Air Quality Assessment

24 Kenilworth Road, Leamington Spa

Report Ref: AQ1922

December 2020

Union House | 111 New Union Street | Coventry | CV1 2NT | T: 0800 689 4329 | E: info@gemairquality.co.uk | www.gemairquality.co.uk

DOCUMENT CONTROL & DISCLAIMER

Title:

24 Kenilworth Road, Leamington Spa:
Air Quality Assessment

Report Ref:

AQ1922

Date Issued:

December 2020

Client Details:

Cloister Capital Limited
10 Waterside
The Moorings
Royal Leamington Spa
CV31 3QA

Produced By:

GEM Air Quality Ltd
Union House
111 New Union Street
Coventry
CV1 2NT

Tel: 0800 689 4329
Email: info@gemairquality.co.uk
www.gemairquality.co.uk

Disclaimer:

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

1.1 Scope

GEM Air Quality Ltd has been commissioned to undertake a detailed air quality assessment based on the potential impacts of existing and future traffic levels on the proposed student led development located at 24 Kenilworth Road in Leamington Spa. The pollutants modelled as part of this assessment are nitrogen oxides (NOx) and particulate matter (PM_{10}).

The impacts of vehicle emissions have been assessed using the techniques detailed within Volume 11, Section 3 of the Design Manual for Roads and Bridges (DMRB)[1] and the Local Air Quality Management Technical Guidance (LAQM.TG16)[2]. The impact of road traffic emissions will be assessed using the ADMS-Roads air dispersion model. This model has been devised by Cambridge Environmental Research Consultants (CERC) and is described as a "*comprehensive tool for investigating air pollution problems due to small networks of roads*".

It should be noted that the short-term impacts of NO_2 and PM_{10} emissions have not been modelled as dispersion models are inevitably poor at predicting short-term peaks in pollutant concentrations, which are highly variable from year to year, and from site to site. Notwithstanding this, general assumptions have been made about short term concentrations based on the modelled annual mean concentrations.

In addition to this, the assessment has also assessed the potential impact on local air quality from demolition and construction activities at the site.

Based on Warwick District Councils Air Quality & Planning Supplementary Planning Document (SPD) the proposed development is classified as "minor". This is because the proposed development is for fewer than 80 units (<150 students) and does not require a Transport Assessment. Furthermore, the proposed development will generate fewer than 100 daily vehicle movements along the A452 Kenilworth Road. As such, a full impact assessment and mitigation assessment has not been undertaken.

[1] Design Manual for Roads and Bridges, Vol 11, Section 3, Part 1 – HA207/07, Highways Agency, May 2007

[2] Part IV of the Environment Act 1995, Local Air Quality Management Technical Guidance (TG16), Defra, February 2018

2 Pollutants & Legislation

2.1 Pollutant Overview

In most urban areas of the UK, traffic generated pollutants have become the most common pollutants. These are nitrogen dioxide (NO_2), fine particulates (PM_{10}), carbon monoxide (CO), 1,3-butadiene and benzene, as well as carbon dioxide (CO_2). This air quality assessment focuses on NO_2 and PM_{10}, as these pollutants are least likely to meet their Air Quality Strategy objectives near roads. Table 1 provides an overview of NO_2 and PM_{10}.

Table 1 – Overview of NO_2 and PM_{10}

Pollutant	Properties	Anthropogenic Sources	Natural Sources	Potential Effects
Particles (PM_{10})	Tiny particulates of solid or liquid nature suspended in the air	Road transport; Power generation plants; Production processes e.g. windblown dust	Soil erosion; Volcanoes; Forest fires; Sea salt crystals	Asthma; Lung cancer; Cardiovascular problems
Nitrogen Dioxide (NO_2)	Reddish-brown coloured gas with a distinct odour	Road transport; Power generation plants; Fossil fuels – extraction & distribution; Petroleum refining	No natural sources, although nitric oxide (NO) can form in soils	Pulmonary edema; Various environmental impacts e.g. acid rain

2.2 Air Quality Strategy

The UK Government and the devolved administrations published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland on 17 July 2007[3]. The Strategy provides an over-arching strategic framework for air quality management in the UK.

With regards to this assessment, the Air Quality Strategy contains national air quality standards and objectives established by the Government to protect human health. The objectives for nitrogen dioxide and particulates (PM_{10} and $PM_{2.5}$) have been set, along with seven other pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, PAHs, sulphur dioxide and ozone). Those which are limit values required by EU Daughter Directives on Air Quality have been transposed into UK law through the Air Quality Standards Regulations 2010 which came into force on 11th June 2010. Table 2 provides the UK Air Quality Objectives for NO_2 and PM_{10}.

