6 Air Quality

6.1 Introduction

6.1.1 This chapter presents an assessment of impacts of the A90 Laurencekirk junction upgrade scheme on air quality and greenhouse gas emissions. The chapter considers local air quality impacts on sensitive receptors at human exposure locations during the construction and operational phases. There are no ecological receptors within the study area. An assessment of the wider regional emissions impacts of the proposed scheme, once operational, is also provided.

6.1.2 Air quality is assessed in relation to the concentrations of specific pollutants in the air, taking into consideration the effect of these pollutants on receptor locations sensitive to changes in pollutant concentrations. In the United Kingdom, vehicular exhaust emissions are the major contributor of these pollutant concentrations. In more rural locations, such as the proposed scheme, the main source of pollutants to the air are often vehicular emissions. Therefore, changes to road junctions and alignments can significantly affect local air quality as emissions increase or decrease due to changes of road location, traffic quantity and speed.

6.1.3 Dust deposition is the main air quality impact associated with the construction phase. Emissions of dust to air can occur during the preparation of the site (e.g. demolition and land clearing), earthworks (including the storage of materials) and construction. There can be substantial variations in day to day emissions depending on climatic conditions and the level of activity and specific operations being undertaken. It is generally rare that construction dust represents an adverse effect to human health given the temporary nature of activities taking place. Impacts are typically associated with the soiling of surfaces, and deposition of material on property, as well as the transfer of dust generating materials from site to the local road network.

6.1.4 Over the course of the construction phase, localised increases of NO_X, NO_2, PM_{10} and $PM_{2.5}$ concentrations are possible due to exhaust emissions from diesel powered vehicles and other on-site equipment (non-road mobile machinery) and road going vehicles accessing the site. Following the DMRB Stage 2 assessment of the 13 options undertaken by Amey in 2018, the DMRB Stage 3 (Ref 6.1) considers the established preferred option, Option 1A (the scheme), and aims to assess with reasonable certainty whether there is a likelihood of the NO_2 or PM_{10} AQOs being exceeded at sensitive receptor locations in Laurencekirk.

6.1.5 The proposed scheme's operational phase local air quality assessment has considered the main pollutants arising from road transport emissions; specifically, nitrogen oxides (NO_x), nitrogen dioxide (NO_2), particulate matter (PM_{10}) less than 10 microns in diameter (PM_{10}) and particulate matter ($PM_{2.5}$) less than 2.5 microns in diameter ($PM_{2.5}$). Carbon dioxide (CO_2) is also considered in the regional assessment.

6.2 Policy and Legislative Background

6.2.1 In Scotland, air quality is regulated through the legislation and regulations summarised in Table 6-1.

Table 6-1: Air quality legislation

Legislative Instrument	Description
National Planning Policy Framework (NPPF) 2018 Update (Ref 6.2)	The 2018 NPPF update describes the policy context in relation to pollutants including air pollutants. Specifically, in terms of development with regards to air quality: "Para 180: Planning policies and decisions should sustain and contribute towards compliance with relevant UK Air Quality Objectives (AQOs) or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air zones is consistent with the local air quality action plan."
Scottish Planning Policy (SPP) (Ref 6.3)	SPP sets out the priorities from the Scottish Government for the operation of the planning system and for the development and the use of the land. Good air quality is referred to as one of the guiding principles that the government considers as contributing to sustainable development. It is also referred to in the guidance for town centre strategies as one of the drivers for green infrastructure. The Scottish Government is committed to the concept of sustainable growth, such as climate change mitigation and adaption, as one of the guiding principles of the policy.
Scotland's Third National Planning Framework (NPF3) (Ref 6.4)	NPF3 is the spatial expression of the Scottish Government's economic Strategy as a guide to sustainable economic growth. Air quality is dealt with in Section 2 in terms of reducing the impact of motor traffic on city and town centres and the improvements this brings to the public realm, along with the health benefits from increasing active travel.
Air Quality (Scotland) Regulations 2000 (Ref 6.5) Air Quality (Scotland) Amendment Regulations 2002 (Ref 6.6) Air Quality (Scotland) Amendment Regulations 2016 (Ref 6.7).	The Scottish Government contributed to the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland published in July 2007. It defined both Standards and Objectives for a range of pollutants.

Legislative Instrument	Description
Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Ref 6.8)	The Clean Air for Europe (CAFE) program reviewed air quality legislation in the European Union and merged much of the existing legislation into a single legal directive, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC. This act incorporated: The EU Framework Directive (96/62/EC) on ambient air quality assessment and management and associated daughter directives (199/30/EC, 2000/69/EC and 2002/3/EC) which set out long term objectives and target values for pollutant concentrations in ambient air. Council decision 97/1010/EC which established the exchange of information and data from networks and individual stations measuring air pollution within member states.
Air Quality Standards (Scotland) Regulations 2010 (Ref 6.9)	Transcribes Directive 2008/50/EC into Scottish legislation (effective from June 2010).
Air Quality Standards Regulations 2016 (Ref 6.10)	Amendments to the transcription of Directive 2008/50/EC into UK legislation (effective from December 2016).
Environmental Protection Act 1990 (EPA) (Ref 6.11)	Part III of the Environmental Protection Act 1990 defines 'statutory nuisance' with regard to dust and places a duty on Local Authorities to detect any such nuisances within their area.
Climate Change (Scotland) Act 2009 (Ref 6.12)	The Climate Change (Scotland) Act aims to manage and respond to climate change in Scotland by setting legally binding targets, taking powers to meet the targets and establishing clear and regular accountability. The main aims of the Act are to: set a target that net Scottish emissions for the year 2050 are 80% lower than the baseline set an interim target that net Scottish emissions for the year 2020 are 42% lower than the baseline set targets for each year in the period 2010-2050 for reductions in net Scottish emissions in order to contribute to the UK Low Carbon Transition Plan improve carbon management which helps the move towards a low-carbon economy demonstrate international leadership in sharing responsibility for reducing global emissions.
Aberdeen City and Shire Strategic Development Plan 2014 (Ref 6.14)	The Aberdeen City and Shire Strategic development plan sets out a range of transport measures to either tackle existing problems or support the growth planned over the next 20 to 25 years. While congestion is a key factor, reducing the effect of transport on the environment (including improving air quality), which includes junction and capacity improvements to the A90.
Aberdeenshire Local Development Plan (2017)	The plan is a set of documents which make the statutory development. Those relevant to air quality are: "Policy P4 Hazardous and potentially polluting developments and contaminated land: Any proposed development which could have a significant detrimental impact on air quality, including the exacerbation of existing air quality issue, must provide appropriate mitigation measures".

6.2.2 The Air Quality Objectives (AQOs) set out the extent to which the Government expects standards to be achieved by a certain date. They take account of the costs, benefits, feasibility

and practicality of achieving the standards. AQOs included in the Regulations and current legislation relevant to the study (PM_{10}, $PM_{2.5}$, NO_2, NO_X and) are shown in Table 6-2.

Table 6-2: Objectives of the UK Air Quality Strategy

Pollutant	Objectives	Measure as	Date to be achieved by and maintained thereafter		
			AQS	Regulations	2008/50/EC
PM_{10} (Scotland)	50 µg/m^3 Not to be exceeded more than 7 times a year	24-hour mean	31-Dec-10	31-Dec-10	1-Jan-05
	18 µg/m^3	Annual mean	31-Dec-10	31-Dec-10	1-Jan-05
$PM_{2.5}$ (Scotland)	10 µg/m^3	Annual mean	31-Dec-10	31-Dec-10	N/A
NO_2	200 µg/m^3 Not to be exceeded more than 18 times a year	1-hour mean	31-Dec-05	31-Dec-05	1-Jan-10
	40 µg/m^3	Annual mean	31-Dec-05	31-Dec-05	1-Jan-10
NO_X	30 µg/m^3	Annual mean	31-Dec-00	31-Dec-00	19-Jul-01

6.2.3 Road traffic emissions are composed primarily of NO_2, NO_X, PM_{10}, $PM_{2.5}$, carbon monoxide (CO), CO2, poly-aromatic hydrocarbons (PAH) and volatile organic compounds (VOC). Whilst excessive levels of these constituents can cause detrimental human health impacts, NO_2, NO_X and PM (at 1µm, 2.5µm and 10µm) from traffic emissions are specifically linked to cardiovascular health issues and mortality in the general population. The policy of the UK statutory consultation agencies is to apply the NO_X objective to internationally designated conservation sites and Sites of Special Scientific Interest (SSSI) on a precautionary basis.

6.2.4 Whilst there is no AQO for $PM_{2.5}$ in UK or EU legislation, Directive 2008/50/EC stipulates a requirement on member states to reduce overall exposure to the general population and provides target values. Scotland set a $PM_{2.5}$ AQO of 10µg/m^3. There is no requirement in DMRB HA207/07 to assess the impact of the scheme against the $PM_{2.5}$ target values. However, to demonstrate that $PM_{2.5}$ will be below the target values, and that the scheme will not lead to any significant $PM_{2.5}$ effects, the pollutant has been considered within this assessment.

6.2.5 The AQOs only apply where members of the public are likely to be regularly present for the averaging time of the objective, i.e., where people will be exposed to the pollutants for long enough at a specified concentration to be affected. The annual mean objectives apply to all locations where people may be regularly exposed including facades of residential properties,

schools, hospitals and care homes. The 24-hour mean objective applies to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties where relevant public exposure is likely, i.e., buildings and façades as opposed to kerbside sites. The 1-hour mean objective also applies to all locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for one hour or more, such as shopping streets, parks and sports grounds. This also includes bus stations and railway stations that are not fully enclosed, building façades and any kerbside locations where the public might have regular access.

6.2.6 Measurements across the UK have shown that the 1-hour mean NO_2 objective is unlikely to be exceeded unless the annual mean NO_2 concentration is greater than 60µg/m^3. Thus exceedances of 60µg/m^3 as an annual mean NO_2 concentration are used as an indicator of potential exceedances of the 1-hour mean objective, as stated in paragraph 7.91 of the Local Air Quality Management Technical Guidance document (LAQM.TG(16)) (Ref 6.17).

6.2.7 Similarly, LAQM.TG(16) sets out the method by which the number of days in which the PM_{10} 24-hour objective is exceeded, and can be obtained based on a relationship with the predicted annual mean.

6.3 Assessment Methodology

General Approach

Construction Phase

6.3.1 During the demolition, site clearance and construction phases, there is the potential for emissions of dust to impact human receptors located within 350m or ecological receptors within 50m of the site.

6.3.2 Potential dust impacts associated with construction activities have been assessed in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (v1.1, 2016). The IAQM guidance provides a five-step process to assess the potential impacts of any demolition, earthworks, construction and vehicle trackout activities for dust pre-mitigation, and provides mitigation measures specific to the risk in order to minimise the risk of potentially significant impacts.

6.3.3 The main impact of any dust emissions, if not mitigated, is annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of appropriate site-specific mitigation, to ensure that dust deposition does not give rise to significant adverse effects.

6.3.4 Emissions from construction related traffic have also been considered in accordance with DMRB HA20/707.

Operational Phase

6.3.5 The air quality assessment identifies potential air quality impacts by estimating changes in pollutant concentrations occurring because of changes in emissions contributions from vehicular activity or changes in road alignment on the affected road network (ARN) that may result in a source of pollution being moved closer to a sensitive receptor.

6.3.6 Current baseline conditions were determined by reviewing the Local Authority Annual Progress Reports (APR), historic monitoring data, and Scottish Air Quality background maps. The data was used to determine the baseline pollutant concentrations at sensitive receptor locations within the study area, with the change in concentrations in each Do-Something scenario compared against the estimated concentrations in each Do-Minimum scenario.

6.3.7 The assessment follows HA207/07 and the associated DMRB Interim Advice Notes (IANS):

- 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 (2012);
- IAN 174/13: Updated advice for evaluating significant local air quality effects for DMRB Volume 11, Section 3, Part 1 Air Quality (2013a); and
- 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 (2013b).

6.3.8 The assessment also considered the Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management (LAQM) Technical Guidance, published in 2018 (hereafter referred to as LAQM.TG(16)).

6.3.9 For local air quality impacts, the DMRB allows for a 'detailed' or 'simple' assessment on human and ecological receptors. For this DMRB Stage 3 assessment, a detailed assessment has been undertaken. A detailed assessment should be applied where there exists the potential to cause significant effects on environmental resources and receptors, with an assessment made of the significance of the changes in local air quality.

6.3.10 Potential air quality impacts arising as a result of dust or combustion emissions associated with the construction phase were assessed following an approach consistent with the IAQM guidance (Ref 6.18).

Study Area

Affected Roads

6.3.11 The air quality assessment is undertaken for ARN. These are defined in HA 207/07 as meeting any of the following criteria:

- Road alignment will change by 5m or more;
- Daily traffic flows will change by 1,000 AADT or more;
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more;
- Daily average speed will change by 10 km/hr or more; and/or
- Peak hour speed will change by 20 km/hr or more.

6.3.12 A regional air quality assessment is performed using ARN that meet the following criteria:

- A change of more than 10% in AADT;
- A change of more than 10% to the number of HDV; and/or
- A change in daily average speed of more than 20 km/hr.

6.3.13 The location and nature of the scheme means that all of the above requirements for local and regional air quality assessment will be met, meaning an assessment of both is required. Local roads that do not meet the criteria are scoped out of the assessment except where a decision of professional judgement was taken to include links whose omission would have a significant effect on air pollutant concentration predictions.

6.3.14 There is no risk of non-compliance with the EU Air Quality Directive during operation of the scheme because none of the affected road links map to compliance road links for which roadside concentrations are reported to the European Commission by the Scottish Government. The permanent effects of the scheme on compliance road links are therefore not reported.

6.3.15 The existing Do Minimum ARN is presented in **Figure 6.1** and the Do Something ARN is presented in **Figure 6.2**.

Construction Phase

6.3.16 In line with the IAQM Dust Guidance (2016), a qualitative dust assessment is required where there is:

- A ‘human receptor’ within:
  - 350m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- An ‘ecological receptor’ within:
  - 50m of the boundary of the site; or

- 50m of the route(s) used by construction vehicles on the public highway; up to 500m from the site entrance(s).

6.3.17 There are a number of 'human' receptors located within 350m of the proposed scheme and within 50m of potential routes to be used by construction vehicles, detailed in **Figure 6.3**.

6.3.18 No national or local designated ecological sites, such as Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSIs) or Local Nature Reserves (LNR) (which are sensitive to and can be adversely affected by nitrogen (N) deposition) were identified within the study area. As such, the impact of dust on ecological features is not considered further in the dust impact assessment.

Operational Phase

6.3.19 The study area is defined according to DMRB HA 207/07 as encompassing all those receptors within 200m of the affected roads. For the purposes of this assessment, affected roads include the existing A90 layout and the scheme alignment, including all affected side roads that meet the criteria discussed in section 6.3.9. The study area includes human receptors as defined in HA 207/07 Chapter 3. There are no ecological receptors within the study area.

6.3.20 Sensitive human receptor locations identified included residential properties and locations used by the elderly/ vulnerable (e.g., Burnside Care Home) and those used by the children (e.g., a school, Mearns Academy). **Figure 6.4** shows the location of selected sensitive receptors.

6.3.21 No national or local designated ecological sites, such as Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSIs) or Local Nature Reserves (LNR) (which are sensitive to and can be adversely affected by nitrogen (N) deposition) were identified within the study area and as such are not considered further within the operational phase dust impact assessment.

Sensitive Receptors

6.3.22 The key representative receptors for modelling shown in Table 6-3 and **Figure 6.4** were chosen according to the guidance in HA 207/07 and in the interest of providing a consistent method of comparison were used for the assessment of all stages of the proposed scheme. These are identified as "LK". Additional sensitive receptors were selected for the Stage 3 using professional judgment as being located in 'worst case' locations relative to the affected modelled road links. These are numbered S3-1 to S3-15. The Amey monitoring locations have also been considered, identified as receptors A to G.

