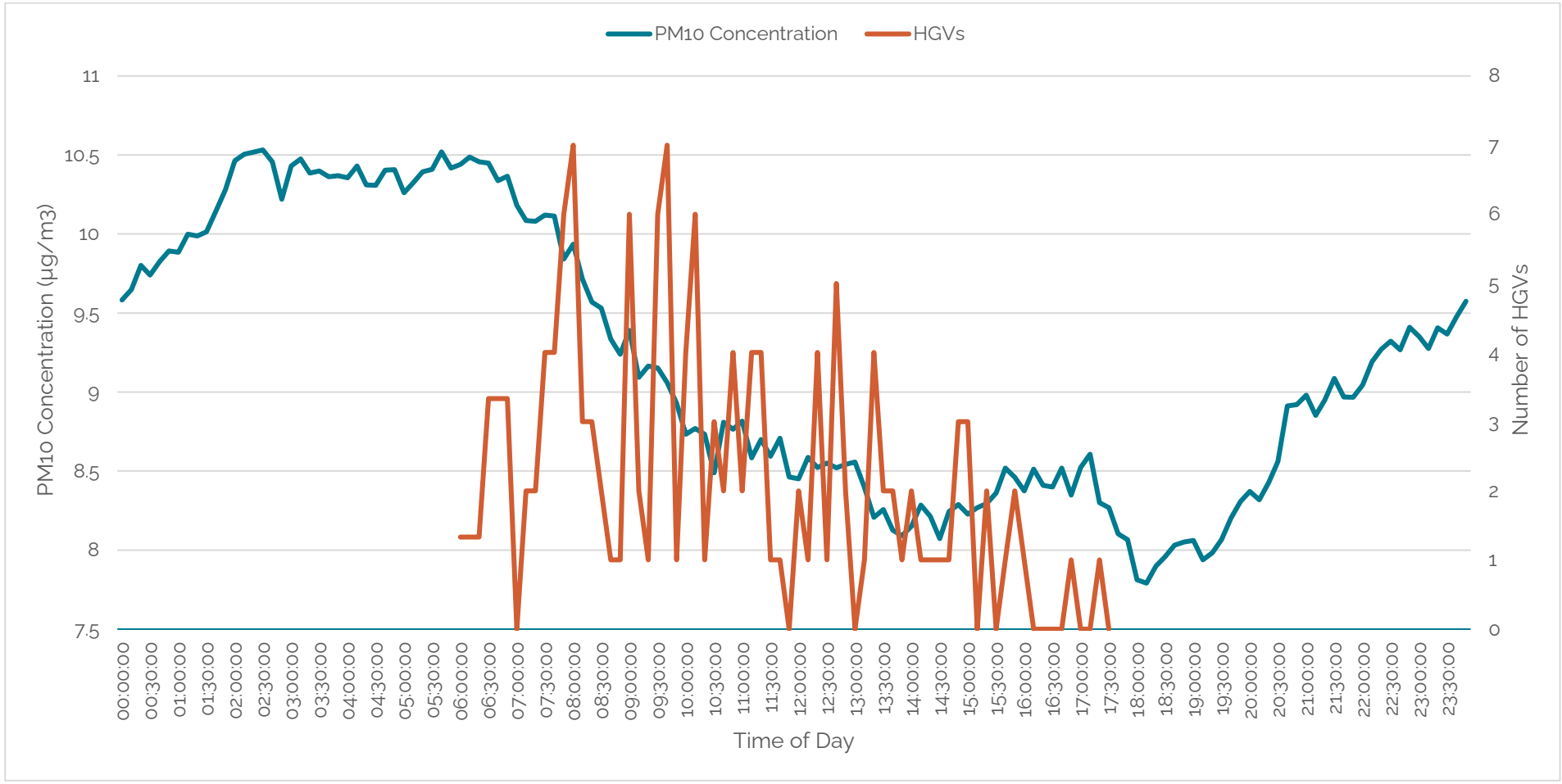

Figure 4: Daily Average Profile of PM_{10} and HGVs

The data in Figure 4 shows that on average over the sampling period concentrations of PM_{10} were highest in the early morning hours 02:00 to 06:30, and lowest during the afternoon and early evening hours of 14:00 to 19:00.

The average daily PM_{10} concentrations do not seem to follow the HGVs variations. However, analysis is limited as it is based on average 10-minute PM_{10} concentrations which may not capture shorter term spikes in PM_{10} concentrations caused by passing traffic. Also, the HGV data are representative of Ford, whereas the PM_{10} concentrations are representative of Upper Coscombe, and therefore may not directly comparable.

