Air Quality Impact Assessment

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Contents

Executive Summary

Hilson Moran has been instructed by K2 and SeHa to undertake an Air Quality Impact Assessment (AQIA) for the proposed SeHa Monopile Manufacturing Facility development, Middlesbrough.

This report addresses the requirements of Condition 28 of the Outline Planning Permission, assessing the construction phase impacts associated with the proposed development.

The report presents the findings of the assessment, which addresses the potential air quality impacts during the construction phase of the Proposed Development. The assessment has been undertaken in line with the relevant policy and guidance, and where necessary outlines the required mitigation measures to minimise impacts.

A qualitative assessment of construction phase impacts has been carried out. There is a medium risk of dust soiling and fugitive PM_{10} emissions during the demolition, earthworks, construction and trackout phases. Through good site practice, the implementation of suitable mitigation measures, the impact of dust and PM_{10} releases will be minimised. The residual effect of the construction phase on air quality is therefore not significant.

A quantitative road traffic assessment has been undertaken using ADMS Roads to consider the impact of construction traffic. The conclusions of the detailed dispersion modelling indicate:

- The impact on annual mean NO_2 concentrations at all existing receptors modelled is negligible;
- Annual mean NO_2 concentrations at all proposed receptors are below the relevant AQS objective;
- All modelled receptors (existing and proposed) are predicted to have 1-hour mean NO_2 concentrations well below the AQS objective; and
- The annual mean concentrations of PM_{10} and $PM_{2.5}$ are below the AQS objective for all modelled receptors and within the AQS objective for 24-hour mean PM_{10}. The impacts are classified as negligible.

Based upon the above findings it is concluded that site-specific mitigation to protect surrounding sensitive receptors from poor air quality resulting from the construction traffic of the Proposed Development is not required.

The residual effect is not significant.

Overall, with the recommended best practice measures in place, the proposals would be compliant with legislation and policy.

1. Introduction

Hilson Moran has been instructed by K2 and SeHa to undertake an Air Quality Impact Assessment (AQIA) for the proposed SeHa Monopile Manufacturing Facility development, located on the outskirts of Middlesbrough on the southern bank of the Tees Estuary, North Yorkshire, centred on National Grid Reference NZ 53672 22030. The Site is identified in **Figure 1.1**, hereafter referred to as the 'Proposed Development' or 'Application Site'.

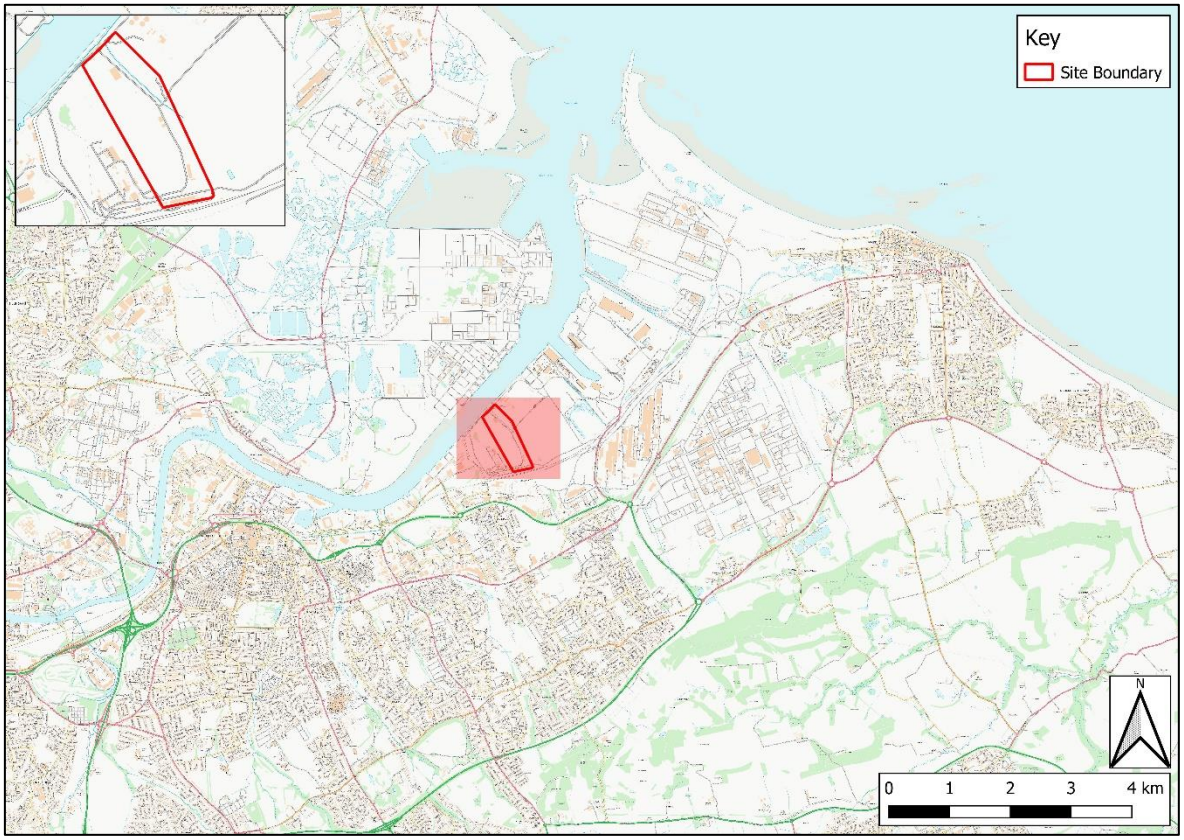


Figure 1.1 ***Site Boundary*** *(Contains Ordnance Survey Data © Crown copyright database right 2022)*

1.1. Background & Proposed Development

Outline planning permission (Reference R/2020/0357/OOM) was granted by Redcar & Cleveland Borough Council (RCBC) in December 2020 for the redevelopment of land at South Tees Development Corporation east of Smiths Dock Road and west of Tees Dock Road South Bank, for the '*demolition of existing structures on site and the development of up to 418,000 sqm (gross) of general industry (Use Class B2) and storage or distribution facilities (Use Class B8) with office accommodation (Use Class B1), HGV and car parking and associated infrastructure works all matters reserved other than access*'.

The planning permission allows the development to be brought forward in a phased manner, with a number of planning conditions attached to the outline permission requiring the submission of information prior to a certain stage or as agreed in the phasing plan.

Within the planning permission, Condition 28 looks to ensure construction activities associated with the development are appropriately managed and stipulates:

"*Following agreement of reserved matters for each phase of the development (in line with the phasing plan) and prior to the construction of that phase of development, a detailed construction traffic assessment and associated air quality assessment shall be submitted to and agreed in writing by the Local Planning Authority. Measures set out within the assessment shall be complied with thereafter, unless otherwise agreed in writing"*.

1.2. Scope of Assessment & Potential Impacts

The scope of this AQIA addresses the requirements of Condition 28 of the Outline Planning Permission, assessing the construction phase impacts associated with the proposed development.

During the construction phase, activities on the Development Site could give rise to dust, which, if transported beyond the site boundary, could have an adverse effect on local air quality and cause a statutory 'nuisance'. Further to this, emissions arising from vehicles attributed to the construction phase have the potential to affect local pollution levels. For both aspects, the impacts are identified and the mitigation measures that should be implemented to minimise the impact are described.

A glossary of terms is provided in **Appendix A**.

2. Legislation, Policy and Guidance

2.1. Legislation

A summary of the relevant air quality legislation is provided below.

2.1.1. Air Quality Strategy for England, Scotland, Wales and Northern Ireland

The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland[1], most recently updated in July 2007. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that the European Union and International agreements are met in the UK.

The AQS covers the following air pollutants: ammonia (NH_3), benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), oxides of nitrogen (NO_X) (including nitrogen dioxide (NO_2)), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3) and polycyclic aromatic hydrocarbons (PAHs).

The AQS sets standards and objectives for the listed pollutants for the protection of human health, vegetation and ecosystems. The standards are based on recommendations by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) based on current understanding and scientific knowledge about the effects of air pollution on health and the environment. The air quality objectives are policy-based targets set by the UK Government that are often expressed as maximum concentrations not to be exceeded either without exception or with a limited number of exceedances within a specified timescale.

For the pollutants considered in this assessment, there are both a long-term (*e.g*. annual mean) and short-term (*e.g*. one hour mean) standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period (no more than 18 exceedances of 200 µg/m^3 per year), whereas for PM_{10} it is a 24-hour averaging period (no more than 35 exceedances of 50 µg/m^3 per year). The variation in time period reflects the varying impacts on health of differing exposures to pollutants.

2.1.2. Air Quality Standards Regulations

The air quality objectives in the AQS are statutory in England through the Air Quality (England) Regulations 2000[2] and the Air Quality (England) (Amendment) Regulations 2002[3] for the purpose of Local Air Quality Management (LAQM).

The Regulations require likely exceedances of the AQS objectives to be assessed in relation to:

> "*…the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…*"

The Air Quality Standards (Amendment) Regulations 2016[4] transpose the European Union Ambient Air Quality Directive (2008/50/EC) into law in England, with the Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 ensuring continuation of the transposition of the Directive. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health, such as NO_2, PM_{10} and $PM_{2.5}$. The limit values for NO_2 and PM_{10} are the same concentration levels as the relevant AQS objectives and the limit value for $PM_{2.5}$ is a concentration of 25 µg/m^3. The relevant air quality objectives are presented in Table 2.1.

Table 2.1 Air Quality Objectives for Relevant Pollutants

Pollutant	UK AQS Objective	Measured As
NO_2	200 µg/m^3	1-hour mean, not to be exceeded more than 18 times a year (99.79 %ile)
	40 µg/m^3	Annual mean
PM_{10}	50 µg/m^3	24-hour mean, not to be exceeded more than 35 times a year (90.41 %ile) for UK
	40 µg/m^3	Annual mean
$PM_{2.5}$	25 µg/m^3	Annual mean

2.1.3. Environment Act 1995

Part IV of the Environment Act 1995[5] requires local authorities to periodically review and assess the quality of air within their administrative area. The reviews have to consider both the air quality at the time of review and likely future air quality during the 'relevant period' and whether any air quality objectives prescribed in regulations are being achieved or are likely to be achieved in the future. Where the objectives are not likely to be achieved, an authority is required to designate an Air Quality Management Area (AQMA). For each designated AQMA the local authority is required to produce an Air Quality Action Plan (AQAP) that works to ensure compliance with the objectives by implementing a number of air quality improvement measures.

2.1.4. Environment Act 2021

Schedule 11 in Part VI of the Environment Act 2021[6] sets out the amendments made from the Environment Act 1995. The principles remain consistent in that the Environment Act 2021 requires local authorities to periodically review and assess the quality of air within their administrative area. Where the objectives are not likely to be achieved, an authority is required to designate an AQMA. For each designated AQMA the local authority is required to produce an Air Quality Action Plan (AQAP) that works to ensure compliance with the objectives by implementing a number of air quality improvements measures.

2.1.5. Environmental Protection Act

Section 79 of the Environmental Protection Act 1990 (as amended)[7] makes provision for the identification and control of statutory nuisances. The Act identifies statutory nuisance, in relation to air quality, as:

- "*Any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*"; and,
- "*Any accumulation or deposit which is prejudicial to health or a nuisance*".

As a result, the level at which a nuisance occurs is highly variable and dependent on perception, with effects influenced by existing conditions and the degree of change that has occurred.

Where a statutory nuisance has been demonstrated the local authority must serve an abatement notice, non-compliance with which would constitute a legal offence. The abatement notice may prevent or restrict occurrence or re-occurrence of the nuisance or the local authority may, itself, undertake action to abate the nuisance and recover any associated expenses.

2.1.6. WHO Guidelines

Table 2.2 states the WHO Air Quality Guidelines for NO_2, PM_{10} and $PM_{2.5}$. Whilst these guidelines are not targeted in the UK, there is a push to meet the guidelines and be more stringent with air quality control.

Table 2.2 WHO Guidelines for Relevant Pollutants

Pollutant	UK AQS Objective	Measured As
NO_2	200 µg/m^3	1-hour mean, not to be exceeded more than 18 times a year (99.79 %ile)
	25 µg/m^3	24-hour mean, not to exceeded more than 3 to 4 times a year (99th %ile)
	10 µg/m^3	Annual mean
PM_{10}	45 µg/m^3	24-hour mean, not to be exceeded more than 35 times a year (90.41 %ile) for UK, not to exceeded more than 3 to 4 times a year (99th %ile) under WHO
	15 µg/m^3	Annual mean
$PM_{2.5}$	15 µg/m^3	24-hour mean, not to exceeded more than 3 to 4 times a year (99th %ile)
	5 µg/m^3	Annual mean

2.2. Planning Policy

2.2.1. National

The National Planning Policy Framework (NPPF)[8] sets out policies, which apply to the preparation of local plans and to development management decisions. This framework sets out the Government's economic, environmental and social planning policies for England. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations.

