13 Air Quality and Dust

Introduction

13.1 This chapter assesses the likely significant effects of the proposed development on local air quality. In particular it considers the potential effects of construction phase dust and operational phase road traffic emissions on air quality at identified existing receptor locations.

13.2 Within this chapter "the Site" refers to land that falls within the application boundaries A and B as identified in the Site Location Plans (**Figure 1.1** and **Figure 1.2**).

13.3 The chapter describes the methods used to assess the likely significant effects, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect effects of the development arising from construction phase fugitive dust emissions, as well as additional road vehicle exhaust emissions generated by the operation phase of the site, the mitigation measures required to prevent, reduce, or offset the identified significant effects and the residual effects. It has been written by Ensafe with due regard to the requirements of South Ribble Borough Council (SRBC).

Planning Policy Context

European Legislation

Ambient Air Quality Directive

13.4 European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$).

13.5 The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for nitrogen dioxide (NO_2), oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}).

UK Legislation

Ambient Air Quality Directive

13.6 The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for seven pollutants, as well as Target Values for an additional six pollutants.

13.7 AQVLs are legally binding limits on 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 groups or on ecosystems.

13.8 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007(Air Quality Strategy for England, Scotland, Wales and Northern Ireland). The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

13.9 Table 13.1 presents the AQOs for pollutants considered within this assessment.

Table 13.1: Air Quality Objectives

Pollutant	Air Quality Objectives	
	Concentration ($\mu g/m^3$)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM_{10}	40	Annual mean
	50	1-hour mean; not to be exceeded more than 35 times a year
$PM_{2.5}$	25	Annual mean

13.11 Table 13.2 summarises the advice provided in DEFRA guidance, Local Air Quality Management Technical Guidance 2016 (LAQM TG16), (DEFRA, 2016) on where the AQOs for pollutants considered within this chapter apply.

Table 13.2: Examples of where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access to. 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 location 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 location 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 be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Local Air Quality Management

13.12 Under Section 82 of the Environment Act (1995) (Part IV), Local Authorities (LAs) are required to periodically review and assess air quality within their area of administration under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQOs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period are likely to be exceeded, the LA is required to declare an Air

Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

Dust

13.13 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2018) are those provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

*"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisanc*e."

13.14 Enforcement of the Act, in regard to nuisance, is currently under the administration of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

National Planning Policy

National Planning Policy Framework

13.15 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021) sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment.

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

[...]

e) 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..." (Paragraph 174 (e)).

"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 186).

13.16 The implications of the NPPF have been considered throughout this assessment.

National Planning Practice Guidance

13.17 The National Planning Practice Guidance (NPPG) (Ministry of Housing, Communities and Local Governments, 2018) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The air quality pages were updated on November 1st 2019 and are summarised under the following headings:

- **Paragraph 001** states that: "*The Department for Environment, Food and Rural Affairs carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values. It is important that the potential impact of new development on air quality is taken into account, where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified*". The role of Local Authorities under LAQM are stated and that AQAPs should be prepared to identify "*measures that will be introduced in pursuit of the objectives…*"
- **Paragraph 005** states that "*Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations…*" "*Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity*."
- **Paragraph 007** states that "*Assessments should be proportional to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific.*"
- **Paragraph 008** states that "*Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact.*"

13.18 These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

Local Planning Policy

Central Lancashire Core Strategy (adopted in July 2012)

13.19 The Central Lancashire Core Strategy was adopted July 2012 and prepared jointly with Preston City Council (PCC), Chorley Council (CC) and SRBC. The Core Strategy is a key document in Central Lancashire's Local Development Framework. Its purpose is to help co-ordinate development in the area and will encourage sustainable managed growth. A review of the Core Strategy indicated the following policies relevant to the preparation of this assessment.

- **Policy 30: Air Quality**

  "Improve air quality through delivery of Green Infrastructure initiatives and through taking account of air quality when prioritising measures to reduce road traffic congestion."

South Ribble Local Plan 2012 – 2026 (adopted in July 2015)

13.20 A review of the South Ribble Local Plan indicated no policies relevant to the preparation of this chapter.

Penwortham Neighbourhood Plan 2016 – 2026

13.21 A review of the Penwortham Neighbourhood Plan indicated no policies relevant to the preparation of this chapter.

Assessment Methodology and Significance Criteria

Assessment Methodology

13.22 The Proposed Development has the potential to cause air quality effects during the construction and operational phases in addition to exposing future site users to elevated pollution levels. These issues have been assessed in accordance with the following methodology.

13.23 Due to the size of the development, a phased approach to construction will be undertaken. The sequencing of the delivery of the indicative phases is currently unknown. Should the application be approved, the Local Planning Authority is invited to impose a condition which requires a detailed phasing plan to be submitted to SRBC as part of the first reserved matters application. An indicative phasing plan for the outline residential-led application is presented at **Figure 5.9**. In the event the proposed phasing plan is likely to have any new or different significant effects to those that have been assessed, a supplemental ES will accompany the submitted phasing plan.

13.24 By considering the site as a whole and in isolation this ensures that a worst case assessment has been considered when assessing the potential impacts on future users and existing sensitive receptors as a result of the proposed development during both the construction and operational phases.

13.25 The assessment presented in this Chapter has assessed Applications A and B. It should be noted that should Application B not come forward, it will not change the significance of effects and assessing both Applications A and B presents a worst-case scenario. Further details on Applications A and B are presented in Chapter 5: The Proposed Development. .

Construction Phase

13.26 There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction, 2014'.

13.27 Activities on the proposed construction site have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction: and,
- Trackout.

13.28 The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to significant increase in exposure to PM_{10} and $PM_{2.5.}$

13.29 The spatial scope for the construction phase assessment is detailed within the methodology below. The assessment has considered the entirety of the site rather than specific phases. By considering the site as a whole this ensures that a worst-case assessment has been considered when assessing the potential magnitude of dust generation and the proximity of existing sensitive receptors.

13.30 The impact of individual phases on newly built proposed units will have a smaller dust source potential and the specific measures outlined within a Construction Environmental Management Plan (CEMP) would sufficiently mitigate the impacts at these proposed units as demonstrated within this assessment.

13.31 The assessment steps are detailed below.

Step 1

13.32 Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the site boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary site or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should also proceed to Step 2.

13.33 Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

Step 2

13.34 Step 2 assesses the risk of potential dust impacts. A site is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and
- The sensitivity of the area to dust impacts, which can defined as low, medium or high sensitivity (Step 2B).

13.35 The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

13.36 Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 13.3.

Table 13.3: Construction Dust – Magnitude of Emissions

Magnitude	Activity	Criteria
Large	Demolition	• Total building volume greater than 50,000m^3 • Potentially dusty construction material (e.g. concrete) • On-site crushing and screening • Demolition activities greater than 20m above ground level
	Earthworks	• Total site area greater than 10,000m^2 • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved
	Construction	• Total building volume greater than 100,000m^3 • On site concrete batching • Sandblasting
	Trackout	• More than 50 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Demolition	• Total building volume 20,000m^3 to 50,000m^3 • Potentially dusty construction material • Demolition activities 10m to 20m above ground level
	Earthworks	• Total site area 2,500m^2 to 10,000m^2 • Moderately dusty soil type (e.g. silt) • 5 to 10 heavy earth moving vehicles active at any one time • Formation of bunds 4m to 8m in height • Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	• Total building volume 25,000m^3 to 100,000m^3 • Potentially dusty construction material (e.g. concrete) • On site concrete batching
	Trackout	• 10 to 50 HDV trips per day • Moderately dusty surface material (e.g. high clay content)

Magnitude	Activity	Criteria
		• Unpaved road length 50m to 100m
	Demolition	• Total building volume under 20,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber) • Demolition activities less than 10m above ground level • Demolition during wetter months
	Earthworks	• Total site area less than 2,500m^2 • Soil type with large grain size (e.g. sand) • Less than 5 heavy earth moving vehicles active at any one time • Formation of bunds less than 4m in height • Total material moved less than 20,000 tonnes • Earthworks during wetter months
	Construction	• Total building volume less than 25,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	• Less than 10 HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

13.37 Step 2B defines the sensitivity of the area around the development site for demolition, construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table 13.4.

Table 13.4: Examples of Factors Defining Sensitivity of an Area

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	• Users expect high levels of amenity • High aesthetic or value property • People expected to be present continuously for extended periods of time • Locations where members of the public are exposed over a time period relevant to the AQO for PM_{10} e.g. residential properties, hospitals, schools and residential care homes	• Internationally or nationally designated site e.g. Special Area of Conservation
Medium	• Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks	• Nationally designated site e.g. Sites of Special Scientific Interest

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
	and places of work	
Low	• Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads	• Locally designated site e.g. Local Nature Reserve

13.38 The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts during the construction phase:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in the document

13.39 These factors were considered in the undertaking of this assessment.

13.40 The sensitivity of the area to dust soiling effects on people and property is shown in Table 13.5.

Table 13.5: Sensitivity of the Area to Dust Soiling Effects

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Low	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

13.41 Table 13.6 outlines the sensitivity of the area to human health impacts.

Table 13.6: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m^3	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m^3	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m^3	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m^3	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	Greater than 32µg/m3	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32µg/m^3	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m^3	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	Less than 24µg/m^3	More than 10	Low	Low	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
		1 - 10	Low	Low	Low	Low	Low
Low	-	More than 1	Low	Low	Low	Low	Low

13.42 Table 13.7 outlines the sensitivity of the area to ecological impacts.

Table 13.7: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	High
Medium	Medium	Medium
Low	Low	Low

13.43 Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

13.44 Table 13.8 outlines the risk category from demolition activities.

Table 13.8: Dust Risk Category from Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

13.45 Table 13.9 outlines the risk category from earthworks and construction activities.

Table 13.9: Dust Risk Category from Earthworks and Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

13.46 Table 13.10 outlines the risk category from from trackout activities.

Table 13.10: Dust Risk Category from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

Step 3

13.47 Step 3 requires the identification of site-specific mitigation measures within the IAQM guidance to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with negligible risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4

13.48 Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.

