Air Quality Assessment:
Cumulative Impact of Developments in Stratford-on-Avon Stage 2

July 2015

Experts in air quality management & assessment

Document Control

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Contents

Tables

Figures

1 Introduction

1.1 This report sets out the second stage of the consideration of the potential cumulative air quality impacts associated with proposed development set out within the Stratford-on-Avon Core Strategy. It has been prepared by Air Quality Consultants Ltd on behalf of Stratford-on-Avon District Council (SDC).

1.2 The Stratford-on-Avon urban area has been designated an Air Quality Management Area (AQMA), as a result of historically measured exceedences of the annual mean nitrogen dioxide objectives. No exceedences of the objective have been measured in recent years and therefore SDC is considering whether to revoke the AQMA. Prior to this decision SDC wishes to determine whether there is a risk that the cumulative impacts of developments in the area could lead to exceedences of the air quality objectives, and thus a requirement for an AQMA, in the future.

1.3 The consideration of the cumulative air quality impacts of the proposed developments has been carried out following a two stage process. The first stage identified a potential for the Core Strategy developments to cumulatively increase traffic by a significant amount in areas where there is a risk that the air quality objectives may be exceeded (Air Quality Consultants, 2014). The current report sets out the second stage, in which air quality modelling is undertaken to determine whether the combined influence of these developments would be sufficient to lead to an exceedence of the air quality objectives.

2 Policy Context and Approach

Air Quality Strategy

2.1 The Air Quality Strategy published by the Department for Environment, Food, and Rural Affairs (Defra) provides the policy framework (Defra, 2007) for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Assessment Criteria

2.2 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations, 2000, Statutory Instrument 928 (2000) and the Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043 (2002).

2.3 The objectives for nitrogen dioxide were to have been achieved by 2005 and continue to apply in all future years thereafter. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded where the annual mean concentration is below 60 $\mu g/m^3$ (Defra, 2009). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level.

2.4 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2009). The annual mean objectives for nitrogen dioxide and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour objective

for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

2.5 The European Union has also set limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$. Achievement of these values is a national obligation rather than a local one (Directive 2008/50/EC of the European Parliament and of the Council, 2008). The limit values for nitrogen dioxide are the same levels as the UK objectives, but applied from 2010 (The Air Quality Standards Regulations (No. 1001), 2010). The limit values for PM_{10} and $PM_{2.5}$ are also the same level as the UK statutory objectives, but applied from 2005 for PM_{10} and will apply from 2015 for $PM_{2.5}$.

2.6 The relevant air quality criteria for this assessment are provided in Table 1.

Table 1: Air Quality Criteria for Nitrogen Dioxide

Pollutant	Time Period	Objective
Nitrogen Dioxide	1-hour Mean	200 μg/m^3 not to be exceeded more than 18 times a year
	Annual Mean	40 μg/m^3
Fine Particles (PM_{10})	24-hour Mean	50 μg/m^3 not to be exceeded more than 35 times a year
	Annual Mean	40 μg/m^3
Fine Particles ($PM_{2.5}$) [a]	Annual Mean	25 μg/m^3

[a] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Modelling

2.7 Concentrations have been predicted using the ADMS-Roads dispersion model. Details of the model inputs and the model verification are provided in Appendix A1, together with the method used to derive current and future year background nitrogen dioxide concentrations.

Sensitive Locations

2.8 Concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been predicted at 18 locations, identified to represent worst-case exposure, within Stratford-on-Avon. When selecting these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of traffic emissions on several road links. The receptors have been located on the façades of the properties closest to the sources and are described in Table 2 and shown in Figure 1. In addition, concentrations have been modelled at a

number of local diffusion tube monitoring sites in order to verify the modelled results (see Appendix A1 for verification method).

Table 2: Description of Receptor Locations

Receptor	Description
Receptor 1 [a]	Residential property at 17 Arden Street
Receptor 2 [a]	Residential property at 2 Banbury Road
Receptor 3 [a]	Residential property at 32 Tiddington Road
Receptor 4 [a]	Residential property at 10 Tiddington Road
Receptor 5 [a]	Residential property on Shipston Road
Receptor 6 [a]	Residential property in Victoria Cottages
Receptor 7 [a]	Residential property at 2 Tiddington Road
Receptor 8 [a]	Residential property at 19 Evesham Place
Receptor 9 [a]	Residential property at 9 Broad Walk
Receptor 10 [a]	Residential property at 1 Wellesbourne Grove
Receptor 11 [a]	Residential property in Scholars Court
Receptor 12 [b]	Residential property in Maltings Court
Receptor 13 [a]	Residential property in Shakespeare Court
Receptor 14 [b]	Residential property at 1 Welcombe Road
Receptor 15 [a]	Residential property in Warwick Mews
Receptor 16 [a]	Residential property in Guild Cottages
Receptor 17 [a]	Residential property in Scholars Court
Receptor 18 [a]	Residential property in Bridgefoot Quay

[a] Receptors modelled at a height of 1.5 m.

[b] Receptors modelled at a height of 2.5 m to represent an elevated ground floor level.

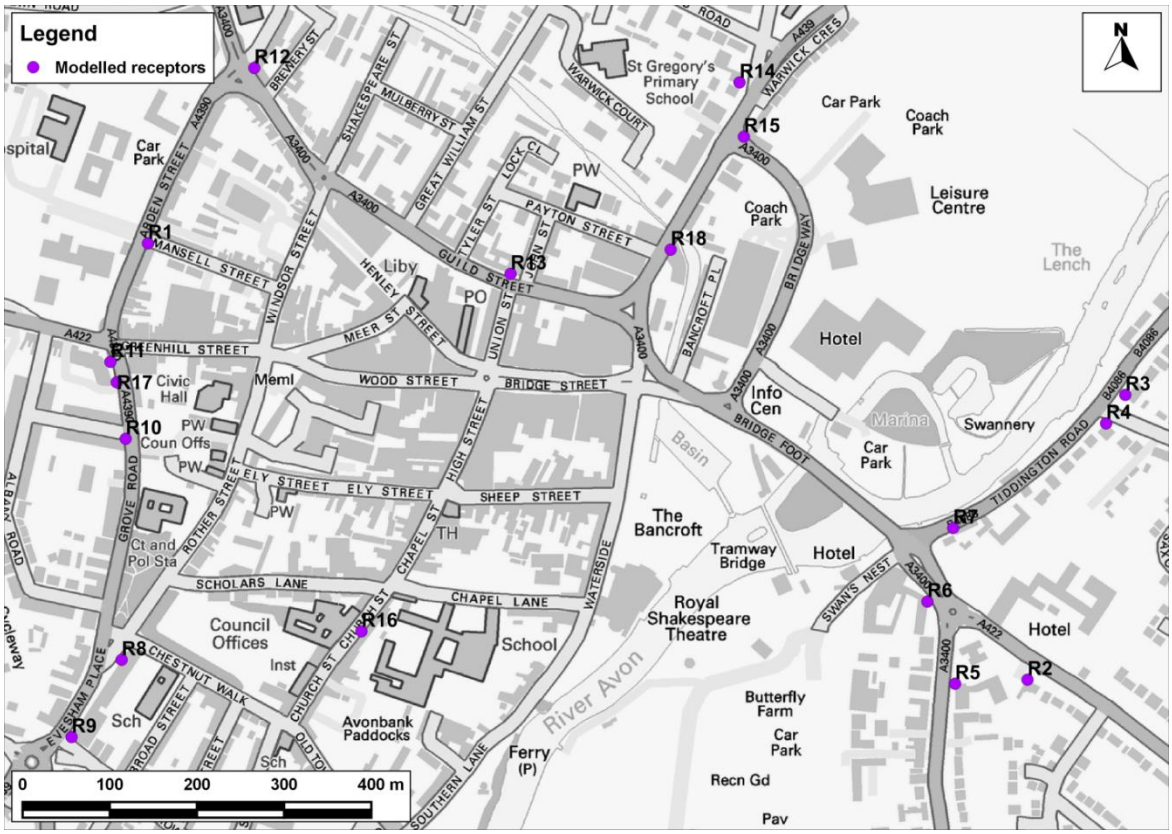

Figure 1: Receptor Locations

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Assessment Scenarios

2.9 Predictions of nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations have been carried out for the following scenarios:

- 2015 reference case – includes Kipling Road, Shipston Road (Waitrose), NC Joseph developments and network amendments;
- 2028 reference case – includes the Stratford Transport Package (STP), Warwick Road Dynamic Signage Strategy and a number of other proposed junction improvements including that at Clopton Bridge;
- 2028 Core Strategy Option 1 – dispersed development ;
- 2028 Core Strategy Option 3 – Long Marston Airfield (includes Western Relief Road); and
- 2028 Core Strategy Option 4 – South East of Stratford (includes Eastern Relief Road).

2.10 A 2028 sensitivity test has been carried out for nitrogen dioxide that involves assuming no reduction in emission factors for road traffic from the baseline year. This is to address the issue

identified by Defra (Carslaw et al., 2011) that road traffic emissions have not been declining as expected (see later section on uncertainty).

3 Measured and Background Concentrations

Local Air Quality Monitoring

3.1 Stratford-on-Avon District Council has investigated air quality within its area as part of its responsibilities under the LAQM regime. In January 2010, an AQMA was declared in Stratford-upon-Avon for exceedences of the nitrogen dioxide objective. The declared AQMA is shown in Figure 2.

3.2 Stratford-on-Avon District Council operates ten nitrogen dioxide monitoring sites within the Stratford-on-Avon urban area, using diffusion tubes prepared and analysed by Kent Scientific Services (using the 20% TEA in water method). Results for the years 2007 to 2013 are summarised in Table 3 and the monitoring locations are shown in Figure 2.

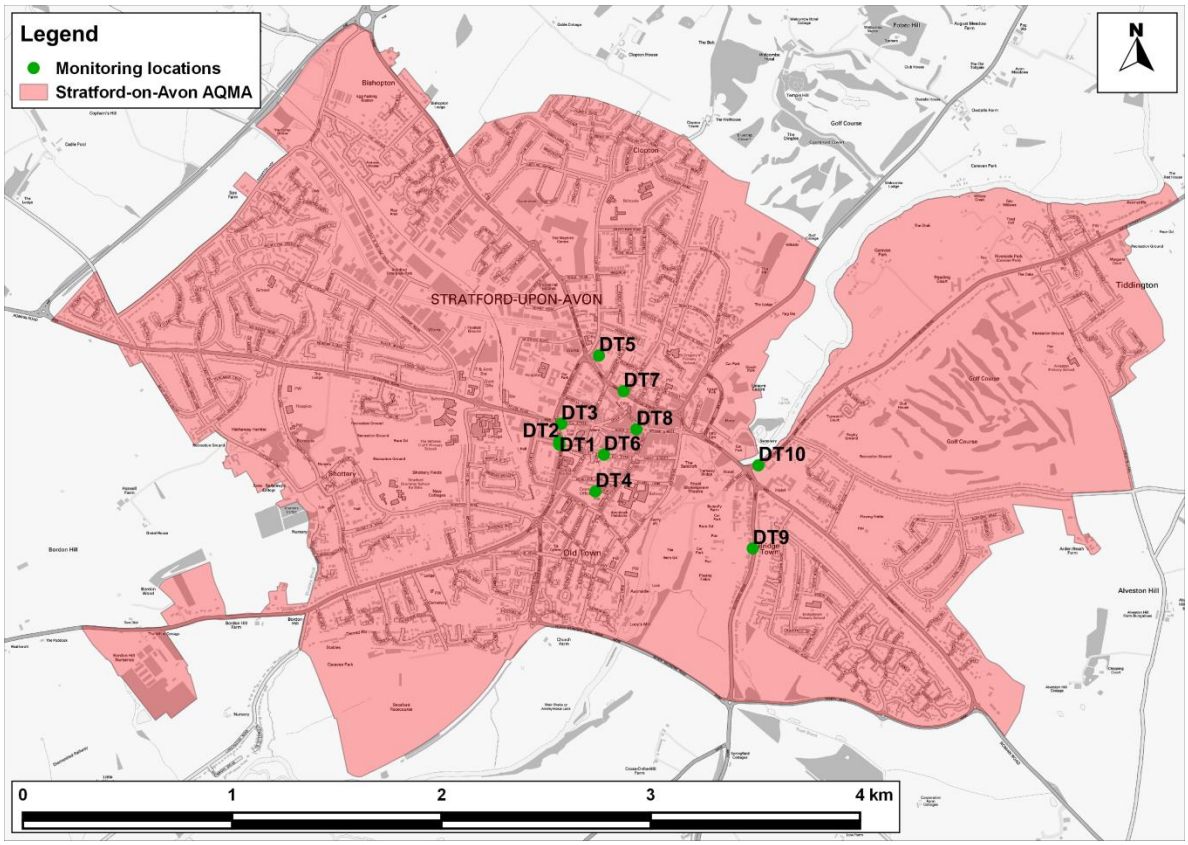

Figure 2: Declared AQMA and Monitoring Locations

Table 3: Summary of Nitrogen Dioxide (NO_2) Monitoring (2007-2013) [a]

Site No.	Site Type	Location	2007	2008	2009	2010	2011	2012	2013
Diffusion Tubes - Annual Mean (µg/m^3)									
DT1	Roadside	Grove Road 1	**47.8**	**47**	**44.9**	**43.7**	36.9	37.1	34.5
DT2	Roadside	Grove Road 2	**42.8**	**44.6**	**43.4**	**42.1**	36.4	35.7	35.3
DT3	Roadside	Greenhill Street	**47.2**	**40.9**	**43.2**	**41**	34.3	32.7	32.6
DT4	Urban Background	Elizabeth House Garden	14.7	15.6	13.7	17.4	12.4	14.4	12.6
DT5	Urban Background	Brewery Street	23.9	22.4	23.6	23.4	18.1	18.3	18.1
DT6	Roadside	Ely Street	24.1	25.6	23.9	24.1	18	23.1	19.7
DT7	Roadside	Guild Street	38.2	34.4	34.2	31.4	27.1	26.5	26.2
DT8	Roadside	Wood Street 2	**45.1**	**44.6**	**41.5**	**43.5**	36.8	31.9	29.8
DT9	Roadside	Shipston Road	26.7	25.5	23.2	24.1	21.8	20.9	20.2
DT10	Kerbside	Tiddington Road	**50.2**	**49.6**	**44.5**	**42.5**	37.7	36.5	37.1
Objective			**40**						

[a] Data have been taken from the 2014 Progress Report (Stratford-on-Avon District Council, 2014). Exceedences of the objectives are shown in bold. 2014 data are not shown, as the supplier of the tubes changed during the year and it is not straight forward to bias adjust the results.