The NPPF sets out the Government's planning policies on the conservation and enhancement of the natural environment, with the following paragraphs relating to air quality:

- Paragraph 8c, which states "*to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy*";
- Paragraph 55, which states "*local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition*";
- Paragraph 105, which states "*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*";

- Paragraph 174e, which states "*preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans*";
- Paragraph 186, which states "*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*";
- Paragraph 188, which states "*The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities*"; and,
- Paragraph 211c, which states "*ensure that any unavoidable noise, dust and particulate emissions and any blasting vibrations are controlled, mitigated or removed at sources, and establish appropriate noise limits for extraction in proximity to noise sensitive properties*".

2.2.2. Local

Local Planning policy is provided by the Redcar & Cleveland Local Plan[9], adopted in May 2018, which sets out the vision and overall development strategy for the Council's area and how it will be achieved for the period until 2032. The vision of the Local Plan is that, by 2032, "*the needs and aspirations of our communities will be met through the delivery of sustainable development across the borough*" and "*our important natural and historic assets will be protected and enhanced, in order to provide good quality environments […] in which, people can live, work and enjoy spending their time"*.

The Local Plan does not contain any specific policies relating to air quality, however it does highlight that the maintenance of good levels of air quality are an important component of sustainable development, with Policy SD 1 on Sustainable Development identifying that "w*hen considering development proposals, the Council will take a positive approach that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework"* and "*where there are no local planning policies relevant to the application, or where relevant policies are out of date at the time of making the decision, then the Council will grant permission unless material considerations indicate otherwise, taking into account whether:*

- *any adverse impacts of granting permission would significantly and demonstrably outweigh the benefits, when assessed against the policies in the NPPF taken as a whole; or*
- *specific policies in that Framework indicate that development should be restricted"*.

Further to this, Policy SD4 on General Development Principles identifies that "*development proposals will be expected to: […] minimise pollution*". Policy LS4 on the South Tees Spatial Strategy also identifies that "*the Council and its partners will aim to: […] encourage clean and more efficient industry in the South Tees area to help reduce […] risk of environmental pollution*".

The Local Plan is supported by a number of Supplementary Planning Documents (SPD), with the South Tees Area SPD[10] relevant to the proposed development. This document identifies one of the main objectives of the document to "*deliver redevelopment in a way that provides long term sustainability, reduces pollution […]*". Development principle STDC1: Regeneration Principles identifies the priority for development to "*reduce pollution, contribute to sustainable flood risk management and habitat protection and encourage biodiversity and long-term sustainability*".

2.3. Guidance

2.3.1. National Planning Practice Guidance

The NPPF is supported by Planning Practice Guidance[11], which outlines how the planning process can address potential air quality impacts associated with new development. It provides guidance on the level of detail required, how impacts can be mitigated and provides information on how local authorities may take air quality as a specific consideration in a planning decision.

2.3.2. Local Air Quality Management Review and Assessment Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities. This technical guidance, identified as LAQM.TG[12], is for use by local authorities for their review and assessment work and has been applied where appropriate to this assessment.

2.3.3. Land-Use Planning and Development Control: Planning for Air Quality

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have published guidance[13] which offers advice as to when an air quality assessment may or may not be required. The guidance document details what should be included within an assessment, how to determine the significance of impacts and the likely mitigation measures required to minimise the impacts.

2.3.4. Guidance on the Assessment of Dust from Demolition and Construction

This document[14], published by the IAQM, provides guidance on how to assess the impact of construction activities on air quality associated with new developments. The methodology prescribed within the document allows the impacts to be categorised based on risk (with reference to dust and PM_{10} on sensitive human and ecological receptors) and, where applicable, identify mitigation measures associated to the risk classification determined.

3. Assessment Methodology

3.1. Scope of the Assessment

The scope of the assessment has been determined in the following way:

- Consultation with the Environmental Health Officer (EHO) at Redcar & Cleveland Borough Council to agree the scope of the assessment and the methodology to be applied;
- Review of Redcar & Cleveland's latest review and assessment reports and the air quality data for the area surrounding the Application Site, including Redcar & Cleveland's local monitoring data and Defra;
- Desk study to confirm the locations of nearby existing receptors that may be sensitive to changes in local air quality, and a review of the masterplan for the Development to establish the location of new sensitive receptors; and,
- Review of the traffic data provided by Arup, the transport consultants for the previous Air Quality ES Chapter for the outline planning permission of the Application Site (Reference R/2020/0357/OOM).

The scope of the assessment includes consideration of the potential impacts on local air quality resulting from:

- Dust and particulate matter generated by on-site activities during the construction phase; and,
- Increases in pollutant concentrations as a result of exhaust emissions arising from construction traffic.

3.2. Construction Phase

3.2.1. Construction Dust

Assessment of the risk of impact associated with the generation of dust during the construction phase of the Proposed Development and determination of subsequent mitigation measures necessary has been undertaken following IAQM guidelines.

The assessment is based on a series of steps: screening the requirement for a detailed assessment, classification of the likely magnitude of dust emissions; characterisation of the area of influence and establishment of its sensitivity to dust; and establishment of the overall risk of impact. The risk of impact from dust emissions from the Proposed Development considers effects on human health, nuisance as a result of dust soiling and ecological receptors from four main activities: demolition; earthworks; construction; and trackout. The potential for dust emissions from each activity should be considered, unless any of them are not relevant to the Proposed Development.

The guidelines identify appropriate screening criteria for the identification of potential receptors, based on a conservative approach and in consideration of the exponential decline in both airborne concentrations and the rate of deposition with distance. A detailed assessment of the impact of dust from construction sites will be required where:

- A 'human receptor' is located within 350 m of the boundary of the site or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance;

- An 'ecological receptor' is located within 50 m of the boundary of the site or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance.

3.2.1.1. Establishing Risk

The magnitude of dust emissions for each activity is classified as small, medium or large depending upon the scale of the works proposed, materials involved and level of activity required. The IAQM guidelines provide examples of how the magnitude of emission can be defined, which are identified in Table 3.1. The Proposed Development is unlikely to satisfy all criteria within the examples, therefore professional judgement and site-specific information are used to identify appropriate emission magnitude.

Table 3.1 Dust Emission Magnitude *(Source: IAQM Guidance, v1.1 Updated June 2016)*

Activity	Small	Medium	Large
Demolition	• Total building volume <20,000m^3 • Construction material with low potential for dust release (*e.g.* metal cladding or timber) • Demolition activities <10m above ground level • Demolition during wetter months	• Total building volume 20,000 – 50,000m^3 • Potentially dusty construction material • Demolition activities 10-20m above ground level	• Total building volume >50,000m^3 • Potentially dusty construction material (*e.g.* concrete) • On-site crushing and screening • Demolition activities >20m above ground level
Earthworks	• Total site area <2,500m^2 • Soil type with large grain size (*e.g* sand) • <5 heavy earth moving vehicles active at any one time • Formation of bunds <4m in height • Total material moved <20,000 tonnes • Earthworks during wetter months	• Total site area 2,500 – 10,000m^2 • Moderately dusty soil type (*e.g.* silt) • 5 – 10 heavy earth moving vehicles active at any one time • Formation of bunds 4 – 8m in height • Total material moved 20,000 – 100,000 tonnes	• Total site area >10,000m^2 • Potentially dusty soil type (*e.g.* clay) • >10 heavy earth moving vehicles at any one time • Formation of bunds >8m in height • Total material moved >100,000 tonnes
Construction	• Total building volume <25,000m^3 • Construction material with low potential for dust (*e.g.* metal cladding or timber).	• Total building volume 25,000 – 100,000m^3 • Potentially dusty construction material (*e.g.* concrete) • On-site concrete batching	• Total building volume >100,000m^3 • On-site concrete batching, sandblasting.
Trackout	• 10 HDV (>3.5t) outward movements* in any one day# • Surface material with low potential for dust release • Unpaved road length <50m	• 10 – 50 HDV (>3.5t) outward movements* in any one day# • Moderately dusty surface material (*e.g.* high clay content) • Unpaved road length 50 – 100m	• >50 HDV (>3.5t) outward movements* in any one day# • Potentially dusty surface material (*e.g.* high clay content) • Unpaved road length >100m
* A vehicle movement is a one way journey, *i.e.* from A to B, and excludes the return journey.			

Activity	Small	Medium	Large
# HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average.			

Consideration is given to the likely sensitivity of the area to the impacts of dust, establishing a sensitivity of low, medium or high for dust soiling, human health and ecological receptors. The sensitivity of the area considers a number of factors, including the specific sensitivities of receptors in the area, the proximity and number of those receptors, local baseline conditions such as background concentrations and site-specific factors.

The first step in identifying the sensitivity of the area is to establish the sensitivity of the receptor, based on the presence or level of activity associated with the area of influence of the Proposed Development. Professional judgement and site-specific information are used to assign an appropriate level of receptor sensitivity using the principles outlined in Table 3.2. Following this, the sensitivity of the area can be established from Tables 3.3 to 3.5 based on the sensitivity of the receptor, number of receptors (in the case of human health and dust soiling) and the distance from source.

Table 3.2 Receptor Sensitivity Definitions *(Source: IAQM Guidance, v1.1 Updated June 2016)*

Sensitivity	Low	Medium	High
Dust Soiling	• Enjoyment of amenity would not reasonably be expected; • There is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; • Transient exposure, where people or property is only expected to be present for limited periods of time as part of the normal pattern of use; • Indicative examples include playing fields, farmland, footpaths, short-term car parks and roads.	• Users would expect to enjoy a reasonable level of amenity, but not reasonably at same level as in their home; • The appearance, aesthetics or value of property could be diminished by soiling; • Indicative examples include parks and places or work	• Users can reasonably expect enjoyment of a high level of amenity; • The appearance, aesthetics or value of property would be diminished by soiling, and continuous or regularly extended periods of presence expected during normal pattern of land use; • Indicative examples include dwellings, museums and other culturally important collections, medium- and long-term car parks and car showrooms.
Human Health	• Locations where human exposure is transient; • Indicative examples include public footpaths, playing fields, parks and shopping streets.	• Locations where people exposed are workers#, and exposure is over a time period relevant to the air quality objective for PM_{10}*; • Indicative examples including office and shop workers, but not those occupationally exposed to dust.	• Locations where members of the public are exposed over a period of time relevant to the air quality objective for PM_{10}*; • Indicative examples include residential properties, hospitals, schools and residential care homes.

Sensitivity	Low	Medium	High
Ecological	• Locations with a local designation where the features may be affected by dust deposition, *e.g.* Local Nature Reserve.	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; • Locations with a national designation where the features may be affected by dust deposition, *e.g.* Site of Special Scientific Interest.	• Locations with an international or national designation and the designated features may be affected by dust soiling, *e.g.* Special Area of Conservation with acid heathland; • Location where there is a community of a particularly dust sensitive species such as vascular species including in the Red Data List for Great Britain.
* In the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day, following Defra Guidance. # Workers are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children, are not normally workers.			

Table 3.3 ***Sensitivity of the Area to Dust Soiling Effects on People and Property*** *(Source: IAQM Guidance, v1.1 Updated June 2016)*

Receptor Sensitivity	Number of Receptors	Distance from Source			
		<20m	<50m	<100m	<350m
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 3.4 ***Sensitivity of the Area to Human Health Impacts*** *(Source: IAQM Guidance, v1.1 Updated June 2016)*

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from Source				
			<20m	<50m	<100m	<200m	<350m
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

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from Source				
			<20m	<50m	<100m	<200m	<350m
Medium	>32 µg/m^3	> 10	High	Medium	Low	Low	Low
		1 – 10	Medium	Low	Low	Low	Low
	28 – 32 µg/m^3	> 10	Medium	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
	24 – 28 µg/m^3	> 10	Low	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
	< 24 µg/m^3	> 10	Low	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
Low	-	> 1	Low	Low	Low	Low	Low

Table 3.5 ***Sensitivity of the Area to Ecological Impacts*** *(Source: IAQM Guidance, v1.1 Updated June 2016)*

Receptor Sensitivity	Distance from Source	
	<20m	<50m
High	High	Medium
Medium	Medium	Low
Low	Low	Low

3.2.1.2. Establishing Significance

The risk of dust related impacts from the Proposed Development is established from the sensitivity of the area and the likely dust emission magnitude. The risk should be established, on the worst-case area sensitivity and in the absence of mitigation, for each of the construction related activities (demolition, earthworks, construction and trackout) following the matrix in Table 3.6.

Table 3.6 ***Risk of Dust Impacts from Each Activity*** *(Source: IAQM Guidance, v1.1 Updated June 2016)*

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

The IAQM guidelines identify a range of mitigation measures intended to reduce the emission and effects of dust from construction sites, and identify their likely applicability to a development

based on the level of impact risk attributed. Consideration is given to these in the development of mitigation measures, with the significance of the residual effect based on professional judgement.

