16 Air Quality

16.1 Introduction

16.1.1 This Chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 3 Environmental Impact Assessment (EIA) of the potential air quality impacts of the Proposed Scheme, Project 9 – Crubenmore to Kincraig. The Proposed Scheme alignment that has been assessed is described in **Chapter 5.**

16.1.2 The EIA was undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 (HA 207/07) (Highways Agency, 2007). The agreed Stage 3 assessment approach of the Proposed Scheme is described in **Chapter 7**.

16.1.3 The chapter includes a review of existing baseline air quality conditions, a summary of relevant air quality policy and legislation, the methodology used, and presents the results of the assessment. Mitigation options are considered for any potentially significant adverse effects.

16.2 Approach and Methods

16.2.1 At the early design and assessment stage, the assessment of potential operational air quality impacts of the Proposed Scheme determined that a detailed assessment at DMRB Stage 3 was not justified. Therefore, a 'Simple Assessment' was carried out using the DMRB screening methodology in order to consider design changes and traffic changes from DMRB Stage 2.

16.2.2 This section details the approach and methodology used to complete the assessment of air quality for the construction and operational phases of the Proposed Scheme. Included in the discussion is a review of the relevant legislation, guidance and criteria used to define significant impacts to recommend adequate mitigation measures if required.

Air Quality Objectives

16.2.3 This assessment considered international and national legislation relevant to assess the impacts of transport schemes on air quality: the European Directive on ambient air quality and cleaner air for Europe (2008/50/EC), which are transposed into Scottish legislation by the Air Quality Standards (Scotland) Regulations 2010, and the Air Quality (Scotland) Amendment Regulations 2016.

16.2.4 The European Union (EU) sets pollutant concentration limit values in a series of Directives with statutory dates for member states to reach these targets. It also requires member states to regularly review and assess air quality in order to meet limit values by the required dates.

16.2.5 The UK government is responsible to the European Commission (EC) for ensuring that it complies with the provisions of the EU Directives. This prompted the Environment Act 1995, of which Part IV established the National Air Quality Strategy (AQS) and the basis of Local Air Quality Management (LAQM).

16.2.6 The UK AQS objective for particulate matter (PM) smaller than 10µm aerodynamic diameter (PM_{10}) annual mean is 40µg m^{-3}. However, Scotland has adopted a more stringent annual mean objective of 18µg m^{-3}. The UK AQS objective for the 24-hour mean PM_{10} concentration is 50µg m^{-3}, not to be exceeded on more than 35 days per calendar year. The more stringent

Scottish objective requires that daily mean PM_{10} concentrations do not exceed 50µg m^{-3} on more than seven days per year.

16.2.7 PM smaller than 2.5 µm aerodynamic diameter ($PM_{2.5}$) is not currently included in the DMRB HA 207/07 air quality guidance; however, the Scottish Government has adopted the World Health Organisation (WHO) guideline value of 10 µg m^{-3} as an annual mean objective.

16.2.8 The air quality objectives of most relevant to the Proposed Scheme are shown in **Table 16-1.**

Table 16-1: Air Quality Objectives for NO_X, NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Averaging Period	Limits (µg/m^3)
Nitrogen Dioxide (NO_X) (for the protection of vegetation and ecosystems)	Annual mean	30
Nitrogen Dioxide (NO_2) (for human health)	Annual mean	40
	1-hour mean (not to be exceeded more than 18 times per year)	200
Particulate Matter (PM_{10}) (for human health)	Annual mean	18
	24-hour mean (not to be exceeded more than 7 times per year)	50
Particulate Matter ($PM_{2.5}$) (for human health)	Annual mean	10

16.2.9 When the annual mean NO_2 concentration is below 60 µg/m^3, it is not considered to represent a risk of exceedance of the 1-hour mean NO_2 objective (for human health) (Air Quality Consultants, 2003).

Scope and Guidance

16.2.10 For DMRB Stage 3, potential impacts on local air quality resulting from both the construction and operation of the Proposed Scheme were assessed in accordance with relevant guidance outlined in DMRB HA 207/07, associated Interim Advice Notes (IANs), Department of Environment, Food and Rural Affairs' (Defra's) *Local Air Quality Management Technical Guidance (LAQM.TG (16)*) and the Institute of Air Quality Management (IAQM) *Guidance on the assessment of dust from demolition and construction* (Version 1.1).

16.2.11 The following Highways England IANs have been utilised in the assessment:

- IAN 170/12: Updated air quality advice on the assessment of future NO_X and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 Air Quality (Highways Agency, 2012)
- IAN 174/13: Updated advice for evaluating significant local air quality effects for DMRB Volume 11, Section 3, Part 1 Air Quality (Highways Agency, 2013a)
- IAN 175/13: Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans (Highways Agency, 2013b).

16.2.12 In accordance with IAN 175/13, Pollution Concentration Mapping (PCM) links have been considered as part of the assessment to verify the potential risk related to EU compliance. However, no PCM links were found in the area of the Proposed Scheme and therefore this was not considered further in the assessment.

16.2.13 IAN 185/15 has not been adopted by Transport Scotland, with an exception where a scheme passes through an Air Quality Management Area (AQMA); this guidance was, therefore, not applicable for this assessment.

Study Area

16.2.14 This sub-section discusses the study areas assumed for the assessment of the construction and operational impacts. The study area for the local air quality assessment is shown in **Drawing 16.1** in **Volume 3,** and the construction dust impact area defined in the assessment is shown in **Drawing 16.2 (Volume 3).**

16.2.15 The extent of the study area for the construction phase has been defined as per IAQM (2014) guidance, which includes sensitive receptors such as houses and schools within 350m of construction activities that are expected to generate dust.

16.2.16 The study area for the operational assessment has been defined in accordance with DMRB HA 207/07 guidance, which is based on the change in traffic and road alignment associated with the scheme. It covers receptors and designated sites within 200m of roads that are expected to be affected by the Proposed Scheme. These receptors were identified using address data from Ordnance Survey (OS, 2015) and maps available in ArcMap 10.4.1 (ESRI Inc., 2017).

Construction Assessment Methodology

16.2.17 The assessment of potential construction impacts has been undertaken in accordance with the IAQM construction dust guidance (2014). The assessment methodology is presented in detail in **Appendix 16.1 (Volume 2)**.

16.2.18 The aim of the assessment was to determine the risk of dust impacts from four construction activities, demolition, earthworks, construction and track-out[1], to identify the level of required mitigation. The assessment included the identification of sensitive receptors within 20m, 50m, 100m, 200m and 350m from the construction boundary. Beyond 350m, any construction effects in terms of air quality (primarily dust deposition) would be minimal. Human and ecological receptors have been chosen based on their sensitivity to dust soiling and PM_{10} exposure.

16.2.19 The scale of likely impacts (classed as small, medium or large) has been considered. Furthermore, the distance of the closest receptors and background PM_{10} concentrations were taken into account to determine the sensitivity of the surrounding area.

