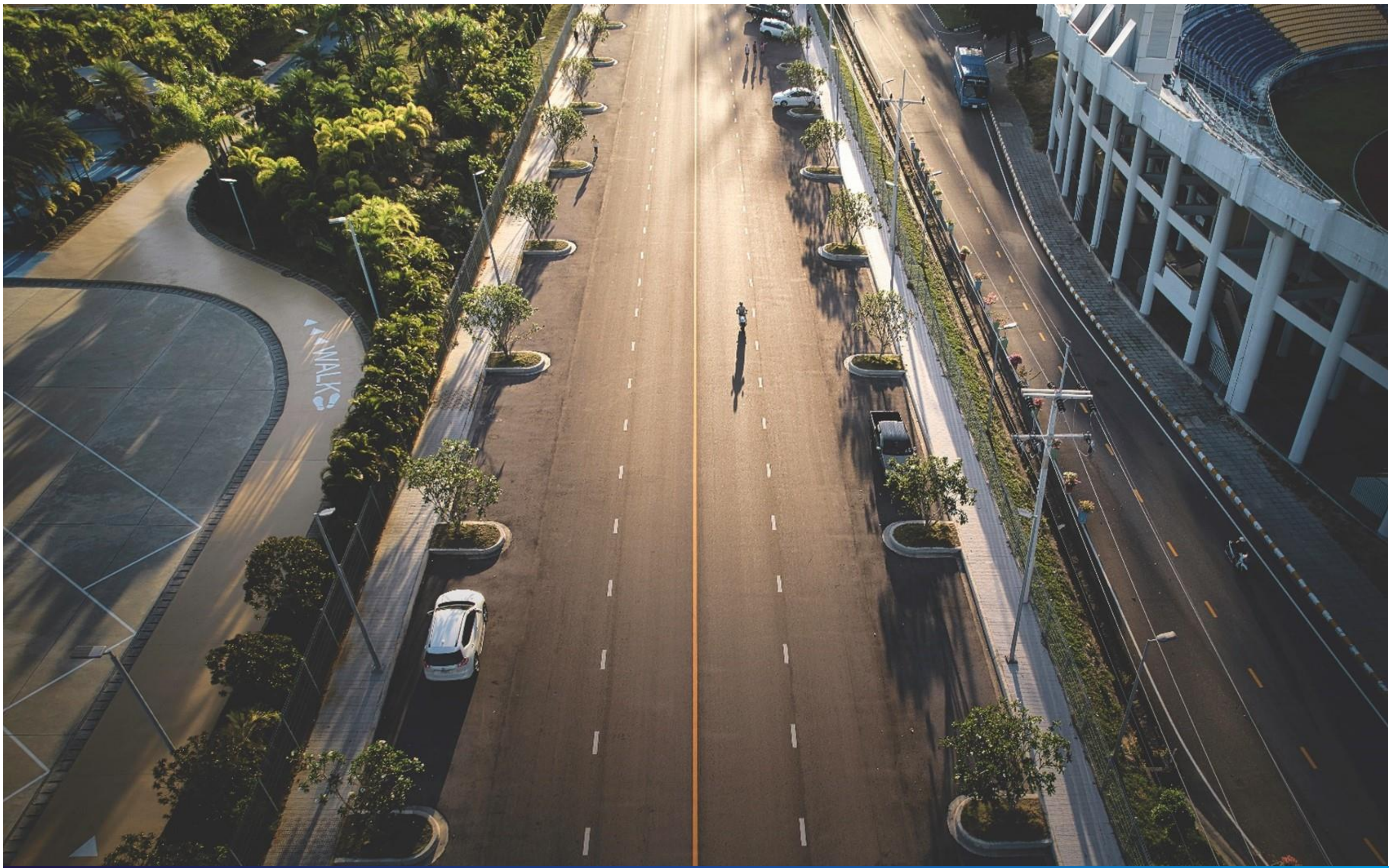

# AIR QUALITY IMPACTS OF THE EMERGING SOUTH OXFORDSHIRE AND VALE OF THE WHITE HORSE JOINT LOCAL PLAN

## Detailed assessment

Report for: South Oxfordshire and the Vale of the White Horse District Councils

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Ricardo is certified to ISO9001, ISO14001, ISO27001 and ISO45001.

# EXECUTIVE SUMMARY

This report details a study undertaken to evaluate the air quality impacts of the emerging Joint Local Plan of the South Oxfordshire and Vale of White Horse district councils (hereafter referred to as 'the authorities'). This assessment has focused on the changes in annual mean Nitrogen Dioxide ($NO_2$) and fine particulate matter ($PM_{2.5}$) concentrations between the adopted local plans for South Oxfordshire and the Vale of White Horse (Do Minimal (DM)) for the year 2041 and the emerging Joint Local Plan (Do Something (DS) for the year 2041.

This study builds on a screening exercise undertaken to identify locations where pollutant concentrations are likely to increase as result of the emerging Joint Local Plan. The findings from the screening exercise identified that the majority of the road links within the authorities are unlikely to experience an adverse impact, as most locations are predicted to experience negligible increases in traffic or reduced traffic volumes with the implementation of the emerging Joint Local Plan. However, the previous study identified 10 sections of road network that might be adversely impacted.

A detailed dispersion modelling exercise was therefore undertaken to establish the air quality impact due to the emerging Joint Local Plan on the road links within the networks identified. The model includes road traffic emissions based on daily average traffic volumes, vehicle composition and speeds for major road links across the authorities and the use of meteorological data to calculate dispersion of these emissions. The model output is the annual mean $NO_2$ and $PM_{2.5}$ concentrations at modelled receptors within each of the scoped-in locations for the two scenarios.

The impact of changes in $NO_2$ and $PM_{2.5}$ concentrations between the adopted local plans for South Oxfordshire and the Vale of White Horse (Do Minimal) and the emerging Joint Local Plan (Do Something) scenarios have been assessed using the impact descriptor matrix tool recommended by the Institute of Air Quality Management (IAQM). The IAQM impact descriptor matrix tool has been adapted to consider changes in $NO_2$ and $PM_{2.5}$ concentrations against the 2041 DM concentrations and not current regulation values which are likely to be revised by 2041.

The results from this study found that the impacts of the emerging Joint Local Plan on $NO_2$ was negligible at eight of the road links modelled in this study, while one road link experienced a 'slight' impact. However, a section of road along the A329 Thame Road, which runs through Stadhampton is predicted to experience a 'moderate' impact from the implementation of the emerging Joint Local Plan as a result of the removal of the planned Stadhampton / Chiselhampton bypass. The moderate impact descriptor highlights that air quality will be adversely impacted by the emerging Joint Local Plan at this location compared to levels predicted from the adopted Joint Local Plan. The emerging Joint Local Plan is predicted to have a 'slight' impact on $PM_{2.5}$ concentrations in Stadhampton and 'negligible' impact at all other locations included in the study.

Overall, the change at this location should be considered with the wider context that the models predict that $NO_2$ concentrations will be well below the current UK target values at all locations in this assessment for both the adopted plans and emerging Joint Local Plans in 2041 even when our conservative emission estimates are used. The results from the study show that annual mean concentrations of $NO_2$ are likely to be below half the UK current standard of 40 $\mu g/m^3$.