Table 6-3: Key representative receptors

Receptor ID	Description	x	y
LK1	3 Mearns Drive, Laurencekirk, Aberdeenshire. AB30 1DF	371107	770857
LK3	Carmondale, 3, Gardenston Street, Laurencekirk, Aberdeenshire. AB30 1UG	371050	770777
LK4	Laurencekirk War Memorial, Laurencekirk, Aberdeenshire. AB30 1HF	371953	771071
LK5	4, Kirkburn, Laurencekirk, Aberdeenshire. AB30 1LG	372016	771094
LK2	3, Kinnear Square, Laurencekirk, Aberdeenshire. AB30 1UL	371156	770709
LK6	16, Aberdeen Road, Laurencekirk, Aberdeenshire. AB30 1ZJ	372062	771693
LK7	Conveth Mains Farm, Laurencekirk, Aberdeenshire. AB30 1RR	372321	772156
S3-1	Crospoles Old Manse	367140	767756
S3-2	19 Napier Place	368607	765970
S3-3	Dubton Cottage	367580	768152
S3-4	Dunthill House	368586	767465
S3-5	Smithy Cottage	370410	769017
S3-6	Kinnear Square	371126	770743
S3-7	c250 High St	371138	770767
S3-8	Blackimuir Avenue/High St	371410	771070
S3-9	Opposite Blacimuir Avenue/High St	371425	771057
S3-10	Blackimuir Avenue/Market Road	371130	771317
S3-11	Station Road/Market Road	371646	771778
S3-12	10 High Street	371810	771544
S3-13	Burnside Nursing Home	371764	771641
S3-14	Mearns Academy Campus	372094	771911
S3-15	Conveth Mains Cottage	372435	772238
A	To quantify NO_2 levels at the A90 Laurencekirk South Junction	370952	770254
B	To quantify NO_2 levels at the A90 Laurencekirk Centre Junction	372032	770960
C	To quantify NO_2 levels at the A90 Laurencekirk North Junction	372709	772452
D	To quantify background NO_2 levels in Laurencekirk and at the school as a sensitive receptor	372132	772105
E	To quantify background NO_2 levels in Laurencekirk and at the nursing home as a sensitive receptor	372043	771523
F	To quantify NO_2 levels within the town of Laurencekirk	371791	771538
G	To quantify NO_2 levels within the town of Laurencekirk	371613	771317

Receptor Sensitivity

6.3.23 UK AQOs that exist within the Air Quality Directive and the AQS Regulations are set according to medical and scientific evidence assessed by the Air Quality Expert Group (AQEG) which

provides independent scientific advice on air quality to Defra, in particular the air pollutants contained in the AQS.

6.3.24 UK AQOs are set in such a way that there should be a zero-risk level to the general population and to ecological receptors.

6.3.25 The guidance in DMRB states that 'particular attention should be paid to the locations of the young, the elderly and other susceptible populations, such as schools and hospitals.' However, it is considered that any member of the public, including those singled out by DMRB for special attention, could be present in any location at any time. With this consideration in mind, all receptors within the study area are generally assessed to have equal sensitivity.

6.3.26 According to Table 2.1 of DMRB Volume 11 Section 2 Part 5 HA205/08, all receptors within the study area are assigned a value (sensitivity) of very high.

6.3.27 There are receptors within the study area which require additional consideration due to the particular vulnerability of their occupants to the effects of deteriorating air quality. These are:

6.3.28 Mearns Academy (Aberdeen Rd, Laurencekirk AB30 1ZJ) which is a secondary school/academy for children between the ages of 11 and 18, with a local library and sports centre incorporated

6.3.29 Burnside Care Home (Borrowmuirhill Rd, Laurencekirk AB30 1HW) which is a residential, nursing, dementia care, respite and convalescent care home provided by Silverline Care.

Traffic Data

6.3.30 The traffic data was sourced from the Amey Laurencekirk S-Paramics microsimulation model. This model was developed from an earlier S-Paramics model produced by CH2M Hill for the Laurencekirk STAG appraisal. The Amey model includes the town of Laurencekirk and a 10km section of the A90 from North Water Bridge, via the Laurencekirk Bypass, to the junction with the B967 at Fordoun. The model also includes the A937 Marykirk to Laurencekirk Road.

6.3.31 The Amey model is a calibrated and validated 24-hour weekday model for a base year of 2014. The model includes the five vehicle classes: car, Light Goods Vehicle (LGV), Other Goods Vehicles (OGV), Public Service Vehicles (PSV) (buses & coaches). All of the buses and coaches are modelled as fixed route services. The model was built using data from classified junction turning counts, automatic traffic counters, Bluetooth origin -destination surveys, queue length surveys, journey time surveys, and number-plate matching surveys. The model includes an AM peak period of 06:00 to 09:00, an inter-peak period of 09:00 to 16:00, a PM peak period of 16:00 to19:00, and off-peak period of 19:00 to 06:00.

6.3.32 The S-Paramics model was able to provide hourly weekday traffic data including traffic volumes, average speeds, and percentages of each vehicle type. Forecast models were produced for 2023, the assumed year of opening of the scheme, and 2032 which represents all years from 2032 onwards. For this DMRB Stage 3 the forecasting data will be provided by the most recent ASAM 14 model.

6.3.33 Future traffic flows can be estimated using the National Road Traffic Forecast (NRTF) factors in conjunction with TEMPRO which provides local scale detail taking into account local planning data. However, due to the age of the TEMPRO guidance relevant to Scotland, this method was not applied. The 2014 Amey model was adjusted to the 2017 air quality monitoring base year through the use of the linear interpolation between the 2014 and 2022 modelled years for each modelled link.

6.3.34 The approach outlined above was agreed with and undertaken by the appointed Transport Consultant. The Traffic Data utilised in this assessment is presented in Appendix 6.2: Traffic Data.

Construction Phase Methodology

6.3.35 The IAQM Guidance on the assessment of dust from demolition and construction provides a framework for the assessment of risk by allocating risk categories based on two factors;

- The scale and nature of the works, which determines the potential dust mitigation magnitude as small, medium or large; and
- The sensitivity of the area to dust impacts, which is defined as low, medium or high sensitivity.

6.3.36 These two factors are combined to determine the risk of dust impacts with no mitigation applied.

6.3.37 Further details of the dust risk assessment methodology and findings are presented in Appendix 6.1.

Operation Modelling Methodology

6.3.38 Detailed air dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS Roads v4.1 air dispersion model, following the appropriate guidance to predict annual mean concentration of NO_2, PM_{10} and $PM_{2.5}$ concentrations for the various scenarios during the operational phase. The risk of exceedance of the short-term AQOs and compliance with 1-hour mean NO_2 and 24-hour mean PM_{10} has been assessed following LAQM.TG(16) guidance.

6.3.39 Modelling of the pollutant emissions allowed for predicted ambient pollution concentrations and annual mean emissions of NO_2 and PM_{10} to be quantified at existing sensitive receptor locations for the following scenarios:

- Verification and baseline year (2017);
- Opening Year (2023) – without proposed scheme (Do Minimum);
- Opening Year (2023) – with proposed scheme (Do Something);
- Future Year (2030) – without proposed scheme (Do Minimum); and
- Future Year (2030) – with proposed scheme (Do Something).

Vehicle Emission Factors

6.3.40 Vehicle emission factors for use in the assessment have been obtained using the Emission Factor Toolkit (EFT) version 8.0.1. The EFT allows calculation of emission factors arising from road traffic for all years between 2015 and 2030. For the prediction of future year emissions, the toolkit takes into account factors such as anticipated advances in vehicle technology and changes in vehicle fleet composition, such that vehicle emissions are assumed to reduce overtime.

6.3.41 Emissions were determined for NO_X, PM_{10} and $PM_{2.5}$ by inputting the daily traffic flows, HDV% and speeds for each of the modelled links into the EFT. The EFT was set for 'Rural (not London)' on a Basic Split for the appropriate year in the area of Scotland. Outputs from the EFT were set for 'Air Quality Modelling (g/km/s). The emission factors derived for the assessment are presented in Appendix 6.3: Emission Factors.

6.3.42 However, there is currently uncertainty over how representative the future EFT emission factor predictions are, particularly for NO_X. Therefore, to account for this, a sensitivity analysis has been undertaken, whereby, the future scenarios have been modelled using current emission factors and backgrounds.

6.3.43 The sensitivity analysis emission factors can be found in Appendix 6.5: Sensitivity Analysis Emission Factors. The sensitivity analysis emission factors are higher than those of the air quality assessment, given that the emissions are calculated based on those of the base year, assuming no future reductions in vehicle emissions. The sensitivity analysis is therefore a 'worst case' scenario.

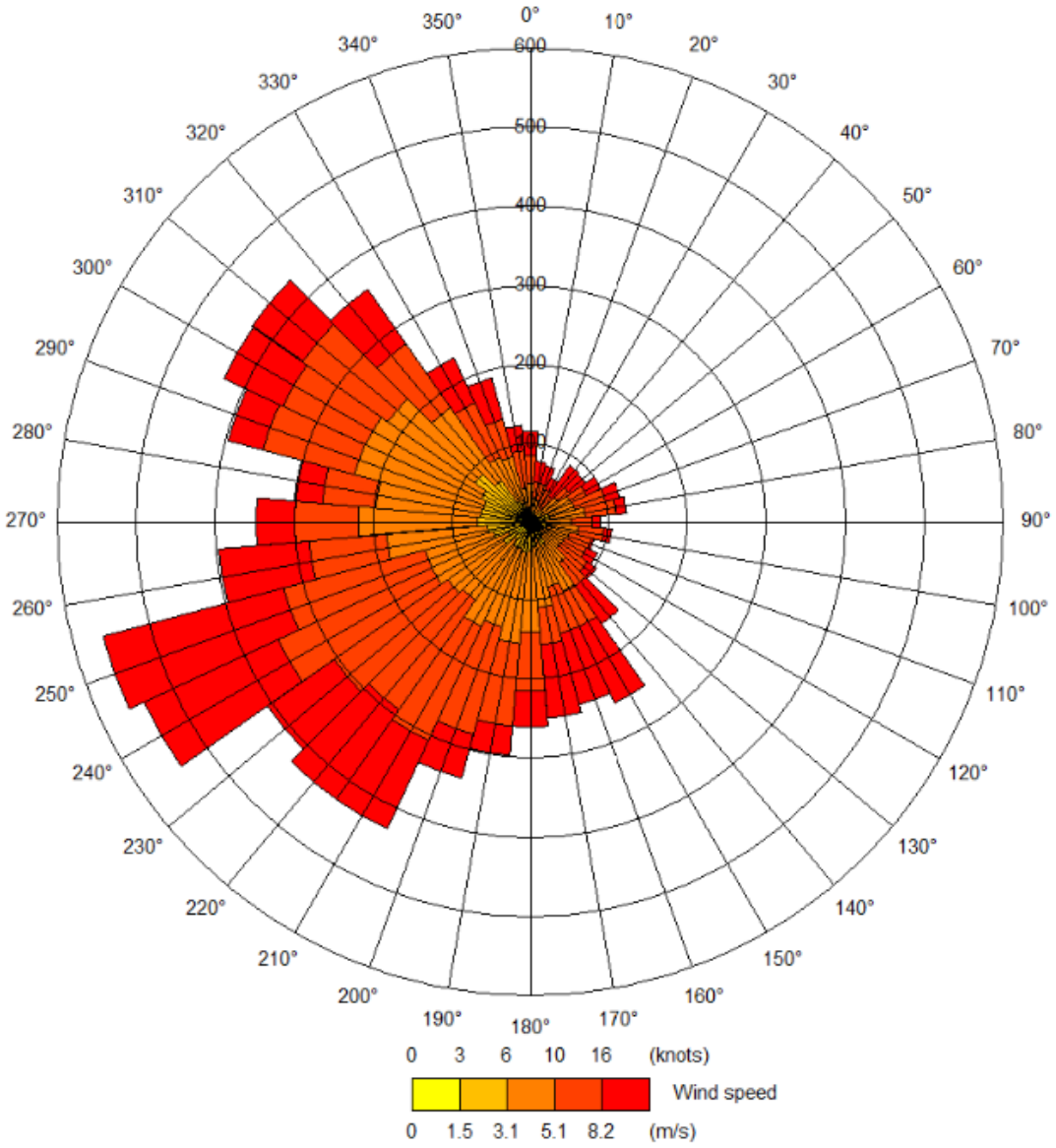
Meteorological Data

6.3.44 Meteorological data utilised in the assessment was taken from Inverbervie meteorological recording station for the 2017 met year. Inverbervie is located approximately 12.8km north east of the proposed scheme. It is anticipated that, over a distance of this magnitude, conditions at

the recording station and the scheme would be similar. The data was considered suitable for an assessment of this nature.

6.3.45 All meteorological records used in the assessment were provided by an established distributor of data of this nature within the UK. A wind rose of the meteorological data utilised in the assessment is presented in Plate 6-1 below.

Plate 6-1: 2017 Windrose for Inverbervie



Monin-Obukhov Length

6.3.46 The Monin-Obukhov length provides a measure of stability to the atmosphere. A minimum Monin-Obukhov length of 10m was used to describe the modelling extents. This value is

considered appropriate and conservative for the nature of the area and is suggested within the ADMS-Roads user guide as being suitable for 'small towns of <50,000'.

6.3.47 A minimum Monin-Obukhov length of 1m was used to describe the meteorological site. The value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'rural location'.

Surface Roughness

6.3.48 The z0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z0 of 0.5m was used to describe the modelling extents. This value of z0 is considered appropriate and conservative for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'parkland, open suburbia'.

Model Verification

6.3.49 The ADMS Roads dispersion model has been widely validated for this type of assessment and is considered to be 'fit for purpose'. Model validation undertaken by the software developer will not have included validation in the vicinity of the proposed scheme.

6.3.50 To determine the performance of the model, at a local level, a comparison of modelled results with the monitoring results carried out within the study area was undertaken. This process of verification aims to minimise model uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results. Model verification was undertaken following the methodology specified in Chapter 7, Section 4 of LAQM.TG16., utilising the monitoring results, outlined in Plate 6-4 from the survey undertaken by Amey.

6.3.51 The contribution from trunk 'A' road and primary 'A' road sectors were removed from the background annual mean NO_X and PM_{10} estimates. Background annual mean NO_2 estimates have been corrected with the NO_X to NO_2 calculator embedded in the Scottish Air Website.

6.3.52 An adjustment factor greater than one was obtained, which would indicate that the model was under-predicting. This factor (3.8706) was applied to the model road NO_X outputs, prior to conversion to annual mean NO_2 concentrations, utilising the NO_X to NO_2 calculator (version 6.1), provided by Defra.

6.3.53 Local roadside monitoring data was not available for PM_{10} and $PM_{2.5}$, as such, the modelled road-PM_{10} and $PM_{2.5}$ components have been adjusted by the verification factor obtained for NO_X before adding the appropriate background concentration.

6.3.54 The number of days with PM_{10} concentrations greater than 50µg/m3 was then estimated using the relationship with the annual mean concentration described in LAQM.TG(16).

6.3.55 LAQM.TG(16) advises that exceedances of the 1 hour mean NO_2 objective are unlikely to occur where annual mean concentrations are below 60µg/m^3, and it provides guidance on the approach that should be taken if either measured or predicted annual mean NO_2 concentrations are 60µg/m^3 or above.

6.3.56 Once processed, the predicted concentrations were compared against the relevant AQOs levels for NO_2 and PM_{10}, set out above.

6.3.57 The verification calculations are presented in Appendix 6.4: Model Verification.

Evaluation of significance

6.3.58 The significance of the predicted permanent effects on air quality has been evaluated using IAN 174/13. The methodology requires the assessment of significance to consider 'residual' effects so that the judgement considers the effectiveness of the mitigation measures applied.

6.3.59 Whilst every endeavour is made to ensure that the assessment methodologies are reasonable, robust and representative there is always an element of residual uncertainty (MoU). This is due to inherent uncertainty in the air quality monitoring, modelling, emission estimates and the traffic data used in the assessment.

6.3.60 The approach to describing the MoU in IAN174/13 is based on Defra's published advice in LAQM.TG(16) on the desirability of achieving 10% verification (between modelled and monitored concentrations) where concentrations are close to or above the air quality threshold.

6.3.61 Table 6-4 presents the different magnitude of change criteria for annual average NO_2 and PM_{10} concentrations which is described as a percentage of the relevant air quality threshold.

Table 6-4: Local Air Quality Receptors Informing Scheme Significance

IAN 174/13 Magnitude of change in NO_2 (µg/m^3)	Value of change in annual average NO_2	Equivalent magnitude of significance
Large (>4)	Greater than full MoU value of 10% of the air quality objective (4µg/m3)	Major
Medium (>2 to 4)	Greater than half of the MoU (2 µg/m3), but less than the full MoU (4µg/m3) of 10% of the air quality objective	Moderate
Small (>0.4 to 2)	More than 1% of objective (0.4 µg/m3) and less than half of the MoU i.e. 5% (2 µg/m3). The full MoU is 10% of the air quality objective (4µg/m3)	Minor
Imperceptible (≤ 0.4)	Less than or equal to 1% of the objective (0.4µg/m3)	No change/ Negligible

6.3.62 The magnitude of change is focussed only on those receptors exceeding air quality thresholds in either the Do-Minimum or Do-Something scenarios. Where the difference in concentrations are less than 1% of the air quality objective then the change in these receptors is considered to be imperceptible and they can be scoped out of the judgement of significance.

6.3.63 Where the outcomes of the assessment indicate that either all modelled concentrations are less than the air quality thresholds or any changes above the air quality thresholds are imperceptible, then the scheme effect is likely to be not significant.

Greenhouse Gases

6.3.64 The assessment of greenhouse gases was performed according to the methodology in Annex 2 HA 207/07 which refers to the UK Government WebTAG methodology. The greenhouse gases calculation methodology from TAG Unit A3 (Ref 6.19) was used along with the most recent fleet and emissions datasets issued by the UK Government to predict the total greenhouse gases released by the scheme.

Professional judgement

6.3.65 Professional judgement was used to evaluate the pros and cons of the scheme based on the number of affected receptors, predicted concentrations and potential for exceedances of the NO_2 and PM_{10} objectives. The final conclusions presented in this report represent an opinion based on professional judgement which considers all assessed quantitative and qualitative information.