16.2.20 Construction impacts have been assessed qualitatively to determine the overall risk level of impacts arising from dust soiling on human health and ecology and to identify suitable mitigation measures. Professional judgement was applied to define the overall significance of impacts taking into account any additional project specific factors.

Operational Assessment Methodology

16.2.21 Potential operational impacts have been assessed taking into account the information obtained from the transport model outputs. The model included the full length of the A9, however the local air quality assessment presented in this chapter only considered data within the Project 9 extent. Other sections of the A9 are considered in separate project assessments.

[1] Track-out is the transport of dust and dirt from the construction site to an appropriate waste facility via the local roads

16.2.22 The following scenarios have been considered in the local air quality assessment:

- 2015: Base Year
- 2026: Opening Year Do-Minimum (DM) without A9 Dualling
- 2026: Opening Year Do-Something (DS) with A9 Dualling

16.2.23 An additional scenario representing the Design Year of the Scheme (2041) has been considered in the regional assessment.

Local Air Quality

16.2.24 The local air quality assessment involves estimating the change in pollutant concentrations resulting from the operation of the Proposed Scheme. Under DMRB HA 207/07 guidance, affected roads are defined where:

- road alignment will change by 5 m or more; or
- daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) flow or more; or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
- daily average speed will change by 10 km hr^{-1} or more; or
- peak hour speed will change by 20 km hr^{-1} or more.

16.2.25 There is the potential for operational air quality impacts to occur on the existing road network where the Proposed Scheme leads to changes in traffic that trigger any of the DMRB HA 207/07 criteria.

16.2.26 Following a DMRB HA 207/07 screening of DMRB Stage 3 traffic data for the Proposed Scheme, the affected road network (ARN) identified for the local air quality assessment encompassed the full length of the A9 mainline within Project 9 and some local roads in Newtonmore and Kingussie. Other roads were screened in primarily due to alignment changes as a result of the new carriageway along the A9, and new connector roads around the Kingussie and Newtonmore junctions. Total traffic volume changes also screened in roads along the A9. New roads around Kingussie and Newtonmore junctions were also included in the ARN. The ARN is presented in **Drawing 16.1** contained in **Volume 3** of this report.

16.2.27 Most of the pollutant emissions at the receptors considered in this assessment are primarily associated with road traffic. Emissions of pollutants were calculated for each affected road using Defra's latest Emission Factor Toolkit (EFT version 7.0, July 2016).

16.2.28 Changes from the DMRB Stage 2 assessment, including changes in modelled traffic volumes in the opening year as well as some alignment changes to the Proposed Scheme, led to air quality impacts requiring a reassessment in DMRB Stage 3. The same method used for DMRB Stage 2 was repeated for DMRB Stage 3. The model calculations were based on distance from the road, fleet composition and traffic volume to estimate NO_X concentration in correspondence of identified receptors. The NO_X concentrations were converted into NO_2 using Defra's NO_x to NO_2 calculator v5.1.

16.2.29 Total air pollutant concentrations comprise a background component (i.e. concentrations associated with emissions at regional level) and local component (i.e. concentrations associated with local traffic emissions). Background pollutant concentrations of NO_X, NO_2, and PM_{10} were obtained from the Scottish Air Quality website (http://www.scottishairquality.co.uk/data/mapping?view=data).

16.2.30 $PM_{2.5}$ concentrations were obtained from Defra's LAQM background maps (https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013). It is common practise to check these against background monitoring data from the same area. A comparison of background pollutant concentrations to background monitoring data could not be carried out as the nearest monitoring sites were more than 10km from the Proposed Scheme extent. However, background values are low (well below the AQS objectives) due to the lack of major sources of emissions, and a verification process is not likely to bring significant benefits in terms of accuracy.

16.2.31 Pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ predicted for the opening year Do Minimum (DM) and Do Something (DS) scenarios for the Proposed Scheme have been compared to ascertain the impact of the Proposed Scheme on local air quality.

Regional Air Quality

16.2.32 The regional air quality assessment considers the change in emissions resulting from the Proposed Scheme. This is required as emissions not only affect local air quality, but also have an impact on a regional, national and international scale.

16.2.33 Under the DMRB HA 207/07 methodology for regional air quality, affected roads are expected to have:

- A change of more than 10% in AADT, or
- A change of more than 10% HDVs, or
- A change in daily average speed of more than 20km hr^{-1}.

16.2.34 Following the DMRB screening criteria, it was determined that the same study area is applicable to the regional assessment as the one used for the local assessment, and it includes the extent of the A9 within the Project 9 boundaries.

16.2.35 Regional air quality emissions have been calculated using Defra's Emission Factor Toolkit 7.0 (EFT v7.0). For future years, the assessment was undertaken for the scheme opening year (2026) and the design year (2041). It should be noted that EFT v7.0 only provides emission estimates up to the year 2030. Year 2030 emissions have therefore been used to represent emissions in the Design Year. Emissions are expected to decline in future years as a result of more stringent emission controls on vehicles; therefore, this approach provides a worst-case assessment of Design Year emissions.

Ecological Designated Sites

16.2.36 Ecological designated sites refer to habitats and species within nature conservation sites (designated sites) that contain features sensitive to air pollution. These can include Special Areas of Conservation (SAC), Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI) and Ramsar sites. Following DMRB HA 207/07 Annex F guidance, these sites have been considered where they are within 200m of the ARN. The full ecological assessment is presented in **Chapter 12** of this report.

16.2.37 The pollutants of most concern in relation to vegetation and ecosystems near roads are oxides of nitrogen (NO_X). Total NO_X concentrations and rates of nitrogen deposition have been calculated along transects that extend from the Proposed Scheme into nearby designated sites.

16.2.38 Road-traffic contributions have been combined with annual background mapped concentrations in order to calculate the total NO_X concentration along each transect. NO_X concentrations have

been adjusted following DMRB Interim Advice Note (IAN 170/12v3) on long-term trend (LTT) Gap Analysis methodology.

16.2.39 The World Health Organization (WHO) have set a critical level for NO_x for the protection of vegetation. The Statutory Nature Conservation Agencies (in Scotland, Scottish Natural Heritage (SNH)) policy is to apply this 30µg m^3 criterion, on a precautionary basis and as a benchmark, in internationally designated conservation sites and SSSIs.

Baseline Data Sources

16.2.40 The Proposed Scheme extents fall within The Highland Council (THC) and therefore THC has responsibility for air quality management. Key baseline data were reviewed from the 2015 THC Air Quality Progress Report (THC, 2015), the 2015 PKC Updating and Screening Assessment, and the Air Quality in Scotland website (http://www.scottishairquality.co.uk/).

16.2.41 Baseline nitrogen deposition and NO_x information relevant to the ecological designated sites present within the study area were obtained from Air Pollution Information Systems (APIS).