3.3 Concentrations have remained below the objective at all sites since 2011. Prior to this, exceedences of the annual mean objective were recorded at sites close to busy roads and junctions.

3.4 The monitoring data indicate a downward trend in monitoring results over the past seven years. This is to be expected due to the progressive introduction of new vehicles operating to more stringent standards, but it does not match the national evidence that concentrations have not reduced strongly over this period.

3.5 There are no monitors measuring PM_{10} or $PM_{2.5}$ concentrations in Stratford-on-Avon District.

Background Concentrations

3.6 In addition to these locally measured concentrations, estimated background concentrations in the study area have been determined for 2013 and the assessment year 2028 using the national pollution maps published by Defra (2014a) (Table 4). In the case of nitrogen dioxide, two sets of future-year backgrounds are presented to take into account uncertainty in future year vehicle

emission factors. The derivation of background concentrations is described in Appendix A1. The background concentrations are all well below the objectives.

Table 4: Estimated Annual Mean Background Pollutant Concentrations in 2013 and 2028 (µg/m^3)

Year	NO_2	PM_{10}	$PM_{2.5}$
2013 [a]	8.9-14.1	15.5-18.1	10.6-11.9
2028 – Without Reductions in Traffic Emissions [b]	6.9-12.2	n/a	n/a
2028 – With Reductions in Traffic Emissions [c]	6.5-10.9	14.2-16.8	9.6-10.8
Objectives	**40**	**40**	**25**

n/a = not applicable

[a] This assumes that road vehicle emission factors in 2013 remain the same as in 2011 (See Appendix A1).

[b] This assumes that road vehicle emission factors in 2028 remain the same as in 2011.

[c] This assumes that road vehicle emission factors reduce between 2013 and 2028 at the current 'official' rates.

4 Model Results

4.1 Predicted annual mean concentrations of nitrogen dioxide have been modelled at each of the existing receptor locations (see Figure 1 and Table 2), as well as on a grid covering the study area. The results, which cover both the existing (2013) and future year (2028) reference cases and development options 1, 3 and 4 in the Core Strategy, are set out in Table 5. Contour plots showing nitrogen dioxide concentrations are provided in Figure 3 to Figure 7. The results assume that vehicle emission factors have not reduced as expected by Defra; results with the expected emissions reductions are presented in Appendix A2. The modelled road components of nitrogen oxides concentrations have been adjusted by a factor of 1.459, which was derived during the model verification process (see Appendix A1 for details of the model verification).

4.2 Assuming no reduction in emissions, the annual mean nitrogen dioxide concentrations are below the objective at all receptors. Concentrations of PM_{10} and $PM_{2.5}$ are well below the relevant objectives throughout the study area.

4.3 Figure 3 and Figure 4 show nitrogen dioxide concentrations at the Clopton Bridge junction with the present road layout (2013) and a proposed future road layout (2028) in which vehicles entering the junction from Tiddington Road will no longer be prevented from turning right. Although concentrations are below the objective where there is relevant exposure in both cases, they are greatly reduced in the future layout scenario.

4.4 Figure 5, Figure 6 and Figure 7 show 2013 concentrations at the Bridgeway gyratory and at the junctions at either end of Arden Street. In most cases, the area in which concentrations are greater than 40 µg/m^3 is confined to the carriageway. In those cases where the 40 µg/m^3 contour does intersect with a building, the building is not residential and hence there are no relevant receptors experiencing a concentration above the objective. This is consistent with the results for the worst-case receptors in Table 5 and applies to all future scenarios.

Table 5: Predicted Annual Mean Nitrogen Dioxide Concentrations (µg/m^3) [a]

Receptor	2013 Reference Case	2028 Reference Case	2028 Core Strategy Option 1	2028 Core Strategy Option 3	2028 Core Strategy Option 4
R1	32.6	30.6	30.4	30.1	27.5
R2	16.3	14.8	15.0	14.8	14.5
R3	20.3	17.8	17.8	17.6	14.5
R4	20.6	18.0	18.1	17.8	15.2
R5	20.7	18.0	18.0	18.9	18.0
R6	28.1	22.5	22.7	22.8	21.9
R7	37.0	30.6	30.4	30.1	22.6
R8	25.2	20.9	20.8	21.7	21.2
R9	29.9	28.2	28.0	28.2	29.0
R10	28.1	24.0	24.1	23.8	24.1
R11	35.7	31.6	31.5	30.6	30.8
R12	33.5	31.7	31.7	31.5	30.4
R13	25.1	23.5	24.0	23.9	21.7
R14	21.8	19.6	20.4	20.6	19.5
R15	31.4	29.1	30.7	31.6	28.6
R16	21.3	17.9	18.5	17.9	18.1
R17	30.8	26.5	26.5	25.9	26.4
R18	29.2	26.8	28.4	28.9	26.0
Objective	**40**				

[a] This assumes that road vehicle emission factors remain the same as in 2011 (See Appendix A1).

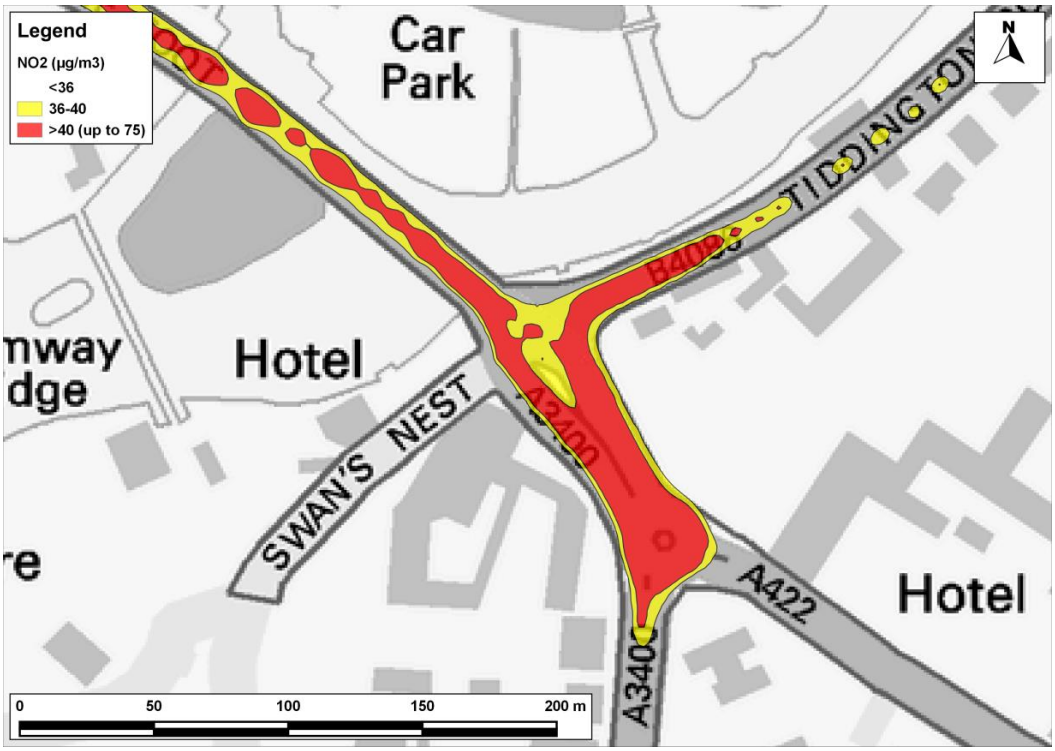

Figure 3: Annual Mean Nitrogen Dioxide Concentrations at Clopton Bridge (2013)

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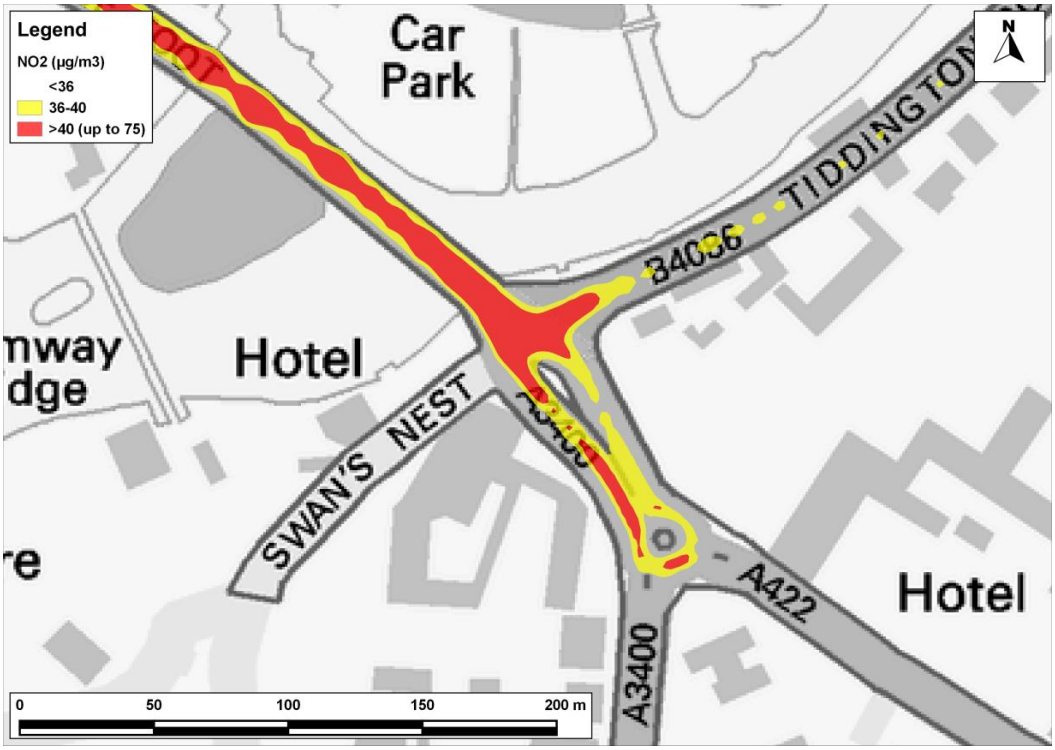

Figure 4: Annual Mean Nitrogen Dioxide Concentrations at Clopton Bridge (2028)

