A57 Link Roads
TR010034
6.3 Environmental Statement
Chapter 5 Air Quality

APFP Regulation 5(2)(a)

Planning Act 2008 Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

January 2022

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A57 Link Roads Scheme

Development Consent Order 202[x]

6.3 ENVIRONMENTAL STATEMENT

CHAPTER 5 AIR QUALITY

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5. Air Quality

5.1 Introduction

5.1.1 This chapter provides the assessment of the air quality effects of the Scheme based on information available at Preliminary Design stage. It outlines the air quality study area, methodology for assessment, baseline conditions, and the potential impacts associated with the Scheme during construction and operation. Where relevant, it identifies mitigation measures recommended to mitigate any potentially significant adverse effects.

5.1.2 This chapter has been prepared by competent experts with relevant and appropriate experience. Details of the relevant experience and qualifications of the technical lead are as summarised in Appendix 4.1 (TR010034/APP/6.5).

5.2 Legislative and Policy Framework

Pollutants

5.2.1 The air pollutants of concern in the context of the air quality assessment of the Scheme are nitrogen dioxide (NO_2) and particulate matter (PM), as these pollutants of most concern in relation to road traffic emissions in England. Relevant human health air quality thresholds are provided in Table 5-1. The assessment also considers the nitrogen deposition effects of the Scheme on vegetation, given the presence of relevant ecological sites within the air quality study area. Appendix 5.1 (TR010034/APP/6.5) has further information on NO_2, NOx (oxides of nitrogen) and PM.

Air Quality Criteria

5.2.2 There are two sets of air quality legislation which include ambient air quality thresholds for the protection of public health that apply in England: legally binding, mandatory limit values originally set by the European Union (EU) Directive 2008/50/EC[1] on ambient air quality and cleaner air for Europe; and regulations implementing national air quality objectives as set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)[2] which local authorities are required to work towards achieving.

5.2.3 The EU (Withdrawal Agreement) Act 2020 sets out arrangement for implementing air quality limit values that are included in the EU Directive on ambient air quality and cleaner air for Europe (2008/50/EC), included in Air Quality Regulations (SI 2010 No.1001)[3] and as amended (SI 2016 No.1184)[4]. The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations

[redacted]

2019 (SI 2019 74)[5] and the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (SI 2020 1313)[6] amend the Air Quality Regulations (SI 2010 No.1001) to account for EU withdrawal. The AQS objectives are implemented in the Air Quality (England) Regulations 2000 (SI 2000/928)[7] and Air Quality (England) (Amendment) Regulations 2002 (SI 2002/3043)[8].

5.2.4 Further details on relevant legislation is given in Appendix 5.2 (TR010034/APP/6.5). Air quality thresholds[9] relevant to the air quality assessment are summarised in Table 5-1.

Table 5-1 Relevant Human Health Air Quality Thresholds

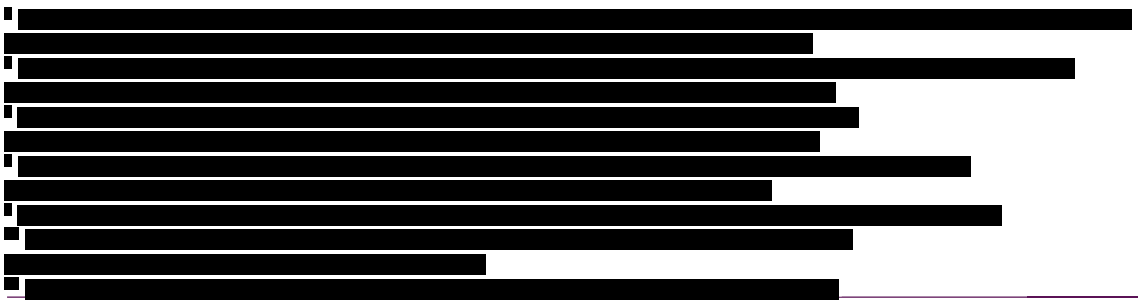
Pollutant	Air Quality Thresholds
NO_2	1-hour mean concentration should not exceed 200 µg/m^3 > 18 times a year
	Annual mean concentration should not exceed 40 µg/m^3
PM_{10}	24-hour mean concentration should not exceed 50µg/m^3 > 35 times a year
	Annual mean concentration should not exceed 40 µg/m^3
$PM_{2.5}$	Annual mean concentration should not exceed 25 µg/m^3

Ecological Criteria

5.2.5 Critical loads for nitrogen deposition have been set by the United Nations Economic Commission for Europe (UNECE)[10]. A critical load is a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur, according to present knowledge. Critical loads vary by type of habitat and species and are available from the Air Pollution Information System (APIS) website[11]. The critical load for deposition (eutrophication) is given as a range and is quoted in units of kilograms per hectare per year (kg/ha/year), however the lower limit of the range is typically used in assessment as a precautionary principle. Further information on critical loads used in the assessment is provided in Section 5.6.9.

Dust Deposition

5.2.6 There are no national standards or guidelines for dust deposition currently set for the UK, nor by the European Union or any international organisation. This is mainly due to the difficulty in setting a standard when dust impacts are a perceptual problem rather than related to health effects. Typically, assessments use an indicative threshold for the 'likelihood of complaint' for instance, in residential areas a dust deposition flux (as an average measured over a month



using a passive deposition gauge) of 200 mg/m^2/day or greater is accepted as best practice[12],[13].

Planning Policy and Framework

5.2.7 Legislation, regulatory and policy framework applicable to air quality are located in Appendix 5.2.

5.3 Assessment Methodology

5.3.1 The air quality assessment for the Scheme has been undertaken in line with DMRB LA 105 Air Quality[14], and consists of the following:

- Discussion of existing baseline conditions.
- Identification of sensitive receptors and Air Quality Management Areas (AQMA), and production of constraints maps.
- Qualitative assessment of the likely effect on air quality during construction.
- Assessment of the likely changes in air pollutant concentrations during operation of the Scheme at selected human health and ecological receptors. The assessment follows the 'detailed' assessment methodology outlined in DMRB guidance, and a dispersion model has been used to estimate NO_2 and particulate matter concentrations at selected receptors in the Scheme opening year (2025).
- Assessment of significance of the air quality effects in the Scheme opening year (2025), including an assessment of compliance with air quality limits values set within the EU Air Quality Directive, and now implemented through the EU (Withdrawal Agreement) Act 2020.
- Identification of the need for mitigation measures where appropriate.

5.3.2 Since the Preliminary Environmental Information Report (PEIR)[15] was completed which supported the Statutory Consultation on the Scheme (November 2020 – December 2020) the following key changes have occurred which has resulted in the air quality assessment being updated:

- The design of the Scheme has been revised. Full detail of the Scheme's history and its development is provided in the Assessment of alternatives chapter (Chapter 3 of this ES (TR010034/APP/6.3)).
- The Scheme specific traffic model has been revised and updated traffic data has been made available for the air quality assessment.
- Updated Defra air quality assessment tools and datasets, and updated Highways England speed band emission rates which account for the August 2020 Defra tools update, have become available.

[12] Vallack HW and Shilito DE (1998). Atmospheric Environment, Vol 32 (No.16) pp.2737-2744
[13] Institute of Air Quality Management, Guidance on Monitoring in the Vicinity of Demolition and Construction Sites. October 2018. Available at: h[redacted]

Existing Air Quality Information

5.3.3 A summary of existing air quality has been provided which updates the information previously collated for the PEIR. Existing air quality has been considered for the air quality study area (defined in section 5.5). The air quality study area considers an Affected Road Network (ARN) determined based on roads meeting the traffic screening criteria in the DMRB LA105 document and adjoining roads within 200 metres.

5.3.4 Information on existing ambient air quality (baseline conditions), and identification of potential air quality constraints to the Scheme have been determined through reference to the following sources:

- AQMA mapping[16]
- Defra Pollution Climate Mapping (PCM) model data (based on a 2018 reference year)[17].
- Local authority Local Air Quality Management (LAQM) reports including local monitoring data for the local authorities included in the study area[18,19].
- Data from Scheme specific air quality monitoring surveys.
- Mapped background pollutant concentrations for the UK available from Defra UK-Air website[20].
- Natural England (NE) Multi-Agency Geographic Information for the Countryside (MAGIC) website, to identify boundaries of national and internationally designated ecological sites[21].
- Woodland Trust Ancient Tree Inventory to identify veteran trees[22].
- Local wildlife site data provided by Derbyshire Biological Records Centre (DBRC) and Greater Manchester Records Centre (GMRC) to identify boundaries of locally designated ecological sites.
- Critical loads and habitat types obtained from the Air Pollution Information System (APIS)11 website.
- Ordnance Survey base mapping to identify locations of sensitive receptors (residential properties, schools and hospitals).

Constraints Map

5.3.5 A constraints map has been produced based on the latest available information and is shown in Figure 5.1 (TR010034/APP/6.4). The constraints map includes the following:

[16] Defra AQMA interactive map [Online]. Accessed March 2021 from [redacted]

- Roads meeting the traffic screening criteria and adjoining roads include in the air quality modelling
- A 200 m buffer of the roads meeting the traffic screening criteria and adjoining roads (air quality study area)
- Designated ecological site boundaries
- AQMA boundaries
- PCM model data links colour coded by exceedance of air quality threshold
- Locations of air quality monitoring sites colour coded by pollutant concentration

Given the number of modelled receptor locations, these are shown separately in Figure 5.2 (TR010034/APP/6.4).

Effects on Air Quality During Construction

5.3.6 A qualitative assessment of the effects on air quality from construction has been undertaken in line with DMRB LA 105, taking into account the nature of any proposed construction activities that have the potential to generate dust and the location of sensitive receptors.

5.3.7 The air quality study area for assessing potential impacts of construction dust during the construction phase is defined as the area within 200 m of the boundary of the footprint of the Scheme's construction activities.

5.3.8 For construction dust the number of sensitive receptors and their distance from the footprint of the construction works have been considered to determine the risk of potential construction dust impacts. Receptors locations are shown in Figure 5.3.

5.3.9 The effect of any construction traffic or disruption to traffic during construction has been considered with reference to the duration of construction works and the expected volume of construction vehicles. The overall duration of construction is expected to be 28 months which is greater than two years. Therefore, further consideration of construction phase traffic impacts has been undertaken.

5.3.10 The expected numbers of construction vehicle movements, duration of movements and construction vehicle advertised routes were screened against DMRB LA 105 traffic screening criteria. However, as the relevant criteria were not met (see section 5.8) then further quantitative assessment was not required.