16.2.42 Traffic data was provided for Base (2015), Opening (2026) and Design Years (2041) without scheme (DM) and with scheme (DS) scenario options. Data was provided for each traffic model link as both one and two-way flows.

Limitations to Assessment

16.2.43 The DMRB HA 207/07 screening method is based on a distance drop-off calculation that does not take into account local atmospheric conditions such as wind speed and direction, which directly influence the rate at which pollutants disperse. A wind speed of 2m/s is assumed and no weighting for wind direction is applied; therefore, the equations used have a tendency to overestimate the pollutant concentrations.

16.2.44 Verification of the calculated pollutant concentrations against measured data was not carried out as no diffusion tube monitoring was undertaken within the Central Section from Glen Garry to Kincraig. The nearest available monitoring data was not considered to be representative of the Proposed Scheme study area. Furthermore, resulting pollutant concentrations are predicted to be <25% of the AQS objectives for annual mean NO_2 and PM. Even considering the uncertainty associated within the DMRB screening calculation methodology, it is unlikely that the Proposed Scheme will lead to any exceedances of the AQS Objectives for NO_2 and PM.

16.2.45 There is uncertainty attached to critical load (or critical level) values for ecological sites, which has implications for the interpretation of the APIS data. The empirical critical loads of total nitrogen deposition for vegetation were derived primarily from field experiments and field observations, while for NO_x critical loads the primary source is experimental studies. There are also uncertainties in the Land Use cover map that is used to assign broad habitats, and default values are often based on measurements at a limited number of sites across the UK (APIS, 2016).

Assigning Sensitivity

Construction

16.2.46 **Tables 16-1-1** to **16-1-5** in **Appendix 16.1 (Volume 2)** provide details on the criteria used to assign sensitivity for the temporary construction dust assessment. The discussion below summarises the findings from these tables.

16.2.47 According to IAQM (2014) sensitive receptors to dust are *"any location where a person or property may experience the adverse effects of airborne dust or dust soiling"*. They are categorised based on their sensitivity to potential dust impacts (high, medium and low). High sensitivity receptors include residential properties, schools and care homes; medium sensitivity receptors include hotels and offices; low sensitivity receptors encompass short-term car parks and footpaths.

16.2.48 Similar to human receptors, ecological receptors to dust are categorised as high, medium or low. High sensitivity ecological receptors include sites, such as Special Areas of Conservation (SACs) or Sites of Special Scientific Interest (SSSI), that contain habitats that are sensitive to dust deposition. Medium sensitivity ecological receptors include sites with important plant species whose dust sensitivity is uncertain and sites with national designation containing features that may be affected by dust deposition. Low sensitivity ecological receptors include locations with a local designation where the features may be affected by dust deposition.

Operation - Local Air Quality and Ecological Designated Sites

16.2.49 During operation, sensitive receptors are defined as:

- Relevant locations with public exposure (including residential, medical and educational premises if present) that are potentially sensitive to NO_2, PM_{10} and $PM_{2.5}$
- Internationally and nationally designated ecological sites near the Proposed Scheme (SSSI, SAC, SPA and Ramsar sites)

Assigning Magnitude and Significance of Impact

16.2.50 IAN 174/13 (Highways Agency, 2013a) provides advice on determining the significance of impacts of the Proposed Scheme on local air quality and ecological designated sites.

Construction

16.2.51 IAQM (2014) provides guidance on assessing the risk of impacts on human health and ecology in order to define appropriate construction dust mitigation measures. The assessment methodology applied in this report is presented in detail in **Appendix 16.1 (Volume 2)**.

Operation Local Air Quality

16.2.52 The significance of an impact is based on the magnitude of the change in pollutant concentration and absolute concentrations in relation to air quality objectives. Only receptors which exceed the air quality objective in either the DM or DS scenarios are used to inform significance.

The magnitude of change for NO_2 and PM_{10} concentrations used to assess operational impacts are shown in **Table 16-2.** Concentration changes less than 0.4µg/m³ for NO_2 and 0.2µg/m³ for PM_{10} are 'imperceptible' and are scoped out of the assessment.

16.2.53 Requirements for assessing $PM_{2.5}$ are not included in DMRB HA 207/07 air quality guidance, and no significance criteria are provided. However, for Scotland a $PM_{2.5}$ air quality objective (EU Air Quality Directive 2008/50/EC) is enforced; therefore, to enable consideration of $PM_{2.5}$, this assessment adopted the criteria from IAN 174/13.

Table 16-2: Magnitude of change criteria

Magnitude of Change in Concentration	Value of Change in Annual Average NO_2 and PM_{10}
Large (>4) NO_2 Large (>3) NO_X Large (>1.8) PM_{10} Large (>1) $PM_{2.5}$	Greater than full Measure of Uncertainty (MoU) value of 10% of the air quality objective (4µg/m³).
Medium (>2 to 4) NO_2 Medium (>1.5 to 3) NO_X Medium (>0.9 to 1.8) PM_{10} Medium (>0.6 to 1) $PM_{2.5}$	Greater than half of the MoU (2µg/m³), but less than the full MoU (4µg/m³) of 10% of the air quality objective.
Small (>0.4 to 2) NO_2 Small (>0.3 to 1.5) NO_X Small (>0.18 to 0.9) PM_{10} Small (>0.1 to 0.5) $PM_{2.5}$	More than 1% of objective (0.4µg/m³) and less than half of the MoU i.e. 5% (2µg/m³). The full MoU is 10% of the air quality objective (4µg/m³).
Imperceptible (≤ 0.4) NO_2 Imperceptible (≤ 0.3) NO_X Imperceptible (≤ 0.18) PM_{10} Imperceptible (≤ 0.1) $PM_{2.5}$	Less than or equal to 1% of objective (0.4µg/m³).
The MoU is due to uncertainty in the air quality monitoring, modelling and traffic data used in the assessment. The approach for defining the MoU is based around the advice in Defra (2009) on the desirability in achieving 10% verification (modelled versus monitored results) where concentrations are close to or above air quality objectives.	

16.2.54 Total number of receptors in each magnitude band are then aggregated and compared to the guideline number of receptors provided in IAN 174/13 to determine whether there is a significant adverse or beneficial (i.e. worsening or improvement) effect. As can be seen in **Table 16-3,** the impact is considered 'Significant' only if the study shows an exceedance of the air quality objective and where the magnitude of change in annual mean NO_2 or PM_{10} is 'Small', with between 30 and 60 receptors affected; or the magnitude is 'Medium' and between 10 and 30 receptors would be affected; or where one single receptors for which a 'Large' change is predicted.

Table 16-3: Guidelines to Numbers of Properties Constituting a Significant Effect

Magnitude of Change in Annual Mean NO_2 or PM_{10} (µg/m³)	Total 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	1 to 10	1 to 10
Medium	10 to 30	10 to 30
Small	30 to 60	30 to 60

16.2.55 The guideline bands have been developed for each magnitude category and set the upper level of likely non-significance and the lower level of likely significance. It should be noted that these are guideline values only and are designed to provide consistency in the assessment of significance across all highway schemes.