# CONTENTS

# 1. PROJECT DESCRIPTION

The National Planning Policy Framework (NPPF)[1] requires local authorities in England to have an up-to-date local plan to provide a positive vision for the future of their area with the objective of contributing to the achievement of sustainable development. South Oxfordshire and the Vale of the White Horse district councils (hereafter referred to as "the authorities") are currently preparing a Joint Local Plan to meet the councils' future development needs up to 2041.

The authorities appointed Ricardo to undertake a screening exercise to understand whether the changes to the adopted local plans for South Oxfordshire and the Vale of White Horse (the adopted local plans) are likely to significantly impact air quality across the authorities. The conclusions drawn from the screening exercise identified that a further detailed assessment was required in 10 locations to gain a full understanding of how the changes will impact air quality.

This report provides:

- a summary of the findings of the screening assessment;
- the appraisal methodology to assess the impacts from the emerging Joint Local Plan on air quality; and;
- the results of the appraisal.

The authorities have commissioned Ricardo to undertake a further assessment to further explore the impacts of the emerging Joint Local Plan on surround air quality. This assessment focuses on the changes in the annual mean concentration of Nitrogen Dioxide ($NO_2$) and $PM_{2.5}$ between two scenarios; the Do Minimal (DM) (representing the adopted local plans) and the Do Something (DS) (representing the emerging Joint Local Plan).

# 2. SCREENING ASSESSMENT RESULTS

The screening assessment report fully details the approach undertaken to screening the impacts of the emerging Joint Local Plan. In summary, it was identified that the emerging Joint Local Plan will:

- Increase the housing allocation on the Dalton Barracks Strategic Allocation (DBSA).
- Reduce the housing allocation on the Chalgrove Strategic Allocation (CSA).
- Remove the planned Stadhampton / Chiselhampton bypass.

It was concluded that these actions are likely to result in an increase in road traffic emissions due to additional road transport vehicles using the road network within the authorities. The key road traffic emissions which are a health concern are the air pollutants, nitrogen dioxide ($NO_2$) and particulate matter ($PM_{2.5}$). The expected increase in traffic volumes would exceed the Institute of Air Quality Management (IAQM) planning guidance[2] screening threshold, where a detailed air quality assessment is required to assess impacts on air quality.

The IAQM screening assessment details seven considerations which should be made to evaluate whether more detailed understanding of the air quality impacts of a scheme is required. It was identified that two of these considerations were relevant to the changes proposed in the emerging Joint Local Plan.

Table 2-1 details the two criteria used in the screening assessment.

[1] https://www.gov.uk/guidance/national-planning-policy-framework

[2] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 2-1: Screening assessment criteria

| The development will: | Indicative Criteria to Proceed to an Air Quality Assessment |
|---|---|
| 1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5t gross vehicle weight). | A change of LDV flows of:<br>- More than 100 AADT within or adjacent to an AQMA<br>- More than 500 AADT elsewhere. |
| 2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight). | A change of HDV flows of:<br>- More than 25 AADT within or adjacent to an AQMA.<br>- More than 100 AADT elsewhere. |

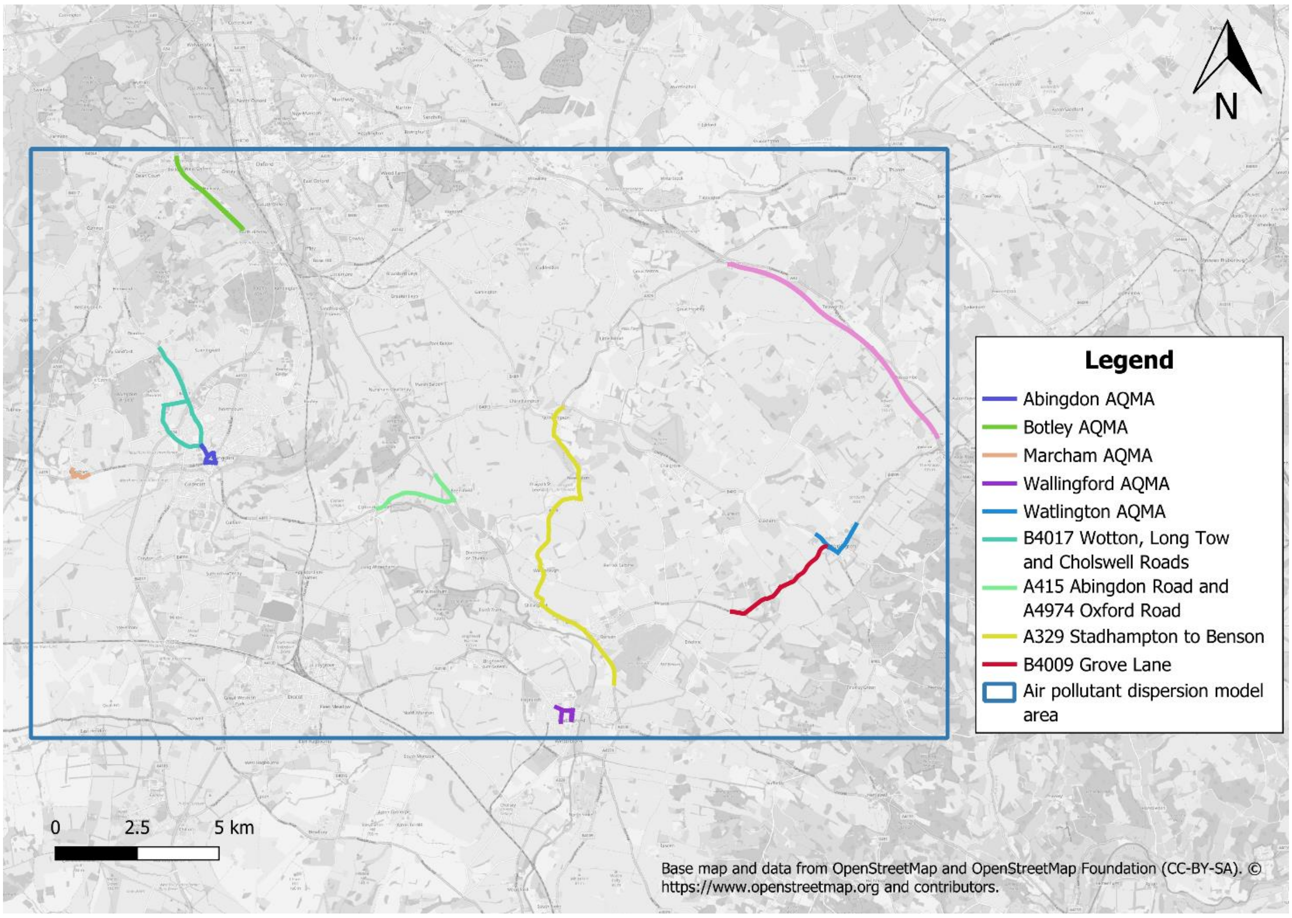
Development proposed in the emerging Joint Local Plan is expected to impact on traffic volumes above the two thresholds detailed in Table 2-1 at 10 locations when the scheme is in full operation (by 2041). Table 2-2 details the locations identified where these thresholds would be exceeded.