3.2.2. Construction Traffic

3.2.2.1. Road Traffic Emissions

To satisfy the requirements of planning Condition 28 of the Outline Planning Permission, detailed dispersion modelling of the construction-generated traffic emissions has been undertaken.

To consider the impact on NO_2, PM_{10} and $PM_{2.5}$ concentrations at the specified receptor locations a detailed assessment has been undertaken using the air dispersion model ADMS-Urban, Version 5.0.1.3 (release date 31st January 2022). This model uses detailed road traffic information, surface roughness, and local meteorological information to predict the impact on pollutant concentrations at specific receptor points. Table 3.7 summarises the air quality modelling parameters for road traffic.

Table 3.7 ADMS Roads Modelling Parameters

Parameter	Local Area	Met. Measurement Site
Latitude	54.0	54.3
Surface-Roughness	0.5	0.5
Monin-Obukhov Length (m)	30	30

The ADMS model uses meteorological data including wind speed and direction to determine the how pollution is transported and diluted with distance from the source.

For this assessment meteorological data from Durham Tees Valley 2019 has been selected for use within the construction dust assessment. This meteorological site is considered representative of the Application Site and aligns with the baseline traffic data obtained.

A summary of the traffic data used in the air quality assessment is presented in **Appendix B** and illustrated in **Figure 3.1**. **Appendix B** includes details regarding Annual Average Daily Traffic (AADT) flows, percentage of Heavy Goods Vehicles (HGV) and vehicle speeds (km/hr).

The traffic data utilised in this AQIA was taken from the Air Quality ES Chapter submitted for the outline planning application in 2020 (Reference R/2020/0357/OOM). The data was produced by Arup (transport consultants) and has been utilised for the '2024 Future Baseline' modelling scenario.

Construction traffic information was provided by Ssyenc (project engineering and construction consultants). The daily construction traffic numbers were provided as part of a monthly phasing plan (see **Appendix C).** To assess the worst-case scenario, the greatest projected daily construction traffic numbers were utilised and applied to all the modelled road links, as no distribution of the construction traffic flows were provided.

For the assessment, the following scenarios have been modelled:

- 2019 Baseline & Model Verification;
- 2024 Future Baseline + Committed Development; and,
- 2024 Future Baseline + Committed Development + Peak Construction Traffic.

3.2.2.2. Vehicle Emission Factors

Vehicle emission factors for input into ADMS-Urban have been calculated using the Emission Factor Toolkit (EFT) version 11.0 (published November 2021), available on the Defra website. The EFT allows for the calculation of emission factors arising from road traffic for all years between 2018 and 2030. For the predictions of future year emissions, the toolkit takes into account factors such as anticipated advances in vehicle technology and changes in fleet composition, such that vehicle emissions are assumed to reduce over time. There is good evidence from real-world testing of EURO 6 (VI) compliant vehicles of substantial improvements in vehicle emissions compared to earlier EURO categories, in particular with respect to NO_X emissions.

Defra's EFT calculator has been used to calculate the emission factors for NO_X, PM_{10} and $PM_{2.5}$.

Emission factors for 2019 have been used for the baseline and model verification scenario and emission factors for 2024 have been used for the future scenarios.

3.2.2.3. Selection of Background Concentrations

The background concentrations of those pollutants included within the AQS and used within the air quality assessment have been mapped at a grid resolution of 1x1 km for the whole of the UK and are available on Defra's website[15]. Estimated background concentrations are available for all years between 2018 and 2030 and the maps assume that background concentrations will reduce (i.e. improve) over time. This assumption is based upon improvements in emissions from various sources. In line with the findings (usually based on monitoring data) of local authorities, measured concentrations have not reduced as expected over time.

For the purposes of the assessment, background concentrations from 2019 have been used in the baseline and verification scenario and background concentrations from 2024 have been utilised in the future scenarios. The background concentrations and relevant receptors used in the assessment are presented in **Appendix D**.

3.2.2.4. Model Verification

The ADMS-Roads dispersion model has been validated by the software developer and is considered to be fit for purpose, however local model validation, *i.e.* in the vicinity of the Proposed Development, has not been undertaken. Therefore, to validate the model and to determine how well the model is performing at a local level, comparing the modelling results with local monitoring data is undertaken. The verification process aims to minimise model uncertainty and error by adjusting the modelled results by a factor to offer greater confidence in the final results. This is undertaken in accordance with the methodology specified in Chapter 7, Section 4, of LAQM.TG16.

Details of the verification factor calculations are presented in **Appendix E** and illustrated on **Figure 3.1**. An adjustment factor of 0.97 was obtained during the verification process, which indicated that the model was over-predicting. As the model was over-predicting, instead of applying this factor to adjust the modelled road-NO_X outputs, the outputs remained unadjusted and an adjustment factor of 1 was assumed.

No local monitoring data was available for PM_{10} and $PM_{2.5}$, therefore the adjustment factor of 1 applied for NO_X has been applied to both the modelled PM_{10} and $PM_{2.5}$ concentrations prior to adding to the appropriate background concentration. This approach is in accordance with LAQM.TG16.

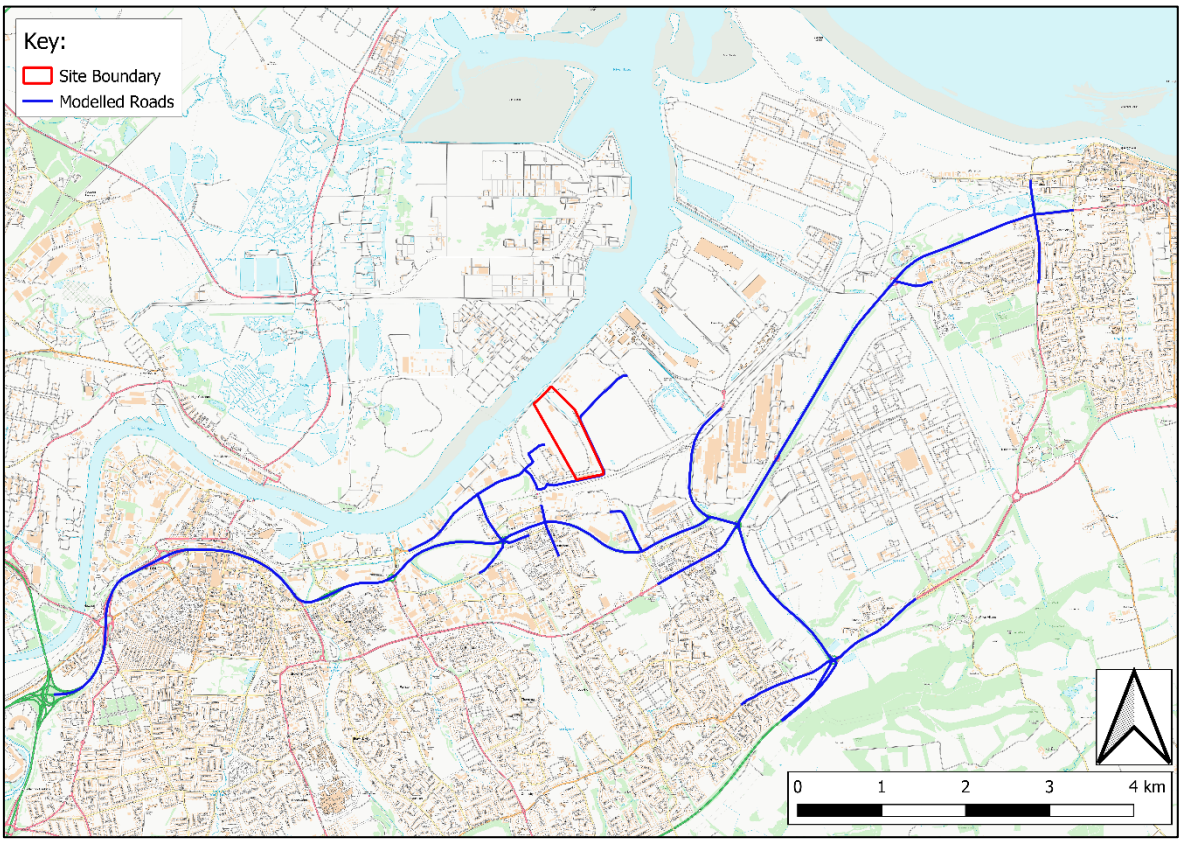


Figure 3.1 ***Modelled Roads*** *(Contains Ordnance Survey Data © Crown copyright database right 2022*

3.2.2.5. Significance Criteria

The EPUK and IAQM provide guidance for establishing the significance of air quality impacts arising as a result of the Proposed Development. The magnitude of impact on individual receptors is dependent upon the long-term average pollutant concentrations at the receptor in the assessment year and the percentage change relative to the Air Quality Assessment Level (AQAL), as identified in Table 3.8.

Table 3.8 ***Impact Descriptors***

Long-term Average Concentration at Receptor in Assessment Year	**Percentage Change in Concentration to AQAL***			
	1	2 – 5	6 – 10	> 10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% of AQAL	Slight	Moderate	Substantial	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
* Where the % change is <0.5% the change is described as 'Negligible' regardless of concentration				

The guidelines do not, however, provide a set method for establishing the significance of impact. Whilst the establishment of the impact magnitude on individual receptors can be identified as negligible, slight, moderate or substantial, the significance of the overall effect is dependent on a number of factors. Therefore, professional judgement will be applied to determine the likely significance of effects, with the following factors considered:

- The existing and future air quality in the absence of the development, notably whether the Air Quality Objectives are likely to be met or the scale of exceedances in the long-term and short-term concentrations;
- The extent of current and future population exposure to the impacts, notably the number of properties and/or people present and the scale of impact (*e.g.* whether the majority of the local population is subject to substantial or slight magnitude impacts);
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts, such as establishing a worst-case scenario for sensitive receptors.

3.3. Sensitive Receptors

Defra provides guidance on locations where the air quality objectives should apply and Table 3.9 and professional judgement have been used to select receptors where likely significant exposure to pollutant concentrations may occur.

Table 3.9 Examples of where the Air Quality Neutral Objectives may or may not apply

Averaging Period	Objectives Should Apply	Objectives Should Generally Not Apply
Annual Mean	• All locations where members of the public might be regularly exposed. • Building facades of residential properties, schools, hospitals, care homes *etc.*	• Building facades of offices or other places of work where members of the public do not have regular access. • Hotels, unless people live there as their permanent residence. • Gardens of residential properties. • Kerbside sites (as opposed to locations at the building façade), or any other locations where public exposure is expected to be short term.
24-hour Mean	• All locations where the annual mean objective would apply, together with hotels. • Gardens of residential properties.	• Kerbside sites (as opposed to locations at the building façade), or any other locations where public exposure is expected to be short term.
1-hour Mean	• All locations where the annual mean and 24 -hour mean objectives apply. • Kerbside sites (for example, pavements of busy shopping streets) • Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. • Any outdoor locations where members of the public might reasonably expected 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 members of the public might reasonably be exposed for a period of 15 minutes or longer.	-

The modelled receptors used within the study area are identified in **Appendix D** and illustrated in **Figure 3.2**. There are two ecological receptors the Teesmouth and Cleveland Coast Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI). The SPA is designated for the presence of breeding and non-breeding bird/seabird populations of international importance, whilst the SSSI is designated for the presence of significant coastal habitats (sand dunes and saltmarshes) and significant assemblages of species (harbour seal, breeding and non-breeding bird assemblages and diverse invertebrate assemblage. All ecologically designed sites (SPA and SSSI) are located more than 200m from roads likely to be used by construction traffic as such the impact of nitrogen deposition and NO_x has been scoped out. The exception to this is to the north east of the Application Site where the A1085 Trunk Road and Kirkleatham Lane (adjacent to Existing Receptors 16 and 17) runs alongside an existing SSSI. Following a review of the information available on APIS (Air Pollution Information System) the SSSI features (*Calidris alba, Calidris canutus and Charadrius hiaticula* (breeding birds)) fall under a nitrogen critical load class of '*Pioneer, low-mid, mid-upper saltmarshes'* which are not sensitive to nutrient nitrogen impacts – as such an assessment of the traffic related nitrogen impacts on the SSSI features has been scoped out.