16.2.56 Where the results reside between the lower and upper guideline bands for any of the magnitude criteria (**Table 16-2**) then scheme effects could be significant and a judgement is required taking into account the results for all six categories (different magnitudes of change for both worsening and improvement).

16.2.57 Scheme effects are more likely to be significant where:

- There are no/ few receptors with any improvements
- PM_{10} and $PM_{2.5}$ annual averages are also affected by small, medium or large deteriorations
- Short term exceedances may be caused or worsened by the Proposed Scheme for either NO_2 or PM_{10}.

16.2.58 Scheme effects are more likely to not be significant where:

- There are receptors with small, medium or large improvements
- PM_{10} and $PM_{2.5}$ annual averages are not affected by small, medium or large deteriorations
- Short term exceedances are not caused or worsened by the Proposed Scheme for either NO_2 or PM_{10}.

Ecological Designated Sites

16.2.59 The approach to the air quality assessment of designated sites is outlined in Annex F of DMRB HA 207/07.

16.2.60 The magnitude of change categories defined in **Table 16-2**, were also used for annual average NO_X concentrations. Annual mean NO_X was used as the main basis for evaluating the significant effects on designated sites.

16.2.61 According to DMRB HA 207/07 guidance, where NO_X concentrations were assessed to be below the AQS objective then significant effects are not anticipated. If the AQS objective is exceeded, then significant effects may occur, and further consideration should be given to the magnitude of change. The exception to this is where changes are less than 0.4µg/m³, then effects are imperceptible and unlikely to be significant.

16.2.62 In addition, critical loads for nitrogen deposition have been set that represent (based on current knowledge) exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem. The critical loads vary by type of ecosystem and can be obtained from the APIS website.

16.3 Baseline Conditions

16.3.1 The baseline assessment has considered air quality monitoring within the THC local authority area, and Scottish air quality background mapped annual concentrations (http://www.scottishairquality.co.uk/data/mapping?view=data), for both local air quality and ecosystems.

16.3.2 The Proposed Scheme does not fall within, nor is it in the vicinity of, any AQMAs. The nearest AQMA is located approximately 44km north of the Project 9 extents, in the city of Inverness part of the Highland Council Local Authority and declared for both NO_2 and PM_{10}.

Air Quality Monitoring

16.3.3 There are two principal methods used for measuring air quality. These include passive sampling techniques such as diffusion tubes or use of sophisticated continuous monitoring equipment.

16.3.4 As it is likely that current baseline NO_2 and PM_{10} concentrations meet AQS objectives at sensitive receptors within the study area, no air quality monitoring was deemed necessary in the A9 Crubenmore to Kincraig section, for the purposes of this assessment.

16.3.5 Two air quality monitoring surveys were carried out for the A9 Dualling Programme in the Northern (between Tomatin and Inverness) and Southern (between Perth and Glen Garry) Sections, by the Atkins-Mouchel Joint Venture (AMJV) and Jacobs UK (JUK), respectively.

16.3.6 The monitoring locations and measured annual mean concentrations of NO_2 are reported in **Appendix 16.2 (Volume 2)**. The Calvine monitoring site (site 25) is the nearest monitoring location to Project 9, situated approximately 30km south east of the southern boundary of Project 9 (at the nearest point). It was consulted to establish baseline conditions along the A9 to the north and south of the Proposed Scheme but was deemed to be too far away to be used for model verification purposes. The measured NO_2 concentrations show there is little or no risk of exceeding NO_2 AQS objectives.

16.3.7 The Highland Council (THC) monitor NO_2 and PM_{10} from a network of continuous monitoring locations and diffusion tube sites. However, none of these monitoring sites are located within the vicinity of Project 9. The nearest automatic monitoring station is located on Telford Street in Inverness, more than 40km north of Project 9; this is shown in **Appendix 16.2 (Volume 2)**.

Background Concentrations

16.3.8 The background concentration of a pollutant is determined by regional, national and international emissions and often represents a significant proportion of the total pollutant concentration. The local component is determined by local pollutant sources such as road traffic and chimney stacks.

16.3.9 Background pollutant concentrations are spatially and temporally variable. Annual mean background concentrations of NO_X, NO_2, and PM_{10} are provided annually and are mapped on a grid resolution of $1km^2$ across the whole of Scotland. Annual mean values are calculated using a Scotland-specific model based on Scottish monitoring and meteorological data and were obtained from the Scottish Government (http://www.scottishairquality.co.uk/data/mapping?view=data). $PM_{2.5}$ background was obtained from Defra background mapping.

16.3.10 To prevent double counting of source contributions, background contributions from the trunk road traffic sector were subtracted from total background NO_X concentrations using the Defra tool (NO_2 Adjustment for NO_X Sector Removal Tool v5.0).

16.3.11 **Table 16-4** provides the total emissions and the percentage emissions contributions to NO_X and PM_{10} in Scotland in 2015 from the latest National Atmospheric Emissions Inventory report (September 2017). As shown in the table, transport, energy, industry, and residential and commercial sources contribute the most to the total NO_X emissions. Residential and commercial sectors are also the largest contributions for PM_{10}, followed by transport, agriculture and industry.

16.3.12 The area surrounding the Proposed Scheme, however, does not include any large industrial sources or energy facilities. There are also no large population centres with domestic heating. Therefore, the main source of emissions in the Proposed Scheme study area is from transport.

Table 16-4: NAEI (2017) Total emissions (kt) and source emission contributions (%) by sector for Scotland in 2015

Sector	NO_X	PM_{10}
Total emissions	84	12
Agriculture	0.0	15.8
Energy Industries	28.2	3.6
Fugitive	0.0	0.0
Industrial Combustion	14.4	10.0
Industrial Processes	0.0	13.2
Residential, Commercial & Public Sector Combustion	12.0	30.0
Solvent Processes	0.0	2.8
Transport Sources	43.4	18.5
Waste	0.0	0.0
Other sources*	2.0	6.5
*Other sources include all "other" categories in the NAEI inventory and several categories that are insignificant for a specific pollutant		

16.3.13 Background NO_2, PM_{10} and $PM_{2.5}$ concentrations are shown in **Table 16-5** for receptors within the vicinity of Project 9. Background pollutant concentrations all meet AQS objectives for all receptors within the vicinity of the study area.

