East Herts District Council

Detailed Modelling Study

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Table of Contents

List of Tables

List of Figures

Executive Summary

Bureau Veritas have been commissioned by East Herts District Council (EHDC) to complete a detailed modelling study of the three Air Quality Management Areas (AQMAs) in East Herts to inform their future Air Quality Action Plan (AQAP) which is now considered out of date[1]. Currently there are three AQMAs within East Herts, declared as a result of exceedances of the 40 µg/m^3 annual mean objective for Nitrogen Dioxide (NO_2). The three AQMAs are defined as follows;

- Bishop's Stortford AQMA – An area encompassing a number of properties around the junction of Dunmow Road, Hockerill Street, London Road and Stansted Road in Bishops Stortford. (Declared February 2007)
- Hertford AQMA – A number of properties in central Hertford. (Declared May 2010)
- Sawbridgeworth AQMA – London Rd and Cambridge Rd and the adjoining roads. (Declared February 2014)

The aim of this detailed modelling study is to increase the Council's understanding of pollutant concentrations within East Herts in order to provide technical input into the updated AQAP and identify if changes to the current AQMAs are required.

In order to provide technical input into an updated AQAP that will cover the three AQMA boundaries, the air quality modelling accounted for a pre-COVID-19 baseline using 2019 traffic data, 2019 monitoring data and the latest Local Air Quality Management (LAQM) tools.

Bishop's Stortford AQMA

Within the Bishop's Stortford AQMA, the modelling has predicted that the 40µg/m^3 NO_2 annual mean Air Quality Strategy (AQS) objective is exceeded at a total of 22 (44%) of modelled receptor locations (i.e. residents within the AQMA), with 2 (4%) further locations modelling concentrations within 10 % of the objective.

Areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to roadside locations near junctions where key arterial roads meet. This confirms that vehicle traffic is the main cause of elevated levels of NO_2 concentrations within the Bishop's Stortford AQMA. Roads contributing to concentrations within the AQMA include A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road.

A NO_x 'source apportionment' exercise has been completed which demonstrates that Diesel Cars are found to the main contributors to total road NO_x concentrations within the Bishop's Stortford AQMA.

A reduction of approximately 45.6% in Road NO_x at the worst case receptor is required to meet the AQO for annual mean NO_2

The observed "road canyon" effects and congestion at the main junction of A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road are considered to be the key contributors to elevated levels of NO_2 annual mean concentrations within the AQMA.

Following the completion of the detailed modelling study, the following recommendations are made:

[1]https://cdn-eastherts.onwebcurl.com/s3fs-public/documents/East_Herts_Air_Quality_Action_Plan_2017-18_-_2019-20_3_final.pdf

- Continue to monitor NO_2 across the AQMA, with the expansion of monitoring along Hockerill Street to the mini-roundabout further east.

- Based on the source apportionment results, any future intervention measures should be targeted at reducing vehicle emissions from all vehicle types. Special targeted measures for reducing Diesel Car and LGV should be the primary focus as these are both observed to be the largest contributors to total vehicle emissions in the areas of exceedance.

- Measures to reduce congestion at the main junction of the A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road would also help to reduce emissions of NO_2 in the Bishop's Stortford AQMA.

Hertford AQMA

Within the Hertford AQMA, the model has predicted that the 40µg/m^3 NO_2 annual mean AQS objective is exceeded at a total 9 (9.2% of all modelled receptors within the AQMA) receptor locations, with 10 (10.2%) further locations within 10% of the objective.

Areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to roadside locations near junctions and roundabouts where the London Road/Gascoyne Way/Hertingfordbury Road dual carriageway passes. This confirms that vehicle traffic is the main contributor to elevated levels of NO_2 concentrations within the Hertford AQMA. Roads contributing to the exceedances include London Road/Gascoyne Way/Hertingfordbury Road, Ware Road and the narrow "road canyon" streets and junctions at Parliament Steet, Old Cross and St Andrews Street.

A NO_x 'source apportionment' exercise has been completed which demonstrates that Diesel Cars are found to the main contributors to total road NO_x concentrations within the Hertford AQMA.

A reduction of approximately 33.7% in Road NO_x at the worst-case receptor is required to meet the AQO for annual mean NO_2

Overall this suggests volume of traffic and congestion on the main roads such as London Road/Gascoyne Way/Hertingfordbury Road are considered to be the key contributor to elevated levels of NO_2 annual mean concentrations within the AQMA.

Following the completion of the detailed modelling assessment, the following recommendations are made:

- Continue to monitor NO_2 across the AQMA, with the potential expansion of automatic monitoring within the three-way junction of Parliament Street, Old Cross and St Andrews Street.

- Based on the source apportionment results, any future intervention measures should be targeted at reducing vehicle emissions from all vehicle types. Special targeted measures for reducing Diesel Car and LGV should be the primary focus as these are both observed to be the largest contributors to total vehicle emissions in the areas of exceedance.

- Measures to reduce congestion at the three-way junction at Parliament Street, Old Cross and St Andrews Street will help to reduce NO_2 emissions as well as measures at reducing vehicle volume on Gascoyne Way.

Sawbridgeworth AQMA

Within the Sawbridgeworth AQMA, the model suggests that the 40µg/m^3 NO_2 annual mean AQS objective is exceeded at a total 3 (2.4%) receptor locations, with 2 (1.6%) further locations within 10 % of the objective.

Areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to roadside locations particularly near junctions where London Road and Cambridge Road meet, confirming vehicular traffic to be the main contributor to elevated levels of NO_2 concentrations within the Sawbridgeworth AQMA.

A NO_x 'source apportionment' exercise has been completed which demonstrates that Diesel Cars are found to the main contributors to total road NO_x concentrations within the Sawbridgeworth AQMA.

A reduction of approximately 40.6% in Road NO_x at the worst-case receptor is required to meet the AQO for annual mean NO_2

Overall this suggests volume of traffic and congestion to the main junctions along London Road and Cambridge Road is considered to be the key contributor to elevated levels of NO_2 annual mean concentrations within the AQMA.

Following the completion of the detailed modelling assessment, the following recommendations are made:

- Continue to monitor NO_2 across the AQMA, with the expansion of monitoring along both Cambridge Road and inclusion of monitoring on London Road.
- Based on the source apportionment results, any future intervention measures should be targeted at reducing vehicle emissions from all vehicle types. Special targeted measures for reducing Diesel Car and LGV should be the primary focus as these are both observed to be the largest contributors to total vehicle emissions in the areas of exceedance.
- Measures to reduce congestions at reducing vehicle volume on both London Road and Cambridge Road will help to reduce NO_x emissions.

1 Introduction

Bureau Veritas have been commissioned by East Herts District Council (EHDC) to complete a detailed modelling study for an updated Air Quality Action Plan (AQAP) for the Council's three Air Quality Management Areas (AQMAs). Currently there are three AQMAs within East Herts, declared as a result of exceedances of the 40 µg/m^3 annual mean objective for Nitrogen Dioxide (NO_2). The three AQMA's are defined as follows;

- Bishop's Stortford AQMA - An area encompassing a number of properties around the junction of Dunmow Road, Hockerill Street, London Road and Stansted Road in Bishops Stortford. (Declared February 2007)
- Hertford AQMA - A number of properties in central Hertford. (Declared May 2010)
- Sawbridgeworth AQMA - London Rd and Cambridge Rd and the adjoining roads. (Declared February 2014)

The Hertford AQMA was also previously declared for exceedances of the annual mean Air Quality Objective (AQO) for PM_{10}. However, this was revoked in 2004. Additionally, the Hertford AQMA was amended in 2019 and the boundary expanded to encompass the main central route passing through Hertford (Gascoyne Way) to the wider Hertford Area.

An Air Quality Action Plan was produced by EHDC in 2017, for 2017/18-2019/20[1]. This AQAP is the only AQAP produced by EHDC since the adoption of all three AQMAs and contains a list of measures to improve air quality across the district.

This detailed modelling study has covered all three AQMAs and has used pre-COVID-19 traffic data and local authority monitoring data to identify if areas within these AQMAs have changed and where specific recommendations on matters related to NO_2 exceedances are needed in order to inform the AQAP.

1.1 Scope of Assessment

It is the general purpose and intent of this assessment to determine, with reasonable certainty, the magnitude and geographical extent of any exceedances of the AQS objectives for NO_2, enabling EHDC to provide a focused consideration on developing measures as part of the AQAP for each of the three AQMAs.

The following are the objectives of the assessment:

- To assess the air quality at selected locations ("receptors") representative of worst-case exposure relative to the averaging period of focus (i.e. annual objective - façades of the existing residential units), based on modelling of emissions from road traffic on the local road network;
- To establish the spatial extent of any likely exceedances of the UK annual mean NO_2 AQS objective limit, and to identify the spatial extent of any areas within 10%;
- To establish the required reduction in emissions to comply with the UK AQS objectives; and
- To determine the relative contributions of various source types to the overall pollutant concentrations within the AQMAs, through source apportionment, in order to inform an updated AQAP.

The approach adopted in this assessment to assess the impact of road traffic emissions on air quality utilised the atmospheric dispersion model ADMS-Roads version 5.0.0.1, focusing on emissions of oxides of nitrogen (NO_x), which comprise of nitric oxide (NO) and nitrogen dioxide (NO_2).

In order to provide consistency with the Council's own work on air quality, the guiding principles for air quality assessments, as set out in the latest guidance provided by Defra for air quality assessment (LAQM.TG(22))[2], have been used.

[2] LAQM Technical Guidance LAQM.TG(22) – August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

2 Air Quality – Legislative Context

2.1 Air Quality Strategy

The importance of existing and future pollutant concentrations can be assessed in relation to the national air quality standards and objectives established by Government. The Air Quality Strategy[3] (AQS) provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the UK Government and Devolved Administrations to protect human health. The air quality objectives incorporated in the AQS and the UK Legislation are derived from Limit Values prescribed in the EU Directives transposed into national legislation by Member States.

The CAFE (Clean Air for Europe) programme was initiated in the late 1990s to draw together previous directives into a single EU Directive on air quality. The CAFE Directive[4] has been adopted and replaces all previous air quality Directives, except the 4th Daughter Directive[5]. The Directive introduces new obligatory standards for $PM_{2.5}$ for Government but places no statutory duty on local government to work towards achievement of these standards.

The Air Quality Standards (England) Regulations[6] 2010 came into force on 11 June 2010 in order to align and bring together in one statutory instrument the Government's obligations to fulfil the requirements of the new CAFE Directive.

The objectives for ten pollutants – benzene (C_6H_6), 1,3-butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), ozone (O_3) and Polycyclic Aromatic Hydrocarbons (PAHs), have been prescribed within the AQS[3].

The EU Limit Values are considered to apply everywhere with the exception of the carriageway and central reservation of roads and any location where the public do not have access (e.g. industrial sites).

The AQS objectives apply at locations outside buildings or other natural or man-made structures above or below ground, where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period. Typically, these include residential properties and schools/care homes for long-term (i.e. annual mean) pollutant objectives and high streets for short-term (i.e. 1-hour) pollutant objectives. Table 2-1 taken from LAQM TG(22)[2] provides an indication of those locations that may or may not be relevant for each averaging period.

This assessment focuses on NO_2 due to the significance this pollutant holds within the Council's administrative area - evidenced by the declared borough-wide AQMA. Moreover, as a result of traffic pollution the UK has failed to meet the EU Limit Values for this pollutant by the 2010 target date. As a result, the Government has had to submit time extension applications for compliance with the EU Limit Values, which has since passed and its continued failure to achieve these limits is currently giving rise to infraction procedures being implemented. The UK is not alone as the challenge of NO_2 compliance at EU level includes many other Member States.

In July 2017, the Government published its plan for tackling roadside NO_2 concentrations[7], to achieve compliance with EU Limit Values. This sets out Government policies for bringing NO_2

[3] Defra (2007), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

[4] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.

[5] Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic hydrocarbons in ambient air.

[6] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.

[7] Defra, DfT (2017), UK plan for tackling roadside nitrogen dioxide concentrations

concentrations within statutory limits in the shortest time period possible. Furthermore, the Clean Air Strategy was published in 2019, which outlines how the UK will meet international commitments to significantly reduce emissions of five damaging air pollutants by 2020 and 2030 under the adopted revised National Emissions Ceiling Directive (NECD)

The AQS objectives for these pollutants are presented in Table 2-2.

Table 2-1 – Examples of where the Air Quality Objectives should apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean and 8-hour mean	All locations where the annual mean objectives would apply, together with hotels. Gardens or residential properties[1].	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be shorter than either the 24- or 8-hour relevant mean.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend one hour or more. Any outdoor locations at which the public may be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-minute mean	All locations where members of the public might reasonably be expected to spend a period of 15 minutes or longer.	

Note [1] For gardens and playgrounds, such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

Table 2-2 – Relevant AQS Objectives for the Assessed Pollutants in England

Pollutant	AQS Objective	Concentration Measured as:	Date for Achievement
Nitrogen dioxide (NO_2)	200 µg/m³ not to be exceeded more than 18 times per year	1-hour mean	31st December 2005
	40 µg/m³	Annual mean	31st December 2005
Particles PM_{10}	50 µg/m³ not to be exceeded more than 35 times a year	24-hour mean	31st December 2004
	40 µg/m³	Annual mean	31st December 2004

Particles $PM_{2.5}$	20 µg/m^3	Annual mean	31st December 2010
$PM_{2.5}$ Exposure Reduction	Target of 15% reduction in concentrations at urban background	Annual Mean	Between 2010 and 2020

2.2 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995[8] (as amended 2021)[9] places a statutory duty on local authorities to periodically review and assess air quality within their area, and determine whether they are likely to meet the AQS objectives set down by Government for a number of pollutants – a process known as Local Air Quality Management (LAQM). The AQS objectives that apply to LAQM are defined for seven pollutants: benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide and particulate matter.

Local Authorities were formerly required to report on all of these pollutants, but following an update to the regime in 2016, the core of LAQM reporting is now focussed around the objectives of three pollutants; NO_2, PM_{10} and SO_2. Where the results of the Review and Assessment process highlight that problems in the attainment of the health-based objectives pertaining to the above pollutants will arise, the authority is required to declare an AQMA – a geographic area defined by high concentrations of pollution and exceedances of health-based standards.

The areas in which the AQS objectives apply are defined in the AQS as locations outside (i.e. at the façade) of buildings or other natural or man-made structures above or below ground where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period of the AQS objective.

Following any given declaration, the Local Authority is subsequently required to develop an Air Quality Action Plan (AQAP), which will contain measures to address the identified air quality issue, and bring the location into compliance with the relevant objective as soon as possible.

One of the objectives of the LAQM regime is for local authorities to enhance integration of air quality into the planning process. Current LAQM Policy Guidance[10] recognises land-use planning as having a significant role in term of reducing population exposure to elevated pollutant concentrations. Generally, the decisions made on land-use allocation can play a major role in improving the health of the population, particularly at sensitive locations – such as schools, hospitals and dense residential areas.

[8] http://www.legislation.gov.uk/ukpga/1995/25/part/IV

[9] Part IV of the Environment Act 2021. Published by the UK Government, 16th November 2021. Available at: https://www.legislation.gov.uk/ukpga/2021/30/part/4/enacted

[10] Local Air Quality Management Policy Guidance LAQM.PG(22). August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

3 Review and Assessment of Air Quality Undertaken by the Council

3.1 Local Air Quality Management

EHDC currently has three AQMAs, declared as a result of exceedances of the 40 µg/m^3 annual mean objective for Nitrogen Dioxide (NO_2). The three AQMA's are defined as follows;

- Bishop's Stortford AQMA - An area encompassing a number of properties around the junction of Dunmow Road, Hockerill Street, London Road and Stansted Road in Bishops Stortford. (Declared February 2007)
- Hertford AQMA - A number of properties in central Hertford. (Declared May 2010)
- Sawbridgeworth AQMA - London Rd and Cambridge Rd and the adjoining roads. (Declared February 2014)

The most recent LAQM report completed by the Council was the combined 2020-2021 ASR[11], containing the 2019 and 2020 monitoring data. The 2020-2021 ASR acknowledged the need for an updated AQAP.

In order to provide technical input into an updated AQAP that will cover the three AQMA boundaries, the air quality modelling has accounted for a pre-COVID-19 based using 2019 traffic data, 2019 monitoring data and the latest Local Air Quality Management (LAQM) tools.

This report details the findings of this analysis, and provides recommendation on matters related to NO_2 exceedances, in order to inform a new targeted set of measures within the updated AQAP.

3.2 Review of Air Quality Monitoring

3.2.1 Local Automatic Air Quality Monitoring

During 2019, EHDC undertook automatic (continuous) monitoring at one site, EH79. EH79 is located on Gascoyne Way, within the Hertford AQMA. EH79 monitors NO_2 and $PM_{2.5}$ via a chemiluminescent and BAM analyser.

Details of EH79 are provided in Table 3-1 and 2019 monitoring results are presented in Table 3-2, whilst the location of the monitoring site is illustrated in Figure 3-2.

Table 3-1 – Automatic Monitor EH79

Site ID	Site Location	Site Type	OS Grid Ref (E, N)	In AQMA	Pollutants Monitored	Inlet Height (m)
EH79	Gascoyne Way	Roadside	532464, 212338	Yes – Hertford AQMA	NO_2 and $PM_{2.5}$	1.5

Table 3-2 – Automatic Monitor EH79: NO_2 Annual Mean Concentrations

Site ID	Valid Data Capture for 2019 (%)	NO_2 Annual Mean Concentration (µg/m^3)				
		2015	2016	2017	2018	2019
EH79	99.8	N/A	**44.4**	34.7	32.2	33.0

[11] https://www.eastherts.gov.uk/environmental-health/air-quality

Table 3-3 – Automatic Monitor EH79: Number of NO_2 Hourly Means Exceedances

Site ID	Valid Data Capture for 2019 (%)	Hourly Means in Excess of the 1-hour Objective (200 µg/m³)				
		2015	2016	2017	2018	2019
EH79	99.8	0	0	0	0	0

Whilst there were no recorded exceedances of either the annual mean or short term AQS objectives for NO_2 at EH79 in 2019, annual mean NO_2 concentrations have exceeded the AQS objective limit in 2016. Hourly mean NO_2 concentrations recorded at EH79 have not reported an exceedance of 200µg/m³ within the past five years.

3.2.2 Local Non-Automatic Air Quality Monitoring

During 2019, EHDC's non-automatic monitoring programme consisted solely of recording NO_2 concentrations using a network of 34 sites (with 7 of these sites being a triplicate colocation site). 28 of these locations are roadside sites and the remaining 6 are kerbside sites.

The details of the diffusion tube monitoring within each AQMA for 2019 are shown in Table 3-4,

Monitoring Locations EH12, EH31, EH32, EH17, EH35, EH36, EH19, EH39 and EH40 are all located within the Bishop's Stortford AQMA and exceed the annual mean AQO for NO_2 in 2019. With two triplicate locations close to exceeding 60µg/m³, the empirical relationship given in LAQM.TG(22)[2] states that exceedances of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60µg/m³ or above at a location of relevant exposure (Table 2-1). This indicates that an exceedance of the 1-hour mean objective is unlikely to have occurred at these sites between 2015 and 2019.

These exceedances are primarily due to vehicle congestions at the main Hockerill junction and the "road canyon" effects of the surrounding streets due to narrow roads and buildings on either side of the roads.

Table 3-5 and Monitoring locations EH25, EH28, EH48, EH79, EH42, EH43, EH44, EH79, EH80, EH81, EH30, EH41, EH52 and EH86 are all located within the Hertford AQMA. Monitoring locations EH25, EH42, EH43, EH44 and EH41 all exceed the annual mean AQO for NO_2. Most monitoring locations that did not exceed the AQO were within 10% of the exceedance value. These exceedances are primarily located at junctions and at Gascoyne Road.

Table 3-6. Figure 3-1, Figure 3-2 and Figure 3-3 illustrate the locations of the non-automatic monitoring locations in each AQMA.

Table 3-4 – EHDC LAQM Diffusion Tube Monitoring – Bishop Stortford AQMA

Site ID	Site Location	In AQMA	Annual Mean NO_2 Concentration (µg/m³)				
			2015	2016	2017	2018	2019
EH12 EH31 EH32	Hockerill St BS	N – adjacent to AQMA	**48.5**	**45.4**	**46.3**	**40.1**	**43.8**
EH17 EH35 EH36	Dunmow Rd	Y – Bishop's Stortford	**68.9**	**64.9**	**63.3**	**58.1**	**59.5**

Site ID	Site Location	In AQMA	Annual Mean NO_2 Concentration (µg/m^3)				
			2015	2016	2017	2018	2019
EH18 EH37 EH38	Stansted Rd	N – adjacent to AQMA	**41.8**	36.8	**40.3**	34.9	36.1
EH19 EH39 EH40	London Rd	Y – Bishop's Stortford	**<u>76.5</u>**	**<u>69.6</u>**	**<u>66.9</u>**	**58.9**	**59.1**

Monitoring Locations EH12, EH31, EH32, EH17, EH35, EH36, EH19, EH39 and EH40 are all located within the Bishop's Stortford AQMA and exceed the annual mean AQO for NO_2 in 2019. With two triplicate locations close to exceeding 60µg/m^3, the empirical relationship given in LAQM.TG(22)[2] states that exceedances of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60µg/m^3 or above at a location of relevant exposure (Table 2-1). This indicates that an exceedance of the 1-hour mean objective is unlikely to have occurred at these sites between 2015 and 2019.

These exceedances are primarily due to vehicle congestions at the main Hockerill junction and the "road canyon" effects of the surrounding streets due to narrow roads and buildings on either side of the roads.