13.49 The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

Operational Phase

Road Traffic Emissions – Air Dispersion Modelling

13.50 The development has potential to cause impacts on existing air quality as a result of additional road traffic exhaust emissions (NO_2, PM_{10} and $PM_{2.5}$) generated by vehicles travelling to and from the site, there is also potential to expose future site-users to elevated pollutant levels associated with Penwortham Way (A582).

13.51 The assessment methodology for the road traffic emissions assessments has been undertaken in accordance with the guidance outlined within SRBC's 'Planning Advisory Note (PAN) – Low Emissions and Air Quality' and the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance 'Land-Use Planning and Development Control: Planning for Air Quality'. The Proposed Development has been classified as a 'Type 3X' in line with the SRBC PAN.

13.52 The total number of vehicles generated by the operational phase would be present during the anticipated scheme completion year of 2031, with first occupation of site users expected in 2025. Due to the projected

improvement of vehicle emissions in the future, guided by government policy and measures detailed with the SRBC PAN, it was considered a robust approach to use a first occupation year emissions scenario (2025). This provide a robust approach where vehicle emissions would be higher than opening year emissions detailed for 2031. The use of 2025 emission factors in combination with the total number of development vehicles, which is representative of the 2031 scheme completion year, during the operational phase ensures a conservative approach.

13.53 In addition, the use of 2025 emission factors assumes an emission drop off based on assumptions provided by DEFRAs Emission Factor Toolkit (EfT) version 10.1. The EfT assumes future reduction to road vehicle exhaust emissions supported by the uptake of low emission vehicles and government incentives and targets concerning fleet proportions by 2030.

13.54 Detailed dispersion modelling has been undertaken to quantify NO_2, PM_{10} and $PM_{2.5}$ concentrations across the site, determine suitability for the proposed use, and to assess and quantify the effects associated with the Proposed Development. The assessment was undertaken using the following scenarios:

- 2019 as baseline year for verification against latest ratified data;
- Completion year do-minimum (DM) (predicted traffic flows in 2031 without the proposed development including cumulative developments flows up to the year 2031); and
- Completion year do-something (DS) (predicted traffic flows in 2031 of completed phasing including cumulative developments flows, with the assessment of total traffic generated by the completed Development in 2031).

13.55 As mentioned in Section 13.52, the DM and DS scenarios above assess predicted traffic flows in 2031 with 2025 emission factors to ensure a robust assessment has been considered which is likely to overpredict pollutant concentrations.

13.56 The 2019 base year scenario uses 2019 traffic data and emission factors for model verification against SRBC monitoring data.

13.57 Traffic data provided by Vectos assessed a 2021 baseline year and given the similarities in the data between 2021 and 2019, it was not considered necessary to factor the traffic down to the baseline assessment year of 2019. Reference should be made to the Transport Assessment in **Appendix 12.1** for further detail regarding traffic data and modelling.

13.58 Additionally, two sensitivity scenarios have been undertaken for the purpose of the assessment. The first scenario uses 2030 emission factors (the maximum output from the Emission Factor Toolkit (EFT) version 10) to represent predicted emissions in the development completion year of 2031. This analysis provides a more realistic approach.

13.59 The second scenario considers the dualling of Penwortham Way (planning ref. LCC/2020/0014), should planning approval be granted. For direct comparison with the scenarios identified within Section 13.54 2025 emission factors have been used in combination with 2031 traffic. Both scenarios consider the cumulative impacts of all current committed developments and therefore it is considered that reasonable and robust scenarios have been considered. The results of the modelling for both scenarios are detailed in **Appendix 13.2.**

13.60 Due to the COVID-19 Pandemic, the use of 2019 baseline air quality data was used due to the possible effects on the reliability of the 2020 air quality monitoring data. Additionally, the 2020 air quality data was not yet available from SRBC. This is in line with the guidance provided by the IAQM website post 'Implications of the COVID-19 pandemic on air quality monitoring and assessments' released on 6th April 2020.

13.61 Reference should be made to **Appendix 13.1** for full assessment input details and model verification results.

Identification of Sensitive Receptors

13.62 Receptors potentially sensitive to changes in pollutant concentrations were identified within 200m of the affected highway network in accordance with the guidance provided within the Environmental Protection UK (EPUK) and IAQM guidance 'Land-Use Planning & Development Control: Planning For Air Quality' on the likely limits of pollutant dispersion from road sources. LAQM (TG16)[2] provides the following examples of where annual mean AQOs should apply:

- Residential properties;
- Schools;
- Hospitals; and
- Care homes.

13.63 Reference should be made to **Figure 13.6** within **Volume 2a: Main Text Figures** for location of sensitive receptors.

Damage Cost Analysis

13.64 As the development is classified as a 'Type 3X' in line with the SRBC PAN, a damage cost assessment is required in order to estimate the monetary cost of the emissions associated with the operational phase of the development. This will be used to inform the level of additional measures required in order to offset development emissions at an early stage.

13.65 Further detail regarding the DEFRA damaging costing analysis is provided within **Appendix 13.3.**

Characterisation of Impact

13.66 Impacts in relation to Air Quality will be characterised based firstly on whether an adverse or beneficial impact is predicted/exists. When considering the introduction of new emissions sources, the prevailing impacts will be adverse with differing magnitude.

13.67 The extent of the assessments will focus on proposed receptors within the red line boundary, existing receptors within and in the immediate vicinity of the development boundaries and also existing receptors along the affected road network, including AQMAs. Where significant impacts are predicted for existing receptors in the immediate vicinity, further receptors may be considered.

13.68 With regards the duration of impact, construction will be considered as transient to any particular individual receptors and any operational impacts will be considered permanent/long term. Any impacts predicted will be considered reversible, where possible, through the use of mitigation measures.

13.69 Likelihood of adverse impact is not directly considered as the assessments are based on absolute criteria given in the relevant standards and guidance and so are assumed to be likely where an impact is predicted.

Significance Criteria

13.70 The following terms have been used to define the significance of the effects identified:

- **Major Beneficial**; where the proposed development could be expected to have a considerable beneficial effect on air quality;
- **Moderate Beneficial;** where the proposed development could be expected to have a limited beneficial effect on local air quality;
- **Minor Beneficial;** where the proposed development could be expected to result in a slight, very short term or highly localised beneficial effect on local air quality;
- **Negligible;** where no discernible effect is expected as a result of the proposed development on local air quality;
- **Minor Adverse;** where the proposed development could be expected to result in a slight, very short term or highly localised adverse effect on local air quality;
- **Moderate Adverse;** where the proposed development could be expected to have a limited adverse effect on local air quality; and
- **Major Adverse;** where the proposed development could be expected to have a considerable beneficial effect on Air quality.

13.71 The sensitivity impact of each receptor, as described above, was defined in accordance with the criteria shown in Table 13.11. These are based upon the guidance provided within the Environmental Protection UK (EPUK) and

Institute of Air Quality Management (IAQM) guidance 'Land-Use Planning and Development Control: Planning for Air Quality'.

Table 13.11: Operational Traffic Exhaust Emissions – Assessment of Impact

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial
110% or more of AQO	Moderate	Substantial	Substantial	Substantial

13.72 The criteria shown in Table 13.11 is adapted from the EPUK and IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance.

13.73 Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 13.11, the EPUK and IAQM document states that this framework is to be used as a starting point to make a judgement on significance of effect but other influences might need to be accounted for. Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- The extent to which an objective is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3.

13.74 These factors were considered, and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and

reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

13.75 An overall assessment of significance will be made based on the above assessment and by giving consideration to further criteria outlined in the EPUK, and IAQM guidance documents.

13.76 To maintain consistency within this ES the impact descriptors of 'slight, moderate and substantial' have been changed to 'minor, moderate and major'. Similarly, those receptors where the proposed scheme leads to an increase or decrease in pollutant concentrations are described as 'adverse' or 'beneficial' respectively. Therefore, the impacts at each representative sensitive receptor are described as one of the following:

- Major Beneficial; (Substantial Beneficial)
- Moderate Beneficial;
- Minor Beneficial; (Slight Beneficial)
- Negligible;
- Minor Adverse; (Slight Adverse)
- Moderate Adverse; and,
- Major Adverse. (Substantial Adverse)

Assumptions/Limitations

13.77 The assessment is limited by the following assumptions that were based on professional judgement:

- The soil type on site being potentially dusty, to present a worst case;
- The unpaved construction road length being greater than 100m;
- The accuracy of estimates of background pollutant concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions between the Site and observation station;
- Overall dispersion model limitations (discussed further in **Appendix 13.1**); and
- Uncertainties associated with pollutant monitoring data

13.78 Robust assumptions have been made where possible to reduce the likelihood of underestimating the impacts of all potential emissions.

13.79 The results of the assumptions made in the construction phase assessment therefore represent a worst case scenario which inform the recommended dust mitigation measures.

13.80 It is therefore considered that any flexibilities in data and assumptions used in this Chapter are unlikely to significantly alter the conclusions of the air quality assessment.

Consultation

13.81 Niel Martin and Melanie Berry, Environmental Protection Officers at SRBC was contacted to discuss the proposed scope of works for the Air Quality Chapter and to obtain the most recent diffusion tube data for the borough. The proposed methodology was agreed via Email. Reference should be made to Table 13.12.

Table 13.12: Consultation

Consultee	Date and Time	Comments	Actions
Environmental Health department – South Ribble Council	21/07/2019 10.05	Email request for the latest LAQM Progress report and diffusion tube monitoring data.	Response received with required documents attached.
Environmental Health department – South Ribble Council	29/7/2021 16.46	Email sent in order to reaffirm agreement of the scope of assessment methodology in line with current guidance and standards.	Response received with agreement of methodology and receipt of relevant data.