Table 2-2: Locations scooped in from the screening assessment

| Location | Finding |
|---|---|
| Abingdon AQMA | The data shows that LDV flows are likely to increase above the threshold of an increase of at least 100 vehicles per day within the AQMA on east and west St Helen Street. The data also shows that AADT traffic is likely to increase on two sections of road which link into the AQMA (Farringdon Road and Bath Street). |
| Botley AQMA | The data shows a change in traffic flow of up to 500 LDVs is expected to occur on the A34 southern bypass within the AQMA. |
| Marcham AQMA | LDV volumes on road links within the AQMA are expected to reduce. However, LDV flows are expected to change by more than 500 outside the AQMA along North Street. |
| Wallingford AQMA | LDV volumes are generally expected to reduce on road links within and surrounding the AQMA. The data also shows that HDV volumes are expected to increase above the 25 AADT threshold along Wantage Road, Station Road, High Street and Castle Street. |
| Watlington AQMA | LDV volumes are predicted to change between 100 - 500 LDV's on Couching Street within the AQMA. |
| B4017 Wotton Road, Long Tow and Cholswell Road | LDVs are expected to change by more than 500 vehicles on the section of road running between the Faringdon / Bath street roundabout to Long Tow (via Cholswell Road). The level of change is predicted across the entirety of Long Tow and also the section of adjoining Wotton Road running between the Honeybottom Lane junction to the Dunmore Road roundabout. The links are directly associated with the DBSA. |
| A415 Abingdon Road, A4074 Oxford Road | LDV is expected to change by more than 500 vehicles on the section of Abingdon Road between the Main Avenue junction and Oxford Road roundabout, the same level of change continues for approximately 1 km along the northern section of Oxford Road from the roundabout. |
| A329 Stadhampton to Benson | LDV is expected to change by more than 500 vehicles on the section of road that runs along Milton Road in Stadhampton to the junction with Church Road in Benson. |
| B4009 Grove Lane | LDV is expected to change by more than 500 vehicles between the junction with Eyre's Lane to Cuxham Road. This length of road links directly into the Watlington AQMA. |

| Location | Finding |
|---|---|
| M40 junctions 6 - 7 | LDV is expected to change by more than 500 vehicles between these two junctions. |

Figure 2-1: Location of scoped in road links




Based on these findings, the authorities have requested that an air quality impact assessment should be undertaken which would involve a detailed air pollutant dispersion modelling study to compare the changes in annual mean $NO_2$ concentrations between the two scenarios.

# 3. METHODOLOGY

## 3.1 OVERALL APPROACH

The approach to the assessment comprises:

- Building an air pollutant dispersion model for the DM and DS 2041 scenarios to predict $NO_2$ and $PM_{2.5}$ concentrations. The input data for the model is detailed in Section 4 and includes the transport model provided by the authorities and emission factors published by the UK Department for Transport. All modelling was carried out following the guidance set out in the guidance document Local Air Quality Management Technical Guidance (TG22[3]), published by Defra.
- Calculations of pollutant concentrations at receptor locations 5m from road centrelines at 10m intervals.
- The average and maximum percentage change in annual mean $NO_2$ and $PM_{2.5}$ concentrations resulting from the implementation of the emerging Joint Local Plan for each road link (shown in Table 6-1 and Table 6-2).
- The Institute of Air Quality Management's impact descriptor matrix was adapted to assess the significance of the impact due to changes in $NO_2$ and $PM_{2.5}$ (see section 3.2).

## 3.2 APPROACH TO ASSESSMENT OF SIGNIFICANCE

The IAQM[4] recommend the use of a "*impact descriptors for individual receptors*" matrix to evaluate the effect of a planning decision at a sensitive receptor point. The matrix, as shown in Table 3-1, is designed to provide an assessment descriptor that is based on the recorded annual mean concentration at a receptor and the change in pollutant concentration compared with the air quality assessment level (AQAL).

Table 3-1: IAQM's impact descriptors for individual receptors matrix

| Long-term average concentration at receptor in assessment year | % Change in Concentration Relative to Air Quality Assessment Level (AQAL) | | | |
|---|---|---|---|---|
| | <1 % | 1 – 5 % | 5 – 10 % | >10 % |
| 75% or less of AQAL | Negligible | Negligible | Slight | Moderate |
| 76 – 94% of AQAL | Negligible | Slight | Moderate | Moderate |
| 95 – 102% of AQAL | Slight | Moderate | Moderate | Substantial |
| 103% – 109% of AQAL | Moderate | Moderate | Substantial | Substantial |
| 110% or more of AQAL | Moderate | Substantial | Substantial | Substantial |

The IAQM recommend that the AQAL is set to standards stated in the UK Air quality standards regulation[5]. With consideration to current trends in ambient $NO_2$ monitoring, it is expected that annual mean concentrations of the pollutant will be well below the current limit values in 2041. It is expected that the UK government will update air quality standards prior to 2041 as current standards are likely to be widely achieved. For $PM_{2.5}$, the UK government has set two targets; with annual mean concentrations to be below 10 µg/m$^3$ at all national monitoring stations in 2040 and the population exposure concentrations to fall by 35% between 2019 and 2040.[6] An assessment against this standard is not possible as the regulations tie to specific measurement points.

This assessment has adapted the IAQM methodology by only considering the first row of the matrix and using the 2041 DM concentration values as the AQAL. The descriptor is then ascertained by understanding the level

[3] https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf
[4] https://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf
[5] https://www.legislation.gov.uk/uksi/2010/1001/contents
[6] https://www.legislation.gov.uk/ukdsi/2022/9780348242959

of pollutant concentration change by the do-something (DS) scenario compared to the do-minimal (DM) baseline (i.e. an increase of concentration from the DM scenario of greater than 10% would be classified as a moderate change).

## 3.3 UNCERTAINTY

Results of the dispersion modelling assessment are subject to a number of sources of uncertainty. In particular, there is a high level of uncertainty associated with projection of concentrations far into the future; the assumptions detailed in section 4 are likely to change between 2024 and 2041. With consideration to this, this report primarily details changes in $NO_2$ and $PM_{2.5}$ concentrations as a relative percentage change (%) between the two scenarios. The use of the relative percentage change above changes in pollutant concentration has been identified as a more robust appraisal method as changes in the underlying assumption will change both scenarios in the same way and therefore not impact the relative percentage change. The use of annual mean concentrations is provided in the results to add some additional context to the relative percentage change value but should not be used for the overall appraisal. Given this consideration, the IAQM impact descriptor table has been adapted so that only the descriptors used in the first row have been applied without consideration to the percentage of AQAL.

# 4. MODELLING METHODOLOGY

The RapidAir® dispersion modelling system has been used for this assessment. This is Ricardo's proprietary modelling system developed for urban air pollution assessment. The model is based on convolution of an emissions grid with dispersion kernels derived from the USEPA AERMOD model. The physical parameterisation (release height, initial plume depth and area source configuration) closely follows guidance provided by the USEPA in their statutory road transport dispersion modelling guidance[7]. AERMOD provides the algorithms which govern the dispersion of the emissions and is an accepted international model for road traffic studies. The combination of an internationally recognised model code and careful parameterisation matching international best practice makes RapidAir© demonstrably fit for purpose for this study.

## 4.1 MODEL DOMAIN

Figure 2-1 shows the extent of the model domain used for the analysis. The modelling area encompasses each of the 10 scoped in road links identified by the screening assessment.