Table 3-5 – EHDC LAQM Diffusion Tube Monitoring – Hertford AQMA

Site ID	Site Location	In AQMA	Annual Mean NO_2 Concentration (µg/m^3)				
			2015	2016	2017	2018	2019
EH25	Old Cross Hertford	Y – Hertford	**41.3**	37.3	**47.8**	39.7	**41.8**
EH28 EH48 EH49	Castle Street Hertford	Y – Hertford	**43.0**	36.7	37.6	32.2	34.7
EH42 EH43 EH44	West St Hertford collocated with EH29	Y – Hertford	**<u>69.2</u>**	**<u>60.5</u>**	**44.5**	37.2	**41.4**
EH79 EH80 EH81	Gascoyne Way, Hertford	Y – Hertford	-	**44.4**	39.1	36.0	32.0
EH30	Downey Cottage, Hertingfordbury Rd, Hertford	Y – Hertford	**45.1**	39.3	**40.6**	33.8	37.3
EH41	Ware Rd Hertford	Y – Hertford	**54.6**	**44.3**	**45.3**	36.1	**40.8**
EH52	Cowbridge Hertford	Y – Hertford	31.0	27.3	31.1	26.9	28.7
EH84	North Road, Hertford	Y – Hertford	-	-	-	30.8	31.5
EH85	Sele House North Road, Hertford	N – adjacent to AQMA	-	-	-	36.4	39.7

Monitoring locations EH25, EH28, EH48, EH79, EH42, EH43, EH44, EH79, EH80, EH81, EH30, EH41, EH52 and EH86 are all located within the Hertford AQMA. Monitoring locations EH25, EH42, EH43, EH44 and EH41 all exceed the annual mean AQO for NO_2. Most monitoring locations that did not exceed the AQO were within 10% of the exceedance value. These exceedances are primarily located at junctions and at Gascoyne Road.

Table 3-6 – EHDC LAQM Diffusion Tube Monitoring – Sawbridgeworth AQMA

Site ID	Site Location	In AQMA	Annual Mean NO_2 Concentration (µg/m^3)				
			2015	2016	2017	2018	2019
EH57	Opp Bell St SBW at crossing	Y – Sawbridgeworth	**<u>68.9</u>**	**<u>60.1</u>**	**46.5**	**47.0**	**50.4**
EH91	14 London Road, SBW	Y – Sawbridgeworth	-	-	-	**41.5**	39.5

Monitoring locations EH57 and EH91 are located within the Sawbridgeworth AQMA, EH57 exceeded the annual mean AQO for NO_2 in 2019 with EH91 only marginally below the AQO and within 10% of the exceedance value. These exceedances are likely due to congestion at junctions and traffic volume.

The results from the Council's 2019 monitoring programme demonstrate NO_2 annual mean concentrations has decreased slightly from 2015. However, there are still exceedances observed within each AQMA. This study will also look to see if the updates to the spatial locations of the AQMA boundaries are necessary.

Figure 3-1 – East Herts District Council – Bishop's Stortford AQMA and Local Authority Monitoring Locations

Figure 3-2 - East Herts District Council – Hertford AQMA and Local Authority Monitoring Locations

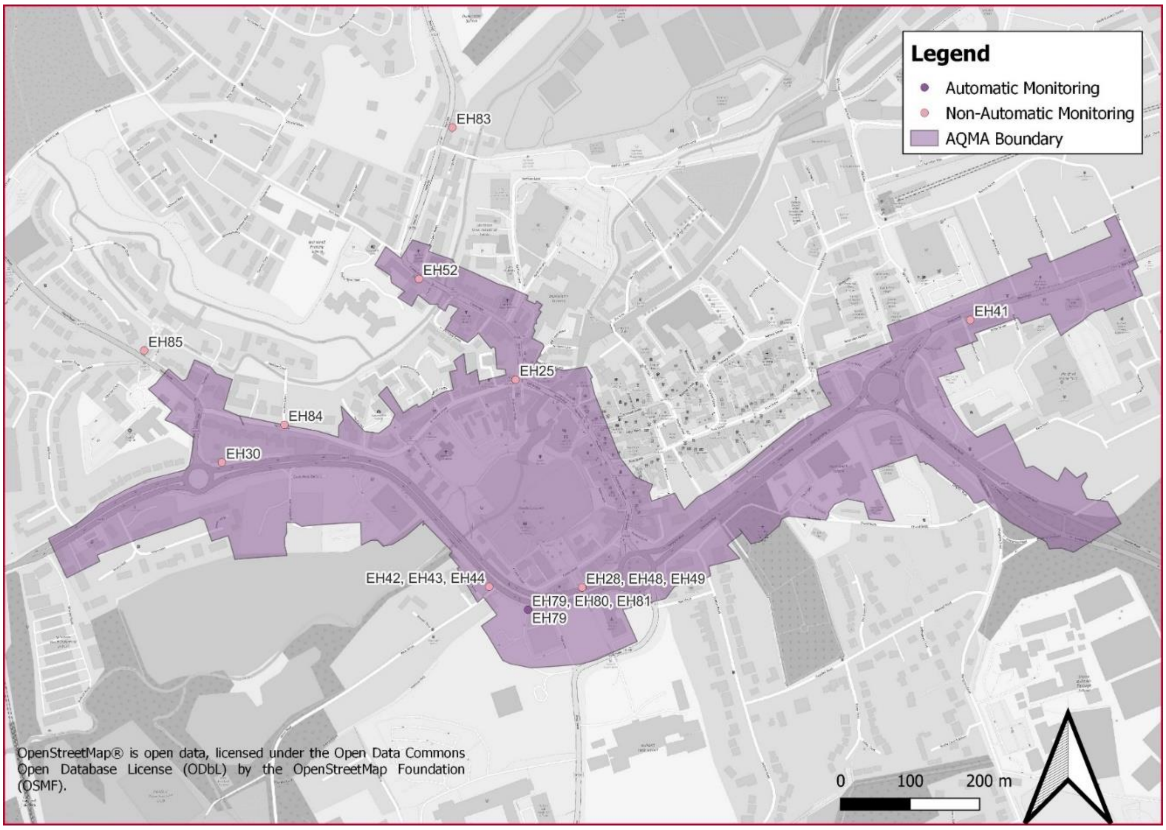


Figure 3-3 - East Herts District Council – Sawbridgeworth AQMA and Local Authority Monitoring Locations

3.3 Defra Background Concentration Estimates

Defra maintains a nationwide model of existing and future background air pollutant concentrations at a 1km x 1km grid square resolution. This data includes annual average concentration for NO_x, NO_2, PM_{10} and $PM_{2.5}$, using a base year of 2019 (the year in which comparisons between modelled and monitoring are made)[12]. The model used to determine the background pollutant levels is semi-empirical in nature: it uses the National Atmospheric Emissions Inventory (NAEI) emissions to model the concentrations of pollutants at the centroid of each 1km grid square, but then calibrates these concentrations in relation to actual monitoring data.

Due to the absence of local background monitoring within East Herts and nearby to the AQMAs, pollutant background concentrations used for the purposes of this assessment have been obtained from the Defra supplied background maps for the relevant 1km x 1km grid squares covering the modelled domain for the year 2019. The relevant annual mean background concentration will be added to the predicted annual mean road contributions in order to predict the total pollutant concentration at each receptor location. The total pollutant concentration can then be compared against the relevant AQS objective to determine the event of an exceedance.

The Defra mapped background concentrations for base year of 2019, which cover the modelled domain, are presented in Table B.1 of Appendix B. All of the mapped background concentrations presented are well below the respective annual mean AQS objectives. No adjustment for background concentration variability with height has been made.

[12] Defra Background Maps (2019), available at https://uk-air.defra.gov.uk/data/laqm-background-home

4 Assessment Methodology

To predict pollutant concentrations of road traffic emissions the atmospheric model ADMS Roads version 5.0.0.1 was utilised to model a 2019 baseline predictions scenario. The guiding principles for air quality assessments as set out in the latest guidance and tools provided by Defra for air quality assessment LAQM.TG(22)[2] have been used.

The approach used in this assessment has been based on the following:

- Prediction of NO_2 concentrations to which existing receptors may be exposed and comparison with the relevant AQS objectives;
- Quantification of relative NO_2 contribution of sources to overall NO_2 pollutant concentration; and
- Determination of the geographical extent of any potential exceedances in regards to the existing AQMA boundaries.

4.1 Traffic Inputs

Traffic flows and vehicle class compositions for the 2019 baseline scenario were taken survey count point data provided by EHDC, the EHDC COMET transport model and the Department for Transport (DfT) traffic count point database. The EHDC COMET model which is a strategic transport model used to show general traffic flow patterns was provided for the Hertford AQMA. Survey count point data was provided for some of the roads within the both the Bishop's Stortford and Sawbridgeworth AQMA, where data was not provided this was sourced from the Department for Transport (DfT) traffic count point data base.

Whilst data from the COMET model was provided as annual average daily traffic, data for the survey points was single day surveys taken on an average day. Following consultation with EHDC transport officers, it was considered that the survey data could be considered as annual average daily traffic.

It should be noted that although the survey point data and DfT traffic was obtained for the baseline year of 2019, the traffic provided as part of the COMET model was derived from 2014. A factor was applied to the COMET model traffic data was derived from the Government software TEMPro[13] to account for growth.

Traffic speeds were modelled at the relevant speed limit for each road. Where appropriate, vehicle speeds have been reduced in accordance with LAQM TG(22)[2] to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue.

The Emissions Factors Toolkit (EFT) version 10.1 developed by Defra[14] has been used to determine vehicle emission factors for input into the ADMS-Roads model, based upon the traffic data inputs.

Details of the traffic flows used in this assessment are provided in Table C.1 of the Appendices. The entire modelled road network across each AQMA is presented in Figure 4-1, Figure 4-2 and Figure 4-3.

[13] Department for Transport, TEMPro, available at: https://www.gov.uk/government/publications/tempro-downloads

[14] Defra, Emissions Factors Toolkit (2019). https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

Figure 4-1 – Bishop's Stortford AQMA Modelled Road Network

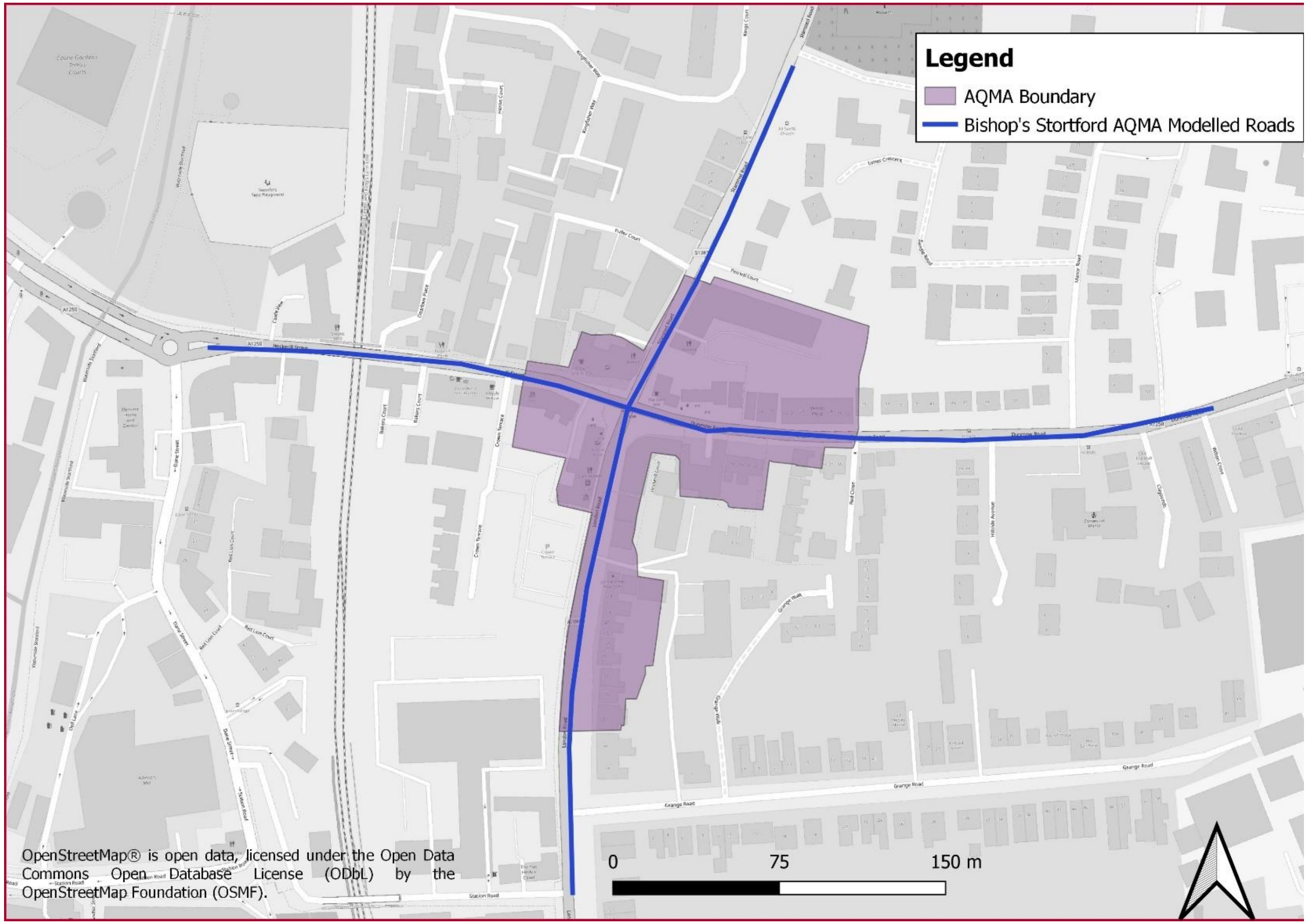


Figure 4-2 – Hertford AQMA Modelled Road Network

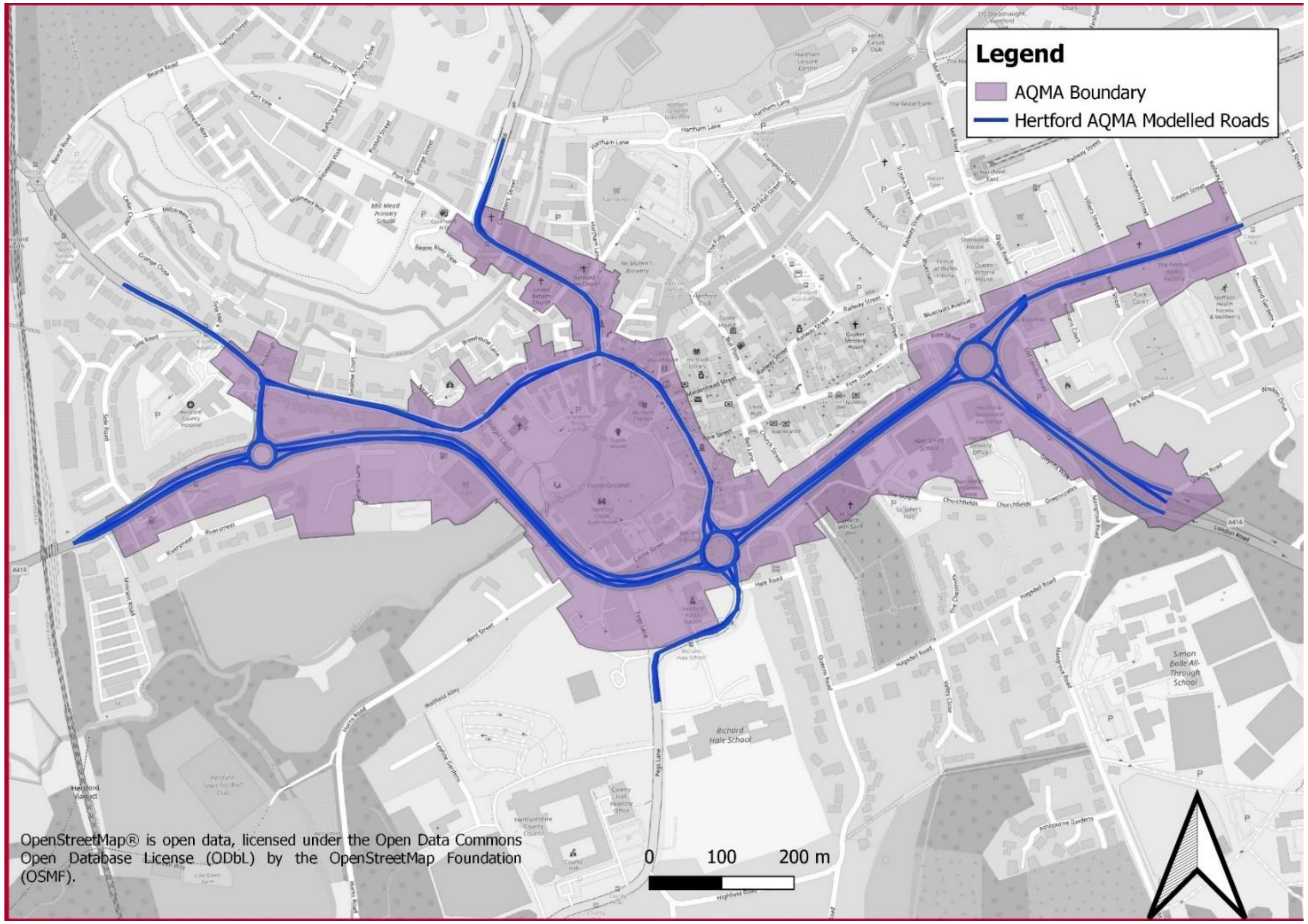


Figure 4-3 – Sawbridgeworth AQMA Modelled Road Network

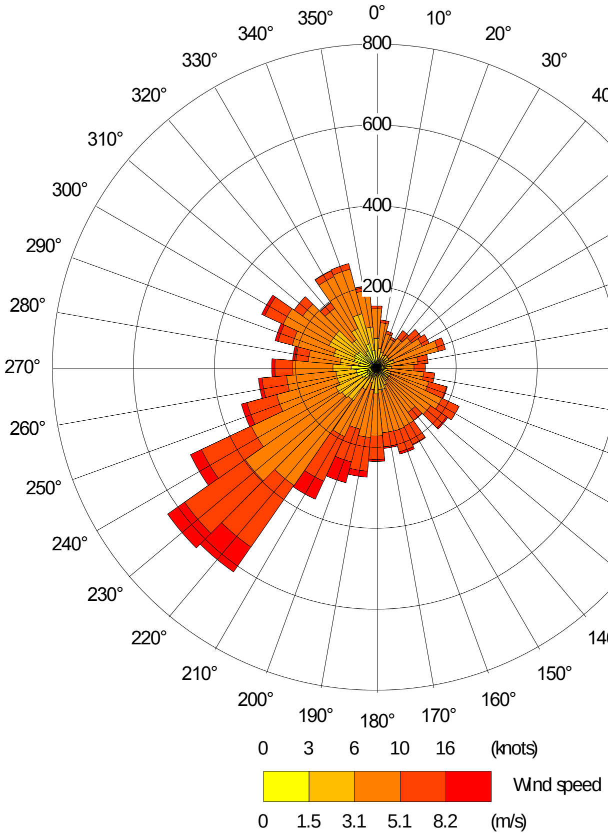
4.2 General Model Inputs

A site surface roughness value of 1 m was entered into the ADMS-roads model, consistent with the built-up nature of the modelled domain. In accordance with CERC's ADMS Roads User Guide[15], a minimum Monin-Obukhov length of 30 m was used for the ADMS Road model to reflect the urban topography of the model domain.

One year of hourly sequential meteorological data from a representative synoptic station is required by the dispersion model. 2019 meteorological data from Stansted weather station has been used in this assessment. The station is located approximately 23 km northeast of the Hertford AQMA (furthest AQMA from the meteorological site) and is considered representative of the meteorological conditions experienced throughout the district. A surface roughness value of 0.5 m was used for the area surrounding the meteorological station, more representative of the Stansted Airport location.

A wind rose for this site for the year 2019 is shown in Figure 4-4.

Figure 4-4 – Wind Rose for Stansted Data 2019



Most dispersion models do not use meteorological data if they relate to calm winds conditions, as dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS-Roads treats calm wind conditions by setting the minimum wind speed to 0.75m/s. It is recommended in LAQM.TG(22)[2] that the meteorological data file be tested within a dispersion model and the relevant output log file checked, to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances. LAQM.TG(22)[2] recommends that meteorological data should have a

[15] CERC (2020), ADMS-Roads User Guide Version 5

percentage of usable hours greater than 85%. If the data capture is less than 85% short-term concentration predictions should be expressed as percentiles rather than as numbers of exceedances. The 2019 meteorological data from Stansted includes 8,644 lines of usable hourly data out of the total 8,760 for the year, i.e. 98.7% usable data. This is therefore suitable for the dispersion modelling exercise.

4.3 Sensitive Receptors

A total of;

- 50 discrete receptors for the Bishop's Stortford AQMA
- 98 discrete receptors for the Hertford AQMA, and
- 125 discrete receptors for the Sawbridgeworth AQMA,

were included within the assessment to represent locations of relevant exposure. Details of the receptors are presented within Table D.1 of the Appendices and their locations are illustrated in Figure 4-5, Figure 4-6, Figure 4-7.

The majority of the receptors in each AQMA were included at a height of 1.5 m to represent ground level exposure. Where there was only sensitive receptors at 1st floor e.g. where there is commercial use at ground floor with flats above, receptors have been modelled at height of 4m. Where there is an elevation change from the receptors adjacent to a road was observed in the Bishop's Stortford AQMA along Dunmow Road receptors have been modelled at 3m.

Concentrations were also modelled across a regular gridded area, at a standardised height of 1.5m, covering the full extent of the model domain. The intelligent gridding option was applied to the ADMS-roads model meaning additional points were added at locations close to the roads for greater output resolution.