Baseline Conditions

13.82 Existing air quality conditions in the vicinity of the Proposed Development site were identified in order to provide a baseline for assessment. These are detailed in the following sections.

Local Air Quality Management

13.83 As required by the Environment Act (1995), SRBC has undertaken Review and Assessment of air quality within their area of administration. This process concluded that annual mean concentrations of NO_2 are above the AQO within the borough. As such, five AQMAs have been declared, with the most relevant to the Proposed Development described as;

- AQMA No. 1 - The stretch of road between the junction of Priory lane/Cop lane and the A59 Liverpool Road, Penwortham. From Kingsway to the north of Priory Lane; Queensway to Kingsway along the A59 Liverpool Road and up to and including property number 32 of Cop Lane;
- AQMA No. 2 - An area encompassing the A6/A675 Victoria Road in Walton-le-Dale between the Bridge Inn/Ribble Crescent to the north and the Yew Tree Inn to the south; and
- AQMA 3 Lostock Hall - Junction of Leyland Lane, Watkin Lane and Brownedge Road, Lostock Hall.

13.84 The Proposed Development is located approximately 1.8km, 2.6km and 0.4km from AQMA No. 1, AMQA No.2 and AQMA 3, respectively. Based on the distribution of the development traffic, there is potential for the development to cause adverse impacts to air quality within these areas. All three AQMAs has been considered further within this Chapter.

13.85 SRBC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs.

Local Air Quality Monitoring Data

13.86 A review of the most recent Air Quality Annual Status Report indicated that SRBC do not undertake any automatic monitoring of any pollutants within the borough, as such due to the lack of information this source of pollutant monitoring has not been considered further in the context of this assessment.

13.87 SRBC do however utilise passive diffusion tubes to monitor NO_2 concentrations throughout the borough. A review of the most recent monitoring data available indicated that there are ten suitable diffusion tubes located in the vicinity of the proposed development. Recent NO_2 monitoring results from this location are shown in Table 13.13. Exceedances of the annual mean AQO for NO_2 are shown in **bold**.

Table 13.13: Diffusion Tube Monitoring Results

Site Name	Type	NGR (m)		Annual Mean NO_2 Concentration (µg/m3)		
		X	Y	2017	2018	2019
28-30 Watkin Lane, Lostock Hall	Roadside	355370	428571	32.09	28.00	30.24
Spar, Watkin Lane, Lostock Hall	Roadside	355429	428518	27.70	32.80	32.05
13 Brownedge Road, Lostock Hall	Roadside	355521	428467	30.82	**40.30**	38.80
Tardy Gate PH, Leyland Rd, Lostock Hall	Roadside	354410	425835	**40.03**	37.80	35.43
477 Leyland Road, Lostock Hall	Roadside	354353	425844	35.32	30.90	30.51
11 Library Liverpool Road, Penworthham	Roadside	352116	428445	28.20	27.2	30.88
"Robert&Co", 36e Liverpool Road, Penwortham	Roadside	351875	428428	23.22	24.50	23.37
Fleece Inn, 43 Liverpool Road, Penwortham	Roadside	351891	428404	29.02	32.30	30.62
14 Victoria Road, Walton- le-Dale	Roadside	354296	425903	27.73	32.20	31.66
40 Victoria Road, Walton-le-Dale	Roadside	355370	428571	32.09	26.60	29.59

Site Name	Type	NGR (m)		Annual Mean NO_2 Concentration (µg/m3)		
		X	Y	2017	2018	2019
69 Victoria Road, Walton- le-Dale	Roadside	355429	428518	27.70	32.30	32.14

13.88 As indicated in Table 13.13, the annual mean AQO for NO_2 was not exceeded at any location during 2019. Reference should be made to **Figure 13.2**, within **Volume 2a: Main Text Figures** for a graphical representation of the monitoring location.

Background Concentrations

13.89 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in 4 grid squares NGRs: (352500, 425500) (352500, 426500), (353500, 425500) and (353500, 426500). Data for these locations were downloaded from the DEFRA website and an average concentration was taken for the purpose of this assessment for the verification year (2019), assessment first occupation year (2025) and development completion year (2031). It is important to note that 2030 data have been used to represent 2031 pollutant concentrations as this is the maximum year of data available from the DEFRA website.

13.90 The average concentrations are summarised in Table 13.14.

Table 13.14: Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m^3)		
	2019	2025	2031
NO_x	13.24	10.23	9.10
NO_2	10.11	7.95	7.11
PM_{10}	10.91	10.19	10.13
$PM_{2.5}$	7.17	6.62	6.57

13.91 As shown in Table 13.14, background concentrations of NO_2 did not exceed the relevant AQOs. It should be noted that 2025 background concentrations have been used for the future modelled DM and DS scenarios within this Chapter with 2031 data only presented for completeness.

Air Quality Receptors

13.92 A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for dust and road vehicle exhaust emission impacts in the following Sections.

Sensitivity of Receptors

Construction Phase Sensitive Assessment

13.93 There are no nationally or European designated ecological receptors within 50m of the Site boundary, or within 50m from a route used by construction vehicles on the public highway (up to 500m from the Site entrance). Therefore, the risk of dust effects at a nationally or European designated ecological receptor site from construction impacts have not been considered further in this assessment.

13.94 Human receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 350m from the development boundary. These are summarised in Table 13.15.

Table 13.15: Demolition, Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors
Less than 20	More than 100
20 - 50	More than 100
50 - 100	More than 100
100 - 350	More than 100

13.95 Reference should be made to **Figure 13.3** within **Volume 2a: Main Text Figures**, for a graphical representation of earthworks and construction dust buffer zones.

13.96 Human receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access route. These are summarised in Table 13.16. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. However, as a worst-case assessment it was confirmed by Vectos, the transport consultant for the proposed development, that the majority of construction traffic would access the site from Penwortham Way (A582) to ensure the maximum potential trackout distance was considered.

Table 13.16: Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors
Less than 20	10 - 100
20 - 50	10 - 100

13.97 Reference should be made to **Figure 13.4**, within **Volume 2a: Main Text Figures**, for a graphical representation of trackout dust buffer zones.

13.98 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 13.17.

Table 13.17: Additional Area Sensitive Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The site is located within an urban residential area. There is likely to have been a history of dust generating activities due to regeneration in the locality.
The likelihood of concurrent dust generating activity on nearby sites	A review of the SRBC planning portal indicated several forthcoming large-scale developments in the vicinity of the site. Further detail of these can be found in Table 13.33.
Pre-existing screening between the source and the receptors	There is no dense vegetation present along the development boundaries. Hence, there is no level of natural protective screening in any directions.
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The wind direction is predominantly from the west and south of the development, as shown in **Figure 13.5** within **Volume 2a: Main Text Figures**. As such, properties to the east and the west would be most affected by dust emissions.
Conclusions drawn from local topography	The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion.
Duration of the potential impact, as a receptor may become more sensitive over time	It is proposed that the construction will be phased and take place over a 8-year period, however the impact at individual receptors is considered to be transient due to phasing.
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline.

13.99 Based on the criteria shown in Table 13.4, the sensitivity of the receiving environment to potential dust impacts was considered to be high. This was because users would expect to enjoy a reasonable level of amenity, aesthetics or value of their property could be diminished by soiling and people would be expected to be present for extended periods of time e.g. residential properties.

13.100 The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Tables 13.8 to 13.10, is shown in Table 13.18.

Table 13.18: Sensitivity of the Surrounding Area

Potential Impact	Sensitivity			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Medium	Medium	Medium	Low

Operational Phase Sensitive Receptors

13.101 Receptors sensitive to potential operational phase road vehicle exhaust emission impacts were identified from a desk-top study and are summarised in Table 13.19. It should be noted that any receptors situated within an AQMA have been defined.

Table 13.19: Existing Sensitive Human Receptors

Receptor		NGR (m)		Distance from Site (m)	Direction from Site
		X	Y		
R1	Residential - 7 Pinewood Road	354157	426772	1,121	North-East
R2	Residential - 1 Loxwood Close	354332	427098	1,473	North-East
R3	Residential - Carwood Road	354368	427144	1,531	North-East
R4	Residential - 3 Dovetree Close	354494	427195	1,656	North-East
R5	Residential - 239A Leyland Rd	353787	426748	854	North-East
R6	Residential - Leyland Road	353749	426779	860	North-East
R7	Residential - Carrington Court	353780	426643	766	North-East
R8	Residential - 297 Leyland Road	353839	426518	715	North-East
R9	Residential - 209 Leyland Road	353611	427023	1,027	North-East
R10	Residential - 45 Pembury Avenue	353559	427097	1,084	North-East
R11	Residential - 163 Leyland Road	353469	427247	1,216	North-East
R12	Residental - 316 Leyland Road	353912	426323	668	East
R13	School - Moor Hey School	354182	426269	905	East
R14	Residential - 388 Leyland Road (AQMA)	354174	426016	869	East
R15	School - St Gerad's RC Primary	354399	425980	1,095	East
R16	Residential - 471 Leyland Road (AQMA)	354288	425916	990	East
R17	Residential - 501 Leyland Road (AQMA)	354340	425860	1,050	East
R18	Residential - 19 Watkin Lane (AQMA)	354437	425752	1,167	East
R19	Residential - 55 Watkin Lane (AQMA)	354576	425686	1,320	East
R20	Residential - 80 Watkin Lane	354754	425343	1,608	South-East
R21	Residential - 57 Brownedge Road	354685	425893	1,387	East
R22	Residential - 185 Brownedge Road	355287	425902	1,987	East
R23	Residential - 55 Victoria Road (AQMA)	355486	428505	3,289	North-East
R24	Residential - Golden Way	351906	426759	1,572	North-West
R25	Residential - Golden Way	352177	426598	1,258	North-West
R26	Residential - Cloughfield	352632	426245	704	West

