Cottam Parkway Railway Station

Environmental Statement

Volume 2: Main Statement

Chapter 8: Air Quality

Document Reference: 07-ES-02-08-03

Lancashire County Council

www.lancashire.gov.uk

ES Chapter Document Control

Project Title: Cottam Parkway Railway Station

Document Reference: 07-ES-02-08-03

Chapter Title: Air Quality

Version No: 3

	Created By	**Checked By**	**LCC Checker and Date Comments Provided**
Version 1 October 2021	Dorota Moroniak-Wawryszuk	Steven Byrne	Nicholas Benson Victoria Walmsley 11/10/2021
Version 2 November 2021	Steven Byrne	David Howells	Nicholas Benson 13/04/2022
Version 3 June 2022	David Howells	Steven Byrne	Niamh O'Sullivan 5/08/2022
Document Status	Final		

8 Air Quality

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8	Air Quality	Appendix 8.1: Figures Appendix 8.2: Air Quality Dispersion Modelling Appendix 8.3: Construction Dust Risk Assessment

8.1 Introduction

8.1.1 This chapter assesses the potential air quality effects resulting from the construction and operation of the Scheme on environmental receptors. The assessment has taken the following approach:

- Identification of relevant baseline conditions;
- Assessment of potential air quality effects from the Scheme;
- Proposals for mitigation measures, if required; and,
- Conclusions on the likely significant residual effects of the Scheme for air quality.

8.1.2 This air quality assessment describes air pollutants in ambient air and dust and considers their potential to cause adverse effects to sensitive receptors.

8.1.3 The main pollutants of concern for air quality in the United Kingdom (UK) are associated with combustion emissions typically arising from road traffic and industry, which are primarily oxides of nitrogen (NO_x), nitrogen dioxide (NO_2) and particulate matter as PM_{10} and $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 10 microns or less and 2.5 microns or less,

respectively). Air pollutants can affect human health and cause damage to sensitive plants and ecosystems.

8.1.4 Air quality also refers to dust, which could affect health or give rise to annoyance due to the soiling of surfaces through deposition. The term 'dust' refers to all particulate matter including all solid particles suspended in air or settled and deposited on a surface after having been suspended in air, due to activities related to construction. This includes the smaller-sized particles associated with potential health impacts (i.e. PM_{10} and $PM_{2.5}$) and the larger particles associated with causing annoyance or affecting sensitive vegetation through deposition on a surface.

8.1.5 The air quality assessment has included consideration of the following:

- Dust emissions generated by demolition, earthworks and construction-related activities during the construction phase; and
- Exhaust emissions of pollutants to air from road vehicles (e.g. cars, vans, buses and lorries) on the local road network during construction and operation of the Scheme.

8.1.6 This assessment has considered the potential air quality and dust impacts on the human populations of communities, and habitats and ecosystems which are near to the emission sources. For human exposure, sensitive receptors (termed ‘human receptors’) include residential properties and schools. In addition, for the construction dust assessment, recreational areas and Public Rights of Way including footpaths have also been included.

8.1.7 For habitats and ecosystems, the sensitive receptors (termed ‘ecological receptors’) include the following:

- Special Areas of Conservation (SACs) and Special Protection Areas (SPAs);
- Ramsar sites;

- Sites of Special Scientific Interest (SSSIs);
- National Nature Reserves (NNRs) and Local Nature Reserves (LNRs);
- Local Wildlife Sites (LWSs) or their equivalent (in this case these are termed Biological Heritage Sites (BHSs); and,
- Ancient woodlands.

8.2 Relevant Legislative, Plans, Policies and Background

Legislation

Environment Act 1995 Part IV

8.2.1 The Act contains provisions for protecting air quality in the UK and for Local Air Quality Management (LAQM). It requires the UK government to produce a national Air Quality Strategy (AQS) which contains Air Quality Objectives (AQOs) and measures for improving ambient air quality. Local authorities are obliged to regularly and systematically review and assess air quality within their boundaries to achieve AQOs. Under the Act, where the air quality standards are not being met, local authorities must issue an order designating an air quality management area (AQMA).

The Air Quality (England) Regulations 2000 and The Air Quality (England) (Amendment) Regulations 2002

8.2.2 These Regulations provide for national Limit Values for pollutants which must be met by local authorities. The current limits are set out in the 2007 AQS (Department for Environment, Food and Rural Affairs (Defra), 2007).

The Air Quality (Standards) Regulations 2010

8.2.3 These Regulations have the objective of improving air quality by reducing the impact of air pollution on human health and ecosystems. The Regulations transpose the air quality Limit Values set out in Directive

2008/50/EC on ambient air quality and cleaner air for Europe, to UK law (still applicable post-Brexit).

Environmental Protection Act 1990

8.2.4 Part III of the Act provides statutory nuisance provisions for dust.

National Planning Policy

The National Planning Policy Framework (the NPPF)

8.2.5 The NPPF (MHCLG, 2021) introduces the presumption in favour of sustainable development in England, where there are no relevant development plan policies, or where the policies which are most important for determining the application are out of date.

8.2.6 Paragraph 174 of NPPF solely references how policies and decisions should enhance and contribute to the natural environment by *'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.'*

8.2.7 Paragraph 186 states in relation to air quality that *'Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need*

for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.'

8.2.8 Paragraph 180 and 181 relate to habitats, biodiversity and principles to be followed when determining planning applications.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland

8.2.9 The strategy (Defra, 2007) provides an overview and outline of the UK government's ambient (outdoor) air quality policy and sets out the AQOs and the measures selected to achieve the desired improvements in air quality.

Local Planning Policy

Central Lancashire Adopted Core Strategy

8.2.10 Policy 30 Air Quality of the Central Lancashire Adopted Core Strategy (Preston City Council et al., 2012) states *'Improve air quality through delivery of Green Infrastructure initiatives and through taking account of air quality when prioritising measures to reduce road traffic congestion.'*

8.2.11 Policy 28 states that *'Proposals for renewable and low carbon energy schemes will be supported and planning permission granted where the following criteria are met:…(c) Any noise, odour, traffic or other impact of development is mitigated so as not to cause unacceptable detriment to local amenity.'*

Preston Local Plan (2012 – 2026)

8.2.12 The Local Plan (Preston City Council, 2012) is in general conformity with the strategic objectives of the adopted Central Lancashire Core Strategy and its strategic vision for Preston and wider Central Lancashire.

Relevant Guidance

Local Air Quality Management – Technical Guidance (TG16)

8.2.13 This Technical Guidance (Defra, 2021a) is a guide for local authorities to follow whilst carrying out the LAQM process and includes detailed technical guidance on air quality screening, modelling and assessment. It also provides guidance on where the AQOs apply.

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

8.2.14 This guidance document produced by Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) (EPUK/IAQM, 2017) contains advice on the need for an air quality assessment regarding traffic emissions and combustion plant, selection of modelling methodologies, how to describe air quality effects, and advice on determining the significance of air quality effects.

Guidance on the Assessment of Dust from Demolition and Construction

8.2.15 This guidance document produced by IAQM (2016) contains guidance for undertaking a risk-based appraisal of dust from demolition and construction-related activities and assigning an appropriate level of dust control and mitigation. It includes recommended dust mitigation measures, monitoring and an approach for determining the significance of effects from dust emissions. It also includes advice on identifying the need to undertake an assessment of emissions to air from construction plant and machinery.

A Guide to the Assessment of Air Quality Impacts on Designated Nature Sites

8.2.16 This guidance document produced by IAQM (IAQM, 2019) contains advice on the need for an air quality assessment regarding traffic emissions and combustion plant, specifically in relation to designated nature sites. The guidance includes advice on screening for nature sites, methodologies and a

discussion of when further assessment is required from a project ecologist to determine if any significant air quality effects exist.

Design Manual for Roads and Bridges (DMRB) LA 105 Air Quality

8.2.17 This document produced by Highways England (Highways England, 2019) provides guidance on the assessment of the impact highways projects (may have on local air quality.

8.3 Methodology

Study Area

Construction Phase – Dust Emissions

8.3.1 Various proposed activities at construction sites could give rise to emissions of dust. There would be potential for dust nuisance at receptors near the construction area and construction access routes associated with the Scheme.