It is also understood that applications to increase production at Oathill Quarry (ref: 21/0050/CWS73M) and at Three-Gates Quarry (ref: 22/0035/CWROMP), if approved, could increase the number of HGV movements on the local road network.

Data in these applications indicate that seasonal variations in production and associated HGV movements occur in August – September. TGPC have stated that the Oathill Quarry application would lead to an additional 50 HGVs per day on the local roads in August - September each year.

EPUK & IAQM guidance[18] contains threshold criteria for changes in Heavy Duty Vehicles (HDV) traffic (which includes for HGVs) which can trigger the need to undertake detailed assessment, typically undertaken using dispersion modelling software, to assess the potential for adverse air quality impacts, typically in terms of changes in concentrations of Nitrogen Dioxide (NO_2), and PM_{10} and $PM_{2.5}$. Therefore, these EPUK & IAQM guidance thresholds for traffic are not applicable to potential dust impacts and are only applicable to assessment of air quality in terms of the AQALs. The threshold criteria are a specific format of traffic data, known as annual average daily traffic (AADT), which is the change in the number of vehicles using a specific road over a calendar year divided by the number of days.

Of relevance to this report, the following threshold criteria would apply to changes in HDV (including HGV) movements:

- A change of +/- 100 HDV AADT (if the change occurs outside of an Air Quality Management Area (AQMA), and/or
- A change of +/- 25 HDV AADT (if the change occurs within or in proximity to an AQMA.

No increase in HGV traffic greater than 100 'daily two-way movement' has occurred at Ford from the available monitoring data. Therefore, assuming that 'daily two-way' movements are equal to AADT, the threshold of an increase of 100 AADT has not been exceeded from review of existing traffic data.

At Upper Coscombe, there is a difference of 157 'daily two-way movements' when comparing the data for August 2019 and March 2022. However, it is unclear if the difference relates to a change in AADT flows attributable to HGVs as the data were acquired over different time periods with an 18-month gap between the data points. On this basis, no comparison can be made to the EPUK & IAQM threshold criteria.

Finally, the increase of 50 HDVs per day between August – September from the Oathill Quarry proposed expansion are unlikely to exceed the 100 AADT threshold, as this change relates to peak flows and is already below the EPUK & IAQM threshold criteria, before averaging over a year.

6. Discussion

Do measurements taken of the current activity exceed acceptable thresholds?

6.1.1 Dust Results

The dust results indicate that thresholds are exceeded for dust deposition at Upper Coscombe for both samples taken, and that dust settlement poses a high dust impact risk at both Upper Coscombe and Ford for Sample 2 (June). The dust impact risk from Sample 1 (May) was also high at Upper Coscombe and Ford, but this is for informative purposes only as sampling exceeded 14 days.

It is important to note that the IAQM guidance on the Assessment of Mineral Dust Impacts for Planning[19] states that:

> *"In contrast to suspended particulate matter (PM), there are no UK or European statutory standards that define the point when deposited dust causes annoyance or disamenity. This is largely due to the difficultly in accurately determining human response to dust accumulation and soiling. There are a number of "custom and practice" thresholds in use."*

These custom and practice thresholds have been used in this assessment, but as stated above, may not directly equate to a presence or absence of annoyance or disamenity caused by dust. But the results point towards the likelihood that dust is impacting the monitored locations.

6.1.2 PM_{10} Concentrations

The monitored PM_{10} concentrations are not suitable for direct comparison against the AQALs as the monitoring is indicative only. So, whilst the annual mean of 10.9 µg/m^3 has been calculated, this is not suitable to compare against the annual mean AQAL of 40 µg/m^3.

Therefore, an analysis of the trends in the PM_{10} data has been undertaken. The data contains short term spikes in the concentration of PM_{10}. However, these short-term spikes cannot be directly attributed to dust from HGV movements from the data available. An analysis of the 10-minute average daily profile of PM_{10} concentrations has also been undertaken (see Figure 4). The changes in the average daily profile of PM_{10} appear to be driven by meteorological boundary layer diurnal changes. However, there is a lack of regionally representative background real time PM_{10} data to confirm this.

It should also be noted that indicative PM_{10} data are only available at the Upper Coscombe monitoring location. This may not be representative of other locations of relevant exposure (residential properties) in the area, and may have also been affected from dust generated at Gutting Quarry as the monitoring was located 170 m west of Guiting Quarry's western boundary. It is not possible to confirm this without further monitoring at other locations.

If acceptable thresholds are exceeded, what reduction in HGV movements or other mitigation methods would be needed to achieve an acceptable level?

From the results of this assessment, it is not possible to quantify what reduction in HGV traffic movements would be needed to reduce the risk of adverse dust impacts. Both the passive and continuous indicative monitoring techniques undertaken inherently measure total dust and PM_{10} from all local sources and cannot isolate dust associated solely with HGV movements on the local road network.