Receptor		NGR (m)		Distance	Direction
R27	Residential - Golden Way	352470	426342	888	West
R28	Residential - Chain House Lane	352853	425391	793	South
R29	Residential - Chain House Lane	352452	425399	1,069	South-West
R30	Residential - Chain House Lane	352999	425435	680	South
R31	Residential - Coote Lane	353905	425580	757	South-East
R32	Residential - 2 Marshall Brow	353962	425165	1,573	North
R33	Residential - Marshall Brow	353660	424627	1,571	North
R34	School - Cop Lane C of E Primary	353338	424204	1,819	North-West
R35	Residential - 236 Cop Lane	353233	423489	1,303	North-West
R36	Residential - 225 Cop Lane	353045	422990	1,450	North-West
R37	Residential - 12 Pope lane	352806	422925	1,113	North-West
R38	School - Penwortham Girls High	353235	422663	2,480	North-West
R39	Residential - 10 Cop Lane	351500	428500	2,614	North-West
R40	Residential - 36 Cop Lane	355392	428554	2,324	North-West
R41	Residential - Pope Lane	355381	428599	1,148	North-West
R42	Residential - 149 Broad Oak Lane	354406	425837	1,698	North-West
R43	Residential - Wingates	354382	425803	1,703	North-West
R44	Residential - 24 Victoria Road (AQMA)	354414	425819	3,265	South-East
R45	Residential - 15 Victoria Road (AQMA)	354382	425828	3,293	South-East
R46	Residential – 15 Brownedge Road (AQMA)	355392	428554	1,122	East
R47	Residential – 7 Watkin Road (AQMA)	355381	428599	1,100	East
R48	Residential – 4 Brownedge Road (AQMA)	354408	425833	1,130	East
R49	Residential -5 Brownedge Road (AQMA)	354379	425804	1,099	East

13.102 Receptors have been modelled at 1.5m to represent the average UK “breathing height” above ground level.

13.103 Reference should be made to **Figure 13.6** within **Volume 2a: Main Text Figures,** for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

Embedded Mitigation

Demolition and Construction

13.104 In order to inform a worst-case assessment, no mitigation measures for the construction phase are assumed to have been embedded.

Completed Development

13.105 In line with the SRBC PAN, it is standard provision for all new developments to provide electric vehicle (EV) infrastructure. The Proposed Development will provide one EV dedicated charging point will be provided per house with a garage or driveway.

13.106 In line with the SRBC PAN further mitigation measures will be provided associated with the operational phase of the development. This will be guided by the damage cost assessment.

Assessment of Likely Significant Effects

13.107 There is the potential for air quality impacts as a result of the construction and operation of the Proposed Development in addition to the exposure of future site users to elevated pollution levels. These are assessed in the following sections.

13.108 As previously mentioned within Section 13.25, if Application B does not come forward, it will not change the significance of effects and assessing both Applications A and B cumulatively presents a worst-case scenario.

Demolition and Construction

Step 1

13.109 The undertaking of activities such as demolition, excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.

13.110 The potential for impacts at sensitive locations depends largely on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

13.111 The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required using IAQM criteria.

Step 2

Demolition

13.112 Demolition will involve the removal of a limited number of outbuildings. It is anticipated that the volume of buildings to be demolished is likely to be less than 20,000m^3. In accordance with the criteria outlined in Table 13.3, the magnitude of potential dust emissions from earthworks is therefore **small.**

13.113 Table 13.18 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 13.8, the development is considered to be a **medium** risk site for dust soiling as a result of demolition activities.

13.114 Table 13.18 indicates the sensitivity of the area to human health impacts is **medium**. In accordance with the criteria outlined in Table 13.8, the development is considered to be a **low** risk site for human health impacts as a result of demolition activities.

Earthworks

13.115 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. Information on soil type was not available for the purpose of this assessment. As such, the soil type was considered to be potentially dusty in order to provide a worst-case scenario.

13.116 The proposed development site is estimated to cover a total area of greater than 10,000m^2. In accordance with the criteria outlined in Table 13.3, the magnitude of potential dust emissions from earthworks is therefore **large**.

13.117 Table 13.18 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 13.9, the development is considered to be a **high** risk site for dust soiling as a result of earthworks activities.

13.118 Table 13.18 indicates the sensitivity of the area to human health is **medium**. In accordance with the criteria outlined in Table 13.9, the development is considered to be a **medium** risk site for human health as a result of earthwork activities.

Construction

13.119 Due to the size of the development site the total building volume is likely to be greater than 100,000m^3. In accordance with the criteria outlined in Table 13.3, the magnitude of potential dust emissions from construction is therefore **large.**

13.120 Table 13.18 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 13.9, the development is considered to be a **high** risk site for dust soiling as a result of construction activities.

13.121 Table 13.18 indicates the sensitivity of the area to human health is **medium**. In accordance with the criteria outlined in Table 13.9, the development is considered to be a **medium** risk site for human health as a result of construction activities.

Trackout

13.122 Information on the number of heavy duty vehicles (HDV) trips to be generated during the construction phase of the development was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project.

13.123 Based on the site area, it is anticipated that the unpaved road length is likely to be greater than 100m. In accordance with the criteria outlined in Table 13.3, the magnitude of potential dust emissions from trackout is therefore **large**.

13.124 Table 13.18 indicates the sensitivity of the area to dust soiling effects to people and property is **high**. In accordance with the criteria outlined in Table 13.10, the development is considered to be a **high** risk site for dust soiling as a result of trackout activities.

13.125 Table 13.18 indicates the sensitivity of the area to human health is **low**. In accordance within the criteria outlined in Table 13.10, the development is considered to be a **low** risk site for human health as a result of trackout activities.

Summary of Dust Risk Effects

13.126 It is considered that concentrations would decrease with height and therefore concentrations at elevations above the ground floor level have not been included within this assessment.

13.127 A summary of the risk from each dust generating activity is provided in Table 13.20.

Table 13.20: Sensitivity of the Surrounding Area

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	High	High	High
Human Health	Low	Medium	Medium	Low

13.128 As indicated in Table 13.20, the potential risk of dust soiling is **medium** from demolition activities and **high** from earthworks, construction and trackout activities. The potential risk of human health impacts is **low** from demolition and trackout activities and **medium** from earthworks and construction activities.

13.129 It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

Impact significance

13.130 This assessment has so far assumed that no mitigation measures are in place. The assessment has indicated that unmitigated impacts for dust soiling and human health have the potential to be significant at nearby sensitive receptors and therefore specific mitigation measures to control dust emissions will be required in the CEMP and are presented in Table 13.31.

Completed Development

Nitrogen Dioxide

Predicted Concentrations at the Development Site

13.131 Annual mean NO_2 concentrations were predicted across the development for the 2031 DS scenario, as shown in **Figure 13.7** within **Volume 2a: Main Text Figures**. Predicted annual mean NO_2 concentrations across the development site during the DS scenario are summarised in Table 13.21.

Table 13.21: Annual Mean NO_2 Concentrations Across the Proposed Development Site

Elevation (m)	Predicted 2031 Annual Mean NO_2 Concentration Range (µg/m^3)
Ground (1.5m)	9.12 - 29.58

13.132 Table 13.21 indicates there were no exceedances of the annual mean AQO across the entirety of the proposed development site in the 2031 DS scenario. As such, there is predicted to be no risk of exceedance of the annual mean AQO for NO_2 at proposed residential receptors.

13.133 It is considered that concentrations would decrease with height and therefore concentrations at elevations above the ground floor level have not been included within this assessment.

13.134 Predictions of 1-hour NO_2 concentrations were not produced as part of the dispersion modelling assessment. LAQM.(TG16) states if annual mean NO_2 concentrations are below 60µg/m^3 then it is unlikely that the 1-hour AQO will be exceeded. As such, based on the results in Table 13.21, it is not predicted that on-site concentrations will exceed the 1-hour mean AQO for NO_2.

13.135 Based on the results detailed above, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future site users from elevated NO_2 concentrations.

Predicted Concentrations at Sensitive Receptors

13.136 Annual mean NO_2 concentrations were predicted for the 2031 DM and DS scenarios and are summarised in Table 13.22.

Table 13.22: Annual Mean NO_2 Concentrations at Existing Sensitive Receptors

Sensitive Receptor		Predicted 2031 Annual Mean NO_2 Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - 7 Pinewood Road	17.00	17.16	0.16
R2	Residential - 1 Loxwood Close	13.06	13.21	0.15
R3	Residential - Carwood Road	14.31	14.50	0.19
R4	Residential - 3 Dovetree Close	11.21	11.29	0.08
R5	Residential - 239A Leyland Rd	22.00	22.20	0.20
R6	Residential - Leyland Road	20.58	20.76	0.18
R7	Residential - Carrington Court	24.87	25.11	0.24
R8	Residential - 297 Leyland Road	21.32	21.48	0.16
R9	Residential - 209 Leyland Road	20.85	21.04	0.19
R10	Residential - 45 Pembury Avenue	21.39	21.58	0.19
R11	Residential - 163 Leyland Road	18.56	18.65	0.09
R12	Residental - 316 Leyland Road	13.88	13.92	0.04
R13	School - Moor Hey School	14.18	14.21	0.03
R14	Residential - 388 Leyland Road (AQMA)	18.25	18.29	0.04
R15	School - St Gerad's RC Primary	13.89	13.95	0.06
R16	Residential - 471 Leyland Road (AQMA)	25.80	25.89	0.09
R17	Residential - 501 Leyland Road (AQMA)	30.13	30.52	0.39
R18	Residential - 19 Watkin Lane (AQMA)	33.09	33.44	0.35
R19	Residential - 55 Watkin Lane (AQMA)	22.31	22.54	0.23
R20	Residential - 80 Watkin Lane	18.53	18.67	0.14
R21	Residential - 57 Brownedge Road	17.32	17.50	0.18
R22	Residential - 185 Brownedge Road	22.09	22.23	0.14
R23	Residential - 55 Victoria Road (AQMA)	27.32	27.53	0.21
R24	Residential - Golden Way	14.51	14.78	0.27
R25	Residential - Golden Way	17.18	17.47	0.29
R26	Residential - Cloughfield	11.26	11.40	0.14
R27	Residential - Golden Way	12.41	12.57	0.16
R28	Residential - Chain House Lane	15.33	15.53	0.20
R29	Residential - Chain House Lane	11.22	11.28	0.06
R30	Residential - Chain House Lane	11.75	12.14	0.39
R31	Residential - Coote Lane	10.71	10.94	0.23
R32	Residential - 2 Marshall Brow	19.59	19.87	0.28
R33	Residential - Marshall Brow	14.68	14.82	0.14