Table 16-5: Annual mean background pollutant concentrations (µg m^{-3}) at human health receptors

Receptor ID	Grid Square (m)	Base Year (2015)			Opening Year (2026)		
		NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
R1	270500,796500	2.6	7.0	4.4	1.9	6.8	4.2
R2-R5	270500,797500	2.7	7.2	4.6	2.0	7.0	4.4
R6-R7	271500,797500	2.6	7.3	4.6	2.0	7.1	4.4
R8-R9	275500,799500	2.6	7.3	4.6	2.0	7.1	4.4
R10	276500,800500	3.1	8.0	4.8	2.4	7.8	4.6
R11-12	276500,801500	2.6	7.5	4.8	2.0	7.3	4.6
R13	278500,802500	2.5	7.1	4.5	1.8	6.9	4.3
R14-16	278500,801500	2.9	7.5	4.6	2.2	7.2	4.4
R17	278500,802500	2.5	7.1	4.5	1.8	6.9	4.3
R18-20	279500,802500	2.6	7.5	4.6	2.0	7.3	4.5
R21	280500,803500	2.5	7.2	4.6	1.8	6.9	4.4
R22-23	281500,803500	2.	7.0	4.5	2.1	6.8	4.3

Key Receptors

Residential Properties

16.3.14 Twenty-three residential receptors are located within 200m of affected roads associated with the Proposed Scheme and were considered for the local air quality assessment. These were identified at sensitive receptor locations alongside the ARN. Locations of the receptors included in this assessment are presented in **Table 16-6** and in **Drawings 16.3** and **16.6** contained in **Volume 3** of this report.

Table 16-6: Sensitive human health receptors identified for the local air quality assessment

Receptor ID	Description	Chainage	X	Y
R1	West Ralia, Newtonmore	42800	270289.82	796989.18
R2	Ralia Beag, Newtonmore	43000	270420.64	797116.97
R3	Ptarmigan Lodge, Newtonmore	43000	270456.81	797072.14
R4	Glens View, Newtonmore	43200	270647.67	797369.23
R5	Invermore Lodge, Newtonmore	43400	270718.25	797420.63
R6	Ralia Lodge, Newtonmore	43800	271195.53	797547.03
R7	Keepers Cottage, Newtonmore	44200	271424.63	797545.51
R8	Knappach, Kingussie	48400	275517.92	799161.70
R9	Ruthven Cottage, Kingussie	48800	275857.18	799311.79
R10	Glebe Court, Kingussie	50400	276367.12	800765.88
R11	Craig-an-Darach, Kingussie	50600	276407.15	801006.21
R12	Kerrow Cottage, Kingussie	50800	276622.62	801256.63
R13	Lynvoan Cottage, Kingussie	52600	278102.36	802010.97
R14	Sithean, Kingussie	52600	278185.34	801827.95
R15	Rathmhor, Kingussie	52600	278343.21	801773.76
R16	Chapelpark Farm House, Kingussie	52800	278389.62	801922.03
R17	West Lodge, Kingussie	53200	278880.52	802012.29
R18	Mains of Balavil, Kingussie	53600	279018.55	802278.44
R19	Railway Cottage, Kingussie	53600	279157.47	802183.28
R20	East Lodge, Kingussie	54200	279602.04	802702.46
R21	Garaidh, Kincraig	55400	280519.88	803424.38
R22	Meadowside House, Kingussie	56000	281007.47	803673.61
R23	Meadowside, Kincraig	56200	281226.53	803714.38

Ecological Designated Sites

16.3.15 Four international and two national designated sites are identified within 200m of the Proposed Scheme (see **Drawing 16.1, Volume 3**):

- River Spey Special Area of Conservation (SAC)
- Insh Marshes SAC
- River Spey - Insh Marshes Special Protection Area (SPA)
- River Spey - Insh Marshes Ramsar
- River Spey - Insh Marshes Special Site of Scientific Interest (SSSI)
- River Spey - SSSI

16.3.16 The River Spey and Insh Marshes SACs and the River Spey - Insh Marshes SPA and Ramsar are internationally designated, whereas the SSSIs are nationally designated. All sites contain habitats of several ecological features, including birds, fish and otters, that are sensitive to changes in NO_X concentrations and nitrogen deposition rates. Such changes can have direct and indirect impacts on vegetation, affecting species composition and ecosystem health.

16.3.17 Information on nitrogen-sensitive habitats, and the baseline nitrogen deposition rates and critical load ranges for habitats in designated sites across the UK are available from APIS.

16.3.18 The River Spey SAC is designated only for faunal species (Atlantic salmon, freshwater pearl mussel and otter), which, according to APIS, could be sensitive to nitrogen deposition. However, there is no sufficient information to establish a relationship between increased nitrogen deposition and effects on fauna (Nijssen et al., 2017)[2] and the expected contribution of the Project to nitrogen deposition is very small. Available information from APIS on the River Spey SSSI was limited, including only indicative critical load ranges for terrestrial vegetation and no information on baseline nitrogen deposition rates. After consulting the project ecologist, both sites (River Spey SAC and SSSI) were therefore screened out of the nitrogen deposition assessment.

16.3.19 APIS reports baseline nitrogen deposition data for 2014 (as the average of the period from 2013 to 2015)[3] on a grid with a resolution of 5km^2. This was projected forward to the base year (2015) and the opening year (2026), assuming a 2% decrease per year (HA 207/07). **Table 16-7** summarises this information below.

Table 16-7: Designated Site Critical Loads for Nitrogen Deposition and Baseline Nitrogen Deposition (kg N ha^{-1} yr^{-1})

Designated Site	Habitat Type	Critical Load	Nitrogen Deposition (Average 2013 – 2015)	Base Year (2015) Nitrogen Deposition	Opening Year (2026) Nitrogen Deposition
River Spey SAC	Rivers and streams	No comparable habitat with established critical load estimate available	6.8	6.7	5.3
Insh Marshes SAC	Permeant Oligotrophic waters, valley mires, poor fens and transition mires, rivers and streams	3 – 15	4.9	4.8	3.8
River Spey – Insh Marshes SPA	Permeant Oligotrophic waters, coniferous woodland, bogs, fen marsh and swamp, dwarf shrub heath, and littoral sediment	3 – 30	7.7	7.5	6.0
River Spey – Insh Marshes SSSI	Valley mires, rich and poor fens, mountain rich fens, and transition mires, moist and wet oligotrophic grasslands, and standing open waters and canals	10 - 30	4.9	4.8	3.8
River Spey SSSI	Acid and calcareous grassland	5 - 25	Nitrogen deposition rates unavailable		

16.3.20 It is important to note that there is uncertainty attached to these APIS values, which has implications for the interpretation of the data. Critical loads are based on empirical data from field experiments and observations. There is high uncertainty associated with these values as

[2] Nijessen et al. (2017), Pathways for the effects of increased nitrogen deposition on fauna.

[3] The deposition of nitrogen is obtained from the Concentration Based Estimated Deposition (CBED), which is based on measured–interpolated data for a 3-year average 2013-2015. Further information on CBED website: http://www.apis.ac.uk/popup/cbed.

they are based on professional judgement. There are also uncertainties associated with land use cover maps that are used to assign broad habitats, with default values often based on very few measurements from a limited number of sites in the UK. Similarly, baseline nitrogen deposition is provided on a 5km grid, which does not account for sub-grid variability.