Whilst Hydrock engineers witnessed HGVs directly causing dust soiling of the road whilst installing the monitoring, dust sources may include background dust settlement / deposition, natural sources, re-suspended dust from other traffic movements or wind-blown dust from the quarry sites themselves.

The exact relationship between the number of HGV movements to dust deposition and dust settlement is unknown. Whilst it is likely that the movement of HGV from quarries contributes to a significant proportion of the dust at the monitored locations, there is no data to directly support this, and no convention for calculating a numerical relationship between HGV movements and dust. Whilst it is reasonable to assume that increasing HGV may worsen dust impacts and reducing them may lessen dust impacts, it is not possible to know by how much.

If the number of HGVs were to increase by 10% or 20% above the levels at the time of measurement, would they exceed acceptable thresholds?

In the absence of a method to compare a 10% or 20% increase in HGVs against acceptable threshold for dust and ambient PM_{10}, a 10% or 20% increase in HGVs is discussed below in terms of the EPUK & IAQM thresholds for increases in traffic.

At Upper Coscombe the highest HGV flows recorded were 550 in March 2022. Against this baseline, an increase in HGVs of 10% would lead to an additional 55 HGVs and an increase of 20% would lead to an additional 110 HGVs. Assuming that the figures are comparable to AADT and that changes are directly attributed to one quarry or cumulative change from the cluster of quarries, then the 20% increase in HGV traffic would trigger the need to undertake a detailed assessment of potential air quality impacts, in accordance with the EPUK & IAQM threshold of 100 AADT HDVs in an area outside of an AQMA.

At Ford the highest HGV flows recorded were 474 in March 2022. Against this baseline, an increase in HGVs of 10% would lead to an additional 47 HGVs and an increase of 20% would lead to an additional 94 HGVs. Neither of these changes exceed the indicative threshold of 100 AADT for further assessment.

However, from this assessment it is not possible to quantify what impact an increase in the number of HGVs by 10% or 20% could have on potential compliance with the PM_{10} AQALs, or what effect such a change would have on dust deposition and dust settlement at the monitored locations.

6.1.3 Mitigation Measures

Mitigation measures for reducing dust generated by HGV movements would be most effective at source and it is good practice for site operators to prepare a dust management plan (DMP) or similar control document detailing measures to reduce adverse impacts. DMPs for each of the quarries in the cluster have not been reviewed in preparing this assessment, so it is not known what measures, if any, are already in place.

However, some examples of good-practice measures from the IAQM guidance on the Assessment of Mineral Dust Impacts for Planning[19] are provided below:

- Standard good practices for site haulage include:
  - avoiding abrupt changes in direction;
  - regular clearing, grading and maintenance of haul routes;
  - setting appropriate site speed limits. If practicable, set site-specific and enforceable speed limits (e.g., 10 mph. on unmade routes). Where not practicable, the Quarry Manager should set speed limits according to operating conditions at the time;
  - fitting heavy plant with upswept exhausts and radiator fan shields;
  - evenly loading vehicles to avoid spillages;
  - regular application of water, whether by bowser or by fixed sprays, in dry conditions;
  - use paved roads where practicable, ensure mobile plant has upward directing exhausts and radiator fan shields.

- It is also important to avoid Trackout from off-site transportation;
  - Clean heavy-duty vehicles used to transport minerals before they leave the site using an effective wheel- or vehicle-washer;
  - A long-paved road after a wheel or vehicle washer before joining the public highway, where feasible, reduces the trick of Trackout off-site;
  - A separate paved parking area for off-site vehicles, such as staff cars, with no access to the working areas, can help prevent track-out of mud onto the public highway.
  - Clean heavy-duty vehicles used to transport minerals before they leave the site using an effective wheel- or vehicle-washer;
  - A long-paved road after a wheel or vehicle washer before joining the public highway, where feasible, reduces the trick of Trackout off-site;
  - A separate paved parking area for off-site vehicles, such as staff cars, with no access to the working areas, can help prevent track-out of mud onto the public highway.