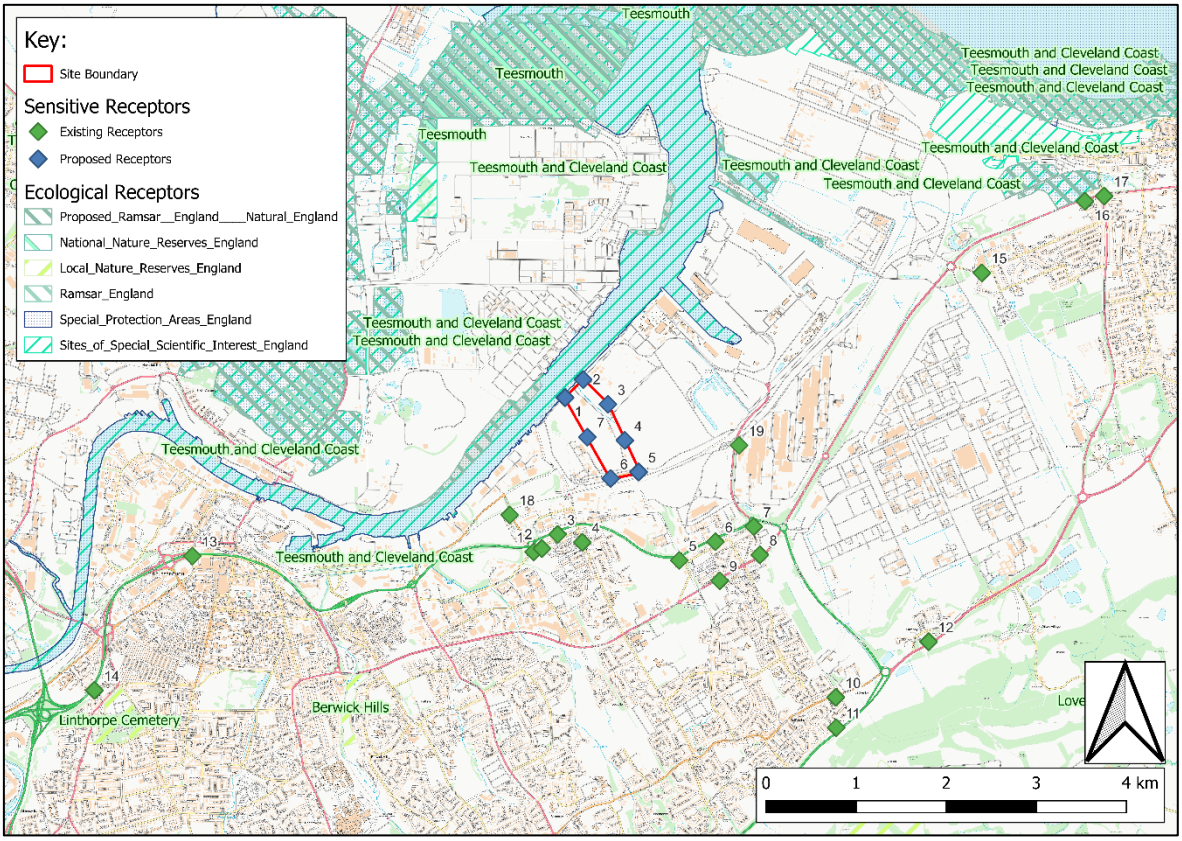


Figure 3.2 ***Modelled Receptors*** *(Contains Ordnance Survey Data © Crown copyright database right 2022)*

3.4. Limitations and Assessment

Professional judgement has been used in the completion of the construction phase dust assessment for the Proposed Development.

It is assumed that the information provided by the transport consultants (Arup) is accurate.

The ADMS Roads dispersion model has been used in this assessment to assess the current and future baseline pollution concentrations in the vicinity of the Proposed Development. The dispersion models rely on input data, such as traffic data and predicted emissions data, *etc*., which may have uncertainties associated with them. The models simplify complex environments and does not always accurately reflect local micro-climatic conditions which may ultimately affect the predicted pollutant concentrations.

For the opening year vehicle emission factors and background concentrations from 2024 have been utilised to reflect likely future improvements improvement.

The background concentrations indicate air quality conditions at ground level. These ground level concentrations have been applied to all receptors, including those at height. As a result, there is potential that concentrations are likely to be lower at the receptors at height than those predicted, but the assessment presents the worst-case scenario and is therefore appropriate.

Hilson Moran consider the assumptions made in the assessment to be reasonable and robust.

4. Baseline Conditions

4.1. Local Designation for Air Quality

RCBC's latest Air Quality Annual Status Report[16] identifies that the borough has a long history of compliance for air quality, and as a result have not been required to declare an Air Quality Management Area (AQMA). Similarly, the neighbouring Middlesbrough Council (MbC) report continued compliance with air quality objectives in their latest Annual Status Report[17] and therefore no requirement to declare an AQMA in their area.

4.2. Defra Background Concentrations

The Defra background concentrations for NO_2, PM_{10} and $PM_{2.5}$ for the 1x1km grid square in which the Proposed Development is located are presented in Table 4.1 below.

Table 4.1 Defra Background Concentrations

Year	Pollutant Concentration (µg/m³)								
	452500 520500	453500 520500	454500 520500	455500 520500	452500 521500	453500 521500	454500 521500	455500 521500	453500 522500
NO_2									
2019	16.48	15.15	13.90	13.84	18.24	14.61	13.30	13.39	16.82
2020	15.75	14.49	13.31	13.27	17.41	13.99	12.76	12.87	16.07
2021	15.21	13.98	12.85	12.80	16.96	13.60	12.41	12.48	15.71
2022	14.71	13.49	12.41	12.35	16.52	13.23	12.06	12.10	15.37
2023	14.30	13.11	12.06	11.99	16.15	12.93	11.80	11.81	15.09
2024	13.82	12.65	11.63	11.55	15.70	12.55	11.45	11.43	14.74
PM_{10}									
2019	11.67	11.78	11.50	11.55	10.55	10.41	10.31	10.82	10.21
2020	11.43	11.54	11.27	11.32	10.33	10.18	10.09	10.60	9.99
2021	11.32	11.43	11.16	11.21	10.22	10.07	9.98	10.49	9.88
2022	11.21	11.31	11.05	11.09	10.11	9.96	9.87	10.38	9.77
2023	11.10	11.20	10.94	10.98	9.99	9.85	9.76	10.27	9.66
2024	10.99	11.09	10.83	10.87	9.88	9.74	9.65	10.16	9.55
$PM_{2.5}$									
2019	7.62	7.73	7.45	7.50	7.07	6.97	6.90	7.16	6.90
2020	7.44	7.55	7.28	7.33	6.90	6.80	6.73	7.00	6.73
2021	7.35	7.46	7.19	7.24	6.81	6.71	6.65	6.91	6.64
2022	7.26	7.37	7.11	7.15	6.72	6.62	6.56	6.82	6.55
2023	7.17	7.28	7.02	7.06	6.63	6.53	6.47	6.73	6.46
2024	7.08	7.19	6.93	6.97	6.54	6.44	6.38	6.64	6.37

4.3. Local Air Quality Monitoring Data

RCBC operate a network of air quality monitoring stations, including two continuous automated monitors and 16 passive diffusion tubes. MbC operate a monitoring network of comprising of two continuous automated monitors and 28 passive diffusion tubes. As identified in **Figure 4.1**, there are several diffusion tube monitoring locations in close proximity to the Application Site.

The automated monitors are located further afield, with one located at Dormanstown on the outskirts of Redcar and three located in the town centre of Middlesbrough. Whilst these are

located more than 2 km from the Application Site, they have been included in the baseline as they provide background information for the wider area and monitoring information locally for particulate matter (PM_{10} and $PM_{2.5}$).

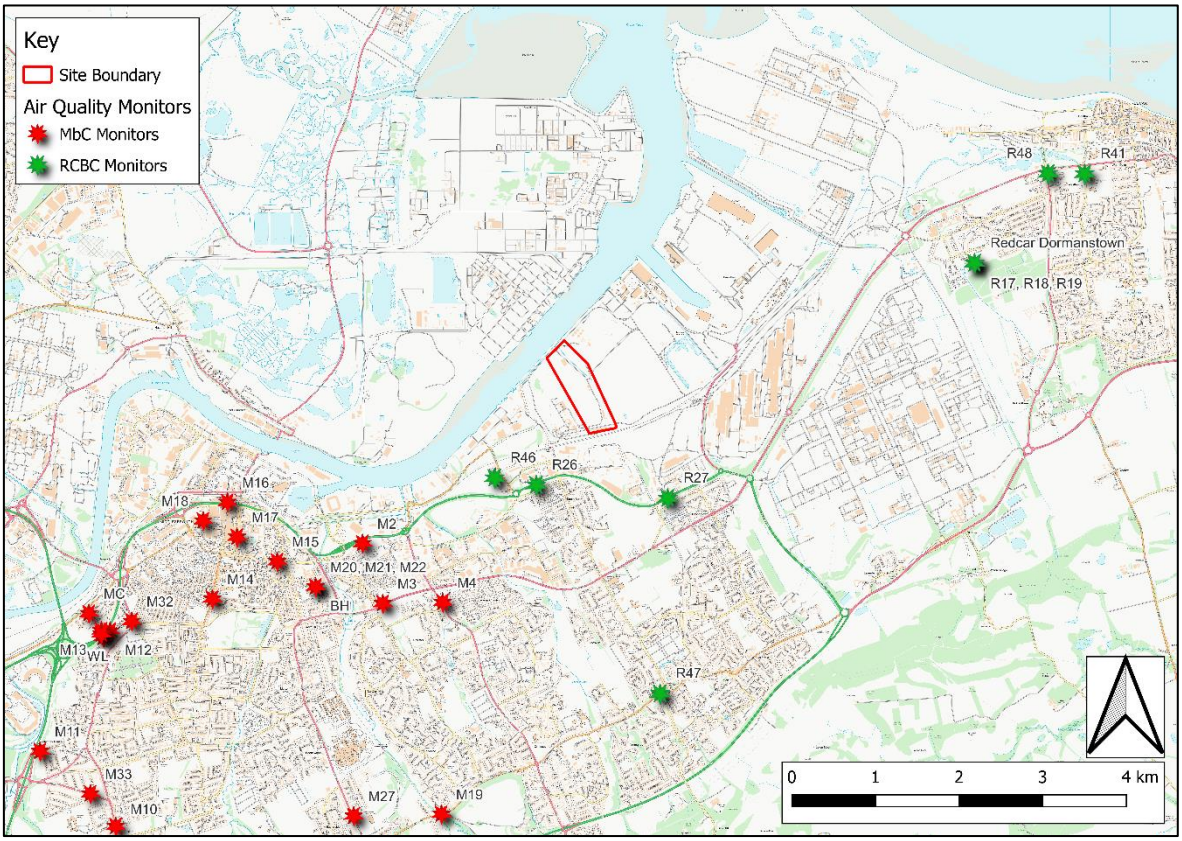


Figure 4.1 ***Local Air Quality Monitoring Network*** *(Contains Ordnance Survey Data © Crown copyright database right 2022)*

4.3.1. Nitrogen Dioxide

The annual mean NO_2 concentrations and number of exceedances of the 1-hour NO_2 objective at the continuous monitors are identified in Table 4.2 and Table 4.3, respectively.

The automated survey results indicate that annual mean NO_2 concentrations were compliant with the relevant AQS objective (40 µg/m^3) at all continuous monitors between 2016 to 2019, with the exception of West Lane in 2018 where concentrations exceeded the AQS objective.

The WHO air quality guideline for annual mean NO_2 concentrations (10 µg/m^3) is met with compliance at the Dormanstown Monitor, however it is exceeded at all three continuous monitors in MbC. Monitor locations at Breckon Hill (BH) and Macmillan College (MC) are urban background monitors located in the carparks Breckon Hill Primary school carpark and Macmillan College carpark, respectively. Monitor location West Lane (WL), was located at a roadside location adjacent to the A66 a major road. Concentrations are expected to be elevated at these locations. Comparatively, we would expect concentrations at the Application Site to be reduced.

The automated survey results indicates compliance with the 1-hour NO_2 mean AQS objective (>200 µg/m^3 not to be exceeding more that 35 times a year) at all four monitoring locations between 2016-2020.

Table 4.2 Continuous Monitoring – Annual Mean NO_2

Site ID	Location	Type	Annual Mean (µg/m³)				
			2016	2017	2018	2019	2020*
Dormanstown	458379, 523486	Suburban	11.0	12.0	10.0	9.0	9.0
Breckon Hill (BH)	450506, 519620	Urban Background	18.1	13.1	14.5	16.1	-
Macmillan College (MC)	447800, 519300	Urban Background	19.0	23.0	23.0	21.0	-
West Lane (WL) – closed in 2019	447800, 519300	Urban Background	-	-	**45.6**	30.8	-
* 2020 Data potentially influenced by Covid-19 Restrictions. Middlesbrough data for 2020 has not been reported at the time of writing.							

Table 4.3 Continuous Monitoring – 1-Hour Mean NO_2

Site ID	Location	Type	Number of exceedances >200 µg/m³				
			2016	2017	2018	2019	2020*
Dormanstown	458379, 523486	Suburban	0	0	0	0	0
Breckon Hill (BH)	450506, 519620	Urban Background	0	0	0	0	0
Macmillan College (MC)	447800, 519300	Urban Background	0	0	0	0	0
West Lane (WL)	447800, 519300	Urban Background	-	-	3	0	-
* 2020 Data potentially influenced by Covid-19 Restrictions. Middlesbrough data for 2020 has not been reported at the time of writing.							