5.3.11 Traffic management during construction is expected to be split into five phases. Further details can be found in section 2.6 of Chapter 2 (TR010034/APP/6.3), but in summary:

- Phase 1 - Autumn 2022 to Spring 2023 - Old Hall Road closed and traffic using Old Road diverted to Roe Cross Road.
- Phase 2 - Spring 2023 to Autumn 2023 - traffic restricted on Mottram Moor. Eastbound traffic would be reduced to one lane but westbound traffic would continue with two lanes.
- Phase 3 - Autumn 2023 to Spring 2024 - temporary realignment of Roe Cross Road with restrictions outside of peak hours for the M67 Junction 4 and Woolley Bridge for modifications/tie ins.

- Phase 4 - Spring 2024 to Autumn 2024 - Mottram Moor Junction completed with diversion of the traffic onto the new junction and conversion of the existing carriageway for access to the local properties.
- Phase 5 - Autumn 2024 To Spring 2025 – detrunking works to existing A57

5.3.12 No single phase of construction related traffic management is expected to be in place for more than 2 years, and the location of traffic management measures will change with each phase as construction of the Scheme progresses. As the duration of construction traffic management at any single location will be less than two years (each phase is approximately 6 months), following guidance further quantitative assessment has not been undertaken.

5.3.13 The effects of construction traffic are temporary, and the effects of any changes are unlikely to significantly affect air quality which is primarily focused on annual mean concentrations.

Effects on Air Quality During Operation

5.3.14 The air quality assessment has been undertaken following the relevant guidance given in DMRB LA 105, as well as Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management Technical Guidance (LAQM.TG16)[23].

5.3.15 The assessment has used the latest updated Defra air quality assessment tools and datasets (released 19 August 2020) and updated Highways England speed band emission rates which account for the August 2020 Defra tools update (4 September 2020).

5.3.16 The assessment has been undertaken for NOx, NO_2 and PM_{10}.

5.3.17 As per the DMRB LA 105 (paragraphs 2.21.2 and 2.21.3), only where PM_{10} concentrations exceed air quality thresholds in the base year (2018) should PM_{10} be included in the opening year (2025) assessment. As PM_{10} concentrations did not exceed air quality thresholds in the base year (see paragraph 5.3.37), no opening year assessment for PM_{10} concentrations has been undertaken.

5.3.18 As per the DMRB LA 105 (paragraph 2.21.4), there is no requirement to include $PM_{2.5}$ in the air quality assessment as: a) the UK currently meets its legal requirements for the achievement of the $PM_{2.5}$ air quality threshold and b) PM_{10} concentrations can be used to demonstrate that the project does not have an impact on the $PM_{2.5}$ air quality threshold. In addition, measured concentrations at monitoring sites within Greater Manchester show that there have been no exceedances of the UK AQS annual mean threshold of 25 µg/m^3 in recent years. The highest annual mean $PM_{2.5}$ concentration measured in Greater Manchester in 2018 was 12 µg/m^3, less than half the annual mean threshold[18]. Hence, $PM_{2.5}$ has not been included in the assessment as it is not considered to be at risk of exceeding current relevant air quality thresholds, either with or without the Scheme.

5.3.19 The key scenarios included in the assessment were:

- Base year (2018) – for model verification (NOx, NO_2 and PM_{10})

[23] Defra (2018) Local Air Quality Management Technical Guidance (TG16) February 2018. Retrieved 2021 from [redacted]

- Projected base year (2025) – for long term trends assessment (NOx and NO_2)
- Opening year (2025) for both without the Scheme (Do Minimum) and with the Scheme (Do Something) (NOx and NO_2)

5.3.20 Traffic data have been provided from a Scheme specific traffic model to enable the ARN for the air quality assessment to be determined. An overview of traffic information from the traffic assessment is presented in Appendix 2.1 (TR010034/APP/6.5).

5.3.21 The air quality study area for the operational phase has been defined as the area within 200 m of the roads meeting the traffic screening criteria within DMRB LA 105 (paragraph 2.1). The following traffic screening criteria have been applied based on the comparison between 'with Scheme' (Do Something (DS)) and 'without Scheme' (Do Minimum (DM)) traffic data as defined in DMRB LA 105:

- Road alignment will change by 5 m or more; or
- Daily traffic flows (two way) will change by 1,000 annual average daily traffic (AADT) or more; or
- Heavy Duty Vehicle (HDV) flows (two way) will change by 200 AADT or more; or
- A change in speed band.

5.3.22 The changes are applied to roads, rather than modelled links, and so where relevant are determined under two-way traffic conditions. The AADT and HDV criteria have been applied to two-way traffic data (the sum of the carriageways not individual carriageways). The speed band criteria have been applied to both one way and two-way traffic data and have considered speeds for all time weekday periods (AADT, AM (0700-1000), inter peak (1000-1600), PM (1600-1900) and off-peak (1900-0700).

Air Quality Modelling

5.3.23 The air quality assessment was undertaken using the CERC Atmospheric Dispersion Modelling System (ADMS) roads dispersion modelling software (ADMS Roads version 5.0.0.1, the latest at the time of the assessment).

5.3.24 The hourly emissions data input to the dispersion model have been estimated using:

- Highways England speed band emission factors (based on EFT v10.1.
- hourly flows of Light Duty Vehicles (LDV) and HDV - during AM, inter peak, PM and off-peak periods.
- traffic speeds input as a speed band category, determined in accordance with DMRB LA 105 (paragraph 2.29 – 2.38 and Appendix A) on speed banding.

5.3.25 In addition, information on road alignment, road width and local meteorological data (taken from Manchester Airport for the base year 2018) have been input into the dispersion model. Further details on modelling setup are in Appendix 5.3 (TR010034/APP/6.5).

Receptors

5.3.26 Representative receptors have been selected for the air quality assessment and include those closest to the roads that trigger the traffic change criteria (and therefore likely to be most affected by changes), as well as those likely to experience the highest total concentrations in areas where there is the potential for exceedances of air quality thresholds without and with the Scheme.

5.3.27 Sensitive human health and ecological receptors for the purposes of air quality assessment are defined in DMRB LA 105 (paragraph 2.18 and 2.25) as:

- Residential properties, locations of susceptible populations e.g. schools, hospitals and care homes for the elderly, or any other location where a member of the public may be exposed to an air pollutant for the relevant regulated time period.
- Designated ecological sites with statutory designations (special protection areas (SPA), special areas of conservation (SAC), sites of special scientific interest (SSSI)) and with non-statutory designations (local nature reserves (LNR), local wildlife sites (LWS), nature improvement areas (NIA), ancient woodland (AW) and veteran trees) containing habitats sensitive to nitrogen deposition.

5.3.28 Ecological receptors representing designated sites that contain habitats sensitive to nitrogen deposition have been included in the air quality assessment. These include the following ecological sites with national and / or international statutory designations:

- South Pennine Moors (SAC)
- Peak District Moors (SPA)
- Dark Peak (SSSI)
- Huddersfield Narrow Canal (SSSI)[24]

5.3.29 Transect receptor points at 10 m intervals up to 200 m from the road have been included for national and international sites with statutory designations (SPA, SAC, and SSSI). A single receptor point at the closest location to the road has been included for the local sites with non-statutory designations (LNR, LWS, Site of Biological Importance (SBI), NIA and AW), as agreed by the Applicant. If the results for these single worst-case receptor points suggested further investigation of change in nitrogen deposition was required, then additional transect points were added.

5.3.30 Receptors details are provided in Appendix 5.3 and receptor locations are shown in Figure 5.2.

Traffic Conditions

5.3.31 Traffic conditions vary throughout the course of a day and a 24-hour profile has been applied in the model to improve the estimation of vehicle emissions in each hour of the year, based on am, inter peak, pm and off peak period traffic flows. The ADMS-Roads model has been set up with a unit emission rate entered into

[24] The Citation includes "Unimproved and semi-improved neutral and acidic grassland, scattered shrubs and areas of bracken occur along the towpath and canal banks." On this basis the area within 200m of the ARN was included in the assessment – should the assessment show any concerns, the location of these Nitrogen sensitive habitat sub-types would be investigated.

the model for each road link and a time varying emissions file created containing the estimated emissions for each hour.

Background Concentrations

5.3.32 The output from the dispersion model has been used to provide estimates of the contribution from road traffic emissions to annual mean concentrations of NOx and PM_{10} at discrete receptors. These concentrations must then be combined with estimates of background concentrations, to account for other sources of air pollution, to derive total annual mean concentrations for comparison with air quality thresholds (NO_2 and PM_{10}).

5.3.33 Background concentrations have been derived from Defra's background maps[20] (2018 reference year) and compared with monitored data at background sites within and around the air quality study area for the Scheme, to ensure the mapped estimates are appropriate. The comparison was undertaken for NO_2 and PM_{10}. The comparison showed that at the majority of relevant sites, mapped estimates of annual mean NO_2 were within 30% of the monitored concentrations[25] with no systematic bias exhibited in the comparisons. On that basis, following guidance Defra annual mean NO_2 background concentrations have been taken as suitable to use in the assessment without further adjustment. For PM_{10}, the comparison showed that at the majority of relevant sites, mapped estimates of annual mean PM_{10} were within 30% of the monitored concentrations, but with some tendency for mapped estimates to underpredict. However, as the majority of mapped estimates are within 30% then (following guidance) no adjustment has been applied. Results of the comparisons are shown in Appendix 5.3 Section 1.3 (Table A-3 and Table A-4).

5.3.34 The background sector removal process within Defra LAQM.TG(16) has been followed to prevent "double counting" of road contributions. Motorway, trunk road and A road in square sources were removed from the total background NO_2 concentration, using the NO_2 Adjustment for NOx sector removal tool v8.0, August 2020. For PM_{10} motorway, trunk road and A road in square sources were also removed by subtracting directly from the total background PM_{10} concentration.

NOx to NO_2 Conversion

5.3.35 Annual mean concentrations of NO_2 were derived from modelled NOx concentrations using the Defra NOx to NO_2 calculator (version 8.1, August 2020). The traffic mix and local authority data used for the conversion have been selected according to the locations of the receptors.

Verification

5.3.36 The annual mean NO_2 concentrations for the base year have been verified by means of comparison against available ratified monitoring data. The modelled road NOx concentrations were adjusted where appropriate, with reference to the methodology set out in Defra's LAQM.TG(16). Once adjusted, the total NO_2 concentrations have been considered to have acceptable model performance in

[25] 30% is the relevant data quality objective for the Defra background maps. Ricardo Energy & Environment, on behalf of Defra (2020), Technical report on UK supplementary assessment under The Air Quality Directive (2008/50/EC), The Air Quality Framework Directive (96/62/EC) and Fourth Daughter Directive (2004/107/EC) for 2018. Retrieved April 2021 from: [redacted]

accordance with Defra's LAQM.TG(16). The model adjustment factors are presented in Appendix 5.3.