8.3.2 In accordance with the IAQM construction dust guidance (IAQM, 2016), potential air quality impacts associated with construction dust were considered at sensitive human receptor locations extending up to 350m from the Scheme where potentially dust-causing activities would be carried out. Potential impacts at distances greater than 350m would be likely to be less than those at locations closer to the Scheme, and any mitigation measures applied to protect sensitive receptors within 350m would help to reduce any possible impacts beyond 350m. The impacts of trackout (construction-related vehicles moving on and around the construction area emitting exhaust particulate matter and re-suspending loose material on the road) have been determined up to 50m from the edge of the local access roads and within 500m of the respective site exits. Further information is provided in the Construction Dust Risk Assessment in Appendix 8.2 in volume 3 of this ES.

8.3.3 In line with the IAQM dust guidance, the assessment has also considered ecological receptors up to 50m from the Scheme.

8.3.4 The study area for the construction dust assessment is shown in Figure 8.1 in Appendix 8.1 in volume 3 of this ES.

Construction Phase – Emissions from Road Traffic

8.3.5 The assessment considered changes in key pollutant concentrations (NO_x, NO_2, PM_{10} and $PM_{2.5}$) as a result of the Scheme, at representative sensitive receptor locations located within 200m of 'affected roads'.

8.3.6 Affected roads in relation to human receptors were identified using the qualifying criteria published in the Environmental Protection UK (EPUK)/IAQM air quality guidance (EPUK/IAQM, 2017), based on changes in road traffic flows between the Do Minimum (DM) (i.e. without the Scheme) and Do Something (DS) (i.e. with the Scheme) scenarios, as follows:

- The change in heavy duty vehicle (HDV) flows on a road is greater than 25 as the annual average daily traffic flow (AADT) within or adjacent to an AQMA or greater than 100 AADT elsewhere; and
- The change in light duty vehicle (LDV) flows is greater than 100 AADT within or adjacent to an AQMA or greater than 500 AADT elsewhere.

8.3.7 The closest human receptors within 200m of road links that experience a change in traffic flows that exceed the above criteria were assessed. Changes in traffic flows less than the criteria, in accordance with the methodology would not require further assessment, as the change in concentrations of pollutants at receptors close to these roads would be imperceptible. For those receptors within 200m of the road links which exceeded the thresholds, a detailed assessment is undertaken using dispersion modelling. The detailed modelling should include all road links within 200m of the chosen receptors.

8.3.8 Affected roads in relation to ecological receptors were identified using the IAQM guidance on designated nature conservation sites (IAQM, 2019), based on changes in road traffic flows between the DM (i.e. without Scheme) and DS (i.e. with Scheme including junction improvements) scenarios, as follows:

- The change in AADT of greater than 1,000; or
- The change in HDV flows of greater than 200 (as an AADT).

8.3.9 Based on these criteria, there were no road links which were identified as 'affected roads' as the changes for the construction phase were below the criteria. Therefore, an assessment of emissions from road traffic on human or ecological receptors was not required for the construction phase.

Operational Phase – Emissions from Road Traffic

8.3.10 The same criteria for human and ecological receptors set out in paragraphs 8.3.6 and 8.3.8 were used to define the geographic scope of the air quality assessment for operation of the Scheme.

8.3.11 There were several road links where the criteria for identifying affected roads for human receptors were exceeded based on changes in traffic flows between the DM and DS scenarios. The closest human receptors to these roads were identified for the assessment. The study area (represented by the affected roads and human receptor locations close to the affected roads) are shown in Figure 8.1.

8.3.12 One road link, the Preston Western Distributor Road (PWDR) to the west of the Scheme, exceeded the criteria for ecological receptors in terms of increasing traffic flows between the DM and DS scenarios. There is one ecological receptor (Lancaster Canal BHS) within 200m of this road link and a transect of receptors up to 200m to the east and west of the PWDR was set up. Two small sections of the Cottam Link Road were forecast to reduce traffic flows by greater than 1000 AADT and, for completeness, additional

transects of ecological receptors within the Lancaster Canal BHS were also included in proximity to these two sections of the Cottam Link Road. The affected roads, with regard to the criteria for ecological receptors which differs to the criteria for human receptors, and ecological receptors are shown in Figure 8.2 in Appendix 8.1 of volume 3 of this ES.

Matters Not Requiring Detailed Assessment

8.3.13 IAQM guidance (IAQM, 2016) specifies the following in relation to the assessment of emissions to air from construction plant and machinery (i.e. non-road vehicles):

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

8.3.14 Based on the relatively low number of diesel-powered plant and machinery items that are likely to be required to operate simultaneously at the same location, the potential impact on local air quality at human and ecological locations in the vicinity of the Scheme is considered to be imperceptible. Typical construction plant are set out in Chapter 3 ;Description of the Scheme' of this ES.

8.3.15 As the Scheme would result in trains being stationary where previously there were no stationary trains, this should be considered within the assessment. Criteria set out in the LAQM TG16 guidance (Defra, 2021a) identify where sections of railway require a detailed assessment of sulphur dioxide (SO_2) emissions from stationary diesel trains (i.e. trains that would stop at the new station). These criteria are:

- Locations where diesel trains are stationary more than three times per day for periods of 15 minutes or more; and

- Where human or ecological receptors are present within 15m of the relevant railway line.

8.3.16 At locations where either of the above criteria are not met, emissions from stationary diesel trains that would not require further assessment, would be considered to be negligible and would not contribute to a significant effect. As the line is electrified, the majority of trains stopping at the new station would be electric multiple-unit passenger trains. However, diesel trains may continue to operate on the line, particularly those travelling to and from Blackpool South where the branch line is not currently electrified. In any case, as there are no human or ecological receptors within 15m of the railway line at the railway station location, no further assessment of SO_2 emissions is required at the location of the Scheme.

8.3.17 As the Scheme would not directly generate additional diesel train movements (i.e. it does not propose new services or increase capacity), emissions of other pollutants from moving trains, such as NO_2, would remain similar to emissions from the existing operation of the Preston Fylde Junction to Blackpool North Fylde Line. Therefore, no further detailed assessment is required.

Method of Assessment

8.3.18 For this assessment the criteria adopted for each of the following three aspects are set out in this section:

- Assessment of dust emissions from construction-related activities which could affect amenity, human health and sensitive ecological sites;

- Protection of human health based on the modelling of emission sources, and prediction of concentrations of pollutants at specific human receptors or locations; and

- Protection of sensitive vegetation and ecosystems based on the modelling of emission sources and prediction of deposition rates of nitrogen at specific ecological receptors.

8.3.19 The process for defining significance is prescribed in accepted practice guidance documents developed by regulatory authorities and working groups comprising experienced air quality professionals, local authority officers and public healthcare bodies (IAQM, 2016 - applicable to dust, EPUK/IAQM, 2017 - with regard to air quality, and IAQM, 2019 - with regard to nature conservation areas).

8.3.20 The relevant guidance on this subject relates to defining whether an air quality effect at human receptors would be significant or not across the study areas as a whole, rather than at individual properties or other human receptors.

8.3.21 The level of value of a receptor is already incorporated within the specific methods prescribed in the standard good practice guidance documents for describing the impact at a particular receptor, which has then been used to ultimately define the significance of air quality effects. This is because the guidance is based on compliance with AQOs (which are specified in legislation) or the criteria themselves are different for receptors of different value. Where possible, a magnitude of change of impact has been specified for the air quality impact to help inform the determination of the significance.

Construction Phase – Dust Emissions

8.3.22 The assessment of dust during construction has been carried out using a risk-based appraisal. This has taken into account the location of nearby sensitive locations in relation to the works associated with constructing the Scheme, and the planned type and scale of the respective construction-related activities. These assessments follow the process set out in the IAQM dust guidance (IAQM, 2016). These guidance documents set out recommendations for dust control and mitigation based on the determined

risk level, which have been adopted. The methodology determines that the greater the risk associated with the construction of a particular development, the higher the level of mitigation, controls, management and monitoring required.