Figure 4-5 – Bishop's Stortford AQMA Modelled Receptors

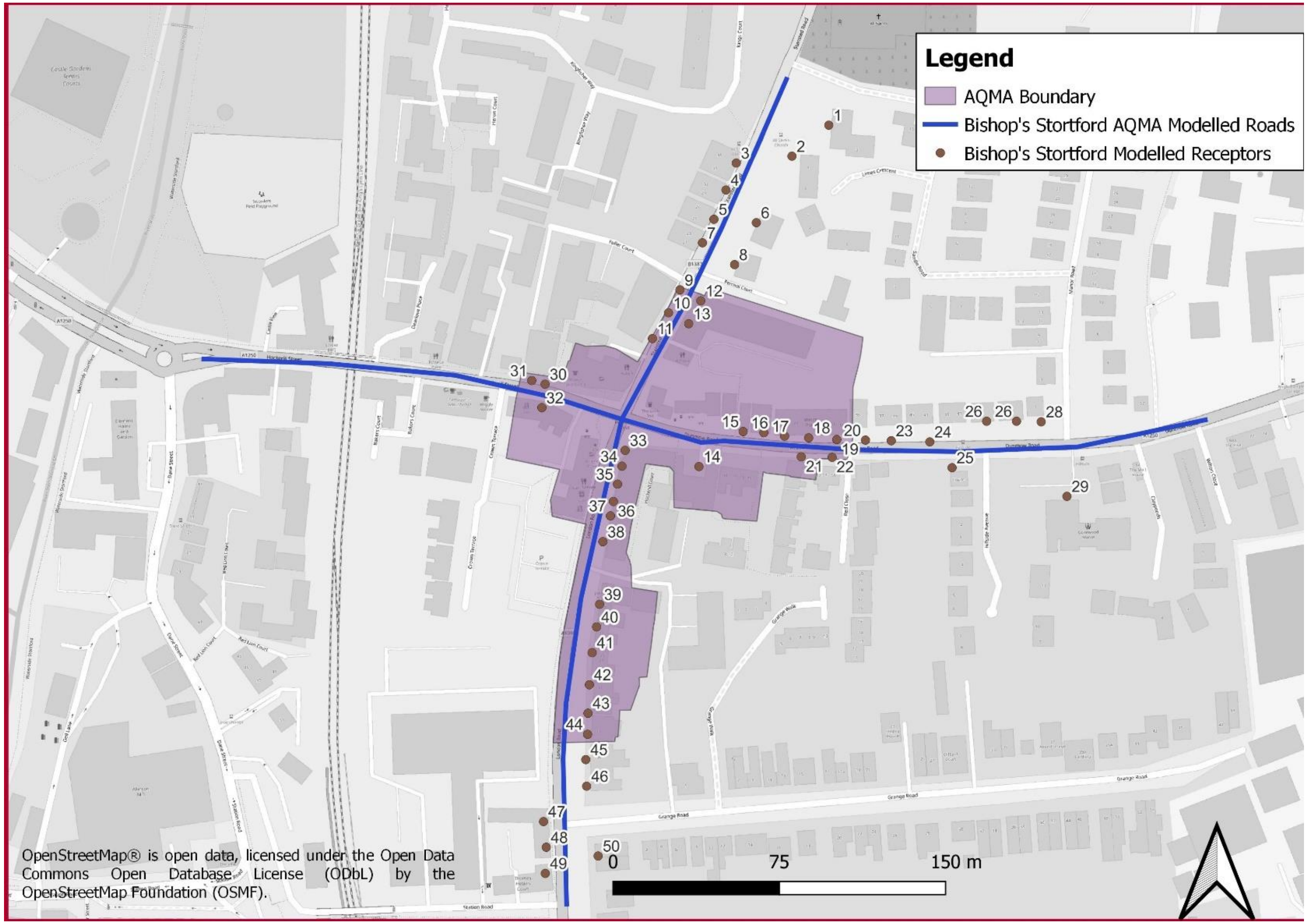


Figure 4-6 – Hertford AQMA Modelled Receptors

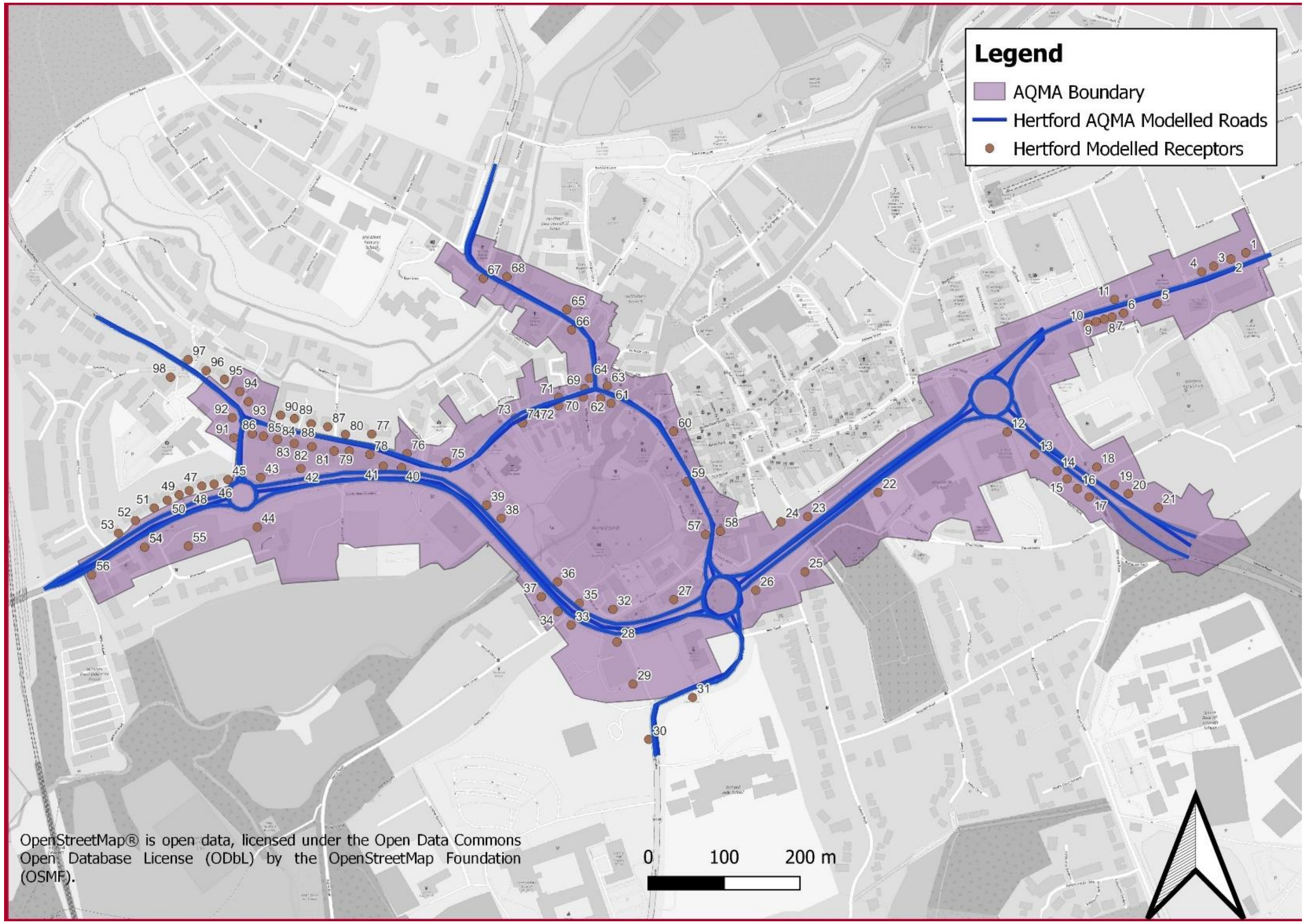
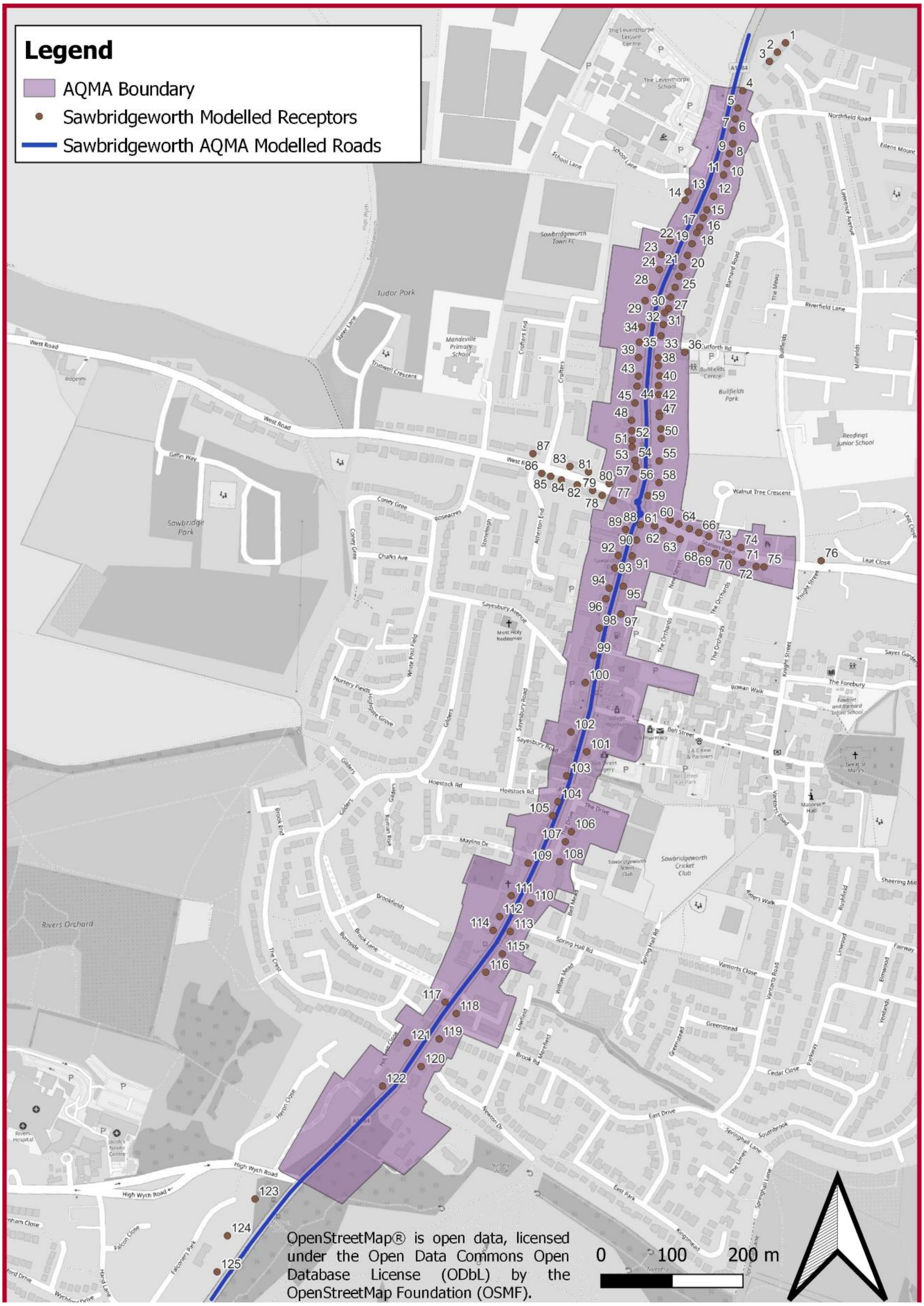


Figure 4-7 – Sawbridgeworth AQMA Modelled Receptors



4.4 Model Outputs

The background pollutant values discussed in Section 3.3 have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO_x.

For the prediction of annual mean NO_2 concentrations for the modelled scenarios, the output of the ADMS-Roads model for road NO_x contributions has been converted to total NO_2 following the methodology in LAQM.TG(22)[2], using the NO_x to NO_2 conversion tool developed on behalf of Defra. This tool also utilises the total background NO_x and NO_2 concentrations. This assessment has utilised version 8.1 (August 2020) of the NO_x to NO_2 conversion tool[16]. The road contribution is then added to the appropriate NO_2 background concentration value to obtain an overall total NO_2 concentration.

For the prediction of short term NO_2 impacts, LAQM.TG(22)[2] advises that it is valid to assume that exceedances of the 1-hour mean AQS objective for NO_2 are only likely to occur where the annual mean NO_2 concentration is 60µg/m^3 or greater.

In addition to total annual mean concentrations, NOx and Particulate Matter (PM_{10} and $PM_{2.5}$) source apportionment was carried out for the following vehicle classes:

- Petrol Cars
- Diesel Cars
- Petrol LGV
- Diesel LGV
- Rigid HGV
- Artic HGV
- Buses
- Motorcycle
- Full Hybrid Petrol Cars
- Plug-in Hybrid Petrol Cars
- Full Hybrid Diesel Cars
- EV Cars

Verification of the ADMS-Roads assessment has been undertaken using a number of local authority diffusion tube monitoring locations, and separate verifications have been undertaken for each AQMA. All NO_2 results presented in the assessment are those calculated following the process of model verification. Full details of the verification process are provided in Appendix A.

4.5 Uncertainty

Due to the number of inputs that are associated with the modelling of the study area there is a level of uncertainty that has to be taken into account when drawing conclusions from the predicted concentrations of NO_2. The predicted concentrations are based upon the inputs of traffic data, background concentrations, emission factors, street canyon calculations, meteorological data, modelling terrain limitations and the availability of monitoring data from the assessment area(s).

4.5.1 Uncertainty in NO_x and NO_2 Trends

Recent studies have identified historical monitoring data within the UK that shows a disparity between measured concentration data and the projected decline in concentrations associated with emission forecasts for future years[17]. Ambient concentrations of NO_x and NO_2 have shown two distinct trends over the past twenty-five years: (1) a decrease in concentrations from around 1996 to 2002/04, followed by (2) a period of more stable concentrations from 2002/04 rather than the further decline in concentrations that was expected due to the improvements in vehicle emissions standards.

[16] Defra NO_x to NO_2 Calculator (2020), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

[17] Carslaw, D, Beevers, S, Westmoreland, E, Williams, M, Tate, J, Murrells, T, Steadman, J, Li, Y, Grice, S, Kent, Aand Tsagatakis, I. 2011, Trends in NO_x and NO_2 emissions and ambient measurements in the UK, prepared for Defra, July 2011.

The reason for this disparity is related to the actual on-road performance of vehicles, in particular diesel cars and vans, when compared with calculations based on the Euro emission standards. Preliminary studies suggest the following:

- NO_x emissions from petrol vehicles appear to be in line with current projections and have decreased by 96% since the introduction of 3-way catalysts in 1993;
- NO_x emissions from diesel cars, under urban driving conditions, do not appear to have declined substantially, up to and including Euro 5. There is limited evidence that the same pattern may occur for motorway driving conditions; and
- NO_x emissions from HDVs equipped with Selective Catalytic Reduction (SCR) are much higher than expected when driving at low speeds.

This disparity in the historical national data highlights the uncertainty of future year projections of both NO_x and NO_2.

Defra and the Devolved Administrations have investigated these issues and have since published updated versions of the EFT that utilise COPERT 5 emission factors, which may go some way to addressing this disparity, but it is considered likely that a gap still remains. This assessment has utilised the latest EFT version 10.1 and associated tools published by Defra to help minimise any associated uncertainty when forming conclusions from the results.

5 Results

5.1 Modelled Concentrations

The results following the detailed modelling assessment have been split into each AQMA:

- Bishop's Stortford AQMA - An area encompassing a number of properties around the junction of Dunmow Road, Hockerill Street, London Road and Stansted Road in Bishops Stortford. (Declared February 2007)
- Hertford AQMA - A number of properties in central Hertford. (Declared May 2010)
- Sawbridgeworth AQMA - London Rd and Cambridge Rd and the adjoining roads. (Declared February 2014)

5.1.1 Bishop's Stortford AQMA - Baseline 2019 NO_2 Concentrations

The assessment has considered emissions of NO_2 from road traffic at 50 existing receptor locations representing locations of relevant exposure, and across a generic output grid covering the modelled area. The intelligent gridding option was applied to the ADMS-roads model meaning further points were added at locations close to the roads for greater output resolution shown in Figure 5-2.

Table 5-1 provides a summary of the modelled receptors split into groups based on the predicted annual mean NO_2 concentration. It can be seen that of the 50 discrete receptors, 22 (44%) are predicted to be above the NO_2 annual mean AQS objective limit, with a further 2 (4%) within 10%. The remaining 26 (52%) receptors were below the AQO for annual mean NO_2.

Table 5-1 – Summary of 2019 Modelled Receptor Results NO_2

Modelled NO_2 Concentration (µg/m^3)	Number of Receptors	Reference to the AQS Objective	Number of Receptors	% of Receptors
>60	0	**Above 60µg/m^3**	**0**	**0.0%**
>44	18	**Above 40µg/m^3 AQS Objective**	**22**	**44.0%**
40 - 44	4			
36 - 40	2	Within 10% of AQS Objective	2	4.0%
32 - 36	7	Below 36µg/m^3 AQS Objective	26	52.0%
<32	19			

The highest annual mean NO_2 concentration was recorded at Receptor 35 with a concentration of 58.1µg/m^3, the highest monitoring location in the Bishop's Stortford AQMA monitored at 59.5µg/m^3 at triplicate monitoring location EH17, EH35, EH36. Receptor 35 is located along a façade of a residential property which immediately fronts onto a stretch of the A1060 – London Road, susceptible to congestion due to the convergence of high capacity and town centre roads (A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road). The roads leading to the junction within Bishop's Stortford are narrow with buildings on either side leading to a "road canyon" effect. Receptor 35 is opposite a local authority triplicate monitoring location, EH19, EH39 and EH40. This monitoring location measured an annual mean NO_2 concentration of 59.1µg/m^3 in 2019.

The empirical relationship given in LAQM.TG(22)[2] states that exceedance of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60µg/m^3 or above. Given the NO_2 annual mean concentration recorded at Receptor 35 is below the hourly exceedance indicator (60µg/m^3), an exceedance of the hourly NO_2 AQS objective is unlikely at this location. This is also the case for triplicate monitoring location EH19, EH39 and EH40 which also does not exceed 60µg/m^3. In addition, on review of the annual mean NO_2 concentration isopleth presented in Figure

5-2 covering the modelled domain, there are no relevant locations with a modelled annual mean NO_2 concentration above 60µg/m^3, which suggests that an exceedance of the hourly NO_2 AQS objective is unlikely across the modelled area.

Figure 5-1 shows the locations of those receptors which are exceeding the 40µg/m^3 annual mean AQS objective and those receptors which are within 10% of the annual mean AQS objective (36 to 40µg/m^3). Based on these results, the following observations were made:

- Areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to roadside locations near junctions where key arterial roads meet, confirming vehicular traffic to be the main contributor to elevated levels of NO_2 concentrations within the Bishop's Stortford AQMA. Notable roads include: A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road.

- These four roads all have narrow streets with buildings on either side leading to canyon effects which are where the highest concentrations are observed.

Monitoring sites within and/or adjacent to the remainder of the locations identified to have a modelled exceedance and/or near exceedance outside of the declared AQMA area should be reviewed in order to validate predicted model findings.

A full set of concentration results for the discrete receptors used within the assessment is provided in Table D.1 of the Appendices. To provide further detail on the AQMA area, annual mean NO_2 concentrations were also predicted at generic gridded receptor locations shown in Figure 5-2.

Figure 5-1 – Bishop's Stortford AQMA Modelled Receptors NO_2 Annual Mean Concentration Range

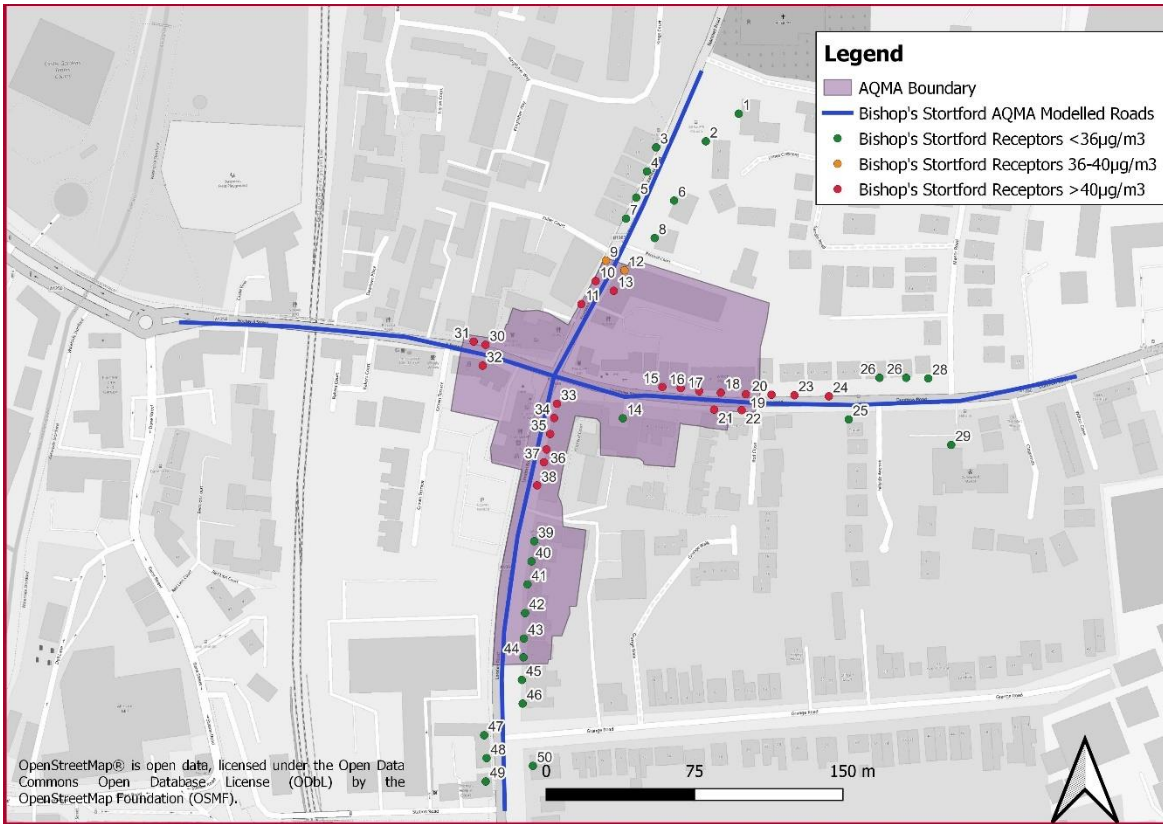
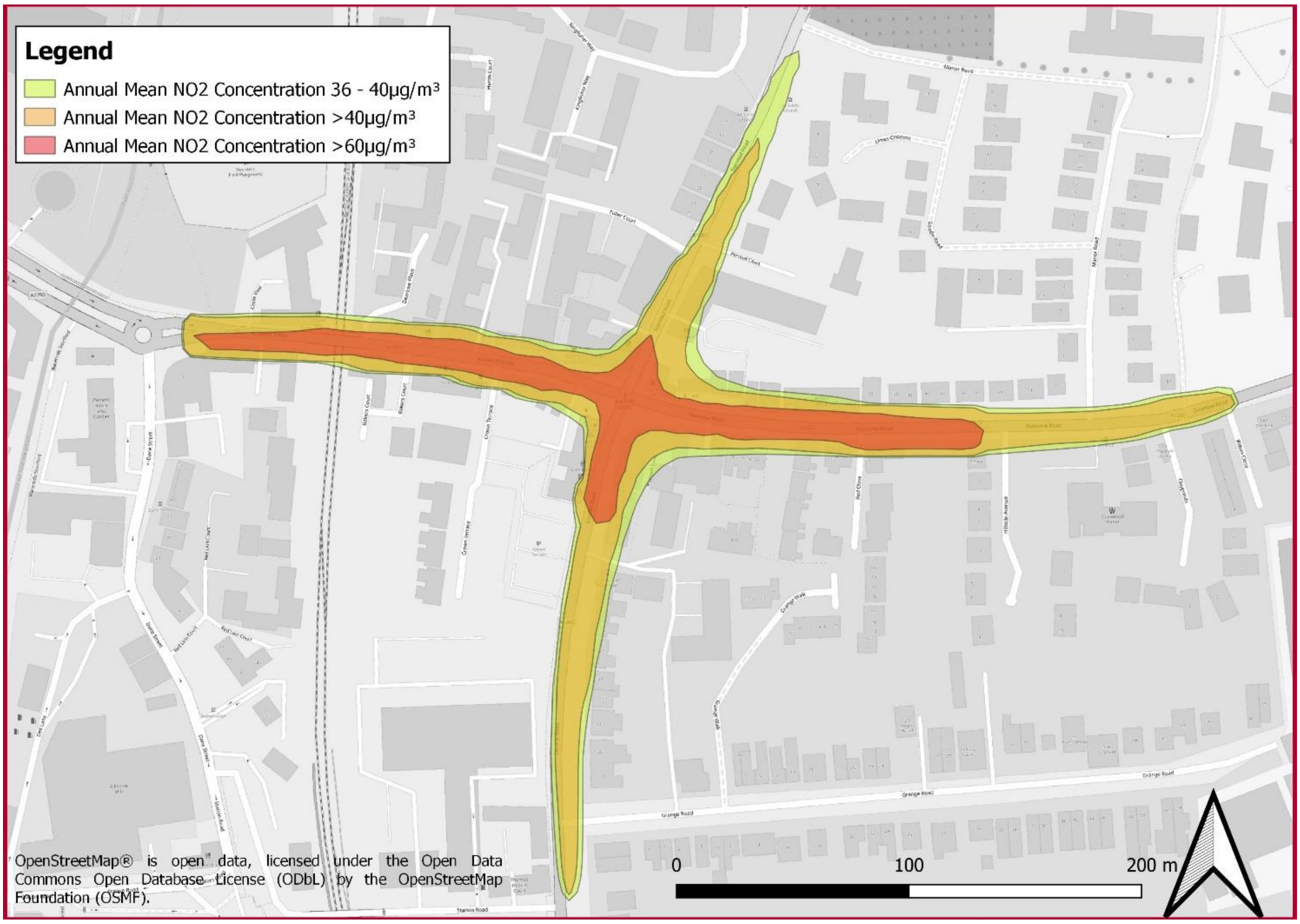