5.3.37 An adjustment factor for PM_{10} has been derived using a single continuous monitoring site, as this was the only available PM_{10} monitoring in the air quality study area for the Scheme. The modelled road PM_{10} concentrations were adjusted where appropriate, with reference to the methodology set out in Defra's LAQM.TG(16).

Trends

5.3.38 An assessment has been undertaken in accordance with DMRB LA 105 (paragraph 2.47 – 2.55) on the assessment of future NOx and NO_2 projections on Long Term Trends (LTT), to account for future year uncertainties in emissions. Air quality assessments following the latest Defra emission factors have been considered to be overly optimistic in some cases. An additional scenario (projected base year) is required to enable the gap analysis to be completed. The projected base year scenario is modelled using the base year traffic data with the opening year vehicle emission factors and background concentrations. The results for the opening year are then adjusted to represent the observed long-term trend profile.

5.3.39 The Highways England Long Term Trend Euro 6 (LTTE6) projection factors have been applied to modelling results for annual mean total NO_2 at human health receptors and annual mean total NOx and road NO_2 at ecological receptors.

5.3.40 Analysis of trends in monitored annual mean NO_2 concentrations has been undertaken to confirm the use of the LTTE6 projection factors is robust. Further details are provided in Appendix 5.3.

Compliance with Limit Values

5.3.41 Evaluation of compliance with limit values has been undertaken in accordance with DMRB LA 105 (paragraphs 2.64 – 2.87), using the latest baseline scenario from Defra's PCM model (2018 reference year).

5.3.42 Where roads within the extent of the ARN are identified, Defra PCM model receptors were included at the following locations to inform the compliance risk assessment:

- The nearest qualifying feature along each PCM link where concentrations are highest.
- A point 4 m from the running lane in the same general location as the qualifying feature for comparison against the national PCM modelled point.

5.3.43 Qualifying features represent locations which meet Defra's interpretation of the Air Quality Directive and include all areas of public access (footpaths, parks, pavements) and sensitive receptors (residential properties, schools, hospitals and elderly care homes), within 15m of the kerbside, but not within 25m of a junction. Receptors details are provided in Appendix 5.5 and receptor locations are shown in Figure 5.4.

Comparison with Short-Term Objectives

5.3.44 Commentary on potential exceedances of the 1-hour mean NO_2 AQS objective is possible with reference to Defra's LAQM.TG(16). The guidance suggests that if

annual mean concentrations of NO_2 do not exceed 60 µg/m^3 then it is unlikely that hourly mean concentrations would exceed the objective for the 1-hour mean.

5.3.45 Defra's LAQM.TG(16) was also used to derive the number of exceedances of the 24-hour mean PM_{10} AQS objective, of which 35 are permitted. The method is based on the relationship between the number of 24-hour exceedances of 50 µg/m^3 and the annual mean concentration derived from UK Automatic Urban Rural Network Sites where. This is described in the equation below:

Equation 5.1 – Calculation of PM_{10} 24-hour mean exceedances

*Number of exceedances of 24-hour mean of 50 µg/m^3 = -18.5 + 0.00145 *a^3 + (206/a)*

Where 'a' = total annual mean PM_{10} concentration

5.3.46 Where the total annual mean PM_{10} concentrations are below 14.5 µg/m^3 there is assumed to be no exceedances of the 24-hour mean of 50 µg/m^3.

Designated Habitats Assessment

5.3.47 Assessment of potential effects of changes in road NOx concentrations on nitrogen deposition rates has been undertaken at identified sensitive ecological designations, in accordance with DMRB LA 105 (paragraph 2.43 – 2.46). The background nitrogen deposition rate at each designated site has been obtained from the APIS website. Relevant habitat types have been obtained from APIS where available or in consultation with a competent expert for biodiversity. Critical loads were obtained from APIS. Habitat types and critical loads are shown in Appendix 5.3 Section 1.5 (Table A-12 for sites with national and international statutory designation and Table A-13 for local non statutory designations). Further details on the assessment methodology for designated habitats are provided in Appendix 5.3.

Magnitude of Impact Classification

5.3.48 Descriptors for magnitude of change in ambient concentrations of NO_2 and PM_{10} are provided in DMRB LA 105 (Table 2.91). Only those receptors predicted to exceed relevant air quality thresholds have been considered when determining significance for human health. The changes in magnitude descriptors depend on the change in concentration relative to the air quality thresholds shown in Table 5-2. Where the change in concentrations is 1% or less of the objective (≤0.4 µg/m^3) this is considered an imperceptible change.

Table 5-2: Magnitude of Change Criteria for Air Quality Human Health Receptors

Magnitude of change in concentration	Value of change in annual mean NO_2 and PM_{10}
Large (>4 µg/m^3)	Greater than 10% of the air quality objective (4 µg/m^3)
Medium (>2 µg/m^3)	Greater than 5% of the air quality objective (2 µg/m^3)
Small (>0.4 µg/m^3)	Greater than 1% of the objective (0.4 µg/m^3)

Table source :DMRB LA 105 (Table 2.91).

Significance

5.3.49 Evaluation of the significance of the effect of the Scheme on human health has been undertaken in accordance with DMRB LA 105 (paragraph 2.89 to 2.96). The number of receptors that exceed relevant air quality thresholds and fall within the 'small', 'medium' and 'large' magnitude of change categories has been calculated and compared to the guidelines presented in Table 5-3.

5.3.50 Significant air quality effects are only identified for receptors where AQS objectives are exceeded with or without the Scheme. Where the changes in concentrations are less than 1% of the AQS objective (i.e. equal to or less than 0.4 µg/m^3) then the change at these receptors is considered to be 'imperceptible' and can be scoped out of the judgement on significance.

Table 5-3: Guideline Band for Number of Receptors Constituting a Significant Effect for Air Quality

Magnitude of change in concentration	Number of receptors with	
	Worsening of air quality objective already above objective or creation of a new exceedance	Improvement of an air quality objective already above objective or the removal of an existing exceedance
Large (>4 µg/m^3)	1 to 10	1 to 10
Medium (>2 µg/m^3)	10 to 30	10 to 30
Small (>0.4 µg/m^3)	30 to 60	30 to 60

Table Source: DMRB LA 105 (Table 2.92N)

5.3.51 Evaluation of the significance of the effect of the Scheme on designated habitats has been undertaken in accordance with DMRB LA 105 (paragraph 2.97 to 2.102, and Figure 2.98). Where the lower critical load of the nitrogen deposition for the relevant habitat is exceeded, and the change in nitrogen deposition is expected to be greater than 1% of the lower critical load then the magnitude of change of the nitrogen deposition was considered further. Where the change in nitrogen deposition was greater than 1% of the lower critical load then the significance of air quality impacts on designated habitats has been assessed by a competent expert for biodiversity.

5.3.52 The overall evaluation of the significance of the effect has been undertaken in accordance with DMRB LA 105 (paragraph 2.103 to 2.106) based on a combination of the effects of the Scheme on human health and designated habitats and the outcome of the compliance risk assessment.

Greater Manchester Clean Air Zone

5.3.53 Greater Manchester intends to implement a Clean Air Zone (CAZ) which will cover parts of the air quality study area. The CAZ covers the administrative boundary of Greater Manchester, which includes Tameside Metropolitan Borough Council. This will be a 'category C' CAZ which requires buses, taxis, lorries and vans to meet certain emission standards to drive within the zone. The CAZ excludes the strategic road network, so vehicles on the A57 itself will not be required to be compliant, but vehicles on other roads included in the air quality

study area within the CAZ boundary will be required to be compliant. The CAZ is due to be in place from Spring 2022 until mid-2026[26].

5.3.54 The CAZ has been developed in parallel with the Scheme, so it was not possible to consider the CAZ within the Scheme traffic and air quality modelling. However, the air quality assessment undertaken, can be considered a worst case representation as it excludes the CAZ.

5.4 Assessment Assumptions and Limitations

5.4.1 Any air quality model has inherent areas of uncertainty, including:

- The traffic data used in the air quality model
- The suitability of emissions data
- Simplifications in model algorithms and empirical relationships that are used to simulate complex physical and chemical processes in the atmosphere.
- The suitability of background concentrations
- The suitability of meteorological data

5.4.2 Uncertainty associated with traffic data has been minimised by using a validated traffic model with data only used from within the defined traffic reliability area (TRA) (all links which meet the DMRB LA 105 traffic change screening criteria are located within the TRA).

5.4.3 Uncertainties associated with emissions data have been minimised by using the most up to date speed-band emission factors available at the time the air quality modelling was undertaken, and by using Highways England LTTE6 projection factors as referenced in DMRB LA 105 (paragraph 2.47 – 2.55).

5.4.4 Another uncertainty is using historical meteorological data to estimate future concentrations. The key limiting assumption is that conditions in the future will be the same as in the past. In line with best practice, the base year meteorology (as used in the model verification and adjustment process) has been used in future year modelling to allow any adjustments to be applied in future cases.

5.4.5 Any air quality model has inherent areas of uncertainty, including: the traffic data used in the air quality model, the suitability of emissions data, background concentrations, and meteorological data and simplifications in model algorithms and empirical relationships used to simulate complex physical and chemical processes in the atmosphere. Uncertainty associated with these parameters has been minimised by using validated models and data and following best practice. The air quality model used in the assessment does not include terrain, however specific conditions (such as valleys) have been addressed through localised model validation zones.

5.4.6 Cumulative effects on air quality could occur as a result of cumulative traffic changes caused by the Scheme combined with other schemes and as a result of new developments. The consideration of cumulative effects for the Scheme is driven by the traffic modelling and its assumptions regarding other schemes and developments. It is assumed that all relevant committed developments are included in the traffic model and so inherent in the data provided for the air

[26] Clean Air Greater Manchester (2020). Greater Manchester Clean Air Plan Consultation Document, October 2020. Retrieved 2020 from [redacted]

quality assessment (refer to the Cumulative effects chapter (Chapter 15)). Further information on this is available in the Transport Assessment Report (APP-185).

5.5 Study Area

5.5.1 The air quality study area was defined in accordance with DMRB LA 105:

- For the potential effects of construction dust, the study area was defined as the area within 200 m of the construction site (DMRB LA 105 paragraph 2.57).
- For the potential effects of traffic emissions during the operational phase the study area was determined in accordance with DMRB LA 105 (paragraph 2.1-2.8). The ARN is based on all roads meeting the traffic screening criteria and adjoining roads within 200 m. An assessment is required for air quality where there are receptors identified within 200 m of the roads that trigger the traffic screening criteria.

5.5.2 The ARN is located within the administrative boundaries of Tameside Metropolitan Borough Council (TMBC) and Stockport Metropolitan Borough Council (SMBC), both of which are part of Greater Manchester Combined Authority (GMCA); as well as High Peak Borough Council (HPBC).