[3] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland, July 2007

Table 2 – UK Air Quality Objectives for Nitrogen Dioxide and Particulate Matter

Pollutant	Objective	Concentration measured as	Obligation
Particles (PM_{10})	50µg/m^3 not to be exceeded more than 35 times a year	24 hour mean	All local authorities
	50µg/m^3 not to be exceeded more than 7 times a year	24 hour mean	Scotland only
	40µg/m^3	Annual mean	All local authorities
	10µg/m^3	Annual mean	Scotland only
Particles ($PM_{2.5}$)	25µg/m^3	Annual Mean	England only (encouraged in Wales)
	10µg/m^3	Annual Mean	Scotland only
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1 hour mean	All local authorities
	40µg/m^3	Annual mean	All local authorities

Objectives for $PM_{2.5}$ were also introduced by the UK Government and the Devolved Administrations in 2010. However, the Air Quality Strategy has adopted an 'exposure reduction' approach for $PM_{2.5}$ in order to seek a more efficient way of achieving further reductions in the health effects of air pollution by providing a driver to improve air quality everywhere in the UK rather than just in a small number of localised hotspot areas.

As defined in Table 4, background $PM_{2.5}$ concentrations are well below the limit value of 25.0 µg/m^3. As such, no further consideration has been given to $PM_{2.5}$ within this assessment.

2.3 Clean Air Strategy

The Clean Air Strategy[4] was published in January 2019 and sets out the comprehensive action that is required from across all parts of government and society to tackle all sources of air pollution. New legislation will create a stronger and more coherent framework for action to tackle air pollution. This will be underpinned by new England-wide powers to control major sources of air pollution, in line with the risk they pose to public health and the environment, plus new local powers to take action in areas with an air pollution problem. These will support the creation of Clean Air Zones to lower emissions from all sources of air pollution, backed up with clear enforcement mechanisms.

[4] Clean Air Strategy 2019, Department for Environment, Food and Rural Affairs, January 2019

2.4 Local Air Quality Management (LAQM)

At the core of LAQM delivery are three pollutant objectives; these are: nitrogen dioxide (NO_2), particulate matter (PM_{10}) and sulphur dioxide (SO_2). All current Air Quality Management Areas (AQMAs) across the UK are declared for one or more of these pollutants, with NO_2 accounting for the majority. It is a statutory requirement for local authorities to regularly review and assess air quality in their area and take action to improve air quality when objectives set out in regulation cannot be met.

2.4.1 Warwick District Council

The Council has declared several Air Quality Management Areas (AQMAs). However, the proposed development is not located within or adjacent to an AQMA.

3 PLANNING POLICY & GUIDANCE

3.1 National Planning Policy & Guidance

3.1.1 National Planning Policy Framework

On a national level, air quality can be a material consideration in planning decisions. The updated National Planning Policy Framework (NPPF) for England, released in February 2019, is considered a key part of the Governments reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

Paragraph 103 within the NPPF states that the "*The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making.*".

It goes on to state in paragraph 181 that "*Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan*".

3.1.2 Land-Use Planning & Development Control

In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) produced guidance to ensure that air quality is adequately considered in the land-use planning and development control processes[5].

The guidance document is particularly applicable to assessing the effect of changes in exposure of members of the public resulting from residential and mixed-use developments, especially those within urban areas where air quality is poorer. It is also relevant to other

[5] Land-Use Planning & Development Control: Planning for Air Quality. Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. EPUK & IAQM. January 2017

forms of development where a proposal could affect local air quality and for which no other guidance exists.

3.2 Local Planning Policy & Guidance

3.2.1 Warwick District Council Local Plan (2017)

Policy TR2 "Traffic Generation" within the Councils Local Plan relates specifically to air quality and states the following:

"*Any development that results in significant negative impacts on air quality within identified Air Quality Management Areas or on the health and wellbeing of people in the area as a result of pollution should be supported by an air quality assessment and, where necessary, a mitigation plan to demonstrate practical and effective measures to be taken to avoid the adverse impacts*".

However, as discussed in Section 1.1 of this report, a full impact assessment has been screened out based on the Councils SPD released in January 2019.

3.2.2 Air Quality & Planning Supplementary Planning Document

The Councils Air Quality & Planning Supplementary Planning Document (SPD) aims to simplify the consideration of air quality impacts associated with development schemes and focus on incorporation of mitigation at design stage, countering the cumulative impacts of aggregated developments, providing clarity to developers and defining of sustainability in air quality terms.

As discussed in Section 1.1 of this report, using the Air Quality & Planning SPD the proposed development is classified as "minor". This is because the proposed development is for fewer than 80 units (<150 students) and does not require a Transport Assessment. Furthermore, the proposed development will generate fewer than 100 daily vehicle movements along the A452 Kenilworth Road. As such, a full impact assessment and mitigation assessment has not been undertaken.

4 Assessment Methodology

4.1 Construction Phase

The Institute of Air Quality Management (IAQM) has published guidance on the assessment of dust from construction and demolition[6]. Based on this guidance, the main air quality impacts that may arise during construction activities are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes, which are evidence of dust emissions;
- Elevated PM_{10} concentrations, as a result of dust generating activities on site; and
- An increase in concentrations or airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment on site.

In relation to the most likely impacts, the guidance states the following:

"*The most common impacts are dust soiling and increased ambient PM_{10} concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of particulate matter in all size fractions.*

Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed".