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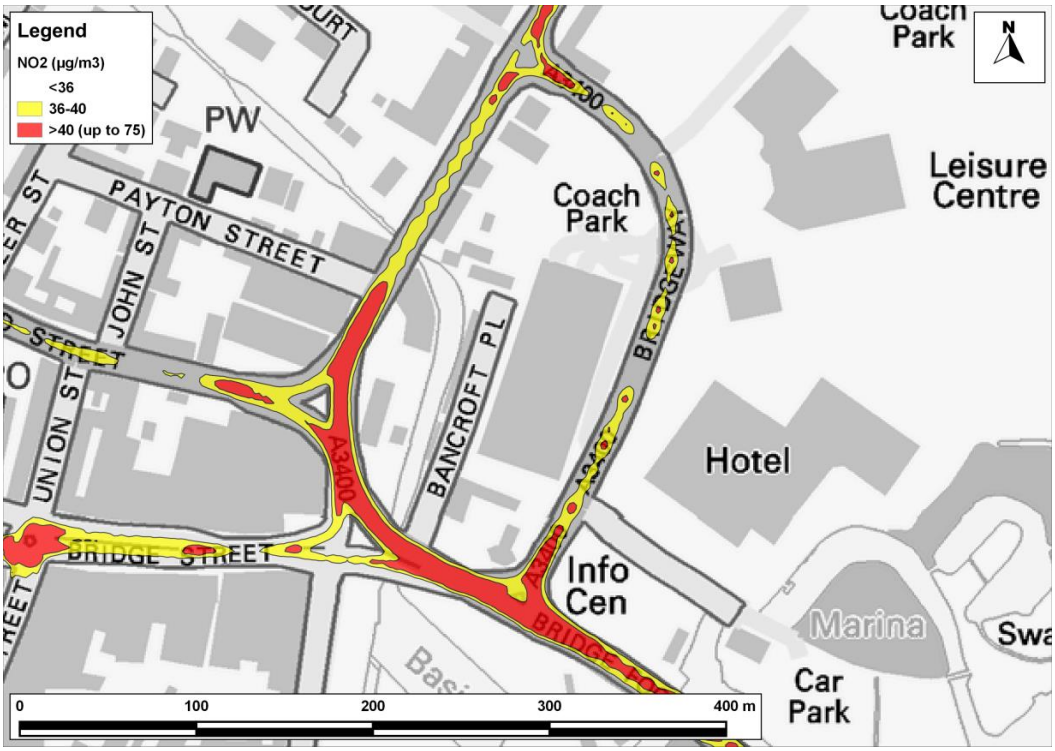

Figure 5: Annual Mean Nitrogen Dioxide Concentrations at Bridgeway Gyratory (2013)

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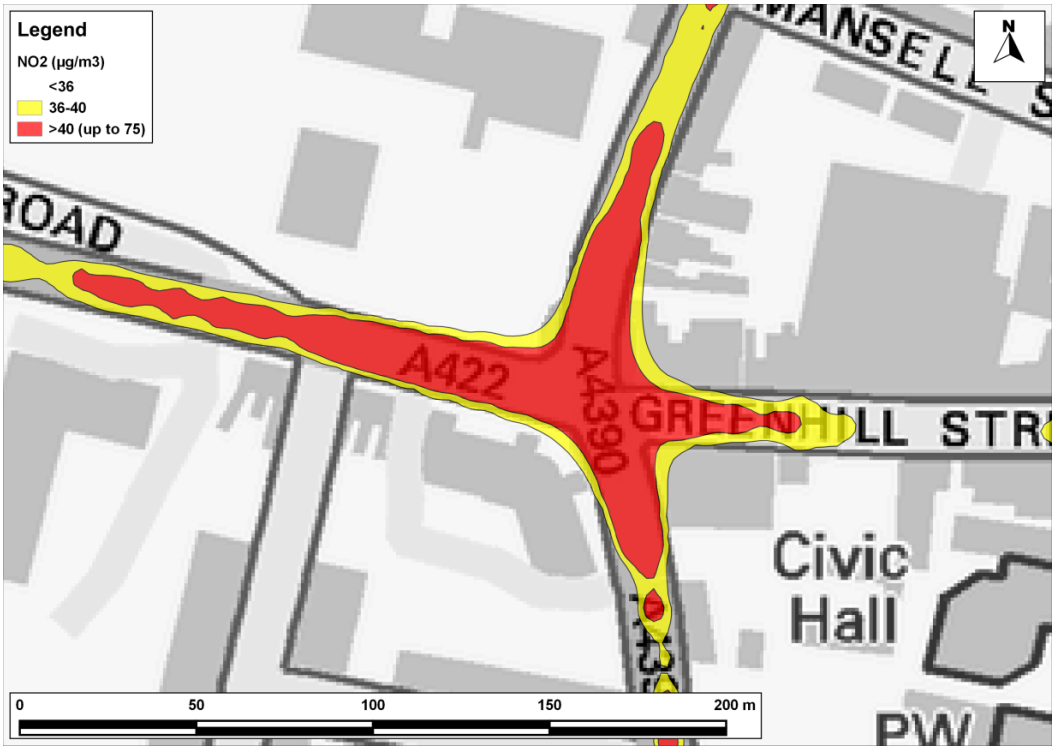

Figure 6: Annual Mean Nitrogen Dioxide Concentrations at Arden Street/Greenhill Street Junction (2013)

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Figure 7: Annual Mean Nitrogen Dioxide Concentrations at Arden Street/Birmingham Road Junction (2013)

Uncertainty in Road Traffic Modelling Predictions

4.5 There are many components that contribute to the uncertainty of modelling predictions. The model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as the model is required to simplify real-world conditions into a series of algorithms. An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix A1). Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of current year (2013) concentrations.

4.6 Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations, and vehicle emissions. A disparity between the road transport emission projections and measured annual mean concentrations of nitrogen oxides and nitrogen dioxide has been identified by Defra (Carslaw et al., 2011). This is evident across the UK, although the effect appears to be greatest in inner London; there is also considerable inter-site variation. Whilst the emission projections suggested that both annual mean nitrogen oxides and

nitrogen dioxide concentrations should have fallen by around 15-25% over the 6 to 8 years prior to 2009, at many monitoring sites levels remained relatively stable, or even showed a slight increase.

4.7 The reason for the disparity is thought to relate to the on-road performance of modern diesel vehicles. New vehicles registered in the UK have to meet progressively tighter European type approval emissions categories, referred to as "Euro" standards. While the nitrogen oxides emissions from newer vehicles should be lower than those from equivalent older vehicles, the on-road performance of some modern diesel vehicles is often no better than that of earlier models (Carslaw et al., 2011). The best current evidence is that, where previous standards have had limited on-road success, the 'Euro VI' and 'Euro 6' standards that new vehicles will have to comply with from 2013/15[1] will achieve the expected on-road improvements, as, for the first time, they will require compliance with the World Harmonized Test Cycle, which better represents real-world driving conditions[2] and includes a separate slow-speed cycle for heavy duty vehicles.

4.8 The forecast reductions in nitrogen oxides emissions may still be optimistic in the near-term. To account for this uncertainty, a sensitivity test has been conducted assuming that the future (2028) road traffic emissions per vehicle are unchanged from 2013 values. The predictions within this sensitivity test are likely to be over-pessimistic, as new, lower-emission Euro VI and Euro 6 vehicles will be on the road from 2013/15. These new vehicles are expected to deliver real on-road reductions in nitrogen oxides emissions.

[1] Euro VI refers to heavy duty vehicles, while Euro 6 refers to light duty vehicles. The timings for meeting the standards vary with vehicle type and whether the vehicle is a new model or existing model.

[2] The test cycle for real-world emissions for Euro 6 vehicles will not be implemented until about 2017. However, there is still expected to be a substantial improvement in NOx emissions from Euro 6 vehicles (as compared with Euro 5) from 2015 onwards.

5 Conclusions

5.1 The cumulative air quality impacts associated with proposed development set out within the Stratford-on-Avon Core Strategy have been assessed. Concentrations have been modelled for 18 worst-case receptors, representing existing properties where impacts are expected to be greatest. In addition, concentrations have been modelled on a grid covering the study area. In the case of nitrogen dioxide, the modelling has been carried out assuming both that vehicle emissions decrease (using 'official' emission factors), and that they do not decrease in future years. This is to allow for uncertainty over emission factors for nitrogen oxides identified by Defra (Carslaw et al., 2011).

5.2 It is concluded that concentrations of PM_{10} and $PM_{2.5}$ will remain below the objectives throughout the study area in 2028, whichever development scenario is implemented. This conclusion is consistent with the outcomes of the reviews and assessments prepared by Stratford-on-Avon District Council which show that exceedences of the PM_{10} objective are unlikely at any location.

5.3 In the case of nitrogen dioxide, the annual mean concentrations remain below the objective at all relevant receptors in 2028, whichever development scenario is implemented, and whether or not a reduction in vehicle emissions of nitrogen oxides is assumed.

5.4 The impacts of traffic generated by the proposed development scenarios have been shown to be acceptable at the worst-case locations assessed, with concentrations being well below the air quality objectives. This conclusion takes account of the uncertainties in future projections, in particular for nitrogen dioxide.

6 References

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7 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
AQC	Air Quality Consultants
AQMA	Air Quality Management Area
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emission Factor Toolkit
Exceedence	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
LAQM	Local Air Quality Management
µg/m^3	Microgrammes per cubic metre
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO_2 + NO)
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
TEA	Triethanolamine – used to absorb nitrogen dioxide

8 Appendices

A1 Modelling Methodology

Background Concentrations

A1.1 The background concentrations across the study area have been defined using the national pollution maps published by Defra (2015a). These cover the whole country on a 1x1 km grid and are published for each year from 2011 until 2030. The maps include the influence of emissions from a range of different sources; one of which is road traffic. As noted in Paragraph 4.6, there is evidence that the current 'official' emissions factors published by Defra may over-predicted the rate at which road traffic emissions of nitrogen oxides will fall in the future. The maps currently in use were verified against measurements made during 2011 at a large number of automatic monitoring stations and so there can be reasonable confidence that the maps are representative of conditions during 2011. Similarly, there is reasonable confidence that the reductions which Defra predicts from other sectors (e.g. rail) will be achieved.

A1.2 In order to calculate background nitrogen dioxide and nitrogen oxides concentrations in 2013, it is assumed that there was no reduction in the road traffic component of backgrounds between 2011[3] and 2013. This has been done using the source-specific background nitrogen oxides maps provided by Defra (2015a). For each grid square, the road traffic component has been held constant at 2011 levels, while 2013 values have been taken for the other components. Nitrogen dioxide concentrations have then been calculated using the background nitrogen dioxide calculator which Defra (2015a) publishes to accompany the maps. The result is a set of 'adjusted 2013 background' concentrations.

A1.3 As an additional step, the background maps have been calibrated against local measurements made by the local authority at the Elizabeth House Garden diffusion tube monitoring site. The calibration is shown in Table A1.1.

Table A1.1: Comparison of Measured and Modelled Background Nitrogen Dioxide Concentrations (µg/m^3)

Monitoring Location	Measured Background NO_2	Modelled Background NO_2	Adjustment Factor
Elizabeth House Garden	12.6	13.9	0.9041

A1.4 Two separate sets of 2028 background nitrogen dioxide and nitrogen oxides concentrations have been used for the future-year assessment. The 2028 background 'without emissions reduction'

[3] This approach assumes that there has been no reduction in emissions per vehicle, but that traffic volumes have remained constant. This is not the same as the assumption made for dispersion modelling, in which emissions per vehicle are held constant while traffic volumes are assumed to change year on year. This discrepancy is unlikely to influence the overall conclusions of the assessment.

has been calculated using the same approach as described for the 2013 data: the road traffic component of background nitrogen oxides has been held constant at 2011 values, while 2028 data are taken for the other components. Nitrogen dioxide has then been calculated using Defra's background nitrogen dioxide calculator. This has been adjusted by a local factor of 0.9041 for the background calibration, as described in Paragraph A1.3. The 2028 background 'with emissions reduction' assumes that Defra's revised predicted reductions occur from 2013 onward. This dataset has been derived first by calculating the ratio of the unadjusted mapped value for 2028 to the unadjusted mapped value for 2013. This ratio has then been applied to the calibrated 2028 value (as derived in Paragraph A1.2).

A1.5 For PM_{10} and $PM_{2.5}$, there is no strong evidence that Defra's predictions are unrealistic and so the year-specific mapped concentrations have been used in this assessment.

Model Inputs

A1.6 Predictions have been carried out using the ADMS-Roads dispersion model (v3.4). The model requires the user to provide various input data, including emissions from each section of road, and the road characteristics (including road width and street canyon height, where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the Emission Factor Toolkit (Version 6.0.1) published by Defra (2015a). For nitrogen dioxide, future-year concentrations have been predicted once using year-specific emission factors from the EFT, and once using emission factors for 2013[4], which is the year for which the model has been verified.

A1.7 The model has been run using the full year of meteorological data that corresponds to the most recent set of nitrogen dioxide monitoring data (2013). The meteorological data has been taken from the monitoring station located at Pershore, which is considered suitable for this area. The windrose for this monitoring station is shown in Figure A1.1.

[4] i.e. combining current-year emission factors with future-year traffic data.