## 4.2 TRANSPORT DATA

The authorities have provided traffic model results from work undertaken by Atkins to model the impact on traffic flows across the region due to updates in the Joint Local Plan. This traffic model dataset contained Annual Average Daily Traffic (AADT) volumes, speeds and basic vehicle composition for motorway, A and B roads across both local authorities for the following scenarios:

- A 2018 baseline scenario, used to carry out model calibration and validation;
- The 2041 DM (the adopted local plans) scenario; and
- The 2041 DS (emerging Joint Local Plan) scenario.

## 4.3 EMISSION CALCULATION METHODOLOGY

The aim of this study is to understand the changes in the $NO_2$ and $PM_{2.5}$ concentration for the 2041 DM and 2041 DS scenarios at the locations shown in Table 2-2. It should be noted that current air quality projections expect that most combustion engine vehicles used today will be replaced by a net-zero alternative in 2041, thus significantly reducing the volume of $NO_x/NO_2$ emitted from road traffic on the regional road network.

Fleet composition data was taken from national fleet projections. Vehicle composition data was extracted for 2018 and 2035 from the Emission Factor Toolkit (EFT) version 12.1.[8] Although data for 2041 are available, there is an increased level of uncertainty in the projections for 2041 as several factors could impact the future

[7] https://www.epa.gov/scram/air-quality-dispersion-modeling
[8] https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/

vehicle turnover for this year. Therefore, data for 2035 was used as a conservative representation of the likely vehicle composition in 2041.

Emissions from all modelled road traffic sources were calculated using speed-dependent vehicle emission factors for $NO_X$ , primary $NO_2$ and $PM_{2.5}$ from the EFT. These factors provide emission factors categorised by vehicle size, age, and Euro classification, taking into account average vehicle mileage and engine degradation. Emission factors are provided for roads with uphill or downhill gradients.

Table 4-1 to Table 4-3 show the fleet composition used for this study.

### 4.3.1 2018 fleet

Table 4-1: NAEI fleet composition for 2018 by engine standard

| | Pre-Euro 1 | Euro 1 | Euro 2 | Euro 3 | Euro 4 | Euro 5 | Euro 6 |
|---|---|---|---|---|---|---|---|
| **Petrol car** | - | - | 0.01 | 0.16 | 0.25 | 0.28 | 0.30 |
| **Hybrid car (petrol)** | | | | 0.01 | 0.13 | 0.32 | 0.53 |
| **Plugin hybrid car (petrol)** | | | | | 0.00 | 0.10 | 0.90 |
| **Diesel car** | - | - | 0.00 | 0.08 | 0.20 | 0.35 | 0.37 |
| **Hybrid car (diesel)** | | | | 0.00 | 0.00 | 0.12 | 0.88 |
| **LGV petrol** | - | - | 0.07 | 0.17 | 0.20 | 0.22 | 0.35 |
| **LGV diesel** | - | - | 0.01 | 0.06 | 0.19 | 0.38 | 0.36 |
| **Taxi petrol** | - | - | 0.07 | 0.17 | 0.20 | 0.22 | 0.35 |
| **Taxi diesel** | - | - | 0.01 | 0.06 | 0.19 | 0.38 | 0.36 |
| **Rigid HGVs** | - | 0.01 | 0.03 | 0.10 | 0.09 | 0.26 | 0.51 |
| **Artic HGVs** | - | 0.00 | 0.00 | 0.02 | 0.03 | 0.20 | 0.74 |
| **Conventional bus** | - | 0.00 | 0.02 | 0.14 | 0.10 | 0.26 | 0.47 |
| **Hybrid bus** | | | | | - | 0.81 | 0.19 |
| **Conventional coach** | - | 0.00 | 0.02 | 0.14 | 0.10 | 0.26 | 0.47 |
| **Hybrid coach** | | | | | - | 0.81 | 0.19 |

### 4.3.2 2041 fleet

Table 4-2: NAEI light duty fleet composition for 2035 by engine standard

| | Euro 2 | Euro 3 | Euro 4 | Euro 5 | Euro 6 a/b/c | Euro 6d - temp | Euro 6 d |
|---|---|---|---|---|---|---|---|
| **Petrol car** | - | - | - | 0.00 | 0.03 | 0.04 | 0.94 |
| **Hybrid car (petrol)** | | - | - | 0.00 | 0.01 | 0.03 | 0.96 |
| **Plugin hybrid car (petrol)** | | | - | 0.00 | 0.00 | 0.01 | 0.99 |
| **Diesel car** | - | - | - | 0.00 | 0.06 | 0.04 | 0.90 |
| **Hybrid car (diesel)** | | - | - | 0.00 | 0.01 | 0.04 | 0.95 |
| **LGV petrol** | - | - | - | 0.00 | 0.00 | 0.01 | 0.99 |

| | Euro 2 | Euro 3 | Euro 4 | Euro 5 | Euro 6 a/b/c | Euro 6d - temp | Euro 6 d |
|---|---|---|---|---|---|---|---|
| **LGV diesel** | - | - | - | 0.00 | 0.01 | 0.03 | 0.96 |
| **Taxi petrol** | - | - | - | 0.00 | 0.00 | 0.01 | 0.99 |
| **Taxi diesel** | - | - | - | 0.00 | 0.01 | 0.03 | 0.96 |

Table 4-3: NAEI heavy duty fleet composition for 2035 by engine standard

| | Euro 1 | Euro 2 | Euro 3 | Euro 4 | Euro 5_ERG | Euro 5 SCR | Euro 6 |
|---|---|---|---|---|---|---|---|
| **Rigid HGVs** | - | - | - | - | 0.00 | 0.00 | 1.00 |
| **Artic HGVs** | - | - | - | - | 0.00 | 0.00 | 1.00 |
| **Conventional bus** | - | - | - | - | 0.00 | 0.00 | 1.00 |
| **Hybrid bus** | | | | - | - | - | 1.00 |
| **Conventional coach** | - | - | - | - | 0.00 | 0.00 | 1.00 |
| **Hybrid coach** | | | | - | - | - | 1.00 |

## 4.4 CHEMISTRY AND BACKGROUND CONCENTRATIONS

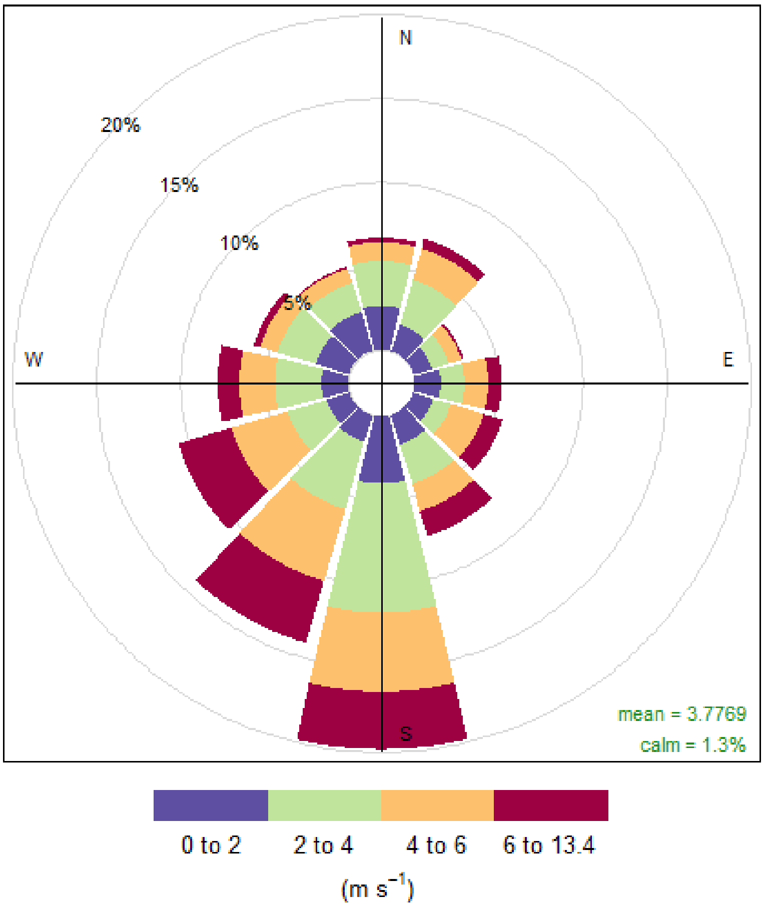
Predicted NOx concentrations have been converted to $NO_2$ using the NOx:NO2 calculator[9] published by Defra, following the approach outlined in LAQM (TG22). Background concentrations of $NO_x$ was required for the analysis and was taken from the furthest forecast year background maps (2030) published by Defra for use with this tool. To avoid double-counting, contributions from local primary roads were removed from the background maps.