The guidance continues by providing an assessment procedure. This includes sub-dividing construction activities into four types to reflect their different potential impacts. These are as follows:

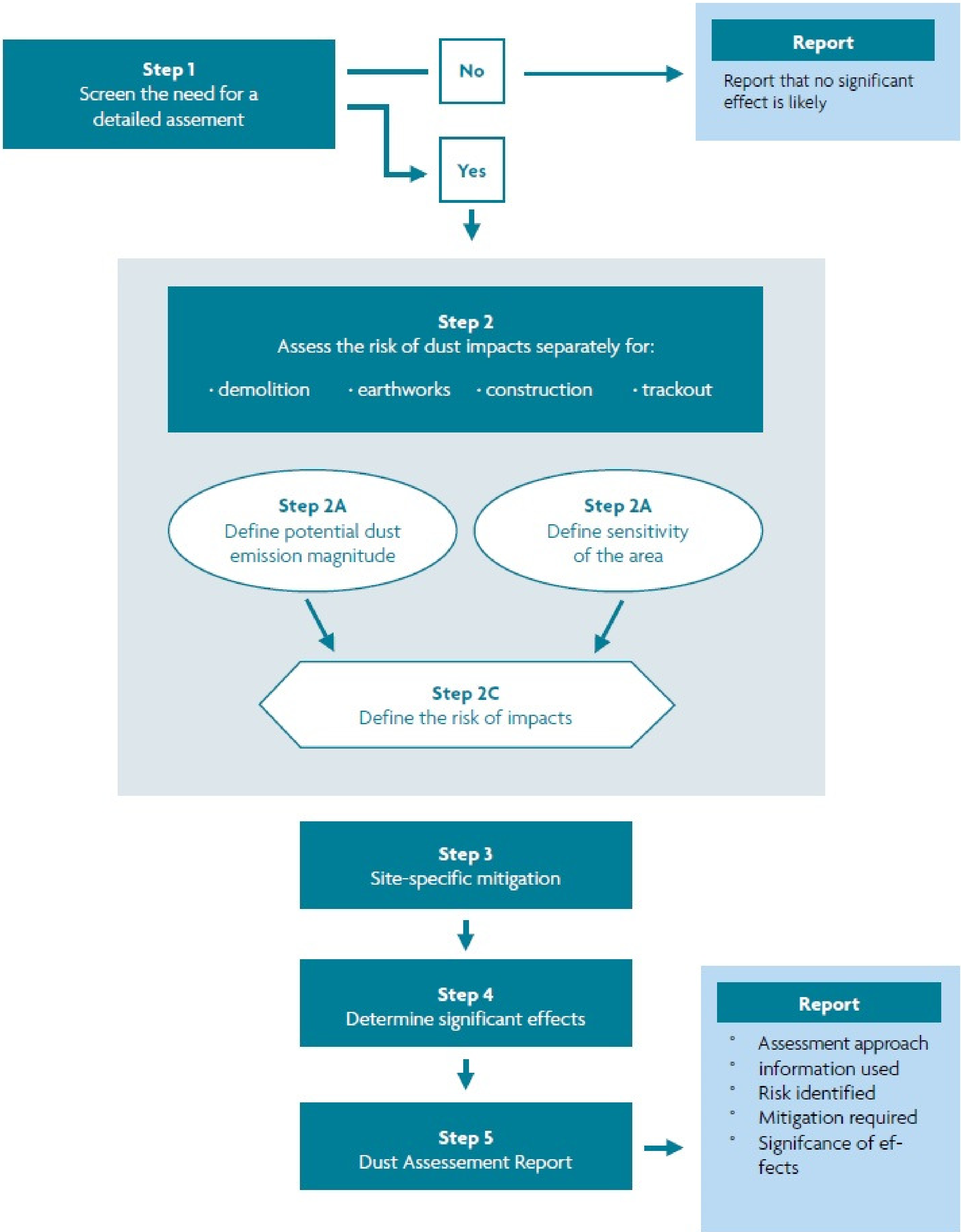
- Demolition;
- Earthworks;
- Construction; and
- Track out.

With regards to the proposed development the potential for dust emissions is assessed for each activity that is likely to take place. The assessment procedure assumes no mitigation measures are applied. The conditions with no mitigation thus form the baseline or "do-nothing" situation for a construction site. The assessment procedure uses the steps provided in the guidance and summarised in Figure 1.

---

6 Holman et al (2014). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf

Figure 1 – Dust Assessment Procedure



4.2 Operational Phase (Traffic Emissions)

4.2.1 Modelled Scenarios

Two scenarios have been modelled as part of this assessment. These are as follows:

- **Scenario 1 (2019)** – existing levels of air quality / model verification; and
- **Scenario 2 (2024)** – future impact of traffic emissions on the proposed development i.e. introduction of new exposure.

The current baseline year (2019) has been modelled as this corresponds with the latest air quality monitoring undertaken by the Council. A future year has been chosen (2024) representing the baseline year plus 5 years and will provide an assessment of the future impact of traffic emissions on the proposed development once completed and fully occupied.

4.2.2 ADMS-Roads

Modelling the impact of traffic emissions on the proposed development will be undertaken using the latest version of the ADMS-Roads model[7]. ADMS-Roads is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure, and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

4.2.3 Emission Factors

Defra and the Devolved Administrations have provided an updated Emission Factors Toolkit (Version 10.1) which incorporates updated NOx emissions factors and vehicle fleet information[8]. These emission factors have been integrated into the latest ADMS-Roads modelling software. However, to undertake a worst-case assessment emission factors for 2019 have been used for all modelled years.