6.1.4 Recommendations

Hydrock recommend that further work would be required to increase reliance on the findings of the monitoring survey:

- Detailed traffic surveys undertaken by a qualified traffic and transport consultant, to obtain data in the format 24-hour AADT;
  - 24-Hour AADT data is required for comparison against the EPUK & IAQM guidance thresholds, above which detailed air quality modelling of NO_2, PM_{10}, and $PM_{2.5}$ concentrations would be recommended for assessment of significance of impacts against the AQALs (modelling also requires 24-Hour AADT data);
  - Traffic surveys should be undertaken to ensure that quarry HGV traffic is captured and that it is representative of quarry operating conditions;
  - In addition to 24-Hour AADT data, there is a need to understand the annual variation in HGV quarry traffic to assess / compare against variations in dust impacts at sensitive receptors;
  - Ideally, the cumulative increases in HGVs caused by proposed quarry expansions would also be understood and compared against the EPUK & IAQM guidance thresholds to ensure that a holistic approach to increases in HGV traffic is taken.
- Undertake detailed dispersion modelling of potential adverse impacts for comparison against established AQALs, to determine the potential change in PM_{10} concentrations as a result of an increase in HGV traffic of 10% and 20% would cause (subject to having appropriate AADT data);
- Further dust monitoring could be undertaken at additional locations to confirm the spatial extent of the potential risk of dust impacts at other properties in the area;
- Allowance for directional dust monitoring. This would show the direction of dispersion of dust (the dust flux) which can facilitate basic source apportionment;
- Further laboratory analysis of dust samples could be undertaken to aid in determining the source and composition of dust;
- Monitoring of regionally representative background PM_{10} concentrations, by a continuous indicative PM_{10} monitor could be undertaken at the same time as continuous indicative PM_{10} monitoring at roadside conditions. This would allow for the comparison of background PM_{10} concentrations to roadside PM_{10} concentrations and the calculation of the indicative road source contribution to total PM_{10}. This would also allow any regional episodes in PM_{10} to be identified;
- Ideally all monitoring would be undertaken for 12 months to capture the effects of both meteorological variations and annual variations in quarry traffic; and,
- Monitoring of $PM_{2.5}$, as $PM_{2.5}$ is recognised to be of concern regarding public health.

7. Summary and Conclusions

Hydrock have been appointed by TGPC to undertake environmental dust and Particulate Matter (PM) monitoring and consultancy services in relation to concern over the potential impact Heavy Goods Vehicle (HGV) movements associated with local stone quarrying operations may be having on local air quality. The purpose of the environmental dust and PM measurements was to ascertain:

- Are acceptable thresholds exceeded;
- If yes, what reduction in HGV movement or other mitigation methods would be needed to bring them to an acceptable level; and
- If the number of HGVs were to increase by 10% or 20% above the levels at the time of measurement, would they exceed acceptable thresholds.

Dust measurements were undertaken at Ford between the 3rd of May and the 2nd of August. Dust deposition and dust settlement measurements were undertaken at both Upper Coscombe and Ford monitoring sites between the 3rd of May and the 18th of June.

The dust deposition results showed that the Upper Coscombe monitoring site exceeds the threshold of 200 mg/m²/day for both samples. Therefore, it is considered the dust deposition is at a level where complaints could occur. However, the monitoring at Upper Coscombe was located 170m from Guiting Quarry, therefore quarry operations from this site may also contribute to the dust impacts monitored at Upper Coscombe. At the Ford monitoring site both samples were below the threshold.

The EAC% per day at Upper Coscombe exceeded the 'objectionable' threshold for the likelihood for complaints, and at Ford exceeded the 'possible complaints' threshold, with reference to EA M17 guidance. Dust settlement results at both monitoring sites also indicate a 'High' impact risk rating, though for Sample 1 (May) this impact risk rating is for informative purposes only. Therefore, during this monitoring period there was a high risk of dust impacts at the monitoring locations.

The monitored PM_{10} concentrations are not suitable for direct comparison against the AQALs as the monitoring is indicative only and therefore no direct comparison to the annual mean AQAL of 40 µg/m³ can be made. Therefore, an analysis of the trends in the PM_{10} data has been undertaken. The data contains short term spikes in the concentration of PM_{10}. However, these short-term spikes cannot be directly attributed to dust from the HGV movements from the data available. The changes in the daily profile of PM_{10} could be driven by meteorological boundary layer diurnal changes. However, there is a lack of regionally representative background real time PM_{10} data to confirm this.

At Upper Coscombe, the highest HGV flows recorded were 550 in March 2022. Against this baseline, an increase in HGVs of 20% would lead to an additional 110 HGVs. Assuming that the figures are comparable to AADT, this change would indicatively require further detailed assessment of PM_{10} impacts against the AQALs in accordance with EPUK & IAQM guidance thresholds. Changes of 20% at Ford would not trigger the need for detailed assessment. These thresholds are not relevant for dust disamenity.

Mitigation measures for reducing dust generated by HGV movements would be most effective at source and it is good practice for site operators to prepare a DMP or similar control document detailing measures to reduce adverse impacts. DMPs for each of the quarries in the cluster have not been reviewed in preparing this assessment, so it is not known what measures, if any, are already in place. However, some examples of good-practice measures from the IAQM guidance on the Assessment of Mineral Dust Impacts for Planning[19] have been provided.