8.3.23 The main potential construction dust emission sources have been categorised according to the IAQM dust assessment method as demolition, earthworks, construction and trackout. These have been defined as follows:

Demolition activities: demolition of buildings and associated infrastructure within the site boundary, including the processing and storage of material associated with the demolitions and removal of vegetation, walls and other site clearance activities;

Earthworks: activities such as establishing site compounds, forming new haul roads and parking area, installing drainage, topsoil stripping and storage of topsoil. Another source would be windborne dust from material stockpiles, storage mounds and exposed areas, which could occur if the wind speed was high enough and the stored or exposed material was dry and friable;

Construction activities: construction of buildings/infrastructure and associated activities relating to the construction of the site compounds; and

Vehicle movement and trackout: construction-related vehicles moving on and around the construction areas emitting exhaust particulate matter and re-suspending loose material on the road. There would be the potential for spillage from transferring material around the construction site/areas, and particulates being lifted from open container vehicles by the wind generated from the vehicle movement. Material 'tracked-out' onto the local road network on the wheels of site traffic could also be re-suspended by passing traffic.

8.3.24 Typical data relating to the works associated with the construction of the Scheme include:

- Site areas;
- Volume of earthworks, including excavations;
- Soil type;
- Number of plant and other equipment in operation;
- Height of bunds or stockpiles;
- Building volumes (construction); and
- Movements of HDVs such as lorries.

8.3.25 Other data informing the classification of the risk has included:

- Background PM_{10} concentrations;
- The presence of human receptor locations within 350m of the construction site boundaries and/or within 50m of the access route(s) used by construction vehicles on the public highway;
- The presence and sensitivity of ecological receptors within 50m of the Proposed Scheme and access routes; and
- The number of properties within set distance bands of the Scheme site boundary, and their sensitivities to dust soiling and human health with regard to PM_{10} concentrations.

8.3.26 The methodology in these guidance documents provided for an assessment of three separate dust impacts from the four activity types (demolition, earthworks, construction and trackout), which were:

- Annoyance due to dust soiling;

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

8.3.27 Although $PM_{2.5}$ has not specifically been included as a parameter within the assessment, the risk levels associated with PM_{10} and any subsequent mitigation measures would also apply to $PM_{2.5}$.

8.3.28 The construction dust assessment assigned a risk classification for each of the four activity types (demolition, earthworks, construction and trackout). This risk classification has then been used to define the recommended site-specific mitigation to reduce the residual effects of construction dust emissions to a level that would not be significant. This is in line with the IAQM dust guidance (IAQM, 2016).

8.3.29 Full details of the assessment methodology, including consideration of significance, is provided in the Construction Dust Risk Assessment in Appendix 8.3 of volume 3 of this ES. A summary of the methodology is provided in Table 8.1.

Table 8.1: Summary of the construction dust assessment methodology

Step	Methodology summary
Step 1	Screen the need for a detailed assessment
Step 2a	Define the potential dust emission magnitudes for each activity
Step 2b	Define the sensitivity of the area, which includes: - receptor sensitivity based on type and location of receptor; and - sensitivity of the study area to dust soiling, human health and ecological impacts based on the

Step	Methodology summary
	relative proximity and number of receptors and existing PM_{10} concentrations.
Step 2c	Define the risk of impacts, based on the dust emission magnitudes and sensitivity conclusions from Step 2a and Step 2b.
Step 3	Identify site-specific construction management measures (if required).
Step 4	Determine any residual significant effects.

Criteria

8.3.30 The assessment criteria associated with the construction phase impacts on local air quality and dust was based on the IAQM dust guidance (IAQM, 2016). Further information on the construction phase assessment methodology including consideration of significance, are provided in the Construction Dust Risk Assessment in Appendix 8.3.

8.3.31 The risk associated with the activities has been defined from the dust emission magnitude and the sensitivity of the area in the vicinity of the Scheme, which were determined during step two of the dust assessment as set out in Table 8.1.

8.3.32 The sensitivity of the receptors has been based on the IAQM dust guidance (IAQM, 2016) and set out in Table 8.2.

Table 8.2: Criteria for determining the sensitivity of receptors for the dust assessment

Sensitivity of receptor	Dust soiling receptors	Receptors for health effects of PM_{10}	Ecology receptors
High	Residential properties, medium and long-term car parks and car showrooms.	Residential properties, hospitals, schools and residential care homes.	Locations with an international or national designation and the designated features may be affected by dust soiling. Locations where there is a community of a particularly dust-sensitive species such as vascular species included in the Red Data list for Great Britain
Medium	Parks, places of work.	Office and shop workers not occupationally exposed to PM_{10}.	Locations where there are particularly important plant species, where dust sensitivity is uncertain or unknown. Locations with a national designation where the features may be affected by dust deposition.

Sensitivity of receptor	Dust soiling receptors	Receptors for health effects of PM_{10}	Ecology receptors
Low	Playing fields, farmland, footpaths, short-term car parks and roads.	Public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition.

8.3.33 The risk classification for the four categories of potential dust impacts (demolition, earthworks, construction and trackout) are shown in Table 8.3. Further explanation, including quantitative criteria, on how the dust emission magnitude and area sensitivity have been defined, is provided in Air Quality Dispersion Modelling in Appendix 8.2 of volume 3 of this ES.

Table 8.3: Risk classification for dust impacts

Sensitivity of area	Dust emission magnitudes		
	Large	Medium	Small
Demolition			
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible
Earthworks			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Sensitivity of area	Dust emission magnitudes		
	Large	**Medium**	**Small**
Construction			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Trackout			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low risk	Negligible
Low	Low risk	Low risk	Negligible

Determining Significance

8.3.34 The approach in step four (as set out in Table 8.1) of the IAQM dust guidance (IAQM, 2016) has been adopted to determine the significance of effects with regard to dust emissions. The guidance states the following:

'For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be not significant'.

8.3.35 The IAQM dust guidance (IAQM, 2016) also states that:

'*Even with a rigorous DMP [Dust Management Plan] in place, it is not possible to guarantee that the dust mitigation measures will be effective all the time, and if, for example, dust emissions occur under adverse weather conditions, or there is an interruption to the water supply used for dust suppression, the local community may experience occasional, short-term dust annoyance. The likely scale of this would not normally be considered*

sufficient to change the conclusion that with mitigation the effects will be not significant'.

8.3.36 Step four of the IAQM dust guidance (IAQM, 2016) recognises that the key to the above approach is that it assumes that the Contractor and regulators would check that mitigation measures, and any appropriate monitoring, are implemented by the Contractor. The environmental management of the construction works would be co-ordinated through the construction management measures as set out within the Code of Construction Practice (CoCP). These would include the necessary systems and procedures to facilitate ongoing checking by the regulators to ensure that dust mitigation is being delivered and that it is effective at reducing any effect to not significant and avoiding statutory dust nuisance issues.

8.3.37 It should be noted that the application of the mitigation is considered to be good practice (i.e. embedded) mitigation that any contractor would implement in agreement with the local planning authority and it is assumed this would be effective. The assessment is undertaken to identify the level of good practice mitigation that is required rather than to identify whether mitigation is required or not. In other words, the determination of significance provided in Section 8.6 is based on the good practice mitigation measures being in place and there is no pre-mitigation assessment.

Operational Phase – Emissions from Road Traffic

8.3.38 The air quality impact of vehicle exhaust emissions associated with the Proposed Scheme was assessed using the EPUK/IAQM air quality guidance (EPUK/IAQM, 2017) as a basis for the assessment. Where required, the assessment has also taken into account the DMRB Guidance LA 105 (Highways England, 2019) and LAQM TG16 (Defra, 2021a). For the Scheme, a detailed assessment was carried out of the affected road network, taking into account diurnal changes in traffic flows (i.e. the average change in the traffic flows throughout a 24-hour period) using the ADMS-Roads 5 dispersion model developed by Cambridge Environmental

Research Consultants Ltd (CERC). Further information regarding the dispersion modelling and results are provided in Air Quality Dispersion Modelling in Appendix 8.2.

8.3.39 The assessment of emissions of NO_x, PM_{10} and $PM_{2.5}$ from road traffic associated with the Scheme has considered the following scenarios:

- Baseline year 2019;
- DM, 2024 (opening year); and
- DS, 2024 (opening year).