4.2.4 Traffic Data

Baseline traffic flows along the A452 Kenilworth Road have been derived from the Department for Transport (DfT)[9]. Baseline data from 2019 has been projected to 2024. Projection of traffic data has been undertaken using growth factors specific to Warwick District Council, obtained from TEMPro[10]. The projected flow rates are provided in Table 3. It is assumed that the percentage HDV and speed will remain unchanged in future years.

[7] Model Version: 5.0.0.1. Interface Version 5.0.0.5313 (16/03/2020)
[8] https://laqm.defra.gov.uk/documents/EFT2020_v10.1.xlsb
[9] https://roadtraffic.dft.gov.uk/manualcountpoints
[10] TEMPro (Trip End Model Presentation Program) version 7, Department for Transport

The A445 Rugby Road has been modelled for the purposes of model verification. Traffic flows for this link have been derived from the Warwickshire traffic counts website[11].

For the modelled speeds, the figures provided in Table 3 have been used. However, where a link approaches a junction a speed of 20 kph has been modelled to represent queuing traffic at a junction.

Table 3 – Annual Average Daily Traffic Flows, Percentage HDV and Speeds for Modelled Roads, 2019 and 2024

Link Name	AADT 2019	AADT 2024	HDV (%)	Speed (kph)
A452 Kenilworth Road	23,886	25,123	2.7%	48
A445 Rugby Road	10,557	--	1.9%	48

4.2.5 Street Canyons

A street canyon may be defined as a relatively narrow street with buildings on both sides, where the height of the buildings is generally greater than the width of the road. Street canyons may result in elevated pollutant concentrations from road traffic emissions due to a reduced likelihood of the pollutants becoming dispersed in the atmosphere. Street canyons have not been modelled as part of this assessment.

4.3 Background Concentrations

Background NOx, NO_2 and PM_{10} concentrations have been obtained from Defra[12]. These 1 km x 1 km grid resolution maps are derived from a base year of 2018 (for NOx, NO_2, PM_{10} and $PM_{2.5}$ only), which are then projected to future years (2019). Background concentrations of NOx, NO_2, PM_{10} and $PM_{2.5}$ derived from Defra are provided in Table 4.

Table 4 – Background NOx, NO_2 and PM_{10} Concentrations

Pollutant	X	Y	2019
NO_2	431500	266500	15.3
NOx			21.0
PM_{10}			13.9
$PM_{2.5}$			9.3

11 https://wcc-trafficsurveys.drakewell.com/c2dev_u/publicmultinodemap.asp
12 http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

To undertake a worst-case assessment, 2019 background concentrations have been assumed for all modelled scenarios.

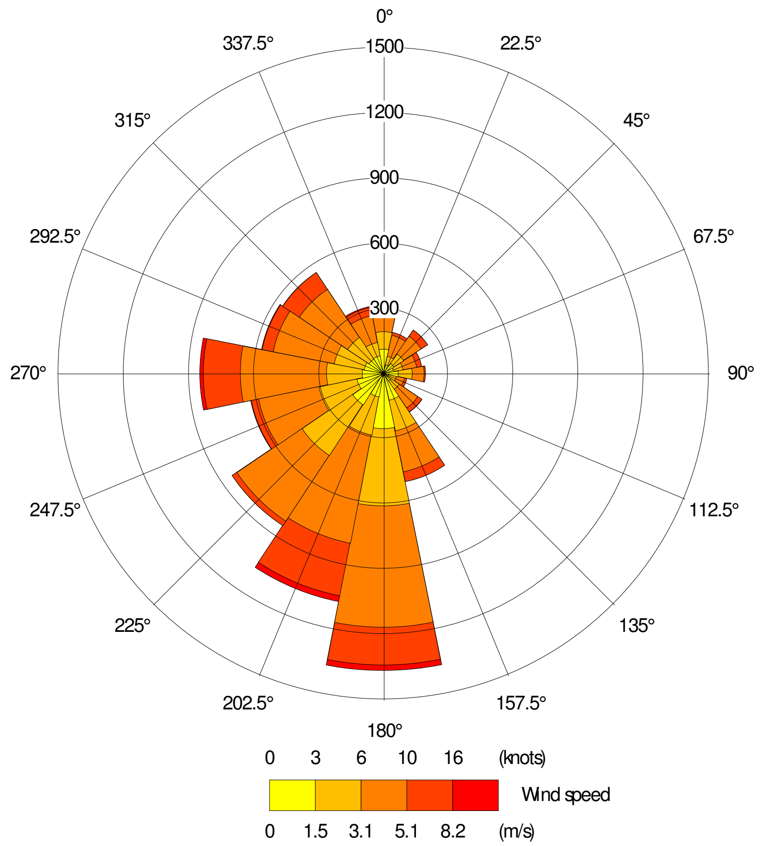
4.4 Surface Roughness

A surface roughness of 1.0 metre has been used in the model. This value is provided by ADMS-Roads as a typical roughness length for cities. This value has been used across the modelled domain.