6.4 Baseline Conditions

Overview

6.4.1 The proposed scheme is located within the administrative boundary of Kincardineshire County Council (KCC).

6.4.2 In order to assess the significance of an effect it is necessary to identify and understand the background conditions within and around the study area.

6.4.3 To identify the existing background conditions a review of the data from the following information sources has been undertaken:

- Air Quality Management Areas locations obtained from Air Quality in Scotland website: www.scottishairquality.co.uk (accessed March 2019);
- Department for the Environment Food and Rural Affairs (Defra) LAQM 1km x 1km grid background pollutant maps (2015);
- Scottish Government LAQM 1km x 1km grid background pollutant maps (2015);

- Defra's Pollution Climate Mapping (PCM);
- Defra's Interactive Monitoring Networks Map (accessed March 2019);
- 2018 Annual Progress Report (APR) for Aberdeenshire Council; and
- Air Quality Management Areas locations obtained from Air Quality in Scotland website.

6.4.4 A review of Defra PCM found no links within the study area. Therefore, it has not been considered further within the assessment.

Air Quality Management Areas

6.4.5 Aberdeenshire enjoys good air quality with no exceedances of the national air quality objectives monitored within the administrative area. Therefore, ACC do not currently have any AQMA's declared within their administrative area.

Monitoring

6.4.6 No representative local air quality monitoring is currently undertaken by ACC.

6.4.7 A field survey was undertaken whereby suitable locations were identified for triplicate NO_2 diffusion tube monitoring. Following LAQM.TG(16) guidance, seven locations were selected as being representative of location exposure conditions, whilst being suitable from both a security and health and safety perspective. The locations included each of the main junctions, two locations on Laurencekirk High Street and two background locations which were also sensitive receptors.

6.4.8 The nearest automatic analysers are in Aberdeen, approximately 39km to the north. Given this distance, and the varying conditions at the different monitoring locations, diffusion tube co-location was not undertaken in this study.

6.4.9 The locations monitored are shown in Table 6-5 and **Figure 6.4**.

Table 6-5: NO_2 Monitoring Locations

Site ID	Location		Within AQMA	Site type	Purpose
	X	Y			
A – South Junction	370953	770253	N	Roadside	To quantify NO_2 levels at the A90 Laurencekirk South Junction
B – Centre Junction	372036	770958	N	Roadside	To quantify NO_2 levels at the A90 Laurencekirk Centre Junction

Site ID	Location		Within AQMA	Site type	Purpose
	X	Y			
C – North Junction	372707	772454	N	Roadside	To quantify NO_2 levels at the A90 Laurencekirk North Junction
D – Mearns Academy	372132	772105	N	Background	To quantify background NO_2 levels in Laurencekirk and at the school as a sensitive receptor
E – Burnside Care Home	372043	771523	N	Background	To quantify background NO_2 levels in Laurencekirk and at the nursing home as a sensitive receptor
F – High Street 1	371790	771540	N	Roadside	To quantify NO_2 levels within the town of Laurencekirk
G – High Street 2	371616	771316	N	Roadside	To quantify NO_2 levels within the town of Laurencekirk

6.4.10 The survey was undertaken between 28th February 2017 and 4th January 2018, meaning over 10 months of sampled and analysed data is available to quantify air quality. As more than 9 months monitoring data has been collected, in line with LAQM.TG(16), averages derived from this are considered representative of air quality at these locations for a full calendar year and annualisation is not required.

6.4.11 The diffusion tube data was corrected for bias, which is the tendency for tubes to over or under predict in comparison to an automatic NO_2 analyser. To achieve this, the National Bias Correction Factor spreadsheet, provided by Defra to Local Authorities (Ref 6.20) was used to apply a bias correction factor. The bias correction factor applied to the diffusion tubes was the factor for the Aberdeen Scientific Services Laboratory. This is the UKAS certified laboratory used to analyse the tubes after exposure.

6.4.12 The averaged results of the triplicate tube monitoring are presented in Table 6-6 below.

Table 6-6: NO_2 Monitoring Results

Site ID	Location		Site type	NO_2 Concentration ($\mu g/m^3$)	Percentage Data Capture
	X	Y			
A – South Junction	370953	770253	Roadside	27.5	100
B – Centre Junction	372036	770958	Roadside	20.3	100

Site ID	Location		Site type	NO_2 Concentration ($\mu g/m^3$)	Percentage Data Capture
	X	Y			
C – North Junction	372707	772454	Roadside	16.2	100
D – Mearns Academy	372132	772105	Background	7.6	100
E – Burnside Care Home	372043	771523	Background	10.0	100
F – High Street 1	371790	771540	Roadside	17.7	91.6
G – High Street 2	371616	771316	Roadside	9.9	86.1

Background NO_X, NO_2, PM_{10} and $PM_{2.5}$ Concentrations

6.4.13 The average annual mean background pollution concentration estimates within the study area for the 2023 Opening Year and the 2030 Future Year are presented in Table 6-7.

Table 6-7: Pollutant Background Concentrations in Study Area

Grid Square	2023				2030			
	NO_2	NO_x	PM_{10}	$PM_{2.5}$	NO_2	NO_x	PM_{10}	$PM_{2.5}$
371500, 770500	3.5	5.3	12.0	5.4	2.9	4.4	11.9	5.2
371500, 771500	4.4	6.6	11.4	5.2	3.8	5.5	11.3	5.0
372500, 771500	3.6	5.3	12.4	5.6	3.0	4.4	12.3	5.4
367500, 767500	3.0	4.7	11.0	5.1	2.5	3.8	10.9	4.9
368500, 765500	3.9	5.5	12.1	5.3	3.2	4.5	12.0	5.1
367500, 768500	2.9	4.3	11.8	5.3	2.5	3.6	11.7	5.2
Results rounded to 1d.p.								

6.4.14 Defra and the Scottish Government provide national background pollution concentrations at 1km x 1km grid squares. The empirically derived concentrations relate the National Atmospheric Emissions Inventory (NAEI) to the national network of pollution measurements. Data for NO_x, NO_2 and PM_{10} were acquired from the Scottish Government, Air Quality in Scotland source.

6.4.15 Scotland specific maps are not currently available for $PM_{2.5}$. The Scottish Government advise that for this pollutant, Defra UK wide background maps from a base year of 2017 are used in the review and assessment of local air quality. This advice has been followed for this assessment.

6.4.16 Background air quality data was obtained from the Defra air quality monitoring archive for 1 km grid squares within the study area for 2017. Plate 6-2, Plate 6-3, Plate 6-4, and Plate 6-5 show the background concentrations for the squares encompassing the study area.

Plate 6-2: NO_2 concentrations covering the study area

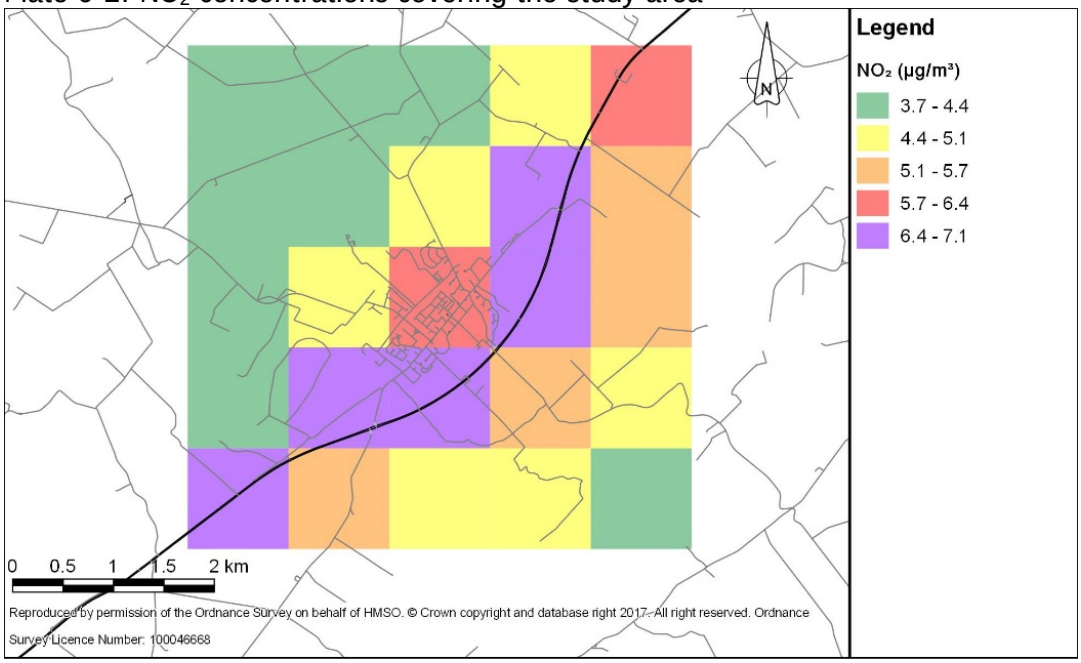


Plate 6-3: NO_X concentrations covering the study area

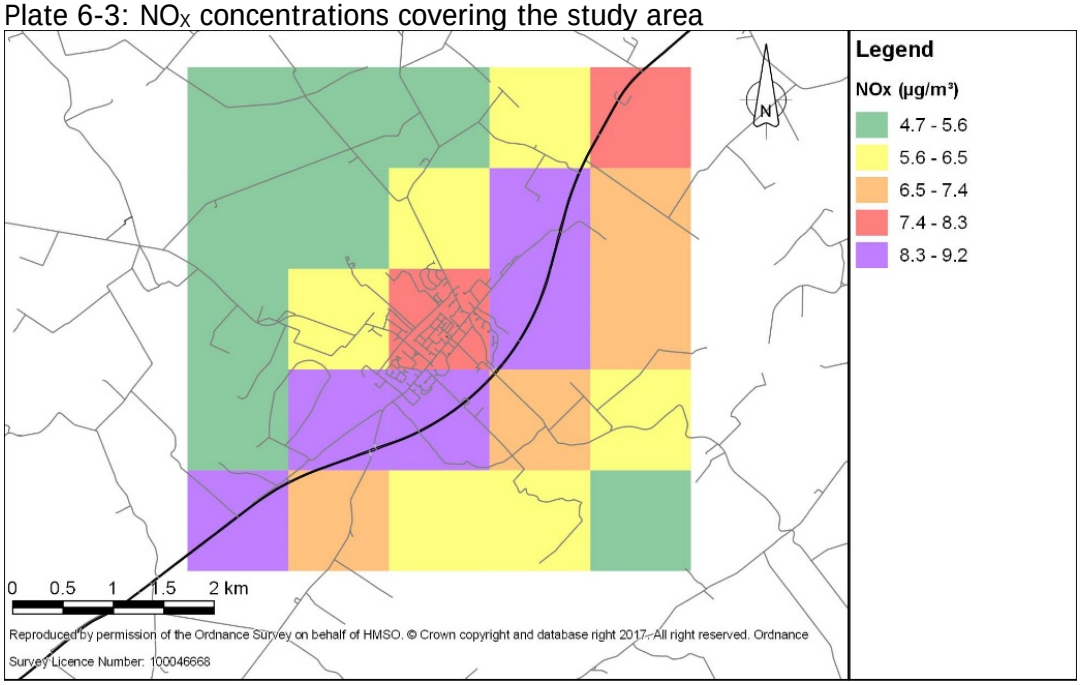


Plate 6-4: PM_{10} concentrations covering the study area

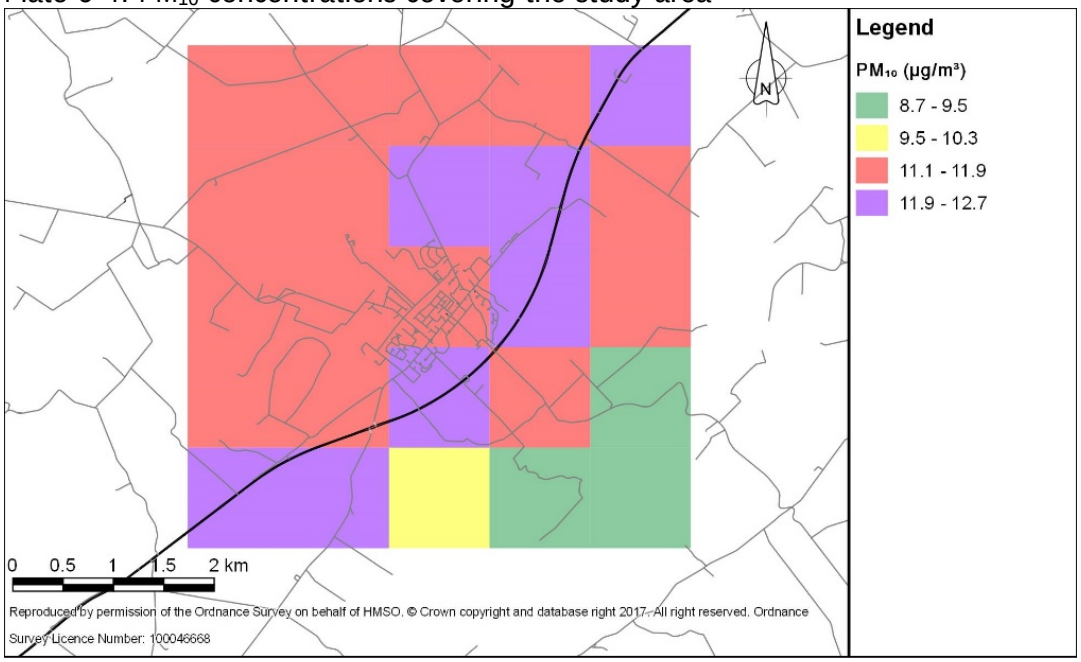


Plate 6-5: $PM_{2.5}$ concentrations covering the study area

6.4.17 The plates show that air quality in the area is generally very good, with background concentrations no more than 70% of the AQS objective at their highest (PM_{10}). Modelled NO_X and NO_2 concentrations are slightly elevated in the 1km squares that include the A90 trunk road reducing to levels approximately 10%-15% of the AQS objectives. There are no agricultural facilities in the area that might affect modelled background concentrations. There is one SEPA Scottish Pollution Release Inventory point within Laurencekirk (Powar Developments Ltd) for

the treatment and disposal of non-hazardous waste at a distance approximately 800m from the existing A90 alignment. All reportable pollutants for the latest submission in 2016 are below the reporting threshold.

6.5 Impact Assessment

Summary

6.5.1 A construction phase dust impact assessment was carried out, using a qualitative risk-based approach on the location of the proposed scheme in relation to sensitive receptors. Construction dust emission receptors were identified based on the nearest potentially sensitive receptor within 350m of the proposed scheme, given that these receptors have the potential to experience impacts of a greater magnitude when compared with more distant receptors. (**Figure 6.3**).

6.5.2 Light and Heavy-Duty vehicle trips will be generated over the schemes construction phase, resulting in additional emissions of NO_X, NO_2, PM_{10} and $PM_{2.5}$ on the local road network surrounding the proposed scheme.

6.5.3 Detailed construction traffic information, such as trip number and routing are not confirmed at DMRB Stage 3. Therefore, in accordance with HA207/07 Air Quality, a qualitative assessment on the effect of construction vehicles has been undertaken. This considers the duration of the construction works, the location of sensitive receptors and the background concentrations within the study area.

6.5.4 No exceedances of AQOs were estimated at any of the selected sensitive receptors during the operational phase. The modelled results suggest that the existing concentrations across the study area are within each of the respective AQOs for each pollutant.

Construction Dust Assessment

6.5.5 The following subsections provide a consideration of potential construction dust emissions and conclude with a determined emission class and risk category for each of the three categories considered from the IAQM guidance. There are no demolition proposals as part of the scheme.

6.5.6 The construction program is described in detail in Section 2.4 of Chapter 2. It is expected to last 12 to 15 months.

Potential Dust Emission Magnitude - Earthworks

6.5.7 The schemes earthworks are required over an area of 208,900m^2. Some minor road cuttings will be required; total volume of cut is estimated to be 16,249m^3 with the maximum depth of cuttings will be 3.5m.

6.5.8 Given the nature of the proposed scheme, it is likely that both earthworks and construction activities will overlap for much of the construction period. Therefore, earthwork activities would take place over most of the construction period, including the summer months which corresponds to periods of lower rainfall and reduced potential for natural dust suppression.

6.5.9 Based on the information above, the dust emission magnitude class for earthworks has been classified as 'large'.

Potential Dust Emission Magnitude - Construction

6.5.10 The total construction volume of the scheme is estimated to be over 100,000m^3 given that the total volume of fill required will be approximately 300,500m^3 with maximum embankment heights of approximately 10m.

6.5.11 Given the nature of the proposed scheme, it is likely that both earthworks and construction activities will overlap for much of the construction period. Therefore, earthwork activities would take place over most of the construction period, including the summer months which corresponds to periods of lower rainfall and reduced potential for natural dust suppression.

6.5.12 Based on the information above, the dust emission magnitude class for construction has been classified as 'large'.