5.5.3 The study area for air quality during operation is provided in Figure 5.2, which shows sensitive human health and ecological receptors within 200 m of the roads that trigger the screening criteria. The study area for construction dust is provided for the Scheme in Figure 5.3 (TR010034/APP/6.4).

5.6 Baseline Conditions

Local Air Quality Management

Air Quality Management Areas (AQMA)

5.6.1 The Greater Manchester AQMA and Glossop AQMA are within the air quality study area. The Greater Manchester AQMA has been jointly designated by local authorities within Greater Manchester and includes areas within the TMBC authority area.

5.6.2 HPBC have designated AQMA's in the Dinting Vale/Glossop area and also in the Tintwistle area. The Tintwistle AQMA is not within the ARN but has been included for information in Table 5-4 and Figure 5.1 due to its proximity to the ARN.

5.6.3 Details of the AQMAs are provided in Table 5-4 and their boundaries are illustrated in Figure 5.1.

Table 5-4: Description of AQMAs

Local Authority	Name	Air Quality Threshold Exceeded	Description
Greater Manchester Combined Authority	Greater Manchester AQMA	NO_2 annual mean	A new single AQMA covering all 10 local authorities in Greater Manchester
High Peak Borough Council	AQMA No.1 Tintwistle*	NO_2 annual mean	An area encompassing a small number of houses located between the A628 and Old Road.
High Peak Borough Council	Glossop AQMA*	NO_2 annual mean	An area encompassing the properties between the A626 Glossop Road/A57 Dinting Vale Junction and the A57 Dinting Vale/Dinting Lane Junction

Table Source: https://uk-air.DEFRA.gov.uk/aqma/maps/; HPBC, 2018 and 2019 ASR (Sept.2019); HPBC Declaration of an Air Quality Management Area on part of the A57, Dinting Vale, Glossop (December 4, 2019). * indicative boundary included in Figure 5.1.

Defra Pollution Climate Mapping (PCM)

5.6.4 Defra's PCM model provides projections of roadside NO_2 concentrations across the UK for the years 2018 to 2030 for the development of the UK plan for tackling roadside nitrogen dioxide concentrations and annual reporting regarding compliance with the limit values. The modelled roadside concentration comprises a background component together with a roadside increment.

5.6.5 Based on the PCM model data (2018 reference year), there are a number of PCM links in the air quality study area. As such, a compliance risk assessment in accordance with DMRB LA 105 (paragraph 2.64 – 2.88) has been undertaken. Locations of PCM links are shown in Figure 5.1.

5.6.6 Defra PCM model data (2018 reference year) indicates that there are no roadside exceedances of the annual mean NO_2 limit value in the air quality study area in either the base year of 2018 or the Scheme opening year of 2025. Defra PCM model data for links within the air quality study area are presented in Appendix 5.4 (TR010034/APP/6.5) Section 1.1 (Table A-1).

Background Mapping

5.6.7 Estimates of current and future year background pollutant concentrations in the UK are available on the Defra UK-Air website. The background estimates, which are a combination of measured and modelled data, are available for each one-kilometre grid square throughout the UK for a reference year background, which is the basis for the future year estimates up to 2030. For this assessment background mapping with a 2018 reference year20 has been used (see paragraph 5.3.33). These background estimates include contributions from all source sectors, e.g. road transport, industry, and domestic and commercial heating systems.

5.6.8 Mapped background annual mean concentrations of NO_2 and PM_{10} for the grid squares within the air quality study area for the air quality model base year of 2018 were below relevant air quality thresholds (5.7 µg/m^3 to 25.0 µg/m^3 and 8.0 µg/m^3 to 14.7 µg/m^3 for NO_2 and PM_{10} respectively).

Designated Habitats

Air Pollution Information System (APIS) Background Mapping

5.6.9 The background nitrogen deposition rate and habitat critical loads for the relevant sensitive habitats (defined in DMRB LA 105) have been obtained from the APIS website. The 2016-2018 background nitrogen deposition rate has been used unadjusted, as a conservative approach, for the Scheme opening year of 2025. Where habitat type was not available on the APIS website, this information has been determined in consultation with a competent expert for biodiversity and a relevant critical load selected from the APIS website. Data is provided in Appendix 5.3 Section 1.5.

Air Quality Monitoring

5.6.10 Air quality monitoring data from continuous monitoring stations (CMS) and passive diffusion tubes (DT) in the air quality study area are detailed below.

Scheme Specific Air Quality Monitoring

5.6.11 Previous scheme specific diffusion tube monitoring surveys was conducted covering the period between 10/12/2015 and 13/12/2016 and a 6-month period between 21/06/2016 and 12/12/2016 (Mottram Moor Link Road (MMLR) survey). In addition, the Applicant also carried monitoring using diffusion tubes between 08/08/2013 and 20/04/2015 at several sites throughout the air quality study area as part of baseline studies for another Scheme (M60 junction 24 to junction 27 Smart Motorway Project survey). Details of the concentrations measured at scheme specific survey locations within the air quality study area of the Scheme are provided in Table 5-5 for previous surveys and the locations are shown in Figure 5.1. The results have been annualised and adjusted to 2018 for use in the model verification.

Table 5-5: Previous Scheme Specific Survey Diffusion Tube Monitoring Results (NO_2) for Air Quality Study Area

Site ID	X	Y	Survey Year Data Capture	Survey Period Mean (Bias Adjusted) ^ (µg/m^3)	2018 Annual Mean* (Annualised and Adjusted) (µg/m^3)
MMLR Survey (Survey Period Mean Dec 2015 to Dec 2016)					
MMLR_001	394961	395192	92%	30.2	25.4
MMLR_002	395291	395256	92%	24.3	21.3
MMLR_003	395526	395405	100%	23.5	20.3
MMLR_006	395369	395062	100%	29.4	25.3
MMLR_007	395621	395230	92%	29.3	25.8
MMLR_008	395724	395310	100%	25.7	22.1

Site ID	X	Y	Survey Year Data Capture	Survey Period Mean (Bias Adjusted) ^ (µg/m^3)	2018 Annual Mean* (Annualised and Adjusted) (µg/m^3)
MMLR_009	395907	395310	100%	24.0	20.6
MMLR_010	398357	395315	100%	27.4	23.6
MMLR_011	398235	395274	100%	26.6	22.9
MMLR_012	398900	395503	100%	**47.5**	**40.8**
MMLR_013	399291	395634	100%	**58.9**	**50.7**
MMLR_014	399315	395639	92%	**89.5**	**74.2**
MMLR_015	399305	395625	100%	**69.9**	**60.1**
MMLR_016	399300	395652	92%	**42.6**	35.9
MMLR_017	399206	395915	100%	28.6	24.6
MMLR_018	399192	395948	100%	26.5	22.8
MMLR_019	399691	395821	100%	**41.0**	35.3
MMLR_020	398451	396636	100%	39.1	33.7
MMLR_021	398148	396838	100%	38.4	33.0
MMLR_022	397449	397210	83%	31.3	28.0
MMLR_024	400101	395942	100%	**48.7**	**41.9**
MMLR_025	400364	396006	92%	**59.6**	**50.3**
MMLR_026	400948	395800	75%	**45.1**	**42.0**
MMLR_027	401756	394528	100%	**55.8**	**48.0**
MMLR_029	400683	396288	58%	**49.2**	**45.8**
MMLR_030	401076	396674	92%	30.6	26.8
MMLR_031	401568	397235	83%	38.9	36.8
MMLR_032	401944	397290	100%	39.0	33.6
MMLR_036	400622	395977	83%	20.6	18.9
MMLR_044	400491	396117	100%	**46.5**	**40.0**
MMLR_045	397842	396691	100%	18.8	16.2
MMLR_046	401550	395144	92%	29.0	25.6
MMLR_047	401258	395132	92%	21.1	19.7
MMLR_048	401109	395390	100%	27.1	23.3
MMLR_049	401023	395672	83%	39.0	33.9
MMLR_050	400744	395788	100%	37.9	32.6
MMLR_051	400495	395917	92%	**47.3**	39.6
MMLR_052	400531	396056	67%	21.4	18.2
MMLR_054	400022	395909	100%	**46.1**	39.7

Site ID	X	Y	Survey Year Data Capture	Survey Period Mean (Bias Adjusted) ^ (µg/m^3)	2018 Annual Mean* (Annualised and Adjusted) (µg/m^3)
MMLR_056	399049	396280	100%	15.2	13.1
MMLR_057	399876	395862	100%	**43.3**	37.3
MMLR_062	401235	396999	100%	34.6	29.8
MMLR_063	396071	395454	100%	20.5	17.6
MMLR_064	399412	395739	100%	**75.7**	**65.2**
MMLR_065	398825	396336	100%	29.8	25.7
MMLR_067	400701	395902	100%	18.4	15.8
MMLR_068	401318	397017	92%	20.8	19.4
MMLR_069ABC	399718	395804	83%	**53.5**	**47.6**
MMLR Survey (Survey Period Mean Jun 2016 to Dec 2016)					
MMLR_071	399397	395833	50%	**40.8**	37.7
MMLR_072	399323	395861	50%	**41.0**	37.9
MMLR_073	399652	395814	50%	**59.0**	**54.6**
MMLR_074	399801	395847	33%	39.9	**51.1**
MMLR_075	399923	395856	50%	**61.1**	**56.6**
M60 Junction 24 to 27 Smart Motorway Project Survey (Survey Period Mean Aug 2014 to Apr 2015)					
M60J24J27_016_0813	391583	395509	100%	**46.2**	37.8
M60J24J27_017_0813	390962	395494	100%	31.3	25.6
M60J24J27_018_0813	390822	395597	100%	38.8	31.7
M60J24J27_019_0813	391007	395062	92%	27.0	22.2
M60J24J27_021_0813	392010	391736.5	100%	**50.2**	**41.1**
M60J24J27_022_0813	392066.7	391643.8	100%	**52.2**	**42.8**
M60J24J27_023_0813	391977.6	391593.8	92%	36.8	30.4
For MMLR survey - ^National bias adjustment factor applied = 0.91. *Annualisation Factor = 0.83 – 1.53 dependant on data capture For M60 Survey - ^National bias adjustment factor applied =0.83, *Annualisation Factor=0.82					
Values in **bold** exceed the annual mean AQS objective					

5.6.12 The MMLR survey data indicates that there were expected to be exceedances of the annual mean NO_2 AQS objective in 2018:

- Adjacent to the A57 through Mottram (MMLR_012, MMLR_013, MMLR_14, MMLR_015, MMLR_024, MMLR_064, MMLR_069ABC, MMLR_073 to MMLR_075).
- Adjacent to the A628 in Hollingworth (MMLR_029, MMLR_44 equals the objective).

- Adjacent to Woolley Lane (MMLR_025 and MMLR_026).
- At the junction of the A57 Dinting Vale and A626 Glossop Road (Dinting Vale Junction) (MMLR_027).