Figure 5-2 – Bishop's Stortford AQMA NO_2 Annual Mean Contour Plot



5.1.2 Hertford AQMA - Baseline 2019 NO_2 Concentrations

The assessment has considered emissions of NO_2 from road traffic at 98 existing receptor locations representing locations of relevant exposure, and across a generic output grid covering the modelled area. The intelligent gridding option was applied to the ADMS-roads model meaning further points were added at locations close to the roads for greater output resolution.

Table 5-2 provides a summary of the modelled receptors split into groups based on the predicted annual mean NO_2 concentration. It can be seen that of the 98 discrete receptors, 9 (9.2%) are predicted to be above the NO_2 annual mean AQS objective limit, with a further 10 (10.2%) within 10%. The remaining 79 (80.61%) receptors were below the AQO for annual mean NO_2.

Table 5-2 – Summary of 2019 Modelled Receptor Results NO_2

Modelled NO_2 Concentration (µg/m³)	Number of Receptors	Reference to the AQS Objective	Number of Receptors	% of Receptors
>60	0	**Above 60µg/m³**	**0**	**0.0%**
>44	5	**Above 40µg/m³ AQS Objective**	**9**	**9.18%**
40 - 44	4			
36 - 40	10	Within 10% of AQS Objective	10	10.2%
32 - 36	14	Below 36µg/m³ AQS Objective	79	60.6%
<32	65			

The highest annual mean NO_2 concentration was recorded at Receptor 26 with a concentration of 50.6µg/m³, this is much greater than the highest monitoring location in 2019, EH25, which monitored an annual mean NO_2 concentration of 41.8µg/m³. Receptor 26 is located at the residential flats which immediately front onto the Gascoyne Way/Parliament Street Roundabout Junction, susceptible to congestion due to the convergence of high capacity and town centre roads, particularly Gascoyne Way.

The empirical relationship given in LAQM.TG(22)[2] states that exceedance of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60µg/m³ or above. Given the NO_2 annual mean concentration recorded at Receptor 26 is below the hourly exceedance indicator (60µg/m³), an exceedance of the hourly NO_2 AQS objective is unlikely at this location. In addition, on review of the annual mean NO_2 concentration isopleth presented in Figure 5-4 covering the modelled domain, there are no relevant locations with a modelled annual mean NO_2 concentration above 60µg/m³, which suggests that an exceedance of the hourly NO_2 AQS objective is unlikely across the modelled area.

Figure 5-3 shows the locations of those receptors which are exceeding the 40µg/m³ annual mean AQS objective and those receptors which are within 10% of the annual mean AQS objective (36 to 40µg/m³). Based on these results, the following observations were made:

- Areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to roadside locations particularly at junctions along the main road running through Hertford, Gascoyne Way, London Road, Ware Road and Hertingfordbury Road. These roads are dual carriageways running through Hertford with a high traffic volume.

- Additionally, areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to the minor roads north of the main dual carriageway, including Parliament Street, Mill Bridge, Cowbridge, St Andrew Street, North Road, Cross Lane and the A119. This is primarily due to the narrow streets and high buildings on either side resulting in “street canyon” effects.

Monitoring sites within and/or adjacent to the remainder of the locations identified to have a modelled exceedance and/or near exceedance outside of the declared AQMA area should be reviewed in order to validate predicted model findings.

A full set of concentration results for the discrete receptors used within the assessment is provided in Table D.1 of the Appendices. To provide further detail on the AQMA area, annual mean NO_2 concentrations were also predicted at generic gridded receptor locations in Figure 5-4.

Figure 5-3 – Hertford AQMA Modelled Receptors NO_2 Annual Mean Concentration Range

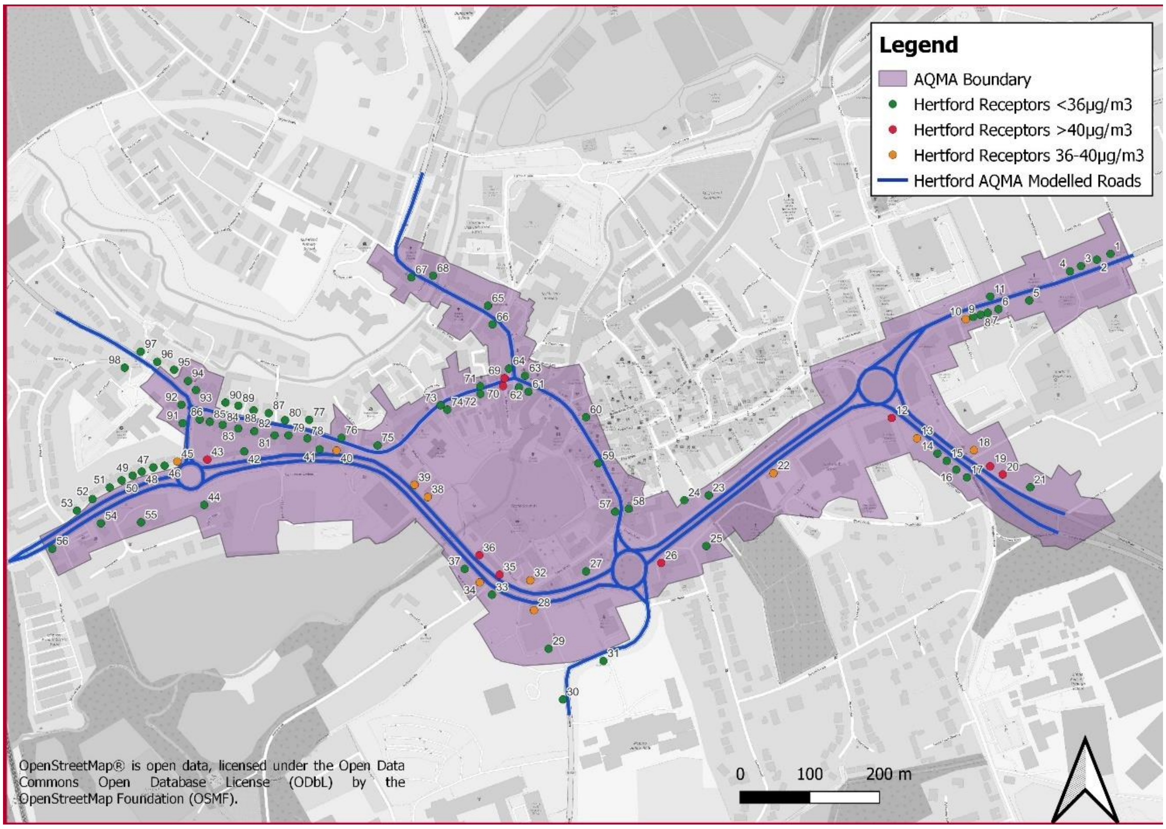
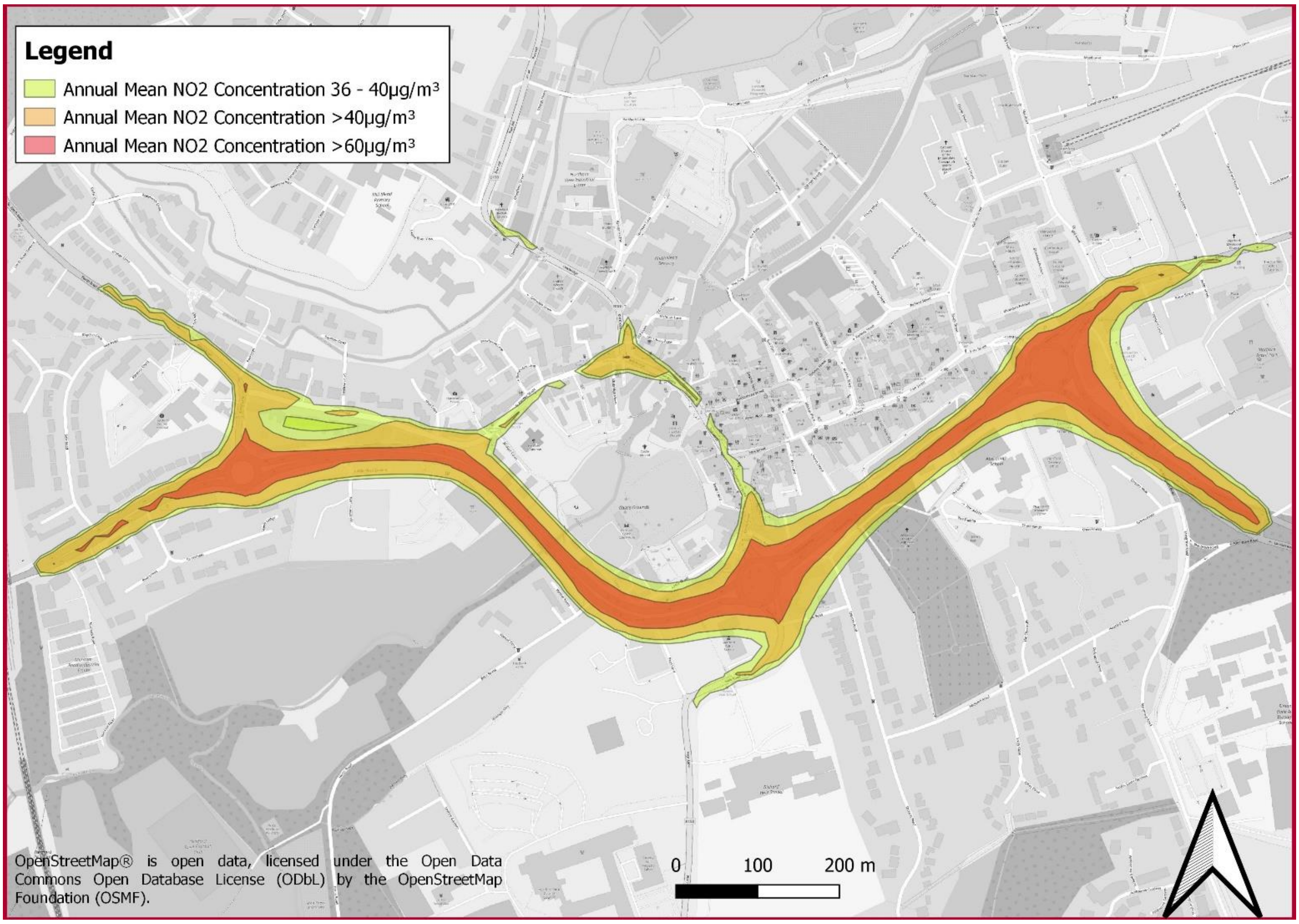


Figure 5-4 – Hertford AQMA NO_2 Annual Mean Contour Plot



5.1.3 Sawbridgeworth AQMA - Baseline 2019 NO_2 Concentrations

The assessment has considered emissions of NO_2 from road traffic at 125 existing receptor locations representing locations of relevant exposure, and across a generic output grid covering the modelled area. The intelligent gridding option was applied to the ADMS-roads model meaning further points were added at locations close to the roads for greater output resolution.

Table 5-3Table 5-1 provides a summary of the modelled receptors split into groups based on the predicted annual mean NO_2 concentration. It can be seen that of the 125 discrete receptors, 3 (2.4%) are predicted to be above the NO_2 annual mean AQS objective limit, with a further 2 (1.6%) within 10%. The remaining 120 (96.0%) receptors were below the AQO for annual mean NO_2.

Table 5-3 – Summary of 2019 Modelled Receptor Results NO_2

Modelled NO_2 Concentration (µg/m^3)	Number of Receptors	Reference to the AQS Objective	Number of Receptors	% of Receptors
>60	0	**Above 60µg/m^3**	**0**	**0.0%**
>44	3	**Above 40µg/m^3 AQS Objective**	**3**	**2.4%**
40 - 44	0			
36 - 40	2	Within 10% of AQS Objective	2	1.6%
32 - 36	26	Below 36µg/m^3 AQS Objective	120	96.0%
<32	94			

The highest annual mean NO_2 concentration was recorded at Receptor 59 with a concentration of 55.8µg/m^3. Receptor 59 is located along a façade of a residential property which immediately fronts onto the double mini-roundabout junctions between London Road, Station Road, Cambridge Road and West Road. The receptor is located just after a set of traffic lights and just before the mini roundabout.

The empirical relationship given in LAQM.TG(22)[2] states that exceedance of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60µg/m^3 or above. Given the NO_2 annual mean concentration recorded at Receptor 59 is below the hourly exceedance indicator (60µg/m^3), an exceedance of the hourly NO_2 AQS objective is unlikely at this location. In addition, on review of the annual mean NO_2 concentration isopleth presented in Figure 5-6 covering the modelled domain, there are no relevant locations with a modelled annual mean NO_2 concentration above 60µg/m^3, which suggests that an exceedance of the hourly NO_2 AQS objective is unlikely across the modelled area.

Figure 5-5 shows the locations of those receptors which are exceeding the 40µg/m^3 annual mean AQS objective and those receptors which are within 10% of the annual mean AQS objective (36 to 40µg/m^3). Based on these results, the following observations were made:

- Areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to roadside locations particularly near junctions where key arterial roads meet, confirming vehicular traffic to be the main contributor to elevated levels of NO_2 concentrations within the Sawbridgeworth AQMA. London Road and Cambridge Road.
- Concentrations of NO_2 that exceeded the AQO were limited to the main central parts of the road and did not 'spill' onto residential receptors that were set back from the road.

Monitoring sites within and/or adjacent to the remainder of the locations identified to have a modelled exceedance and/or near exceedance outside of the declared AQMA area should be reviewed in order to validate predicted model findings.

A full set of concentration results for the discrete receptors used within the assessment is provided in Table D.1 of the Appendices. To provide further detail on the AQMA area, annual mean NO_2 concentrations were also predicted at generic gridded receptor locations Figure 5-6.

Figure 5-5 – Sawbridgeworth AQMA Modelled Receptors NO_2 Annual Mean Concentration Range

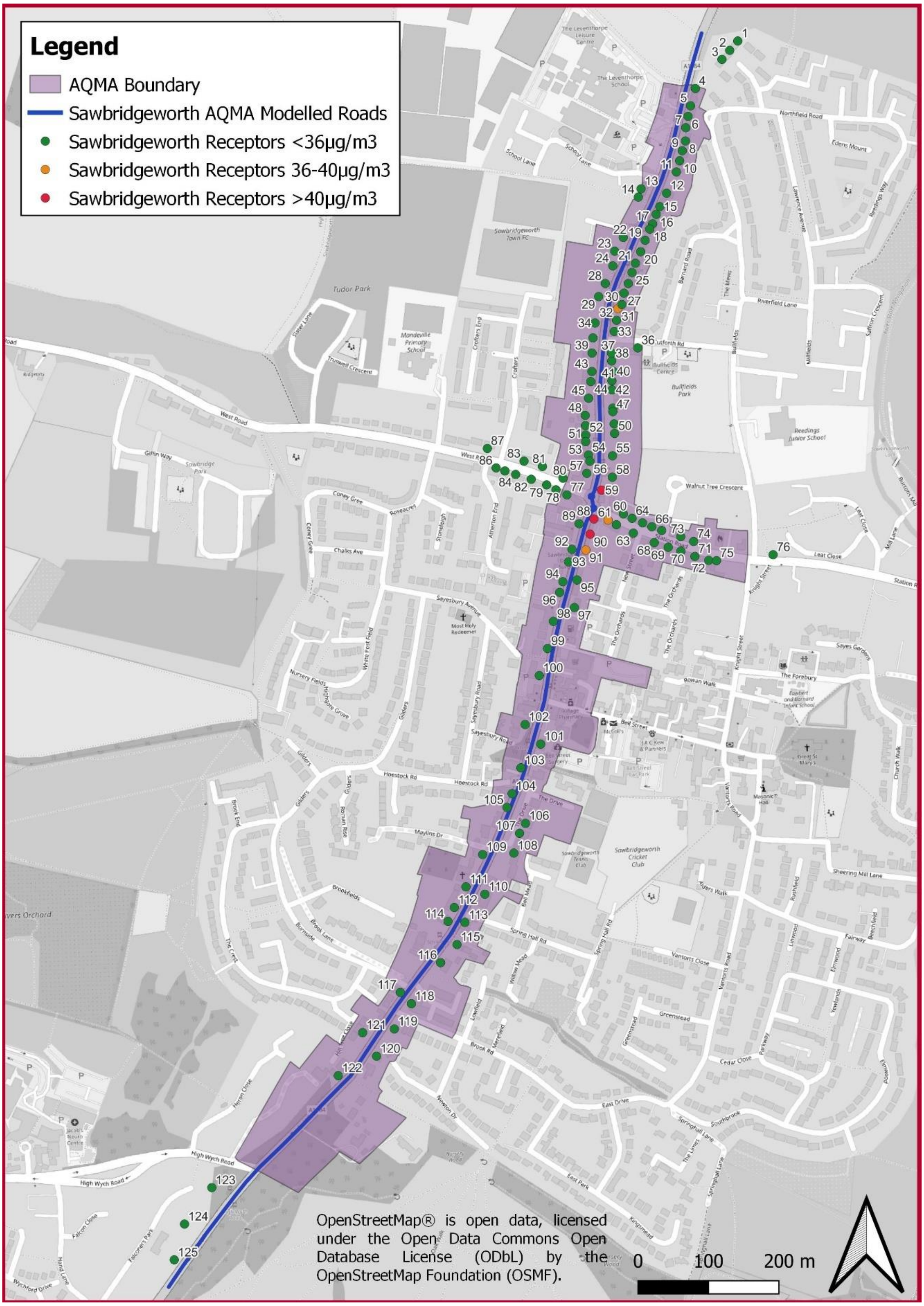


Figure 5-6 – Sawbridgeworth AQMA NO_2 Annual Mean Contour Plot

5.2 Estimated Year of Compliance

Following the identification of exceedances of the AQS objectives, it is useful to provide an estimate of the year by which concentrations at the identified locations of exceedances will become compliant with the relevant AQS objective. This is initially provided below assuming only the trends for future air quality, as currently predicted by Defra, are realised. The implementation of specific intervention measures to mitigate the local air quality issues, as are currently being developed by the Council within a revised AQAP, would then be considered most likely to bring forwards the estimated date of compliance.

Following the methodology outlined in LAQM.TG(22)[2] paragraph 7.70 onward, the year by which concentrations at the identified locations of exceedances will become compliant with the NO_2 annual mean AQS objective has been estimated. This has been completed using the predicted modelled NO_2 concentrations from the 2019 Base scenario.

5.2.1 Bishop's Stortford AQMA - Baseline 2019 NO_2 Concentrations

As a worst-case approach, the projection is based upon the receptor predicted as having the maximum annual mean NO_2 concentration, which in this case is Receptor 35. The appropriate roadside NO_2 projection factors, as provided on the LAQM Support website[18], are then applied to this concentration value to ascertain the estimated NO_2 annual mean reduction per annum, and hence the anticipated year of compliance. In this case, roadside projection factors for 'Rest of UK (HDV <10%)' have been applied, consistent with the worst-case receptor location.

The projected NO_2 annual mean concentrations following the above approach are presented in Table 5-4.