Hydrock recommend that further work would be required to increase reliance on the findings of the monitoring survey, outlined in full detail in Section 6.1.4.

Appendix A Glossary

Term	Description
AAC%	Absolute Area Coverage (AAC) is the "total" dust coverage on the sample surface, determined as pixels having a lower greyscale value than a reference value in a computer scanned image of a "sticky pad" sample as a % of total area. AAC% is the coverage of dust, irrespective of colour. If it can be seen it in the scanned image, any dust, pale or dark, can be recorded as AAC. Therefore, AAC is a very sensitive measure and is effective in detecting low levels of dust.
AADT	Annual Average Daily Traffic (AADT) is the total volume of vehicle traffic of a highway or road for a year divided by 365 days. AADT is a simple, but useful, measurement of how busy the road is.
Disamenity	The government Planning Portal does not define disamenity, but its literal meaning would be "impaired amenity" and from its definition of amenity could be considered to be a negative element or elements that detract from the overall character or enjoyment of an area. The Oxford English Dictionary defines disamenity as "the unpleasant quality or character of something". In relation to the impacts of landfills, Defra has described disamenity as nuisance caused by an activity such as noise, odour, litter, vermin, visual intrusion and associated perceived discomfort.
Dust	Solid particles that are suspended in air, or have settled out onto a surface after having been suspended in air. The terms dust and particulate matter are often used fairly interchangeably, although in some contexts one term tends to be used in preference to the other. In this report the term "dust" is used to define the particles that may give rise to soiling and to human health and ecological effects. NB: this is different to the definition of "dust" given in BS 6069 Part 2, where dust refers to particles up to 75 µm diameter.
Dust soiling	The effect of deposited dust upon surfaces, which can lead to annoyance.
EAC%	Effective Area Coverage (EAC) is the "dust soiling" determined by the loss of reflectance using a smoke stain reflectometer, or as a relative difference in greyscale of pixels in a computer-scanned image of a "sticky pad" sample. EAC% therefore considers the darkness or greyscale discolouration of dust and is used as a measure of dust soiling. EAC% generally increases with dust coverage.
NO_2	Nitrogen Dioxide (NO_2) is a gas that is emitted from combustion processes. NO_2 has a variety of environmental and health impacts.
PM (Particulate Matter)	A term used to describe the solid matter suspended in the air, which is considered am air pollutant when in certain size categories. **PM_{10}** and **$PM_{2.5}$** describe particulate matter less than 10 micrometres in diameter and less than 2.5 micrometres in diameter respectively.
Trackout	The transport of dust and dirt from the mineral site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy goods vehicles (HGVs) leave the site with dusty materials, which may then spill onto the road, and/or when HGVs transfer dust and dirt onto the road having travelled over muddy ground on site.

Appendix B Policy and Guidance

Legislation and Policy

Air Quality Regulations and Objectives

There are two sets of air quality legislation which include ambient air quality thresholds for the protection of public health that apply in England, these include legally binding limit values originally set by the European Union (EU) Directive 2008/50/EC[4] on ambient air quality and cleaner air for Europe; and regulations implementing national air quality objectives as set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)[5] which local authorities are required to work towards achieving.

The EU (Withdrawal Agreement) Act 2020 sets out arrangement for implementing air quality limit values that are included in the EU Directive on ambient air quality and cleaner air for Europe (2008/50/EC) included in the following:

- Air Quality Regulations (SI 2010 No.1001)[6] and amended (SI 2016 No.1184)[7];
- The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 (SI 2019 74)[8];
- The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (SI 2020 1313)[9] amend the Air Quality Regulations (SI 2010 No.1001) to account for EU withdrawal; and
- The AQS objectives are implemented in the Air Quality (England) Regulations 2000 (SI 2000/928)[10] and Air Quality (England) (Amendment) Regulations 2002 (SI 2002/3043)[11].

The Air Quality Strategy 2023 sets out the government's policies and framework for improving air quality in the UK with the aim of meeting the requirements of above legislation The Air Quality Strategy also outlines the Limit Values, Target Values, Standards, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report). Those relevant to this assessment is provided below, in Table 9:

Table 9: National Air Quality Objectives

Pollutant	Averaging Period	AQALs	
PM_{10}	24 Hour Mean	50 µg/m^3	50 µg/m^3 not to be exceeded more than 35 times a year.
	Annual Mean	40 µg/m^3	
$PM_{2.5}$	Annual Mean	20 µg/m^3	

Defra's Local Air Quality Management Technical Guidance 2022 (LAQM.TG(22))[17] provides guidance on where the above AQAL's should apply. This is summarised below, in Table 10.