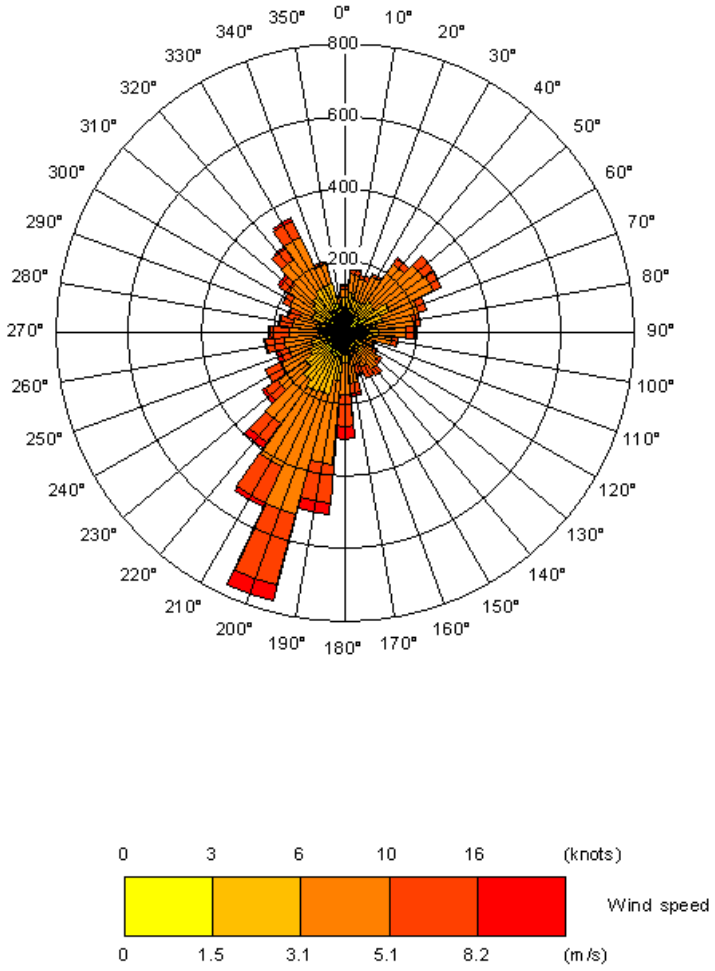

Figure A1.1: 2013 Windrose for the Pershore Monitoring Station

A1.8 AADT flows and vehicle fleet composition data have been provided by ARUP. Traffic speeds have been based on those provided by ARUP, with some having been adjusted based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction. Diurnal flow profiles for the traffic have been derived from the national diurnal profiles published by DfT (DfT, 2011).

A1.9 Figure A1.2 shows the road network included within the model and defines the study area.

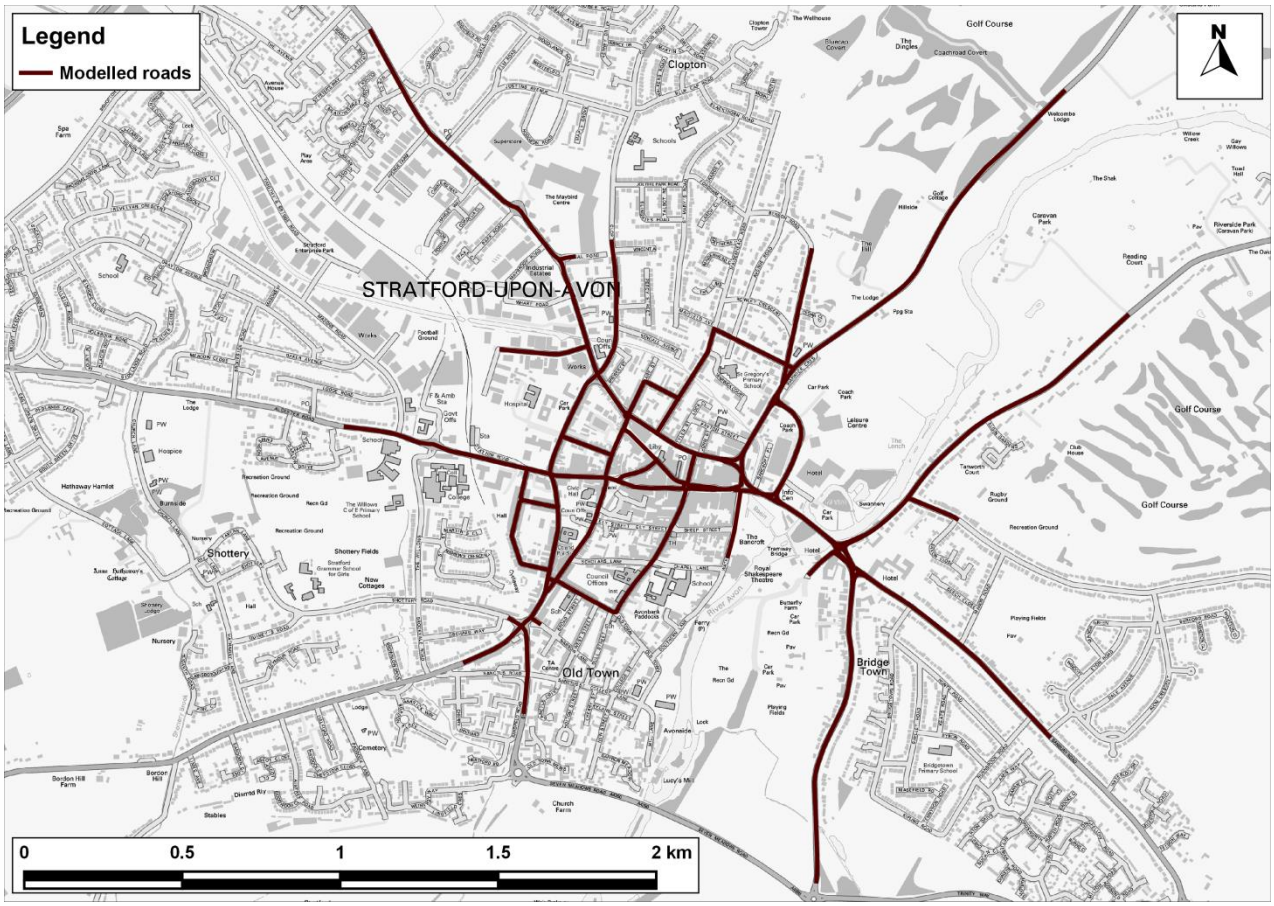

Figure A1.2: Modelled Road Network

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Model Verification

A1.10 In order to ensure that ADMS-Roads accurately predicts local concentrations, it is necessary to verify the model against local measurements. The verification methodology is described below.

A1.11 Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + NO_2). The model has been run to predict the annual mean NOx concentrations during 2013 at local diffusion tube monitoring sites. Concentrations have been modelled at the respective heights of the monitors.

A1.12 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx has been calculated from the measured NO_2 concentrations and the predicted background NO_2 concentration using the NOx from NO_2 calculator (Version 4.1) available on the Defra LAQM Support website (Defra, 2015a).

A1.13 A primary adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero

(Figure A1.3). This factor has then been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations. The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO_2 concentration within the NOx to NO_2 calculator. A secondary adjustment factor has finally been calculated as the slope of the best-fit line applied to the adjusted data and forced through zero (Figure A1.4).

A1.14 A primary adjustment factor of 1.459 has been applied to all modelled nitrogen dioxide data. The secondary adjustment factor of 0.999 has not been applied, in order to provide a conservative assessment.

A1.15 The results imply that the model has under predicted the road-NOx contribution. This is a common experience with this and most other models.

A1.16 Table A1.2 and Figure A1.5 compare final adjusted modelled total NO_2 at each of the monitoring sites to measured total NO_2; Figure A1.5 shows a 1:1 relationship.

Table A1.2: Comparison of Measured and Modelled Nitrogen Dioxide Concentrations ($\mu g/m^3$)

Monitoring Location	Background NO_2	Measured NO_2	Adjusted Modelled NO_2
Grove Road 2	12.6	35.3	31.15
Grove Road 1	12.6	34.5	30.12
Greenhill Street	14.1	32.6	35.31
Guild Street	13.5	26.5	30.91
Wood Street 2	12.1	29.8	32.23
Shipston Road	12.1	20.2	19.78
Tiddington Road	12.1	37.1	35.96

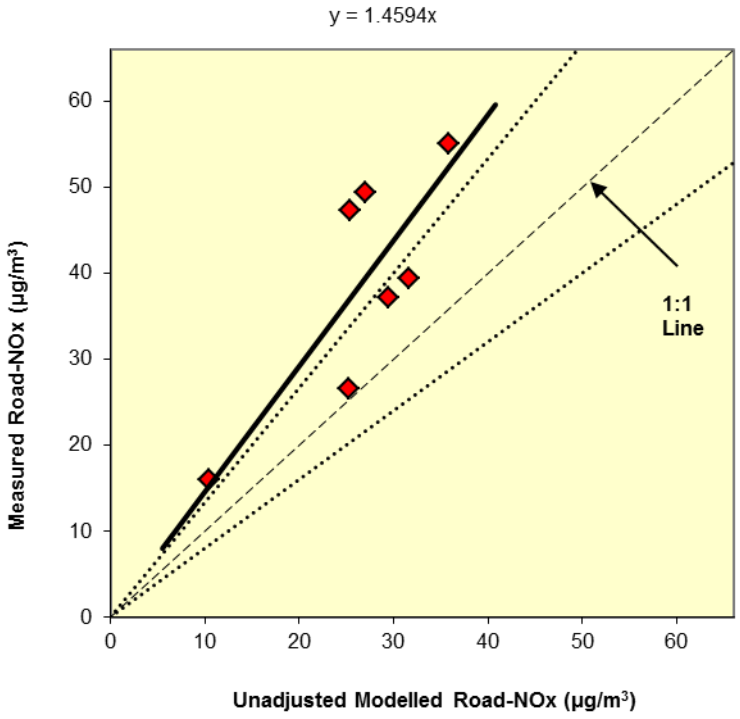

Figure A1.3: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show ± 25%.

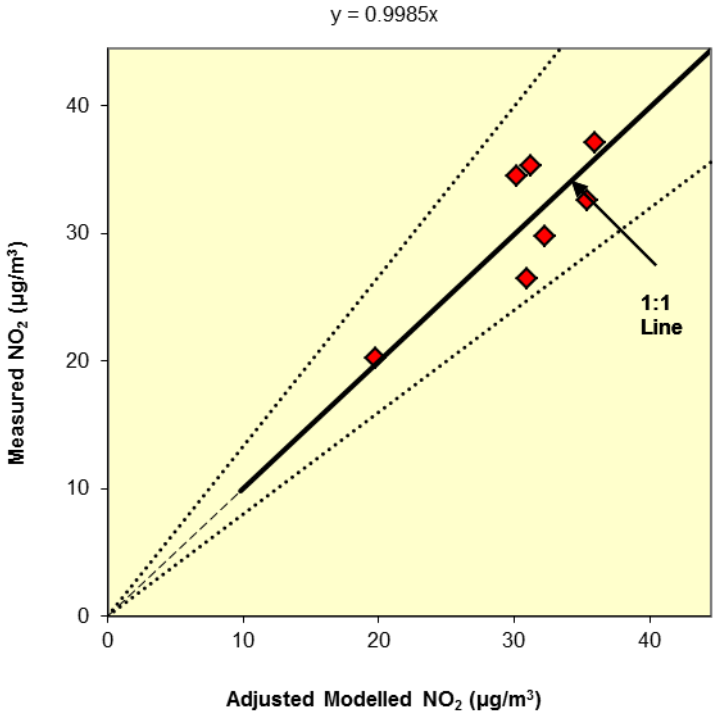

Figure A1.4: Comparison of Measured Total NO_2 to Primary Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

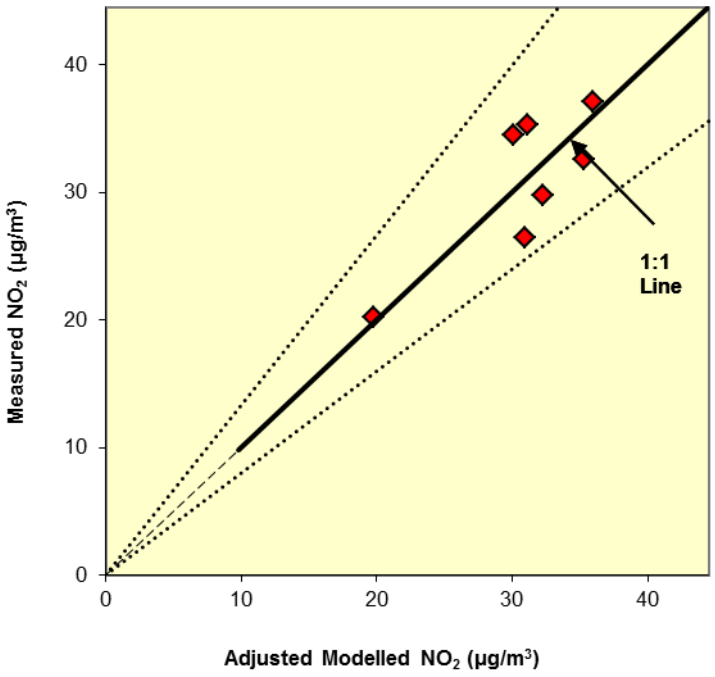

Figure A1.5: Comparison of Measured Total NO_2 to Final Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

Model Post-processing

A1.17 The model predicts road-NOx concentrations at each receptor location. These concentrations have then been adjusted using the primary adjustment factor, which, along with the background NO_2, is processed through the NOx to NO_2 calculator available on the Defra LAQM Support website (Defra, 2015a). The traffic mix within the calculator has been set to "All other urban UK traffic", which is considered suitable for the study area. The calculator predicts the component of NO_2 based on the adjusted road-NOx and the background NO_2. This is then adjusted by the secondary adjustment factor to provide the final predicted concentrations.