Potential Dust Emission Magnitude - Trackout

6.5.13 Construction vehicles will access the site via the existing road network (A90).

6.5.14 Confirmation on the number of additional HDV movements were not available at the time of the assessment. Given the scale and nature of the works required, based on conservative professional judgment, it is estimated there would be approximately 140 AADT HDV movements in any one day during peak activity stages of the construction program.

6.5.15 Based on the information available, the dust emission magnitude class from track out has been classified as 'large'.

Summary

6.5.16 A summary of the dust emission magnitude for each phase is presented in Table 6-8.

Table 6-8: Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	N/A
Earthworks	Large
Construction	Large

Activity	Dust Emission Magnitude
Trackout	Large

Receptor Sensitivity

6.5.17 Receptor sensitivity to 'dust soiling' and "PM_{10} sensitivity" has been determined in accordance with the method outlined in Appendix 6.1. Receptors are illustrated in **Figure 6.3**, with distance bands to show the relative distance from the proposed scheme.

Dust Soiling

6.5.18 In terms of dust soiling there are between 1 and 10 human receptors within 100m of the site boundary. These receptors (residential) are locations where users can reasonably expect enjoyment of a high level of amenity year-round. Given the distance from the scheme boundary to the receptors, the sensitivity of the area is considered to be 'low'.

PM_{10}

6.5.19 There are between 1 and 10 residential receptors within 100m of the site boundary. Based on the background concentrations for the 1km^2 centred on the scheme, and those surrounding, background concentrations are considered to be 'well below' the annual mean AQO. It is therefore considered highly unlikely that the construction operations would cause the annual or 24-hour objective for PM_{10} to come close to an exceedance in the locality.

6.5.20 Therefore, in accordance with the IAQM guidance outlined in Appendix 6.1, the sensitivity of the area to human health impacts is defined as 'low'.

Sensitivity Summary

6.5.21 A summary of the sensitivity of the area to potential impacts from construction dust is presented within Table 6-9.

Table 6-9: Sensitivity of the Area to Potential Impacts from Construction Dust

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Low	Low	Low
Human Health	N/A	Low	Low	Low

6.5.22 A summary of the determined unmitigated risk category for each phase of the construction operation identified above is presented within Table 6-10.

Table 6-10: Summary of Dust Risk

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Low Risk	Low Risk	Low Risk
Human Health	N/A	Low Risk	Low Risk	Low Risk

6.5.23 The above summary demonstrates that the proposed scheme, pre-mitigation, has the potential to result in a Low Risk of impacting sensitive receptors from dust soiling and a Low Risk of impact on human health. Full details of the dust risk assessment process are presented in Appendix 6.1.

6.5.24 Mitigation measures detailed in Section 6.8 have been recommended to ensure the residual effect of construction dust on the receptors and the surrounding area will be temporary, and, where possible, negligible.

6.5.25 The completion of the construction dust assessment has shown that the residual effect of the proposed development in the context of construction dust emissions will be 'not significant'. This conclusion has been made based on the assumption that the suggested mitigation measures will be implemented and is relevant for all sensitive receptors within 350m of the scheme boundary.

6.5.26 Subject to a Construction Environmental Management Plan (CEMP) being in place, and the measures being regularly monitored and reviewed; this will provide a full level of mitigation during the scheme's construction phase.

Construction - Traffic

6.5.27 Construction vehicle movements should be considered when HDV vehicle movements will change by 200 AADT or more (DMRB HA207/07). Consultation with the appointed transport consultant has confirmed that HDV movements for the scheme will be approximately 140 AADT. The impact of construction traffic emissions on local air quality concentrations of NO_2, and PM_{10} when compared to the normal traffic levels on the existing road network within the study area is therefore considered to be negligible. Further, construction vehicles will not be entering the centre of Laurencekirk. As such, temporary impacts will be limited to the extent of the A90 and scheme locale.

6.5.28 The construction programme is assumed to start in July 2022 and will last for approximately 12 - 15 months, this will allow the construction of the structure, traffic management and phasing for the embankment and road construction. Taking the anticipated duration of the construction phase into consideration, the impacts of the emissions from these vehicles would be temporary

in nature. The number of HDVs entering and exiting the site will not exceed the DMRB screening criteria beyond which a detailed assessment is required. Therefore, the impact of emissions from construction related HDVs is considered to be negligible and not significant.

Operational Phase – Impact on Local Air Quality

6.5.29 This section presents the potential impacts along modelled affected roads within the study area on local air quality during the operational phase of the proposed scheme. The modelled estimates at human receptor locations includes assessed receptors at worst case locations situated on the mainline of the proposed scheme and on surrounding affected routes.

6.5.30 Estimated annual mean concentrations and changes in concentration at receptor locations are presented in Table 6-11 and Table 6-12 for the 2023 Opening Year scenario and Table 6-13 for the 2030 Future Year scenario.

6.5.31 Where monitoring locations were not located at a representative receptor location, the magnitude of change/ effect is not considered. The change and effect categories at receptor locations are calculated from the DM and DS results for the relevant scenario and rounded to one decimal place.

6.5.32 Whilst there is no AQO for $PM_{2.5}$ in UK or EU legislation, Directive 2008/50/EC stipulates a requirement on member states to reduce overall exposure to the general population and provides target values. Scotland set a $PM_{2.5}$ AQO of 10µg/m^3. In order to demonstrate compliance with the $PM_{2.5}$ AQO, and that the scheme will not lead to any significant $PM_{2.5}$ effects, the pollutant has been considered within this assessment.

2023 Opening Year

6.5.33 It has been estimated that the majority of receptors included in the assessment will experience increases in annual mean concentration between the DM and DS scenarios. There are no exceedances for the respective annual mean NO_2 or PM_{10} AQO in either the DM or DS scenarios.

6.5.34 Since there are no exceedances of the AQO, none of the impacts are significant, as outlined in Table 6-11 and Table 6-13.

Table 6-11: 2023 Opening Year NO_2 Results

Receptor	NO_2 Concentration (µg/m^3)				Magnitude of Change/ Effect
	2017 Baseline	2023 Do Minimum	2023 Do Something	Change	
LK1	5.2	4.2	4.5	0.3	Imperceptible Negligible

Receptor	NO_2 Concentration (µg/m^3)				Magnitude of Change/ Effect
	2017 Baseline	2023 Do Minimum	2023 Do Something	Change	
LK3	5.3	4.3	4.6	0.3	Imperceptible Negligible
LK4	7.6	6.1	6.6	0.4	Small Minor
LK5	7.5	5.9	6.5	0.6	Small Minor
LK2	5.9	4.7	5.2	0.5	Small Minor
LK6	5.7	4.6	5.0	0.4	Imperceptible Negligible
LK7	6.8	5.5	6.0	0.5	Small Minor
S3-1	20.5	15.4	16.6	1.2	Small Minor
S3-2	7.6	6.1	7.3	1.2	Small Minor
S3-3	15.8	11.9	13.1	1.2	Small Minor
S3-4	4.7	3.8	3.9	0.0	Imperceptible Negligible
S3-5	8.0	6.4	7.9	1.6	Small Minor
S3-6	9.8	7.2	8.3	1.1	Small Minor
S3-7	7.6	5.7	8.7	3.0	Medium Moderate
S3-8	12.6	9.7	10.6	0.9	Small Minor
S3-9	8.9	6.9	7.5	0.6	Small Minor
S3-10	7.8	6.1	6.5	0.4	Imperceptible Negligible
S3-11	8.8	7.0	7.5	0.5	Small Minor
S3-12	17.8	13.9	15.4	1.5	Small Minor
S3-13	7.2	5.8	6.2	0.4	Small Minor
S3-14	6.6	5.3	5.8	0.5	Small Minor
S3-15	8.1	6.6	7.2	0.6	Small Minor
A	23.3	17.7	15.7	-	-
B	20.4	15.5	16.5	-	-
C	18.8	14.4	16.5	-	-
D	5.2	4.3	4.5	0.2	Imperceptible Negligible
E	5.7	4.6	4.9	0.4	Imperceptible Negligible
F	12.1	9.6	10.8	1.3	Small Minor
G	8.5	6.7	7.1	0.4	Small Minor

Plate 6-6: 2023 Modelled NO_2 Concentrations

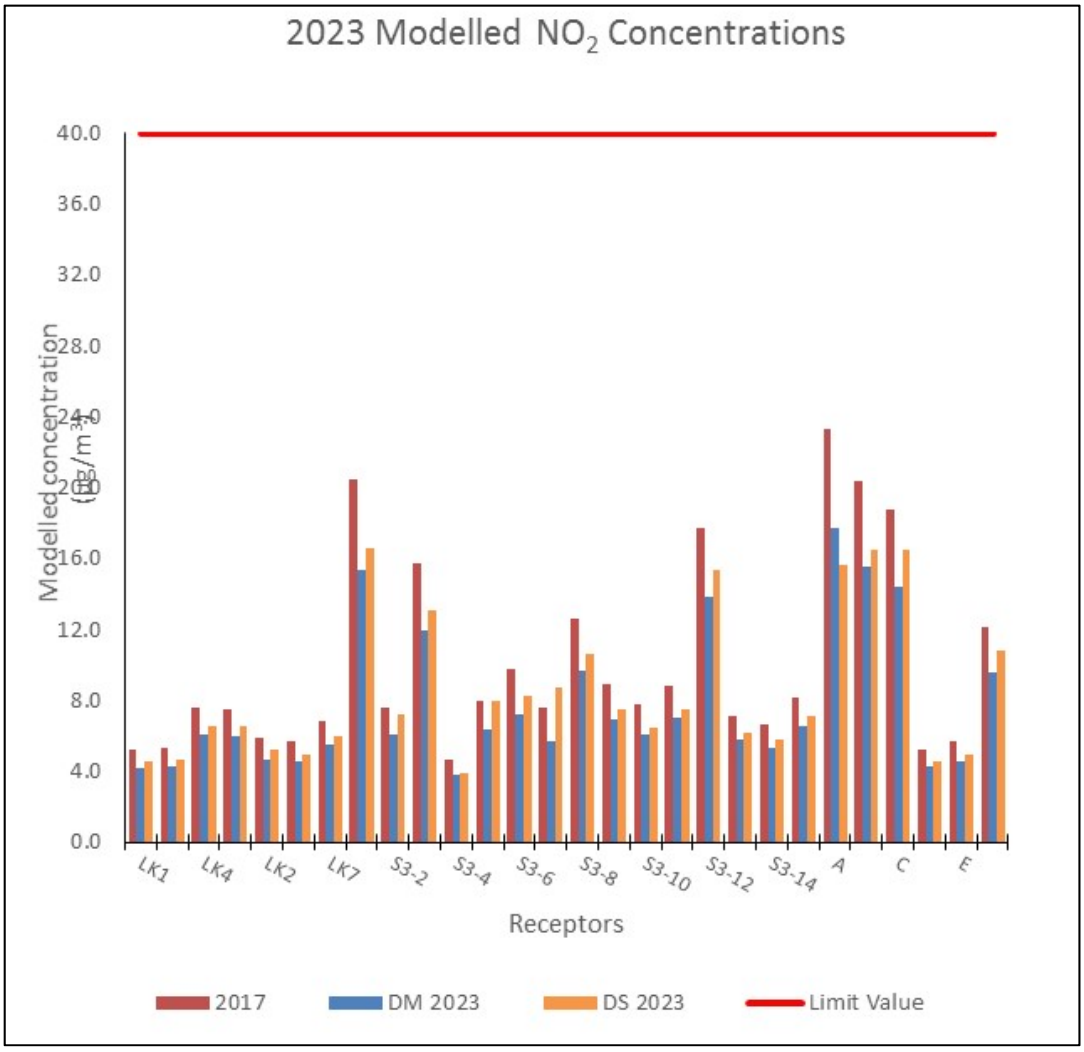


Plate 6-7: 2023 Modelled NO_2 Concentrations

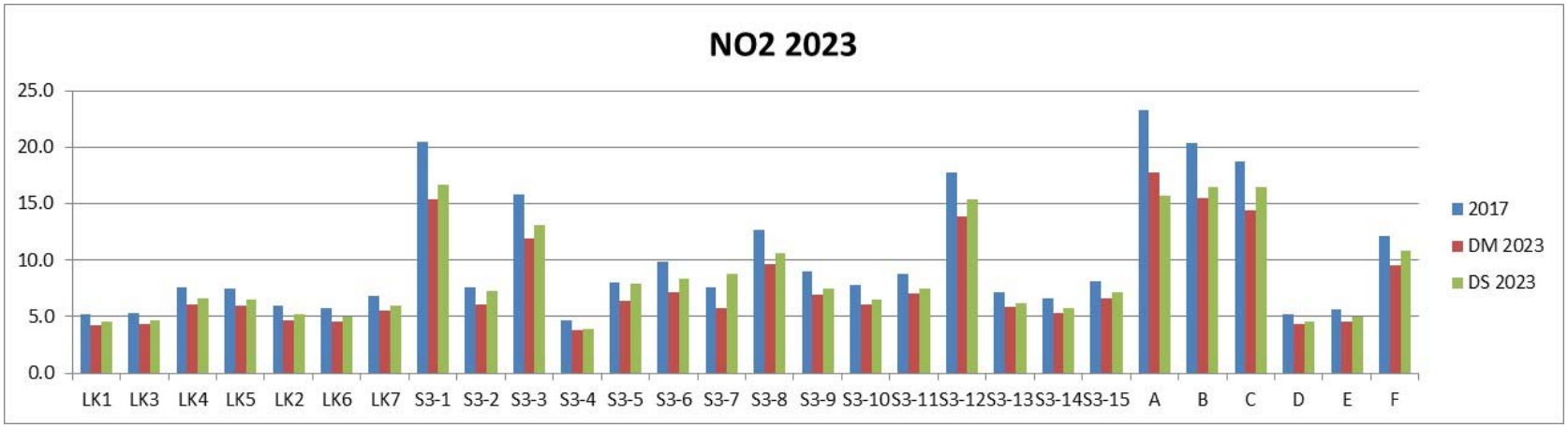
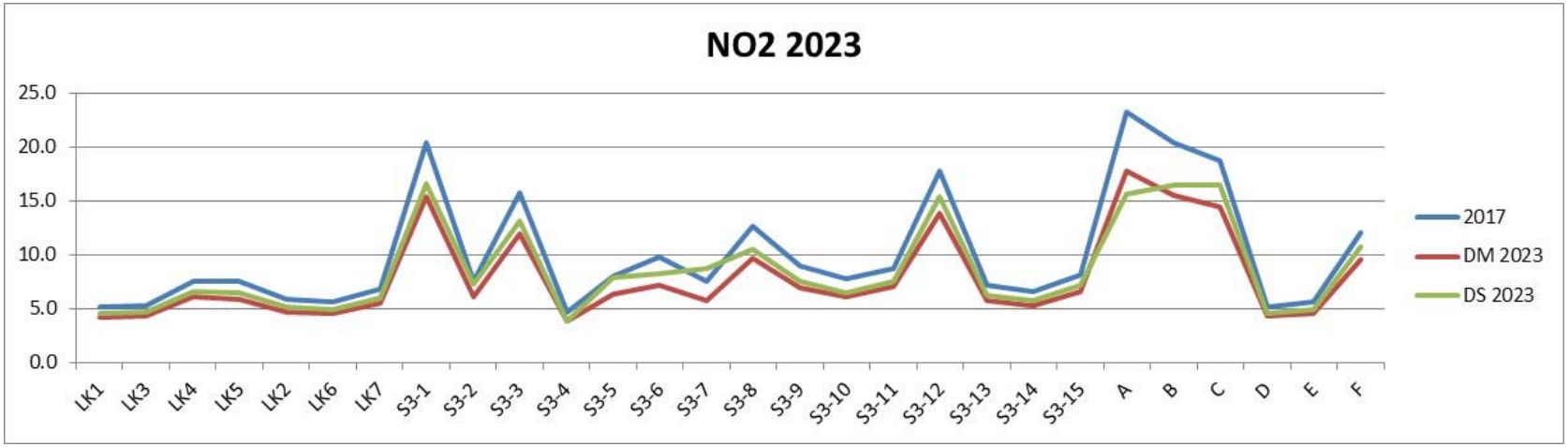


Plate 6-8: 2023 Modelled NO_2 Concentrations



6.5.35 The greatest increase in annual mean NO_2 concentration between the DM and DS scenario is predicted at S3-7 (c250 High Street), with a concentration change of 3µg/m^3, as a result of increased traffic flows on the High Street. This impact is Medium (Moderate) in magnitude, with NO_2 concentrations at the receptor not predicted to exceed the annual mean NO_2 AQO in either of the modelled scenarios.