Sensitive Receptor		Predicted 2031 Annual Mean NO_2 Concentration (µg/m^3)		
		DM	DS	Change
R34	School - Cop Lane C of E Primary	14.12	14.32	0.20
R35	Residential - 236 Cop Lane	13.82	14.04	0.22
R36	Residential - 225 Cop Lane	15.65	15.93	0.28
R37	Residential - 12 Pope lane	14.30	14.48	0.18
R38	School - Penwortham Girls High	13.03	13.16	0.13
R39	Residential - 10 Cop Lane	13.26	13.43	0.17
R40	Residential - 36 Cop Lane	13.11	13.31	0.20
R41	Residential - Pope Lane	13.32	13.56	0.24
R42	Residential - 149 Broad Oak Lane	25.63	26.08	0.45
R43	Residential - Wingates	11.52	11.62	0.10
R44	Residential - 24 Victoria Road (AQMA)	20.55	20.68	0.13
R45	Residential - 15 Victoria Road (AQMA)	27.10	27.30	0.20
R46	Residential – 15 Brownedge Road (AQMA)	31.75	32.07	0.32
R47	Residential – 7 Watkin Road (AQMA)	32.37	32.77	0.40
R48	Residential – 4 Brownedge Road (AQMA)	21.66	21.85	0.19
R49	Residential -5 Brownedge Road (AQMA)	34.95	35.32	0.37

13.137 As indicated in Table 13.22, predicted 2031 annual mean NO_2 concentrations did not exceed the AQO at any sensitive receptor location in both the DM and DS scenario.

13.138 Predicted impacts on annual mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 13.23.

Table 13.23: Predicted Annual Mean NO_2 Impacts at Existing Sensitive Receptors

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Residential - 7 Pinewood Road	0.40	75% or Less of AQO	Negligible
R2	Residential - 1 Loxwood Close	0.38	75% or Less of AQO	Negligible
R3	Residential - Carwood Road	0.47	75% or Less of AQO	Negligible
R4	Residential - 3 Dovetree Close	0.20	75% or Less of AQO	Negligible
R5	Residential - 239A Leyland Rd	0.50	75% or Less of AQO	Negligible
R6	Residential - Leyland Road	0.45	75% or Less of AQO	Negligible
R7	Residential - Carrington Court	0.60	75% or Less of AQO	Negligible
R8	Residential - 297 Leyland Road	0.40	75% or Less of AQO	Negligible

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R9	Residential - 209 Leyland Road	0.47	75% or Less of AQO	Negligible
R10	Residential - 45 Pembury Avenue	0.47	75% or Less of AQO	Negligible
R11	Residential - 163 Leyland Road	0.23	75% or Less of AQO	Negligible
R12	Residental - 316 Leyland Road	0.10	75% or Less of AQO	Negligible
R13	School - Moor Hey School	0.08	75% or Less of AQO	Negligible
R14	Residential - 388 Leyland Road (AQMA)	0.10	75% or Less of AQO	Negligible
R15	School - St Gerad's RC Primary	0.15	75% or Less of AQO	Negligible
R16	Residential - 471 Leyland Road (AQMA)	0.23	75% or Less of AQO	Negligible
R17	Residential - 501 Leyland Road (AQMA)	0.98	76-94% of AQO	Negligible
R18	Residential - 19 Watkin Lane (AQMA)	0.87	76-94% of AQO	Negligible
R19	Residential - 55 Watkin Lane (AQMA)	0.58	75% or Less of AQO	Negligible
R20	Residential - 80 Watkin Lane	0.35	75% or Less of AQO	Negligible
R21	Residential - 57 Brownedge Road	0.45	75% or Less of AQO	Negligible
R22	Residential - 185 Brownedge Road	0.35	75% or Less of AQO	Negligible
R23	Residential - 55 Victoria Road (AQMA)	0.53	75% or Less of AQO	Negligible
R24	Residential - Golden Way	0.67	75% or Less of AQO	Negligible
R25	Residential - Golden Way	0.72	75% or Less of AQO	Negligible
R26	Residential - Cloughfield	0.35	75% or Less of AQO	Negligible
R27	Residential - Golden Way	0.40	75% or Less of AQO	Negligible
R28	Residential - Chain House Lane	0.50	75% or Less of AQO	Negligible
R29	Residential - Chain House Lane	0.15	75% or Less of AQO	Negligible
R30	Residential - Chain House Lane	0.98	75% or Less of AQO	Negligible
R31	Residential - Coote Lane	0.57	75% or Less of AQO	Negligible
R32	Residential - 2 Marshall Brow	0.70	75% or Less of AQO	Negligible
R33	Residential - Marshall Brow	0.35	75% or Less of AQO	Negligible
R34	School - Cop Lane C of E Primary	0.50	75% or Less of AQO	Negligible
R35	Residential - 236 Cop Lane	0.55	75% or Less of AQO	Negligible
R36	Residential - 225 Cop Lane	0.70	75% or Less of AQO	Negligible
R37	Residential - 12 Pope lane	0.45	75% or Less of AQO	Negligible
R38	School - Penwortham Girls High	0.33	75% or Less of AQO	Negligible
R39	Residential - 10 Cop Lane	0.43	75% or Less of AQO	Negligible

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R40	Residential - 36 Cop Lane	0.50	75% or Less of AQO	Negligible
R41	Residential - Pope Lane	0.60	75% or Less of AQO	Negligible
R42	Residential - 149 Broad Oak Lane	1.13	75% or Less of AQO	Negligible
R43	Residential - Wingates	0.25	75% or Less of AQO	Negligible
R44	Residential - 24 Victoria Road (AQMA)	0.32	75% or Less of AQO	Negligible
R45	Residential - 15 Victoria Road (AQMA)	0.50	75% or Less of AQO	Negligible
R46	Residential – 15 Brownedge Road (AQMA)	0.80	76-94% of AQO	Negligible
R47	Residential – 7 Watkin Road (AQMA)	1.00	76-94% of AQO	Negligible
R48	Residential – 4 Brownedge Road (AQMA)	0.48	75% or Less of AQO	Negligible
R49	Residential -5 Brownedge Road (AQMA)	0.92	76-94% of AQO	Negligible

13.139 As indicated in Table 13.23, the impacts on annual mean NO_2 concentrations as a result of the development was predicted to be negligible at all locations considered.

Particulate Matter (PM_{10})

Predicted Concentrations at the Development Site

13.140 Annual mean PM_{10} concentrations were predicted across the development for the 2031 DS scenario, as shown in **Figure 13.8** within **Volume 2a: Main Text Figures**. Predicted annual mean PM_{10} concentrations across the development site during the DS scenario are summarised in Table 13.24.

Table 13.24: Annual Mean PM_{10} Concentrations Across the Proposed Development Site

Elevation (m)	Predicted 2031 Annual Mean PM_{10} Concentration Range ($\mu g/m^3$)
Ground (1.5m)	10.49 – 13.85

13.141 Table 13.24 indicates there were no exceedances of the annual mean AQO across the entirety of the proposed development site in 2031. As such, there is predicted to be no risk of exceedance of the annual mean AQO for PM_{10} at proposed residential receptors.

13.142 It is considered that concentrations would decrease with height and therefore concentrations at elevations above the ground floor level have not been included within this assessment.

13.143 Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future site users from elevated PM_{10} concentrations.

Predicted Concentrations at Sensitive Receptors

13.144 Annual mean PM_{10} concentrations were predicted for the 2031 DM and DS scenarios and are summarised in Table 13.25.

Table 13.25: Annual Mean PM_{10} Concentrations at Existing Sensitive Receptors

Sensitive Receptor		Predicted 2031 Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - 7 Pinewood Road	12.17	12.22	0.05
R2	Residential - 1 Loxwood Close	11.37	11.41	0.04
R3	Residential - Carwood Road	11.72	11.77	0.05
R4	Residential - 3 Dovetree Close	10.85	10.87	0.02
R5	Residential - 239A Leyland Rd	13.11	13.16	0.05
R6	Residential - Leyland Road	12.79	12.84	0.05
R7	Residential - Carrington Court	13.74	13.81	0.07
R8	Residential - 297 Leyland Road	13.14	13.18	0.04
R9	Residential - 209 Leyland Road	12.84	12.89	0.05
R10	Residential - 45 Pembury Avenue	12.96	13.01	0.05
R11	Residential - 163 Leyland Road	12.78	12.81	0.03
R12	Residental - 316 Leyland Road	11.63	11.64	0.01
R13	School - Moor Hey School	11.32	11.33	0.01
R14	Residential - 388 Leyland Road (AQMA)	12.14	12.15	0.01
R15	School - St Gerad's RC Primary	11.66	11.68	0.02
R16	Residential - 471 Leyland Road (AQMA)	14.19	14.21	0.02
R17	Residential - 501 Leyland Road (AQMA)	15.16	15.26	0.10
R18	Residential - 19 Watkin Lane (AQMA)	15.96	16.05	0.09
R19	Residential - 55 Watkin Lane (AQMA)	13.45	13.51	0.06
R20	Residential - 80 Watkin Lane	12.77	12.81	0.04
R21	Residential - 57 Brownedge Road	12.43	12.48	0.05