4.5 Meteorological Data

Hourly sequential meteorological data from Church Lawford meteorological station has been used. Wind speed and direction data from Church Lawford meteorological station has been plotted as a wind rose in Figure 2.

Figure 2 – Wind Speed and Direction Data, Church Lawford



4.6 Model Output

4.6.1 NOx/NO_2 Relationship

The most NOx to NO_2 calculator[13] has been used to determine NO_2 concentrations for this assessment, based on predicted NOx concentrations using ADMS-Roads. Converted NO_2 concentrations are initially compared against local monitoring data to verify the model output. If the model performance is considered unacceptable then the NOx concentrations are adjusted before conversion to NO_2.

4.6.2 Predicted Short Term Concentrations

As discussed in the introduction, it has not been possible to model the short-term impacts of NO_2 and PM_{10}. Research[14] has indicated that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 µg/m^3. A concentration of 60 µg/m^3 has therefore been used to screen the likelihood of exceedance of the hourly mean NO_2 objective.

For PM_{10}, a relationship between the annual mean and the number of 24-hour mean exceedences has been devised and is as follows:

- No. 24-hour mean exceedences = -18.5 + 0.00145 x annual mean^3 + (206/annual mean)

This relationship has been applied to the modelled annual mean concentrations to estimate the number of 24-hourly exceedences.

4.6.3 Model Verification

Monitored concentrations from the following sites have been used for the purposes of model verification during the baseline year (2019). This is the closest roadside monitoring site to the proposed development.

Table 5 – Modelled Verification Locations

ID	Location	X	Y	Height (m)
AURN 2	Rugby Road	431271	266404	3.5

13 https://laqm.defra.gov.uk/documents/NOx_to_NO2_Calculator_v8.1.xlsm

14 Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

4.6.4 Receptor Locations

To assess the potential impact of the traffic emissions from the local road network, several receptors have been identified representing the different facades of the proposed development. The location of these receptors, together with their height above ground level is provided in Table 6 and represented in Figure 3.

Table 6 – Modelled Receptor Locations

AQA ID	X	Y	Height (m)	Description
1	431756	266906	1.5, 4.5 & 7.5	Proposed Ground, First and Second Floors
2	431771	266903		
3	431780	266907		
4	431798	266915		
5	431814	266917		
6	431791	266909		

Figure 3 – Modelled Receptor Locations

4.7 Significance Criteria

4.7.1 Construction Phase

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk. A development is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (see Table 7); and
- the sensitivity of the area to dust impacts, which is defined as low, medium or high sensitivity (see Table 3).

These two factors are combined to determine the risk of dust impacts with no mitigation applied (see Table 10). The risk category assigned to the development can be different for each of the four potential activities (demolition, earthworks, construction and trackout).

Table 7 – Dust Emission Magnitude

Activity	Dust Emission Class		
	Large	Medium	Small
Demolition	Total building volume >50,000 m³, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level	Total building volume 20,000 – 50 000m³, potentially dusty construction material, demolition activities 10-20 m above ground level	Total building volume <20,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months
Earthworks	Total site area >10,000 m², potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes	Total site area 2,500 – 10,000 m², moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m - 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes	Total site area <2,500 m², soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months
Construction	Total building volume >100,000 m³, piling, on site concrete batching; sandblasting	Total building volume 25,000 m3 – 100,000 m³, potentially dusty construction material (e.g. concrete), piling, on site concrete batching	Total building volume <25,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber)
Track out	>50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m	10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100 m;	<10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50 m.

Table 8 – Sensitivity of the Area to Dust Soiling Effects on People and Property

Sensitivity of the Area to Dust Soiling Effects					
Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 9 – Sensitivity of the Area to Human Health Impacts

Sensitivity of the Area to Human Health Effects							
Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 10 – Risk of Dust Impacts

Construction Activity	Sensitivity of Area	Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Track out	High	High Risk	Low Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

4.7.2 Operational Phase

The significance of emissions will be determined by comparing the predicted results to the Air Pollution Exposure Criteria (APEC) detailed in the *Air Quality and Planning Guidance* written by the London Air Pollution Planning and the Local Environment (APPLE) working group[15]. The Air Pollution Exposure Criteria is considered appropriate to describe the significance of the impacts predicted, together with an indication as to the level of mitigation required in order for the development to be approved. The APEC table is provided below.