The results of diffusion tube monitoring in the vicinity of the Application Site, undertaken by RCBC (denoted by the R prefix) and MbC (denoted by the M prefix), are presented in Table 4.3.

The monitoring identifies that all locations fall within the AQS objective of 40 µg/m³ in the period between 2016 and 2020.

The annual mean NO_2 concentrations do, however, exceed the WHO air quality guidelines at all locations with the exception of R57 in 2020. Several diffusion tubes are placed at roadside locations (R26, R27, R54, R57, M2, M4) and are in close proximity to major roads and junctions, therefore concentrations are expected to be elevated. Comparatively, we would expect concentrations at the Application Site to be reduced.

Table 4.4 Diffusion Tube Monitoring – Annual Mean NO_2

Site ID	Location	Type	Annual Mean (µg/m³)				
			2016	2017	2018	2019	2020*
R26	453142, 520836	Roadside	20.5	19.8	24.7	19.5	17.7
R27	454712, 520678	Roadside	26.4	25.5	29.8	24.8	21.0
R46	452644, 520921	Suburban	-	-	-	16.1	14.0
R47	454621, 518344	Suburban	-	-	-	20.3	17.0
R48	459257, 524555	Suburban	-	-	-	-	-
R51	455379, 520543	Suburban	-	-	-	-	11.7
R54	453831, 516212	Roadside	-	-	-	-	27.3

Site ID	Location	Type	Annual Mean (µg/m³)				
			2016	2017	2018	2019	2020*
R57	455344, 520005	Roadside	-	-	-	-	9.6
M2	451059, 520133	Roadside	22.5	18.5	20.8	18.0	-
M4	452021, 519435	Roadside	25.0	21.4	24.4	20.7	-
M20	450506, 519620	Urban Background	17.8	17.0	20.8	19.9	-
M24	447943, 519060	Roadside	-	22.9	30.1	24.3	14.9
* 2020 Data potentially influenced by Covid-19 Restrictions. Middlesbrough data for 2020 has not been reported at the time of writing.							

4.3.2. Particulate Matter

The annual mean particulate matter (PM_{10} and $PM_{2.5}$) concentrations and the number of exceedances of the 24-hour PM^{10} objective at the continuous monitors are identified in Tables 4.5 and 4.6, respectively.

The results indicate that the annual mean PM_{10} concentrations were compliant with the relevant AQS objective (40 µg/m³) at all continuous monitor locations. The results also indicate compliance with the $PM_{2.5}$ AQS objective (25 µg/m³) at all continuous monitor locations.

The WHO air quality guideline for PM_{10} concentrations (15 µg/m³) is met with compliance at Dormanstown and MC, but is exceeded at BH and WL. The WHO air quality guideline for $PM_{2.5}$ concentrations (5 µg/m³) is exceeded at all three monitor locations.

The continuous monitors for all locations did not identify any exceedances of the daily mean AQS objective for PM_{10}.

Table 4.5 Continuous Monitoring – Annual Mean PM_{10} and $PM_{2.5}$

Site ID	Location	Type	Annual Mean (µg/m³)				
			2016	2017	2018	2019	2020*
PM_{10}							
Dormanstown	458379, 523486	Suburban	12.7	12.0	12.0	14.0	13.0
Breckon Hill (BH)	450506, 519620	Urban Background	13.9	13.4	15.6	17.7	-
Macmillan College (MC)	447800, 519300	Urban Background	15.0	12.0	15.0	15.0	-
West Lane (WL)	447967, 519020	Roadside	-	-	29.2	36.9	-
$PM_{2.5}$							
Dormanstown	458379, 523486	Suburban	8.9	8.4	8.4	9.8	9.1
Breckon Hill (BH)	450506, 519620	Urban Background	10.2	7.0	8.9	10.3	7.6
Macmillan College (MC)	447800, 519300	Urban Background	11.0	6.7	7.0	8.7	6.8
* 2020 Data potentially influenced by Covid-19 Restrictions. Middlesbrough data for 2020 has not been reported at the time of writing, although $PM_{2.5}$ data available through Redcar and Cleveland Borough Council ASR.							

Table 4.6 Continuous Monitoring – 24-Hour Mean PM_{10}

Site ID	Location	Type	Number of exceedances >50 µg/m³				
			2016	2017	2018	2019	2020*
Dormanstown	458379, 523486	Suburban	0	1	0	0	0
Breckon Hill (BH)	450506, 519620	Urban Background	3	3	2	6	2
Macmillan College (MC)	447800, 519300	Urban Background	0	0	0	2	0
West Lane (WL)	447967, 519020	Roadside	-	-	0	0	-

* 2020 Data potentially influenced by Covid-19 Restrictions.
Middlesbrough data for 2020 has not been reported at the time of writing, although $PM_{2.5}$ data available through Redcar and Cleveland Borough Council ASR.

5. Effects Appraisal and Site Suitability

5.1. Construction Phase

5.1.1. Construction Dust

5.1.1.1. Assessment of Potential Dust Emission Magnitude

The likely magnitude of dust emissions from the Proposed Development for the four main activities has been assessed, as identified in Table 5.1.

Table 5.1 Predicted Magnitude of Dust Emissions from Proposed Development

Activity	Magnitude	Justification
Demolition	Medium	Demolition of parts of the site have been undertaken as part of prior approval, notably the South Bank Coke Ovens Battery at the southern end of the site (including the Willputte Battery, chimney and flare stack). There are a couple of buildings present on the site, comprising typical warehousing structures and brick buildings, that will require demolition on the site. The total building volume remaining for demolition is considered likely to be under 50,000 m^2 and all below 20 m above ground level, with potentially dusty construction materials for the non-warehousing buildings.
Earthworks	Large	Ground remediation and levelling has been undertaken as part of an earlier phase of the development (Phase 2), and therefore the earthworks associated with this are not considered in the assessment, with the baseline comprising a level site. However, the total site area significantly exceeds the highest total site area threshold, with a potentially dusty soil type present. Given the scale of the development site, the presence of more than 10 heavy earth moving vehicles is likely. Therefore, whilst the total material moved has been reduced by the prior works, a large magnitude is considered appropriate on a precautionary approach given the scale of the site.
Construction	Medium	The total building volume significantly exceeds the upper threshold (>100, 000m^3), however the main building component is of a construction material that has a low potential for dust. In addition to this, a Repair Coating Bay of 6,500 m^2 and two-storey office block of 1,800 m^2 are also proposed, but again of a construction material that has a low potential for dust generation. Therefore, a medium magnitude is considered to be appropriate.
Trackout	Large	The daily construction traffic numbers provided (see **Appendix C**) indicate a maximum of 38 HGVs, and a total of 128 construction vehicles (LGVS and HGVs) in any one day. The surface material has a high potential for dust generation and unpaved road lengths greater than 100 m are highly likely on the site.

5.1.1.2. Sensitivity of Receptors to Dust Emission Effects

The wind rose for Durham Tees Valley in 2019, provided in **Appendix C,** indicates that the prevailing wind direction is from the south and south-west. Therefore, existing receptors that are located to the north and east of the Site are most likely to fall within the area of influence from dust emissions generated by the construction phase.

The majority of dust generated by the construction phase is likely to be deposited in close proximity to the source. Surrounding the Application Site there are several existing receptors of generally low sensitivity, comprising commercial and industrial uses only.

The Site is, however, in close proximity to the revised Teesmouth and Cleveland Coast SPA and SSSI. Whilst the site is located just over 50 m from the boundary (c. 67m at its closest point), consideration has been given to this as a receptor as a precaution. The habitat alongside the site will provide some supporting habitat for qualifying features of the SPA (*i.e. foraging habitat for wetland birds*), with the Ecology Chapter of the South Industrial Zone, South Tees Environmental Statement[18] identifying that qualifying features of the SPA were not present within the development site. Therefore, with this in mind and given it falls outside of the 50 m area of influence, it is considered appropriate for the sensitivity of the receptor to be classified as medium.

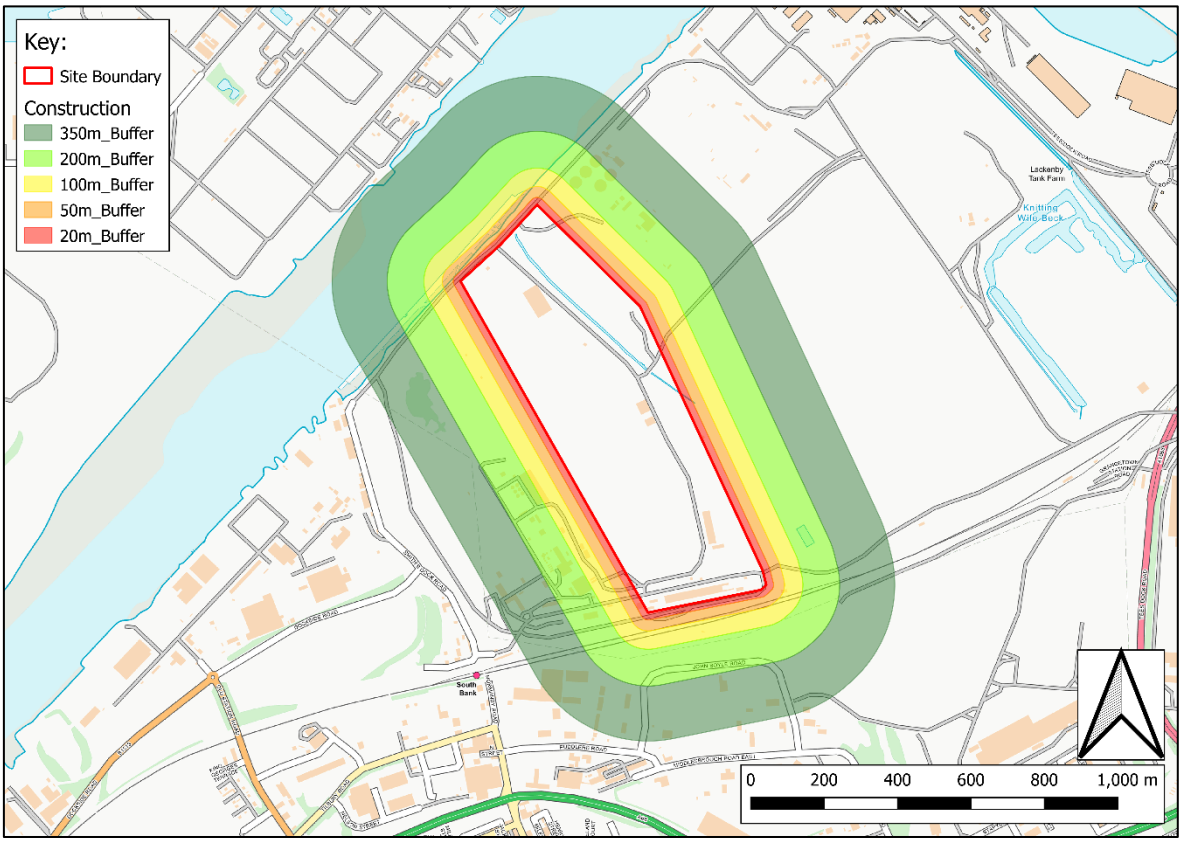


Figure 5.1 Construction Zones of Influence *(© OpenStreetMap contributors 2022)*

The Defra background PM_{10} concentration is between 10.41 µg/m^3 and 10.82 µg/m^3 for the Application Site in 2019, which is well below the annual mean air quality objective and well below the threshold of 24 µg/m^3 set out in the IAQM Construction Guidance.

The sensitivity of the area to each of the previously identified impact types associated with the Proposed Development are identified in Table 5.2.

Table 5.2 Sensitivity of Receptors to Dust Emission Effects

Impact Type	Sensitivity of Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low	Low
Human Health	Low	Low	Low	Low
Ecological	Medium	Medium	Medium	Medium

The sensitivity of the surrounding area is Low for Dust Soiling and Human Health, and Medium for Ecological impacts.

5.1.1.3. Risk of Impact

To determine the risk of impacts prior to the implementation of mitigation the dust emission magnitude and the sensitivity of the area have been combined. Table 5.3 below summaries the potential risk of impacts during the construction phase.

Table 5.3 Risk of Dust Related Impacts from the Proposed Development

Impact Type	Risk			
	Demolition M	Earthworks L	Construction M	Trackout L
Dust Soiling	Low Risk	Low Risk	Low Risk	Low Risk
Human Health	Low Risk	Low Risk	Low Risk	Low Risk
Ecological	Medium Risk	Medium Risk	Medium Risk	Medium Risk

The risk of dust related impacts from the Proposed Development on existing receptors in the vicinity of the Application Site ranges from Low Risk to Medium Risk for dust soiling, human health and ecological impacts without the implementation of mitigation.