Table 5-4 – Projected Annual Mean NO_2 Concentrations – Bishop's Stortford AQMA

Receptor 35											
2019 Annual Mean Concentration (µg/m³)	Predicted Annual Mean Concentration (µg/m³)										
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
58.1	**55.2**	**52.1**	**49.2**	**46.6**	**44.1**	**41.8**	39.8	37.9	36.3	34.8	33.5
In **bold**, exceedance of the NO_2 annual mean AQS objective of 40µg/m³ Vehicle Adjustment Factor = Rest of UK (HDV <10%)											

Table 5-4 indicates that the first year by which Receptor 35 will be exposed to a concentration below the annual mean NO_2 AQS objective will be 2026. Additionally, it is expected that concentrations are expected to drop below 10% of the annual mean NO_2 AQS objective by 2029. 2026 is therefore considered the predicted year of compliance for those receptors used within the model, which are believed to represent worst case exposure within the Bishop's Stortford AQMA, in the absence of the implementation of any specific intervention measures to further bring forward local air quality improvements in the area.

Table 5-5 below also illustrates the required reduction in NO_x emissions for annual mean NO_2 concentrations to fall below the AQO of 40µg/m³. As shown a 45.6% reduction in road NO_x is required to meet the AQO for annual mean NO_2 at the worst-case receptor in the Bishop's Stortford AQMA.

[18] https://laqm.defra.gov.uk/tools-monitoring-data/roadside-no2-projection-factor.html

Table 5-5 – Required Reduction in NO_x emissions to meet AQO for Annual Mean NO_2

Metric	Value (Concentrations as µg/m³)
Worst-Case Relevant Exposure NO_2 Concentration	58.1
Equivalent NO_x Concentration	108.8
Background NO_x	18.3
Background NO_2	13.5
Road NO_x - Current	98.9
Road NO_x - Required (to achieve NO_2 concentration of 39.9µg/m³)	53.8
Required Road NO_x Reduction	45.1
Required % Reduction	45.6%

5.2.2 Hertford AQMA - Baseline 2019 NO_2 Concentrations

As a worst-case approach, the projection is based upon the receptor predicted as having the maximum annual mean NO_2 concentration, which in this case is Receptor 26. The appropriate roadside NO_2 projection factors, as provided on the LAQM Support website[19], are then applied to this concentration value to ascertain the estimated NO_2 annual mean reduction per annum, and hence the anticipated year of compliance. In this case, roadside projection factors for ‘Rest of UK (HDV <10%)’ have been applied, consistent with the worst-case receptor location.

The projected NO_2 annual mean concentrations following the above approach are presented in Table 5-6

Table 5-6 – Projected Annual Mean NO_2 Concentrations – Hertford AQMA

Receptor 35											
2019 Annual Mean Concentration (µg/m³)	Predicted Annual Mean Concentration (µg/m³)										
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
50.6	**48.1**	**45.4**	**42.8**	**40.6**	38.4	36.4	34.7	33.0	31.6	30.3	29.2
In **bold**, exceedance of the NO_2 annual mean AQS objective of 40µg/m³ Vehicle Adjustment Factor = Rest of UK (HDV <10%)											

Table 5-6 indicates that the first year by which Receptor 35 will be exposed to a concentration below the annual mean NO_2 AQS objective will be 2024. Additionally, it is expected that concentrations are expected to drop below 10% of the annual mean NO_2 AQS objective by 2026. 2024 is therefore considered the predicted year of compliance for those receptors used within the model, which are believed to represent worst case exposure within the Hertford AQMA, in the absence of the implementation of any specific intervention measures to further bring forward local air quality improvements in the area.

Table 5-7 below also illustrates the required reduction in NO_x emissions for annual mean NO_2 concentrations to fall below the AQO of 40µg/m³. As shown a 25.7% reduction in road NO_x is required to meet the AQO for annual mean NO_2 at the worst-case receptor in the Hertford AQMA.

[19] https://laqm.defra.gov.uk/tools-monitoring-data/roadside-no2-projection-factor.html

Table 5-7 – Required Reduction in NO_x emissions to meet AQO for Annual Mean NO_2

Metric	Value (Concentrations as µg/m³)
Worst-Case Relevant Exposure NO_2 Concentration	50.6
Equivalent NO_x Concentration	96.9
Background NO_x	20.7
Background NO_2	15.1
Road NO_x - Current	76.2
Road NO_x - Required (to achieve NO_2 concentration of 39.9µg/m³)	50.5
Required Road NO_x Reduction	25.7
Required % Reduction	33.7%

5.2.3 Sawbridgeworth AQMA - Baseline 2019 NO_2 Concentrations

As a worst-case approach, the projection is based upon the receptor predicted as having the maximum annual mean NO_2 concentration, which in this case is Receptor 59. The appropriate roadside NO_2 projection factors, as provided on the LAQM Support website[20], are then applied to this concentration value to ascertain the estimated NO_2 annual mean reduction per annum, and hence the anticipated year of compliance. In this case, roadside projection factors for 'Rest of UK (HDV <10%)' have been applied, consistent with the worst-case receptor location.

The projected NO_2 annual mean concentrations following the above approach are presented in Table 5-8.

Table 5-8 – Projected Annual Mean NO_2 Concentrations – Sawbridgeworth AQMA

Receptor 35											
2019 Annual Mean Concentration (µg/m³)	Predicted Annual Mean Concentration (µg/m³)										
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
55.8	**53.0**	**50.1**	**47.3**	**44.8**	**42.4**	**40.2**	38.2	36.4	34.8	33.4	32.2
In **bold**, exceedance of the NO_2 annual mean AQS objective of 40µg/m³ Vehicle Adjustment Factor = Rest of UK (HDV <10%)											

Table 5-8 indicates that the first year by which Receptor 59 will be exposed to a concentration below the annual mean NO_2 AQS objective will be 2026. Additionally, it is expected that concentrations are expected to drop below 10% of the annual mean NO_2 AQS objective by 2028. 2026 is therefore considered the predicted year of compliance for those receptors used within the model, which are believed to represent worst case exposure within the Sawbridgeworth AQMA, in the absence of the implementation of any specific intervention measures to further bring forward local air quality improvements in the area.

Table 5-9 below also illustrates the required reduction in NO_x emissions for annual mean NO_2 concentrations to fall below the AQO of 40µg/m³. As shown a 40.6% reduction in road NO_x is required to meet the AQO for annual mean NO_2 at the worst-case receptor in the Sawbridgeworth AQMA.

[20] https://laqm.defra.gov.uk/tools-monitoring-data/roadside-no2-projection-factor.html

Table 5-9 – Required Reduction in NO_x emissions to meet AQO for Annual Mean NO_2

Metric	Value (Concentrations as µg/m³)
Worst-Case Relevant Exposure NO_2 Concentration	55.9
Equivalent NO_x Concentration	112.8
Background NO_x	15.3
Background NO_2	11.5
Road NO_x - Current	97.5
Road NO_x - Required (to achieve NO_2 concentration of 39.9µg/m³)	57.9
Required Road NO_x Reduction	39.6
Required % Reduction	40.6%

5.3 Source Apportionment

To help inform the development of measures as part of the action plan stage of the project, a NO_x source apportionment exercise was undertaken for the following vehicle classes:

- Petrol Cars
- Diesel Cars
- Petrol LGV
- Diesel LGV
- Rigid HGV
- Artic HGV
- Buses
- Motorcycle
- Full Hybrid Petrol Cars
- Plug-in Hybrid Petrol Cars
- Full Hybrid Diesel Cars
- EV Cars

This will provide vehicle emission proportions of NO_x that will allow the Council to design specific AQAP measures targeting a reduction in emissions from specific vehicle types for each of the AQMAs.

It should be noted that emission sources of NO_2 are dominated by a combination of direct NO_2 (f-NO_2) and oxides of nitrogen (NO_x), the latter of which is chemically unstable and rapidly oxidised upon release to form NO_2. Reducing levels of NO_x emissions therefore reduces levels of NO_2. As a consequence, the source apportionment study has considered the emissions of NO_x which are assumed to be representative of the main sources of NO_2.

The sections below detail the source apportionment results for NO_x concentrations at modelled receptors for three scenarios:

- The average Total NO_x split across all modelled receptors. This provides useful information to understand the split between local and regional background sources as well as local road sources. In accordance with TG(22)[2]. Regional background is considered to be the emissions from background sources that the authority is unable to influence and the local background the background emissions they have some influence over. Local Sources give rise to the hotspot areas of exceedances, and the principal sources for the local authority.

- The average NO_x contributions within the AQMA. This will inform potential prominent NO_x contributors present within the identified area of exceedance and therefore be useful when testing and adopting action measures; and,

- The location where the maximum road NO_x concentration has been predicted within the AQMA. This is likely to be in the area of most concern within the proposed AQMA and so a good place to test and adopt action measures. Any gains predicted by action measures are however likely to be greatest at this location and so would not represent gains across the whole modelled area.

Details of the source apportionment for PM_{10} and $PM_{2.5}$ for each of the AQMAs has also been provided. Although there are no exceedances of the PM_{10} or $PM_{2.5}$ annual or daily AQO in any of the AQMAs within EHDC, the source apportionment below illustrates the key sources and areas of emissions for both PM_{10} and $PM_{2.5}$

5.3.1 Bishop's Stortford AQMA - Baseline 2019 NOx Concentrations

When considering the average NO_x background split across all modelled receptor locations, the following observations were found:

- Regional Background NO_x accounted for 10.1% (7.2µg/m^3)
- Local Background NO_x accounted for 15.7% (11.1µg/m^3)
- Local Road Traffic accounted for the largest majority, 74.2% (52.4µg/m^3)

When considering the average NO_x concentration across all modelled receptor locations, the following observations were found:

- Road traffic accounts for 52.4/m^3 (74.2%) of total NO_x (70.7µg/m^3), with background accounting for 18.3µg/m^3 (25.8%);
- Of the total road NO_x, Diesel Cars are the highest contributing vehicle class accounting for 55.9% (29.3µg/m^3);
- Diesel LGVs are found to be the second highest contributing vehicle class accounting for 16.8% (8.8µg/m^3);
- Rigid HGVs, Petrol Cars and Buses account for similar total road NO_x (Rigid HGVs – 8.4% (4.4µg/m^3), Petrol Cars – 8.2% (4.3µg/m^3) and Buses 7.0% (3.7µg/m^3)));
- Artic HGV's accounted for 3.3% with all other vehicle types accounting for <1%.

When considering the modelled receptor location at which the maximum road NO_x concentration has been predicted:

- Road traffic accounts for 84.4% (98.9µg/m^3) of the total averaged NO_x (117.2µg/m^3) – highlighting contributions from road traffic to be the core component in areas of exceedance;
- Of the total road NO_x, Diesel Cars are found to be the highest contributing vehicle class accounting for 55.2% (54.6µg/m^3). This is very similar to the trend across all modelled receptors, indicating that Diesel Vehicles are the predominant source of NO_x emissions across the AQMA;
- Diesel LGVs are found to be the second highest contributing vehicle class accounting for 18.8% (18.6µg/m^3). This observed percentage contribution slightly higher than the observations found across the AQMA;
- Rigid HGVs account for 9.6% (9.4µg/m^3) of the total road NO_x, Artic HGVs accounting for 3.7% (3.7µg/m^3) and Petrol Cars 8.8% (8.7µg/m^3). This is a slight increase to the contribution observed across the whole AQMA and suggests an influence on exceedance within key areas of the AQMA;

- Buses account for 3.5% (3.5µg/m^3) of the total road NO_x – a large decrease in percentage contribution in comparison to the whole- suggesting that buses are not a large influence on exceedance of the AQO within this specific area of the AQMA; and

- All other vehicle types are similarly found to contribute <1%.

The NO_x source apportionment exercise demonstrates a largely consistent ranking of contributing vehicle classes exhibited (Diesel Cars, Diesel LGVs, Rigid HGVs and Buses), where Diesel Cars primarily are found to be the main contributors to total road NO_x concentrations across the Bishop's Stortford AQMA.

Whilst comparing modelled contributions at identified receptor locations within the AQMA against the max receptor within the AQMA, Diesel Cars were observed to have a very similar influence to total road NO_x concentrations within the AQMA. This is the case for all the other vehicle types, with only buses showing a large decrease in percentage contribution at the max receptors when compared the average across the AQMA

Overall this suggests the volume of traffic, "street canyon" effects and congestion in the AQMA is considered to be the key contributor to elevated levels of NO_2 annual mean concentrations within the AQMA. The key location in the AQMA where elevated levels of NO_2 are observed is the main junction of A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road.

Table 5-10 and Table 5-11 illustrate the NO_x source apportionment results for the Bishop's Stortford AQMA, with Figure 5-7 providing a graphical representation of the split in background concentrations, and local road source.

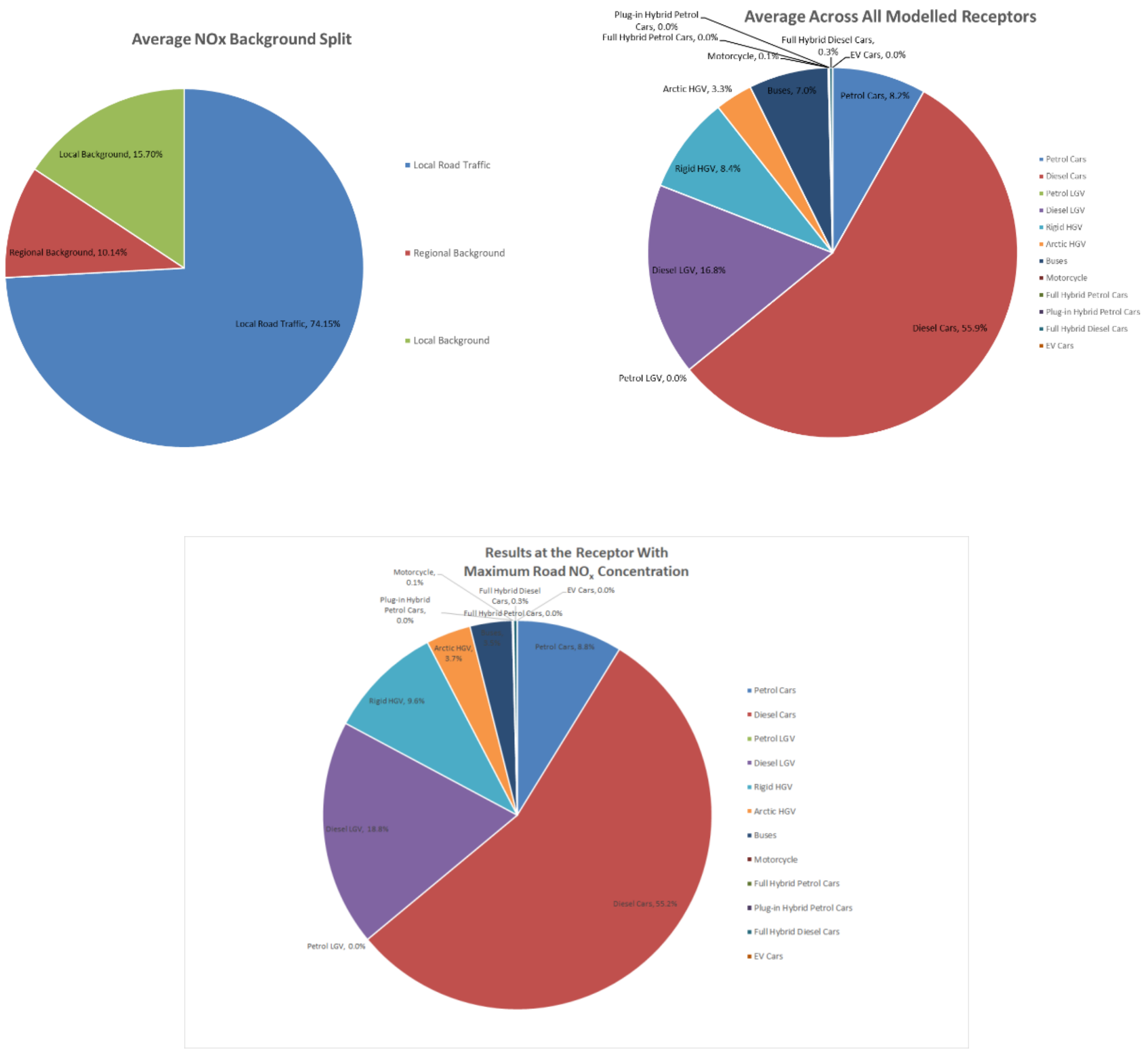
Table 5-10 – Total NO_x Source Apportionment Across All Receptors

Results	Local Background NO_x	Regional Background NO_x	Local Road NO_x
NO_x Concentration (µg/m^3)	11.1	7.2	52.4
Percentage of total NO_x (µg/m^3)	15.7	10.1	74.2

Table 5-11 – Detailed Source Apportionment of Road NO_x Concentrations

Results	All Vehicles	Petrol Cars	Diesel Cars	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses	Motorcycle	Full Hybrid Petrol Cars	Plug-in Hybrid Petrol Cars	Full Hybrid Diesel Cars	EV Cars	Background
Average Across all Receptors within AQMA														
NO_x Concentration (µg/m^3)	52.4	4.3	29.3	<0.1	8.8	4.4	1.7	3.7	0.0	<0.1	<0.1	0.2	0.0	18.3
Percentage of total NO_x (µg/m^3)	74.2	6.1	41.5	<0.1	12.5	6.3	2.4	5.2	0.1	<0.1	<0.1	0.2	0.0	25.8
Percentage Road Contribution to total NO_x (µg/m^3)	100.0	8.2	55.9	<0.1	16.8	8.4	3.3	7.0	0.1	<0.1	<0.1	0.3	0.0	-
At Receptor with Maximum Road NO_x Concentration														
NO_x Concentration (µg/m^3)	98.9	8.7	54.6	<0.1	18.6	9.4	3.7	3.5	0.1	<0.1	<0.1	0.3	0.0	18.3
Percentage of total NO_x (µg/m^3)	84.4	7.4	46.6	<0.1	15.9	8.1	3.1	3.0	0.1	<0.1	<0.1	0.3	0.0	15.6
Percentage Road Contribution to total NO_x (µg/m^3)	100.0	8.8	55.2	<0.1	18.8	9.6	3.7	3.5	0.1	<0.1	<0.1	0.3	0.0	-

Figure 5-7 Detailed Source Apportionment of NO_x Concentrations – Bishop's Stortford AQMA



5.3.2 Bishop's Stortford AQMA - Baseline 2019 PM_{10} and $PM_{2.5}$ Concentrations

When considering the average PM_{10} and $PM_{2.5}$ background split across all modelled receptor locations, the following observations were found:

- Regional Background PM_{10} accounted for 74.2% (14.6µg/m^3)
- Local Background PM_{10} accounted for 1.7% (0.3µg/m^3)
- Local Road Traffic PM_{10} accounted for 24.1% (4.7µg/m^3)
- Regional Background $PM_{2.5}$ accounted for 76.1% (9.7µg/m^3)
- Local Background $PM_{2.5}$ accounted for 1.7% (0.2µg/m^3)
- Local Road Traffic $PM_{2.5}$ accounted for 22.2% (2.8µg/m^3)

When considering the average PM_{10} and $PM_{2.5}$ concentration across the AQMA for the local road traffic emissions, the following observations were found.

- Both PM_{10} and $PM_{2.5}$ as expected had very similar proportions for their split per vehicle type
- Petrol and Diesel Cars accounted a similar proportion for both PM_{10} and $PM_{2.5}$ around 38% for Petrol Cars and 36% for Diesel Cars
- Diesel LGVs then followed with around 11.5% for both PM_{10} and $PM_{2.5}$.
- Rigid HGVs, Artic HGVs and Buses accounted for around 5.7%, 3.1% and 3.5% respectively for PM_{10} and $PM_{2.5}$.
- Hybrid Petrol Cars accounted for around 1.4% with all other vehicle types less than 1%.

Overall the PM_{10} and $PM_{2.5}$ source apportionment indicated that higher traffic volumes and high proportion vehicles, such as cars and diesel LGVs result in a higher percentage of PM_{10} and $PM_{2.5}$ emissions within the Bishop's Stortford AQMA.

Table 5-12 and Table 5-13 illustrate the PM_{10} and $PM_{2.5}$ source apportionment results for the Bishop's Stortford AQMA. With Figure 5-8 and Figure 5-9 providing a graphical representation of the split in background concentrations and local road source.