Table 6-12: 2023 Opening Year PM_{10} Results

Receptor	PM_{10} Concentration (µg/m3)				Magnitude Category
	2017 Baseline	2023 Do Minimum	2023 Do Something	Change	
LK1	12.4	12.0	12.2	0.2	Imperceptible Negligible
LK3	12.4	12.1	12.2	0.1	Imperceptible Negligible
LK4	11.8	11.6	11.8	0.2	Imperceptible Negligible
LK5	13.0	12.8	13.0	0.2	Imperceptible Negligible
LK2	12.4	12.1	12.3	0.2	Imperceptible Negligible
LK6	12.8	12.5	12.7	0.1	Imperceptible Negligible
LK7	12.7	12.6	12.7	0.1	Imperceptible Negligible
S3-1	13.3	13.5	13.7	0.3	Imperceptible Negligible
S3-2	12.7	12.4	12.7	0.2	Imperceptible Negligible
S3-3	13.5	13.6	13.8	0.2	Imperceptible Negligible
S3-4	11.8	11.5	11.6	0.1	Imperceptible Negligible
S3-5	12.4	12.2	12.5	0.3	Imperceptible Negligible
S3-6	12.8	12.5	12.8	0.2	Imperceptible Negligible
S3-7	12.6	12.3	12.9	0.5	Small Minor
S3-8	12.3	12.2	12.3	0.2	Imperceptible Negligible
S3-9	12.0	11.7	11.9	0.1	Imperceptible Negligible
S3-10	11.9	11.6	11.7	0.1	Imperceptible Negligible
S3-11	12.0	11.9	11.9	0.0	No Change
S3-12	12.6	12.5	12.6	0.1	Imperceptible Negligible
S3-13	11.8	11.5	11.6	0.1	Imperceptible Negligible
S3-14	12.9	12.7	12.8	0.1	Imperceptible Negligible
S3-15	12.9	12.8	12.9	0.1	Imperceptible Negligible
A	14.2	14.5	14.2	-	-
B	13.6	13.8	14.1	-	-
C	14.2	14.3	14.6	-	-
D	12.5	12.3	12.4	0.1	Imperceptible Negligible

Receptor	PM_{10} Concentration (µg/m3)				Magnitude Category
	2017 Baseline	2023 Do Minimum	2023 Do Something	Change	
E	12.8	12.5	12.7	0.2	Imperceptible Negligible
F	12.2	12.0	12.2	0.2	Imperceptible Negligible
G	11.9	11.6	11.8	0.2	Imperceptible Negligible

Plate 6-9: 2023 Modelled PM_{10} Concentrations

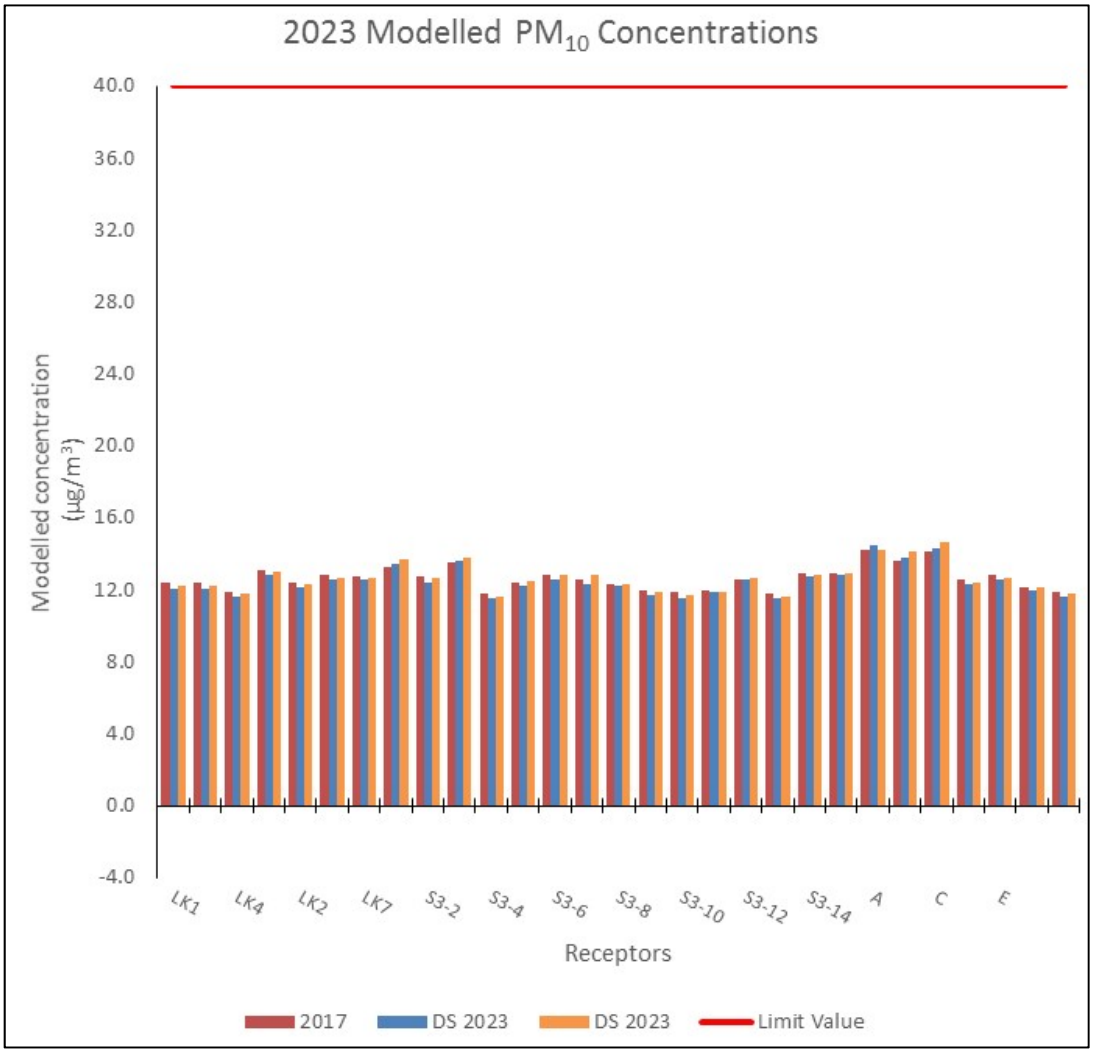


Plate 6-10: 2023 Modelled PM_{10} Concentrations

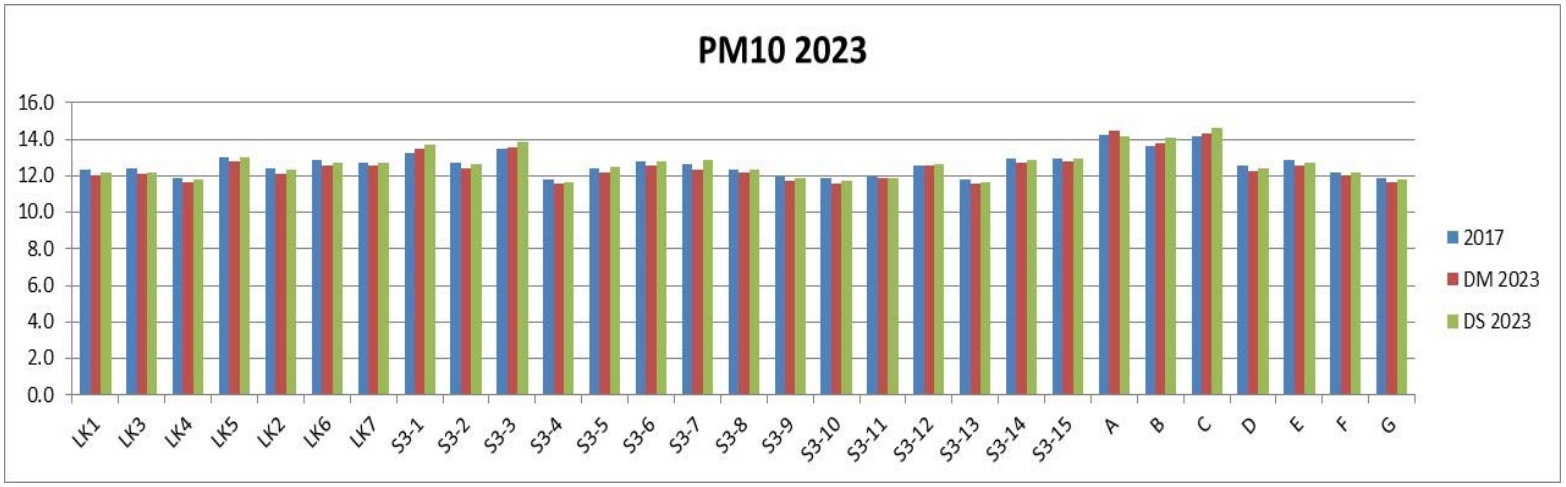
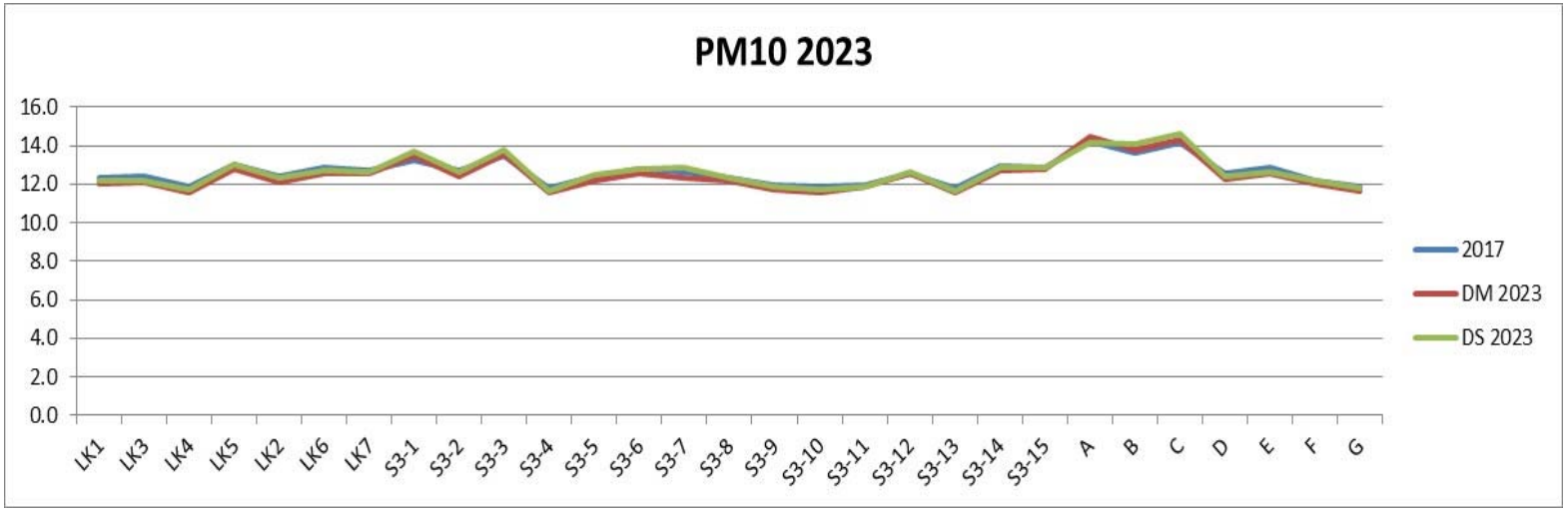


Plate 6-11: 2023 Modelled PM_{10} Concentrations



6.5.36 The greatest increase in annual mean PM_{10} concentration between DM and DS is predicted at S3-7 (c250 High Street), with a concentration change of 0.5µg/m^3, as a result of increased traffic flows on the High Street. This impact is Small (Minor) in magnitude, with PM_{10} concentrations at the receptor not predicted to exceed the annual mean PM_{10} AQO in either of the modelled scenarios.

Table 6-13: 2023 Opening Year $PM_{2.5}$ Results

Receptor	$PM_{2.5}$ Concentration (µg/m^3)				Magnitude Category
	2017 Baseline	2023 Do Minimum	2023 Do Something	Change	
LK1	5.8	5.5	5.5	0.0	Imperceptible Negligible
LK3	5.8	5.5	5.5	0.0	Imperceptible Negligible
LK4	5.6	5.4	5.4	0.1	Imperceptible Negligible
LK5	6.1	5.8	5.9	0.1	Imperceptible Negligible
LK2	5.8	5.5	5.6	0.1	Imperceptible Negligible
LK6	5.9	5.7	5.7	0.0	Imperceptible Negligible
LK7	6.0	5.7	5.8	0.0	Imperceptible Negligible
S3-1	6.7	6.5	6.7	0.2	Imperceptible Negligible
S3-2	5.8	5.5	5.6	0.1	Imperceptible Negligible
S3-3	6.5	6.3	6.5	0.2	Imperceptible Negligible
S3-4	5.5	5.2	5.2	0.0	Imperceptible Negligible
S3-5	5.9	5.6	5.7	0.1	Imperceptible Negligible
S3-6	6.0	5.7	5.9	0.1	Imperceptible Negligible
S3-7	5.9	5.6	5.9	0.3	Small Minor
S3-8	6.0	5.7	5.8	0.1	Imperceptible Negligible
S3-9	5.7	5.4	5.5	0.1	Imperceptible Negligible
S3-10	5.6	5.3	5.4	0.0	Imperceptible Negligible
S3-11	5.7	5.4	5.5	0.1	Imperceptible Negligible
S3-12	6.1	5.8	5.9	0.1	Imperceptible Negligible
S3-13	5.6	5.3	5.3	0.0	Imperceptible Negligible
S3-14	6.0	5.8	5.8	0.0	Imperceptible Negligible
S3-15	6.1	5.8	5.9	0.1	Imperceptible Negligible
A	7.1	6.9	6.8	-0.1	
B	6.7	6.5	6.7	0.2	
C	6.9	6.7	6.9	0.2	
D	5.9	5.6	5.6	0.0	Imperceptible Negligible
E	5.9	5.7	5.7	0.0	Imperceptible Negligible

Receptor	$PM_{2.5}$ Concentration (µg/m³)				Magnitude Category
	2017 Baseline	2023 Do Minimum	2023 Do Something	Change	
F	5.8	5.6	5.7	0.1	Imperceptible Negligible
G	5.7	5.4	5.4	0.0	Imperceptible Negligible