5.1.2. Construction Non-Road Mobile Machinery (NRMM)

NRMM emissions, as stated within IAQM guidance, are unlikely to significantly impact on local air quality and in most cases do not need to be quantitively assessed. Thus, significant impacts from NRMM have been discounted. However, mitigation measures for NRMM have been identified to ensure best practice.

5.1.3. Construction Traffic Emissions

A full breakdown of the detailed dispersion modelling results is presented in **Appendix F**, however a summary is provided below.

5.1.3.1. Impact Assessment

Annual Mean NO_2 Concentrations

The objective for annual mean NO_2 concentrations is 40 µg/m^3.

'Without' and 'with' the construction of the Proposed Development, the annual mean NO_2 concentrations at all 19 existing receptor locations were compliant with the AQS Objective. The highest predicted concentration with the construction of the Proposed Development is 26.9 µg/m^3 at existing receptor E13.

The greatest predicted change in annual mean NO_2 brought about by development generated road traffic is 0.1 µg/m^3 at various existing receptor locations E9 and E18. According to the EPUK/IAQM

guidance, the impacts on annual mean NO_2 concentrations at all existing receptors were negligible.

With the construction of the Proposed Development, annual mean NO_2 concentrations at modelled proposed receptor locations below the AQS objective. The highest concentration is 17.0 µg/m^3 at proposed receptor locations P1, P2 and P3.

On this basis, mitigation to protect future users of the Proposed Development from elevated annual mean NO_2 concentrations is not required.

Hourly Mean NO_2 Concentrations

To determine compliance with the 1-hour mean objective for NO_2, detailed modelling has been undertaken to compare total concentrations against the relevant AQS objective – 200 µg/m^3.

With the construction of the Proposed Development, short-term NO_2 concentrations at all existing receptors are predicted to be below AQS objective. The highest predicted concentration with the Proposed Development operational is 57.8 µg/m^3. The impacts of the construction-generated traffic on hourly mean NO_2 concentrations are negligible, therefore mitigation is not required.

All new proposed receptors would experience concentrations below the short-term AQS objective, with the highest predicted concentration being 31.0 µg/m^3 at P3. On this basis, mitigation to protect future users of the Proposed Development from elevated hourly mean NO_2 concentrations is not required.

Annual Mean PM_{10} Concentrations

The objective for annual mean PM_{10} concentrations is 40 µg/m^3.

'Without' and 'with' the construction of the Proposed Development, the annual mean PM_{10} concentrations at all existing receptors are below the AQS Objective. The highest predicted concentration with the construction of the Proposed Development is 16.0 µg/m^3 at existing receptor locations E14.

The greatest predicted change in annual mean PM_{10} brought about by construction-generated road traffic is 0.1 µg/m^3 at existing receptor location E19. According to the EPUK/IAQM guidance, the impacts on annual mean PM_{10} concentrations at existing receptors are negligible.

With the construction of the Proposed Development, annual mean PM_{10} concentrations at all modelled proposed receptors were below the AQS objective - the highest concentration is 10.5 µg/m$_3$ at proposed receptor locations P4, P6 and P7.

On this basis, mitigation to protect future users of the Proposed Development from elevated annual mean PM_{10} concentrations is not required.

Daily Mean PM_{10} Concentrations

The AQS objective for daily mean PM_{10} concentrations is 50 µg/m^3, to be exceeded no more than 35 times a year.

The assessment demonstrates that all existing receptors fall within the daily mean PM_{10} objective with a maximum of 2 days of exceedance predicted in both the 'without' and 'with' Development scenarios. Furthermore, there are no differences between the 'without' and 'with' development scenarios. As a result, the impacts on daily mean PM_{10} concentrations are negligible.

For daily mean PM_{10}, it is predicted that all new receptors would be well within the AQS objective, again with a maximum of 3 predicted exceedances of the limit at all proposed receptor locations.

Annual Mean $PM_{2.5}$ Concentrations

The objective for annual mean $PM_{2.5}$ concentrations is 25 µg/m^3.

'Without' and 'with' the construction of the Proposed Development, the annual mean $PM_{2.5}$ concentrations at all existing receptors are below the AQS Objective. The highest predicted concentration with the construction of the Proposed Development is 10.2 µg/m^3 at existing receptor E14.

There is no predicted change in annual mean $PM_{2.5}$ brought about by construction-generated road traffic at the existing receptor locations. In accordance with the EPUK/IAQM guidance, the impacts on annual mean $PM_{2.5}$ concentrations at existing receptors are negligible.

With the construction of the Proposed Development, annual mean $PM_{2.5}$ concentrations at all modelled proposed receptors were below the AQS objective - the highest concentration is 7.0 µg/m^3 at P4, P5, P6 and P7.

On this basis, mitigation to protect future users of the Proposed Development from elevated annual mean $PM_{2.5}$ concentrations is not required

6. Mitigation

6.1. Construction Phase

6.1.1. Construction Dust

Mitigation

The IAQM guidelines provide an indication of the mitigation measures that would be appropriate for inclusion within the Proposed Development, based on the level of risk of dust related impacts identified for each of the activities. Consequently, the following mitigation measures should be incorporated into the Proposed Development and delivered through the implementation of a Construction Environment Management Plan (CEMP), which can be secured via a suitably worded planning condition.

Mitigation measures that are generic to each of the activities, and therefore should be implemented for the duration of the construction related works where applicable are identified in Table 6.1, whilst activity specific mitigation measures are identified in Table 6.2.

Table 6.1 Mitigation to be implemented during the Construction Phase

Development Element	Mitigation Measure
Communication	Develop and implement a stakeholder communications plant that includes community engagement before work commences on site. 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.
Planning	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the measures recommended in this table.
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 the complaints log available to the local authority when asked. Record any exceptional incidents that cause dust and/or emissions, either on- or off- site, and the action taken to resolve the situation in the log book.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of the site boundary, with cleaning provided if necessary. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.

Development Element	Mitigation Measure
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if at a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Preparing and Maintaining the Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period. Avoid site run-off of water or mud. Keep site fencing, barriers and scaffolding clean using wet methods. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. Cover, seed or fence stockpiles to prevent wind whipping.
Operating Vehicle/ Vehicle Movements	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 practicable. Impose and signpost a maximum speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate). Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing).

Development Element	Mitigation Measure
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 suppression/mitigation, using non-potable water where possible and appropriate. Use enclosed chutes and conveyors and covered skips. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fin water sprays on such equipment wherever appropriate. Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management	Avoid bonfires and burning of waste materials.

Table 6.2 Activity Specific Mitigation Measures to be implemented during the Construction Phase

Development Activity	Mitigation Measure
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. Only remove the cover in small areas during work and not all at once.
Construction	Avoid scabbling (roughening of concrete surfaces) if possible. Ensure sand and other aggregates are stored in bunds in areas that are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. For small supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. Avoid dry sweeping of large areas.

Development Activity	Mitigation Measure
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. Record all inspections of haul routes and any subsequent action in a site log book. Install hard surface haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. Access gates to be located at least 10m from receptors where possible.

Residual Effect

The residual effects of dust and PM_{10} generated by construction activities following the application of mitigation measures described above and good side practise is not significant.

6.1.2. Construction Traffic Emissions

The impacts of construction traffic on NO_2, PM_{10} and $PM_{2.5}$ concentrations has been determined as negligible at all existing and proposed receptor locations. On this basis, the effects are not significant and site-specific mitigation in relation to construction traffic is not required. However this does not deter from the good site practice measures set out in Tables 6.1 and 6.2, alongside a CEMP, which will minimise emissions into the air.

7. Summary and Conclusion

A qualitative assessment of construction phase impacts has been carried out. There is a medium risk of dust soiling and fugitive PM_{10} emissions during the demolition, earthworks, construction and trackout phases. Through good site practice, the implementation of suitable mitigation measures, the impact of dust and PM_{10} releases will be minimised. The residual effect of the construction phase on air quality is therefore not significant.

A quantitative road traffic assessment has been undertaken using ADMS Roads. The conclusions of the detailed dispersion modelling indicate:

- The impact on annual mean NO_2 concentrations at all existing receptors modelled is negligible;
- Annual mean NO_2 concentrations at all proposed receptors are below the relevant AQS objective;
- All modelled receptors (existing and proposed) are predicted to have 1-hour mean NO_2 concentrations well below the AQS objective; and
- The annual mean concentrations of PM_{10} and $PM_{2.5}$ are below the AQS objective for all modelled receptors and within the AQS objective for 24-hour mean PM_{10}. The impacts are classified as negligible.

Based upon the above findings it is concluded that site-specific mitigation to protect surrounding sensitive receptors from poor air quality resulting from the construction traffic of the Proposed Development is not required.

The residual effect is not significant.

Overall, with the recommended best practice measures in place, the proposals would be compliant with legislation and policy.

Appendix A – Glossary of Terms

Term	Definition
AADT - Annual Average Daily Traffic	A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Air Quality Objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air Quality Standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective)
Ambient Air	Outdoor air in the troposphere, excluding workplace air.
Annual Mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area.
Conservative	Tending to over-predict the impact rather than under-predict.
Data Capture	The percentage of all the possible measurements for a given period that were validly measured.
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport.
Dust	Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials.
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle
LAQM	Local Air Quality Management
NO_2	Nitrogen dioxide
NO_X	Nitrogen oxides
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres (µm)
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres (µm)
Trackout	The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/ demolition site with dusty materials, which may then spill onto the road, and/or when HDV's transfer dust and dirt onto the road having travelled over muddy ground on site.

Appendix B – Traffic Data

ID	Width	Speed	2019 Baseline					2024 Baseline + Committed Development					2024 Baseline + Committed Development + Construction				
			AADT	AAHT	HGV %	HGV AADT	HGV AAHT	AADT	AAHT	HGV %	HGV AADT	HGV AAHT	AADT	AAHT	HGV %	HGV AADT	HGV AAHT
1	6.8	16	92	4	39.13	36	2	92	4	39.13	36	2	92	4	39.13	36	2
2	6.8	16	92	4	39.13	36	2	92	4	39.13	36	2	92	4	39.13	36	2
3	6.8	16	92	4	39.13	36	2	92	4	39.13	36	2	92	4	39.13	36	2
4	7.2	48	2449	102	24.00	624	26	2458	102	24.00	590	25	2550	106	24.00	648	27
5	7.2	48	2449	102	24.00	624	26	2458	102	24.00	590	25	2550	106	24.00	648	27
6	10.2	16	2449	102	24.00	624	26	2458	102	24.00	590	25	2550	106	24.00	648	27
7	10.2	16	5271	220	28.00	1512	63	5401	225	28.00	1512	63	5493	229	28.00	1574	66
8	7	80	5271	220	28.00	1512	63	5401	225	28.00	1512	63	5493	229	28.00	1574	66
9	10.5	16	7390	308	18.00	1366	57	7594	316	18.00	1367	57	7686	320	18.00	1420	59
10	7.3	48	7390	308	18.00	1366	57	7594	316	18.00	1367	57	7686	320	18.00	1420	59
11	13	16	7390	308	18.00	1366	57	7594	316	18.00	1367	57	7686	320	18.00	1420	59
12	16	16	35897	1496	13.00	4703	196	35737	1489	13.00	4646	194	35829	1493	13.00	4694	196
13	16	48	2056	86	1.00	57	2	2106	88	1.00	21	1	2198	92	1.00	58	2
14	16	48	4825	201	1.00	84	4	6734	281	1.00	67	3	6826	284	1.00	104	4
15	15	16	35084	1462	13.00	4597	192	33591	1400	13.00	4367	182	33683	1403	13.00	4415	184
16	15	80	35084	1462	13.00	4597	192	33591	1400	13.00	4367	182	33683	1403	13.00	4415	184
17	15	16	35084	1462	13.00	4597	192	33591	1400	13.00	4367	182	33683	1403	13.00	4415	184
18	15	80	48069	2003	8.00	3882	162	47805	1992	8.00	3824	159	47897	1996	8.00	3868	161