5.6.13 The highest annualised 2018 annual mean NO_2 concentration of 74.2 µg/m^3 is located at the Mottram Moor Junction (MMLR_014).

5.6.14 There are two exceedances of the annual mean NO_2 AQS objective in 2018 for the M60 junction 24 to junction 27 survey locations M60J24J27_021 and M60J24J27_022 adjacent to the junction of A560 and Stockport Road West.

5.6.15 Monitoring locations with exceedances are shown in Figure 5.1.

5.6.16 Defra's LAQM.TG(16) guidance suggests that if annual mean concentrations of NO_2 exceeds 60 µg/m^3 then it is likely that hourly mean concentrations would exceed the NO_2 AQS objective for the 1-hour mean. There are three sites that exceed 60 µg/m^3 (MMLR_014, MMLR_015 and MMLR_064 - all adjacent to the A57 through Mottram).

5.6.17 A further scheme specific diffusion tube monitoring survey commenced on 18/08/2018 (TPU survey). The survey is ongoing and covers some additional sites from those included in the MMLR survey. Details of the sites included in the TPU survey that are comparable to previous MMLR survey locations are provided in Appendix 5.4 Section 1.2. The survey was paused between March 2020 and September 2020 due to COVID-19 restrictions. The monitoring locations are predominantly roadside.

5.6.18 Details of the concentrations measured at scheme specific survey locations within the air quality study area of the Scheme are provided in Table 5-5 for and the locations are shown in Figure 5.1. Survey period means (January 2019 to December 2019) and the 2018 annualised means used for the model verification are presented in Table 5-6. Results for the full survey period for all locations included in the TPU survey are provided in Appendix 5.4 Section 1.2.

5.6.19 An adjustment factor of less than 1 has been applied to the survey period mean reflecting a nationwide trend in increased annual mean NO_2 concentrations between 2018 and 2019. Annualisation has been undertaken in line with Defra's LAQM.TG16 guidance which advises the use of background CMS for this process. Background CMS sites used in the adjustment measured higher annual mean concentrations in 2019 than in 2018. This is also true of all background CMS sites in the Greater Manchester area. This reflects a notably low wind speed year in 2019 with analysis of meteorological data from Manchester Airport indicating that 2019 had the lowest average windspeed and most calms days in the last 10 years. Sites included in the TPU survey did not typically have 100% data capture, which also impacted the factor applied to adjust to 2018.

Table 5-6 - Scheme Specific TPU Diffusion Tube Monitoring Results (NO_2) for Air Quality Study Area

Site ID	X	Y	Survey Year Data Capture	Survey Period Mean (Bias Adjusted) ^ (µg/m^3)	2018 Annual Mean* (Annualised) (µg/m^3)
TPU1	401756	394528	100%	**45.1**	**43.0**
TPU16	401764	394507	100%	37.1	35.5
TPU17	401796	394509	83%	**44.0**	**43.5**
TPU20	401823	394503	92%	**43.1**	**41.4**
TPU29	400744	395787	25%	32.8	25.9
TPU31	400368	396012	25%	**49.7**	39.0
TPU32	400032	395915	25%	**40.6**	32.2
TPU33	399168	395938	25%	30.6	23.9
TPU34	399415	395741	25%	**59.8**	**47.2**
TPU35	399289	395635	25%	**49.0**	38.9
TPU36	399321	395427	25%	31.2	24.7
TPU38	401656	395107	25%	23.3	18.1
TPU42	401930	394439	25%	34.4	27.4
^ Survey period mean calculated for January 2019 to December 2019. National bias adjustment factor applied = 0.93. *Annualisation Factor = 0.79-0.99 depending on data capture.					
Values in **bold** exceed the annual mean AQS objective					

5.6.20 For the TPU survey the annualised and adjusted 2018 annual mean concentrations exceed the annual mean AQS objective for NO_2 at the Dinting Vale Junction (TPU1, TPU17 and TPU20) and adjacent to the A57 Mottram Moor (TPU34). No annual mean concentrations exceed 60 µg/m^3 and therefore hourly mean concentrations are unlikely to exceed the NO_2 AQS objective for the 1-hour mean at the TPU monitoring sites.

Local Authority Monitoring

5.6.21 TMBC undertakes both automatic and diffusion tube monitoring at locations within the air quality study area. Historical annual mean NO_2 concentrations at CMS and diffusion tube locations within the air quality study area are shown in Table 5-7 and in Figure 5.1. TMBC undertakes monitoring at other sites within their boundary, but at locations outside of the air quality study area for the Scheme. This data is available in reports18 the local authority produce under their LAQM duties.

Table 5-7: Annual Mean NO_2 Concentrations at Tameside Monitoring Sites

Site ID	X	Y	Site Type	Annual Mean NO_2 Concentration ($\mu g/m^3$)				
				2015	2016	2017	2018	2019
TAM 1 (CMS)	399719	395804	UT	**54.0**	**49.0**	**44.0**	**43.0**	**40.0**
T 3	391000	395130	UB	30.9	31.9	29.3	28.0	28.5
T 11	400390	396025	UT	**61.1**	**62.8**	**58.4**	**56.7**	**55.1**
T 18	391970	395521	UT	**45.7**	**49.3**	**47.8**	**41.6**	**43.5**
T 19	392477	395506	UT	37.8	39.5	33.1	36.0	37.9
T 20	394610	395102	UT	37.0	**41.8**	39.5	**40.1**	37.1
T 21	400423	395965	UT	**53.4**	**56.1**	**53.8**	**50.9**	**46.8**
T 45, 46 and 47 (TAM 1 co-location)	399719	395805	UT	-	**63.2**	**57.0**	**55.9**	**54.4**
T 48	392699	395731	UT	-	30.1	35.0	30.3	32.8
UT=urban traffic, UB=Urban Background; concentrations have been annualised and bias adjusted where necessary by GMCA.								
Values in **bold** exceed the AQS objective; '-' = monitoring data not available								

Table source: 2018 ASR (Greater Manchester Combined Authority), June 201918. Grid reference for T 3 amended due to error in values reported in ASR.

5.6.22 The annual mean NO_2 concentration recorded at Mottram Moor CMS (TAM 1) was 40.0 $\mu g/m^3$ in 2019, which equals the annual mean NO_2 AQS objective. The CMS has recorded exceedances of the annual mean NO_2 AQS objective in previous years. The annual mean concentrations between 2015 and 2019 show a decreasing trend at the site. There have been no exceedances of the NO_2 hourly mean objective at the site between 2015 and 2019.

5.6.23 The 2019 diffusion tube monitoring data identified four locations exceeding the NO_2 annual mean AQS objective within the study area; adjacent to the A57 in Denton (T18) and in Mottram (T45, T46, T47) and adjacent to the A628 (T11) and Woolley Lane (T21).

5.6.24 The TMBC CMS site (TAM1) also measures PM_{10} concentrations (Table 5-8). Concentrations were well below the annual mean objective of 40 $\mu g/m^3$ at this site between 2015 and 2019. There were a maximum of 7 exceedances of the daily mean objective of 50 $\mu g/m^3$ per year in the five year period between 2015 and 2019, well below the 35 permitted per year.

Table 5-8: Annual Mean PM_{10} Concentrations at Tameside CMS

Site ID	X	Y	Site Type	Annual Mean PM_{10} Concentration (mg/m^3)				
				2015	2016	2017	2018	2019
TAM 1 (CMS)	399719	395804	UT	18	18	17	19	18

5.6.25 HPBC undertake diffusion tube monitoring at 10 locations within the air quality study area. The most recent available data recorded at these locations are shown in Table 5-9 and the location of the monitoring sites are shown in Figure 5.1. There was one exceedance of the AQS objective for annual mean NO_2 in 2018 and 2019 recorded at HP25, located at the Dinting Vale Junction. HPBC undertakes monitoring at other sites within their boundary, but at locations outside of the air quality study area for the Scheme. This data is available in reports the local authority produced under their LAQM duties.

Table 5-9: High Peak Borough Council Diffusion Tube Monitoring Results (NO_2)

Site ID	X	Y	Site Type	Annual Mean NO_2 Concentration (mg/m^3)				
				2015	2016	2017	2018	2019
HP1	403591	394050	RD	15.1	17.8	22.5	22.9	19.2
HP14	401111	395390	RD	21.8	20.4	25.8	24.1	23
HP20	401956	397279	KB	32.0	30.8	38.5	28.4	26.3
HP24	403794	394089	RD	-	-	-	29.8	29.4
HP25	401797	394508	RD	-	-	-	**53.6**	**49.2**
HP26	401025	395670	RD	-	-	-	34.5	30.8
HP27	401014	395872	RD	-	-	-	32.7	33.7
HP29	401215	396967	RD	-	-	-	30.7	27.5
HP30	401641	397240	RD	-	-	-	28.3	27.3
HP31	401876	397261	RD	-	-	-	37.8	35.9
RD=Roadside, KB=Kerbside; concentrations have been annualised and bias adjusted where necessary by HPBC								
Values in **bold** exceed the AQS objective, '-' = monitoring data not available								

Table source: 2018 and 2019 ASR (High Peak Borough Council) September 201919 for data up to and including 2018. Data for 2019 provided via email by High Peak Borough Council.

5.7 Potential Impacts

Construction

Dust Emissions

5.7.1 There is the potential for elevated dust deposition and soiling at properties within 200 m of the construction site boundary as a consequence of the construction works, if dust raising activities are not effectively controlled and mitigated. The level and distribution of dust emissions would vary according to the duration and location of activity, weather conditions, and the effectiveness of suppression measures.

5.7.2 The approximate number of properties which could be affected by construction dust, located within 200 m of the construction site boundary for the Scheme has been assessed. The Scheme has the potential for construction dust to affect approximately 1911 human health receptors. There are no designated ecological sites within 200 m of the construction site boundary.

5.7.3 Receptors within 200 m of the construction site boundary for the Scheme within the respective distance bands (0-50 m, 50-100 m and 100-200 m) from construction activities as per DMRB LA 105 (paragraph 2.57) are shown in Figure 5.3. Table 5-10 summarises the number of properties likely to be affected by construction dust.

Table 5-10: Approximate Number of Sensitive Receptors Likely to be Affected by Construction Dust

Total Number of Receptors	Receptor count in distance bands		
	0 - 50 m	50 - 100 m	100 - 200 m
1911	687	440	784

5.7.4 The prevailing winds recorded at Manchester meteorological station are from the south as shown in the wind rose in Appendix 5.3 Section 1.1 (Plate A.1). The highest windspeeds are also recorded from the south, suggesting the wind is more likely to transport dust raised on site to the north of the construction works. Dust sensitive receptors are located in Mottram, Woolley Bridge, Hollingworth, Brookfield and Hattersley.