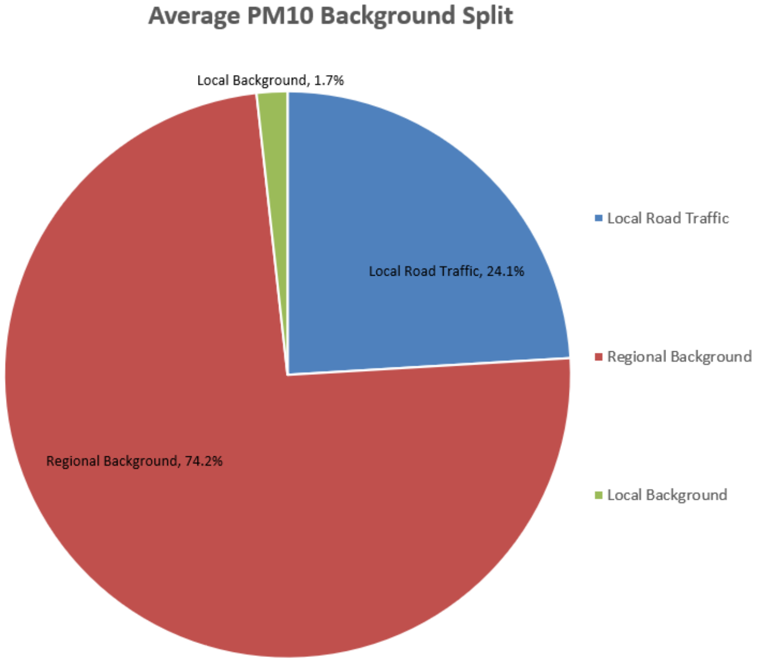
Table 5-12 – Total PM_{10} and $PM_{2.5}$ Source Apportionment Across All Receptors

Results	Local Background	Regional Background	Local Road
PM_{10}			
PM_{10} Concentration (µg/m^3)	0.3	14.6	4.7
Percentage of total PM_{10} (µg/m^3)	1.7	74.2	24.1
$PM_{2.5}$			
$PM_{2.5}$ Concentration (µg/m^3)	0.2	9.7	2.8
Percentage of total PM_2 (µg/m^3)	1.7	76.1	22.2

Table 5-13 – Detailed Source Apportionment of Road PM_{10} and $PM_{2.5}$ Concentrations within Bishop's Stortford AQMA

Results	All Vehicles	Petrol Cars	Diesel Cars	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses	Motorcycle	Full Hybrid Petrol Cars	Plug-in Hybrid Petrol Cars	Full Hybrid Diesel Cars	EV Cars	Background
PM_{10} Average Across all Receptors within AQMA														
PM_{10} Concentration (µg/m^3)	4.7	1.9	1.6	<0.1	0.5	0.3	0.1	0.2	0.0	0.1	0.0	0.0	0.0	15.0
Percentage of total PM_{10} (µg/m^3)	24.1	9.5	8.3	<0.1	2.7	1.4	0.7	0.8	0.1	0.4	0.1	0.0	0.1	75.9
Percentage Road Contribution to total PM_{10} (µg/m^3)	100.0	39.7	34.4	<0.1	11.1	5.7	3.1	3.2	0.2	1.5	0.4	0.2	0.3	-
$PM_{2.5}$ Average Across all Receptors within AQMA														
$PM_{2.5}$ Concentration (µg/m^3)	2.8	1.1	1.0	0.0	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	9.9
Percentage of total $PM_{2.5}$ (µg/m^3)	22.2	8.3	8.0	0.0	2.5	1.3	0.7	0.8	0.1	0.3	0.1	0.0	0.1	77.8
Percentage Road Contribution to total $PM_{2.5}$ (µg/m^3)	100.0	37.3	36.2	0.1	11.4	5.8	3.1	3.5	0.3	1.4	0.4	0.2	0.3	-

Figure 5-8 – Detailed Source Apportionment of PM_{10} Concentrations – Bishop's Stortford AQMA



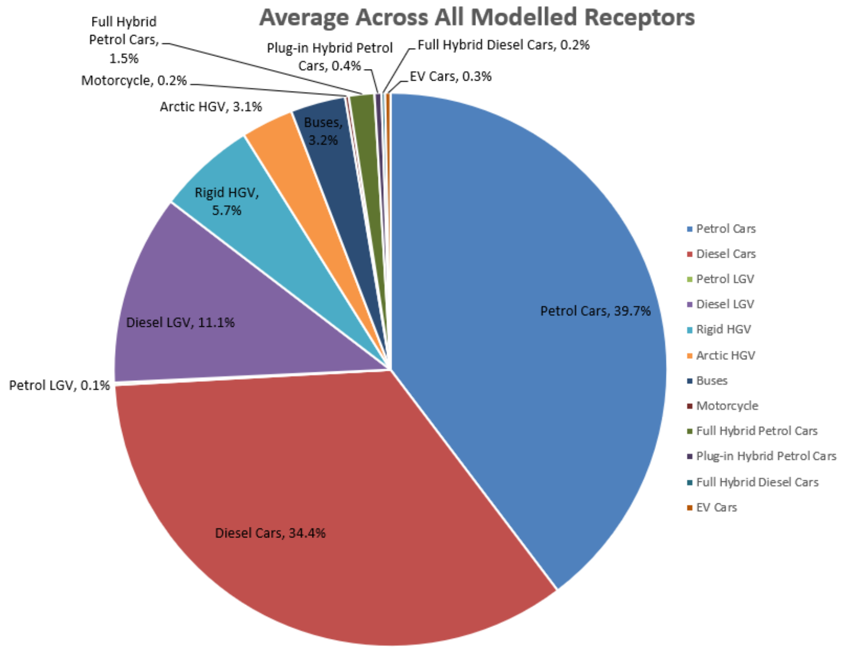
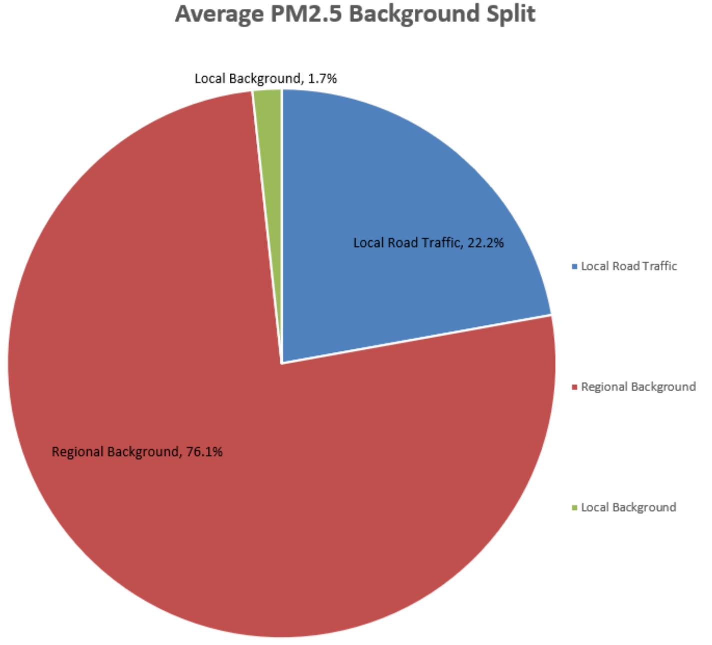
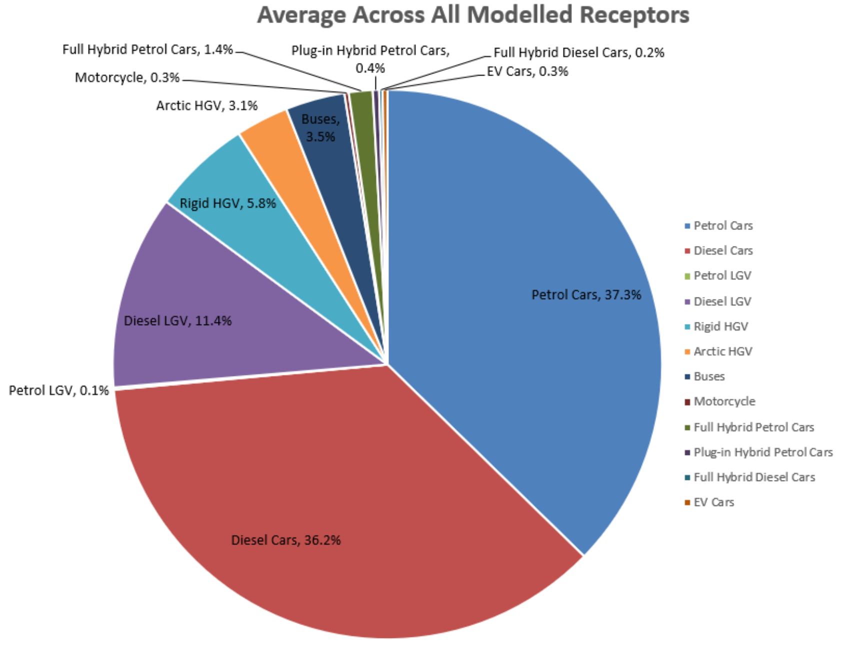


Figure 5-9 – Detailed Source Apportionment of $PM_{2.5}$ Concentrations – Bishop's Stortford AQMA





5.3.3 Hertford AQMA - Baseline 2019 NOx Concentrations

When considering the average NO_x background split across all modelled receptor locations, the following observations were found:

- Regional Background NO_x accounted for 14.2% (7.3µg/m^3)
- Local Background NO_x accounted for 25.5% (13.1µg/m^3)
- Local Road Traffic accounted for the largest majority, 60.3% (31.0µg/m^3)

When considering the average NO_x concentration across all modelled receptor locations, the following observations were found:

- Of the total road NO_x, Diesel Cars are highest contributing vehicle class accounting for 52.7% (16.3µg/m^3);
- Diesel LGVs are found to be the second highest contributing vehicle class accounting for 19.7% (6.1µg/m^3);
- Rigid HGVs, Petrol Cars and Buses account for similar total road NO_x (Rigid HGVs – 8.8% (2.7µg/m^3), Petrol Cars – 8.5% (2.6µg/m^3) and Buses 6.5% (2.0µg/m^3)));
- Artic HGV's accounted for 3.2% with all other vehicle types accounting for <1%.

When considering the modelled receptor location at which the maximum road NO_x concentration has been predicted:

- Road traffic accounts for 78.6% (76.2µg/m^3) of the total averaged NO_x (96.9µg/m^3) – highlighting contributions from road traffic to be the core component in areas of exceedance;
- Of the total road NO_x, Diesel Cars are found to be the highest contributing vehicle class accounting for 59.3% (45.2µg/m^3). This is very similar to the trend across all modelled receptors, indicating that Diesel Vehicles are the predominant source of NO_x emissions across the AQMA;
- Rigid HGVs are found to be the second highest contributing vehicle class accounting for 12.8% (9.7µg/m^3). This observed percentage contribution is 4% higher than the observations found across the AQMA;
- Diesel LGVs account for 10.5% (8.0µg/m^3) of the total road NO_x, Artic HGVs accounting for 5.0% (3.8µg/m^3) and Petrol Cars 9.0% (6.9µg/m^3). This is a slight increase to the contribution observed for petrol cars and artic HGVs but a decrease of 9.2% for diesel LGV's across the whole AQMA and suggests an influence on exceedance within key areas of the AQMA;
- Buses account for 2.9% (2.2µg/m^3) of the total road NO_x – a large decrease in percentage contribution in comparison to the whole- suggesting that buses are not a large influence on exceedance of the AQO within this specific area of the AQMA; and
- All other vehicle types are similarly found to contribute <1%.

The NO_x source apportionment exercise demonstrates a largely consistent ranking of contributing vehicle classes exhibited (Diesel Cars, Diesel LGVs, Rigid HGVs and Buses), where Diesel Cars primarily are found to be the main contributors to total road NO_x concentrations across the Hertford AQMA.

Whilst comparing modelled contributions at identified receptor locations within the AQMA against the max receptor within the AQMA, Diesel Cars were observed to have a very similar influence to total road NO_x concentrations within the AQMA. This is the case for all the other vehicle types, with diesel LGVs and buses showing a decrease in percentage contribution at the max receptors when compared the average across the AQMA and Rigid HGVs an increase.

Overall this suggests volume of traffic and congestion on the main roads such as Gascoyne Way is considered to be the key contributor to elevated levels of NO_2 annual mean concentrations within the AQMA.

Table 5-10Table 5-14 and Table 5-15 illustrate the NO_x source apportionment results for the Bishop's Stortford AQMA, with Figure 5-10 providing a graphical representation of the split in background concentrations, and local road source.

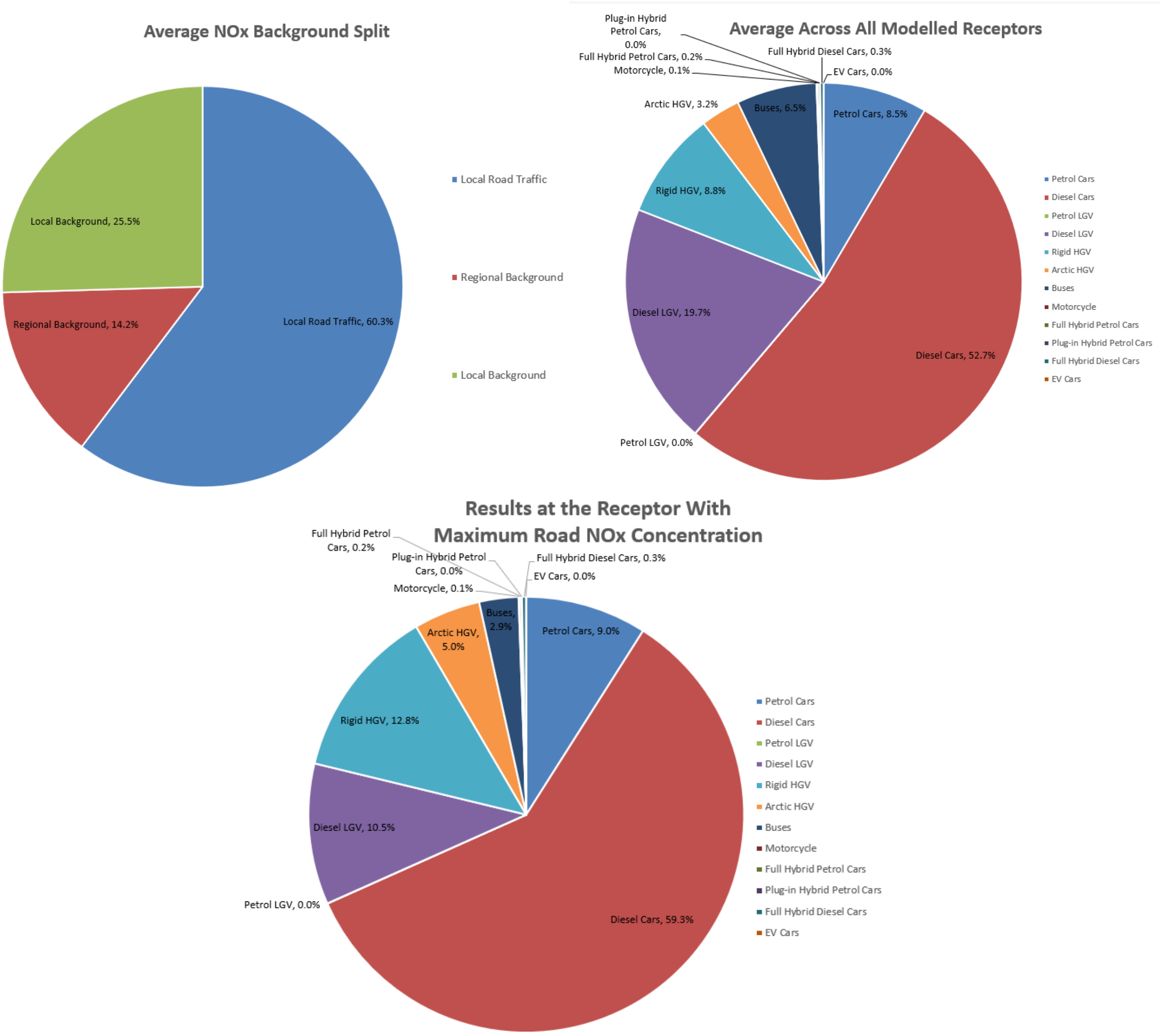
Table 5-14 – Total NO_x Source Apportionment Across All Receptors – Hertford AQMA

Results	Local Background NO_x	Regional Background NO_x	Local Road NO_x
NO_x Concentration (µg/m^3)	13.1	7.3	30.9
Percentage of total NO_x (µg/m^3)	25.5	14.2	60.3

Table 5-15 – Detailed Source Apportionment of Road NO_x Concentrations – Hertford AQMA

Results	All Vehicles	Petrol Cars	Diesel Cars	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses	Motorcycle	Full Hybrid Petrol Cars	Plug-in Hybrid Petrol Cars	Full Hybrid Diesel Cars	EV Cars	Background
Average Across all Receptors within AQMA														
NO_x Concentration (µg/m^3)	30.9	2.6	16.3	<0.1	6.1	2.7	1.0	2.0	0.0	0.0	<0.1	0.1	0.0	20.4
Percentage of total NO_x (µg/m^3)	60.3	5.1	31.8	<0.1	11.9	5.3	1.9	3.9	0.1	0.1	<0.1	0.2	0.0	39.7
Percentage Road Contribution to total NO_x (µg/m^3)	100.0	8.5	52.7	<0.1	19.7	8.8	3.2	6.5	0.1	0.2	<0.1	0.3	0.0	-
At Receptor with Maximum Road NOx Concentration														
NO_x Concentration (µg/m^3)	76.2	6.9	45.2	<0.1	8.0	9.7	3.8	2.2	0.1	0.1	<0.1	0.2	0.0	20.7
Percentage of total NO_x (µg/m^3)	78.6	7.1	46.6	<0.1	8.2	10.1	3.9	2.3	0.1	0.1	<0.1	0.2	0.0	21.4
Percentage Road Contribution to total NO_x (µg/m^3)	100.0	9.0	59.3	<0.1	10.5	12.8	5.0	2.9	0.1	0.%	<0.1	0.3	0.0	-

Figure 5-10 – Detailed Source Apportionment of NO_x Concentrations – Hertford AQMA



5.3.4 Hertford AQMA - Baseline 2019 PM_{10} and $PM_{2.5}$ Concentrations

When considering the average PM_{10} and $PM_{2.5}$ background split across all modelled receptor locations, the following observations were found:

- Regional Background PM_{10} accounted for 80.7% (15.0µg/m^3)
- Local Background PM_{10} accounted for 2.3% (0.4µg/m^3)
- Local Road Traffic PM_{10} accounted for 17.0% (3.2µg/m^3)
- Regional Background $PM_{2.5}$ accounted for 83.0% (10.3µg/m^3)
- Local Background $PM_{2.5}$ accounted for 2.2% (0.3µg/m^3)
- Local Road Traffic $PM_{2.5}$ accounted for 14.8% (1.8µg/m^3)

When considering the average PM_{10} and $PM_{2.5}$ concentration across the AQMA for the local road traffic emissions, the following observations were found.

- Both PM_{10} and $PM_{2.5}$ as expected had very similar proportions for their split per vehicle type
- Petrol and Diesel Cars accounted a similar proportion for both PM_{10} and $PM_{2.5}$ around 38% for Petrol Cars and 33% for Diesel Cars
- Diesel LGVs then followed with around 11.5% for both PM_{10} and $PM_{2.5.}$
- Rigid HGVs, Artic HGVs and Buses accounted for around 7.0%, 3.8% and 3.0% respectively for PM_{10} and $PM_{2.5}$.
- Hybrid Petrol Cars accounted for around 1.4% with all other vehicle types less than 1%.

Overall the PM_{10} and $PM_{2.5}$ source apportionment indicated that higher traffic volumes and high proportion vehicles, such as cars and diesel LGVs result in a higher percentage of PM_{10} and $PM_{2.5}$ emissions within the Hertford AQMA.

Table 5-16 and Table 5-17 illustrate the PM_{10} and $PM_{2.5}$ source apportionment results for the Bishop's Stortford AQMA. With Figure 5-11 and Figure 5-12 providing a graphical representation of the split in background concentrations and local road source.

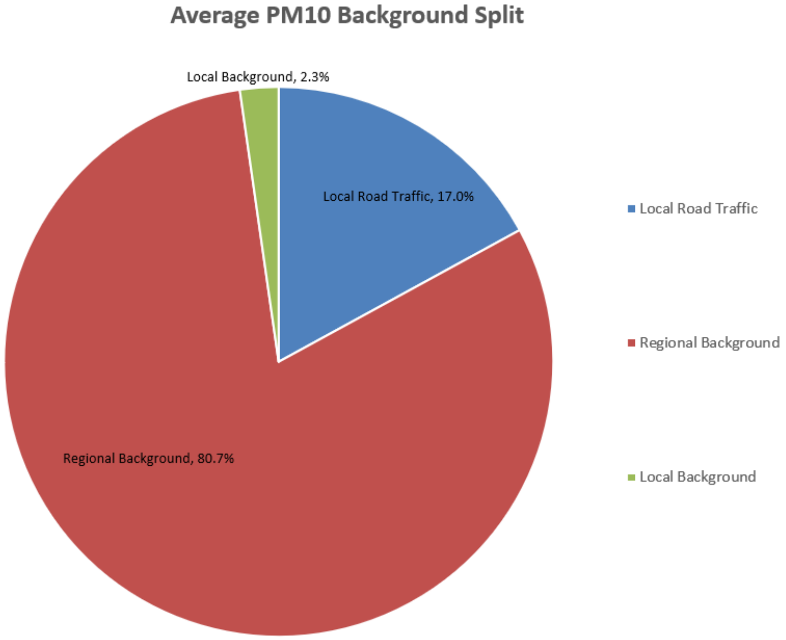
Table 5-16 – Total PM_{10} and $PM_{2.5}$ Source Apportionment – Hertford AQMA

Results	Local Background	Regional Background	Local Road
PM_{10}			
PM_{10} Concentration ($\mu g/m^3$)	0.4	15.0	3.2
Percentage of total PM_{10} ($\mu g/m^3$)	2.3	80.7	17.0
$PM_{2/5}$			
$PM_{2.5}$ Concentration ($\mu g/m^3$)	0.3	10.3	1.8
Percentage of total PM_2 ($\mu g/m^3$)	2.2	83.0	14.8

Table 5-17 – Detailed Source Apportionment of Road PM_{10} and $PM_{2.5}$ Concentrations within Hertford AQMA

Results	All Vehicles	Petrol Cars	Diesel Cars	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses	Motorcycle	Full Hybrid Petrol Cars	Plug-in Hybrid Petrol Cars	Full Hybrid Diesel Cars	EV Cars	Background
PM_{10} Average Across all Receptors within AQMA														
PM_{10} Concentration ($\mu g/m^3$)	3.2	1.2	1.0	<0.1	0.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	15.4
Percentage of total PM_{10} ($\mu g/m^3$)	17.0	6.7	5.6	<0.1	1.9	1.2	0.6	0.5	0.0	0.2	0.1	0.0	0.1	83.0
Percentage Road Contribution to total PM_{10} ($\mu g/m^3$)	100.0	39.1	32.9	<0.1	11.4	7.0	3.8	2.9	0.3	1.5	0.4	0.2	0.3	-
$PM_{2.5}$ Average Across all Receptors within AQMA														
$PM_{2.5}$ Concentration ($\mu g/m^3$)	1.8	0.7	0.6	<0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	10.6
Percentage of total $PM_{2.5}$ ($\mu g/m^3$)	14.9	5.5	5.1	<0.1	1.7	1.0	0.6	0.5	0.1	0.2	0.1	0.0	0.0	85.1
Percentage Road Contribution to total $PM_{2.5}$ ($\mu g/m^3$)	100.0	37.2	34.5	<0.1	11.6	7.0	3.8	3.2	0.3	1.4	0.4	0.2	0.3	-

Figure 5-11 – Detailed Source Apportionment of PM_{10} Concentrations – Hertford AQMA