Table 10: Summary of where AQALs should apply

Averaging Period	Objectives should apply at:	Objectives should generally NOT apply at:
Annual Mean	All locations where members of the public might be regularly exposed. Building facades of	Building facades of offices or other places of work where members of the public do not have regular access.

Averaging Period	Objectives should apply at:	Objectives should generally NOT apply at:
	residential properties, schools, hospitals, care homes etc.	Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to other locations at the building façade) or any other location where public exposure is expected to be short term.
24 Hour Mean and 8 Hour Mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to other locations at the building façade) or any other location where public exposure is expected to be short term.
1 Hour Mean	All locations where the annual Mean and: 24 and 8-hour mean objectives apply. Kerbside site (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railways stations etc. which are not fully enclosed, where members of the public might be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expect to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15 Minute Mean	All locations where member of the public might reasonably be exposed for a period of 15 minutes	

Local Air Quality Management

Obligations under the Environment Act 2021[12] (which provides an amendment to the Environment Act 1995[13]) requires local authorities to review and assess air quality in their administrative boundaries. Where AQALs are predicted to be exceeded, the local authority must declare an Air Quality Management Area (AQMA) at sensitive receptor locations and formulate an Air Quality Action Plan (AQAP) to reduce pollution concentrations to values below AQALs. This will be of relevance where PM_{10} is considered an issue in an AQMA.

AQMAs have been reviewed for the local area. The closest AQMA to the study area is located over 15km to the south west of the monitoring sites in Cheltenham and is therefore not relevant to this assessment.

National Planning Policy Framework

The National Planning Policy Framework (NPPF)[1] sets out the Government's planning policy for England. It requires planning decisions for any new development to prevent new and existing development from

contributing to, or being put at risk from, unacceptable levels of air pollution (paragraph 174). It also states that planning decisions should sustain and contribute towards compliance with relevant limit values or national objectives for air pollutants, taking into account the presence of AQMAs and Clean Air Zones (CAZ)s (paragraph 186), and the cumulative impacts from other sites (paragraph 185).

Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. Furthermore, planning decisions should ensure that any new development in AQMAs and CAZs is consistent with the local air quality action plan.

Also, to help reduce congestion and emissions, to improve air quality and public health, significant development should be focused on locations which are / can be made sustainable through limiting the need to travel (paragraph 105).

The NPPF also states that when determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy, but that in considering proposals for mineral extraction, minerals planning authorities should:

- ensure that there are no unacceptable adverse impacts on the natural and historic environment, human health or aviation safety, and take into account the cumulative effect of multiple impacts from individual sites and/or from a number of sites in a locality; and,
- ensure that any unavoidable noise, dust and particle (PM) emissions and any blasting vibrations are controlled, mitigated or removed at source.

Planning Practice Guidance

Reference ID 32 (Air Quality) of the National Planning Practice Guidance (NPPG)[2], which was updated in November 2019, provides guiding principles on how planning can take account of the impact of new development on air quality. The NPPG summarises the importance of air quality in planning and the key legislation relating to it.

In addition, the Minerals section of the NPPG[3] provides the principles to be followed in considering the environmental effects of surface mineral workings and states that:

> *"Where dust emissions are likely to arise, mineral operators are expected to prepare a dust assessment study, which should be undertaken by a competent person/organisation with acknowledged experience of undertaking this type of work."*

On what a dust assessment study should contain the NPPG states:

> *"There are five key stages to a dust assessment study:*
>
> *• establish baseline conditions of the existing dust climate around the site of the proposed operations;*
>
> *• identify site activities that could lead to dust emission without mitigation;*
>
> *• identify site parameters which may increase potential impacts from dust;*
>
> *• recommend mitigation measures, including modification of site design; and*
>
> *• make proposals to monitor and report dust emissions to ensure compliance with appropriate environmental standards and to enable an effective response to complaints."*

The Minerals section of the NPPG is not prescriptive on how that impact should be assessed, but does describe some specific aspects that should be included:

"The location of residential areas, schools and other dust sensitive land uses should be identified in relation to the site, as well as proposed or likely sources of dust emission from within the site.

The assessment should explain how topography may affect the emission and dispersal of site dust, particularly the influence of areas of woodland, downwind or adjacent to the site boundary, and of valley or hill formations in altering local wind patterns.

The assessment should explain how climate is likely to influence patterns of dispersal by analysing data from the UK Meteorological Office or other recognised agencies on wind conditions, local rainfall and ground moisture conditions."

The Mineral NPPG also states:

"Additional measures to control fine particulates (PM_{10}) to address any impacts of dust might be necessary if, within a site, the actual source of emission (e.g., the haul roads, crushers, stockpiles etc.) is in close proximity to any residential property or other sensitive use. Operators should follow the assessment framework for considering the impacts of PM_{10} from a proposed site.