8.3.40 The traffic flows, traffic flow composition (i.e. the proportion of the flows which are LDVs and HDVs) and vehicle speed data for the dispersion modelling scenarios were obtained from the outputs of the traffic modelling for the Scheme.

8.3.41 Measures have been taken as part of this assessment to improve the accuracy of the model estimates by verifying the model predictions against roadside measurements in accordance with Defra LAQM TG16 guidance (Defra, 2021a) (see Air Quality Dispersion Modelling in Appendix 8.2 of volume 3 of the ES). The estimates are composed of calculations of the impact of all the modelled emission sources at a single point or location referred to as a receptor.

8.3.42 The ADMS-Roads modelling system has taken into account the emissions produced by LDVs and HDVs travelling at a certain speed or driving condition along a section of road over an average hour and predicts the dispersion of these emissions for a given set of meteorological conditions over the period of one year.

8.3.43 Emission rates of pollutants from LDVs and HDVs were calculated for each modelled road link, based on the traffic flows, average speed and percentage HDV composition, using the Emission Factor Toolkit v11 (EFT

v11) (Defra, 2021b). The resulting emissions for each scenario were input into the ADMS-Roads dispersion model.

8.3.44 As noted above, the effect of meteorological conditions on dispersion were considered within the model. The most significant factors in the dispersion of emitted pollutants are wind speed and direction. Meteorological data for 2019 from the Blackpool station were used in the ADMS-Roads model. This was considered the most representative recording station for the study area.

Background Concentrations

8.3.45 'Background' air quality is a concept used to enable assessment of the impacts of particular emissions sources, without the need for all sources in the area to be considered explicitly within the modelling. The background concentrations are added to the predicted contributions from the road traffic and for each modelled location to derive the total pollution concentration.

8.3.46 Defra provides empirically-derived national background maps, providing estimates of background pollutant concentrations on a 1km x 1km grid square resolution (Defra, 2020a). The data for NO_x, NO_2, PM_{10} and $PM_{2.5}$ were obtained based on the 2018 base year from which the future modelled years were projected (i.e. 2019 and 2024). The mapped data were obtained for the Preston City Council local authority area as this encapsulates the study area.

8.3.47 Sector removal of major 'A' roads background concentrations was undertaken to ensure double counting of road traffic emissions from roads included in the dispersion modelling did not occur. Adjustment of the background mapped data was also undertaken based on the comparison of relevant background monitored concentrations to the mapped background. These adjustments are described in further detail in Air Quality Dispersion Modelling in Appendix 8.2.

8.3.48 Existing nitrogen deposition rates were obtained from the Air Pollution Information System (APIS) website (Centre for Ecology and Hydrology, 2021). These were selected for the locations of the ecological receptor transects within the Lancaster Canal BHS and representative of the deposition value for tall and short vegetation (i.e. representing the short and tall vegetation types identified by the project ecologists to be present at the BHS). These were based on the latest existing deposition data available on the APIS website, using the 3-year mean for the 2017 – 2019 period.

Prediction of Environmental Concentrations (including adjustment for long-term trends in NO_x and NO_2)

8.3.49 The ADMS-Roads model was used to predict the road traffic contributions of NO_x, PM_{10} and $PM_{2.5}$ concentrations at the identified receptors. As noted above, the total pollutant concentrations were produced by the addition of the road traffic emissions to the background concentrations of NO_x, PM_{10} and $PM_{2.5}$ for human receptors. The total NO_2 concentrations from road traffic, including the background NO_2 concentrations, were derived from the modelled NO_x concentrations at locations located within 200m of the modelled road links using the Defra NO_x from NO_2 calculator (v8.1) (Defra, 2020b).

8.3.50 A further adjustment step for the modelled road traffic component was undertaken to account for the observed trends in ambient roadside NO_x and NO_2. National Highways has developed the gap analysis methodology to adjust model predictions, to uplift the opening year (i.e. 2024) predicted concentrations to align them better with the long-term trends of NO_x and NO_2 (Highways England, 2019). Although the emission factors in EFT v11 (Defra, 2021b) used to calculate the future year vehicle emissions takes account of some of the previous known discrepancies in the long-term trends for vehicle emissions, the gap analysis methodology was applied as a conservative approach. Further information is provided in Air Quality Dispersion Modelling in Appendix 8.2.

8.3.51 Adjustments were applied to the model predictions based on a comparison against measured air quality concentrations for a past base year (i.e. 2019) in a process known as model verification (as described in paragraph 8.3.41).

Identification of Sensitive Receptor Locations

8.3.52 Within the study area, three types of sensitive receptors were considered:

- Human receptors including residential properties and other sensitive receptors (such as schools, nursing homes, hospitals, permanent canal boat residents and traveller sites etc.);
- Ecological receptors (designated sites at international, European, national or local level); and
- Pollution Climate Mapping (PCM) receptors (locations adjacent to roads included in the Defra PCM model).

8.3.53 The Ordnance Survey Address Base Premium (Ordnance Survey, 2021) dataset was used to define building use within the study area and identify potentially sensitive human receptor locations within 200m of the affected road links.

8.3.54 To capture the potential effects of the Scheme within the study area, a total of 444 human receptors were modelled which were representative of human health exposure at the closest relevant locations within 200m of the affected road network. These receptors represent the locations where the largest changes in pollutant concentrations and highest total concentrations are likely to occur. The affected road network and human receptors are shown in Figure 8.1 in Appendix 8.1.

8.3.55 A total of 114 ecological receptors were modelled to represent locations within the Lancaster Canal BHS which were close to the roads experiencing changes of greater than 1000 AADT. These roads and the ecological receptors are shown in Figure 8.2 in Appendix 8.1.

8.3.56 In accordance with DMRB LA105 (Highways England, 2019), PCM locations (i.e. at 4m and at any public reportable location) for the limit value compliance assessment are required for modelling on any affected road links within the Defra PCM model. There was one PCM road link which coincided with the affected road network, the A5085 Blackpool Road (PCM Census ID 802007696). Receptors adjacent to the A5085 were specified in the dispersion model as shown in Figure 8.3 in Appendix 8.1.

Criteria and Determining Significance

8.3.57 The assessment criteria for the protection of human health for the dispersion modelling assessment of emissions of pollutants to air from road traffic were based on the AQOs. The AQOs are set at the same level as the air quality Limit Values discussed in Section 8.2 and so have been used as the threshold criteria in this assessment. The relevant AQOs are set out in Table 8.4.

Table 8.4:Relevant Air Quality Objectives

Pollutant	Objective Concentration	Measured as	AQO or Limit Value
Nitrogen dioxide (NO_2)	200µg/m^3	1-hour mean not to be exceeded more than 18 times per year	AQO and Limit Value
	40µg/m^3	Annual mean	AQO and Limit Value
Oxides of Nitrogen (NO_x) – for the protection of vegetation and	30µg/m^3	Annual mean	AQO and Limit Value

Pollutant	Objective Concentration	Measured as	AQO or Limit Value
ecosystems			
Particulate matter (PM_{10})	50µg/m^3	24-hour mean not to be exceeded more than 35 times per year	AQO and Limit Value
	40µg/m^3	Annual mean	AQO and Limit Value
Particulate matter ($PM_{2.5}$) [1]	25µg/m^3	Annual mean	Limit Value

Note 1: In England, for $PM_{2.5}$, there is an average exposure reduction target at a national level. For this assessment the EU Limit Value of 25µg/m^3 has been adopted as the AQO.

8.3.58 As well as comparing the total predicted concentrations to the respective AQOs, the determination of the significance of the potential changes in concentrations of pollutants was assessed on the basis of air quality guidance produced by the EPUK and the IAQM (EPUK/IAQM, 2017).

8.3.59 The EPUK/IAQM air quality guidance (EPUK/IAQM, 2017) sets out an assessment framework for describing air quality impacts, whether adverse or beneficial, from a dispersion modelling assessment that can be used as a starting point to make a judgement of the overall significance of effect. An impact is the change in the concentration of an air pollutant, as experienced by a receptor, as the result of a new development. The guidance states the following:

- *'…the assessment may use its own set of criteria to define magnitude, but the important matter to be concluded is the likely significant effects of*

the impacts *on air quality. There is, therefore, a two-stage process to be followed in the assessment:*

- *A qualitative or* quantitative *description of the impacts on local air quality arising from the development; and*
- *A judgement on the overall significance of the effects of any impacts*.'