## 4.5 METEOROLOGICAL DATA

Meteorological data measured at Benson airport during 2018 was used to calculate the atmospheric conditions which will influence the dispersion of pollutants emitted from the road network. Any gaps in this dataset were backfilled with 2018 meteorological data collected at the two closest meteorological sites where conditions were judged to be representative of conditions of the modelled area, Brize Norton and RAF Fairford airports.

[9] https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/

Figure 4-1: Windrose of data collected at Benson airport (2018)




The wind rose shows that the locations across the authorities are likely to experience a predominant southerly to south-westerly wind direction with wind speeds up to 13.4 m/s.

## 4.6 SURFACE ROUGNESS AND TERRAIN

A length scale parameter called the surface roughness length is used in the model to characterise the study area in terms of the effects of friction between the air and ground on wind speed and turbulence. A surface roughness of 1m was used for this study, representing cities and woodland.

## 4.7 STREET CANYONS

A street canyon is a place where the street is flanked by buildings on both sides creating a canyon-like environment which leads to build up of pollutant.

The RapidAir© model includes the AEOLIUS model which was developed by the UK Met Office in the 1990s. This tool enables street canyons to be identified through the comparison of several basic inputs.

Through a combination of review of terrain maps (surface and terrain layers) and street/satellite data. A GIS file was constructed that details building locations and heights. This file was combined with the road geometries, emission and meteorological data to be used as an input for AEOLUIS. The AEOLUIS model was then run to identify canyons within the study domain.

## 4.8 RECEPTORS

A network of sample locations was created at a 5m distance from centre line of the modelling road network at 10m intervals. Figure 4-2 provides an illustration of the sample locations used for the analysis.

Figure 4-2: Illustration of sampling network used for the results analysis


## 4.9 TIME VARIATION

The air pollutant dispersion modelling follows the temporal traffic patterns that have been calculated in the transport model provided by the authorities.

# 5. MODEL VALIDATION AND CALIBRATION

### 5.1.1 Approach

Modelled concentrations for the year 2018 have been compared with the 2018 monitoring data to derive a verification factor of **1.29**, following the approach outlined in the LAQM Technical Guidance. These adjustment factors are then applied to all future modelled years. Following this adjustment, model verification is carried out by comparing the total predicted $NO_2$ concentrations against the measured $NO_2$ concentrations.

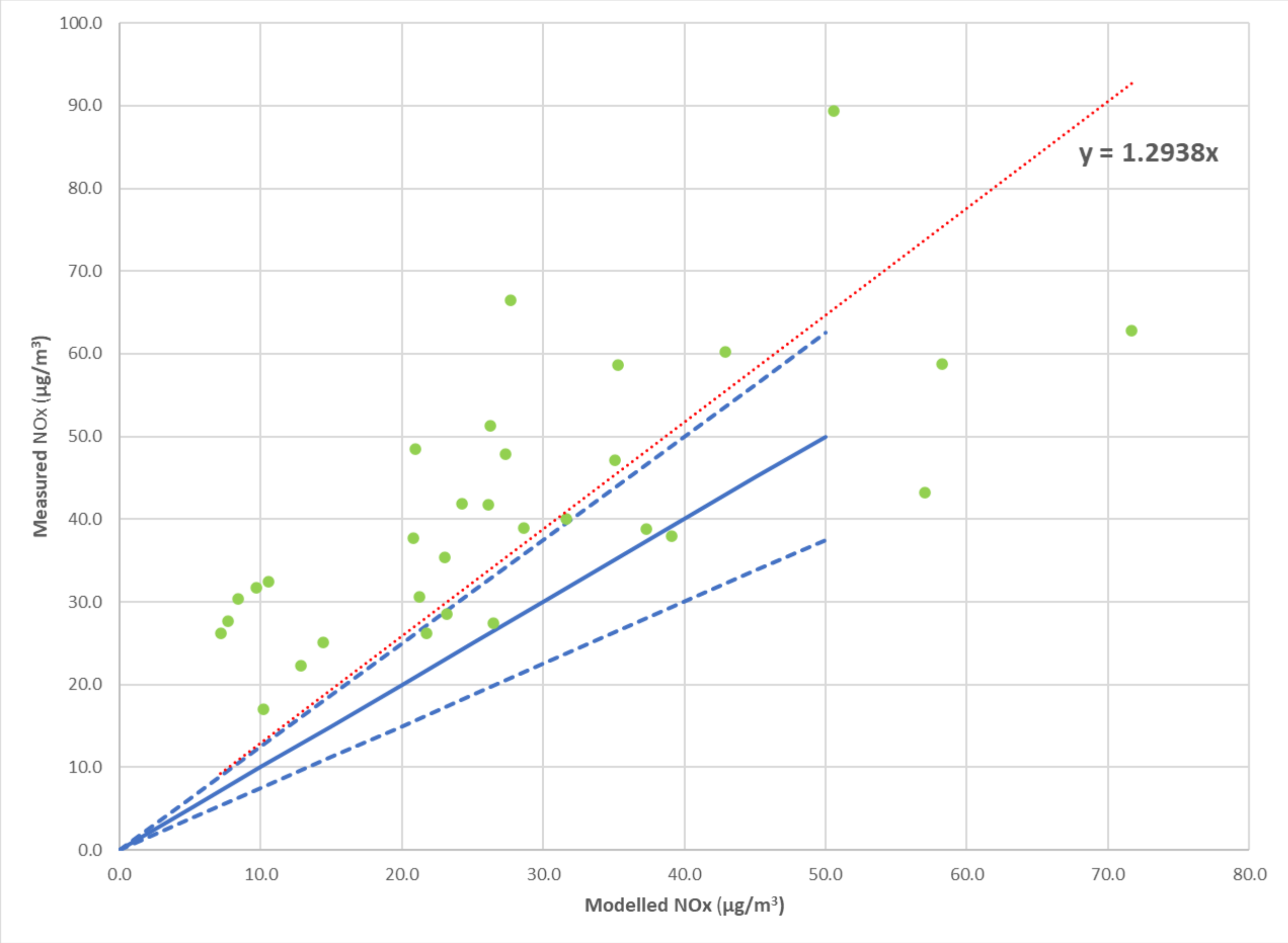
### 5.1.2 Model calibration

A total of 31 $NO_2$ measurement sites operated by the authorities have been used for model verification. Adjustment factors for emissions from roads were derived following the methodology described in LAQM.TG(22), whereby the predicted road contribution to $NO_X$ concentrations was compared with measured road NOx concentration. Although the diffusion tubes measure $NO_2$ rather than $NO_x$; the road contribution to $NO_X$ concentrations at these sites was estimated using the latest version of the $NO_x$ to $NO_2$ calculator published by Defra. Background $NO_X$ concentrations for use in this tool were taken from the Defra background maps. This approach uses background concentrations of $NO_X$ as an input.