16.3.21 **Table 16-8** presents a summary of the receptors considered in each part of the construction and operational assessments of local air quality. Ecological receptors in the Insh Marshes SAC, River Spey-Insh Marshes SPA and SSSI ecological designated sites, represent medium sensitivity habitats in relation to dust as defined by the IAQM guidance. Despite the designated importance of these sites, the sensitivity of plant species to the changes in air quality is uncertain, nevertheless it may contain features that could be potentially affected by dust deposition.

Regional Assessment

16.3.22 The regional assessment did not consider the impacts of the Proposed Scheme at individual receptors, rather the wider impacts of total emissions from the road network. The sum of pollutant contributions from individual traffic links is considered instead.

Summary

16.3.23 **Table 16-8** summarises the key receptors considered in each assessment of air quality impacts, as shown in **Drawings 16-3** to **16-6**, contained in **Volume 3**.

Table 16-8: Summary of key receptors considered in each assessment of air quality impacts

Assessment (Phase)	Description
Local Air Quality (Operational)	A total of 23 sensitive receptors (R1 – R23) were selected among those identified within 200m of the scheme and considered for the local air quality assessment.
Ecological (Operational)	Fifteen ecological receptors have been chosen within 200m of affected roads to represent the identified designated sites (Insh Marshes SAC, and the River Spey-Insh Marshes SPA and SSSI).
Dust (Construction)	Human receptors: 23 No. with medium sensitivity. Ecological receptors: medium sensitivity receptors within 20m and 50m of the works boundary.

16.4 Potential Impacts Assessment

Impact Assessment Introduction

16.4.2 This sub-section considers the potential temporary (construction) and permanent (operational) air quality impacts for the Proposed Scheme.

Construction Impact Assessment: Temporary

16.4.3 Following the construction assessment methodology presented in **Section 16.2** and **Appendix 16.1 (Volume 2)**, 23 medium sensitivity receptors, all residential properties and commercial properties including a hotel and some shops, were identified. No low sensitivity receptors were found.

16.4.4 The construction assessment considered potential temporary impacts during demolition, earthworks, construction and track-out and the level of any mitigation required. Dust emissions can result in dust soiling and lead to elevated PM_{10} concentrations. Elevated dust emissions can also have impacts on vegetation via deposition, which can alter photosynthetic processes and

cause damage to sensitive habitats. The construction assessment methodology is presented in detail in **Appendix 16.1 (Volume 2)** to this report.

16.4.5 Exhaust emissions from HDVs movements along the local road network and on-site plant (also known as non-road mobile machinery or NRMM) during the construction phase also have the potential to cause adverse impacts at identified receptors. However, according to the IAQM construction dust guidance (2014), generated emissions *are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed.*

16.4.6 Demolition activities along the length of the Proposed Scheme will include the demolition of several culverts and structures, including the River Spey bridge and associated embankment. The overall volume of material to be demolished will be less than 20,000 m^3, which would lead to a **Small** magnitude according to the IAQM (2014) guidance. Other minor demolition activities will include road signage that are also considered and have been considered to have a **Small** magnitude.

16.4.7 Considerable earthworks are expected to take place along the Proposed Scheme, including such activities as vegetation clearance, excavation, and other land manipulation for drainage and the Proposed Scheme alignment. The total area comprising earthworks activities is expected to exceed 10,000m^2. Therefore, earthworks are assigned a **Large** magnitude.

16.4.8 Construction activities will involve construction of the new carriageway, two main junctions at Newtonmore and Kingussie, two smaller junctions at Glentruim and Balavil and local road realignments to accommodate access provision. Construction will also involve other structures including the new crossing of the River Spey and associated floodplain, which comprises a combination of embankment and bridge. Specific volumes to be constructed are unknown at this time, however assuming a conservative approach, these are expected to be between 25,000m^3 and 100,000m^3. Following the IAQM guidance, construction is therefore assigned a **Medium** magnitude.

16.4.9 Based on estimated number of the HDVs required to construct the Proposed Scheme, more than 50 HDVs movements per day are expected during the construction phase. Track-out is therefore assigned a **Large** magnitude.

16.4.10 Construction dust impacts have been assessed within 350m of the permanent works boundary for the Proposed Scheme following IAQM (2014) guidance. Human receptors were identified within 20m, 50m, 100m, 200m and 350m of the Proposed Scheme permanent works boundary.

16.4.11 Human health impacts also take the local background PM_{10} concentration into consideration as dust emissions will lead to localised increases. The background PM_{10} concentration for the area surrounding the Proposed Scheme is approximately 7.3µg m^{-3} for the Base Year.

16.4.12 Based on the number and sensitivity of human receptors, and the background PM_{10} concentration, the area sensitivity is **Low** for human health impacts and **Medium** for dust soiling.

16.4.13 Identified ecological designated sites have been assessed at 20m and 50m from the permanent works boundary and consist of habitats with unknown sensitivities to dust impacts. Dust deposition due to the demolition of the River Spey crossing and construction of the new crossing, together with earthworks, has the potential to affect habitats and plant communities. Dust can have two types of effect on vegetation: physical and chemical. Direct physical effects include reduced photosynthesis, respiration and transpiration through smothering. Chemical changes to soils or watercourses may lead to a loss of plants or animals for example via changes in acidity. Indirect effects can include increased susceptibility to stresses such as pathogens and air pollution. These changes are likely to occur only as a result of long-term demolition and

construction works adjacent to a sensitive habitat. However, the portion of the ecological designated sites potentially affected by dust emissions is very limited, with only the closest portion of the designated area potentially affected by dust generated during construction (typically within the first 50m). Therefore, the overall area sensitivity to ecological impacts is **Medium**.

16.4.14 The sensitivity of the area to specific impacts is combined with the estimated magnitudes of construction activities and used to inform the assessment of the risk of dust impacts from each construction activity. **Table 16-9** presents the risk of dust impacts for dust soiling, human health and ecology for each of the four construction stage activities. The level of risk is used to inform relevant mitigation measures, in **section 16.5**, to reduce negative impacts from construction.

Table 16-9: Overall risk of dust impacts from the four IAQM defined construction activities

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Track-out
Dust Soiling	Low Risk	Medium Risk	Medium Risk	Medium Risk
Human Health	Low Risk	Low Risk	Low Risk	Low Risk
Ecological	Low Risk	Medium Risk	Medium Risk	Medium Risk

16.4.15 There is a **Medium Risk** of impact for dust soiling and a **Low Risk** of impact for Human health from each of the four construction activities.

16.4.16 Ecological impacts considered the demolition of the existing River Spey crossing and the construction of the new crossing which will take place within the River Spey designated sites. The assessment concluded that there is a **Medium Risk** of impact for ecological receptors. As described in the Design Summary and Buildability Report (see **section 11.3**), specific control measures will be adopted to minimise the potential for pollution and contamination within the designated sites. This will include measures to ensure that mud and debris do not fall into the river and to limit the movement of earthworks materials either side of the River Spey, and areas adjoining designated site boundaries. In addition, impacts tend to be reversible once the works are completed, and dust emissions cease. Furthermore, the prevailing climatic conditions in the area, with precipitation throughout the year (some areas of the western Highlands receive about 3,000mm per year of rainfall), is likely to mitigate the impact of any dust deposition.