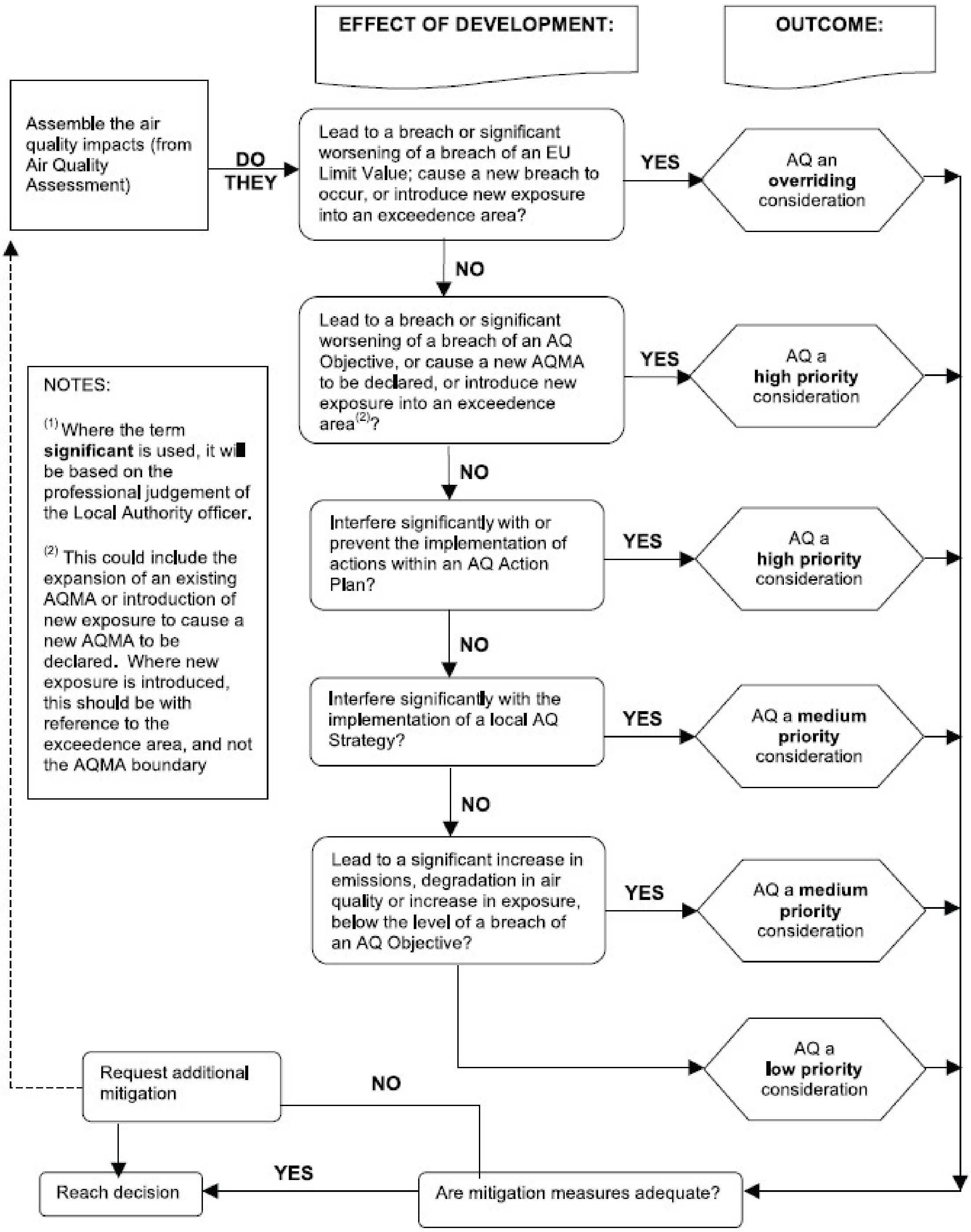
Table 11 – Air Pollution Exposure Criteria (APEC)

APEC Category	NO_2	PM_{10}	Recommendations
A	>5% below national annual mean objective	>5% below national annual mean objective >1-day less than national 24-hour objective	No air quality grounds for refusal; however mitigation of any emissions should be considered.
B	Between 5% below or above national annual mean objective	Between 5% above or below national annual mean objective Between 1-day above or below national 24-hour objective	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered
C	>5% above national annual mean objective	>5% above national annual mean objective >1-day more than national 24-hour objective	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated

Furthermore, the guidance released by Environmental Protection UK also provides steps for a Local Authority to follow in order to assess the significance of air quality impacts of a development proposal. This procedure, shown in Figure 4, has also been applied to the modelled results.

[15] Air Quality and Planning Guidance, written by the London Air Pollution Planning and the Local Environment (APPLE) working group, January 2007

Figure 4 – Assessing the Significance of Air Quality Impacts of a Development Proposal



5 Air Quality Assessment

5.1 Impact from Construction Activities

The assessment of construction activities has focused on demolition, earthworks, construction and track out activities at the site. Using the criteria provided in Table 7 the dust emission magnitude for each activity is as follows:

- Demolition = Small;
- Earthworks = Small;
- Construction = Small; and
- Track out = Small.

The sensitivity of the surrounding area to dust soiling and human health (Table 12) is then defined based on the criteria in Tables 8 and 9, which includes the number of highly sensitive receptors that fall within a certain distance of the proposed construction phase (see Figure 5).