A2 Results With Emissions Reduction

A2.1 Results assuming that vehicle emissions reduce as expected are given in Table A2.1. All are well below the objective.

Table A2.1: Predicted Annual Mean Nitrogen Dioxide Concentrations (µg/m^3)

Receptor	2028 Reference Case	2028 Core Strategy Option 1	2028 Core Strategy Option 3	2028 Core Strategy Option 4
R1	16.6	16.6	16.5	16.1
R2	10.8	10.9	10.9	10.9
R3	11.5	11.5	11.5	10.8
R4	11.6	11.7	11.6	11.1
R5	11.9	11.8	12.3	12.0
R6	13.6	13.7	13.8	13.7
R7	15.8	15.7	15.7	13.9
R8	12.6	12.5	13.0	12.6
R9	15.0	14.9	15.3	15.2
R10	13.4	13.5	13.5	13.3
R11	17.1	17.1	16.9	16.9
R12	17.9	17.8	17.8	17.6
R13	13.8	14.0	14.0	13.7
R14	12.8	13.1	13.2	12.9
R15	16.5	17.2	17.7	16.7
R16	12.0	12.1	12.0	12.1
R17	14.3	14.4	14.3	14.2
R18	15.5	16.0	16.3	15.3
Objective	**40**			

A3 Traffic data

A3.1 Traffic data used in the modelled scenarios are provided below.

Table A3.1: Traffic Data for 2013 Reference Case

Road Link	AADT	HDV	%HDV	Speed (kph)
Tiddington Rd SW	8,655	692	8.0	16
Bridge Foot to Tiddington Rd	5,060	63	1.3	40
Clopton Br SE	11,713	265	2.3	30
Clopton Br NW	14,018	828	5.9	31
Swans Nest E	909	-	0.0	15
Swans Nest W	732	-	0.0	35
Banbury Rd S	15,326	892	5.8	18
Clopton Br S	15,326	892	5.8	18
Clopton Br N	15,481	887	5.7	27
Shipston Rd N	6,472	181	2.8	13
Shipston Rd S	5,018	215	4.3	15
Banbury Rd NW	2,963	75	2.5	15
Banbury Rd SE	4,177	42	1.0	19
Clopton Br to Banbury Rd	15,602	891	5.7	18
Banbury Rd to Shipston Rd	14,375	924	6.4	12
Shipston Rd to Clopton Rd	15,800	888	5.6	12
Clopton Bridge roundabout	319	1	0.2	15
Banbury Rd roundabout	11,425	849	7.4	15
Shipston Rd roundabout	9,357	709	7.6	12
Swans Nest	1,641	-	0.0	24
Shipston Rd	11,494	396	3.4	24
Banbury Rd	7,185	118	1.6	35
Clopton Br	25,694	1,090	4.2	29
Clopton Br N sl2	14,749	887	6.0	28
Bridge Foot to Banbury Rd	6,649	202	3.0	37

Road Link	AADT	HDV	%HDV	Speed (kph)
Tiddington Rd1	15,304	813	5.3	32
Bridgeway SE	11,752	265	2.3	15
Bridge Foot NW	13,920	822	5.9	16
Bridgeway SW	6,304	112	1.8	18
Bridgeway	18,086	378	2.1	26
Bridge Foot	20,224	934	4.6	20
Swan's Nest to Tiddington Rd	1,631	58	3.6	4
Tiddington Rd NE	6,642	121	1.8	22
Clopton Br N sl	14,749	887	6.0	28
Clopton Br to Tiddington Rd	-	-	0.0	0
Swan's Nest to Bridge Foot	-	-	0.0	0
Swan's Nest/Clopton Br to Tiddington Rd	1,587	58	3.7	8
Warwick Rd2	11,094	321	2.9	33
Warwick Rd1	12,990	345	2.7	26
Warwick Bridgeway SE	8,362	152	1.8	14
Warwick Rd4	8,961	325	3.6	35
Warwick Rd3	17,333	477	2.7	25
Warwick Bridgeway NE	9,250	153	1.7	24
Warwick Rd5	18,228	478	2.6	30
Bridge St1 sl	7,442	373	5.0	16
Bridge Foot2	13,228	548	4.1	13
Bridge Foot3	11,965	323	2.7	12
Warwick Rd6	18,853	489	2.6	19
Guild St1	6,901	166	2.4	15
Bridge Foot Guild St	8,001	499	6.2	21
Guild St4	15,134	661	4.4	33
Guild St3	15,183	663	4.4	27
Guild St2	14,881	663	4.5	30
Guild St rb	15,992	650	4.1	24
Guild St6	15,992	650	4.1	24

Road Link	AADT	HDV	%HDV	Speed (kph)
Guild St5	15,535	658	4.2	21
Bridge St BridgeFoot	6,850	277	4.1	19
Bridge St W	7,694	368	4.8	17
Bridge St E	6,871	268	3.9	16
Bridge St 2	13,972	626	4.5	25
Bridge St W sl	7,694	368	4.8	17
Wood St	7,721	496	6.4	19
Wood St rb	7,731	497	6.4	26
Wood St sl	7,767	508	6.5	13
Greenhill St	10,657	492	4.6	28
Greenhill St sl2	10,633	489	4.6	14
Greenhill St sl	10,631	491	4.6	11
Alcester Rd3	16,001	1,336	8.3	32
Alcester Rd2	16,209	1,337	8.2	29
Alcester Rd1	16,209	1,337	8.3	15
Alcester Rd sl	16,209	1,337	8.3	15
Grove Rd sl	11,598	1,042	9.0	9
Grove Rd3	11,656	1,053	9.0	32
Grove Rd2	11,476	1,049	9.1	26
Grove Rd1	11,606	1,045	9.0	26
Grove Rd4	11,707	1,056	9.0	28
Arden St sl	13,968	1,175	8.4	14
Arden St3	15,169	1,160	7.6	30
Arden St2	15,169	1,160	7.6	30
Arden St1	13,941	1,175	8.4	32
Arden St sl2	15,300	1,122	7.3	19
Arden St4	15,279	1,165	7.6	23
Clopton Rd sl	3,291	46	1.4	7
Birmingham Rd sl	17,595	322	1.8	12
Birmingham Rd	19,639	675	3.4	26

Road Link	AADT	HDV	%HDV	Speed (kph)
Birmingham Rd rb	19,655	677	3.4	24
Birmingham Rd7	22,125	612	2.8	26
Birmingham Rd6	20,489	553	2.7	34
Birmingham Rd5	20,464	552	2.7	20
Birmingham Rd sl2	24,134	570	2.4	19
Birmingham Rd4	24,147	570	2.4	28
Birmingham Rd3	25,185	626	2.5	30
Birmingham Rd2	25,145	626	2.5	33
Birmingham Rd1	26,072	697	2.7	19
Birmingham Rd sl1	26,072	697	2.7	19
Regal Rd	5,076	18	0.4	16
Henley St sl	-	-	0.0	0
Union St	50	1	2.0	20
Henley St sl2	-	-	0.0	0
Union Rd sl	47	1	2.2	20
High St rb	9,064	226	2.5	25
Union St FA	8,131	311	3.8	9
Union St EF	8,135	311	3.8	15
Union St DE	6,287	419	6.7	7
Union St CD	8,744	427	4.9	9
Union St BC	8,074	310	3.8	6
Union St AB	8,074	310	3.8	6
Meer St sl2	-	-	0.0	0
Meer St	-	-	0.0	0
Meer St sl1	-	-	0.0	0
Shakespeare St rb	2,931	37	1.3	16
Windsor St sl2	6,312	47	0.7	19
Windsor St4	6,340	47	0.7	20
Windsor St3	5,131	47	0.9	17
Windsor St2	2,595	42	1.6	21

Road Link	AADT	HDV	%HDV	Speed (kph)
Windsor St1	1,918	63	3.3	17
Windsor St sl1	1,909	64	3.3	3
Rother St sl	7,877	167	2.1	7
Shake St DA	9,885	219	2.2	8
Shake St CD	11,601	461	4.0	7
Shake St BC	14,113	508	3.6	10
Shake St AB	11,337	188	1.7	12
Mansell St	2,907	1	0.0	16
Mansell St sl2	1,595	1	0.1	15
Mansell St sl1	2,907	1	0.0	16
Rother St sl3	9,493	334	3.5	17
Rother St5	7,164	211	2.9	29
Rother St4	7,079	219	3.1	28
Rother St3	6,380	207	3.2	25
Rother St2	6,316	165	2.6	26
Rother St1	7,407	166	2.2	22
Rother St sl2	7,407	166	2.2	22
Evesham Pl1	9,645	1,054	10.9	33
Evesham Pl2	19,145	1,388	7.3	26
Broad Walk sl	1,211	50	4.1	13
Evesham Pl rb	20,700	1,432	6.9	19
Mulberry St sl	3,046	38	1.2	15
Shakespeare St	2,931	37	1.3	16
Maidenhead Rd2	4,040	53	1.3	22
Maidenhead Rd1	3,814	39	1.0	22
Gt William St2	3,814	39	1.0	22
Gt William St1	884	0	0.0	10
Gt William St sl	881	0	0.0	13
St Gregorys Rd sl2	4,333	142	3.3	18
St Gregorys Rd2	4,333	142	3.3	18

Road Link	AADT	HDV	%HDV	Speed (kph)
St Gregorys Rd1	3,660	51	1.4	16
St Gregorys Rd sl1	3,660	51	1.4	16
St Gregorys Rd sl3	3,601	27	0.7	9
Welcombe Rd sl	6,249	155	2.5	24
Welcombe Rd3	2,256	38	1.7	28
Welcombe Rd2	3,524	38	1.1	23
Welcombe Rd1	5,184	40	0.8	20
Tiddington Rd2	12,939	779	6.0	40
Loxley Rd	3,116	84	2.7	24
Loxley Rd sl	3,116	84	2.7	24
Waterside3	234	-	0.0	16
Waterside2	656	59	8.9	12
Waterside1	318	19	5.9	17
Bridge St1	7,115	353	5.0	27
High St2	6,062	200	3.3	31
High St1	9,063	226	2.5	27
Clopton Rd3	3,157	9	0.3	20
Clopton Rd2	3,288	9	0.3	27
Clopton Rd1	3,316	46	1.4	26
Birmingham Rd rb2	21,967	611	2.8	18
Western Rd sl	2,233	88	3.9	13
Albany Rd 1	14	0	2.3	3
Wellesbourne Gr	553	1	0.2	16
Wellesbourne Gr sl	553	1	0.2	16
Chestnut Wk4	4,804	153	3.2	28
Chestnut Wk3	4,263	155	3.6	32
Chestnut Wk2	3,946	130	3.3	29
Chestnut Wk1	4,039	133	3.3	27
Chestnut Wk sl2	4,031	133	3.3	13
Chestnut Wk sl1	2,066	3	0.2	10

Road Link	AADT	HDV	%HDV	Speed (kph)
Church St sl	4,159	156	3.8	15
Church St2	4,159	156	3.8	15
Church St1	4,201	157	3.7	22
Birmingham Rd8	20,697	692	3.3	20
Evesham Rd	12,557	837	6.7	29
Evesham Rd rb	12,546	836	6.7	34
Seven Med Rd	18,467	1,016	5.5	35
Seven Med Rd rb	18,457	1,014	5.5	26
Alcester Rd4	16,001	1,336	8.3	32
Alcester Rd rb	16,001	1,336	8.3	32
Shottery Rd rb	5,642	437	7.7	10
Albany Rd 3	128	0	0.2	17
Western Rd	2,015	80	4.0	28
Albany Rd 2	250	0	0.2	19

Table A3.2: Traffic Data for 2028 Reference Case

Road Link	AADT	HDV	%HDV	Speed (kph)
Clopton Br SE	10,902	266	2.4	24
Clopton Br NW	16,281	895	5.5	16
Swans Nest E	1,566	-	0.0	9
Banbury Rd S	7,231	222	3.1	8
Clopton Br S	7,231	222	3.1	8
Clopton Br N	11,672	265	2.3	10
Shipston Rd N	5,779	155	2.7	17
Shipston Rd S	4,042	240	5.9	15
Banbury Rd NW	6,607	182	2.8	20
Banbury Rd SE	3,771	48	1.3	19
Clopton Br to Banbury Rd	7,676	224	2.9	11
Banbury Rd to Shipston Rd	10,500	357	3.4	11
Shipston Rd to Clopton Rd	12,213	270	2.2	16