Plate 6-12: 2023 Modelled $PM_{2.5}$ Concentrations

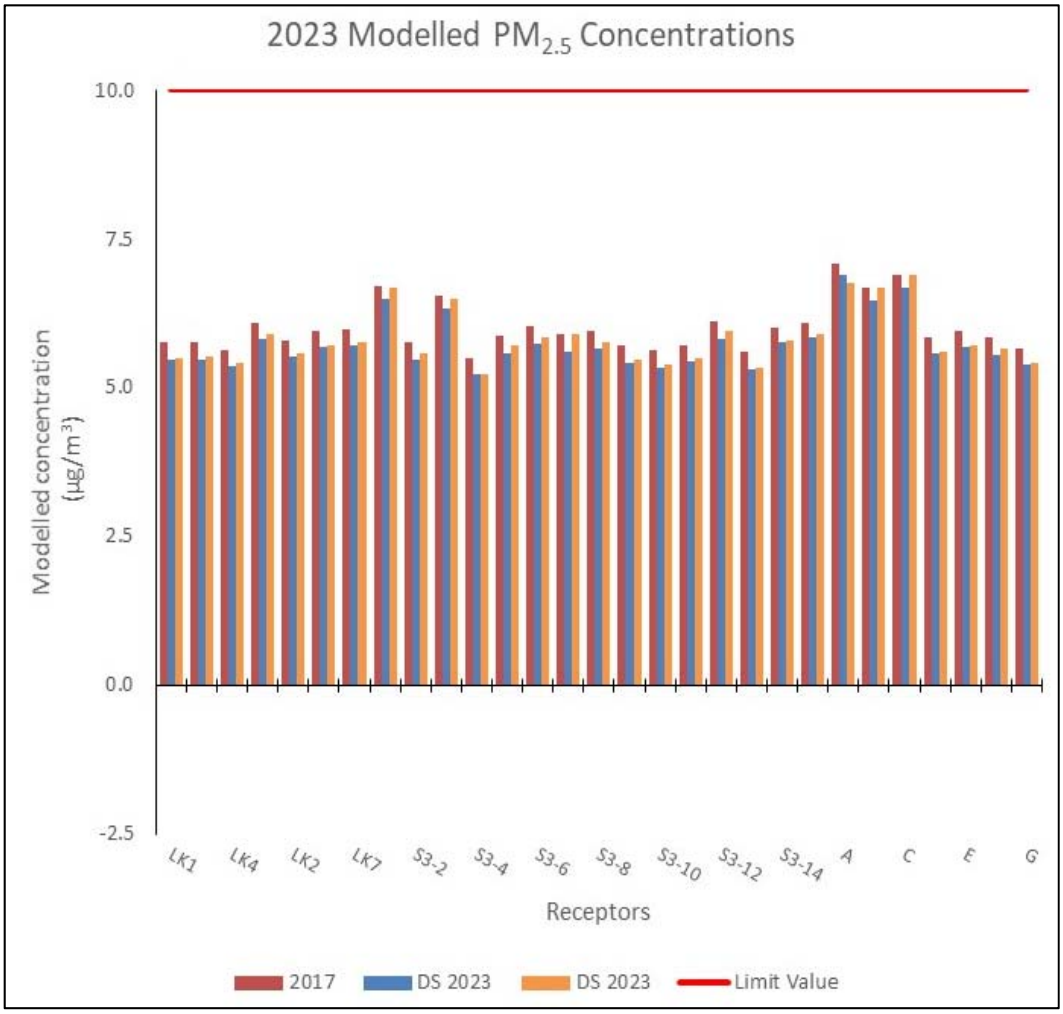


Plate 6-13: 2023 Modelled $PM_{2.5}$ Concentrations

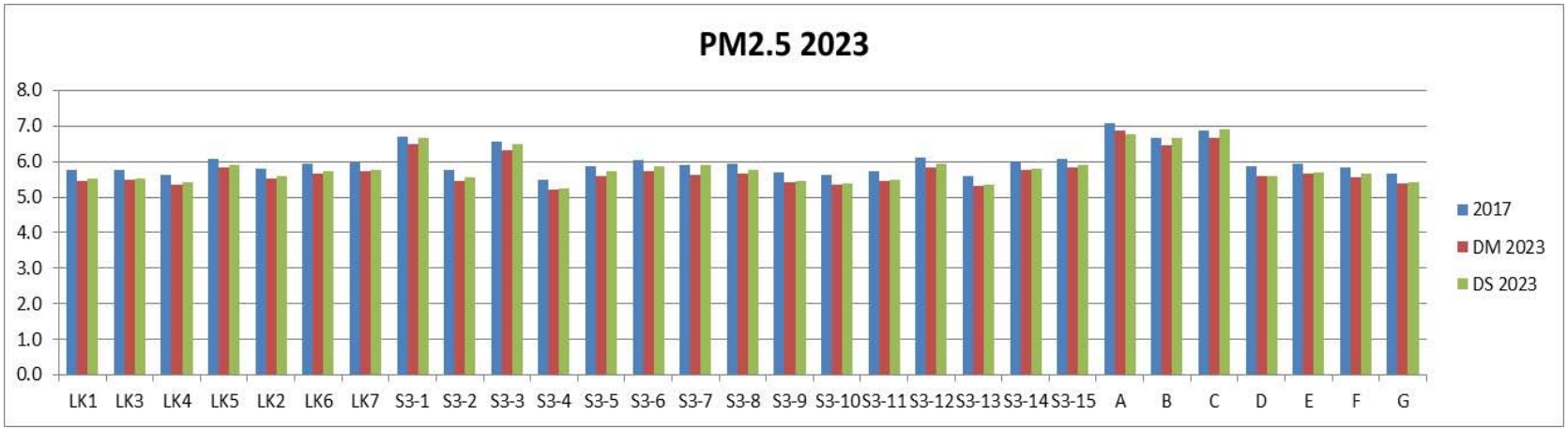
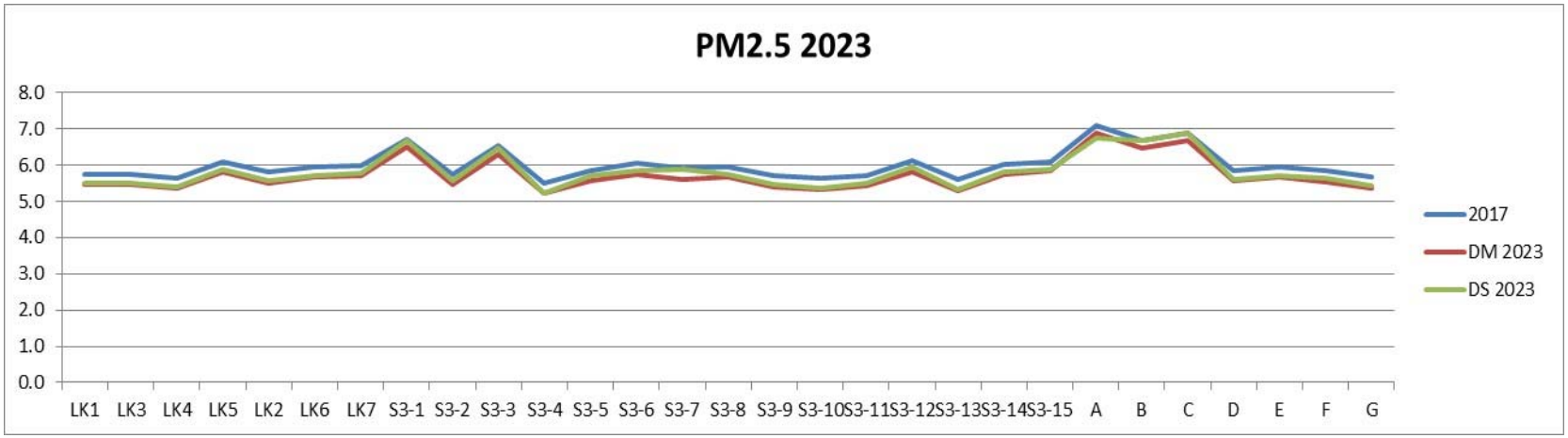


Plate 6-14: 2023 Modelled $PM_{2.5}$ Concentrations



6.5.37 The largest increase in annual mean $PM_{2.5}$ concentration (0.3 µg/m^3) between DM and DS is predicted at S3-7 (c250 High Street). This impact is Small (Minor) in magnitude, with $PM_{2.5}$ concentrations at the receptor not predicted to exceed the annual mean $PM_{2.5}$ AQO in either of the modelled scenarios.

6.5.38 Of the 26 receptor locations included in the assessment, all but one location is predicted to experience an increase in annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations, with the remaining receptor predicted to experience no change.

6.5.39 The residual impact of the proposed scheme on local air quality for all statutory pollutants in 2023 will be not significant.

2030 Future Year

6.5.40 It has been estimated that the majority of receptors included in the assessment will experience increases in annual mean concentration between the DM and DS scenarios. However, there are no predicted exceedances of the annual mean NO_2 or PM_{10} AQOs in either the DM or DS scenario.

6.5.41 Since there are no exceedances of the AQO, none of the impacts are significant, as outlined in Table 6-14 to Table 6-16 below.

Table 6-14: 2030 Future Year NO_2 Results

Receptor	NO_2 Concentration (µg/m^3)				Magnitude Category
	2017 Baseline	2030 Do Minimum	2030 Do Something	Change	
LK1	5.2	3.4	3.6	0.2	Imperceptible Negligible
LK3	5.3	3.5	3.7	0.2	Imperceptible Negligible
LK4	7.6	4.9	5.2	0.3	Imperceptible Negligible
LK5	7.5	4.6	4.9	0.4	Imperceptible Negligible
LK2	5.9	3.7	4.0	0.3	Imperceptible Negligible
LK6	5.7	3.7	4.0	0.3	Imperceptible Negligible
LK7	6.8	4.4	4.7	0.3	Imperceptible Negligible
S3-1	20.5	10.2	11.0	0.7	Small Minor
S3-2	7.6	4.7	5.5	0.8	Small Minor
S3-3	15.8	8.1	8.8	0.7	Small Minor

Receptor	NO_2 Concentration (µg/m^3)				Magnitude Category
	2017 Baseline	2030 Do Minimum	2030 Do Something	Change	
S3-4	4.7	3.2	3.2	0.0	No Change
S3-5	8.0	4.8	5.9	1.1	Small Minor
S3-6	9.8	5.3	6.0	0.7	Small Minor
S3-7	7.6	4.4	6.3	1.9	Small Minor
S3-8	12.6	7.2	7.8	0.6	Small Minor
S3-9	8.9	5.4	5.8	0.4	Imperceptible Negligible
S3-10	7.8	4.8	5.1	0.2	Imperceptible Negligible
S3-11	8.8	5.8	6.1	0.4	Imperceptible Negligible
S3-12	17.8	11.0	12.1	1.1	Small Minor
S3-13	7.2	4.8	5.1	0.3	Imperceptible Negligible
S3-14	6.6	4.2	4.5	0.3	Imperceptible Negligible
S3-15	8.1	5.1	5.5	0.4	Imperceptible Negligible
A	23.3	12.0	10.7	-	-
B	20.4	10.5	11.1	-	-
C	18.8	10.0	11.3	-	-
D	5.2	3.5	3.7	0.2	Imperceptible Negligible
E	5.7	3.7	3.9	0.2	Imperceptible Negligible
F	12.1	7.6	8.5	0.9	Small Minor
G	8.5	5.3	5.6	0.3	Imperceptible Negligible

Plate 6-15: 2030 Modelled NO_2 Concentrations

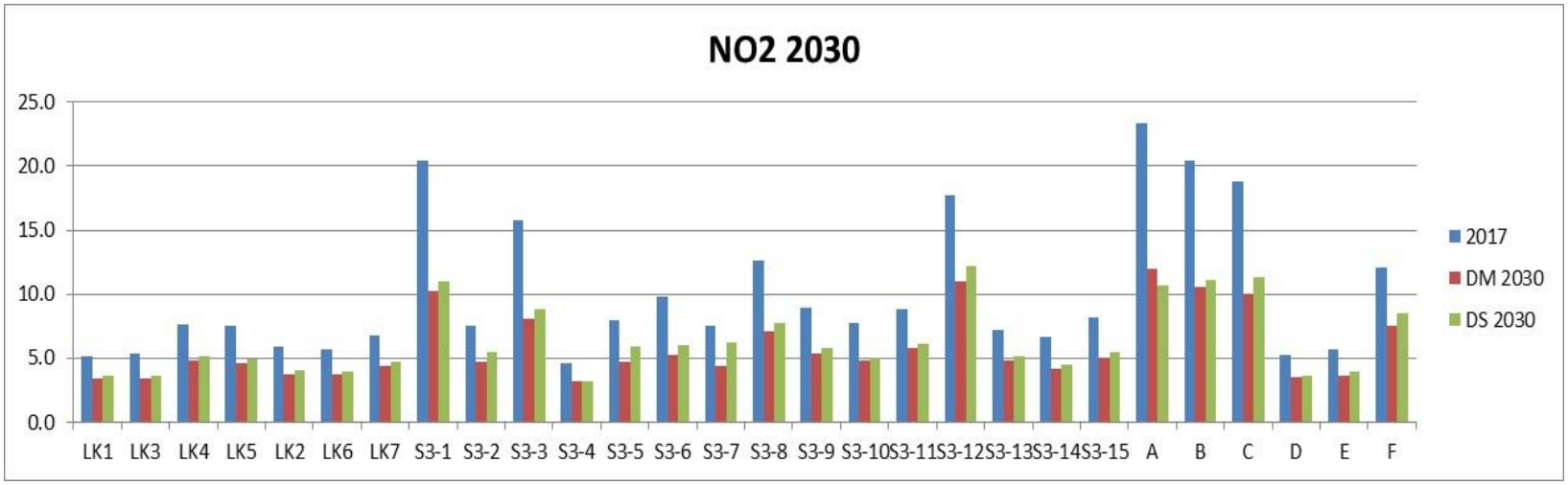


Plate 6-16: 2030 Modelled NO_2 Concentrations

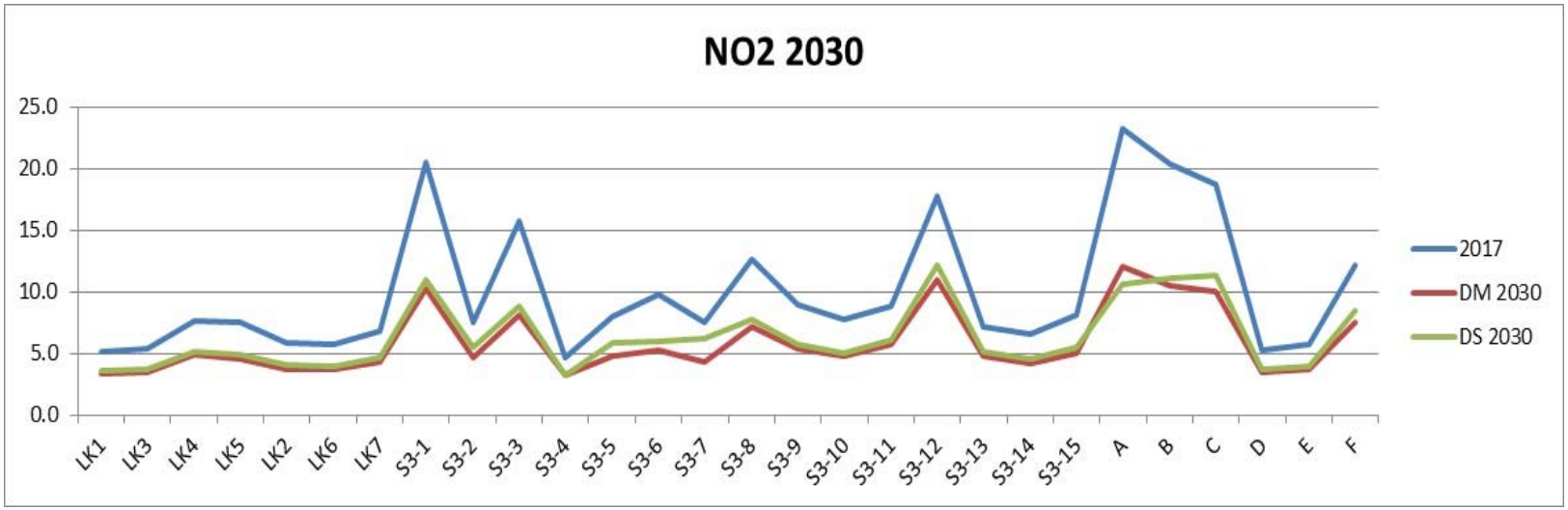
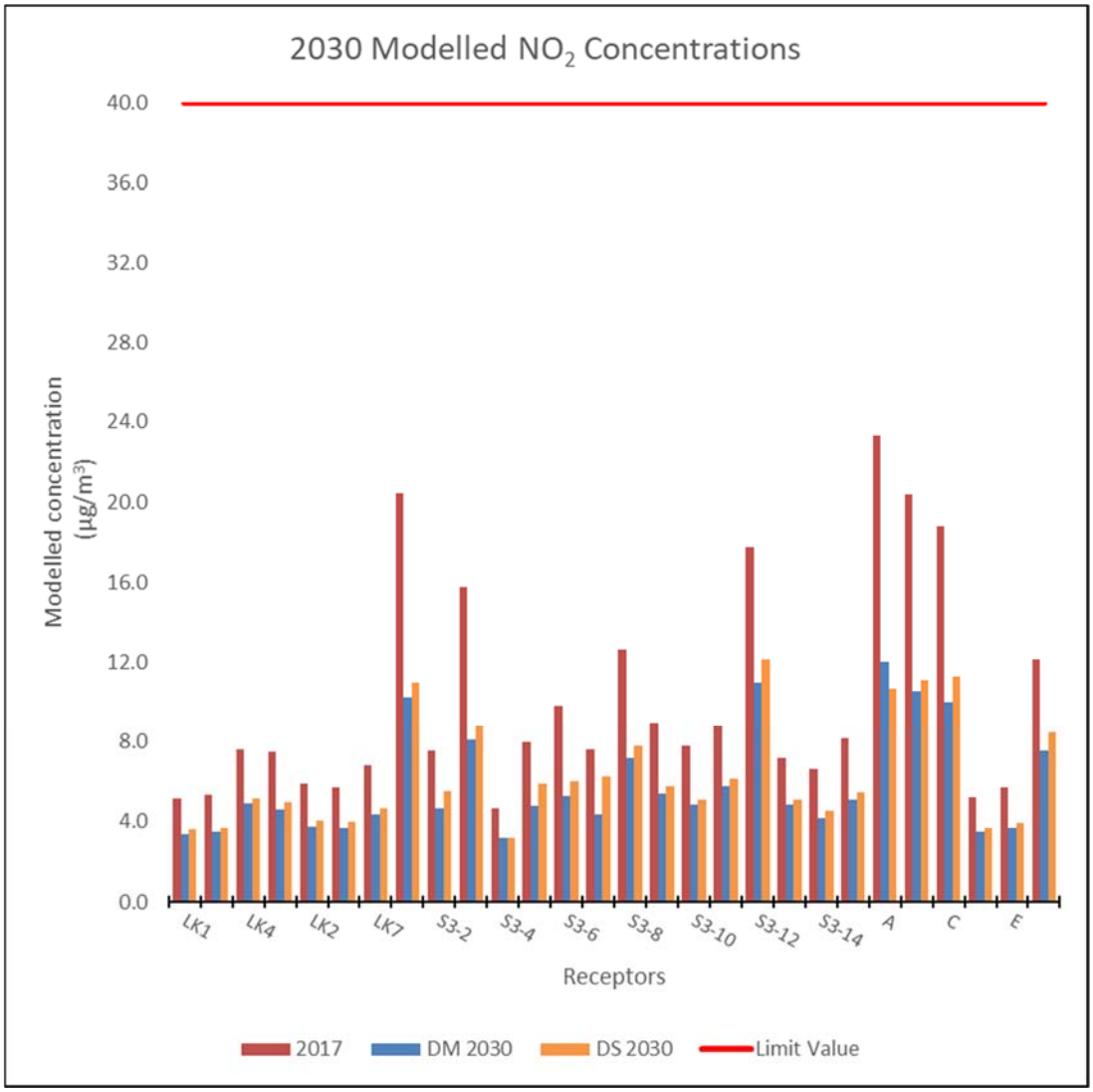


Plate 6-17: 2030 Modelled NO_2 Concentrations



6.5.42 The greatest increase in annual mean NO_2 concentration between the DM and DS scenario is predicted at S3-7 (c250 High Street), with a concentration change of 1.9µg/m^3, as a result of increased traffic flows on the High Street. This impact is Small (Minor) in magnitude, with NO_2 concentrations at the receptor not predicted to exceed the annual mean NO_2 AQO in either of the modelled scenarios.