Table 12 – Sensitivity of the Surrounding Area

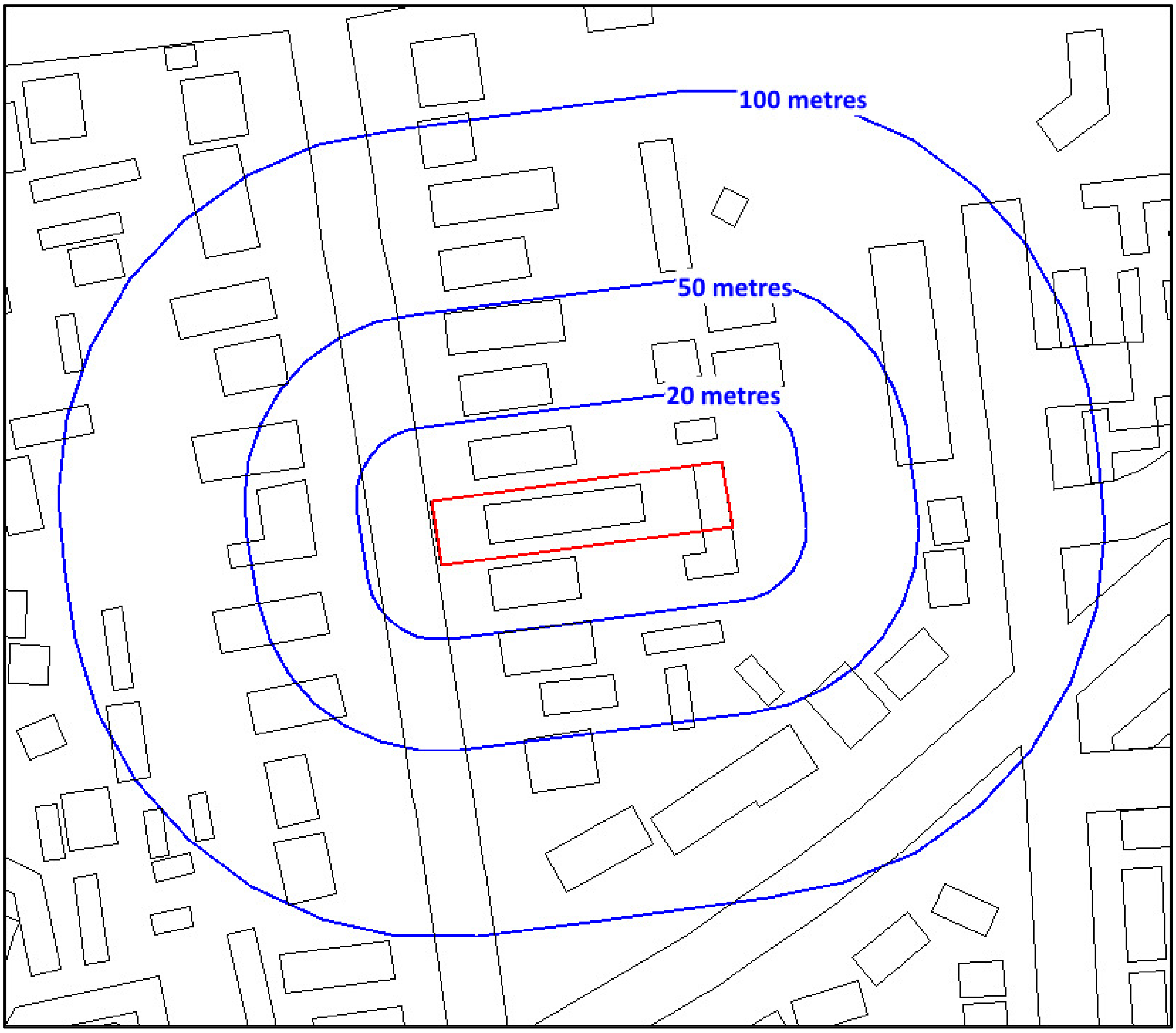
Potential Impact	Comments	Sensitivity
Dust Soiling	There are between 10 and 100 high sensitivity receptors e.g. residential properties, within 50 metres of the proposed development	Medium
Human Health	There are between 10 and 100 high sensitivity receptors e.g. residential properties, within 50 metres of the proposed development	Low

The dust emission magnitudes and sensitivity of the surrounding area are combined to determine the risk of dust impacts with no mitigation applied. These are summarised in Table 13.

Table 13 – Summary of Dust Risk

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Track out
Dust Soiling	Low Risk	Low Risk	Low Risk	Negligible
Human Health	Negligible	Negligible	Negligible	Negligible

Figure 5 – Distance from the Proposed Development



It should also be noted that the likelihood of an adverse impact occurring is correlated to wind speed and wind direction. As such, unfavourable wind speeds and wind directions must occur at the same time as a dust generating activity to generate an adverse impact. The overall impacts also assume that the dust generating activities are occurring over the entirety of the site meaning that as an activity moves further away from a potential receptor the magnitude and significance of the impact will be further reduced.

5.2 Impact of Vehicle Emissions

5.2.1 Model Verification

Using the guidance provided within the Local Air Quality Management Technical Guidance TG(16), the modelled output has been verified against the monitoring data obtained from the sites listed in Table 5. The following tables provide a summary of the model verification process for NOx/NO_2 and PM_{10} concentrations.

Table 14 – Comparison of Modelled and Monitored NO_2 Concentrations ($\mu g/m^3$), 2019

Verification Location	Modelled Concentration	Monitored Concentration	Difference [(modelled - monitored)/ monitored] x100
NO_2			
AURN 2	18.7	16.3	14.5%
PM_{10}			
AURN 2	14.5	13.3	9.3%

As described in the Technical Guidance (LAQM.TG16), in order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within ±25% (ideally ±10%) of the monitored concentrations. Given that the modelled concentrations are within these limits no model adjustment has been undertaken.