An analysis was initial undertaken to the evaluate the model has a whole against the 31 measurement locations. Review of the results of this analysis identified locations where the model was not performing well, and further refinement was undertaken of the model to help improvement performance. The refinement consisted of correcting distances between source and monitoring location, building heights and positions and fleet speeds in locations where the underlying transport model has limitations.

Figure 5-1, Figure 5-2 and Figure 5-3 shows the model verification for the road NOx and total $NO_2$ concentration values.

Figure 5-1: Unadjusted modelled vs measured annual mean road NOx contribution, µg/m³, 2018




Note: Red line represents regression line of dataset. Solid blue line represents x = y. Dotted represent +/- 25% of x=y.

Figure 5-2: Adjusted modelled vs measured annual mean road NOx contribution, µg/m3, 2018

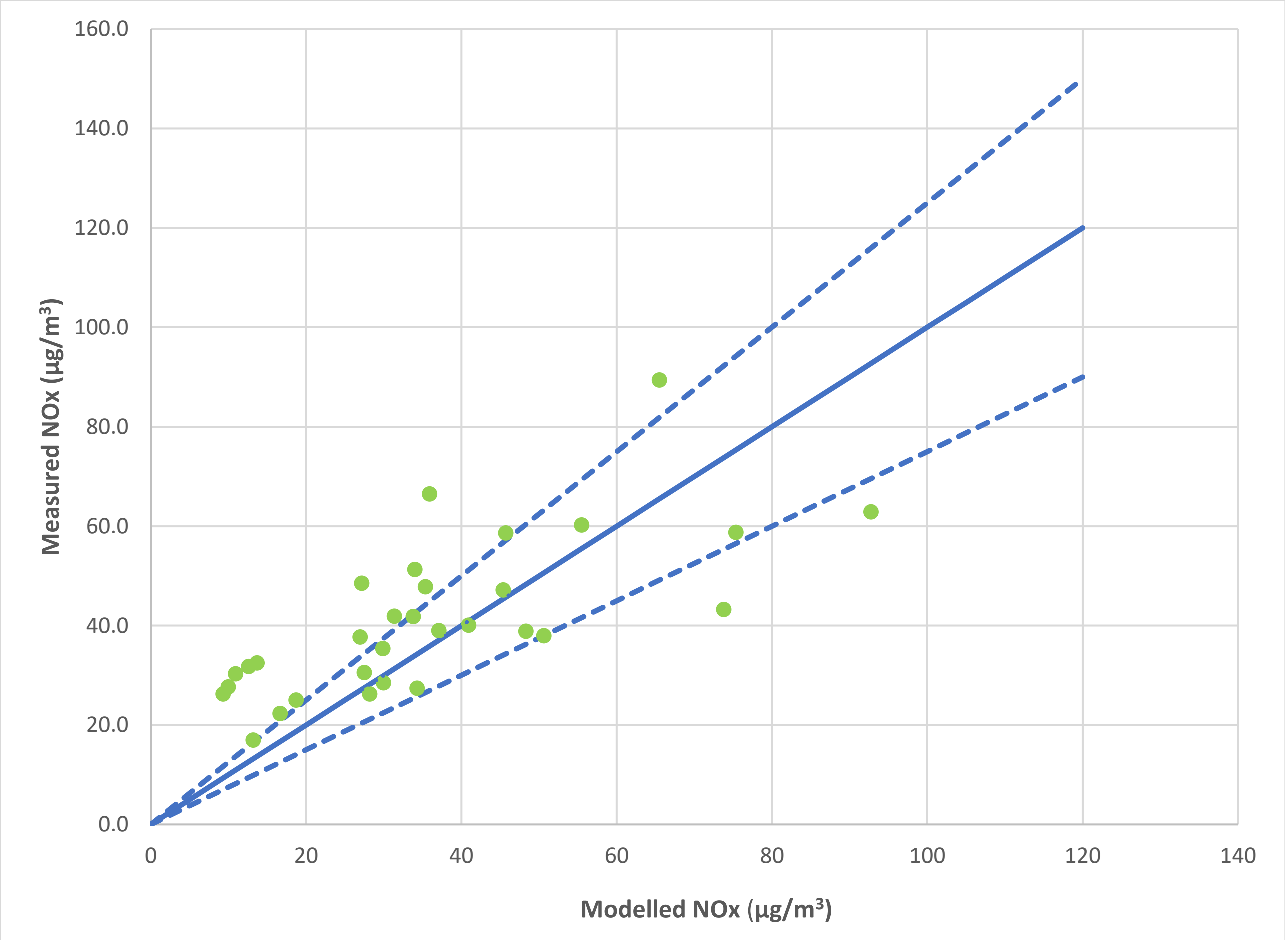


Figure 5-3: Adjusted modelled and measured annual mean $NO_2$

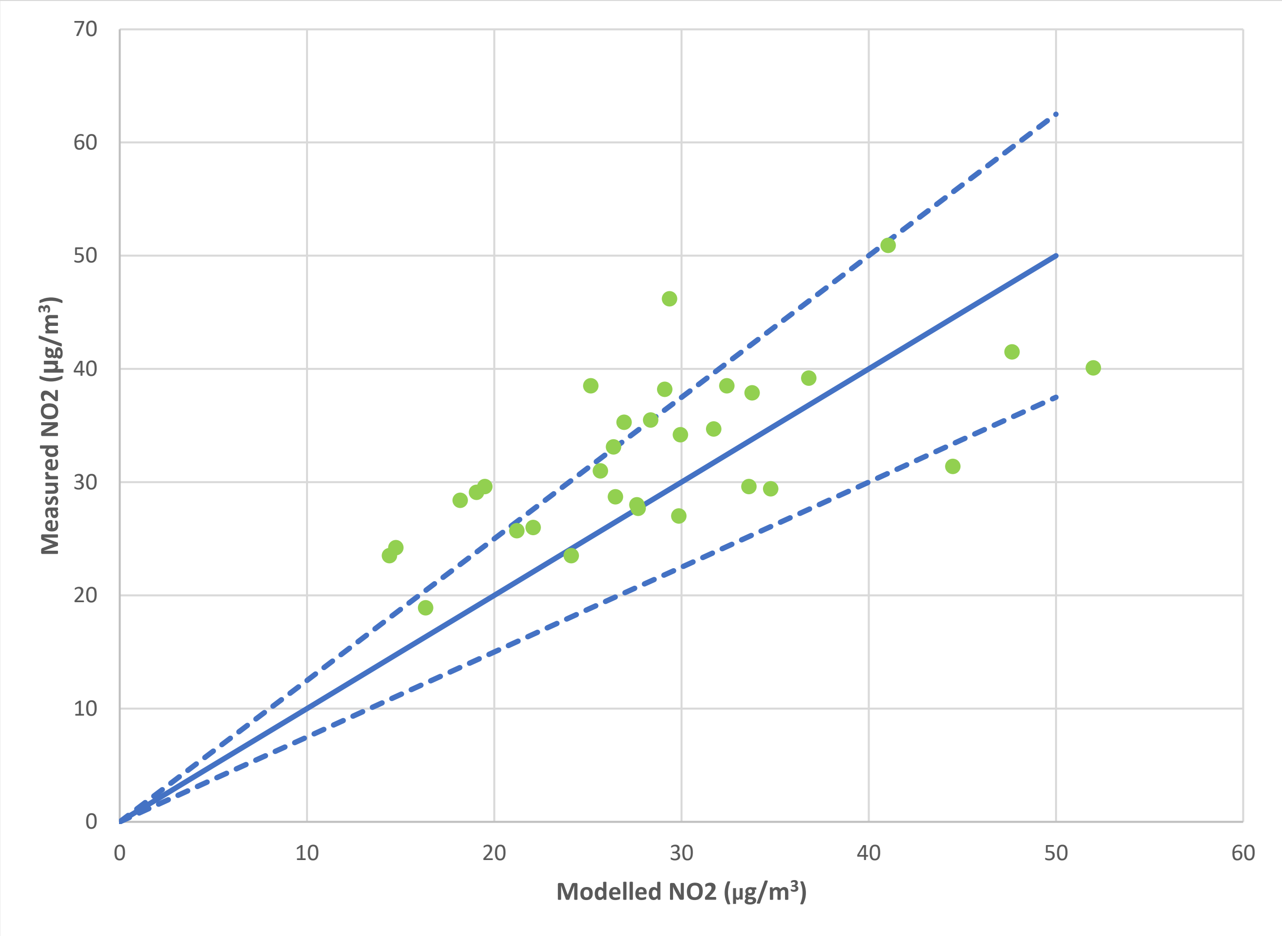



Figure 5-2 and Figure 5-3 show that the model performs within the LAQM TG (22) 25% (represented in by blue dotted line) acceptable range of accuracy at the majority of the measurement locations.

# 6. RESULTS

## 6.1 SUMMARY

Table 6-1 shows the mean, minimum and maximum level of percentage change in annual mean $NO_2$ concentration (i.e. DS minus DM) in relation to the air quality standard along the 10 modelled road networks.

Table 6-1: Max concentration and the mean, minimum and maximum changes in annual mean $NO_2$ concentration

| Location | Maximum annual averaged $NO_2$ concentration ($\mu g/m_3$) predicted in location in DS | Mean change (%) | Maximum change (%) | IAQM impact descriptor |
|---|---|---|---|---|
| Abingdon AQMA | 19.2 | -0.1 | 6.4 | Slight |
| Botley AQMA | 15.5 | -0.8 | -0.3 | Negligible |
| Marcham AQMA | 18.8 | -1.3 | 0.4 | Negligible |
| Wallingford AQMA | 14.2 | -0.3 | 0.3 | Negligible |
| Watlington AQMA | 10.0 | -1.3 | -0.4 | Negligible |
| B4017 Wotton Road, Long Tow and Cholswell Road | 14.9 | 0.5 | 2.6 | Negligible |
| A415 Abingdon Road, A4974 Oxford Road | 9.8 | -1.5 | 1.3 | Negligible |
| A329 Stadhampton to Benson | 10.6 | 1.1 | 12.7 | Moderate |
| B4009 Grove Lane | 7.5 | 0.1 | 0.3 | Negligible |
| M40 junctions 6 - 7 | 11.2 | -0.8 | -0.3 | Negligible |
| **Average change (all locations)** | | **-0.4** | | |

Table 6-1 shows that as a result of the emerging Joint Local Plan the following changes are predicted:

- A mean reduction of 0.4% in $NO_2$ concentrations.
- Out of all the 10 locations, the highest maximum change in $NO_2$ concentration is predicted to occur on the A329 road network that connects Stadhampton to Benson, where the model predicts a change in $NO_2$ of 12.7%. This is considered a moderate adverse impact (i.e., >10%) using the adapted IAQM impact descriptor in Table 3-1.