8.3.60 The impact descriptors for this modelling assessment (in relation to changes to long-term predicted concentrations) were based on the EPUK/IAQM air quality guidance (EPUK/IAQM, 2017) as set out in Table 8.5. Predicted increases would be described as adverse (e.g. minor adverse impact) and decreases described as beneficial (e.g. minor beneficial impact). The impact descriptors are equivalent to the magnitude of change as described in Chapter 4 'Assessment Methodology and Consultation Process' and the value of the receptor is inherent in the EPUK/IAQM methodology (EPUK/IAQM, 2017), as it is based on compliance with air quality standards derived from national legislation

Table 8.5: Impact descriptors for individual receptors (long-term concentrations)

Long-term average concentration at receptor in assessment year [3]	Percentage change in concentration relative to AQO [1, 2]			
	1%	2–5%	6–10%	>10%
75% or less of AQO	Negligible	Negligible	Minor	Moderate
76% to 94% of AQO	Negligible	Minor	Moderate	Moderate

95% to 102% of AQO	Minor	Moderate	Moderate	Major
103% to109% of AQO	Moderate	Moderate	Major	Major
110% or more of AQO	Moderate	Major	Major	Major

Note 1: table intended to be used by rounding the percentage change to whole numbers.

Note 2: any changes of 0% (i.e. less than 0.5%) are described as negligible.

Note 3: when defining the long-term average concentration as a percentage of the AQO, where there is a decrease in concentration the Do Minimum concentration should be used and where there is an increase in concentration the Do Something concentration should be used.

8.3.61 In relation to the assessment against the short-term AQOs, research undertaken on behalf of Defra and the devolved administrations (Defra, 2021a) identified that road traffic emission-related exceedances of the NO_2 one-hour mean AQO are unlikely to occur where the annual mean is below 60µg/m^3. Similarly, the number of road traffic emission-related exceedances of the 24-hour mean AQO for PM_{10} of 50µg/m may be estimated using the relationship set out in LAQM TG16 (Defra, 2021a), which implies that the 24-hour mean AQO for PM_{10} is likely to be met if the predicted annual mean PM_{10} concentration is 31.8µg/m^3 or less.

8.3.62 This approach was used as the initial basis for judging the overall significance of the effects of air quality at human receptors which are made using professional judgement. The EPUK/IAQM air quality guidance (EPUK/IAQM, 2017) states that 'the reasons for reaching the conclusions on significance should be transparent and set out logically.' The professional judgement used for this assessment included consideration of the following:

- The existing and future air quality in the absence of the Scheme;

- The extent of the population exposure to the impacts, for example, the description of the impacts at the receptors and number of properties affected by minor, moderate or major air quality effects; and
- Other factors where relevant, such as the presence of an AQMA.

8.3.63 As discussed in the EPUK/IAQM air quality guidance (EPUK/IAQM, 2017), the judgement of a significant effect occurring would be based on the overall balance of impacts across the study area. As noted in the guidance, it is more difficult to identify the overall significance of the air quality effects in the intermediate region where there are both beneficial and adverse impacts across the study area.

8.3.64 For predicted changes in nitrogen deposition at ecological receptors, any impacts which could potentially lead to a significant effect would be passed to the project ecologists to determine their significance. In this case, where the increase in nitrogen deposition is greater than 1% of the critical load value this would require further consideration by the project ecologist to determine whether this would be significant effect. Where changes were less than 1% of the critical load, this would be considered as a not significant effect within this chapter.

Limitations

8.3.65 It should be emphasised that the air quality impact assessment and emission calculations are based on a series of computer models of future conditions. The process begins with the modelling of future traffic flows, which are subject to their own inherent degree of uncertainty. The emissions are then calculated and the emission data are fed into dispersion models to derive total concentrations to compare future air quality conditions both with and without the Scheme. The air quality models draw on a number of other trends and parameters that must be projected into the future. The modelling process includes atmospheric dispersion modelling, which provides an estimate of concentrations arising from input emissions and historical meteorological data.

8.3.66 As with any computer model that seeks to predict future conditions, there is therefore uncertainty in the predictions made. Whilst being the best predictions available, elements of impact prediction such as the specific concentration of a given pollutant at a given property, or whether an exceedance of AQOs or limit values would or would not occur at a given location, are not precise and are always subject to a margin of error. However, the assessment process is considered to be based on the most reasonable, robust and representative methodologies, taking advice from published guidance.

8.3.67 Dispersion models tend to perform better when predicting long-term averaging periods (i.e. annual means) rather than short-term averaging periods. Statistical relationships are used in the assessment of road traffic emissions to calculate the likelihood of an exceedance of the one-hour mean NO_2 and 24-hour mean PM_{10} AQOs from the long-term (i.e. annual mean) modelling results.

8.3.68 Sensitive locations have been determined using online mapping e.g. Google Earth/Maps and also Ordnance Survey mapping data. There may in some cases be properties, such as those recently built, which are not yet present within these data sources.

Assumptions

8.3.69 The dust risk assessment was undertaken on the basis that all activities would be carried out adjacent to the Scheme boundary. This would overestimate the risk associated with some of the activities, and a higher level of risk may have been specified as a result. Therefore, this approach is considered to represent a precautionary assessment.

8.3.70 The assessment has assumed that all road links are at ground level. Therefore, the predicted concentrations at receptors adjacent to any elevated sections of road would likely be an overestimate and a conservative approach.

8.4 Baseline Description and Evaluation

8.4.1 Baseline data were collated from a variety of sources in compiling this assessment, including:

- LAQM reviews undertaken by local authorities, including Preston City Council (PCC) and Fylde Borough Council (FBC);
- A site-specific supplementary monitoring survey undertaken as part of the assessment;
- Defra background pollution maps (Defra, 2020a) and existing nitrogen deposition data for the study area provided by the Centre for Ecology and Hydrology; and
- Pollution Climate Mapping (PCM) model outputs produced by Defra (Defra, 2020c); and

Local Air Quality Management

8.4.2 The Scheme and the study areas are fully located within the jurisdiction of PCC. The latest available LAQM report produced by PCC, the 2019 Annual Status Report (ASR) (PCC, 2019), states there are five AQMAs declared within PCC for NO_2 and one measured exceedance of the annual mean AQO for NO_2 of 40µg/m^3 was recorded within AQMA 4 in 2018 (a value of 44µg/m^3). Measured concentrations at all other locations were within the AQO, which ranged from 19µg/m^3 to 37µg/m^3. The nearest AQMA to the Scheme is AQMA 2 which is approximately 3km to the east of the nearest section of the affected road network (the junction of A5085 Blackpool Road and Lea Road). PCC does not undertake any NO_2 monitoring in close proximity to the Proposed Scheme or affected road network, with the majority of monitoring locations close to or within the AQMAs. The data in the ASR indicates a mixed trend over the last five years, with the majority of locations experiencing a flat or slightly reducing trend, with more marked reductions at a small number of locations.

8.4.3 Monitoring of $PM_{2.5}$ is undertaken at an urban background location in Preston (monitoring location ID PRA2). An annual mean concentration of 9µg/m^3 was recorded in 2018, which confirms a reducing trend over the 5-year period, with the concentration of 12µg/m^3 recorded in 2014.

8.4.4 The FBC local authority area boundary is approximately 1km to the west of the Scheme and affected road network. The latest available LAQM report produced by FBC, the 2021 ASR (FBC, 2021), states there are no AQMAs declared within FBC. The highest recorded annual mean NO_2 concentration at any location, distance corrected to nearest exposure, was 18.5µg/m^3. The measured concentrations at all locations ranged from 7µg/m^3 to 18.5µg/m^3. The ASR reports that trend data over the last five years indicates that NO_2 concentrations have generally reduced.