Road Link	AADT	HDV	%HDV	Speed (kph)
Clopton Bridge roundabout	540	5	0.9	13
Banbury Rd roundabout	3,905	176	4.5	11
Shipston Rd roundabout	6,458	116	1.8	13
Swans Nest	1,579	-	0.0	30
Shipston Rd	9,832	396	4.0	25
Banbury Rd	10,386	231	2.2	36
Clopton Br	27,133	1,158	4.3	25
Clopton Br N sl2	11,672	265	2.3	10
Bridge Foot to Banbury Rd	10,902	266	2.4	24
Tiddington Rd1	13,442	845	6.3	30
Bridgeway SE	11,036	269	2.4	14
Bridge Foot NW	16,153	889	5.5	19
Bridgeway SW	5,741	118	2.0	5
Bridgeway	16,807	387	2.3	25
Bridge Foot	21,893	1,007	4.6	20
Clopton Br N sl	11,672	265	2.3	10
Warwick Rd2	10,591	334	3.2	32
Warwick Rd1	12,620	372	2.9	27
Warwick Bridgeway SE	7,945	156	2.0	14
Warwick Rd4	8,833	312	3.5	36
Warwick Rd3	16,789	469	2.8	24
Warwick Bridgeway NE	8,586	136	1.6	23
Warwick Rd5	17,429	449	2.6	30
Bridge St1 sl	8,302	365	4.4	16
Bridge Foot2	13,982	624	4.5	32
Bridge Foot3	11,310	263	2.3	20
Warwick Rd6	18,103	463	2.6	17
Guild St1	6,808	201	3.0	11
Bridge Foot Guild St	8,352	522	6.2	30
Guild St4	15,314	718	4.7	33

Road Link	AADT	HDV	%HDV	Speed (kph)
Guild St3	15,426	723	4.7	27
Guild St2	15,150	723	4.8	29
Guild St rb	16,021	714	4.5	23
Guild St6	16,021	714	4.5	23
Guild St5	15,706	718	4.6	21
Bridge St BridgeFoot	5,777	169	2.9	14
Bridge St W	8,226	345	4.2	18
Bridge St E	5,802	170	2.9	15
Bridge St 2	13,448	506	3.8	24
Bridge St W sl	8,226	345	4.2	18
Wood St	8,465	390	4.6	20
Wood St rb	8,479	392	4.6	32
Wood St sl	8,473	388	4.6	14
Greenhill St	11,911	458	3.8	29
Greenhill St sl2	11,889	457	3.8	13
Greenhill St sl	11,877	459	3.9	12
Alcester Rd3	17,628	1,218	6.9	29
Alcester Rd2	17,797	1,221	6.9	30
Alcester Rd1	17,830	1,220	6.8	15
Alcester Rd sl	17,830	1,220	6.8	15
Grove Rd sl	11,191	652	5.8	10
Grove Rd3	11,249	657	5.8	29
Grove Rd2	11,093	656	5.9	26
Grove Rd1	11,208	654	5.8	24
Grove Rd4	11,122	659	5.9	35
Arden St sl	14,448	1,079	7.5	14
Arden St3	15,046	1,065	7.1	29
Arden St2	15,046	1,065	7.1	29
Arden St1	14,435	1,080	7.5	32
Arden St sl2	15,215	1,048	6.9	18

Road Link	AADT	HDV	%HDV	Speed (kph)
Arden St4	15,167	1,074	7.1	23
Clopton Rd sl	3,057	52	1.7	7
Birmingham Rd sl	18,524	389	2.1	14
Birmingham Rd	20,612	801	3.9	25
Birmingham Rd rb	20,612	801	3.9	25
Birmingham Rd7	23,309	431	1.9	28
Birmingham Rd6	21,576	361	1.7	37
Birmingham Rd5	21,554	360	1.7	19
Birmingham Rd sl2	24,858	383	1.5	19
Birmingham Rd4	24,862	384	1.5	27
Birmingham Rd3	25,848	461	1.8	31
Birmingham Rd2	25,812	461	1.8	33
Birmingham Rd1	26,568	500	1.9	18
Birmingham Rd sl1	26,568	500	1.9	18
Regal Rd	4,957	22	0.4	16
Henley St sl	-	-	0.0	0
Union St	147	4	2.6	20
Henley St sl2	-	-	0.0	0
Union Rd sl	139	3	2.2	17
High St rb	8,726	251	2.9	25
Union St FA	7,504	229	3.0	9
Union St EF	7,506	229	3.0	17
Union St DE	6,422	349	5.4	8
Union St CD	9,579	425	4.4	9
Union St BC	7,344	225	3.1	6
Union St AB	7,344	225	3.1	6
Meer St sl2	-	-	0.0	0
Meer St	-	-	0.0	0
Meer St sl1	-	-	0.0	0
Shakespeare St rb	3,559	65	1.8	19

Road Link	AADT	HDV	%HDV	Speed (kph)
Windsor St sl2	6,493	17	0.3	20
Windsor St4	6,494	17	0.3	18
Windsor St3	5,153	17	0.3	16
Windsor St2	2,612	12	0.4	20
Windsor St1	2,233	34	1.5	14
Windsor St sl1	2,218	34	1.5	3
Rother St sl	8,808	198	2.2	7
Shake St DA	10,116	283	2.8	10
Shake St CD	12,371	524	4.2	7
Shake St BC	14,732	540	3.7	9
Shake St AB	11,572	231	2.0	11
Mansell St	3,240	-	0.0	16
Mansell St sl2	1,730	-	0.0	15
Mansell St sl1	3,240	-	0.0	16
Rother St sl3	8,433	290	3.4	37
Rother St5	7,212	213	2.9	28
Rother St4	7,238	228	3.1	26
Rother St3	6,766	231	3.4	26
Rother St2	6,729	200	3.0	30
Rother St1	8,023	199	2.5	22
Rother St sl2	8,023	199	2.5	22
Evesham Pl1	9,972	651	6.5	32
Evesham Pl2	18,389	942	5.1	20
Broad Walk sl	1,025	52	5.1	11
Evesham Pl rb	18,911	988	5.2	11
Mulberry St sl	3,681	65	1.8	15
Shakespeare St	3,559	65	1.8	19
Maidenhead Rd2	4,637	82	1.8	21
Maidenhead Rd1	4,452	68	1.5	21
Gt William St2	4,452	68	1.5	21

Road Link	AADT	HDV	%HDV	Speed (kph)
Gt William St1	785	0	0.0	10
Gt William St sl	781	0	0.0	13
St Gregorys Rd sl2	4,670	134	2.9	18
St Gregorys Rd2	4,670	134	2.9	18
St Gregorys Rd1	4,097	51	1.3	17
St Gregorys Rd sl1	4,097	51	1.3	17
St Gregorys Rd sl3	3,917	40	1.0	9
Welcombe Rd sl	6,220	135	2.2	24
Welcombe Rd3	2,258	39	1.7	28
Welcombe Rd2	3,576	39	1.1	22
Welcombe Rd1	5,073	42	0.8	20
Tiddington Rd2	12,409	870	7.0	39
Loxley Rd	2,728	56	2.1	23
Loxley Rd sl	2,728	56	2.1	23
Waterside3	340	0	0.1	16
Waterside2	788	60	7.6	12
Waterside1	618	26	4.2	17
Bridge St1	7,669	338	4.4	23
High St2	6,125	154	2.5	31
High St1	8,728	251	2.9	27
Clopton Rd3	2,951	8	0.3	20
Clopton Rd2	3,028	8	0.3	28
Clopton Rd1	3,079	52	1.7	26
Birmingham Rd rb2	23,159	430	1.9	19
Western Rd sl	1,686	52	3.1	10
Albany Rd 1	18	-	0.0	3
Wellesbourne Gr	533	1	0.3	15
Wellesbourne Gr sl	533	1	0.3	15
Chestnut Wk4	4,979	133	2.7	25
Chestnut Wk3	3,952	124	3.1	32

Road Link	AADT	HDV	%HDV	Speed (kph)
Chestnut Wk2	3,678	97	2.6	28
Chestnut Wk1	4,044	102	2.5	26
Chestnut Wk sl2	4,028	101	2.5	14
Chestnut Wk sl1	1,138	10	0.9	10
Church St sl	4,400	103	2.3	17
Church St2	4,400	103	2.3	17
Church St1	4,437	103	2.3	22
Birmingham Rd8	21,468	526	2.4	22
Evesham Rd	11,694	647	5.5	34
Evesham Rd rb	11,647	643	5.5	10
Seven Med Rd	20,997	1,101	5.2	33
Seven Med Rd rb	20,981	1,100	5.2	8
Alcester Rd4	17,628	1,218	6.9	29
Alcester Rd rb	17,628	1,218	6.9	29
Shottery Rd rb	4,747	304	6.4	11
Albany Rd 3	131	0	0.3	18
Western Rd	1,543	55	3.5	27
Albany Rd 2	243	0	0.2	19
Tiddington Rd Sl	13,386	836	6.2	23

Table A3.3: Traffic Data for 2028 Core Strategy Option 1

Road Link	AADT	HDV	%HDV	Speed (kph)
Clopton Br SE	11,078	272	2.5	25
Clopton Br NW	16,489	897	5.4	17
Swans Nest E	1,527	-	0.0	9
Banbury Rd S	7,368	226	3.1	8
Clopton Br S	7,368	226	3.1	8
Clopton Br N	11,827	270	2.3	9
Shipston Rd N	5,137	143	2.8	17
Shipston Rd S	4,295	265	6.2	16

Road Link	AADT	HDV	%HDV	Speed (kph)
Banbury Rd NW	7,348	222	3.0	20
Banbury Rd SE	3,564	51	1.4	19
Clopton Br to Banbury Rd	7,673	228	3.0	10
Banbury Rd to Shipston Rd	11,444	399	3.5	10
Shipston Rd to Clopton Rd	12,258	275	2.2	16
Clopton Bridge roundabout	431	5	1.3	13
Banbury Rd roundabout	4,109	177	4.3	10
Shipston Rd roundabout	7,149	134	1.9	13
Swans Nest	1,540	-	0.0	29
Shipston Rd	9,448	408	4.3	25
Banbury Rd	10,929	273	2.5	35
Clopton Br	27,507	1,165	4.2	25
Clopton Br N sl2	11,827	270	2.3	9
Bridge Foot to Banbury Rd	11,078	272	2.5	25
Tiddington Rd1	13,323	834	6.3	30
Bridgeway SE	11,228	274	2.4	15
Bridge Foot NW	16,346	889	5.4	20
Bridgeway SW	6,441	115	1.8	7
Bridgeway	17,701	390	2.2	25
Bridge Foot	22,787	1,003	4.4	20
Clopton Br N sl	11,827	270	2.3	9
Warwick Rd2	15,711	453	2.9	32
Warwick Rd1	18,071	490	2.7	26
Warwick Bridgeway SE	9,203	152	1.6	13
Warwick Rd4	10,853	411	3.8	36
Warwick Rd3	20,071	563	2.8	25
Warwick Bridgeway NE	8,404	140	1.7	23
Warwick Rd5	19,268	551	2.9	29
Bridge St1 sl	7,826	349	4.5	16
Bridge Foot2	15,298	636	4.2	33

Road Link	AADT	HDV	%HDV	Speed (kph)
Bridge Foot3	12,684	289	2.3	19
Warwick Rd6	20,013	567	2.8	17
Guild St1	7,355	279	3.8	12
Bridge Foot Guild St	8,322	510	6.1	28
Guild St4	15,893	784	4.9	33
Guild St3	16,027	790	4.9	27
Guild St2	15,693	789	5.0	29
Guild St rb	16,685	781	4.7	24
Guild St6	16,685	781	4.7	24
Guild St5	16,432	785	4.8	22
Bridge St BridgeFoot	5,809	168	2.9	15
Bridge St W	7,827	331	4.2	19
Bridge St E	5,856	170	2.9	16
Bridge St 2	13,058	490	3.8	24
Bridge St W sl	7,827	331	4.2	19
Wood St	8,526	383	4.5	20
Wood St rb	8,528	384	4.5	32
Wood St sl	8,545	381	4.5	14
Greenhill St	11,132	442	4.0	29
Greenhill St sl2	11,111	442	4.0	14
Greenhill St sl	11,092	442	4.0	12
Alcester Rd3	17,566	1,183	6.7	29
Alcester Rd2	17,573	1,184	6.7	29
Alcester Rd1	17,616	1,185	6.7	15
Alcester Rd sl	17,616	1,185	6.7	15
Grove Rd sl	11,751	643	5.5	10
Grove Rd3	11,798	647	5.5	30
Grove Rd2	11,636	646	5.5	26
Grove Rd1	11,761	644	5.5	24
Grove Rd4	11,627	647	5.6	35