ID	Width	Speed	2019 Baseline					2024 Baseline + Committed Development					2024 Baseline + Committed Development + Construction				
			AADT	AAHT	HGV %	HGV AADT	HGV AAHT	AADT	AAHT	HGV %	HGV AADT	HGV AAHT	AADT	AAHT	HGV %	HGV AADT	HGV AAHT
19	18	80	48069	2003	8.00	3882	162	47805	1992	8.00	3824	159	47897	1996	8.00	3868	161
20	18	80	55501	2313	7.00	3921	163	55210	2300	7.00	3865	161	55302	2304	7.00	3907	163
21	15	80	67215	2801	6.00	4069	170	66881	2787	6.00	4013	167	66973	2791	6.00	4054	169
22	15	80	67215	2801	6.00	4069	170	66881	2787	6.00	4013	167	66973	2791	6.00	4054	169
23	16	80	74676	3112	6.00	4517	188	74316	3097	6.00	4459	186	74408	3100	6.00	4500	188
24	24	80	85407	3559	5.00	4306	179	85008	3542	5.00	4250	177	85100	3546	5.00	4291	179
25	7.6	48	4825	201	1.00	84	4	6734	281	1.00	67	3	6826	284	1.00	104	4
26	6.5	48	2056	86	1.00	57	2	2106	88	1.00	21	1	2198	92	1.00	58	2
27	15	80	35897	1496	13.00	4703	196	35737	1489	13.00	4646	194	35829	1493	13.00	4694	196
28	17	16	35897	1496	13.00	4703	196	35737	1489	13.00	4646	194	35829	1493	13.00	4694	196
29	15	48	6366	265	18.00	1182	49	6348	265	18.00	1143	48	6440	268	18.00	1195	50
30	8.5	48	6366	265	18.00	1182	49	6348	265	18.00	1143	48	6440	268	18.00	1195	50
31	15	20	7137	297	1.00	107	4	6950	290	1.00	69	3	7042	293	1.00	106	4
32	6	20	7137	297	1.00	107	4	6950	290	1.00	69	3	7042	293	1.00	106	4
33	17	16	43098	1796	13.00	5639	235	43331	1805	13.00	5633	235	43423	1809	13.00	5681	237
34	16	80	43098	1796	13.00	5639	235	43331	1805	13.00	5633	235	43423	1809	13.00	5681	237
35	18	16	43098	1796	13.00	5639	235	43331	1805	13.00	5633	235	43423	1809	13.00	5681	237
36	13.5	48	5376	224	18.00	1004	42	5393	225	18.00	971	40	5485	229	18.00	1023	43
37	7.3	48	5376	224	18.00	1004	42	5393	225	18.00	971	40	5485	229	18.00	1023	43
38	15	16	39499	1646	10.00	3986	166	40217	1676	10.00	4022	168	40309	1680	10.00	4067	169

ID	Width	Speed	2019 Baseline					2024 Baseline + Committed Development					2024 Baseline + Committed Development + Construction				
			AADT	AAHT	HGV %	HGV AADT	HGV AAHT	AADT	AAHT	HGV %	HGV AADT	HGV AAHT	AADT	AAHT	HGV %	HGV AADT	HGV AAHT
39	15	80	39499	1646	10.00	3986	166	40217	1676	10.00	4022	168	40309	1680	10.00	4067	169
40	15.5	16	39499	1646	10.00	3986	166	40217	1676	10.00	4022	168	40309	1680	10.00	4067	169
41	13.5	16	21900	913	32.00	7044	294	22916	955	32.00	7333	306	23008	959	32.00	7399	308
42	9.3	48	21900	913	32.00	7044	294	22916	955	32.00	7333	306	23008	959	32.00	7399	308
43	15	16	32595	1358	7.00	2318	97	33217	1384	7.00	2325	97	33309	1388	7.00	2368	99
44	14	112	32595	1358	7.00	2318	97	33217	1384	7.00	2325	97	33309	1388	7.00	2368	99
45	16.5	16	32595	1358	7.00	2318	97	33217	1384	7.00	2325	97	33309	1388	7.00	2368	99
46	14	16	7120	297	7.00	534	22	7652	319	7.00	536	22	7744	323	7.00	578	24
47	14	64	7120	297	7.00	534	22	7652	319	7.00	536	22	7744	323	7.00	578	24
48	16.5	16	19883	828	9.00	1825	76	21220	884	9.00	1910	80	21312	888	9.00	1954	81
49	14.5	112	19883	828	9.00	1825	76	21220	884	9.00	1910	80	21312	888	9.00	1954	81
50	17	16	19883	828	9.00	1825	76	21220	884	9.00	1910	80	21312	888	9.00	1954	81
51	12.5	48	6780	283	9.00	646	27	7446	310	9.00	670	28	7538	314	9.00	714	30
52	11.5	112	16539	689	4.00	698	29	17964	749	4.00	719	30	18056	752	4.00	758	32
53	7.5	112	16803	700	4.00	708	30	18991	791	4.00	760	32	19083	795	4.00	799	33
54	15	80	38707	1613	2.00	810	34	41739	1739	2.00	835	35	41831	1743	2.00	873	36
55	7	48	6780	283	9.00	646	27	7446	310	9.00	670	28	7538	314	9.00	714	30
56	7.5	112	16539	689	4.00	698	29	17964	749	4.00	719	30	18056	752	4.00	758	32
57	7.3	112	16803	700	4.00	708	30	18991	791	4.00	760	32	19083	795	4.00	799	33
58	14.5	80	38707	1613	2.00	810	34	41739	1739	2.00	835	35	41831	1743	2.00	873	36

ID	Width	Speed	2019 Baseline					2024 Baseline + Committed Development					2024 Baseline + Committed Development + Construction				
			AADT	AAHT	HGV %	HGV AADT	HGV AAHT	AADT	AAHT	HGV %	HGV AADT	HGV AAHT	AADT	AAHT	HGV %	HGV AADT	HGV AAHT
59	16	112	15319	638	7.00	1108	46	15366	640	7.00	1076	45	15458	644	7.00	1118	47
60	11	112	15319	638	7.00	1108	46	15366	640	7.00	1076	45	15458	644	7.00	1118	47
61	11	112	15319	638	7.00	1108	46	15366	640	7.00	1076	45	15458	644	7.00	1118	47
62	11.5	112	15319	638	7.00	1108	46	15366	640	7.00	1076	45	15458	644	7.00	1118	47
63	13	112	15319	638	7.00	1108	46	15366	640	7.00	1076	45	15458	644	7.00	1118	47
64	13	48	17348	723	1.00	209	9	17388	725	1.00	174	7	17480	728	1.00	211	9
65	9.3	48	17348	723	1.00	209	9	17388	725	1.00	174	7	17480	728	1.00	211	9
66	12.5	112	9263	386	7.00	684	29	9241	385	7.00	647	27	9333	389	7.00	689	29
67	12.5	112	9263	386	7.00	684	29	9241	385	7.00	647	27	9333	389	7.00	689	29
68	11.4	64	13326	555	7.00	969	40	13336	556	7.00	934	39	13428	560	7.00	976	41
69	14	64	13326	555	7.00	969	40	13336	556	7.00	934	39	13428	560	7.00	976	41
70	12.5	48	8826	368	2.00	213	9	8801	367	2.00	176	7	8893	371	2.00	214	9
71	10	48	8826	368	2.00	213	9	8801	367	2.00	176	7	8893	371	2.00	214	9
72	10.5	48	9616	401	2.00	228	10	9598	400	2.00	192	8	9690	404	2.00	230	10
73	5.2	48	9616	401	2.00	228	10	9598	400	2.00	192	8	9690	404	2.00	230	10
74	9	48	10326	430	7.00	759	32	10313	430	7.00	722	30	10405	434	7.00	764	32
75	7.3	48	10326	430	7.00	759	32	10313	430	7.00	722	30	10405	434	7.00	764	32

Appendix C – Construction Phasing Plan

1 Consruction volume

Number of Pile	6,080	nos
Volume of Concrete	150,000	m3
Total quantity of steel structure	17,500	ton
Gross internal area	103,041	m2

2 Proposed phasing plans.
by Archi

3 Detail of on site construction plant(equipements) & Daily Construction traffic numbers (HGV and LGV)

Monthly Heavy equipment Plan				2022					
				Jul +1 Month	Aug +2 Month	Sep +3 Month	Oct +4 Month	Nov +5 Month	Dec +6 Month
Total Number of Equipment	Daily stationed heavy equipment on site	Pile Rig	Daily	2.0	7.0	10.5	11.0	11.0	10.0
		Crane	Daily	2.0	7.0	10.5	11.0	15.0	18.0
		Boom Lift	Daily	-	-	-	-	8.0	16.0
		Cissor Lift	Daily	-	-	-	-	2.0	4.0
		Excavator	Daily	6.0	21.0	31.5	33.0	33.0	30.0
		Dump Truck	Daily	1.0	2.0	4.0	5.0	6.0	3.0
		Concrete Truck	Daily	2.0	6.0	14.0	17.0	19.0	9.0
		Trailer(Material)	Daily	1.0	1.0	1.0	1.0	3.0	4.0
		Total	Sum	14.0	44.0	71.5	78.0	97.0	94.0
	Number of access vehicle	HGV	Daily	1.0	13.0	25.0	30.0	34.0	23.0
		LGV	Daily	13.0	23.0	32.0	35.0	42.0	38.0
		Total	Sum	14.0	36.0	57.0	65.0	76.0	61.0

Monthly Heavy equipment Plan				2023											
				Jan +7 Month	Feb +8 Month	Mar +9 Month	Apr +10 Month	May +11 Month	Jun +12 Month	Jul +13 Month	Aug +14 Month	Sep +15 Month	Oct +16 Month	Nov +17 Month	Dec +18 Month
Total Number of Equipment	Daily stationed heavy equipment on site	Pile Rig	Daily	10.0	8.0	8.0	1.0	-	-	-	-	-	-	-	-
		Crane	Daily	18.0	24.0	24.0	16.0	19.0	22.0	17.0	11.5	15.0	6.0	5.0	5.0
		Boom Lift	Daily	16.0	28.0	28.0	51.0	59.0	45.0	51.0	21.0	25.0	11.0	7.0	7.0
		Cissor Lift	Daily	4.0	6.0	10.0	16.0	18.0	18.0	18.0	20.0	21.0	25.0	25.0	21.0
		Excavator	Daily	30.0	27.0	27.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		Dump Truck	Daily	5.0	5.0	4.0	3.0	2.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0
		Concrete Truck	Daily	17.0	16.0	13.0	10.0	6.0	10.0	11.0	11.0	15.0	13.0	12.0	12.0
		Trailer(Material)	Daily	5.0	6.0	6.0	6.0	7.0	8.0	4.0	3.0	3.0	1.0	1.0	1.0
		Total	Sum	105.0	121.0	121.0	89.0	94.0	107.0	87.0	78.5	82.0	63.0	59.0	51.0
	Number of access vehicle	HGV	Daily	35.0	37.0	30.0	30.0	28.0	35.0	33.0	32.0	38.0	36.0	33.0	29.0
		LGV	Daily	50.0	56.0	50.0	58.0	66.0	78.0	77.0	76.0	84.0	92.0	87.0	68.0
		Total	Sum	85.0	93.0	80.0	88.0	94.0	113.0	110.0	108.0	122.0	128.0	120.0	97.0

Monthly Heavy equipment Plan				2024						Remark
				Jan +19 Month	Feb +20 Month	Mar +21 Month	Apr +22 Month	May +23 Month	Jun +24 Month	
Total Number of Equipment	Daily stationed heavy equipment on site	Pile Rig	Daily	-	-	-	-	-	-	
		Crane	Daily	-	-	-	-	-	-	
		Boom Lift	Daily	5.0	5.0	5.0	5.0	5.0	-	
		Cissor Lift	Daily	19.0	19.0	17.0	17.0	17.0	10.0	
		Excavator	Daily	4.0	4.0	4.0	3.0	3.0	1.0	
		Dump Truck	Daily	3.0	2.0	1.0	-	-	-	
		Concrete Truck	Daily	10.0	4.0	3.0	-	-	-	
		Trailer(Material)	Daily	1.0	1.0	1.0	-	-	-	
		Total	Sum	40.0	33.0	29.0	25.0	25.0	11.0	
	Number of access vehicle	HGV	Daily	17.0	17.0	13.0	8.0	7.0	5.0	
		LGV	Daily	69.0	56.0	18.0	37.0	33.0	23.0	
		Total	Sum	86.0	73.0	31.0	45.0	40.0	28.0	

4 Significant noise-generating works

Main noise Equipment	Main Activity	Period
Hydraulic Breaker(0.2,0.6m3	Hacking of pile head	July.2022 - Mar.2023
Concrete pump	Concrete casting	July.2022 - Mar.2024

※Construction noise barrier to be considered

Appendix D – Modelled Receptors and Background Concentrations

Receptor ID	X	Y	2019			2024		
			NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)
E1	452925	520644	16.5	11.7	7.6	13.8	11.0	7.1
E2	453016	520682	15.1	11.8	7.7	12.6	11.1	7.2
E3	453192	520839	15.1	11.8	7.7	12.6	11.1	7.2
E4	453467	520750	15.1	11.8	7.7	12.6	11.1	7.2
E5	454540	520554	13.9	11.5	7.5	11.6	10.8	6.9
E6	454941	520759	13.9	11.5	7.5	11.6	10.8	6.9
E7	455365	520928	13.8	11.5	7.5	11.6	10.9	7.0
E8	455435	520614	13.8	11.5	7.5	11.6	10.9	7.0
E9	454991	520325	13.9	11.5	7.5	11.6	10.8	6.9
E10	456278	519032	13.2	13.2	7.9	10.8	12.5	7.3
E11	456285	518692	12.3	11.8	7.4	10.1	11.1	6.9
E12	457309	519649	11.9	11.4	7.2	9.9	10.7	6.7
E13	449137	520606	22.0	12.5	8.2	18.0	11.8	7.6
E14	448047	519112	21.7	14.4	9.3	18.0	13.6	8.7
E15	457900	523739	14.6	11.7	7.4	12.8	11.1	6.9
E16	459043	524536	13.8	11.1	7.3	11.9	10.4	6.8
E17	459257	524592	13.8	11.1	7.3	11.9	10.4	6.8
E18	452660	521054	18.2	10.6	7.1	15.7	9.9	6.5
E19	455205	521827	13.4	10.8	7.2	11.4	10.2	6.6
P1	453274	522355	16.8	10.2	6.9	14.7	9.5	6.4
P2	453474	522556	16.8	10.2	6.9	14.7	9.5	6.4
P3	453749	522282	16.8	10.2	6.9	14.7	9.5	6.4
P4	453937	521881	14.6	10.4	7.0	12.5	9.7	6.4
P5	454090	521531	13.3	10.3	6.9	11.4	9.7	6.4
P6	453779	521459	14.6	10.4	7.0	12.5	9.7	6.4
P7	453521	521918	14.6	10.4	7.0	12.5	9.7	6.4

Appendix E – Model Verification

The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations. Discrepancies occur due to model uncertainties, such as:

- Estimates of background pollutant concentrations;
- Meteorological data uncertainties;
- Traffic data uncertainties;
- Model input parameters; and
- Overall limitations of the dispersion model.