8.4.5 No monitoring of other pollutants such as PM_{10} or $PM_{2.5}$ is undertaken within the FBC area.

Air Quality Monitoring Survey

8.4.6 A six-month site specific NO_2 monitoring survey using diffusion tubes was undertaken July 2020 to January 2021 inform the assessment process and obtain measurements in close proximity to the Scheme and surrounding local road network. The monitoring locations are shown in Figure 8.4 in Appendix 8.1 and full details of the survey are provided in Air Quality Dispersion Modelling in Appendix 8.2. The measured annual mean concentrations (representing the 2019 annual mean for use in the verification of the road traffic emissions modelling in the Base 2019 scenario) are set out in Table 8.6.

Table 8.6: NO2 monitoring survey results

Site ID	Description	Site Type	Annual Mean NO_2 Concentration (Annualised to 2019) ($\mu g/m^3$)
A	A585 Fleetwood Road	Roadside	18.0
B	A583 Blackpool Road	Roadside	17.8
C	A584 Preston New Road	Roadside	16.0
D	A583 Blackpool Road	Roadside	20.0
E	Darkinson Lane	Roadside	10.9
F	Sidgreaves Lane	Roadside	11.1
G	Lea Road	Roadside	16.5
H	A5085 Blackpool Road	Roadside	19.6
I	A583 Riversway	Roadside	28.8
J	A5072 Tulketh Road	Roadside	16.7
K	B6241 Tom Benson Way	Roadside	25.6
L	Hoyles Lane	Roadside	17.4

8.4.7 The monitoring survey results indicate that annual mean NO_2 concentrations are relatively low in the proximity to the Scheme and on the local road network, and generally lower than the concentrations recorded at roadside

locations within the more central Preston areas reported in the PCC ASR (PCC, 2019). The highest concentration of 28.8µg/m^3 was recorded adjacent to the A583 Riversway, a relatively busy road leading into Preston city centre. All concentrations were well within the AQO of 40µg/m^3. At the more rural locations close to the Proposed Scheme location (sites E and F), the NO_2 concentrations were much lower and are more likely to be representative of the background NO_2 concentration.

Defra background mapping

8.4.8 The Defra mapped 1km x 1km grid background pollutant concentrations for 2019 and 2024 encompassing the Scheme and assessed receptor locations are presented in Table 8.7 (Defra, 2020a). These have been adjusted as described in Air Quality Dispersion Modelling in Appendix 8.2. All background pollutant concentrations are within the AQOs.

Table 8.7: Mapped Background Annual Mean Pollutant Concentrations at Human Receptors (Adjusted)

Pollutant	2019 Background Concentration Range (µg/m^3)	2024 Background Concentration Range (µg/m^3)
Nitrogen dioxide (NO_2)	10.7 – 13.2	9.0 – 10.9
Oxides of nitrogen (NO_x)	14.1 – 17.9	11.7 – 14.5
Particulate matter (PM_{10})	9.7 – 11.3	9.1 – 10.7
Particulate matter ($PM_{2.5}$)	6.4 – 7.6	5.9 – 7.1

Pollution Climate Mapping

8.4.9 The Pollution Climate Mapping (PCM) model is run by Ricardo-AEA on behalf of Defra and is designed to fulfil part of the UK's EU Directive (2008/50/EC) requirements to report on the concentrations of pollutants in the atmosphere. Modelled PCM NO_2 concentrations are provided for a 2018 base year and projected to future years at representative roads throughout the UK (Defra, 2020c).

8.4.10 Based on the required study area for the Scheme, there is one PCM link which corresponds to the affected road network. The respective modelled road contributions for the assessed base year (2019) and opening year (2024) are outlined in Table 8.8.

Table 8.8: Identified PCM Links and Modelled NO_2, 2019 and 2024

PCM Road Name	PCM Road Census ID	2019 NO_2 Concentration ($\mu g/m^3$)	2024 NO_2 Concentration ($\mu g/m^3$)
A5085 Blackpool Road	802007696	16.8	12.6

Ecological Sites – Nitrogen Deposition

8.4.11 Discussions were held with the project ecologist to identify the types of vegetation present at the receptor transects within the Lancaster Canal BHS and the likely sensitivity of these areas to air pollution. It was identified that the ecological receptor transect areas include hedgerows, some broadleaved woodland, improved grassland and neutral grassland.

8.4.12 The existing nitrogen deposition rates for short vegetation (i.e. the grassland) and tall vegetation (i.e. the hedgerows and woodland) were obtained from

the APIS website (Centre for Ecology and Hydrology, 2021). The existing deposition rate for short vegetation is 27.02 kg N/ha/year and for tall vegetation is 45.05 kg N/ha/year. These deposition rates are above the indicative lowest critical load values of 10 kg N/ha/year for these types of vegetation (broadleaved deciduous woodland and neutral grassland) as specified on the Search by Location function on the APIS website (Centre for Ecology and Hydrology, 2021). This is common across the UK where existing nitrogen deposition is in exceedance of the critical loads for many sensitive habitats and species.

8.5 Consultation

8.5.1 Consultation was undertaken with the Environmental Protection Department at PCC in July 2020. In this consultation, the proposed scope and details of the NO_2 monitoring survey were discussed and agreed.

8.5.2 Further communication was undertaken with PCC in September 2021 to obtain the latest LAQM information and to confirm the proposed assessment methods for the air quality assessment.

8.5.3 Public consultation was carried out by Lancashire County Council between December 2021 and January 2022. Local residents raised concerns regarding air pollution from increased road traffic on the local road network. The changes in vehicle flows on the local road network and associated pollutant emissions were considered in detail as part of this air quality assessment.

8.6 Impacts – Construction

Dust Emissions

8.6.1 The assessment of the potential effects from dust emissions from construction activities have been assessed at the Scheme. The full

assessment is set out in Construction Dust Risk Assessment in Appendix 8.3.

Potential Dust Emission Magnitude

8.6.2 Table 8.9 presents the dust emission magnitude for each activity at the Proposed Scheme based on the criteria set out in the IAQM dust guidance (IAQM, 2016).

Table 8.9: Summary of dust emission magnitude

Activity	Dust Emission Magnitude
Demolition	Not applicable (no demolition)
Earthworks	Large
Construction	Medium
Trackout	Large

Sensitivity of the Area – Human Receptors

8.6.3 The sensitivities of the surrounding area to earthworks, construction and trackout activities based on the criteria set out in the IAQM dust guidance (IAQM, 2016) are presented in Table 8.10.

Table 8.10: Sensitivity of the area for human receptors

Potential impact	Sensitivity of Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	Medium	Medium	Medium
Human health		Low	Low	Low

8.6.4 A full description of how the sensitivity of the human receptors have been defined is presented in Construction Dust Risk Assessment in Appendix 8.3.

Sensitivity of the Area – Ecological Receptors

8.6.5 There is one relevant ecological receptor within 50m of the Scheme boundary, the Lancaster Canal BHS. This is adjacent to the works required for the new access road and bridge over the canal. The sensitivity of the Lancaster Canal BHS has been defined as Low (it is a locally designated site with vegetation which is potentially sensitive to dust soiling). Based on the location of the BHS adjacent to the construction area and potential construction traffic route on Lea Road, the sensitivities to demolition, earthworks, construction and trackout activities based on the criteria set out in the IAQM dust guidance (IAQM, 2016) are presented in Table 8.11.

Table 8.11: Sensitivity of the area for ecological receptors

Potential Impact	Sensitivity of Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Ecological receptors (Lancaster Canal BHS)	N/A	Low	Low	Low

Risk of Impacts

8.6.6 Using the dust emission magnitudes for the various activities in Table 8.9 and the sensitivity of the area provided in Table 8.10 and Table 8.11, the risks associated with each assessed site are provided in Table 8.12 for dust soiling, human health impacts and ecological impacts.

Table 8.12: Sensitivity of the area for ecological receptors

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	Medium Risk	Medium Risk	Medium Risk
Human health		Low Risk	Low Risk	Low Risk
Ecological		Low Risk	Low Risk	Low Risk

Summary of Dust Effects

8.6.7 The dust risks summarised in Table 8.12 were used to identify the recommended level of construction management measures as part of the dust assessment (see Construction Dust Risk Assessment in Appendix 8.3). The measures to be implemented are set out in the CoCP and summarised in Section 8.9. These are based on the highest risk level identified for each of the construction activities. For general dust control and management, these are based on the highest risk level identified (i.e. Medium Risk).