Sensitive Receptor		Predicted 2031 Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		DM	DS	Change
R22	Residential - 185 Brownedge Road	12.90	12.94	0.04
R23	Residential - 55 Victoria Road (AQMA)	16.07	16.13	0.06
R24	Residential - Golden Way	11.93	12.01	0.08
R25	Residential - Golden Way	12.17	12.25	0.08
R26	Residential - Cloughfield	10.96	10.99	0.03
R27	Residential - Golden Way	11.19	11.23	0.04
R28	Residential - Chain House Lane	12.18	12.24	0.06
R29	Residential - Chain House Lane	10.98	10.99	0.01
R30	Residential - Chain House Lane	11.18	11.28	0.10
R31	Residential - Coote Lane	10.55	10.61	0.06
R32	Residential - 2 Marshall Brow	13.43	13.52	0.09
R33	Residential - Marshall Brow	11.86	11.90	0.04
R34	School - Cop Lane C of E Primary	11.72	11.77	0.05
R35	Residential - 236 Cop Lane	11.62	11.67	0.05
R36	Residential - 225 Cop Lane	12.10	12.18	0.08
R37	Residential - 12 Pope lane	11.87	11.92	0.05
R38	School - Penwortham Girls High	11.63	11.66	0.03
R39	Residential - 10 Cop Lane	11.41	11.45	0.04
R40	Residential - 36 Cop Lane	11.67	11.72	0.05
R41	Residential - Pope Lane	11.66	11.73	0.07
R42	Residential - 149 Broad Oak Lane	15.34	15.48	0.14
R43	Residential - Wingates	11.06	11.09	0.03
R44	Residential - 24 Victoria Road (AQMA)	14.01	14.05	0.04
R45	Residential - 15 Victoria Road (AQMA)	15.99	16.05	0.06
R46	Residential – 15 Brownedge Road (AQMA)	14.24	14.34	0.10
R47	Residential – 7 Watkin Road (AQMA)	15.57	15.67	0.10
R48	Residential – 4 Brownedge Road (AQMA)	12.95	13.00	0.05
R49	Residential -5 Brownedge Road (AQMA)	15.06	15.17	0.11

13.145 As indicated in Table 13.25, predicted 2031 annual mean PM_{10} concentrations did not exceed the AQO at any sensitive receptor location in both the DM and DS scenario.

13.146 Predicted impacts on annual mean PM_{10} concentrations at the sensitive receptor locations are summarised in Table 13.26.

Table 13.26: Predicted 2031 Annual Mean PM_{10} Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Residential - 7 Pinewood Road	0.13	75% or Less of AQO	Negligible
R2	Residential - 1 Loxwood Close	0.10	75% or Less of AQO	Negligible
R3	Residential - Carwood Road	0.12	75% or Less of AQO	Negligible
R4	Residential - 3 Dovetree Close	0.05	75% or Less of AQO	Negligible
R5	Residential - 239A Leyland Rd	0.13	75% or Less of AQO	Negligible
R6	Residential - Leyland Road	0.13	75% or Less of AQO	Negligible
R7	Residential - Carrington Court	0.18	75% or Less of AQO	Negligible
R8	Residential - 297 Leyland Road	0.10	75% or Less of AQO	Negligible
R9	Residential - 209 Leyland Road	0.13	75% or Less of AQO	Negligible
R10	Residential - 45 Pembury Avenue	0.12	75% or Less of AQO	Negligible
R11	Residential - 163 Leyland Road	0.08	75% or Less of AQO	Negligible
R12	Residental - 316 Leyland Road	0.02	75% or Less of AQO	Negligible
R13	School - Moor Hey School	0.02	75% or Less of AQO	Negligible
R14	Residential - 388 Leyland Road (AQMA)	0.02	75% or Less of AQO	Negligible
R15	School - St Gerad's RC Primary	0.05	75% or Less of AQO	Negligible
R16	Residential - 471 Leyland Road (AQMA)	0.05	75% or Less of AQO	Negligible
R17	Residential - 501 Leyland Road (AQMA)	0.25	75% or Less of AQO	Negligible
R18	Residential - 19 Watkin Lane (AQMA)	0.23	75% or Less of AQO	Negligible
R19	Residential - 55 Watkin Lane (AQMA)	0.15	75% or Less of AQO	Negligible
R20	Residential - 80 Watkin Lane	0.10	75% or Less of AQO	Negligible
R21	Residential - 57 Brownedge Road	0.13	75% or Less of AQO	Negligible
R22	Residential - 185 Brownedge Road	0.10	75% or Less of AQO	Negligible

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R23	Residential - 55 Victoria Road (AQMA)	0.15	75% or Less of AQO	Negligible
R24	Residential - Golden Way	0.20	75% or Less of AQO	Negligible
R25	Residential - Golden Way	0.20	75% or Less of AQO	Negligible
R26	Residential - Cloughfield	0.07	75% or Less of AQO	Negligible
R27	Residential - Golden Way	0.10	75% or Less of AQO	Negligible
R28	Residential - Chain House Lane	0.15	75% or Less of AQO	Negligible
R29	Residential - Chain House Lane	0.02	75% or Less of AQO	Negligible
R30	Residential - Chain House Lane	0.25	75% or Less of AQO	Negligible
R31	Residential - Coote Lane	0.15	75% or Less of AQO	Negligible
R32	Residential - 2 Marshall Brow	0.23	75% or Less of AQO	Negligible
R33	Residential - Marshall Brow	0.10	75% or Less of AQO	Negligible
R34	School - Cop Lane C of E Primary	0.12	75% or Less of AQO	Negligible
R35	Residential - 236 Cop Lane	0.13	75% or Less of AQO	Negligible
R36	Residential - 225 Cop Lane	0.20	75% or Less of AQO	Negligible
R37	Residential - 12 Pope lane	0.13	75% or Less of AQO	Negligible
R38	School - Penwortham Girls High	0.07	75% or Less of AQO	Negligible
R39	Residential - 10 Cop Lane	0.10	75% or Less of AQO	Negligible
R40	Residential - 36 Cop Lane	0.13	75% or Less of AQO	Negligible
R41	Residential - Pope Lane	0.18	75% or Less of AQO	Negligible
R42	Residential - 149 Broad Oak Lane	0.35	75% or Less of AQO	Negligible
R43	Residential - Wingates	0.07	75% or Less of AQO	Negligible
R44	Residential - 24 Victoria Road (AQMA)	0.10	75% or Less of AQO	Negligible
R45	Residential - 15 Victoria Road (AQMA)	0.15	75% or Less of AQO	Negligible
R46	Residential – 15 Brownedge Road (AQMA)	0.25	75% or Less of AQO	Negligible
R47	Residential – 7 Watkin Road (AQMA)	0.25	75% or Less of AQO	Negligible
R48	Residential – 4 Brownedge Road (AQMA)	0.13	75% or Less of AQO	Negligible
R49	Residential -5 Brownedge Road (AQMA)	0.27	75% or Less of AQO	Negligible

13.147 As indicated in Table 13.26, the impacts on annual mean PM_{10} concentrations as a result of the development was predicted to be negligible at all locations considered.

Particulate Matter ($PM_{2.5}$)

Predicted Concentrations at the Development Site

13.148 Annual mean $PM_{2.5}$ concentrations were predicted across the development for the 2031 DS scenarios, as shown in **Figure 13.9** within **Volume 2a: Main Text Figures**. Predicted annual mean $PM_{2.5}$ concentrations across the development site during the DS scenario are summarised in Table 13.27.

Table 13.27: Annual Mean $PM_{2.5}$ Concentrations Across the Proposed Development Site

Elevation (m)	Predicted 2031 Annual Mean $PM_{2.5}$ Concentration Range (µg/m^3)
Ground (1.5m)	6.78 – 9.46

13.149 Table 13.27 indicates there were no exceedances of the annual mean AQO across the entirety of the proposed development site in 2031. As such, there is predicted to be no risk of exceedance of the annual mean AQO for $PM_{2.5}$ at proposed residential receptors.

13.150 It is considered that concentrations would decrease with height and therefore concentrations at elevations above the ground floor level have not been included within this assessment.

13.151 Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future site users from elevated $PM_{2.5}$ concentrations.

Predicted Concentrations at Sensitive Receptors

13.152 Annual mean $PM_{2.5}$ concentrations were predicted for the 2031 DM and DS scenarios and are summarised in Table 13.28. Exceedances are shown in bold.

Table 13.28: Predicted 2031 Annual Mean $PM_{2.5}$ Concentrations

Sensitive Receptor		Predicted 2031 Annual Mean $PM_{2.5}$ Concentration (µg/m^3)		
		DM	DS	Change
R1	Residential - 7 Pinewood Road	7.88	7.91	0.03
R2	Residential - 1 Loxwood Close	7.33	7.36	0.03
R3	Residential - Carwood Road	7.53	7.56	0.03
R4	Residential - 3 Dovetree Close	7.04	7.05	0.01

Sensitive Receptor		Predicted 2031 Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)		
		DM	DS	Change
R5	Residential - 239A Leyland Rd	8.45	8.48	0.03
R6	Residential - Leyland Road	8.27	8.30	0.03
R7	Residential - Carrington Court	8.82	8.86	0.04
R8	Residential - 297 Leyland Road	8.46	8.49	0.03
R9	Residential - 209 Leyland Road	8.41	8.43	0.02
R10	Residential - 45 Pembury Avenue	8.47	8.50	0.03
R11	Residential - 163 Leyland Road	8.35	8.36	0.01
R12	Residental - 316 Leyland Road	7.59	7.60	0.01
R13	School - Moor Hey School	7.40	7.41	0.01
R14	Residential - 388 Leyland Road (AQMA)	7.88	7.88	0.00
R15	School - St Gerad's RC Primary	7.86	7.87	0.01
R16	Residential - 471 Leyland Road (AQMA)	9.31	9.33	0.02
R17	Residential - 501 Leyland Road (AQMA)	9.87	9.93	0.06
R18	Residential - 19 Watkin Lane (AQMA)	10.33	10.38	0.05
R19	Residential - 55 Watkin Lane (AQMA)	8.89	8.92	0.03
R20	Residential - 80 Watkin Lane	8.49	8.51	0.02
R21	Residential - 57 Brownedge Road	8.30	8.33	0.03
R22	Residential - 185 Brownedge Road	8.41	8.44	0.03
R23	Residential - 55 Victoria Road (AQMA)	9.96	9.99	0.03
R24	Residential - Golden Way	7.33	7.38	0.05
R25	Residential - Golden Way	7.78	7.82	0.04
R26	Residential - Cloughfield	7.09	7.11	0.02
R27	Residential - Golden Way	7.23	7.25	0.02
R28	Residential - Chain House Lane	7.53	7.57	0.04
R29	Residential - Chain House Lane	6.86	6.87	0.01
R30	Residential - Chain House Lane	6.97	7.03	0.06
R31	Residential - Coote Lane	6.83	6.87	0.04
R32	Residential - 2 Marshall Brow	8.70	8.75	0.05
R33	Residential - Marshall Brow	7.82	7.85	0.03
R34	School - Cop Lane C of E Primary	7.57	7.60	0.03
R35	Residential - 236 Cop Lane	7.51	7.54	0.03
R36	Residential - 225 Cop Lane	7.79	7.83	0.04
R37	Residential - 12 Pope lane	7.65	7.68	0.03