5.7.5 The Scheme is a bypass project and therefore is considered to have a “large” dust risk potential. Given that there are sensitive receptors within 50 m of construction activities, the receiving environment is considered to be “high sensitivity”. The overall construction dust risk potential for the Scheme is therefore classed as “high” (DMRB LA 105 Table 2.58a and Table 2.58b).

5.7.6 A summary of construction dust related mitigation measures are provided in section 5.8. Details of mitigation measures are included in an Environmental Management Plan (EMP) (TR010034/APP/7.2) and Record of Environmental Actions and Commitments (REAC) (TR010034/APP/7.3).

Construction Traffic

5.7.7 An increase in vehicle movements is expected to occur during the construction period, associated with the transport of materials, plant and labour to and from site. The number of HDV movements are not anticipated to exceed the DMRB LA 105 traffic screening criteria for quantitative assessment of 200 HDV per day, nor will total vehicle movements exceed 1000 AADT per day (DMRB LA 105 paragraphs 2.61 and 2.1).

5.7.8 Substantial traffic management or the need to divert existing traffic during the construction phase is not expected to be required. Construction related traffic management is expected to be split into five phases. No single phase of phase construction traffic management is expected to be in place for more than 2 years and the location of traffic management measures will change with each phase as construction of the Scheme progresses. As the duration of construction traffic management at any single location will be less than two years, further quantitative assessment has not been undertaken, in line with DMRB LA 105. Further details on the construction phase and construction traffic management can be found in section 2.6 of Chapter 2.

5.7.9 Any impact during construction would be expected to be less than that during operation and would be temporary.

Operation

Human Health Impacts

5.7.10 Pollutant concentrations were estimated for the Scheme opening year of 2025 at 621 human health receptors. The NO_2 concentrations were adjusted following verification, details of which are provided in Appendix 5.3 Section 1.3. Concentrations of NO_2 were compared with relevant UK AQS objectives to determine whether there were likely to be any exceedances.

5.7.11 Modelling has been undertaken in accordance with DMRB LA 105 (paragraph 2.47 – 2.55) using Highways England LTTE6 projection factors to determine the future year concentrations.

5.7.12 Annual mean NO_2 results for all receptors included in the air quality model are provided in Appendix 5.5 (TR010034/APP/6.5) Section 1.2. Annual mean NO_2 results at receptors which are exceeding the annual mean NO_2 AQS objective in either the without Scheme (Do Minimum (DM)) or with Scheme (Do Something (DS)) scenario are shown in Figure 5.5 (TR010034/APP/6.4). Table 5-11 below presents a subset of receptors to illustrate the changes in concentrations of annual mean NO_2 for areas within the Scheme air quality study area. Receptors were selected so as to be representative of the locations presented.

Table 5-11: Estimated Annual Mean NO_2 Concentrations (µg/m^3) for Illustrative Selection of Human Health Receptors within Scheme Air Quality Study Area

Receptor ID	Location	Figure Reference	X	Y	2025 DM NO_2	2025 DS NO_2	2025 NO_2 Change	Magnitude of Impact
R20	A628 Market Street, Hollingworth (Gun Inn Junction)	Figure 5.2, Sheet 8	400367	396005	**57.0**	38.6	-18.4	Large decrease
R28	A628 Market Street, Hollingworth (Gun Inn Junction)	Figure 5.2, Sheet 8	400399	396031	**55.4**	**50.6**	-4.8	Large decrease
R89	Four Lanes, Mottram	Figure 5.2, Sheet 3	399071	395985	13.7	17.7	+4.0	Medium increase
R95	A57 Mottram Moor	Figure 5.2, Sheet 5	399316	395639	**65.4**	36.9	-28.5	Large decrease
R96	A57 Mottram Moor	Figure 5.2, Sheet 7	399540	395802	**52.9**	27.6	-25.3	Large decrease
R104	A57 Woolley Bridge	Figure 5.2, Sheet 4	401058	395531	27.7	31.9	+4.2	Large increase
R113	John Street, Hyde	Figure 5.2, Sheet 2	394935	395210	26.1	27.1	+1.0	Small increase
R127	High Street East, Glossop	Figure 5.2, Sheet 2	403762	394087	27.6	28.7	+1.1	Small increase
R150	Mottram Moor	Figure 5.2, Sheet 5	399320	395658	**69.7**	27.6	-42.1	Large decrease
R282	A57 Hyde Road, Mottram	Figure 5.2, Sheet 5	399256	395611	**57.5**	23.4	-34.1	Large decrease

Receptor ID	Location	Figure Reference	X	Y	2025 DM NO_2	2025 DS NO_2	2025 NO_2 Change	Magnitude of Impact
R319	A57 Dinting Vale at Glossop Road Junction	Figure 5.2, Sheet 15	401760	394526	**42.4**	**44.1**	+1.7	Small increase
R323	A57 Dinting Vale at Glossop Road Junction	Figure 5.2, Sheet 15	401820	394501	32.2	32.6	+0.4	Imperceptible
R590	St. Anne's Road, Denton	Figure 5.2, Sheet 1	393319	395575	31.5	32.6	+1.1	Small increase
R602	Holland Street East, Denton	Figure 5.2, Sheet 1	392057	395572	35.0	35.8	+0.8	Small increase
Values in **bold** exceed the AQS objective								

5.7.13 There are exceedances of the annual mean NO_2 AQS objective in the opening year 2025 without the Scheme at 76 of the 621 human health receptors. The exceedances are located adjacent to the A57 through Mottram, at the Woolley Lane/A57/A628 junction (Gun Inn Junction), adjacent to the A628 north of the Gun Inn Junction and at the Dinting Vale Junction.

5.7.14 Of the 76 receptors exceeding without the Scheme, 75 receptors have a decrease in annual mean NO_2 concentrations with the Scheme in place, and one receptor has a 'small' increase (i.e. less than 2.0µg/m³, DMRB LA 105 Table 2.91). The receptors with decreases in annual mean concentrations are located adjacent to the A57 in Mottram, at the Gun Inn Junction, and adjacent to the A628 north of the Gun Inn Junction. The decrease in concentrations is primarily due to a reduction in traffic flow on the existing A57 on Hyde Road (-16,365 AADT), Mottram Moor (-16,634 AADT) and Woolley Lane (-13,760 AADT) as traffic transfers to the new link roads which are located at a greater distance from receptors. The reduction in traffic on the A57 Hyde Road, Mottram Moor and Woolley Lane results in a reduction in emissions from these roads and therefore an associated reduction in concentrations at adjacent receptors. Of the 75 receptors with a decrease with the Scheme, 60 receptors have a decrease in concentrations to below the annual mean NO_2 AQS objective and so as a direct result of the Scheme no longer exceed air quality thresholds.

5.7.15 The highest annual mean NO_2 concentration without the Scheme is at a receptor located at the Mottram Moor Junction (receptor R150). The estimated annual mean NO_2 concentrations is 69.7 µg/m^3 in the without the Scheme scenario and 27.6 µg/m^3 in the with Scheme scenario. The reduction in concentrations at this receptor with the Scheme in place is a 'large' decrease (DMRB LA 105 Table 2.91). This is due to a reduction in total traffic flow on the A57 through Mottram (-16,634 AADT on Mottram Moor) as traffic transfers to the new link roads which are located at a greater distance from receptors. The reduction in traffic on the A57 through Mottram results in a reduction in emissions and therefore an associated reduction in concentrations at adjacent receptors.

5.7.16 With the Scheme in the opening year 2025 there are still exceedances of the annual mean NO_2 AQS objective at 16 receptors but 15 have a decrease as a result of the Scheme i.e. a relative improvement in air quality. These 15 receptors are located adjacent to the A628 north of the Gun Inn Junction. The decrease in concentrations at these 15 locations are due to a reduction in total traffic flow on the A57 Mottram Moor, west of the Gun Inn Junction (-12,572 AADT) and

Woolley Lane (-13,760 AADT), as traffic transfers to the new link roads which are located at a greater distance from receptors . The reduction in traffic on the A57 Mottram Moor and Woolley Lane results in a reduction in emissions and therefore there an associated reduction in concentrations at adjacent receptors. The traffic changes in the A628 north of Gun Inn Junction do not sufficiently change to affect emission from this section of road.

5.7.17 There is one receptor exceeding the annual mean NO_2 AQS objective in the with and without Scheme scenario that will experience an increase (worsening) with the Scheme. This isolated receptor (R319) is located at the Dinting Vale junction and will have a 'small' increase of 1.7 µg/m^3. There is an increase in traffic on the A57 north of the Dinting Vale Junction (+2,571 AADT) as vehicles choose to switch route choice from the A626 Glossop Road to use the A57 north of the Dinting Vale Junction to access the new link roads. This is not sufficiently outweighed by the reduction in traffic on the A626 Glossop Road with the Scheme (-868 AADT). This results in a 'small' increase in concentration at R319, due to the overall increase in emissions from the combined traffic changes on each approach to the junction.

5.7.18 In other parts of the air quality study area, annual mean concentrations are below the annual mean NO_2 AQS objective both with and without the Scheme, but will experience increases and decreases in concentrations as a result of changes to route choice and associated traffic changes. The combination of road traffic emissions, background concentrations and the distance of receptors from road sources are not sufficient to result in receptors in other parts of the study area experiencing concentrations above the annual mean NO_2 AQS objective. The changes in concentrations are as follows:

- North of Mottram receptors adjacent to the new bypass (illustrated by R89 in Table 5-11) would experience an increase in concentrations due to the introduction of the new road, which introduces a new road emission source resulting in higher concentrations. However, annual mean NO_2 concentrations would remain well below the AQS objective.
- Around Woolley Bridge receptors (illustrated by R104 in Table 5-11) would experience an increase in concentrations due to the introduction of the new link road, which introduces a new road emission source resulting in higher concentrations. However annual mean NO_2 concentrations would remain below the AQS objective.
- In Glossop receptors (illustrated by R127 in Table 5-11) would experience an increase in concentrations due to an increase in traffic flow on the A57 High Street East (+1,068 AADT) and A57 Sheffield Road (+1,165 AADT). The increase in traffic on these roads results in an increase in emissions and therefore an associated increase in concentrations at adjacent receptors. However annual mean NO_2 concentrations would remain below the AQS objective.

- In Hyde (illustrated by R113 in Table 5-11) and Denton (illustrated by R590 and R602 in Table 5-11) receptors adjacent to the M67 would experience an increase in concentrations due to an increase in traffic flow on the M67 (maximum increase on any section of the M67 is +7,476 AADT). The increase in traffic on the M67 results in an increase in emissions and therefore an associated increase in concentrations at adjacent receptors. However annual mean NO_2 concentrations would remain below the AQS objective.