Table 6-15: 2030 Future Year PM_{10} Results

Receptor	PM_{10} Concentration (µg/m^3)				Magnitude Category
	2017 Baseline	2030 Do Minimum	2030 Do Something	Change	
LK1	12.4	12.0	12.1	0.1	Imperceptible Negligible
LK3	12.4	12.1	12.1	0.0	No Change

Receptor	PM_{10} Concentration (µg/m^3)				Magnitude Category
	2017 Baseline	2030 Do Minimum	2030 Do Something	Change	
LK4	11.8	11.6	11.7	0.1	Imperceptible Negligible
LK5	13.0	12.8	12.9	0.1	Imperceptible Negligible
LK2	12.4	12.1	12.2	0.1	Imperceptible Negligible
LK6	12.8	12.5	12.6	0.1	Imperceptible Negligible
LK7	12.7	12.6	12.7	0.1	Imperceptible Negligible
S3-1	13.3	13.5	13.8	0.3	Imperceptible Negligible
S3-2	12.7	12.4	12.6	0.2	Imperceptible Negligible
S3-3	13.5	13.6	13.9	0.3	Imperceptible Negligible
S3-4	11.8	11.5	11.5	0.0	No Change
S3-5	12.4	12.2	12.5	0.3	Imperceptible Negligible
S3-6	12.8	12.5	12.8	0.3	Imperceptible Negligible
S3-7	12.6	12.3	12.8	0.5	Small Minor
S3-8	12.3	12.2	12.4	0.2	Imperceptible Negligible
S3-9	12.0	11.7	11.8	0.1	Imperceptible Negligible
S3-10	11.9	11.6	11.6	0.0	No Change
S3-11	12.0	11.9	12.0	0.1	Imperceptible Negligible
S3-12	12.6	12.5	12.8	0.3	Imperceptible Negligible
S3-13	11.8	11.5	11.6	0.1	Imperceptible Negligible
S3-14	12.9	12.7	12.8	0.1	Imperceptible Negligible
S3-15	12.9	12.8	12.9	0.1	Imperceptible Negligible
A	14.2	14.5	14.3	-	-
B	13.6	13.8	14.2	-	-
C	14.2	14.3	14.7	-	-
D	12.5	12.3	12.3	0.0	No Change
E	12.8	12.5	12.6	0.1	Imperceptible Negligible

Receptor	PM_{10} Concentration (µg/m^3)				Magnitude Category
	2017 Baseline	2030 Do Minimum	2030 Do Something	Change	
F	12.2	12.0	12.2	0.2	Imperceptible Negligible
G	11.9	11.6	11.7	0.1	Imperceptible Negligible

Plate 6-18: 2030 Modelled PM_{10} Concentrations

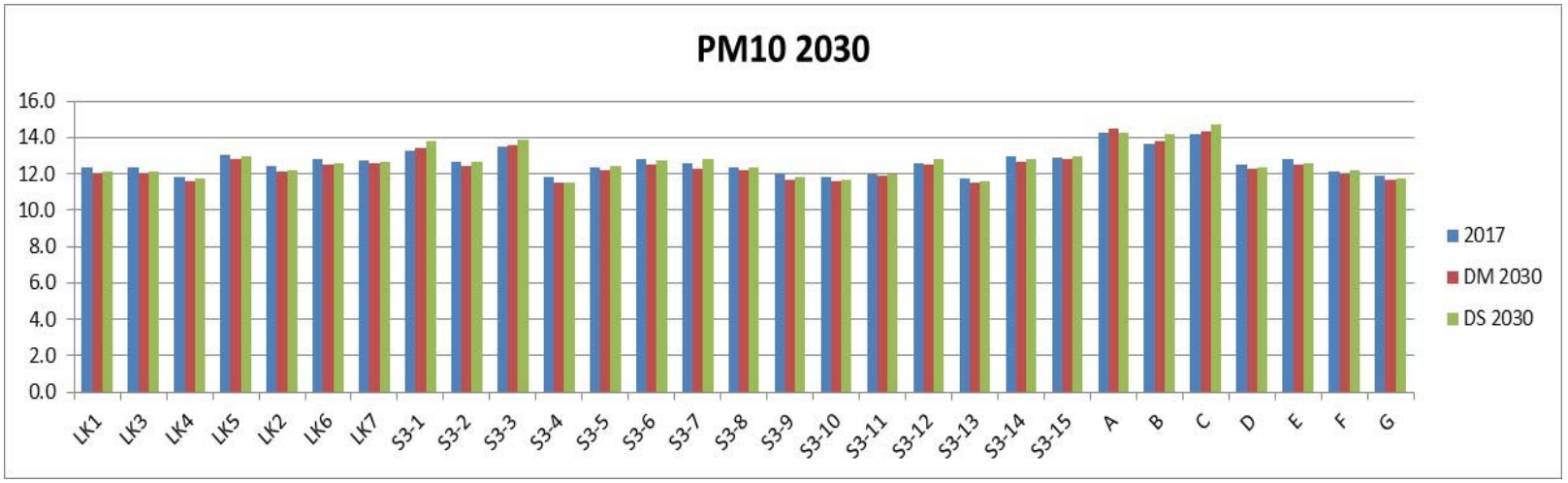


Plate 6-19: 2030 Modelled PM_{10} Concentrations

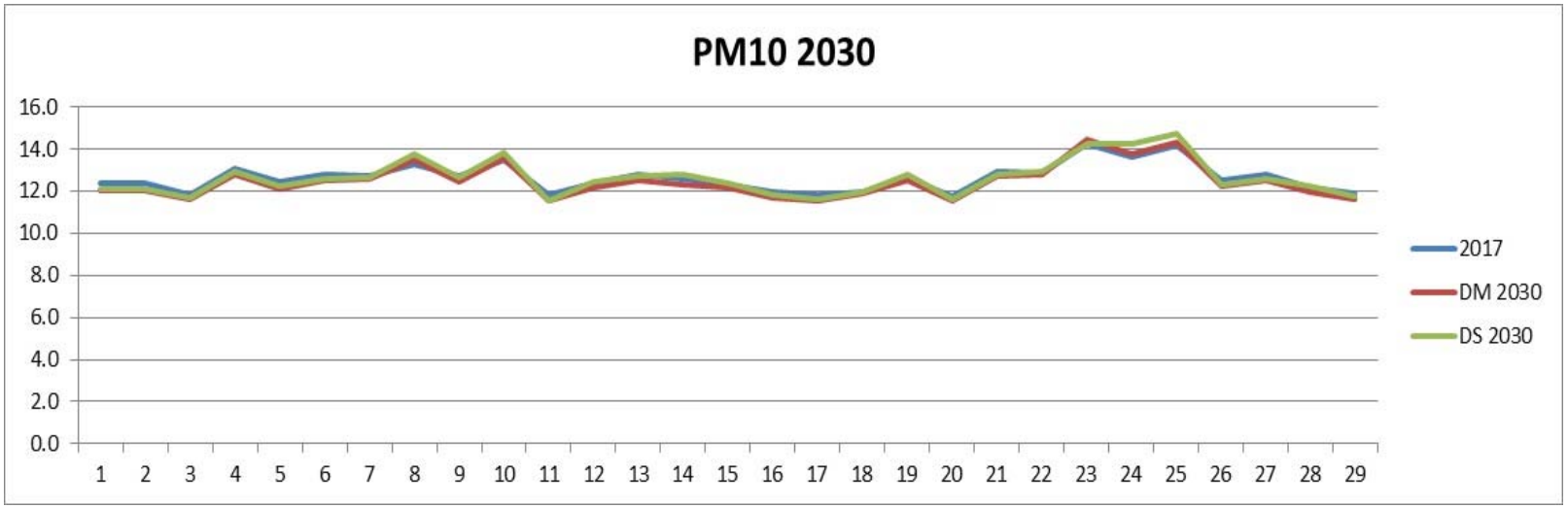
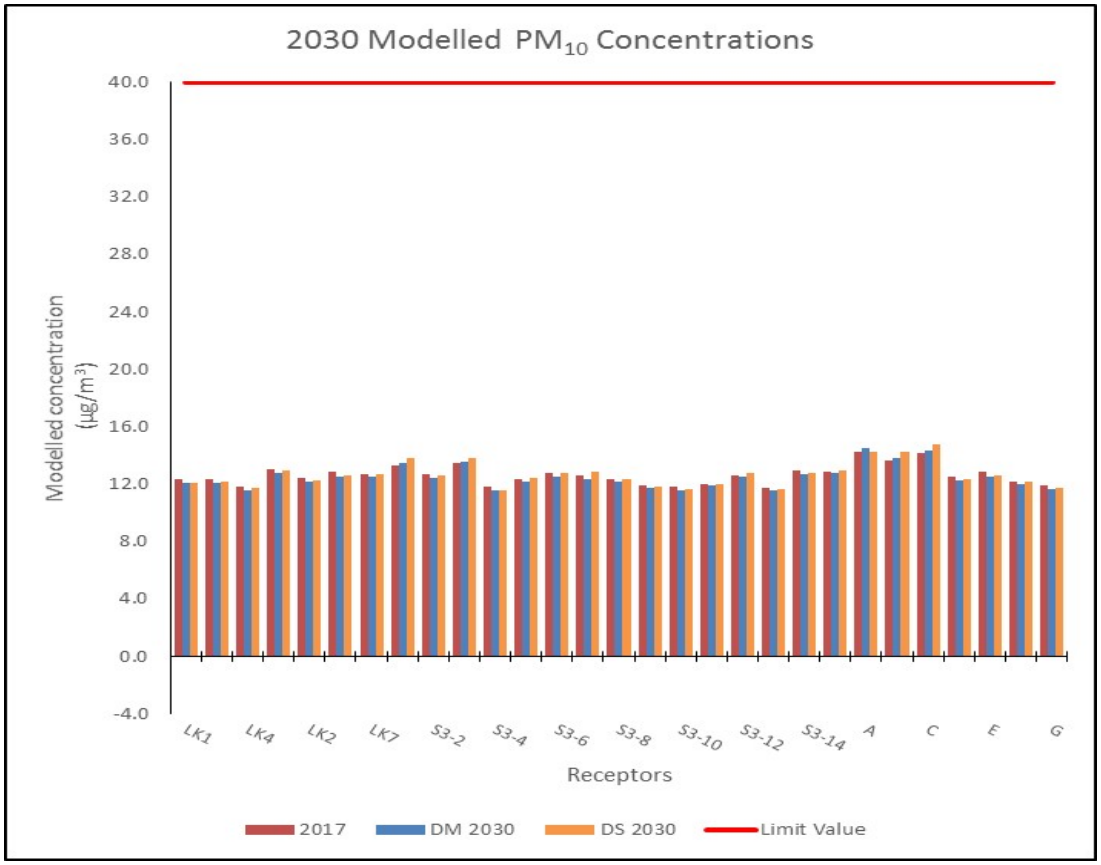


Plate 6-20: 2030 Modelled PM_{10} Concentrations



6.5.43 The greatest increase in annual mean PM_{10} concentration between DM and DS is predicted at S3-7 (c250 High Street), with a concentration change of 0.5µg/m^3, as a result of increased traffic flows on the High Street. This impact is Small (Minor) in magnitude, with PM_{10} concentrations at the receptor not predicted to exceed the annual mean PM_{10} AQO in either of the modelled scenarios.

Table 6-16: 2030 Future Year $PM_{2.5}$ Results

Receptor	PM2.5 Concentration (µg/m^3)				Magnitude Category
	2017 Baseline	2030 Do Minimum	2030 Do Something	Change	
LK1	5.8	5.3	5.3	0.0	Imperceptible Negligible
LK3	5.8	5.3	5.4	0.0	Imperceptible Negligible
LK4	5.6	5.2	5.3	0.1	Imperceptible Negligible
LK5	6.1	5.7	5.7	0.1	Imperceptible Negligible
LK2	5.8	5.4	5.4	0.1	Imperceptible Negligible
LK6	5.9	5.5	5.6	0.0	Imperceptible Negligible
LK7	6.0	5.6	5.6	0.1	Imperceptible Negligible

Receptor	PM2.5 Concentration (µg/m^3)				Magnitude Category
	2017 Baseline	2030 Do Minimum	2030 Do Something	Change	
S3-1	6.7	6.4	6.6	0.2	Imperceptible Negligible
S3-2	5.8	5.3	5.4	0.1	Imperceptible Negligible
S3-3	6.5	6.2	6.4	0.2	Imperceptible Negligible
S3-4	5.5	5.1	5.1	0.0	Imperceptible Negligible
S3-5	5.9	5.4	5.6	0.2	Imperceptible Negligible
S3-6	6.0	5.6	5.7	0.1	Imperceptible Negligible
S3-7	5.9	5.4	5.8	0.3	Small Minor
S3-8	6.0	5.5	5.6	0.1	Imperceptible Negligible
S3-9	5.7	5.3	5.3	0.1	Imperceptible Negligible
S3-10	5.6	5.2	5.2	0.0	Imperceptible Negligible
S3-11	5.7	5.3	5.4	0.1	Imperceptible Negligible
S3-12	6.1	5.7	5.9	0.1	Imperceptible Negligible
S3-13	5.6	5.2	5.2	0.0	Imperceptible Negligible
S3-14	6.0	5.6	5.7	0.1	Imperceptible Negligible
S3-15	6.1	5.7	5.8	0.1	Imperceptible Negligible
A	7.1	6.8	6.7	-0.1	
B	6.7	6.4	6.6	0.2	
C	6.9	6.6	6.8	0.2	
D	5.9	5.4	5.4	0.0	Imperceptible Negligible
E	5.9	5.5	5.5	0.0	Imperceptible Negligible
F	5.8	5.4	5.5	0.1	Imperceptible Negligible
G	5.7	5.2	5.3	0.0	Imperceptible Negligible