8.6.8 The construction of the Scheme would not be unusual in scale in comparison with other medium or large infrastructure projects in the UK. There are mitigation methods already available that have been successfully applied on other schemes to manage emissions of dust, such that significant off-site effects have not occurred. Such measures would be normal good practice

that would be adopted by any contractor meeting the requirements of the construction management measures within the CoCP. It is considered that there would be no potentially dust-generating activities proposed that could not be managed using normal good practice (IAQM, 2016) to prevent significant effects at any off-site receptor.

8.6.9 The IAQM dust guidance (IAQM, 2016) notes that, with the application of construction management measures of the type available for use on the Proposed Scheme, the environmental effect would not be significant at any off-site receptor. IAQM dust guidance (IAQM, 2016) notes that, even with a rigorous package of mitigation measures in place, such as is proposed in the CoCP, occasional impacts may occur. The CoCP provides a framework by which the level of mitigation would be adapted to respond proactively to the changing risk of dust emissions, so that significant effects would be prevented. This includes a monitoring programme to monitor the effectiveness of the construction management measures.

8.6.10 With the construction management measures applied, as specified in the CoCP, the likely effect of dust emissions on human health (based on the IAQM dust assessment methodology (IAQM, 2016)) and compliance with the AQOs) and amenity during construction, would not be significant.

8.7 Impacts – Operation

Emissions from Road Traffic

8.7.1 This section presents the impact of the Scheme, in the opening year, on local air quality close to the affected roads in the study area.

Human Receptors

8.7.2 The predicted annual mean concentrations for the base 2019, DM 2024 and DS 2024 scenarios are presented in Table 8.13. The table shows a selection of the results for those receptors predicted to experience the highest change

in concentrations and where the total concentrations were highest. The results for all modelled receptors are provided in Air Quality Dispersion Modelling in Appendix 8.2.

8.7.3 The change in NO_2 concentrations across the study area at all modelled human receptors is presented in Figure 8.5 in Appendix 8.1. Those receptors included in Table 8.13 are highlighted for information purposes.

Table 8.13: Predicted annual mean NO_2 concentration at human receptors

Receptor	Modelled Total NO_2 ($\mu g/m^3$)			Change in Concentration (DS-DM)		Magnitude of Change Descriptor	Category
	Base 2019	DM 2024	DS 2024	$\mu g/m^3$	% Change Relative to AQO		
HH_86	15.4	11.8	12.0	0.18	0%	Negligible	Top 10 receptors with the largest increases (DS-DM)
HH_144	15.5	11.9	12.1	0.18	0%	Negligible	
HH_168	17.2	14.0	14.2	0.17	0%	Negligible	
HH_255	15.6	11.9	12.1	0.17	0%	Negligible	
HH_33	14.6	11.5	11.7	0.16	0%	Negligible	
HH_115	15.3	11.8	11.9	0.16	0%	Negligible	
HH_145	15.6	12.0	12.1	0.16	0%	Negligible	
HH_192	14.6	11.5	11.7	0.16	0%	Negligible	
HH_242	14.6	11.4	11.6	0.16	0%	Negligible	
HH_249	15.3	11.8	11.9	0.16	0%	Negligible	
HH_308	20.5	15.5	15.5	-0.04	0%	Negligible	Top 10 receptors

Receptor	Modelled Total NO_2 ($\mu g/m^3$)			Change in Concentration (DS-DM)		Magnitude of Change Descriptor	Category
	Base 2019	DM 2024	DS 2024	$\mu g/m^3$	% Change Relative to AQO		
HH_311	18.5	14.6	14.6	-0.01	0%	Negligible	with the highest total concentration (DS 2024)
HH_146	19.1	14.5	14.6	0.10	0%	Negligible	
HH_106	18.3	14.5	14.5	-0.02	0%	Negligible	
HH_168	17.2	14.0	14.2	0.17	0%	Negligible	
HH_98	18.2	14.2	14.1	-0.15	0%	Negligible	
HH_167	15.4	13.9	13.9	-0.01	0%	Negligible	
HH_1	15.2	13.9	13.9	-0.01	0%	Negligible	
HH_169	16.7	13.6	13.8	0.16	0%	Negligible	
HH_99	17.4	13.7	13.7	-0.05	0%	Negligible	
HH_280	14.9	11.9	11.6	-0.35	-1%	Negligible	Top 10 receptors with the largest decreases (DS-
Fut_Dev_7	13.9	12.6	12.2	-0.34	-1%	Negligible	
HH_111	14.9	11.9	11.6	-0.34	-1%	Negligible	

Receptor	Modelled Total NO_2 ($\mu g/m^3$)			Change in Concentration (DS-DM)		Magnitude of Change Descriptor	Category
	Base 2019	DM 2024	DS 2024	$\mu g/m^3$	% Change Relative to AQO		
HH_313	14.9	11.9	11.6	-0.34	-1%	Negligible	DM)
HH_245	14.9	11.9	11.6	-0.34	-1%	Negligible	
HH_287	14.9	11.9	11.6	-0.33	-1%	Negligible	
HH_91	14.8	11.9	11.6	-0.33	-1%	Negligible	
HH_110	14.9	11.9	11.5	-0.33	-1%	Negligible	
HH_228	15.5	12.8	12.4	-0.32	-1%	Negligible	
HH_320	14.8	11.8	11.5	-0.31	-1%	Negligible	

8.7.4 The annual mean NO_2 concentrations are predicted to be below the AQO of 40µg/m^3 at all receptor locations close to the affected road network in both the DM and DS 2024 scenarios. The highest annual mean NO_2 concentration was predicted in both the DM and DS 2024 scenarios close to the affected road network at HH_308 (up to 15.5µg/m^3), which is located adjacent to the junction of A5085 Blackpool Road and Lea Road. The largest increase of 0.18µg/m^3 was predicted at HH_86 and HH_144 (both close to A5085 Blackpool Road). Some decreases were predicted at human receptors close to road links where reductions in traffic flow are forecast due to the operation of the Scheme (a decrease of up to 0.35µg/m^3). The largest decreases were predicted at human receptors close to Lea Road (i.e. receptors HH_111, HH_245, HH_280 and HH_313) and future committed development to the north east of the Scheme (i.e. Fut_Dev_7).

8.7.5 The impact on NO_2 concentrations at all receptors due to the operation of the Proposed Scheme, whether increases or decreases, is categorised as negligible.

8.7.6 The LAQM TG16 guidance (Defra, 2021a) states that exceedance of the 1-hour NO_2 AQO is unlikely where annual mean NO_2 concentrations are below 60µg/m^3. The annual mean NO_2 concentrations predicted at all receptors were below 60µg/m^3 and therefore, exceedance of the 1-hour NO_2 AQO is unlikely as a result of the Scheme.

8.7.7 All predicted total annual mean PM_{10} concentrations at human receptors were below 11µg/m^3 in the DM and DS scenarios and are well below the AQO of 40µg/m^3. The maximum predicted increase at any of the receptor points was 0.1 µg/m^3 and the maximum decrease was 0.1µg/m^3 (i.e. a change of 0% compared to the AQO). The impact is categorised as negligible at all receptors. The PM_{10} results for all modelled receptors are provided in Air Quality Dispersion Modelling in Appendix 8.2.

8.7.8 The LAQM TG16 guidance (Defra, 2021a) sets out a relationship which indicates that the 24-hour AQO for PM_{10} is likely to be met where annual

mean PM_{10} concentrations are 31.8µg/m^3 or less. The annual mean PM_{10} concentrations predicted at all receptors were well below 31.8µg/m^3 and therefore, exceedance of the 24-hour AQO is unlikely as a result of the Scheme.

8.7.9 All predicted total annual mean $PM_{2.5}$ concentrations at human receptors were a maximum of 8µg/m^3 in the DM and DS scenarios and are well below the AQO of 25µg/m^3. There was a predicted increase or decrease of no more than 0.1µg/m^3 at any of the receptors (i.e. a change of 0% compared to the AQO). The impact is categorised as negligible at all receptors. The $PM_{2.5}$ results for all modelled receptors are provided in Air Quality Dispersion Modelling in Appendix 8.2.