5.7.19 In line with Defra's LAQM.TG16 there are expected to be exceedances of the NO_2 1-hour mean AQS objective where annual mean concentrations are estimated to be more than 60 µg/m³. Four receptors are estimated to have annual mean concentrations exceeding 60 µg/m³ in the without Scheme scenario, located at the Mottram Moor Junction (R4, R95 and R150) and at the Back Moor Junction (R21). However, these locations would not have annual mean NO_2 concentrations greater than 60 µg/m³ in the 'with Scheme' scenario due to reductions in concentrations with the Scheme in place from reduced traffic flow on the existing A57 through Mottram (-16,634 AADT). The reduction in traffic on the A57 through Mottram results in a reduction in emissions and therefore an associated reduction in concentrations at adjacent receptors.

5.7.20 The human health receptors informing the significance of effect on air quality are presented in Table 5-12.

Table 5-12: Significance for Human Health

Magnitude of Change in Annual Average NO_2 (µg/m³)	Total Receptors with:	
	Worsening of air quality objective already above objective or creation of new exceedance	Improvement of air quality objective already above objective or the removal of an existing exceedance
Large (>4)	0 (0 in total)	66 (66 in total)
Medium (>2)	0 (0 in total)	9 (75 in total)
Small (>0.4)	1 (1 in total)	0 (75 in total)

5.7.21 DMRB LA 105 Table 2.92N, replicated in Table 5-3, provides guideline bands on the number of properties experiencing worsening and improvement when considering evaluation of significance. For both worsening and improvement of air quality with a 'large' change, the guideline band is 1 to 10 receptors, with a 'medium' change the guideline band is 10 to 30 receptors and with a 'small' change the guideline band is 30 to 60 receptors.

5.7.22 There are many receptors with 'medium' and 'large' improvements in NO_2 concentrations including 60 receptors that experience a decrease in concentrations to below the annual mean AQS objective. This is as a result of traffic reductions in the with Scheme case when traffic moves to using the new link roads and away from locations where receptors experienced exceedances without the Scheme. This outweighs the one receptor with a 'small' increase in concentrations. There are no exceedances of the short-term NO_2 AQS objective with the Scheme.

5.7.23 Modelled annual mean PM_{10} and daily exceedances for all receptors are provided in Appendix 5.5 Section 1.2. There are no exceedances of the PM_{10} AQS objectives in the base year (2018), therefore, assessment of PM_{10} concentrations

in the Scheme opening year (2025) has not been undertaken (as per the DMRB LA 105 (para 2.21.2)).

5.7.24 Overall, the impact of the Scheme is an improvement in air quality for human health receptors and there is **not** a significant adverse effect due to the Scheme. The Scheme achieves the environmental objective to improve air quality in Mottram-in-Longdendale, through reduced congestion and removal of traffic from residential areas.

Compliance Risk Assessment

5.7.25 Compliance with the Air Quality Directive has been considered using the principles in DMRB LA 105 (paragraph 2.64 – 2.87) where Defra PCM model links coincide with the modelled area to aid the assessment of significance of effect. Air quality modelling for the compliance risk assessment has been undertaken for receptor points at a distance of 4 m from roads included in the Defra PCM model and at all relevant qualifying features.

5.7.26 Using the project air quality model, receptor points at a distance of 4 m from those roads included in the Defra PCM model were compared to concentrations taken from the Defra PCM model itself to determine whether the project air quality modelling aligns with the Defra PCM model. In accordance with DMRB LA 105 (para 2.54) the comparison uses the project air quality modelling results without the Highways England LTTE6 projection factors applied. The difference between the two models was found to be greater than 10% and therefore in line with DMRB LA 105 (paragraph 2.75.1) the project air quality model has been used to inform the compliance risk assessment. The comparison is shown in Appendix 5.5 Section 1.3.

5.7.27 The qualifying feature receptor locations included in the compliance risk assessment are given in Appendix 5.5 Section 1.3 and shown on Figure 5.4 (TR010034/APP/6.4). Annual mean NO_2 results for all qualifying feature receptor locations are provided in Appendix 5.5 Section 1.3.

5.7.28 There are exceedances of the annual mean NO_2 limit value of 40 $\mu g/m^3$ in 2025 without the Scheme at qualifying features adjacent to the A57 through Mottram and the A628 in Hollingworth, north of the Gun Inn Junction. However, all these qualifying feature locations are expected to have a decrease in concentrations with the Scheme in place, due to a reduction in traffic volume on the existing A57, as traffic transfers to the new link roads, which are located at a greater distance. The reduction in traffic on the existing A57 (Hyde Road (-16,365 AADT), Mottram Moor (-16,634 AADT) and Woolley Lane (-13,760 AADT)) results in a reduction in emissions from these roads and therefore an associated reduction in concentrations at adjacent locations. Despite reduction in concentrations two exceedances of the annual mean NO_2 limit value of 40$\mu g/m^3$ remain in 2025 at qualifying features adjacent to the A628 in Hollingworth, north of the Gun Inn Junction Table 5-13 below presents the maximum annual mean NO_2 concentration at qualifying features for Defra PCM model links that coincide with the project air quality model.

Table 5-13: Estimated Annual Mean NO_2 Results Concentrations (µg/m^3) at Qualifying Features for Compliance Risk Assessment

PCM Census ID	Location	Receptor ID	X	Y	2025 DM NO_2	2025 DS NO_2	2025 NO_2 Change	Magnitude of Impact
802077877	A560 Stockport Road	PA124	398484	395048	16.0	15.2	-0.8	Small decrease
802048026	A560 Stockport Road East	PA287	392583	391798	23.4	23.0	-0.4	Imperceptible
802027296	A560 Stockport Road West	PA276	392495	391761	34.8	34.0	-0.8	Small decrease
802077828	A57 Dinting Vale	PA179	401761	394526	31.3	32.6	1.3	Small increase
802077314	A57 High Street East / Sheffield Road	PA41	403658	394064	27.8	29.0	1.2	Small increase
802056586	A57 Hyde Road	PA9	393210	395532	27.8	28.6	0.8	Small increase
802046583	A57 Hyde Road / Mottram Moor	PA109	399549	395791	**53.3**	17.4	-35.9	Large decrease
802081169	A57 Manchester Road (Denton)	PA100	392042	395517	23.5	24.5	1.0	Small increase
802060027	A57 Manchester Road / Market Street (Hyde)	PA283	394516	395114	25.2	25.9	0.7	Small increase
802081159	A57 Manchester Road North / South	PA113	391545	395507	27.1	27.5	0.4	Imperceptible
802026575	A57 Mottram Moor	PA69	400329	396000	38.1	30.0	-8.1	Large decrease
802006564	A57 Woolley Bridge / Brookfield	PA27	401052	395525	29.5	33.8	4.3	Large increase
802007958	A6017 Stockport Road	PA75	392519	395584	22.5	23.1	0.6	Small increase
802077878	A6018 Back Moor	PA86	399489	395814	31.7	20	-11.7	Large decrease
802007727	A6018 Mottram Road	PA246	396823	398391	22.3	22.5	0.2	Imperceptible
802018257	A627 Clark Way	PA285	394575	395228	31.5	32.9	1.4	Small increase
802028694	A627 Clark Way	PA73	395004	395089	23.6	24.6	1.0	Small increase
802077829	A628 Manchester Road	PA195	401763	397250	26.2	26.6	0.4	Imperceptible
802073379	A628 Market Street / Manchester Road	PA220	400381	396022	**45.5**	**41.0**	-4.5	Large decrease
802027854	M60 J24-M67 J1 and slip roads	PA184	401075	396555	25.0	25.4	0.4	Imperceptible
802047903	M67 J1-J2	PA125	393338	395533	34.5	36.3	1.8	Small increase
802007807	M67 J2-3 and slip roads	PA106	393612	395503	32.5	34.3	1.8	Small increase
802073381	Woolley Lane	QF878	400370	396008	36.7	26.5	-10.2	Large decrease

Values in **bold** exceed the NO_2 limit value

PCM links 802058255 (A57 Mottram Road), 802081172 (A57 roundabout at M60 J24), 802099611 (M60 J24 to J23 and slip roads) and 802073973 (M60 J24-J25) have no relevant qualifying feature or public access receptors in locations where the PCM coincides with the ARN.

5.7.29 The human health receptor locations included in the air quality assessment across the full air quality study area, including those links not aligning to PCM links, have been included in the compliance risk assessment and there are not expected to be any additional locations away from the PCM model road network which exceed the annual mean NO_2 limit value of 40 µg/m^3 in the Scheme opening year with the Scheme.

5.7.30 The Scheme would not result in an increase in concentrations of annual mean NO_2 where there are existing exceedances of the annual mean NO_2 limit value, nor would any new exceedances of the annual mean NO_2 limit value be introduced by the Scheme. Consequently, the Scheme is not considered to be a risk to non-compliance with the Air Quality Directive.

Designated Habitats Impacts

5.7.31 Total nitrogen deposition has been modelled for ecological receptors within relevant ecological sites. These cover one SAC (South Pennine Moors), one SPA (Peak District Moors), three SSSI, four LNR, and 71 non-statutory designated ecological sites (LWS, SBI and AW).

5.7.32 The change in nitrogen deposition rates for ecological receptors within the SPA, SAC and SSSI sites and non-statutory designated sites are provided in Appendix 5.5 Section 1.4.

5.7.33 DMRB LA 105 (para 2.97 to 2.102, and Figure 2.98) provides designated habitat screening criteria for determining the need for further consideration of the impacts of nitrogen deposition. The designated habitat screening criteria are considered to be exceeded where total nitrogen deposition is greater than the lower level of the relevant lower critical load, and the change in nitrogen deposition is greater than 1% of the relevant lower critical load. Where these criteria are exceeded further consideration was given to the magnitude of the change in nitrogen deposition. Where this is greater than 0.4 kg N/ha/yr then the significance of effect was assessed by a competent expert for biodiversity. Further details on the assessment methodology for designated habitats are provided in Appendix 5.3.

5.7.34 The change in nitrogen deposition rates with the Scheme are less than the DMRB LA 105 designated habitat screening criteria and the magnitude of change of the nitrogen deposition is less than 0.4 kg N/ha/yr at all relevant statutory designated sites (SSSI, SAC, SPA and LNR). The competent biodiversity expert concluded the Scheme is therefore not expected to have a significant effect on the designated habitats within these sites.

5.7.35 Given the number of non-statutory designated ecological sites within the air quality study area and the limited information available on designated features within them, detailed habitat identification was not undertaken for all the sites. Nitrogen deposition rates were therefore calculated for all non-statutory designated ecological site receptors as both “woodland” and “grassland” habitat types (for which there are different NO_2 to nitrogen deposition conversion factors).