- The second highest maximum change in $NO_2$ concentration is predicted to occur within the Abingdon AQMA, where the model predicts a change in $NO_2$ of 6.4%. This is considered a slight adverse impact (i.e., 6 - 10%) using the adapted IAQM impact descriptor in Table 3-1. However, the mean change in

concentration in the AQMA is -0.1%, suggesting that concentrations within the AQMA reduce overall with the implementation of the emerging Joint Local Plan.

- $NO_2$ concentrations will reduce overall in Marcham, Wallingford and Watlington AQMAs and along the A415 Abingdon and adjoining A4974 Oxford roads. This was identified to be due to the increased traffic on road links in these locations being offset by a decrease in traffic volumes in the opposite direction.
- Overall, the maximum changes in $NO_2$ concentration across eight of the scoped in locations would results in a negligible impact, while one road link experienced a slight adverse' impact and the final road link along the A329 Thame Road running through Stadhampton experienced a moderate impact.

Table 6-2 shows the mean, minimum and maximum level of percentage change in annual mean $PM_{2.5}$ concentration (i.e. DS minus DM) in relation to the air quality standard at the 10 modelled road networks.

Table 6-2: Max concentration and the mean, minimum and maximum changes in annual mean $PM_{2.5}$ concentration

| Location | Mean change (%) | Maximum change (%) | IAQM impact descriptor |
|---|---|---|---|
| Abingdon AQMA | -0.1 | 0.1 | Negligible |
| Botley AQMA | 0.0 | 0.2 | Negligible |
| Marcham AQMA | -0.5 | 0.2 | Negligible |
| Wallingford AQMA | -0.1 | 0.0 | Negligible |
| Watlington AQMA | -0.6 | -0.2 | Negligible |
| B4017 Wotton Road, Long Tow and Cholswell Road | 0.4 | 1.3 | Negligible |
| A415 Abingdon Road, A4974 Oxford Road | -0.8 | 1.0 | Negligible |
| A329 Stadhampton to Benson | 0.5 | 6.8 | Slight |
| B4009 Grove Lane | 0.1 | 0.2 | Negligible |
| M40 junctions 6 - 7 | 0.0 | 0.0 | Negligible |
| **Average change (all locations)** | **-0.1** | | |

Table 6-2 shows as a result of the emerging Joint Local Plan the following changes are predicted:

- A mean change in $PM_{2.5}$ concentration of -0.1%
- Out of all the 10 locations, the highest maximum change in $PM_{2.5}$ concentration is predicted to occur on the A329 road network that connects Stadhampton to Benson, where the model predicts a change in $PM_{2.5}$ of 6.8%. This is considered a slight adverse impact (i.e., 5-10%) using the adapted IAQM impact descriptor in Table 3-1.

- $PM_{2.5}$ concentrations will reduce overall in the Abingdon, Marcham, Wallingford and Watlington AQMAs and along the A415 Abingdon and adjoining A4974 Oxford roads. This was identified to be due to the increased traffic on road links in these locations being offset by a decrease in traffic volumes in the opposite direction.
- Overall, the maximum changes in $PM_{2.5}$ concentration across nine of the scoped in locations would results in a negligible impact, while the A329 running between Stadhampton and Benson is predicted to experience a slight adverse impact.