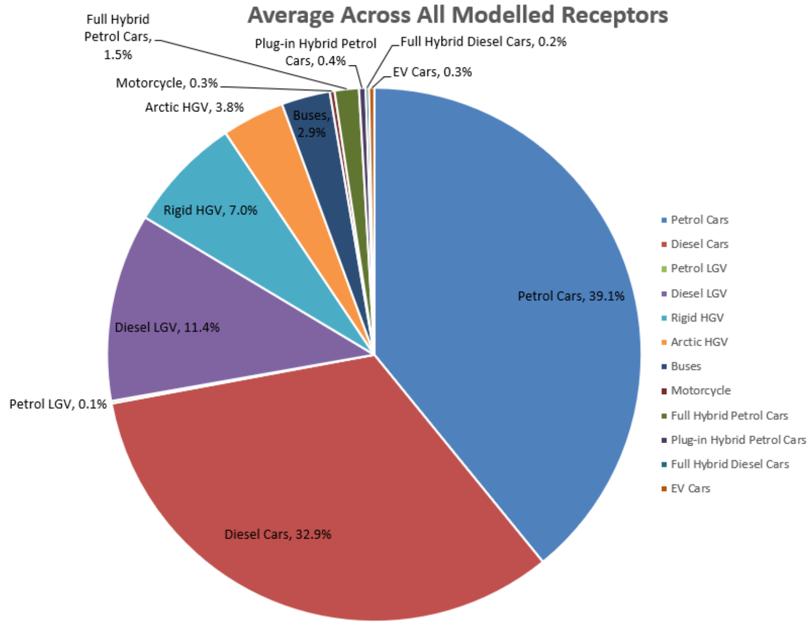
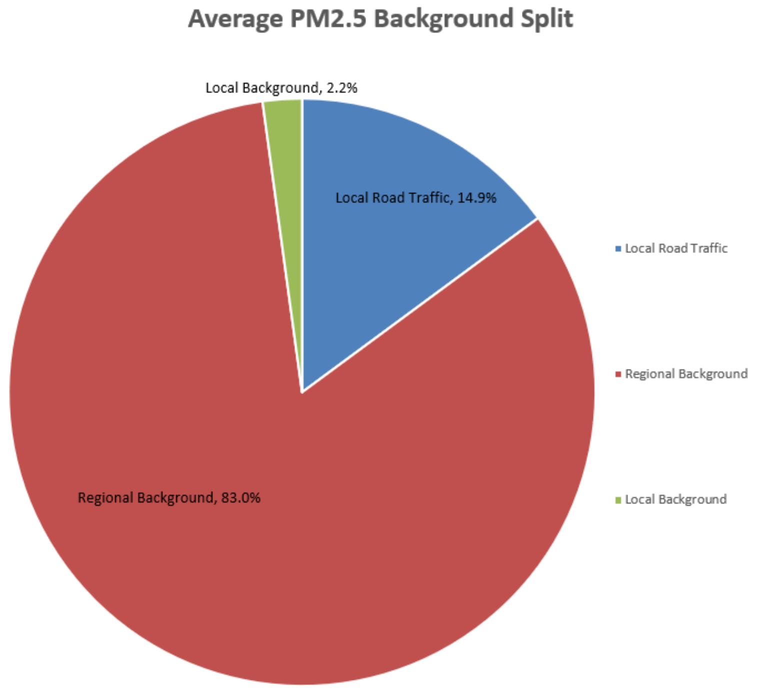
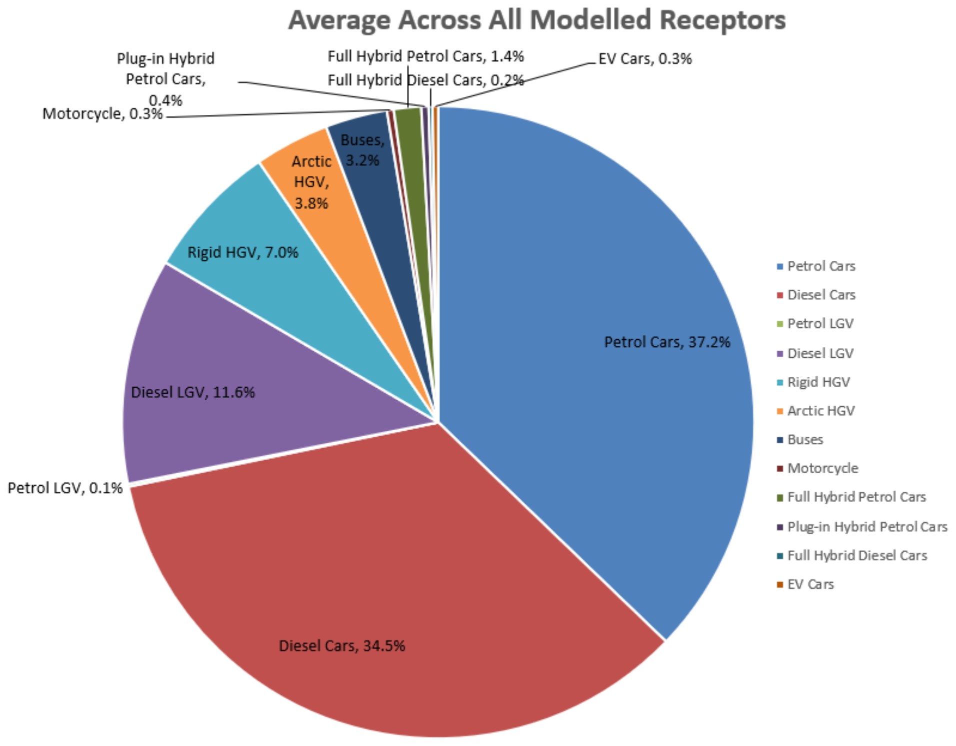


Figure 5-12 – Detailed Source Apportionment of $PM_{2.5}$ Concentrations - Hertford AQMA





5.3.5 Sawbridgeworth AQMA - Baseline 2019 NOx Concentrations

When considering the average NO_x background split across all modelled receptor locations, the following observations were found:

- Regional Background NO_x accounted for 16.8% (7.4µg/m^3)
- Local Background NO_x accounted for 18.1% (7.9µg/m^3)
- Local Road Traffic accounted for the largest majority, 65.1% (28.6µg/m^3)

When considering the average NO_x concentration across all modelled receptor locations, the following observations were found:

- Of the total road NO_x, Diesel Cars are highest contributing vehicle class accounting for 49.4% (14.1µg/m^3);
- Diesel LGVs are found to be the second highest contributing vehicle class accounting for 28.4% (8.1µg/m^3);
- Petrol Cars then follow contributing 8.1% (2.3µg/m^3)
- Rigid HGVs and Buses account for similar total road NO_x (Rigid HGVs – 5.9% (1.7µg/m^3), and Buses 5.5% (1.6µg/m^3)));
- Artic HGV's accounted for 2.1% with all other vehicle types accounting for <1%.

When considering the modelled receptor location at which the maximum road NO_x concentration has been predicted:

- Road traffic accounts for 86.0% (97.5µg/m^3) of the total averaged NO_x (113.4µg/m^3) – highlighting contributions from road traffic to be the core component in areas of exceedance;
- Of the total road NO_x, Diesel Cars are found to be the highest contributing vehicle class accounting for 49.1% (47.9µg/m^3). This is very similar to the trend across all modelled receptors, indicating that Diesel Vehicles are the predominant source of NO_x emissions across the AQMA;
- Diesel LGVs are found to be the second highest contributing vehicle class accounting for 24.2% (23.6µg/m^3). This observed percentage contribution slightly higher than the observations found across the AQMA;
- Rigid HGVs account for 7.8% (7.6µg/m^3) of the total road NO_x, Buses accounting for 8.2% (8.0µg/m^3) and Petrol Cars 7.4% (7.3µg/m^3). This is a slight increase to the contribution observed across the whole AQMA for Rigid HGVs and buses and suggests an influence on exceedance within key areas of the AQMA;
- Artic HGVs account for 3.0% and all other vehicle types are similarly found to contribute <1%.

The NO_x source apportionment exercise demonstrates a largely consistent ranking of contributing vehicle classes exhibited throughout all scenarios (Diesel Cars, Diesel LGVs, Rigid HGVs and

Buses), where Diesel Cars primarily are found to be the main contributors to total road NO_x concentrations across the Sawbridgeworth AQMA.

Whilst comparing modelled contributions at identified receptor locations within the AQMA against the max receptor within the AQMA, Diesel Cars were observed to have a very similar influence to total road NO_x concentrations within the AQMA. This is the case for all the other vehicle types, with only Rigid HGVs and buses showing a slight increase in percentage contribution at the max receptors when compared the average across the AQMA

Overall this suggests volume of traffic and congestion to the main junctions along Gascoyne Way is considered to be the key contributor to elevated levels of NO_2 annual mean concentrations within the AQMA.

Table 5-18 and Table 5-19 illustrate the NO_x source apportionment results for the Bishop's Stortford AQMA, with Figure 5-13 providing a graphical representation of the split in background concentrations, and local road source.

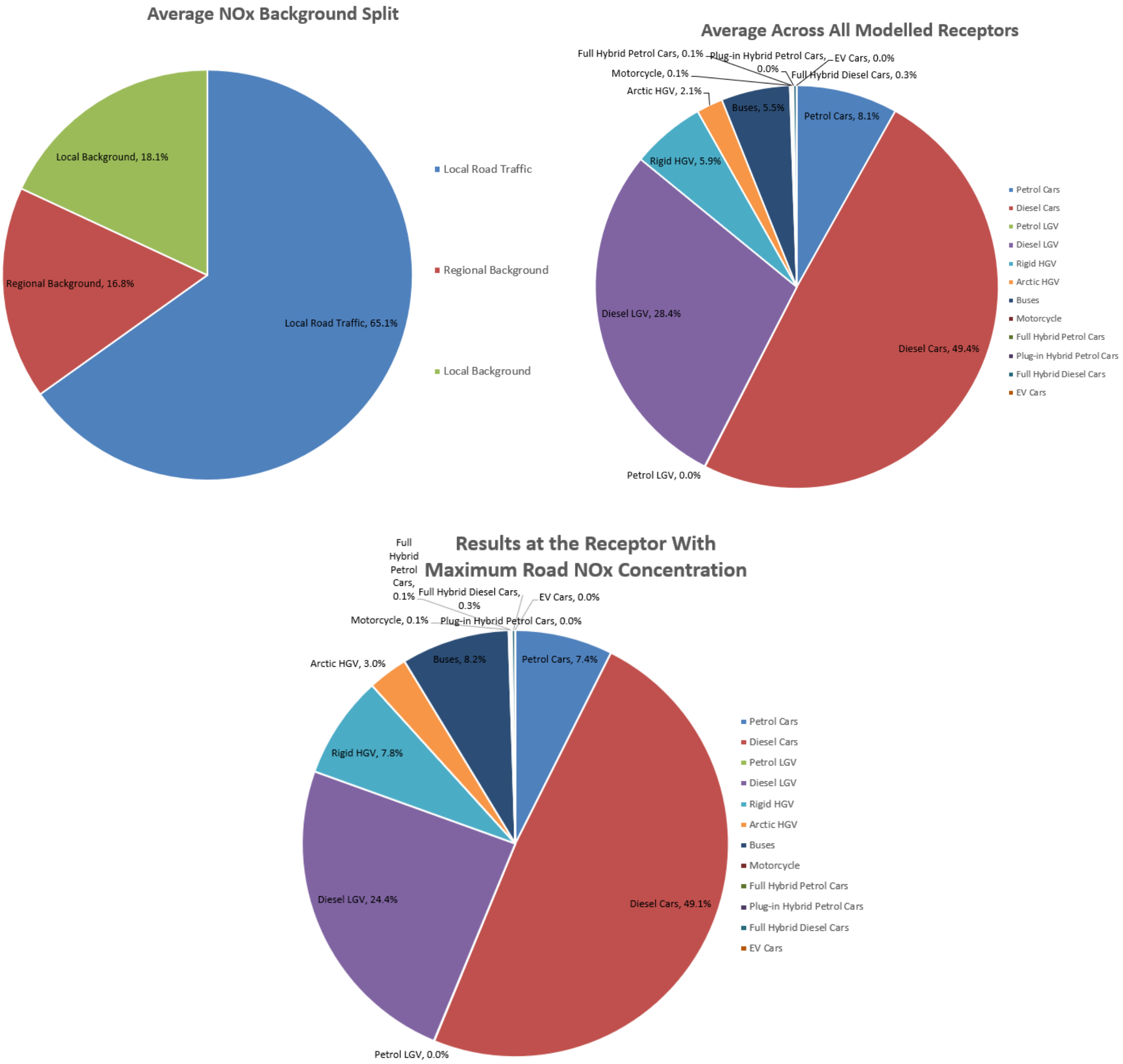
Table 5-18 – Total NO_x Source Apportionment – Sawbridgeworth AQMA

Results	Local Background NO_x	Regional Background NO_x	Local Road NO_x
NO_x Concentration (µg/m^3)	7.9	7.4	28.6
Percentage of total NO_x (µg/m^3)	18.1	16.8	65.1

Table 5-19 – Detailed Source Apportionment of Road NO_x Concentrations – Sawbridgeworth AQMA

Results	All Vehicles	Petrol Cars	Diesel Cars	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses	Motorcycle	Full Hybrid Petrol Cars	Plug-in Hybrid Petrol Cars	Full Hybrid Diesel Cars	EV Cars	Background
Average Across all Receptors within AQMA														
NO_x Concentration (µg/m^3)	28.6	2.3	14.1	<0.1	8.1	1.7	0.6	1.6	0.0	0.0	<0.1	0.1	0.0	15.3
Percentage of total NO_x (µg/m^3)	65.1	5.3	32.2	<0.1	18.5	3.8	1.4	3.6	0.1	0.1	<0.1	0.2	0.0	34.9
Percentage Road Contribution to total NO_x (µg/m^3)	100.0	8.1	49.4	<0.1	28.4	5.9	2.1	5.5	0.1	0.1	<0.1	0.3	0.0	-
At Receptor with Maximum Road NOx Concentration														
NO_x Concentration (µg/m^3)	97.5	7.3	47.9	<0.1	23.6	7.6	3.0	8.0	0.1	0.1	<0.1	0.3	0.0	15.9
Percentage of total NO_x (µg/m^3)	86.0	6.4	42.2	<0.1	20.8	6.7	2.6	7.1	0.1	0.1	<0.1	0.2	0.0	14.0
Percentage Road Contribution to total NO_x (µg/m^3)	100.0	7.4	49.1	<0.1	24.2	7.8	3.0	8.2	0.1	0.1	<0.1	0.3	0.0	-

Figure 5-13 – Detailed Source Apportionment of NO_x Concentrations – Sawbridgeworth AQMA



5.3.6 Sawbridgeworth AQMA - Baseline 2019 PM_{10} and $PM_{2.5}$ Concentrations

When considering the average PM_{10} and $PM_{2.5}$ background split across all modelled receptor locations, the following observations were found:

- Regional Background PM_{10} accounted for 82.1% (14.6µg/m^3)
- Local Background PM_{10} accounted for 1.3% (0.2µg/m^3)
- Local Road Traffic PM_{10} accounted for 16.6% (3.0µg/m^3)
- Regional Background $PM_{2.5}$ accounted for 83.7% (9.6µg/m^3)
- Local Background $PM_{2.5}$ accounted for 1.3% (0.1µg/m^3)
- Local Road Traffic $PM_{2.5}$ accounted for 15.0% (1.7µg/m^3)

When considering the average PM_{10} and $PM_{2.5}$ concentration across the AQMA for the local road traffic emissions, the following observations were found.

- Both PM_{10} and $PM_{2.5}$ as expected had very similar proportions for their split per vehicle type
- Petrol and Diesel Cars accounted a similar proportion for both PM_{10} and $PM_{2.5}$ around 37% for Petrol Cars and 32% for Diesel Cars
- Diesel LGVs then followed with around 16.5% for both PM_{10} and $PM_{2.5.}$
- Rigid HGVs, Artic HGVs and Buses accounted for around 5.1%, 2.8% and 3.3% respectively for PM_{10} and $PM_{2.5}$.
- Hybrid Petrol Cars accounted for around 1.4% with all other vehicle types less than 1%.

Overall the PM_{10} and $PM_{2.5}$ source apportionment indicated that higher traffic volumes and high proportion vehicles, such as cars and diesel LGVs result in a higher percentage of PM_{10} and $PM_{2.5}$ emissions within the Sawbridgeworth AQMA.

Table 5-20 and Table 5-21 illustrate the PM_{10} and $PM_{2.5}$ source apportionment results for the Bishop's Stortford AQMA. With Figure 5-14 and Figure 5-15 providing a graphical representation of the split in background concentrations and local road source.

Table 5-20 – Total PM_{10} and $PM_{2.5}$ Source Apportionment – Sawbridgeworth AQMA

Results	Local Background	Regional Background	Local Road
PM_{10}			
PM_{10} Concentration (µg/m^3)	0.2	14.6	3.0
Percentage of total PM_{10} (µg/m^3)	1.3	82.1	16.6
$PM_{2/5}$			
$PM_{2.5}$ Concentration (µg/m^3)	0.1	9.6	1.7
Percentage of total PM_2 (µg/m^3)	1.3	83.7	15.0

Table 5-21 – Detailed Source Apportionment of Road PM_{10} and $PM_{2.5}$ Concentrations within Sawbridgeworth AQMA

Results	All Vehicles	Petrol Cars	Diesel Cars	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses	Motorcycle	Full Hybrid Petrol Cars	Plug-in Hybrid Petrol Cars	Full Hybrid Diesel Cars	EV Cars	Background
PM_{10} Average Across all Receptors within AQMA														
PM_{10} Concentration (µg/m^3)	3.0	1.1	0.9	<0.1	0.5	0.2	0.1	0.1	0.0	0.0	0.0	<0.1	0.0	14.8
Percentage of total PM_{10} (µg/m^3)	16.6	6.3	5.3	<0.01	2.7	0.8	0.5	0.5	0.1	0.2	0.1	<0.1	0.1	83.4
Percentage Road Contribution to total PM_{10} (µg/m^3)	100.0	38.0	31.8	0.2	16.4	5.1	2.8	3.2	0.3	1.4	0.4	0.2	0.3	-
$PM_{2.5}$ Average Across all Receptors within AQMA														
$PM_{2.5}$ Concentration (µg/m^3)	1.7	0.6	0.6	<0.1	0.3	0.1	0.0	0.1	0.0	0.0	0.0	<0.1	0.0	9.7
Percentage of total $PM_{2.5}$ (µg/m^3)	15.0	5.5	5.0	<0.1	2.5	0.8	0.4	0.5	0.1	0.2	0.1	<0.1	0.0	85.0
Percentage Road Contribution to total $PM_{2.5}$ (µg/m^3)	100.0	36.3	33.2	0.2	16.6	5.0	2.8	3.3	0.4	1.4	0.4	0.2	0.3	-

Figure 5-14 – Detailed Source Apportionment of PM_{10} Concentrations – Sawbridgeworth AQMA

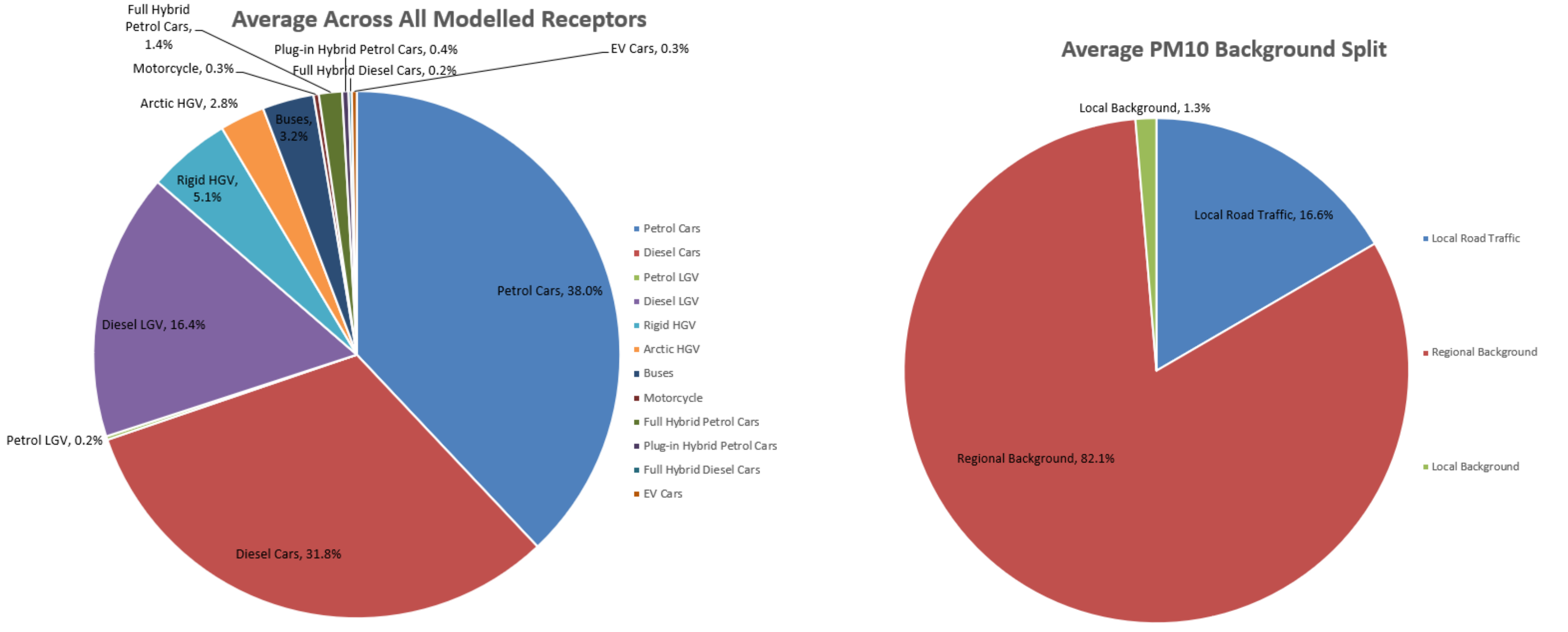
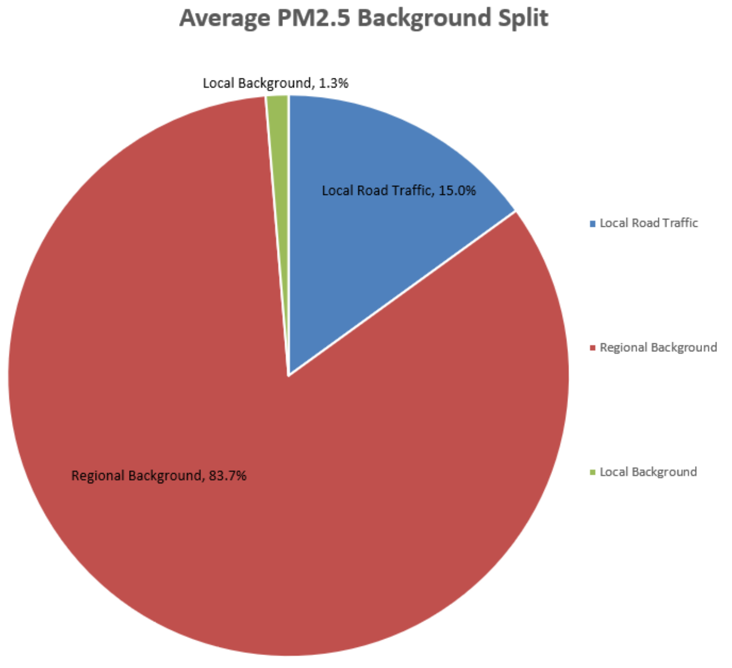
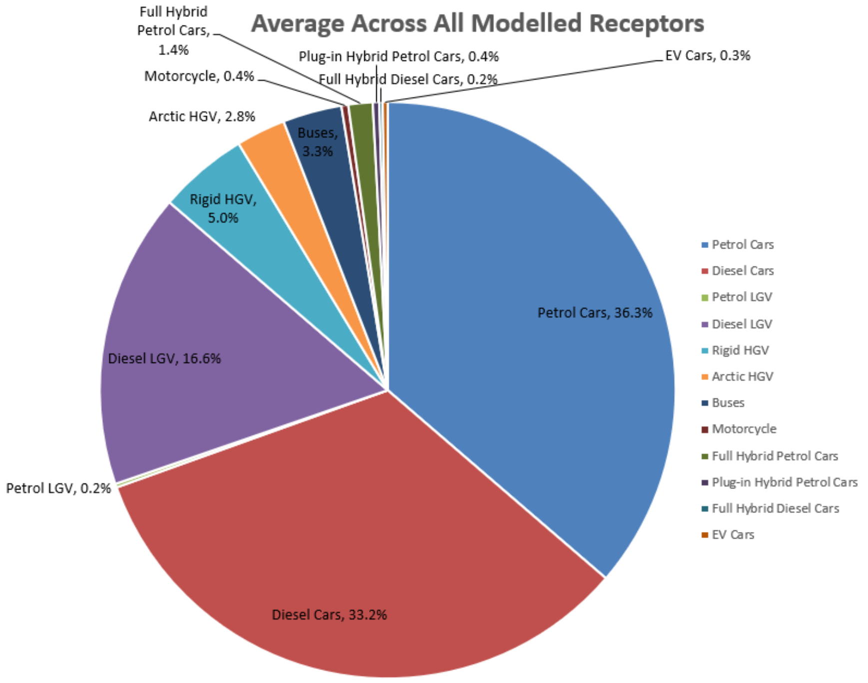


Figure 5-15 – Detailed Source Apportionment of $PM_{2.5}$ Concentrations – Sawbridgeworth AQMA





5.4 Congestion within AQMAs

As stated within TG(22)[2], consideration should be given to the vehicle emission split between moving and stationing traffic as congestion is a key part of all three AQMAs within East Herts District Council, particularly within the Sawbridgeworth and Bishop's Stortford AQMAs.