The actual cut-off point for consideration of additional assessments for individual proposals will vary according to local circumstances (such as the topography, the nature of the landscape, the respective location of the site and the nearest residential property or other sensitive use in relation to the prevailing wind direction and visibility)".

Local Planning Policy

The local planning authorities of relevance in the study area are:

- Gloucestershire County Council (GCC) who are the Minerals and Waste Planning Authority (MWPA) for the county and is responsible for preparing minerals and waste-related planning policies, development plan documents and guidance;
- Tewkesbury Borough Council (TBC) who are the local planning authority for the borough, which includes the Upper Coscombe monitoring location; and
- Cotswold District Council (CDC) who are the planning authority for the district, which includes the Ford monitoring location.

The adopted local plans, supplementary planning documents, and minerals and waste-related planning policies have been reviewed for policies of relevance to this assessment. These relevant policies are shown below.

Policy EN15 of the Cotswold District Local Plan 2011-2031[14] states:

1. Development will be permitted that will not result in unacceptable risk to public health or safety, the natural environment or the amenity of existing land uses through:

a. pollution of the air, land, surface water, or ground water sources; and/or

b. generation of noise or light levels, or other disturbance such as spillage, flicker, vibration, dust or smell."

No policies of relevance were identified in the Tewkesbury Borough Plan 2011-2031[15].

Section 10 of the Minerals Local Plan for Gloucestershire Development Management[16] includes Policy DM01 Amenity, which states:

"Mineral development proposals will be permitted only where it can be demonstrated adverse impacts on the amenity of local communities within Gloucestershire and those of neighbouring

administrative areas will be avoided, strictly controlled or mitigated so as to ensure unacceptable impacts will not arise in respect of noise, vibration, air pollution and visual intrusion."

Guidance

EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality

This guidance[18] provides indicative thresholds for changes in traffic levels, above which potential impacts may require further detailed assessment. These are given below in Table 11:

Table 11: EPUK & IAQM Assessment Criteria

Criteria	The Development Will:	Indicative Criteria above which further assessment of effects on air quality may be required:
1	Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV - cars and small vans <3.5t gross vehicle weight)	A change of LDV flows of: » more than 100 AADT within or adjacent to an AQMA » more than 500 AADT elsewhere
2	Cause a significant change in Heavy Duty (HDV) flows on local roads with relevant receptors (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: » more than 25 AADT within or adjacent to an AQMA » more than 100 AADT elsewhere.

It is noted in the EPUK & IAQM guidance that exceedance of one of the above criteria does not automatically lead to the requirement for a detailed assessment of potential air quality impacts, if there is sufficient existing evidence to make a sound conclusion on the likelihood of potential impacts and their significance. Furthermore, if none of the criteria are met, then there should be no requirement to carry out an air quality assessment, and the impacts can be considered as having an insignificant effect.

IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning

This guidance[19] is focussed on assessing the impacts of mineral sites in terms of nuisance dust and PM_{10} and $PM_{2.5}$ impacts.

Defra's LAQM.TG(22)

Defra's LAQM.TG(22)[17] states that dust emissions from a range of fugitive and uncontrolled sources can give rise to elevated PM_{10} concentrations.

Dust may arise from:

- On-site activities, such as handling of dusty materials, the cutting of concrete, etc;
- Wind-blown dust from stockpiles and dusty surfaces; or
- The passage of vehicles over unpaved ground and along public roads affected by dust and dirt tracked out from dusty sites;

Appendix C PM_{10} Monitoring Data

The maximum 15-minute and maximum 1-hour concentrations of PM_{10} for each day are shown below in Table 12:

Table 12: PM_{10} Daily Results

Date	Measured PM_{10}	
	Max 15 Min	Max 1 Hour
	µg/m³	µg/m³
03/05/2023	20.9	20.0
04/05/2023	41.3	37.3
05/05/2023	9.8	9.3
06/05/2023	20.7	20.4
07/05/2023	18.8	16.3
08/05/2023	11.8	10.8
09/05/2023	19.1	17.1
10/05/2023	8.6	8.1
11/05/2023	12.4	9.2
12/05/2023	22.7	21.9
13/05/2023	27.4	26.9
14/05/2023	40.0	37.2
15/05/2023	11.2	10.1
16/05/2023	18.4	15.1
17/05/2023	14.1	13.3
18/05/2023	16.9	13.9
19/05/2023	24.9	24.0
20/05/2023	20.8	18.1
21/05/2023	11.8	11.6
22/05/2023	20.5	18.4
23/05/2023	13.4	12.5
24/05/2023	18.2	17.5
25/05/2023	22.7	16.9
26/05/2023	9.9	9.4
27/05/2023	13.4	13.1
28/05/2023	12.5	11.1
29/05/2023	8.0	7.1
30/05/2023	11.4	10.3
31/05/2023	11.6	11.0