5.2.2 Nitrogen Dioxide

Predicted annual mean concentrations for NO_2 in 2019 and 2024 are provided in Table 15. As mentioned in Section 4.6.1, NO_2 concentrations have been calculated from the predicted NOx concentrations using the latest NOx-NO_2 conversion spreadsheet available from the Air Quality Archive.

The ADMS predictions for annual mean NO_2 concentrations in 2019 and 2024 indicate that the annual mean objective (40 $\mu g/m^3$) would achieved at all modelled receptors.

Nitrogen dioxide also has an hourly objective of 200 $\mu g/m^3$ not to be exceeded more than 18 times in one year. However, the hourly mean concentration has not been calculated directly by ADMS Roads. This is as a result of an evaluation of continuous monitoring data from across the UK that revealed that the relationship between the annual mean and hourly mean NO_2 concentrations was very weak. Nonetheless, research undertaken in 2003[16] has indicated

[16] Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 µg/m^3. Given that predicted NO_2 concentrations in 2019 and 2024 are below 60 µg/m^3 the likelihood of the short-term objective being exceeded is considered low.

Table 15 – Predicted NO_2 Concentrations, Annual Mean (µg/m^3)

Receptor ID	2019			2024		
	GF	1st	2nd	GF	1st	2nd
1	18.7	17.8	16.8	18.9	17.9	16.9
2	17.4	17.1	16.6	17.6	17.2	16.6
3	17.0	16.8	16.4	17.1	16.8	16.5
4	16.4	16.3	16.2	16.5	16.4	16.2
5	16.2	16.1	16.0	16.2	16.1	16.0
6	16.6	16.5	16.3	16.7	16.5	16.3
Objective	**40.0**					

5.2.3 Particulate Matter

Predicted annual mean concentrations for PM_{10} in 2019 and 2024 are provided in Table 16.

Table 16 – Predicted PM_{10} Concentrations, Annual Mean (µg/m^3)

Receptor ID	2019			2024		
	GF	1st	2nd	GF	1st	2nd
1	14.5	14.4	14.2	14.6	14.4	14.2
2	14.3	14.2	14.1	14.3	14.3	14.2
3	14.2	14.2	14.1	14.2	14.2	14.1
4	14.1	14.1	14.1	14.1	14.1	14.1
5	14.1	14.0	14.0	14.1	14.1	14.0
6	14.1	14.1	14.1	14.2	14.1	14.1
Objective	**40.0**					

The ADMS predictions for annual mean PM_{10} concentrations in 2019 and 2024 indicate that the annual mean objective (40 µg/m^3) would be achieved at all the modelled receptor locations. In addition, the maximum number of days when PM_{10} concentrations are more than 50 µg/m^3 is 0, less than the 35 exceedences allowed in the regulations.

6 Conclusions And Recommendations

6.1 Impact from Construction Activities

A qualitative assessment of dust levels associated with the proposed development has been carried out. The impact of dust soiling and PM_{10} can be reduced to negligible through appropriate mitigation measures, which are listed in Table 17 and are applicable to a low risk site. Implementation of these Best Practice Measures will help reduce the impact of the construction activities to an acceptable level.

With these mitigation measures enforced, the likelihood of nuisance dust episodes occurring at those receptors adjacent to the development are considered low. Notwithstanding this, the developer should consider the potential impact of air quality and dust on occupational exposure standards (to minimise worker exposure) and breaches of air quality objectives that may occur outside the site boundary. Monitoring is not recommended at this stage; however, continuous visual assessment of the site should be undertaken and a complaints log maintained in order determine the origin of a particular dust nuisance. Keeping an accurate and up to date complaints log will isolate particular site activities to a nuisance dust episode and help prevent it from reoccurring in the future.

6.2 Impact of Vehicle Emissions

The predicted concentrations of PM_{10} and NO_2 in all modelled years are below the relevant objectives. Predicted concentrations at all the modelled receptors fall within APEC Category A, which states that there are “no air quality grounds for refusal, however, mitigation of any emissions should be considered”. Overall, using the flow chart presented in Figure 4, air quality is a low priority consideration at the modelled locations in each of the modelled years.

6.2.1 Building Mitigation

Based on the results and discussion above there is no need to consider building mitigation.

6.2.2 Additional Mitigation

Based on the Warwick District Council Air Quality & Planning Supplementary Planning Document (SPD) the following “Type 1” mitigation measures will need to be adopted on-site:

- 1 charging point per unit (dwelling with dedicated parking) or 1 charging point per 10 spaces (unallocated parking) and ensure appropriate cabling is provided to enable increase in future provision

Table 17 – Mitigation of Construction Activities

Construction Activity	Mitigation Measures
Communications	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make a complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
Monitoring	Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
Preparing and maintaining the site	Plan site layout: machinery and dust causing activities should be located away from receptors.
	Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
	Avoid site runoff of water or mud.
Operating vehicle/machinery	Ensure all non-road mobile machinery (NRMM) comply with standards.
	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
	Use enclosed chutes, conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
Waste Management	Reuse and recycle waste to reduce dust from waste materials
	Avoid bonfires and burning of waste materials.