16.4.17 The overall risk of dust impacts for the construction phase of the Proposed Scheme is **Medium** and is considered significant enough to require mitigation.

16.4.18 The risk of impacts presented above represents the worst-case scenario. Construction works will span a wide area and will move as various parts of the Proposed Scheme are completed. Therefore, construction dust impacts will be spatially and temporally variable. In addition, meteorological conditions will affect the magnitude of dust emissions; under wet conditions dust emissions are significantly reduced.

Operational Impact Assessment: Permanent

Local Air Quality

16.4.19 Results of the local air quality assessment are presented in **Table 16-3-1** to **Table 16-3-3** in **Appendix 16.3 (Volume 2)**. NO_2, PM_{10} and $PM_{2.5}$ concentrations were predicted for the Base Year (2015) and Opening Year (2026) DM and DS scenarios.

16.4.20 The background pollution maps and vehicle emission factors assume that air quality improves in future years as older vehicles are replaced with modern cleaner vehicles. However, a report produced on behalf of Defra (*'Trends in NO_x and NO_2 emissions and ambient measurements in the UK'*, Defra 18th July 2011 version) considered NO_2 monitoring data from across the UK and showed that reductions in concentrations had slowed in recent years. This trend is thought to be related to the increased use of modern diesel vehicles which emit more NO_x than expected under urban driving conditions and have higher primary NO_2 emissions than petrol vehicles. To reduce this discrepancy, a LTT gap analysis has been carried out for NO_2, in accordance with IAN 170/12v3 (HA, 2012).

16.4.21 On February 2016, Highways England published an interim note about an alternative long-term trends projection methodology for NO_2 called LTT_{E6}. The analysis concluded that the previous LTT assessment was too pessimistic. However, recent studies have confirmed that a large number of Euro 6 diesel cars are failing to meet the emission standard. The LTT presented in IAN170 was deemed to be the most conservative approach and therefore was used in this assessment.

16.4.22 In all scenarios considered, estimated annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ remain below the respective AQS objectives. No exceedances of the 1-hour NO_2 or 24-hour PM_{10} AQS objectives are predicted. In addition, according to IAN 174/13 Table 2.3, a significant effect for local air quality is realised where the outcomes of the assessment indicate an exceedance of the limit and when at least 30 receptors experience a Small magnitude change (i.e. between 0.4 and 2 µg/m^3) or more than 10 receptors have a Medium magnitude (i.e. between 2 µg/m^3 and 4 µg/m^3) or at least one has a Large magnitude (i.e. > 4 µg/m^3). As presented in **Appendix 16.3 (Volume 2)**, only one receptor (i.e. R18) is expected to be subjected to a Medium magnitude and only 11 will experience a Small change. All other changes in concentrations at receptors are imperceptible.

16.4.23 Given the low concentrations (well below the AQS objectives) and, as per the methodology presented in **Section 16.2**, the impact on local air quality associated with the Proposed Scheme is **not considered to be significant**.

Regional Air Quality

16.4.24 Regional emissions were predicted for the Project 9 region in the Base Year (2015), and the Opening (2026) and Design (2041) Years DM and DS scenarios.

16.4.25 NO_X, PM_{10} and CO_2 emissions are shown to increase for all pollutants due to the Proposed Scheme. Year 2030 emissions were used for the Design Year, as this is the latest year available in the EFT. **Table 16-10** below summarises the regional assessment results.

Table 16-10: Results of the regional assessment for the pollutants NO_X, PM_{10} and CO_2

Pollutant	Base 2015	Opening Year 2026		Change due to scheme in 2026 (DS-DM)	% Change (relative to DM)	Design Year 2041		Change due to scheme in 2041 (DS-DM)	% Change (relative to DM)
		DM	DS			DM	DS		
NO_x (kg yr^{-1})	43,500	13,999	19,219	+5,220	+37	14,122	18,447	+4,325	+31
PM_{10} (kg yr^{-1})	3,032	2,685	3,029	+344	+13	3,055	3,280	+225	+7
CO_2 (T yr^{-1})	16,664	17,357	21,224	+3,867	+22	19,853	23,017	+3,164	+16

16.4.26 A decrease in emissions is predicted for NO_X and PM_{10} between 2015 and the 2026 Do-Minimum scenario. This decrease in emissions is the result of the expected improvement in emissions per vehicle due to fleet turnover to later Euro standards, improved emission technologies and fuel economy. CO_2 emissions increase because for this specific pollutant the improved emission technologies are not expected to compensate the increase in the number of vehicles.

16.4.27 Increases in regional emissions are predicted for both opening (DS) and design (DS) years, mainly because the Proposed Scheme is expected to lead to an increase in traffic flows due to the increased capacity. Total vehicle kilometres (vkm) also increase in the opening and design years as a result of the Proposed Scheme design, which also contributes to increased regional emissions. This suggests that the extent of the improvement in emissions per vehicle (due to fleet turnover to later Euro standards, improved emission technologies and fuel economy) is less than the increase in emissions associated with traffic growth. It should be noted that the ARN is limited to the A9 mainline and a few secondary local roads. Relative to the total emissions across Scotland for NO_X, PM_{10} and CO_2, the increase of emissions as a result of the Proposed Scheme is small.

16.4.28 According to the Scotland's Air Quality Pollutant Inventory (AQPI) (National Atmospheric Emissions Inventory - NAEI, 2016) total NO_X and PM_{10} emissions from all sectors were 90.8 and 18 kilo-tonnes in 2014 respectively. No future estimate is available. The increase in emissions associated with the Proposed Scheme (less than 1%) will not significantly affect regional air quality.

Ecological Designated Sites

16.4.29 The potential impacts of the Proposed Scheme on habitats within the designated sites have been considered along the Insh Marshes SAC, River Spey-Insh Marshes SPA and SSSI transects, extending up to 200m from the Proposed Scheme. Each transect was chosen at worst case locations, where the respective designated site was nearest to the A9. The selected receptors are shown in **Drawings 16.4** to **16.5 (Volume 3)**.

16.4.30 Road-traffic contributions have been combined with background concentrations to obtain the total NO_X concentration. Background concentrations used in the assessment of the existing baseline (2015) and opening year (2026) are presented in **Table 16-11**.