Road Link	AADT	HDV	%HDV	Speed (kph)
Arden St sl	14,224	1,066	7.5	14
Arden St3	14,743	1,059	7.2	30
Arden St2	14,743	1,059	7.2	30
Arden St1	14,219	1,067	7.5	32
Arden St sl2	14,998	1,040	6.9	19
Arden St4	14,947	1,070	7.2	24
Clopton Rd sl	3,182	58	1.8	6
Birmingham Rd sl	18,287	460	2.5	14
Birmingham Rd	20,856	870	4.2	26
Birmingham Rd rb	20,856	870	4.2	26
Birmingham Rd7	20,640	356	1.7	27
Birmingham Rd6	18,697	281	1.5	38
Birmingham Rd5	18,679	281	1.5	19
Birmingham Rd sl2	22,700	303	1.3	20
Birmingham Rd4	22,706	304	1.3	28
Birmingham Rd3	23,714	407	1.7	32
Birmingham Rd2	23,691	406	1.7	34
Birmingham Rd1	24,666	446	1.8	18
Birmingham Rd sl1	24,666	446	1.8	18
Regal Rd	4,837	19	0.4	16
Henley St sl	-	-	0.0	0
Union St	220	6	2.7	20
Henley St sl2	-	-	0.0	0
Union Rd sl	215	6	2.6	17
High St rb	8,495	246	2.9	25
Union St FA	7,690	230	3.0	9
Union St EF	7,695	230	3.0	17
Union St DE	6,568	349	5.3	8
Union St CD	9,213	403	4.4	9
Union St BC	7,459	224	3.0	6

Road Link	AADT	HDV	%HDV	Speed (kph)
Union St AB	7,459	224	3.0	6
Meer St sl2	-	-	0.0	0
Meer St	-	-	0.0	0
Meer St sl1	-	-	0.0	0
Shakespeare St rb	3,432	73	2.1	19
Windsor St sl2	7,205	13	0.2	20
Windsor St4	7,205	13	0.2	18
Windsor St3	5,894	13	0.2	16
Windsor St2	3,094	9	0.3	20
Windsor St1	2,501	33	1.3	13
Windsor St sl1	2,487	32	1.3	2
Rother St sl	8,906	189	2.1	7
Shake St DA	11,177	362	3.2	10
Shake St CD	12,028	515	4.3	7
Shake St BC	15,097	528	3.5	9
Shake St AB	12,170	299	2.5	11
Mansell St	3,487	-	0.0	17
Mansell St sl2	1,919	-	0.0	15
Mansell St sl1	3,487	-	0.0	17
Rother St sl3	7,912	282	3.6	35
Rother St5	6,520	184	2.8	28
Rother St4	6,724	201	3.0	26
Rother St3	6,387	214	3.3	29
Rother St2	6,342	188	3.0	30
Rother St1	7,906	189	2.4	22
Rother St sl2	7,906	189	2.4	22
Evesham Pl1	10,468	636	6.1	35
Evesham Pl2	18,360	917	5.0	20
Broad Walk sl	1,065	57	5.4	12
Evesham Pl rb	18,932	969	5.1	12

Road Link	AADT	HDV	%HDV	Speed (kph)
Mulberry St sl	3,549	73	2.1	15
Shakespeare St	3,432	73	2.1	19
Maidenhead Rd2	4,392	86	2.0	21
Maidenhead Rd1	4,142	74	1.8	21
Gt William St2	4,142	74	1.8	21
Gt William St1	952	1	0.1	10
Gt William St sl	945	1	0.1	13
St Gregorys Rd sl2	4,107	120	2.9	18
St Gregorys Rd2	4,107	120	2.9	18
St Gregorys Rd1	3,617	55	1.5	16
St Gregorys Rd sl1	3,617	55	1.5	16
St Gregorys Rd sl3	4,166	41	1.0	9
Welcombe Rd sl	4,394	111	2.5	25
Welcombe Rd3	1,784	25	1.4	28
Welcombe Rd2	3,074	25	0.8	22
Welcombe Rd1	4,223	31	0.7	20
Tiddington Rd2	12,309	868	7.1	39
Loxley Rd	2,824	62	2.2	23
Loxley Rd sl	2,824	62	2.2	23
Waterside3	344	1	0.3	16
Waterside2	802	59	7.4	12
Waterside1	564	25	4.5	17
Bridge St1	7,248	324	4.5	24
High St2	6,162	170	2.8	31
High St1	8,500	246	2.9	27
Clopton Rd3	2,898	8	0.3	20
Clopton Rd2	3,032	8	0.3	28
Clopton Rd1	3,199	59	1.8	26
Birmingham Rd rb2	20,472	355	1.7	19
Western Rd sl	1,939	55	2.9	11

Road Link	AADT	HDV	%HDV	Speed (kph)
Albany Rd 1	19	0	1.4	3
Wellesbourne Gr	539	0	0.1	15
Wellesbourne Gr sl	539	0	0.1	15
Chestnut Wk4	5,145	153	3.0	26
Chestnut Wk3	4,009	139	3.5	31
Chestnut Wk2	3,675	117	3.2	28
Chestnut Wk1	4,061	123	3.0	26
Chestnut Wk sl2	4,043	123	3.0	14
Chestnut Wk sl1	1,143	12	1.1	10
Church St sl	4,673	126	2.7	16
Church St2	4,673	126	2.7	16
Church St1	4,690	126	2.7	22
Birmingham Rd8	19,056	435	2.3	22
Evesham Rd	11,306	614	5.4	34
Evesham Rd rb	11,255	611	5.4	10
Seven Med Rd	21,277	1,075	5.1	32
Seven Med Rd rb	21,270	1,073	5.0	8
Alcester Rd4	17,566	1,183	6.7	29
Alcester Rd rb	17,566	1,183	6.7	29
Shottery Rd rb	4,768	298	6.2	11
Albany Rd 3	138	0	0.1	18
Western Rd	1,725	56	3.3	27
Albany Rd 2	252	0	0.1	19
Tiddington Rd Sl	13,275	825	6.2	24

Table A3.4: Traffic Data for 2028 Core Strategy Option 3

Road Link	AADT	HDV	%HDV	Speed (kph)
Clopton Br SE	11,867	255	2.1	24
Clopton Br NW	16,660	769	4.6	17
Swans Nest E	1,589	-	0.0	10

Road Link	AADT	HDV	%HDV	Speed (kph)
Banbury Rd S	8,463	206	2.4	8
Clopton Br S	8,463	206	2.4	8
Clopton Br N	12,386	211	1.7	9
Shipston Rd N	6,963	138	2.0	17
Shipston Rd S	5,781	237	4.1	15
Banbury Rd NW	6,560	154	2.3	20
Banbury Rd SE	3,670	44	1.2	19
Clopton Br to Banbury Rd	8,999	210	2.3	11
Banbury Rd to Shipston Rd	11,881	319	2.7	10
Shipston Rd to Clopton Rd	13,039	219	1.7	16
Clopton Bridge roundabout	653	8	1.2	13
Banbury Rd roundabout	5,329	166	3.1	10
Shipston Rd roundabout	6,100	82	1.3	13
Swans Nest	1,603	-	0.0	28
Shipston Rd	12,748	376	2.9	24
Banbury Rd	10,227	198	1.9	35
Clopton Br	28,473	1,022	3.6	26
Clopton Br N sl2	12,386	211	1.7	9
Bridge Foot to Banbury Rd	11,867	255	2.1	24
Tiddington Rd1	13,008	783	6.0	30
Bridgeway SE	12,029	256	2.1	13
Bridge Foot NW	16,533	762	4.6	23
Bridgeway SW	6,781	121	1.8	4
Bridgeway	18,842	376	2.0	24
Bridge Foot	23,313	884	3.8	20
Clopton Br N sl	12,386	211	1.7	9
Warwick Rd2	18,361	453	2.5	32
Warwick Rd1	19,373	465	2.4	26
Warwick Bridgeway SE	10,098	144	1.4	13
Warwick Rd4	12,242	415	3.4	36

Road Link	AADT	HDV	%HDV	Speed (kph)
Warwick Rd3	22,357	560	2.5	25
Warwick Bridgeway NE	8,588	134	1.6	22
Warwick Rd5	20,840	549	2.6	30
Bridge St1 sl	7,230	270	3.7	16
Bridge Foot2	16,488	600	3.6	34
Bridge Foot3	14,087	295	2.1	21
Warwick Rd6	21,572	565	2.6	17
Guild St1	7,520	272	3.6	10
Bridge Foot Guild St	8,249	480	5.8	28
Guild St4	16,044	750	4.7	32
Guild St3	16,148	754	4.7	29
Guild St2	15,808	754	4.8	30
Guild St rb	17,635	745	4.2	20
Guild St6	17,635	745	4.2	20
Guild St5	16,603	748	4.5	25
Bridge St BridgeFoot	5,949	178	3.0	16
Bridge St W	7,485	260	3.5	18
Bridge St E	5,998	180	3.0	15
Bridge St 2	12,840	430	3.4	24
Bridge St W sl	7,485	260	3.5	18
Wood St	8,163	349	4.3	20
Wood St rb	8,173	349	4.3	33
Wood St sl	8,182	349	4.3	14
Greenhill St	10,682	342	3.2	30
Greenhill St sl2	10,655	339	3.2	14
Greenhill St sl	10,658	342	3.2	12
Alcester Rd3	16,893	1,035	6.1	30
Alcester Rd2	16,904	1,036	6.1	30
Alcester Rd1	16,899	1,034	6.1	16
Alcester Rd sl	16,899	1,034	6.1	16

Road Link	AADT	HDV	%HDV	Speed (kph)
Grove Rd sl	11,890	605	5.1	9
Grove Rd3	11,949	606	5.1	30
Grove Rd2	11,783	605	5.1	26
Grove Rd1	11,893	606	5.1	24
Grove Rd4	11,823	607	5.1	34
Arden St sl	14,506	1,058	7.3	14
Arden St3	15,173	1,045	6.9	30
Arden St2	15,173	1,045	6.9	30
Arden St1	14,507	1,058	7.3	32
Arden St sl2	15,383	1,023	6.6	19
Arden St4	15,359	1,052	6.9	23
Clopton Rd sl	3,511	52	1.5	6
Birmingham Rd sl	18,382	437	2.4	14
Birmingham Rd	20,576	830	4.0	27
Birmingham Rd rb	20,576	830	4.0	27
Birmingham Rd7	21,227	351	1.7	28
Birmingham Rd6	19,253	275	1.4	38
Birmingham Rd5	19,235	275	1.4	19
Birmingham Rd sl2	23,190	296	1.3	20
Birmingham Rd4	23,200	296	1.3	28
Birmingham Rd3	24,259	387	1.6	33
Birmingham Rd2	24,255	387	1.6	34
Birmingham Rd1	25,168	431	1.7	19
Birmingham Rd sl1	25,168	431	1.7	19
Regal Rd	5,024	20	0.4	16
Henley St sl	4	-	0.0	1
Union St	268	5	2.0	21
Henley St sl2	-	-	0.0	0
Union Rd sl	267	5	1.9	20
High St rb	8,133	235	2.9	25

Road Link	AADT	HDV	%HDV	Speed (kph)
Union St FA	7,695	244	3.2	9
Union St EF	7,696	244	3.2	17
Union St DE	6,276	278	4.4	8
Union St CD	8,710	342	3.9	9
Union St BC	7,422	238	3.2	6
Union St AB	7,422	238	3.2	6
Meer St sl2	4	-	0.0	1
Meer St	4	-	0.0	1
Meer St sl1	4	-	0.0	2
Shakespeare St rb	774	64	8.2	18
Windsor St sl2	6,687	12	0.2	20
Windsor St4	6,685	12	0.2	19
Windsor St3	5,418	12	0.2	17
Windsor St2	2,644	6	0.2	21
Windsor St1	2,328	27	1.2	14
Windsor St sl1	2,321	27	1.2	3
Rother St sl	8,954	169	1.9	8
Shake St DA	12,062	351	2.9	12
Shake St CD	11,227	482	4.3	7
Shake St BC	13,804	494	3.6	11
Shake St AB	10,262	285	2.8	7
Mansell St	3,010	-	0.0	17
Mansell St sl2	1,445	-	0.0	16
Mansell St sl1	3,010	-	0.0	17
Rother St sl3	10,812	299	2.8	33
Rother St5	8,487	178	2.1	28
Rother St4	8,377	192	2.3	27
Rother St3	7,416	201	2.7	29
Rother St2	7,374	171	2.3	32
Rother St1	8,339	171	2.1	23