Plate 6-21: 2030 Modelled $PM_{2.5}$ Concentrations

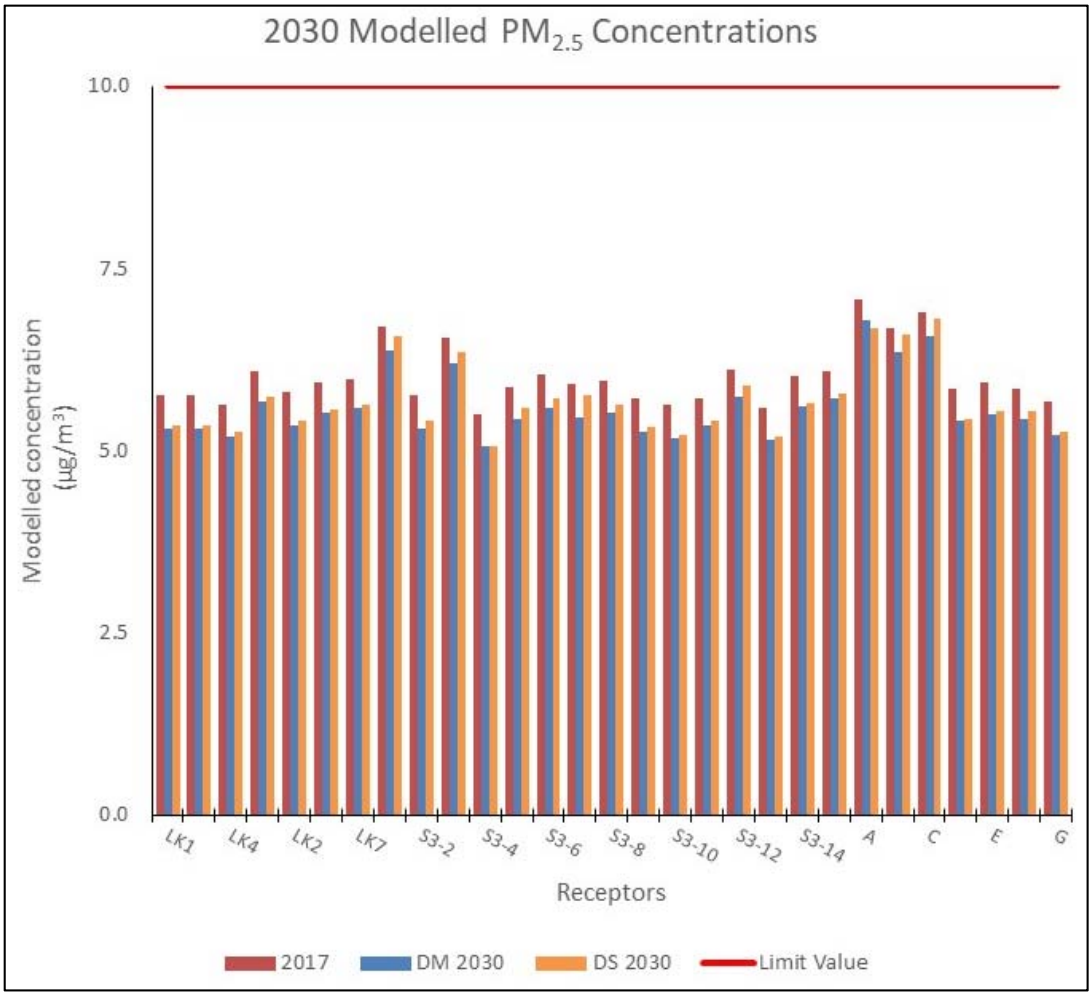


Plate 6-22: 2030 Modelled $PM_{2.5}$ Concentrations

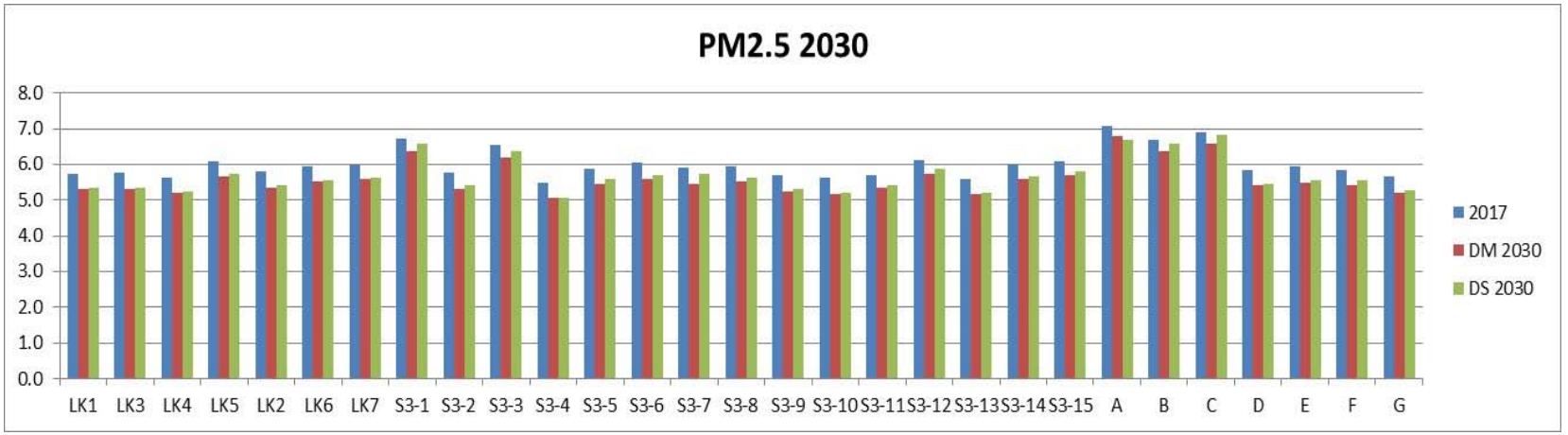
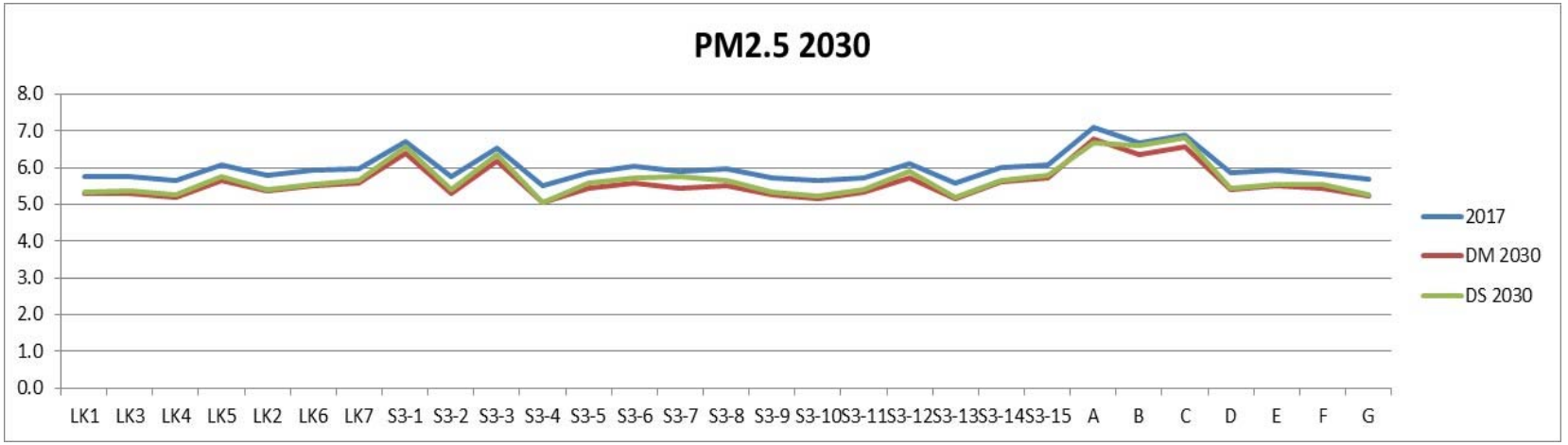


Plate 6-23: 2030 Modelled $PM_{2.5}$ Concentrations



6.5.44 The largest increase in annual mean $PM_{2.5}$ concentration (0.3 µg/m3) between DM and DS is predicted at S3-7 (c250 High Street). This impact is Small (Minor) in magnitude, with $PM_{2.5}$ concentrations at the receptor not predicted to exceed the annual mean AQO in either of the modelled scenarios.

6.5.45 Of the 26 receptor locations included in the assessment, all but one is predicted to experience a small increase in annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations, with the remaining receptor predicted to experience no change.

6.5.46 The residual impact of the scheme in terms of local air quality for all statutory pollutants in 2030 will be not significant.

Impact Significance

2023 Opening Year

6.5.47 The pollutant concentrations at all assessed receptors are predicted to be well below (<75%) of the relevant AQOs in the 2023 Opening Year scenario. Therefore, in accordance with the guidelines in IAN174/13, there has been no significant effects identified on local air quality. Furthermore, none of the affected road links within the study area are within the EU Compliance Risk Road Network; therefore, there is no potential non-compliance with this EU Directive.

6.5.48 In accordance with IAN174/13, the following 'Key Criteria Questions' have been answered for the 2023 Opening Year Scenario, as shown in Table 6-17 below.

Table 6-17: 2023 Summary of Significance Criteria

No.	Key Criteria Question	Answer
1	Is there a risk that environmental standards will be breached?	No
2	Will there be a large change in environmental conditions?	No
3	Will the effect continue for a long time?	No
4	Will many people be affected?	No
5	Will it be difficult to avoid, reduce, repair or compensate for the effect?	No
6	On balance, is the overall effect significant?	No

2030 Future Year

6.5.49 The pollutant concentrations at all assessed receptors are predicted to be well below (<75%) of the relevant AQOs in the 2030 Future Year scenario. Therefore, in accordance with the guidelines in IAN174/13, there have been no significant effects identified on local air quality. Furthermore, none of the affected road links within the study area are within the EU Compliance Risk Road Network; therefore, there is no potential non-compliance with this EU Directive.

6.5.50 In accordance with IAN174/13, the following 'Key Criteria Questions' have been answered for the 2030 Future Year Scenario, as shown in Table 6-18 below.

Table 6-18: 2030 Summary of Significance Criteria

No.	Key Criteria Question	Answer
1	Is there a risk that environmental standards will be breached?	No
2	Will there be a large change in environmental conditions?	No
3	Will the effect continue for a long time?	No
4	Will many people be affected?	No
5	Will it be difficult to avoid, reduce, repair or compensate for the effect?	No
6	On balance, is the overall effect significant?	No

Regional Emissions

2023 Opening Year

6.5.51 Table 6-19 shows the change in output from the DMRB calculator for regional impacts between the Do-Minimum and Do Something scenarios for the opening year (2023).

Table 6-19: Predicted Regional Results for the Opening Year (2023)

Pollutant	Do Minimum	Do Something	Change	Percentage (%) Change
CO (kg/year)	112,615	115,903	3,288	2.92
THC (kg/year)	18,069	18,462	393	2.17
NO_X (kg/year)	116,359	116,945	585	0.50
PM_{10} (kg/year)	3,548	3,517	-31	-0.87
C (t/year)	13,120	13,275	155	1.18

6.5.52 Table 6-19 shows an increase of up to 3% for four of the five pollutants. PM_{10} shows a decrease of -0.87%.

2030 Future Year Scenario

6.5.53 Table 6-20 shows the change in output from the DMRB calculator for regional impacts between the Do-Minimum and Do Something scenarios for the future year (2030). Given that the DMRB calculator emissions only go up to 2025, the results below are based on 2025 emissions.

Table 6-20: Predicted Regional Results for the Future Year (2030)

Pollutant	Do Minimum	Do Something	Change	Percentage (%) Change
CO (kg/year)	124,649	128,518	3,869	3.10
THC (kg/year)	19,773	20,233	460	2.33
NO_X (kg/year)	126,324	127,302	978	0.77
PM_{10} (kg/year)	3,909	3,899	-10	-0.26
C (t/year)	14,355	14,566	211	1.47

6.5.54 Table 6-20 shows an increase of up to 3.1% for four of the five pollutants. PM_{10} shows a decrease of -0.26%.

6.6 Sensitivity Analysis

6.6.1 This section presents the Sensitivity Analysis' potential impacts along modelled affected roads within the study area on local air quality during the operational phase of the proposed scheme. The modelled estimates at human receptor locations includes assessed receptors at worst case locations situated on the mainline of the proposed scheme and on surrounding affected routes.

6.6.2 Estimated annual mean concentrations and changes in concentration at receptor locations are presented in Appendix 6.6.

6.6.3 Where monitoring locations were not located at a representative receptor location, the magnitude of change/ effect is not considered. The change and effect categories at receptor locations are calculated from the DM and DS results for the relevant scenario and rounded to one decimal place.

2023 Opening Year

6.6.4 It has been estimated that the majority of receptors included in the assessment will experience increases in annual mean concentration between the DM and DS scenarios. There are no exceedances for the respective annual mean NO_2, PM_{10} or $PM_{2.5}$ AQOs in either the DM or DS scenarios.

6.6.5 Though the magnitude of change and magnitude of impact is generally greater than that of the air quality assessment, since there are no exceedances of the AQO, none of the effects are significant.

2030 Future Year

6.6.6 It has been estimated that the majority of receptors included in the assessment will experience increases in annual mean concentration between the DM and DS scenarios. There are no exceedances for the respective annual mean NO_2, PM_{10} or $PM_{2.5}$ AQOs in either the DM or DS scenarios.

6.6.7 Though the magnitude of change and magnitude of impact is generally greater than that of the air quality assessment, since there are no exceedances of the AQO, none of the effects are significant.

6.7 Greenhouse Gases

6.7.1 The results of the greenhouse calculations for the change in total emissions between the Do-Minimum and Do Something scenarios are shown in Table 6-21.

Table 6-21: Predicted Change in Total Greenhouse Gas Emissions

Year	Do-Minimum (tCO2e)	Do-Something (tCO2e)	Difference (tCO2e)
2023	31345	32073	728
2024	31658	32359	701
2025	31971	32644	674
2026	32283	32930	647
2027	32596	33216	620
2028	32909	33501	593
2029	33221	33787	566
2030	33534	34073	539
2030	33847	34358	512
2032	34159	34644	485

Impact Significance

6.7.2 There is currently no government guidance published for assessing the significance of impacts of individual road schemes on regional or local greenhouse gas emissions. Regional scale emissions are managed at a national (UK) level and are not considered for individual schemes in isolation. Professional judgement is therefore applied to the results of the simple regional assessment in comparison to national emissions estimates to determine significance.

6.7.3 The increase in emissions has been compared with the 2014 UK National Air Emissions Inventory (Defra, 2014) emissions for the pollutants. Table 6-19 shows the increases from the proposed scheme. The 4th Carbon budget, which covers the years 2023 – 2027 has a carbon budget level of 1,950 MtCO2e and the 5th Carbon budget, which covers the years 2028 has a

carbon budget level of 1,725 MtCO2e. The cumulative difference in tCO2e for the period of interest will be less than 0.0002% and is therefore not considered to be significant.

Air Quality Compliance

6.7.4 Table 6-22 provides an assessment of compliance of the scheme against relevant legislation.

Table 6-22: Assessment of the scheme against policy

Legislative Instrument	Compliance
National Planning Policy Framework (NPPF) 2018 Update	All receptors are predicted to experience a negligible impact in terms of pollutant concentrations. Therefore, the proposed scheme complies with the NPPF.
Scottish Planning Policy (SPP)	All receptors are predicted to experience a negligible impact in terms of pollutant concentrations. Taking into account the implications of the air quality impacts in line with the SPP, the proposed scheme complies with the policy.
Scotland's Third National Planning Framework (NPF3)	All receptors are predicted to experience a negligible impact in terms of pollutant concentrations. Given all receptors are predicted to experience a negligible impact in terms of pollutant concentrations, the scheme complies with the Framework.
Aberdeen City and Shire Strategic Development Plan 2014	The proposed scheme forms part of the A90's junction capacity improvements outlined within the Strategic Development Plan. The proposed scheme therefore complies with the Plan.
Aberdeenshire Local Development Plan	Given all receptors are predicted to experience a negligible impact in terms of pollutant concentrations, the proposed scheme will not have a significant detrimental impact on air quality. It therefore complies with Policy P4 of the Plan.

6.8 Mitigation

Standard Mitigation

Construction

6.8.1 It is recommended that effective dust mitigation measures, in accordance with those listed as 'highly recommended' within the IAQM guidance document should be implemented in order to mitigate potential dust effects. Additionally, all documentation and dust generation logs should be held on site and made available to the local authority if requested.

6.8.2 Listed below are the Mitigation measures 'highly recommended' for Communications, based on a Low Risk:

- Display the name and contact details of person(s) accountable for air quality and dust issues on the side of the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.

6.8.3 Listed below are the Mitigation measures 'highly recommended' and 'desirable' (identified in italics) for Dust Management, based on a Low Risk:

Develop and Implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this (the IAQM) document. The desirable measures should be included as appropriate for the site. (…) The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.

- Site Management:
  - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
  - Make the complaints log available to the local authority when asked.
  - Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
- Monitoring:
  - Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of (the) site boundary, with cleaning to be provided if necessary.
  - Carry out regular site inspections to monitor compliance with the DMP, record inspections results, and make an inspection log available to the local authority when asked.
  - Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Preparing and Maintaining the Site:
  - Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
  - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
  - Fully enclose site or specific operations where there is a high potential for dust producing and the site is active for an extensive period.
  - Avoid site runoff of water or mud.

- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

o Operating vehicle/machinery and sustainable travel:

- Only use cutting, grinding or sawing equipment fitted in conjunction with suitable dust suppression techniques such as water sprays or local extractions, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment whenever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

o Waste Management:

- Avoid bonfires and burning of waste materials.

6.8.4 There are no measures specific to earthworks which are ‘highly recommended’ or 'desirable' for a Low Risk site.

6.8.5 Listed below are the Mitigation measures 'highly recommended' and 'desirable' (identified in italics) for Construction, based on a Low Risk:

o Avoid scabbling (roughening of concrete surfaces) if possible

o Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

6.8.6 Listed below are the Mitigation measures 'highly recommended' and 'desirable' (identified in italics) for trackout, based on a Low Risk:

- Use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

6.8.7 With the above mitigation measures in place, the impact magnitude is considered to be Negligible.

6.8.8 The potential for cumulative dust generation from committed developments within the development locale is considered to be low. The impact of the committed development in the context of construction phase impacts is therefore considered to be 'not significant' in line with the IAQM guidance.

Assessment of Potential Air Quality Impacts from Construction Traffic

6.8.9 There is no significant impact predicted on local air quality concentrations as a result of construction traffic. Therefore, no mitigation measures beyond standard commitments are therefore deemed necessary or proposed.

Local Air Quality – Human Exposure Receptors/Designated Sites

6.8.10 There is no significant impact predicted on local air quality concentrations at human exposure receptors or designated sites as a result of the proposed scheme. Therefore, no mitigation measures are required.

Regional Emissions

6.8.11 Regional emissions increase as a result of the proposed scheme are considered to be not significant.

6.9 Residual Effects

6.9.1 With the proposed scheme in place and considering the mitigation measures as described in Section 6.8 (Mitigation), all impacts on air quality are predicted to be not significant.

6.9.2 There is no available guidance to determine the significance of regional scale impacts and emissions are managed at a national level only. However, such is the small magnitude of these emissions, the effect in isolation is judged as not significant.

6.10 Summary

6.10.1 The calculated local air quality impact predictions at key receptors were all found to be negligible, at worst case receptor locations. The regional air quality effects are not significant.