5.7.36 As a precautionary approach, screening against the DMRB LA 105 designated habitat screening criteria was undertaken assuming a “woodland” habitat was present as there is a higher conversion rate of NO_2 concentrations to nitrogen deposition for “woodland” habitat.

5.7.37 Changes to nitrogen deposition exceeding the DMRB LA 105 designated habitat screening criteria and with a magnitude of change of the nitrogen deposition greater than 0.4 kg N/ha/yr were identified in small areas at the boundary of the following four non-statutory designated sites:

- Dark Peak NIA
- Melandra Castle and Railway LWS
- Peak Forest Canal North SBI
- Shire Hill Ancient Woodland

5.7.38 Ecological transect receptors meeting the designated habitat screening criteria for “woodland” habitats and where the changes of the nitrogen deposition are greater than 0.4 kg N/ha/yr are shown in Figure 5.5.

5.7.39 In accordance with the procedure in DMRB LA 105 (as shown in the flow diagram Figure 2.98), detailed site investigation was required to determine whether there are species that could be adversely affected by increased nitrogen deposition within these four sites. Full details of the habitat types and site condition for the four sites, as identified following site investigation, are provided in Chapter 8, Appendix 8.4.

5.7.40 Upon further investigation by a competent biodiversity expert, the Shire Hill Ancient Woodland was identified as containing a woodland habitat sensitive to nitrogen deposition within areas that could be impacted by changes in air quality. For the Dark Peak NIA and Peak Forest Canal North SBI sites “woodland” habitat was not found to be present and thus a lower nitrogen deposition conversion factor for a “grassland” habitat was appropriate, under which the designated habitat screening criteria is not exceeded. The habitats within the Melandra Castle and Railway LWS were not considered congruent with the designation of the LWS (consisting of a highly disturbed area with sparse self-seeded young trees, and presence of several invasive species).

5.7.41 The significance of air quality effects on Shire Hill Ancient Woodland has been assessed by a competent biodiversity expert, which concluded that air quality effects at the site was not significant, based on the short term duration of the impact, and the relatively small area of impact, which is considered unlikely to lead to long-term perceptible changes of the composition and species richness within the woodland. The full reasons for this judgement are set out in Chapter 8, Appendix 8.4 (TR010034/APP/6.5)).

5.8 Design, Mitigation and Enhancement Measures

Construction

5.8.1 Construction activities for the Scheme represent a ‘high’ construction dust risk potential. Mitigation measures to control dust during construction would be specified within contract documentation, as detailed the First iteration Environmental Management Plan (EMP) (TR010034/APP/7.2) and the Register of Environmental Actions and Commitments (REAC) (TR010034/APP/7.3), prior to construction of the Scheme. The precise measures, suitable for a ‘high’ construction dust risk site would depend on the intended construction methods and the degree of dust generation of construction activities. If necessary, monitoring parameters and a programme will be established, and the

effectiveness of mitigation will be evaluated in line with DMRB LA 105 Table 2.108.1. It is expected that the use of standard industry best practice would mitigate the risk of construction dust impacts in the majority of cases.

5.8.2 Such measures may include but not necessarily be limited to:

- Regular water-spraying and sweeping of unpaved and paved roads to minimise dust and remove mud and debris
- Using wheel washes, shaker bars or rotating bristles for vehicles leaving the site where appropriate to minimise the amount of mud and debris deposited on the public highway
- Sheeting vehicles carrying dusty materials to prevent materials being blown from the vehicles whilst travelling
- Enforcing speed limits for vehicles on unmade surfaces and site haul roads to minimise dust entrainment and dispersion
- Ensuring any temporary site roads are no wider than necessary to minimise their surface area
- Damping down of surfaces prior to their being worked
- Storing dusty materials away from site boundaries and in appropriate containment (e.g. sheeting, sacks, barrels etc.).

Operation

5.8.3 There are not expected to be any significant adverse effects with the Scheme for the human health receptors, ecological sites (SSSI, SAC, SPA, LNR and non-statutory designations), or risk of compliance with the Air Quality Directive and so mitigation of the operational impacts for these receptors is not required.

5.9 Assessment of Likely Significant Effects

Significant effects

Construction

5.9.1 Any adverse air quality effects due to construction will be temporary and can be suitably minimised by the application of standard and appropriate mitigation measures. On this basis, there is unlikely to be a significant effect on air quality due to the construction of the Scheme.

Operation

5.9.2 Table 5-14 outlines supporting information used to arrive at the overall evaluation of air quality significance of the Scheme.

Table 5-14: Overall Evaluation of Air Quality Significance

Key Criteria Questions	Yes/No
Is there a risk that environmental standards will be breached?	No. There are expected to be exceedances of the annual mean NO_2 AQS objective in the opening year 2025 with and without the Scheme at human health receptors, but there are no new exceedances of the AQS objective with the Scheme in operation.
Will there be a large change in environmental conditions?	Yes there will be a large beneficial change. There will be large decreases in annual mean NO_2 at 66 human health receptors which exceed the annual mean NO_2 AQS objective, with 57 of these no longer exceeding with the introduction of the Scheme.
Will the effect continue for a long time?	n/a There are not expected to be adverse effects for human health receptors from operation of the Scheme.
Will many people be affected?	75 residential receptors will have a perceptible improvement in air quality with the Scheme (the exceed in the without Scheme and have reduced concentrations in the with scheme). One residential receptor will have a perceptible worsening in air quality with the Scheme.
Is there a risk that designated sites, areas, or features will be affected?	National and International Designated Ecological Sites – are not expected to exceed DMRB LA 105 designated habitat screening criteria. Locally designated sites – the majority of sites are not expected to exceed DMRB LA 105 designated habitat screening criteria. Locally designated sites – Four sites required further assessment by the competent biodiversity expert. The overall significance of effect for ecological receptors has been assessed by the competent biodiversity expert as not significant.
Will it be difficult to avoid or reduce or repair or compensate for the effect?	No. There are no significant adverse effects for ecological receptors from operation of the Scheme.
On balance is the overall effect significant?	Overall, there is **no** significant adverse effect on human health due to the Scheme, the overall impact of the Scheme is expected to be an improvement. Where receptors exceed the annual mean NO_2 AQS objective there would be 66 receptors with a 'large' decrease in annual mean NO_2 concentrations. 60 receptors would no longer exceed with the scheme in place. This outweighs the one human health receptor with a 'small' worsening. There is not a risk of non-compliance with the Air Quality Directive. The overall significance of effect for ecological receptors within designated sites has been assessed by the competent biodiversity expert as not significant.

5.10 National Policy Statement for National Networks (NPS NN) compliance

5.10.1 Overall the scheme is consistent with the requirements set out in paragraphs 5.12 and 5.13 of the NPS NN as it would not trigger a significant adverse air quality effect, nor would it affect the UK's reported ability to meet the annual mean NO_2 limit value in the shortest timescale possible.

5.11 Monitoring

5.11.1 Given that the Scheme is not expected to have any significant adverse effects on air quality during construction or operation, no further air quality monitoring is required.

5.12 Summary

5.12.1 The air quality study area is within the boundaries of three local authorities: TMBC, SMBC and HPBC. There are two designated AQMAs within the air quality study area; Greater Manchester AQMA, and Glossop AQMA.

5.12.2 Local air quality monitoring data indicates that there are currently exceedances of annual mean AQS objective for NO_2 in Denton, Hyde, Mottram, Woolley Bridge, Hollingworth and Dinting Vale. There are also exceedances of the hourly mean AQS objective for NO_2 adjacent to the A57 in Mottram. There are no exceedances of particulate matter AQS objectives in the air quality study area.

5.12.3 During construction, there is the potential for increased emissions of dust, however, with the application of appropriate mitigation significant effects at nearby receptors would be unlikely. Additional traffic during the construction phase and construction related traffic management measures have been determined as unlikely to affect air quality.

5.12.4 During operation, there would be no significant adverse effect on human health due to the Scheme, and the overall impact of the Scheme would be an improvement in air quality. The Scheme achieves the environmental objective to improve air quality in Mottram-in-Longdendale, through reduced congestion and removal of traffic from residential areas.

5.12.5 The air quality within the study area changes from exceedances of the annual mean NO_2 AQS objective in the opening year at 76 modelled sensitive receptors without the Scheme to 16 receptors with the scheme in place. Of these 76 receptors, 75 have a decrease in concentrations (improvement), with 60 no longer exceeding when the Scheme is in place. These receptors are located adjacent to the A57 in Mottram, at the Gun Inn Junction, and adjacent to the A628 north of the Gun Inn Junction. Of the 75 decreases, 66 have a 'large' decrease with the Scheme, and 57 of the 66 decrease to such an extent that exceedances of the annual mean NO_2 AQS objective are removed with the Scheme in place. The decreases in concentrations are primarily due to a reduction in traffic flow on the existing A57 on Hyde Road, Mottram Moor and Woolley Lane as traffic transfers to the new link roads. The reduction in traffic on the existing A57 results in a reduction in emissions and therefore an associated reduction in concentrations at adjacent receptors.

5.12.6 One receptor at the Dinting Vale Junction has a 'small' increase in concentrations with the Scheme due to traffic flow increasing on the A57 north of Dinting Vale Junction.

5.12.7 In other parts of the air quality study area, annual mean concentrations are below the annual mean NO_2 AQS objective with and without the Scheme, but will experience increases and decreases in concentrations as a result of changes to route choice leading to changes in traffic levels and hence changes in emissions and therefore concentrations at adjacent receptors.

5.12.8 There are exceedances of the annual mean NO_2 limit value in 2025 at PCM qualifying features adjacent to the A57 through Mottram (without and with the Scheme), and at qualifying features adjacent to the A628 north of the Gun Inn Junction (without the Scheme). All qualifying features with exceedances in 2025 reduce concentrations with the Scheme, due to a reduction in traffic volume on the existing A57 through Mottram as traffic transfers to the new link road. Consequently, the Scheme is not considered to affect the risk of non-compliance.

5.12.9 During operation, there is no significant effect on the statutory designated habitats (SPA, SAC, SSSI and LNR), nor on the non-statutory designated sites within the study area (LWS, SBI and AW).

5.12.10 The Greater Manchester CAZ has been developed in parallel with the Scheme, so it was not possible to consider the CAZ within the Scheme traffic and air quality modelling. However, the air quality assessment undertaken can be considered a worst-case representation of pollutant concentrations as it excludes the CAZ. It is anticipated that the CAZ would bring about further improvements in concentration of annual mean NO_2.

5.12.11 Overall the scheme is consistent with the requirements set out in paragraphs 5.12 and 5.13 of the NPS NN as it would not trigger a significant adverse air quality effect, nor would it affect the UK's reported ability to meet the annual mean NO_2 limit value in the shortest timescale possible.

Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ
National Highways Limited registered in England and Wales number 09346363