Sensitive Receptor		Predicted 2031 Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)		
		DM	DS	Change
R38	School - Penwortham Girls High	7.51	7.53	0.02
R39	Residential - 10 Cop Lane	7.42	7.45	0.03
R40	Residential - 36 Cop Lane	7.46	7.49	0.03
R41	Residential - Pope Lane	7.48	7.52	0.04
R42	Residential - 149 Broad Oak Lane	9.25	9.33	0.08
R43	Residential - Wingates	7.20	7.21	0.01
R44	Residential - 24 Victoria Road (AQMA)	8.80	8.82	0.02
R45	Residential - 15 Victoria Road (AQMA)	9.92	9.95	0.03
R46	Residential – 15 Brownedge Road (AQMA)	9.36	9.41	0.05
R47	Residential – 7 Watkin Road (AQMA)	10.11	10.17	0.06
R48	Residential – 4 Brownedge Road (AQMA)	8.60	8.63	0.03
R49	Residential -5 Brownedge Road (AQMA)	9.83	9.89	0.06

13.153 As indicated in Table 13.28, predicted 2031 annual mean $PM_{2.5}$ concentrations did not exceed the AQO at any sensitive receptor location in both the DM and DS scenario.

13.154 Predicted impacts on annual mean $PM_{2.5}$ concentrations at the sensitive receptor locations are summarised in Table 13.29.

Table 13.29: Predicted 2031 Annual Mean $PM_{2.5}$ Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Residential - 7 Pinewood Road	0.12	75% or Less of AQO	Negligible
R2	Residential - 1 Loxwood Close	0.12	75% or Less of AQO	Negligible
R3	Residential - Carwood Road	0.12	75% or Less of AQO	Negligible
R4	Residential - 3 Dovetree Close	0.04	75% or Less of AQO	Negligible
R5	Residential - 239A Leyland Rd	0.12	75% or Less of AQO	Negligible
R6	Residential - Leyland Road	0.12	75% or Less of AQO	Negligible
R7	Residential - Carrington Court	0.16	75% or Less of AQO	Negligible
R8	Residential - 297 Leyland Road	0.12	75% or Less of AQO	Negligible
R9	Residential - 209 Leyland Road	0.08	75% or Less of AQO	Negligible

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R10	Residential - 45 Pembury Avenue	0.12	75% or Less of AQO	Negligible
R11	Residential - 163 Leyland Road	0.04	75% or Less of AQO	Negligible
R12	Residental - 316 Leyland Road	0.04	75% or Less of AQO	Negligible
R13	School - Moor Hey School	0.04	75% or Less of AQO	Negligible
R14	Residential - 388 Leyland Road (AQMA)	<0.01	75% or Less of AQO	Negligible
R15	School - St Gerad's RC Primary	0.04	75% or Less of AQO	Negligible
R16	Residential - 471 Leyland Road (AQMA)	0.08	75% or Less of AQO	Negligible
R17	Residential - 501 Leyland Road (AQMA)	0.24	75% or Less of AQO	Negligible
R18	Residential - 19 Watkin Lane (AQMA)	0.20	75% or Less of AQO	Negligible
R19	Residential - 55 Watkin Lane (AQMA)	0.12	75% or Less of AQO	Negligible
R20	Residential - 80 Watkin Lane	0.08	75% or Less of AQO	Negligible
R21	Residential - 57 Brownedge Road	0.12	75% or Less of AQO	Negligible
R22	Residential - 185 Brownedge Road	0.12	75% or Less of AQO	Negligible
R23	Residential - 55 Victoria Road (AQMA)	0.12	75% or Less of AQO	Negligible
R24	Residential - Golden Way	0.20	75% or Less of AQO	Negligible
R25	Residential - Golden Way	0.16	75% or Less of AQO	Negligible
R26	Residential - Cloughfield	0.08	75% or Less of AQO	Negligible
R27	Residential - Golden Way	0.08	75% or Less of AQO	Negligible
R28	Residential - Chain House Lane	0.16	75% or Less of AQO	Negligible
R29	Residential - Chain House Lane	0.04	75% or Less of AQO	Negligible
R30	Residential - Chain House Lane	0.24	75% or Less of AQO	Negligible
R31	Residential - Coote Lane	0.16	75% or Less of AQO	Negligible
R32	Residential - 2 Marshall Brow	0.20	75% or Less of AQO	Negligible
R33	Residential - Marshall Brow	0.12	75% or Less of AQO	Negligible
R34	School - Cop Lane C of E Primary	0.12	75% or Less of AQO	Negligible
R35	Residential - 236 Cop Lane	0.12	75% or Less of AQO	Negligible
R36	Residential - 225 Cop Lane	0.16	75% or Less of AQO	Negligible
R37	Residential - 12 Pope lane	0.12	75% or Less of AQO	Negligible

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R38	School - Penwortham Girls High	0.08	75% or Less of AQO	Negligible
R39	Residential - 10 Cop Lane	0.12	75% or Less of AQO	Negligible
R40	Residential - 36 Cop Lane	0.12	75% or Less of AQO	Negligible
R41	Residential - Pope Lane	0.16	75% or Less of AQO	Negligible
R42	Residential - 149 Broad Oak Lane	0.32	75% or Less of AQO	Negligible
R43	Residential - Wingates	0.04	75% or Less of AQO	Negligible
R44	Residential - 24 Victoria Road (AQMA)	0.08	75% or Less of AQO	Negligible
R45	Residential - 15 Victoria Road (AQMA)	0.12	75% or Less of AQO	Negligible
R46	Residential – 15 Brownedge Road (AQMA)	0.20	75% or Less of AQO	Negligible
R47	Residential – 7 Watkin Road (AQMA)	0.24	75% or Less of AQO	Negligible
R48	Residential – 4 Brownedge Road (AQMA)	0.12	75% or Less of AQO	Negligible
R49	Residential -5 Brownedge Road (AQMA)	0.24	75% or Less of AQO	Negligible

13.155 As indicated in Table 13.29, the impacts on annual mean $PM_{2.5}$ concentrations as a result of the development was predicted to be negligible at all locations considered.

Impact Significance

13.156 The overall significance of operational phase road traffic emission impacts was determined as **not significant**. This was based on the predicted impacts at discrete receptor locations and the considerations outlined in Sections 13.66 to 13.76. Further justification is provided in Table 13.30.

Table 13.30: Overall Road traffic Exhaust Impact Significance

Guidance	Comment
Number of properties affected by minor, moderate or substantial air quality impacts and a judgement on the overall balance	Impacts on NO_2, PM_{10} and $PM_{2.5}$ concentrations were predicted to be negligible at all sensitive receptors considered. Given the use of 2031 traffic data with 2025 emission factors and 2025 background data, the assessment is considered to provide an overestimation and therefore a sufficient level of confidence can be placed within the predicted **not significant** impacts.
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant.	The proposed development results in no new exposure to annual mean pollutant concentrations above the AQOs.
The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors	The change in concentration relative to the AQO was predicted to range from: • 0.08% to 1.13% for NO_2; • 0.02% to 0.35% for PM_{10}; and • <0.01% to 0.32% for $PM_{2.5}$. As such, resultant impacts on annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations were predicted to be **negligible** at all sensitive receptor locations.
Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease	There were no exceedances of the annual mean AQO for NO_2, PM_{10} or $PM_{2.5}$ at sensitive locations throughout the modelling extents.
The extent to which an objective is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3	There were no exceedances of the annual mean AQO for NO_2 at any sensitive locations within the modelling and site extents.

AQMA Impacts

13.157 Sensitive receptors R14, R16 to R19, and R46 to R49 are located within the vicinity of AQMA 3, the closest AQMA to the Proposed Development. The impact of NO_2, PM_{10} and $PM_{2.5}$ on these sensitive receptors was predicted to be negligible at all nine locations as detailed in Table 13.30.

13.158 The impact of NO_2, PM_{10} and $PM_{2.5}$ on the three sensitive receptors (R23, R44, R45) located within the AQMA No. 2 were also predicted to be negligible.

13.159 The remaining AQMA receptors R38 and R39 are situated within AQMA No. 1 and the impact of NO_2, PM_{10} and $PM_{2.5}$ on these sensitive receptors was predicted to be negligible.

13.160 Based on the results of the operational phase assessment the overall significance of potential impacts on the AQMA was determined to be not significant, in accordance with the EPUK and IAQM guidance.

Sensitivity Analysis

13.161 Predicted impacts on annual mean pollutant concentrations as a result of operational phase exhaust emissions using 2030 emission factors were predicted to be negligible at all 49 sensitive receptor locations. As such, the overall significance of potential impacts for this scenario was determined to be **not significant** in accordance with the EPUK and IAQM guidance.