## 6.2 REVIEW OF MAXIMUM CHANGES

Further analysis was undertaken to understand the impacts of the emerging Joint Local Plan at the two locations where the impact is described as greater than '*negligible*': within the Abingdon AQMA and along the A329 linking Stadhampton to Benson.

### 6.2.1 Impacts in Stadhampton

Figure 6-1 shows the level of change predicted across the A329 Stadhampton to Benson Road link. The figure shows that area highest impacts from the emerging Joint Local Plan are predicted to occur along the A329 Thame Road which runs through Stadhampton, where the maximum percentage change is expected to reach 12.7% for $NO_2$ and 6.8% for $PM_{2.5}$. For further context, the predicted maximum sampled annual mean $NO_2$ concentration is predicted to be 10.6 µg/m$^3$ along this part of the road network, far below the current UK standard of 40 µg/m$^3$.

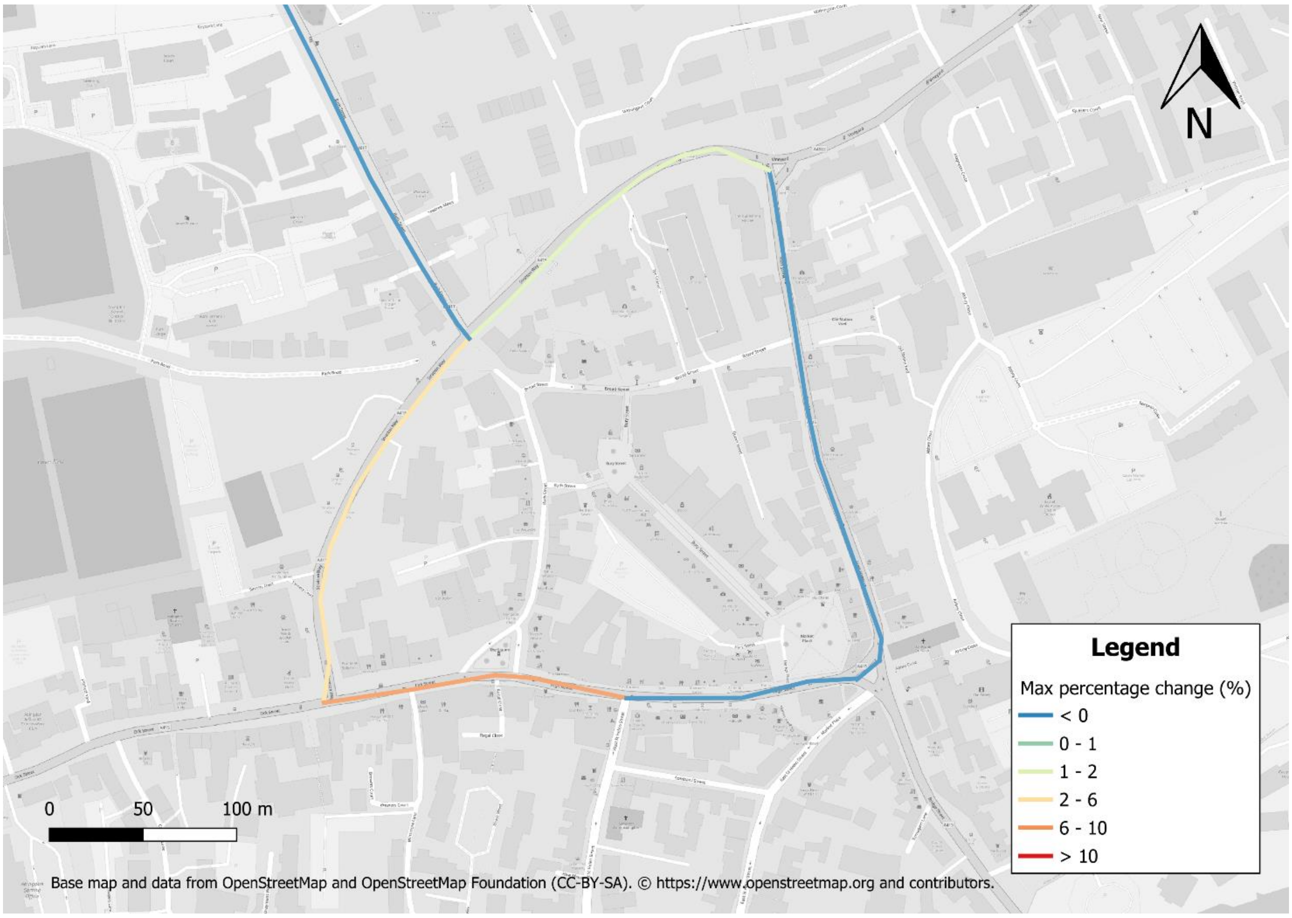
Removal of the Stadhampton bypass is expected to increase total traffic volumes (for both directions) by 14,513 vehicles along this length of road. The level of impact is expected to reduce to negligible levels after the road network passes south of nearby Brookhampton and the remainder of the screening in area between Stadhampton and Benson.

Figure 6-1: Impacts of the DS scenario on the A329 Stadhampton to Benson Road network

### 6.2.2 Impacts in the Abingdon AQMA

Figure 6-2 shows the level of change predicted across the current Abingdon AQMA. The figure shows that the emerging Joint Local Plan is predicted to increase $NO_2$ by 6.4% at a receptor influenced by traffic volumes along the A415 Ock Street between the square and Stratton way.

Figure 6-2: Impacts of the DS scenario across the existing Abingdon AQMA




Total traffic volumes are predicted to decrease by 131 vehicles along this length of road; however, this decrease in volume is offset by a reduction in speed from 6 km/h to 5km/h which is predicted to result in an increase in overall $NO_x$ emissions.

# 7. CONCLUSIONS

This report describes an air quality assessment to evaluate the air quality impacts of the emerging Joint Local Plan. The analysis focuses on the impacts to air quality along 10 sections of road network where traffic volumes are predicted to increase significantly.

The air quality impact assessment has focused on the changes in annual mean Nitrogen Dioxide ($NO_2$) and fine particulate matter ($PM_{2.5}$) concentrations when comparing impacts from the adopted local plans for South Oxfordshire and the Vale of White Horse (Do Minimal (DM)) for the year 2041 to those from the emerging Joint Local Plan (Do Something (DS) for the year 2041.

An air pollutant dispersion model was constructed using traffic data modelled by the authorities' traffic consultant. The difference in concentrations at modelled receptor points near these road links was then calculated and described using an adaption of the impact descriptor matrix tool recommended by the Institute of Air Quality Management (IAQM).

The results from this study found that the emerging Joint Local Plan is expected to result in '*negligible'* impacts on $NO_2$ concentrations along eight of the road links included in the assessment, with one road link predicted to experience a '*slight'* impact. However, the A329 Thame Road running through Stadhampton is predicted to experience a '*moderate'* impact on $NO_2$ concentrations compared to the DM scenario. The increased traffic volume along this section of road is also predicted to have a '*slight'* impact on concentrations of $PM_{2.5}$. The emerging Joint Local Plan is expected to have a '*negligible'* impact on all other road links included in this analysis.

Overall, the change at this location should be considered with the wider context that the models predict that $NO_2$ concentrations will be well below current UK target values at all locations in this assessment for both the adopted and emerging Joint Local Plans in 2041 even when conservative emission estimates are used.

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