Date	Measured PM_{10}	
	Max 15 Min	Max 1 Hour
	µg/m³	µg/m³
01/06/2023	14.9	14.6
02/06/2023	14.0	10.5
03/06/2023	13.1	12.8
04/06/2023	17.6	17.0
05/06/2023	15.8	14.8
06/06/2023	15.2	14.6
07/06/2023	13.4	12.6
08/06/2023	15.6	14.3
09/06/2023	23.4	21.5
10/06/2023	27.6	26.5
11/06/2023	37.9	37.6
12/06/2023	36.9	34.4
13/06/2023	28.8	27.8
14/06/2023	18.8	18.0
15/06/2023	19.7	19.0
16/06/2023	23.7	23.4
17/06/2023	23.4	22.7
18/06/2023	39.2	38.4
19/06/2023	20.3	19.3
20/06/2023	12.2	11.0
21/06/2023	12.2	11.4
22/06/2023	15.7	14.4
23/06/2023	13.5	12.9
24/06/2023	12.4	11.7
25/06/2023	9.7	8.9
26/06/2023	6.6	6.5
27/06/2023	21.5	20.4
28/06/2023	15.5	14.3
29/06/2023	16.5	15.1
30/06/2023	10.4	9.6
01/07/2023	20.2	19.9
02/07/2023	17.6	17.0
03/07/2023	7.1	6.7
04/07/2023	14.5	12.7
05/07/2023	8.4	7.7

Date	Measured PM_{10}	
	Max 15 Min	Max 1 Hour
	µg/m³	µg/m³
06/07/2023	6.5	6.0
07/07/2023	11.9	10.7
08/07/2023	12.6	12.2
09/07/2023	7.6	7.0
10/07/2023	9.0	8.3
11/07/2023	7.3	6.9
12/07/2023	9.7	9.5
13/07/2023	10.2	9.1
14/07/2023	10.5	10.0
15/07/2023	7.7	7.4
16/07/2023	8.1	8.0
17/07/2023	7.8	7.6
18/07/2023	10.4	7.5
19/07/2023	9.0	8.1
20/07/2023	11.2	10.6
21/07/2023	18.7	17.0
22/07/2023	8.4	8.1
23/07/2023	7.4	6.8
24/07/2023	9.4	9.2
25/07/2023	10.8	8.2
26/07/2023	8.5	7.8
27/07/2023	9.4	9.1
28/07/2023	8.0	7.4
29/07/2023	5.8	5.6
30/07/2023	8.8	8.3
31/07/2023	11.3	10.6
01/08/2023	10.3	10.0
02/08/2023	7.1	6.3

Appendix D TGPC 2022 Traffic Counts

Traffic Count conducted on 24 October 2022 between 06:30 and 18:30

		Towards Tewkesbury				Towards Stow on the Wold			
From	To	All HGV	Comm. Van	Car	Motor Cycle	All HGV	Comm. Van	Car	Motor Cycle
06:30	07:00	2	4	15	0	6	5	36	0
07:00	07:30	3	6	14	0	4	15	28	0
07:30	08:00	2	10	31	0	5	23	56	0
08:00	08:30	4	10	19	0	7	20	44	0
08:30	09:00	3	6	25	0	3	9	30	0
09:00	09:30	6	6	26	0	12	14	25	0
09:30	10:00	4	4	19	0	2	13	30	1
10:00	10:30	11	3	24	0	11	5	54	0
10:30	11:00	4	12	25	0	5	12	41	0
11:00	11:30	4	9	20	0	3	6	42	0
11:30	12:00	3	26	21	0	2	6	30	2
12:00	12:30	4	16	39	0	7	7	33	0
12:30	13:00	4	11	29	0	2	7	34	0
13:00	13:30	7	9	24	0	6	8	35	0
13:30	14:00	5	6	32	0	3	8	25	0
14:00	14:30	8	11	35	0	3	4	25	0
14:30	15:00	8	8	35	0	3	13	32	0
15:00	15:30	7	14	25	0	4	13	38	0
15:30	16:00	5	7	30	0	2	7	24	1
16:00	16:30	1	22	34	1	0	12	34	1
16:30	17:00	1	10	47	0	1	7	30	0
17:00	17:30	0	14	51	0	1	10	41	0
17:30	18:00	0	8	42	0	1	5	23	0
18:00	18:30	1	5	29	0	0	3	15	0
Totals:		**97**	**237**	**691**	**1**	**93**	**232**	**805**	**5**