13.162 Predicted impacts on annual mean NO_2 concentrations as a result of operational phase exhaust emissions, when considering the dualling of Penwortham Way, were predicted to be **minor beneficial** at 2 sensitive receptors (R18 and R47) and negligible at the remaining 47 sensitive receptors considered. Impacts on PM_{10} and $PM_{2.5}$ were predicted to be negligible at all 49 sensitive receptor locations. the overall significance of potential impacts for this scenario was determined to be **not significant** in accordance with the EPUK and IAQM guidance.

13.163 Full assessment results and commentary can be found within **Appendix 13.2.**

Development Phasing Impacts

Construction

13.164 It should be noted that the construction phase assessment has considered the entirety of the site rather than specific phases. The phasing of construction activities would reduce the overall impact magnitude and duration at individual sensitive receptors. Assuming the relevant mitigation measures outlined in Table 13.31 are implemented, the residual effect from all dust generating activities is predicted to be not significant, in accordance with the IAQM guidance.

13.165 It should be noted that the impact of the construction phase at sensitive receptors introduced to the site during later phase development, is considered negligible assuming good practice dust control measures are implemented Therefore the construction phase is not a restraint to planning consent for the proposed development.

Completed Development

13.166 The overall significance of operational phase road traffic emission impacts was determined as not significant. This was based on the predicted impacts at discrete receptor locations and the considerations outlined in Section 3. Further justification is provided in Table 13.30.

13.167 Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future site users from elevated pollutant concentrations.

13.168 As there were no exceedances of the relevant AQOs for all pollutant concentrations across the development site, there are no constraints to the location of the proposed residential units, school, district centre and community centre.

Additional Mitigation / Enhancement Measures

13.169 This section describes the measures which are required to mitigate any significant environmental effects with regards to air quality.

Demolition and Construction

13.170 The IAQM guidance provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the development site and are summarised in Table 13.3. The mitigation measures outlined in Table 13.31 can be reviewed prior to the commencement of construction works incorporated into the CEMP.

Table 13.31: Fugitive Dust Mitigation Measures

Issue	Control Measure
Communications	• Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary • Develop and implement a stakeholder communications plan that includes community engagement • Display the head or regional office contact information • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA
Site Management	• Record all dusty and air quality complaints • Make the complaints log available to the LA when asked • Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation • Hold regular liaison meeting with other high-risk construction sites within 500m of the site boundary (if applicable). Ensure plans are coordinated and dust and particulate matter emissions are minimised
Monitoring	• Undertake daily on-site and off-site inspection where receptors are nearby to monitor dust • Carry out regular site inspections to monitor compliance with the DMP • Increase frequency of site inspections when activities with a high potential to produce dust are being carried out

Issue	Control Measure
Preparing and Maintaining the Site	• Plan site layout so that machinery and dust causing activities are located away from receptors • Fully enclose site or specific operations where there is a high potential for dust production and the site as actives for an extensive period • Avoid site runoff 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 • Cover, seed or fence stockpiles to prevent wind whipping • Use water as dust suppressant where applicable
Operating Vehicle/ Machinery and Sustainable Travel	• All vehicles to switch off engines - no idling vehicles • Avoid the use of diesel or petrol-powered generators where practicable • Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph in unsurfaced haul roads • Produce a Construction Logistics Plan to manage sustainable deliveries • Implement a Travel Plan that supports and encourages sustainable travel
Operations	• Cutting equipment to use water as dust suppressant or suitable local extract ventilation • Ensure adequate water supply on the site for effective dust/particulate matter suppression/mitigation • Use enclosed chutes and covered skips • Minimise drop heights • Ensure equipment is readily available on site to clean any spillages
Waste Management	• Avoid bonfires and burning of waste materials
Demolition	• Soft strip inside buildings before demolition • Ensure effective water suppression is used during demolition operations • Avoid explosive blasting. • Bag and remove any biological debris before demolition
Earthworks and Construction	• Re-vegetate earthworks and exposed areas • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate • Only remove the cover in small areas during work and not all at once • Avoid scabbling • Ensure sand and other aggregates are stored and not able to dry out, unless it is required for a specific process • Ensure bulk cement and other fine powder materials are delivered and stored to prevent escape • For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust

Issue	Control Measure
Trackout	• Use water-assisted dust sweeper on the access and local roads • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving sites are covered to prevent escape of materials • Inspect on-site haul routes for integrity, instigate necessary repairs and record in site log book • Install hard surfaced haul routes which are regularly damped down • Implement a wheel washing system at a suitable location near site exit • 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

13.171 Assuming the relevant mitigation measures outlined in Table 13.31 are implemented, the residual effect from all dust generating activities during the construction phase of the development, is predicted to be **not significant,** in accordance with the IAQM guidance.

Completed Development

13.172 The assessment indicated that the overall effects on existing and future human sensitive receptor locations is not significant as a result of the Proposed Development. As such, there is not a direct requirement to mitigate operational impacts and the proposed development should comply with the relevant EPUK and IAQM Planning Guidance. The guidance provides minimum best practice techniques for all developments.

Further Mitigation

13.173 As mentioned in Section 13.64, a damage cost assessment has been undertaken, which will inform the level of additional measures required in order to offset development emissions. A summary of the measures that will be implemented at an early stage are provided below.

- Sustainable Travel Plan including measures such as; car clubs, walking and cycling incentives, promotion of public transport and a residents Travel Pack;
- Improvements and provision of public transport links and infrastructure; and
- Provision of cycle storage infrastructure.

13.174 Further details of the damage cost assessment and mitigation measures can be found in **Appendix 13.2.** Additional measures may be required and will be fully discussed and agreed with SRBC before completion of the development.

Likely Residual Effects of the Development and their Significance

Construction Phase – Step 4

13.175 It should be noted that all the anticipated development phases have been considered within the construction phase assessment for the Proposed Development. Assuming the relevant mitigation measures outlined in Table 13.31 are implemented, the residual effect from all dust generating activities is predicted to be not significant, in accordance with the IAQM guidance. As mentioned previously, these mitigation measures will be detailed within the CEMP. The phasing of construction activities would further reduce the impact magnitude and duration at individual sensitive receptors.

13.176 It should be noted that the impact of the construction phase at sensitive receptors introduced to the site during later phase development, is considered not significant, assuming good practice dust control measures are implemented. These measures will be detailed within the CEMP. Therefore, the construction phase is not a restraint to planning consent for the proposed development.

Completed Development Phase

13.177 Impacts on NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of operational phase emissions were predicted to be negligible at 49 sensitive locations and at nearby AQMA's for the Proposed Development. The overall significance of impacts was therefore considered to be not significant, in accordance with the EPUK and IAQM guidance without the consideration of mitigation measures. Consequently, the residual effects from road vehicle exhaust emissions associated with traffic generated by the proposal are predicted to be negligible. In addition, there were no predicted exceedances of the AQOs at proposed sensitive locations across the development site and therefore the exposure of future site users is also considered not significant.

13.178 A summary of the residual effects of the assessment are provided within Table 13.32.

Table 13.32: Residual Effects Summary

Description of Effect	Potential effect including significance	Mitigation	Residual Effect including significance
Construction and Demolition			
Dust Soiling, Human Health and Amenity	Substantial potentially Significant	Measures outlined in the IAQM guidance on recommended dust controls as stated in Table 13.31 to be included in the CEMP	Negligible – Not Significant
Completed Development			
Existing Receptors – Human Health and Amenity	Negligible – Not Significant	Best Practice Measures	Negligible – Not Significant

Description of Effect	Potential effect including significance	Mitigation	Residual Effect including significance
Proposed Development Site Sensitive Receptors	Negligible – Not Significant	Not required	Negligible – Not Significant
Cumulative Effects			
Construction (Demoltion, Earthwork, Construction, Trackout)	Substantial potentially Significant	Measures outlined in the IAQM guidance on recommended dust controls as stated in Table 13.31 to be included in the CEMP	Negligible – Not Significant
Completed Development: • Onsite human receptors • Existing Human receptors	Negligible – Not Significant	Best Practice Measures	Negligible – Not Significant

Conclusions

13.179 The proposed development has the potential to cause air quality impacts at sensitive locations. As such, an Air Quality ES Chapter was required to quantify pollutant levels across the site, consider its suitability for the proposed end-use and assess potential impacts as a result of the development for two development scenarios.

13.180 During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust mitigation measures are implemented through a CEMP, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **negligible** and therefore **not significant.**

13.181 Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and to predict air quality impacts as a result of road vehicle exhaust emissions associated with traffic generated by the development. Results were subsequently verified using monitoring results obtained from SRBC.

13.182 The dispersion modelling results indicated that pollutant levels at sensitive locations across the site were below all relevant AQOs. The location is therefore considered suitable for the proposed end-use without the inclusion of mitigation methods to protect future users from poor air quality. Predicted impacts on existing sensitive receptors as a result of operational exhaust emissions were predicted to be **negligible**. The overall significance of potential impacts was determined to be **not significant**, in accordance with the EPUK and IAQM guidance.

References

Central Lancashire (2012) Local Development Framework Adopted Core Strategy .

Department for Environment, Food and Rural Affairs (DEFRA) (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

Department for Environment, Food and Rural Affairs (DEFRA) (2021) Local Air Quality Management Technical Guidance 2016 LAQM.TG(16).

England Directive 2008/50/EC (2016) The Air Quality Standards (Amendment) Regulations.

Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) (2017) Land-Use Planning and Development Control: Planning for Air Quality.

Institute of Air Quality Management (IAQM) (2016) Guidance on the Assessment of Dust from Demolition and Construction.

Ministry of Housing, Communities & Local Government (2019), The National Planning Guidance (NPPG).

Ministry of Housing, Communities & Local Government (2021) The National Planning Policy Framework (NPPF).

South Ribble Borough Council (2015) South Ribble Local Plan.

South Ribble Borough Council (2016) Penwortham Neighbourhood Plan 2016 – 2026.

South Ribble Borough Council (2020) Planning Advisory Note – Low Emissions and Air Quality