NO_2 is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. Therefore model verification for nitrogen oxides (NO_X = NO + NO_2) the primary pollutant is appropriate. This has been undertaken in accordance Chapter 7 of LAQM.TG(16).

The model has been run to predict the 2019 annual mean road-NO_X contribution at the monitoring locations given below. The model outputs of road-NO_X for each location have been compared with the 2018 'measured' road-NO_X, which was determined utilising the NO_X from NO_2 calculator and the NO_2 concentration data from RCBC and MbC monitoring.

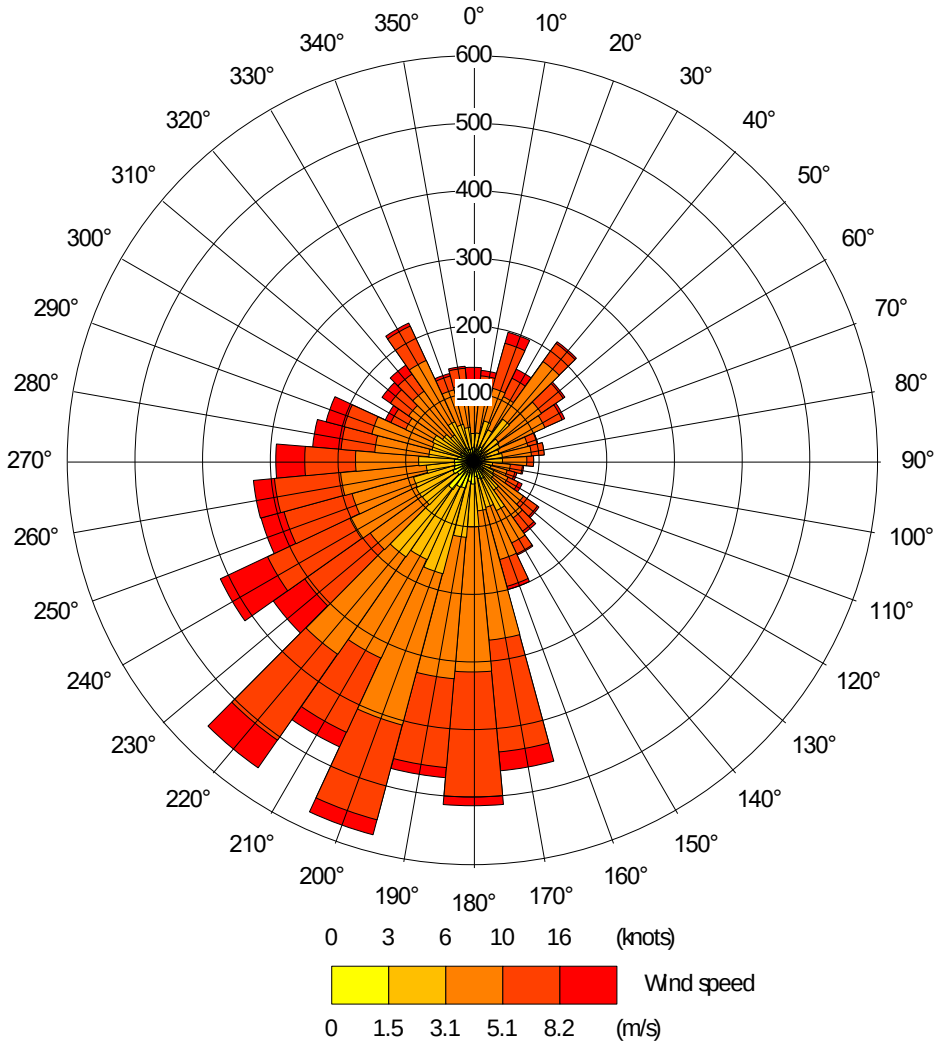
Details of the data used in the verification process is in the table and figure below.

ID	2019 Monitored Total NO_2 (µg/m^3)	Background NO_2 (µg/m^3)	2019 Monitored Road Contribution NO_X (µg/m^3)	2019 Modelled Road Contribution NO_X (µg/m^3)	Ratio of monitored NO_X road contribution/modelled road contribution NO_X
R26	19.5	15.15	8.88	8.11	1.09
R27	24.8	13.90	16.11	20.75	0.78
R48	17.7	13.78	3.83	7.25	0.53
WL	30.8	19.71	21.17	21.65	0.98
M24	24.3	19.71	19.37	8.72	2.22

The adjustment factor calculated is 0.97. This indicated that the model was over-predicting. As the model was over-predicting, instead of applying this factor to adjust the modelled road-NO_X outputs, the outputs remained unadjusted and an adjustment factor of 1 was assumed.

For PM_{10} and $PM_{2.5}$ there are no relevant local monitoring data against which the model could be verified. Consequently, the verification factors determined above for adjusting the road-NO_X contribution has been applied to the predicted road-PM_{10} and road-$PM_{2.5}$ contributions, consistent with guidance set out in LAQM.TG(16).

Appendix F – Durham Tees Valley 2019 Windrose



Appendix G – Modelled Results

Annual Mean NO_2

Receptor ID	Without Development (µg/m³)	With Development (µg/m³)	Change (µg/m³)	Impact/ Exceed
E1	17.8	17.8	0.0	Negligible
E2	16.2	16.2	0.0	Negligible
E3	16.9	16.9	0.0	Negligible
E4	16.5	16.5	0.0	Negligible
E5	16.4	16.4	0.0	Negligible
E6	15.7	15.7	0.0	Negligible
E7	15.8	15.8	0.0	Negligible
E8	15.0	15.0	0.0	Negligible
E9	14.5	14.6	0.1	Negligible
E10	14.1	14.1	0.0	Negligible
E11	14.3	14.3	0.0	Negligible
E12	14.9	14.9	0.0	Negligible
E13	26.9	26.9	0.0	Negligible
E14	26.1	26.1	0.0	Negligible
E15	15.5	15.5	0.0	Negligible
E16	15.0	15.0	0.0	Negligible
E17	15.3	15.3	0.0	Negligible
E18	19.0	19.1	0.1	Negligible
E19	15.1	15.1	0.0	Negligible
P1		17.0		Negligible
P2		17.0		Negligible
P3		17.0		Negligible
P4		14.8		Negligible
P5		13.6		Negligible
P6		15.0		Negligible
P7		14.8		Negligible

1-Hour Mean NO_2 Results

Receptor ID	Without Development (µg/m³)	With Development (µg/m³)	Change (µg/m³)	Impact/ Exceed
E1	38.0	38.0	0.0	Negligible
E2	33.9	33.9	0.0	Negligible
E3	34.6	34.6	0.0	Negligible
E4	33.5	33.6	0.1	Negligible
E5	41.6	41.6	0.0	Negligible
E6	32.5	32.5	0.0	Negligible
E7	39.2	39.2	0.0	Negligible
E8	27.7	27.7	0.1	Negligible
E9	27.8	27.8	0.0	Negligible

Receptor ID	Without Development (µg/m³)	With Development (µg/m³)	Change (µg/m³)	Impact/ Exceed
E10	26.4	26.5	0.0	Negligible
E11	29.7	29.7	0.1	Negligible
E12	30.5	30.6	0.0	Negligible
E13	57.7	57.8	0.0	Negligible
E14	52.1	52.1	0.0	Negligible
E15	30.7	30.7	0.0	Negligible
E16	29.4	29.4	0.0	Negligible
E17	30.3	30.4	0.1	Negligible
E18	36.5	36.5	0.0	Negligible
E19	29.9	30.0	0.0	Negligible
P1		30.8		Negligible
P2		30.9		Negligible
P3		31.0		Negligible
P4		26.8		Negligible
P5		25.2		Negligible
P6		27.4		Negligible
P7		26.8		Negligible

Annual Mean PM_{10} Results

Receptor ID	Without Development (µg/m³)	With Development (µg/m³)	Change (µg/m³)	Impact/ Exceed
E1	12.0	12.0	0.0	Negligible
E2	12.1	12.1	0.0	Negligible
E3	12.4	12.4	0.0	Negligible
E4	12.1	12.1	0.0	Negligible
E5	12.1	12.1	0.0	Negligible
E6	12.2	12.2	0.0	Negligible
E7	12.1	12.1	0.0	Negligible
E8	12.0	12.0	0.0	Negligible
E9	11.7	11.7	0.0	Negligible
E10	13.5	13.5	0.0	Negligible
E11	12.3	12.3	0.0	Negligible
E12	12.4	12.4	0.0	Negligible
E13	14.4	14.4	0.0	Negligible
E14	16.0	16.0	0.0	Negligible
E15	12.0	12.0	0.0	Negligible
E16	11.5	11.5	0.0	Negligible
E17	11.6	11.6	0.0	Negligible
E18	10.8	10.8	0.0	Negligible
E19	11.4	11.5	0.1	Negligible
P1		10.3		Negligible
P2		10.3		Negligible
P3		10.3		Negligible

Receptor ID	Without Development (µg/m³)	With Development (µg/m³)	Change (µg/m³)	Impact/ Exceed
P4		10.5		Negligible
P5		10.4		Negligible
P6		10.5		Negligible
P7		10.5		Negligible

Daily Mean PM_{10} Results

Receptor ID	Without Development (Number of days exceeding AQS)	With Development (Number of days exceeding AQS)	Change (Number of days)	Impact/ Exceed
E1	1	1	0	Negligible
E2	1	1	0	Negligible
E3	1	1	0	Negligible
E4	1	1	0	Negligible
E5	1	1	0	Negligible
E6	1	1	0	Negligible
E7	1	1	0	Negligible
E8	1	1	0	Negligible
E9	1	1	0	Negligible
E10	0	0	0	Negligible
E11	1	1	0	Negligible
E12	1	1	0	Negligible
E13	0	0	0	Negligible
E14	0	0	0	Negligible
E15	1	1	0	Negligible
E16	2	2	0	Negligible
E17	1	1	0	Negligible
E18	2	2	0	Negligible
E19	2	2	0	Negligible
P1		3		Negligible
P2		3		Negligible
P3		3		Negligible
P4		3		Negligible
P5		3		Negligible
P6		3		Negligible
P7		3		Negligible

Annual Mean $PM_{2.5}$ Results

Receptor ID	Without Development (µg/m³)	With Development (µg/m³)	Change (µg/m³)	Impact/ Exceed
E1	7.8	7.8	0.0	Negligible
E2	7.9	7.9	0.0	Negligible

Receptor ID	Without Development (µg/m^3)	With Development (µg/m^3)	Change (µg/m^3)	Impact/ Exceed
E3	8.1	8.1	0.0	Negligible
E4	7.9	7.9	0.0	Negligible
E5	7.8	7.8	0.0	Negligible
E6	7.8	7.8	0.0	Negligible
E7	7.8	7.8	0.0	Negligible
E8	7.7	7.7	0.0	Negligible
E9	7.6	7.6	0.0	Negligible
E10	8.0	8.0	0.0	Negligible
E11	7.7	7.7	0.0	Negligible
E12	7.8	7.8	0.0	Negligible
E13	9.2	9.2	0.0	Negligible
E14	10.2	10.2	0.0	Negligible
E15	7.6	7.6	0.0	Negligible
E16	7.6	7.6	0.0	Negligible
E17	7.6	7.6	0.0	Negligible
E18	7.2	7.2	0.0	Negligible
E19	7.5	7.5	0.0	Negligible
P1		6.9		Negligible
P2		6.9		Negligible
P3		6.9		Negligible
P4		7.0		Negligible
P5		7.0		Negligible
P6		7.0		Negligible
P7		7.0		Negligible

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