Road Link	AADT	HDV	%HDV	Speed (kph)
Rother St sl2	8,339	171	2.1	23
Evesham Pl1	10,822	605	5.6	34
Evesham Pl2	21,612	904	4.2	20
Broad Walk sl	953	40	4.2	11
Evesham Pl rb	22,084	949	4.3	11
Mulberry St sl	1,028	64	6.2	10
Shakespeare St	774	64	8.2	18
Maidenhead Rd2	2,533	69	2.7	21
Maidenhead Rd1	2,257	68	3.0	21
Gt William St2	2,257	68	3.0	21
Gt William St1	1,734	4	0.2	10
Gt William St sl	1,697	3	0.2	3
St Gregorys Rd sl2	2,543	111	4.4	18
St Gregorys Rd2	2,543	111	4.4	18
St Gregorys Rd1	2,177	35	1.6	16
St Gregorys Rd sl1	2,177	35	1.6	16
St Gregorys Rd sl3	2,661	13	0.5	9
Welcombe Rd sl	4,036	106	2.6	24
Welcombe Rd3	1,557	7	0.5	28
Welcombe Rd2	2,764	7	0.3	21
Welcombe Rd1	3,912	9	0.2	20
Tiddington Rd2	12,223	815	6.7	39
Loxley Rd	2,760	52	1.9	23
Loxley Rd sl	2,760	52	1.9	23
Waterside3	282	-	0.0	15
Waterside2	756	67	8.9	12
Waterside1	349	19	5.4	17
Bridge St1	6,871	252	3.7	24
High St2	5,449	145	2.7	31
High St1	8,132	235	2.9	27

Road Link	AADT	HDV	%HDV	Speed (kph)
Clopton Rd3	3,335	6	0.2	20
Clopton Rd2	3,436	6	0.2	27
Clopton Rd1	3,541	52	1.5	25
Birmingham Rd rb2	21,086	350	1.7	19
Western Rd sl	2,091	49	2.3	11
Albany Rd 1	7	-	0.0	3
Wellesbourne Gr	517	2	0.4	15
Wellesbourne Gr sl	517	2	0.4	15
Chestnut Wk4	5,107	143	2.8	27
Chestnut Wk3	4,465	147	3.3	33
Chestnut Wk2	4,080	121	3.0	30
Chestnut Wk1	4,496	126	2.8	26
Chestnut Wk sl2	4,487	125	2.8	13
Chestnut Wk sl1	994	2	0.2	10
Church St sl	4,350	114	2.6	15
Church St2	4,350	114	2.6	15
Church St1	4,309	114	2.6	22
Birmingham Rd8	19,281	444	2.3	22
Evesham Rd	11,558	479	4.1	35
Evesham Rd rb	11,533	478	4.1	11
Seven Med Rd	18,420	640	3.5	34
Seven Med Rd rb	18,402	640	3.5	8
Alcester Rd4	16,893	1,035	6.1	30
Alcester Rd rb	16,893	1,035	6.1	30
Shottery Rd rb	4,338	204	4.7	11
Albany Rd 3	133	1	0.5	18
Western Rd	1,892	50	2.7	27
Albany Rd 2	242	1	0.4	19
Tiddington Rd Sl	12,964	775	6.0	23

Table A3.5: Traffic Data for 2028 Core Strategy Option 4

Road Link	AADT	HDV	%HDV	Speed (kph)
Clopton Br SE	9,434	191	2.0	26
Clopton Br NW	16,536	291	1.8	17
Swans Nest E	1,637	-	0.0	9
Banbury Rd S	8,411	156	1.9	9
Clopton Br S	8,411	156	1.9	9
Clopton Br N	12,783	233	1.8	9
Shipston Rd N	6,507	187	2.9	17
Shipston Rd S	4,471	193	4.3	16
Banbury Rd NW	6,793	110	1.6	21
Banbury Rd SE	4,381	25	0.6	19
Clopton Br to Banbury Rd	8,611	156	1.8	11
Banbury Rd to Shipston Rd	11,014	240	2.2	11
Shipston Rd to Clopton Rd	13,033	234	1.8	16
Clopton Bridge roundabout	250	1	0.3	13
Banbury Rd roundabout	4,230	130	3.1	11
Shipston Rd roundabout	6,542	47	0.7	13
Swans Nest	1,639	-	0.0	28
Shipston Rd	10,976	380	3.5	25
Banbury Rd	11,178	135	1.2	36
Clopton Br	25,927	481	1.9	26
Clopton Br N sl2	12,783	233	1.8	9
Bridge Foot to Banbury Rd	9,434	191	2.0	26
Tiddington Rd1	9,266	167	1.8	31
Bridgeway SE	9,520	192	2.0	15
Bridge Foot NW	16,427	288	1.8	19
Bridgeway SW	7,192	116	1.6	4
Bridgeway	16,731	309	1.8	25
Bridge Foot	23,620	405	1.7	20
Clopton Br N sl	12,783	233	1.8	9

Road Link	AADT	HDV	%HDV	Speed (kph)
Warwick Rd2	14,420	252	1.7	32
Warwick Rd1	16,059	278	1.7	26
Warwick Bridgeway SE	9,717	70	0.7	14
Warwick Rd4	9,912	300	3.0	36
Warwick Rd3	19,639	370	1.9	24
Warwick Bridgeway NE	6,721	139	2.1	24
Warwick Rd5	16,639	438	2.6	30
Bridge St1 sl	9,984	170	1.7	16
Bridge Foot2	14,028	223	1.6	33
Bridge Foot3	10,666	262	2.5	19
Warwick Rd6	17,377	452	2.6	17
Guild St1	6,726	191	2.8	10
Bridge Foot Guild St	9,313	123	1.3	26
Guild St4	16,299	312	1.9	32
Guild St3	16,344	314	1.9	30
Guild St2	16,044	314	2.0	32
Guild St rb	17,754	311	1.8	20
Guild St6	17,754	311	1.8	20
Guild St5	16,814	312	1.9	25
Bridge St BridgeFoot	6,053	162	2.7	16
Bridge St W	9,443	140	1.5	18
Bridge St E	6,079	163	2.7	16
Bridge St 2	14,935	296	2.0	23
Bridge St W sl	9,443	140	1.5	18
Wood St	8,358	195	2.3	19
Wood St rb	8,369	195	2.3	32
Wood St sl	8,372	196	2.3	14
Greenhill St	11,975	274	2.3	29
Greenhill St sl2	11,964	274	2.3	13
Greenhill St sl	11,952	274	2.3	12

Road Link	AADT	HDV	%HDV	Speed (kph)
Alcester Rd3	18,599	924	5.0	30
Alcester Rd2	18,549	923	5.0	29
Alcester Rd1	18,601	922	5.0	15
Alcester Rd sl	18,601	922	5.0	15
Grove Rd sl	10,370	798	7.7	9
Grove Rd3	10,421	801	7.7	30
Grove Rd2	10,264	800	7.8	26
Grove Rd1	10,386	800	7.7	23
Grove Rd4	10,286	801	7.8	35
Arden St sl	13,121	635	4.8	14
Arden St3	13,637	626	4.6	30
Arden St2	13,637	626	4.6	30
Arden St1	13,119	635	4.8	32
Arden St sl2	13,918	612	4.4	19
Arden St4	13,868	640	4.6	24
Clopton Rd sl	3,201	49	1.5	6
Birmingham Rd sl	18,562	377	2.0	13
Birmingham Rd	20,104	399	2.0	26
Birmingham Rd rb	20,104	399	2.0	26
Birmingham Rd7	22,282	409	1.8	28
Birmingham Rd6	20,322	333	1.6	38
Birmingham Rd5	20,302	333	1.6	19
Birmingham Rd sl2	24,182	355	1.5	20
Birmingham Rd4	24,192	356	1.5	28
Birmingham Rd3	25,051	422	1.7	32
Birmingham Rd2	25,041	422	1.7	34
Birmingham Rd1	25,919	465	1.8	18
Birmingham Rd sl1	25,919	465	1.8	18
Regal Rd	4,893	22	0.4	16
Henley St sl	-	-	0.0	0

Road Link	AADT	HDV	%HDV	Speed (kph)
Union St	144	3	1.8	21
Henley St sl2	-	-	0.0	0
Union Rd sl	144	3	1.8	19
High St rb	9,562	242	2.5	25
Union St FA	7,406	218	2.9	9
Union St EF	7,410	219	3.0	18
Union St DE	6,680	162	2.4	8
Union St CD	10,389	217	2.1	9
Union St BC	7,259	216	3.0	6
Union St AB	7,259	216	3.0	6
Meer St sl2	-	-	0.0	0
Meer St	-	-	0.0	0
Meer St sl1	-	-	0.0	0
Shakespeare St rb	745	62	8.3	19
Windsor St sl2	6,434	13	0.2	20
Windsor St4	6,433	13	0.2	18
Windsor St3	5,091	13	0.2	17
Windsor St2	2,256	10	0.4	20
Windsor St1	1,859	32	1.7	14
Windsor St sl1	1,850	32	1.7	2
Rother St sl	8,894	205	2.3	8
Shake St DA	11,065	272	2.5	10
Shake St CD	11,862	128	1.1	7
Shake St BC	14,113	141	1.0	10
Shake St AB	9,260	210	2.3	10
Mansell St	3,578	-	0.0	17
Mansell St sl2	2,018	-	0.0	16
Mansell St sl1	3,578	-	0.0	17
Rother St sl3	8,960	290	3.2	38
Rother St5	7,751	217	2.8	28

Road Link	AADT	HDV	%HDV	Speed (kph)
Rother St4	7,689	231	3.0	26
Rother St3	7,240	245	3.4	25
Rother St2	7,228	204	2.8	29
Rother St1	8,540	205	2.4	23
Rother St sl2	8,540	205	2.4	23
Evesham Pl1	9,227	791	8.6	33
Evesham Pl2	18,171	1,082	6.0	20
Broad Walk sl	1,149	57	5.0	12
Evesham Pl rb	18,818	1,137	6.0	9
Mulberry St sl	1,006	62	6.2	11
Shakespeare St	745	62	8.3	19
Maidenhead Rd2	2,213	71	3.2	22
Maidenhead Rd1	1,878	63	3.3	20
Gt William St2	1,878	63	3.3	20
Gt William St1	1,264	0	0.0	10
Gt William St sl	1,249	0	0.0	2
St Gregorys Rd sl2	3,375	115	3.4	18
St Gregorys Rd2	3,375	115	3.4	18
St Gregorys Rd1	2,681	42	1.5	17
St Gregorys Rd sl1	2,681	42	1.5	17
St Gregorys Rd sl3	3,842	32	0.8	9
Welcombe Rd sl	5,234	118	2.3	23
Welcombe Rd3	2,300	33	1.4	28
Welcombe Rd2	3,621	33	0.9	22
Welcombe Rd1	5,308	35	0.7	20
Tiddington Rd2	6,455	176	2.7	40
Loxley Rd	4,381	55	1.3	25
Loxley Rd sl	4,381	55	1.3	25
Waterside3	529	1	0.1	16
Waterside2	989	60	6.1	13

Road Link	AADT	HDV	%HDV	Speed (kph)
Waterside1	1,087	36	3.3	17
Bridge St1	8,879	133	1.5	23
High St2	6,681	147	2.2	31
High St1	9,561	242	2.5	28
Clopton Rd3	3,043	6	0.2	20
Clopton Rd2	3,161	6	0.2	28
Clopton Rd1	3,224	49	1.5	25
Birmingham Rd rb2	22,119	408	1.8	19
Western Rd sl	1,960	55	2.8	12
Albany Rd 1	16	0	0.3	3
Wellesbourne Gr	529	2	0.3	15
Wellesbourne Gr sl	529	2	0.3	15
Chestnut Wk4	5,360	126	2.4	25
Chestnut Wk3	3,878	103	2.7	30
Chestnut Wk2	3,637	94	2.6	28
Chestnut Wk1	3,996	101	2.5	25
Chestnut Wk sl2	3,983	100	2.5	14
Chestnut Wk sl1	1,047	10	0.9	11
Church St sl	4,677	101	2.2	16
Church St2	4,677	101	2.2	16
Church St1	4,739	101	2.1	22
Birmingham Rd8	20,498	492	2.4	22
Evesham Rd	11,596	575	5.0	34
Evesham Rd rb	11,552	574	5.0	10
Seven Med Rd	21,496	1,270	5.9	32
Seven Med Rd rb	21,486	1,271	5.9	9
Alcester Rd4	18,599	924	5.0	30
Alcester Rd rb	18,599	924	5.0	30
Shottery Rd rb	4,722	265	5.6	11
Albany Rd 3	134	1	0.5	18

Road Link	AADT	HDV	%HDV	Speed (kph)
Western Rd	1,754	56	3.2	27
Albany Rd 2	250	1	0.4	19
Tiddington Rd Sl	9,250	167	1.8	23