Table 16-11: Annual mean background pollutant concentrations (µg m^{-3}) used in the assessment

Receptor	Easting (m)	Northing (m)	Background NO_X	
			Base Year (2015)	Opening Year (2026)
Insh Marshes SAC, River Spey-Insh Marshes SPA and SSSI, (E1-E5)	272500	798500	3.5	2.60
Insh Marshes SAC, River Spey-Insh Marshes SPA and SSSI, (E6-E10)	276500	800500	4.0	3.1
Insh Marshes SAC, River Spey-Insh Marshes SPA and SSSI, (E11-E15)	281500	803500	3.6	2.7

16.4.31 Total NO_X concentrations have been adjusted using the LTT Gap Analysis method discussed in **section 16.2**. The results of the assessment of NO_X concentrations for ecological receptors in the study area are presented in **Appendix 16.3 (Volume 2)**.

16.4.32 NO_X concentrations are below the AQS objective of 30µg m^{-3} in all scenarios for all ecological receptors.

16.4.33 The changes in NO_X concentrations are a result of the combination of changes to the alignment of the A9 mainline and an increase in traffic volumes. NO_X concentrations therefore increase for receptors at the nearest point of designated sites to the road and drop off at receptors further from the A9, becoming imperceptible.

16.4.34 The changes are insignificant because they do not lead to exceedance of the AQS objective. Furthermore, the existing A9 carriageway crosses the designated sites at this location. In the DS scenario, the new carriageway moves between E6 and E7, therefore leading to increases of NO_X concentrations at these receptors. The effect would be offset by the new carriageway moving further away from other parts of the designated site from the existing alignment. Finally, E6 and E7 represent the worst-case locations for the Proposed Scheme in terms of NO_X impacts on designated sites; each designated site covers a wide area, and any effects on a small section near the A9 would not impact the sites on a whole.

16.4.35 IAN 174/13 guidance recommends that the NO_2 impact magnitude criteria in **Table 16-2** and **Table 16-3** were also used to assess the Proposed Scheme impacts on NO_X in the three designated sites. Where a potentially significant effect is evident due to NO_X concentrations, the nitrogen deposition rates would further assist in the evaluation of significance. However, results for the assessment of NO_X concentrations for all ecological receptors do not constitute a significant effect as the Proposed Scheme does not lead to any exceedances of the NO_X objective ($30\mu g\ m^{-3}$). Nitrogen deposition rates were therefore not assessed further for designated sites within the study area.

16.5 Mitigation and Monitoring Requirements

16.5.1 The findings of the assessment presented in **section 16.4** were used to develop relevant mitigation measures for the operational and construction phases of the Proposed Scheme to mitigate significant adverse impacts. **Table 16-12** presents mitigation measures that are common to the A9 Dualling projects and specific to Project 9.

16.5.2 The operational impacts are anticipated to be not significant and therefore no air quality specific mitigation measures have been identified for the operation of the Proposed Scheme.

Monitoring Requirements

16.5.3 No significant air quality impacts are anticipated during the construction or operation of the Proposed Scheme. Potential non-significant construction impacts are expected to be mitigated by measures described in **Table 16-12,** and the residual impact is anticipated to be negligible. No air quality specific monitoring requirements are required for the construction or operation of the Proposed Scheme.

Table 16-12: Proposed standard and scheme-specific dust emission and air quality construction phase mitigation measures

Item Ref.	Approximate Chainage/ Location	Timing of Measure	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required
Standard A9 Mitigation					
SMC-AQ1	Throughout Proposed Scheme	Construction	In relation to minimising fugitive dust emissions from earthworks, material storage and concrete batching the following mitigation items will be implemented: • stockpiles and mounds will be at a suitable angle of repose to prevent material slippage, will be enclosed or securely sheeted, and/or kept damped as necessary during dry weather; • the surfaces of any long-term stockpiles which give rise to a risk of dust or air pollution will be covered with appropriate sheeting or will be treated to stabilise the surfaces; • mixing of large quantities of concrete will be carried out only in enclosed or shielded areas; • all handling areas will be maintained in a dust free state as far as is practicable with sprinklers and hoses used to prevent dust escaping from the site boundaries; and • procedures will be established so that the site is regularly inspected for spillage of dusty or potentially dusty materials and any such spillage would be dealt with promptly where necessary to prevent dust nuisance.	To reduce fugitive dust emissions from earthworks, material storage and concrete batching.	None required
SMC-AQ2	Throughout Proposed Scheme	Construction	In relation to minimising dust from vehicle movements within the site the following mitigation items will be implemented: • the Contractor will employ appropriate measures, such as covering materials deliveries or loads entering and leaving the construction site by a fixed cover or sheeting appropriately fixed and suitable for the purposes of preventing materials and dust spillage; • where unsurfaced routes are identified as creating dust emissions during periods of dry weather, surfaces will be regularly dampened down using water bowsers; and • appropriate speed limits will be established and enforced over all unmade surfaces.	To reduce dust from vehicle movements	None required
SMC-AQ3	Throughout Proposed Scheme	Construction	In relation to appropriate cleaning of public roads the following mitigation items will be implemented: • wheel washing facilities will be installed as required and heavy vehicles will be required to use the facilities prior to leaving the site; • subject to approval from the Roads Authority, public roads immediately outside the site entrance will be cleaned using vacuum sweeper brushes and other specialised road cleaning equipment as necessary to maintain an appropriate state of cleanliness; and • roads and footpaths adjacent to the proposed scheme will be cleaned, with damping if necessary.	To reduce potential of dust from public roads	None required

Item Ref.	Approximate Chainage/ Location	Timing of Measure	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required
Project Specific Mitigation					
P09-AQ 1	Throughout Proposed Scheme	Construction	In relation to preparing and maintaining the site, the following additional mitigation item will be implemented: • Plan site layout so that machinery and dust causing activities are located as far as practicable from receptors. This is particularly relevant around the Newtonmore and Kingussie junctions where the greatest number of receptors are located.	Ensuring the site layout minimises the risk of dust emissions.	None required

16.6 Residual Impacts

16.6.1 During the construction of the Proposed Scheme, activities have the potential to give rise to fugitive dust. However, as reported in **Table 16-13**, with appropriate mitigation, short-term impacts can be minimised during construction works to become insignificant.

16.6.2 No mitigation is proposed for operational air quality as impacts are predicted to be not significant.

Table 16-13: Summary of air quality residual impacts – Proposed Scheme

Environmental topic	Residual Impacts – Air quality and construction dust
Air Quality – During Construction	No significant impact with mitigation in place
Air Quality – During operation	Not significant

16.7 Overall Evaluation of Significant Effects

16.7.1 The overall impact of the Proposed Scheme follows the guidance presented in IAN 174/13, whereby the professional judgement of the significance determination is presented in terms of specific scheme-related questions. **Table 16-14** presents the evaluation of significant air quality effects of the Proposed Scheme.

Table 16-14: Summary of air quality effects – Proposed Scheme

Key Criteria Questions	Yes/ No
Is there a risk that environmental standards will be breached?	No
Will there be a large change in environmental conditions?	No
Will the effect continue for a long time?	No
Will many people be affected?	No
Is there a risk that designated sites, areas, or features will be affected?	No
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No
On Balance is the Overall Effect Significant?	**No**

16.8 References

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