8.7.10 The maximum predicted annual mean NO_2 concentrations at the PCM receptors adjacent to the A5085 Blackpool Road in the DS 2024 scenario was 16.6µg/m^3, which is well within the Limit Value of 40µg/m^3. The modelling undertaken for this assessment is slightly higher than the Defra PCM modelling reported in Table 8.8 (a value of 12.6µg/m^3). The maximum predicted increase in annual mean NO_2 concentrations due to the Proposed Scheme at any of the PCM receptors was 0.3µg/m^3, which indicates that there are no compliance issues with the Limit Value for this road link.

Ecological Receptors

8.7.11 The predicted nitrogen deposition at key ecological receptors is set out in Table 8.14. The table shows the results for those receptors where the predicted change due to the Scheme is above 1% of the critical load, where the critical load is already exceeded due to the existing nitrogen deposition rates.

Table 8.14: Predicted annual mean nitrogen deposition rates at Lancaster Canal BHS

Receptor	Vegetation Type	Critical Load (kg N/ha/year)	Modelled Total Nitrogen Deposition (kg N /ha/year)		Change in Deposition (DS-DM)	
			DM 2024	DS 2024	kg N/ha/year	% Change Relative to Critical Load
D_LWS_0	Short	10	28.71	28.88	0.16	1.6%
	Tall	10	48.44	48.76	0.33	3.3%
D_LWS_1	Tall	10	46.45	46.60	0.14	1.4%
C_LWS_0	Tall	10	48.67	48.86	0.19	1.9%
D_DC_0	Tall	10	44.75	44.90	0.16	1.6%
D_DC_1	Tall	10	44.74	44.86	0.12	1.2%
D_DC_2	Tall	10	44.74	44.84	0.10	1.0%
E_DC_0	Tall	10	44.74	44.88	0.14	1.4%
F_DC_0	Tall	10	44.74	44.87	0.13	1.3%

8.7.12 The nitrogen deposition results in Table 8.14 show that further consideration is required by the project ecologist in relation to short vegetation at one receptor (D_LWS_0), a location immediately adjacent to the PWDR. At all other ecological receptor locations within the Lancaster Canal BHS, the predicted changes in nitrogen deposition for short vegetation were less than 1% of the critical load value and considered as not significant.

8.7.13 For tall vegetation, the predicted changes in nitrogen deposition were 1% or higher compared to the critical load value at eight receptor locations within the Lancaster Canal BHS (three locations adjacent to the PWDR and five locations adjacent to the proposed station access road including D_LWS_0). At all other ecological receptor locations within the Lancaster Canal BHS, the predicted changes in nitrogen deposition for tall vegetation were less than 1% of the critical load value and considered as not significant.

8.7.14 The receptor locations which were predicted to experience a change in nitrogen deposition of 1% or more in comparison to the critical load are shown in Figure 8.6 in Appendix 8.1. The significance of the predicted increase in nitrogen deposition at these locations is determined in Chapter 6 ;Ecology'. The full results of the nitrogen deposition modelling are set out in Air Quality Dispersion Modelling in Appendix 8.2.

8.8 Cumulative Effects

8.8.1 Regarding human receptors, there is unlikely to be inter-project cumulative effects beyond those already considered within the assessment. For example, the road traffic flows associated with the PWDR and other relevant committed developments were included within both the DM 2024 and DS 2024 scenarios. Therefore, the assessment of road traffic emissions during the operational phase includes the contribution from other projects.

8.8.2 For inter-project cumulative effects during the construction phase, the construction activities from any other nearby developments which occur

simultaneously would also be implementing appropriate dust mitigation and control in accordance with their respective planning permissions.

8.8.3 Any inter-project cumulative effects with regard to nitrogen deposition at the Lancaster Canal BHS (e.g. combined impacts from the operation of the PWDR and the Scheme) are discussed in Chapter 6 Ecology of this ES.

8.9 Mitigation

8.9.1 The good practice mitigation measures of relevance to air quality, which would be required to control dust emissions during the construction phase, would be agreed between the construction Contractor and relevant local planning authority via the Construction Environmental Management Plan (CEMP) or equivalent management plan such as a specific dust management plan. These would be developed and informed by the 'highly recommended' mitigation measures set out in the IAQM guidance based on the requirements for a medium risk site, and where these are relevant to the types of construction activities (IAQM, 2016). The full list of proposed measures to control dust emissions and monitor the effectiveness of the mitigation are specified within the CoCP. These would be used by the construction Contractor in developing the CEMP or equivalent plan. A summary of some of the measures are set out below:

- Site management measures including a procedure for recording and responding to dust complaints, recording incidents and actions taken to resolve these;
- Appropriate visual inspections and monitoring (on and off-site) to identify any issues that are causing dust emissions, the level of inspection and monitoring required would be based on the proximity and number of nearby sensitive locations such as residential properties or ecological sites (some aspects of this measure are listed as 'desirable' for a medium risk site in the IAQM guidance, but is proposed to be adopted in this case);

- In relation to operating machinery, ensure vehicles switch off engines when stationary and imposing appropriate speed limits on haul roads within the construction sites (although imposing speed limits is listed as 'desirable' in the IAQM guidance for a medium risk site it is proposed to be adopted in this case given the proximity of some receptors to the construction areas);
- Controlling the runoff of water or mud from the site;
- No bonfires or burning of waste materials;
- Good management of earthworks and excavated materials storage to prevent wind whipping (e.g. using water suppression during very windy conditions if site inspections identify dust emissions which could impact on nearby sensitive locations);
- Ensuring any materials brought on to site (e.g. sand and aggregates etc.) are stored so as not to be allowed to dry out unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Where there is a risk of dust nuisance, use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques;
- Ensuring an adequate water supply for effective dust/particulate matter suppression/mitigation;
- Where there is a risk of dust nuisance, covering of dust sources such as skips, where practicable;
- Where there is a risk of dust nuisance, control drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use of fine water sprays on such equipment wherever appropriate;

- Cleaning of surfaces where required, to prevent dust being blown out of the construction compound areas, especially when it is windy. Ensuring equipment is readily available on site to clean any dry spillages, clean up spillages as soon as reasonably practicable using wet cleaning methods where appropriate;
- Using water suppression on internal site haul roads where dust emissions are visible;
- Sheeting of vehicles containing dusty/friable materials when entering and leaving the site;
- If appropriate, implementing the use of a wheel washing system (with rumble grids) to dislodge accumulated dust and mud prior to leaving the site and cleaning of public highways in the vicinity of work areas to reduce trackout; and
- Use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary, any material tracked out of the site.

8.10 Residual Impacts

8.10.1 With the implementation of appropriate good practice dust mitigation measures during the construction phase of the Scheme, no significant residual air quality effects are predicted with regard to dust emissions from the construction compounds and construction areas.

8.10.2 Road traffic emissions during the construction phase would be negligible as changes in road traffic flows would be below the criteria for identifying the need for a more detailed assessment. These were screened out from further assessment and the effect on air quality at human or ecological receptors is not significant.

8.10.3 The assessment of road traffic emissions during the operational phase indicated that changes in air quality would be negligible and would represent a not significant effect on air quality at human receptors. No mitigation

measures were required for this aspect. Further consideration was required within the Chapter 6 'Ecology' for nitrogen deposition at the Lancaster Canal BHS.

8.10.4 Emissions from diesel trains were screened out from further assessment and the effect would be not significant at human or ecological receptors.

8.11 Summary

8.11.1 This chapter considered the potential air quality impacts and residual effects associated with the construction and operation of the Scheme at human and ecological receptors.

8.11.2 The assessment included detailed consideration of dust emissions during construction and road traffic emissions during operation. Emissions from road traffic during construction and from diesel trains were screened out from further assessment.

8.11.3 Appropriate good practice mitigation measures were identified to manage and control dust emissions during the construction phase based on the identified risk levels. With these measures in place, it was concluded that air quality effects would be not significant.

8.11.4 The assessment of road traffic emissions demonstrated that any changes in air quality at human receptor locations would be negligible, and therefore a not significant effect on air quality. The significance of increases in nitrogen deposition at the Lancaster Canal BHS is determined with Chapter 6 'Ecology'.

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