As the vehicle source apportionment for each of the AQMAs has been detailed above, this section will look at both the worst-case receptor and the overall average within each AQMA when reviewing the proportion of emissions across the AQMAs associated with congested roads and non-congested or free flowing roads.

All roads and congested roads have been modelled in ADMS-Road 5.0.1 in accordance with the methodologies detailed in TG(22)[2]. Congested roads are predominantly those road links which have been modelled at slower speeds to account for vehicles slowing or stopping for junctions or traffic lights. All results are presented following model verification.

5.4.1 Congestion within Bishop's Stortford AQMA

Following the source apportionment assessment of the Bishop's Stortford AQMA, it was considered that congestion leading up to the 4-way junction from the A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road has resulted in exceedances of the annual mean NO_2 AQO. The streets leading up to the junction are also narrow with high buildings on either side which has also likely lead to "street canyon" effects at the congested roads.

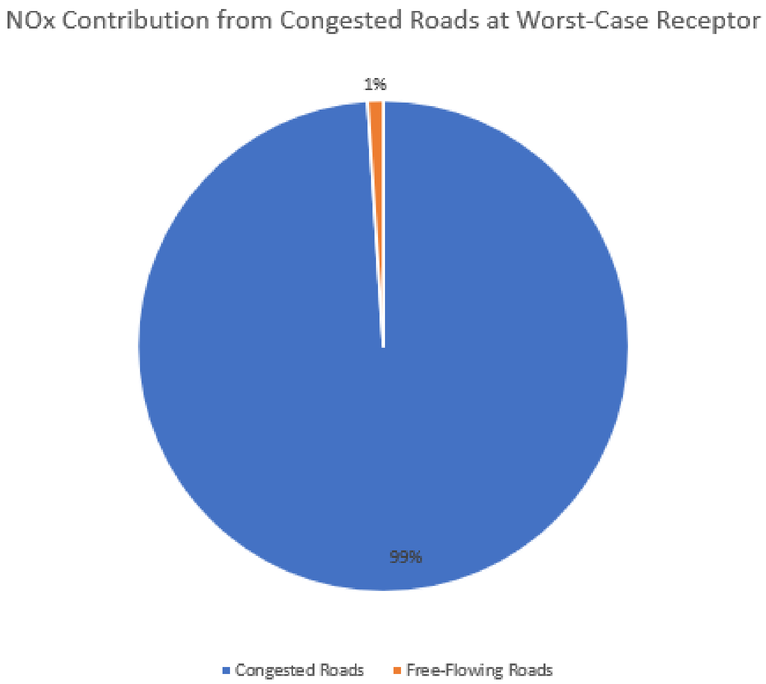
Table 5-22 below illustrates the total road NO_x and percentage of total road NO_x from both congested roads and free-flowing roads at both the worst-case receptor within the Bishop's Stortford AQMA and across the entire AQMA on average, excluding the contribution from background sources. Figure 5-16 also presents a graphical representation of the results shown below.

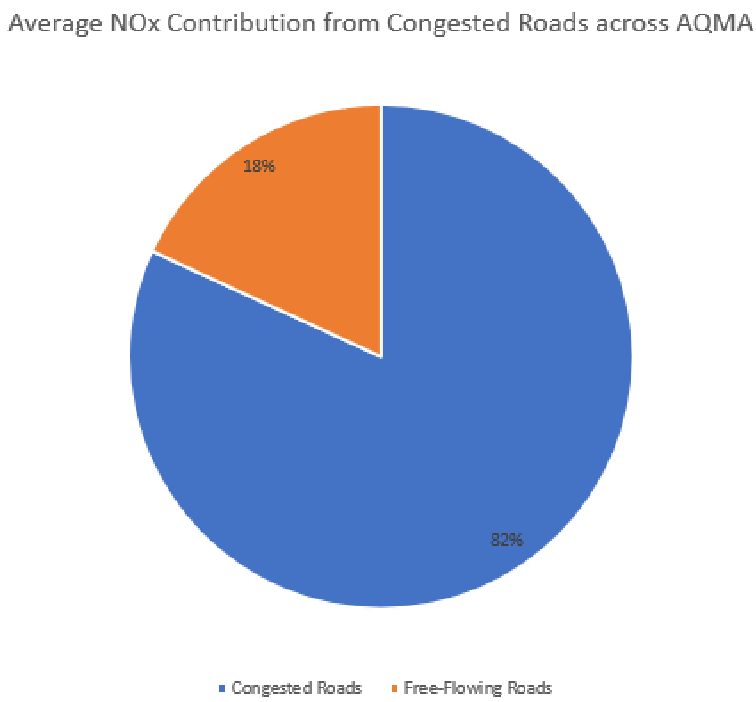
Overall the results within the Bishop's Stortford AQMA illustrated that the key source of NO_x emissions within the AQMA is from the congested road. On average 82% of emissions within the AQMA derive from congested roads.

Table 5-22 – Congestion Contribution in Bishop's Stortford AQMA

Receptor	Congested Roads	Free Flowing Roads
Worst Case Receptor (R26)		
Total Road NO_x (µg/m^3)	96.8	1.0
Percent of Total Road NO_x	99%	1%
Across AQMA		
Total Road NO_x (µg/m^3)	40.4	8.9
Percent of Total Road NO_x	82%	18%

Figure 5-16 – Congested Road Contribution Figure within Bishop's Stortford AQMA





5.4.2 Congestion within Hertford AQMA

Following the source apportionment assessment of the Hertford AQMA, it was considered that the congestion on the main dual carriageway running through Hertford and the associated congestion leading to the roundabouts, as well as congestion at the three-road junction for Parliament Street Old Cross and St Andrew Street has resulted in exceedances of the annual mean NO_2 AQO. The streets leading up to the three-road junction are also narrow with high buildings on either side which has also likely led to canyon effects at the congested roads.

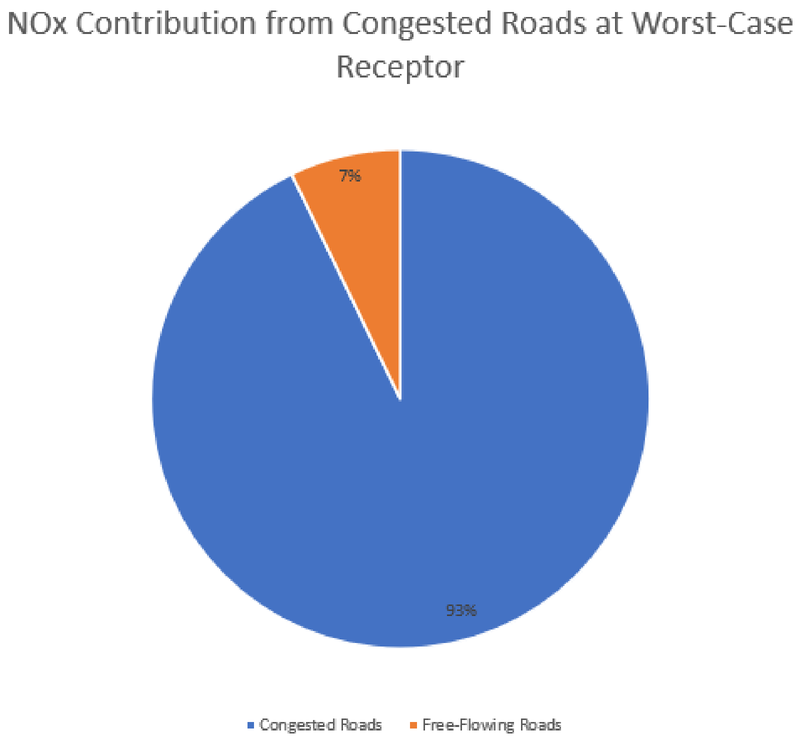
Table 5-23 below illustrates the total road NO_x and percentage of total road NO_x from both congested roads and free-flowing roads at both the worst-case receptor within the Hertford AQMA and across the entire AQMA on average, excluding the contribution from background sources. Figure 5-17 also presents a graphical representation of the results shown below.

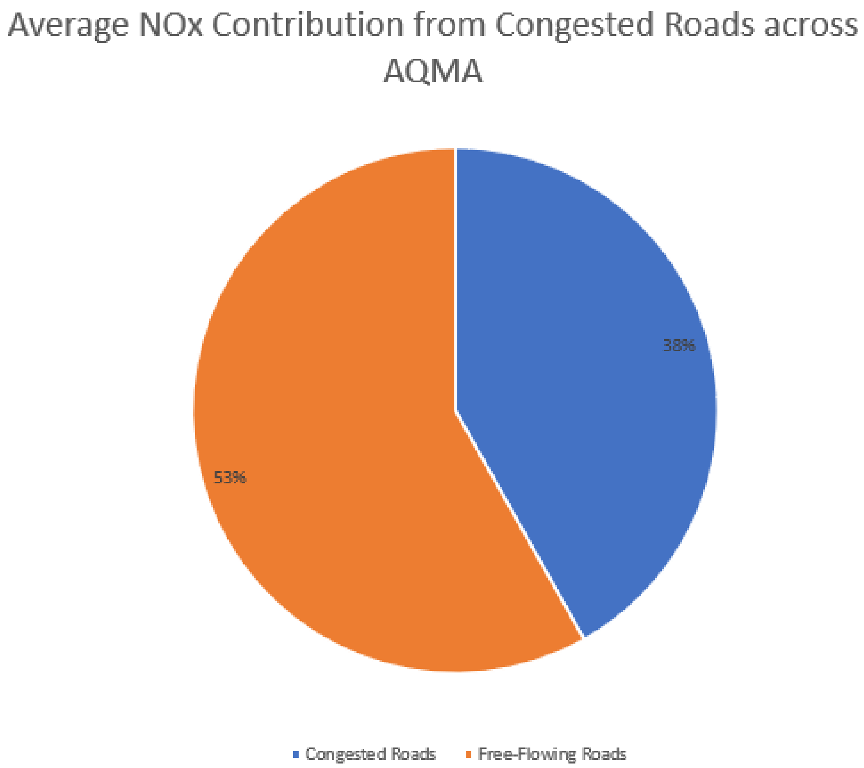
Overall the results within the Hertford AQMA illustrated that the key source of NO_x emissions within the AQMA is on average not from the congested roads. The worst-case receptors is located adjacent to a roundabout where congestions is expected, however the majority of receptors are located along free-flowing roads and as such there are only 38% of NO_x emissions across the AQMA associated with congested roads. The exceedances of the annual mean NO_2 AQO is likely due to the “street canyon” effects along Parliament Street, Old Cross and St Andrews Street as well as the volume of traffic on Gascoyne Way.

Table 5-23 – Congestion Contribution in Hertford AQMA

Receptor	Congested Roads	Free Flowing Roads
Worst Case Receptor (R35)		
Total Road NO_x ($\mu g/m^3$)	67.9	5.2
Percent of Total Road NO_x	93%	7%
Across AQMA		
Total Road NO_x ($\mu g/m^3$)	11.7	18.9
Percent of Total Road NO_x	38%	53%

Figure 5-17 – Congested Road Contribution Figure within Hertford AQMA





5.4.3 Congestion within Sawbridgeworth AQMA

Following the source apportionment assessment of the Sawbridgeworth AQMA, it was considered that the congestion at the London Road, Cambridge Road double roundabout and traffic lights along the roads has resulted in exceedances of the annual mean NO_2 AQO.

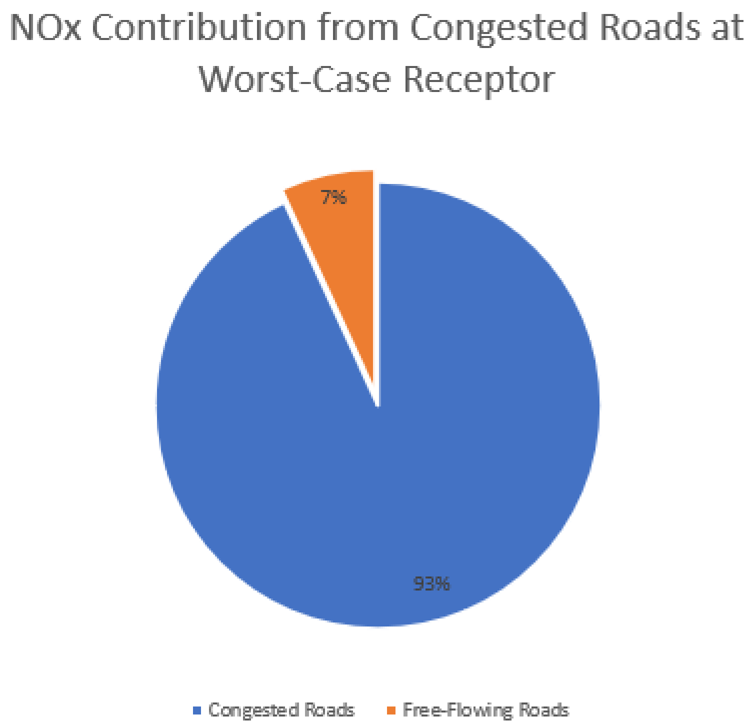
Table 5-24 below illustrates the total road NO_x and percentage of total road NO_x from both congested roads and free-flowing roads at both the worst-case receptor within the Sawbridgeworth AQMA and across the entire AQMA on average, excluding the contribution from background sources. Figure 5-18 also presents a graphical representation of the results shown below.

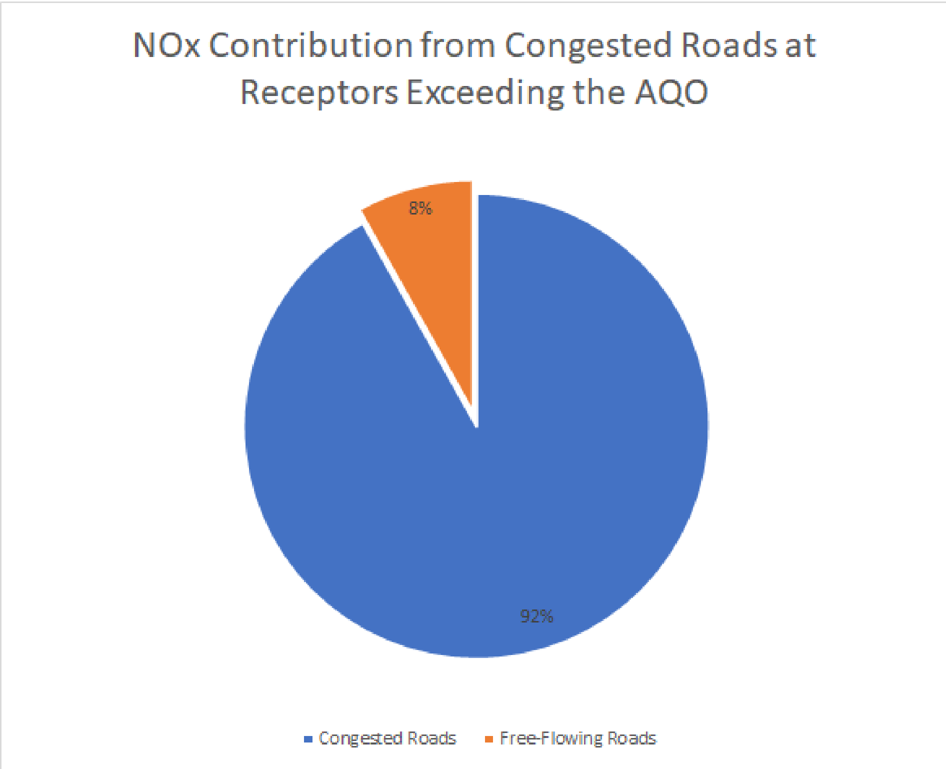
The results within the Sawbridgeworth AQMA show that the majority of the AQMA is below 40µg/m^3 NO_2 with modelled and monitored exceedances being limited to the junction of London Road and Cambridge Road. As such, a review of the areas of exceedance has been completed and is shown below. While across the AQMA congestion is not a major contributor, at areas which exceed the AQMA, the congested roads account for 93% of Total Road NOx.

Table 5-24 – Congestion Contribution in Sawbridgeworth AQMA

Receptor	Congested Roads	Free Flowing Roads
Worst Case Receptor (R59)		
Total Road NO_x (µg/m^3)	87.0	6.4
Percent of Total Road NO_x	93%	7%
Across AQMA		
Total Road NO_x (µg/m^3)	6.7	21.6
Percent of Total Road NO_x	24%	76%

Figure 5-18 – Congested Road Contribution Figure within Sawbridgeworth AQMA





6 Conclusions and Recommendations

The dispersion modelling exercise undertaken has provided the following updated perspective on NO_2 challenges within the three declared AQMAs in East Herts District Council.

6.1 Bishop's Stortford AQMA

6.1.1 Bishop's Stortford Predicted Concentrations

The model suggests that the 40µg/m^3 NO_2 annual mean AQS objective is exceeded at a total 22 (44%) receptor locations, with 2 (4%) further locations within 10 % of the objective.

The highest modelled annual mean NO_2 concentration was recorded at Receptor 35 with a concentration of 58.1µg/m^3. Receptor 35 is located along a façade of a residential property which immediately fronts onto a stretch of the A1060 – London Road. The stretch of road is susceptible to congestion due to the convergence of high capacity and town centre roads (A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road). The roads leading to the junction within Bishop's Stortford are narrow with buildings on either side creating a canyon effect. Receptor 35 is opposite a local authority triplicate monitoring location, EH19, EH39 and EH40. This monitoring location monitored an annual mean NO_2 concentration of 59.1µg/m^3 in 2019.

The empirical relationship given in LAQM.TG(22)[2] states that exceedance of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60µg/m^3 or above. Given the NO_2 annual mean concentration recorded at Receptor 35 is below the hourly exceedance indicator (60µg/m^3), an exceedance of the hourly NO_2 AQS objective is unlikely at this location. This is also the case for triplicate monitoring location EH19, EH39 and EH40 which also does not exceed 60µg/m^3.

On review of the annual mean NO_2 concentration isopleth presented in Figure 5-2 covering the modelled domain, there are no relevant locations with a modelled annual mean NO_2 concentration above 60µg/m^3, which suggests that an exceedance of the hourly NO_2 AQS objective is unlikely across the modelled area.

Based on the modelled results, the following observations were made:

- Areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to roadside locations near junctions where key arterial roads meet, confirming vehicular traffic to be the main contributor to elevated levels of NO_2 concentrations within Bishop's Stortford AQMA. Notable roads include: A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road.

- These four roads all have narrow streets with buildings on either side leading to canyon effects which are where the highest concentrations are observed.

6.1.2 Bishop's Stortford Estimated Year of Compliance

Using the recommended method in TG(22)[2], the estimated year of compliance within the AQMA should no additional measures be put in place is 2026 and will be below 10% of the AQO by 2029.

A reduction of approximately 45.6% in Road NO_x at the worst-case receptor is required to meet the AQO for annual mean NO_2.

6.1.3 Bishop's Stortford Source Apportionment

To help inform the development of measures as part of the AQAP, a NO_x source apportionment exercise was undertaken to provide an understanding of the main vehicle emission contributors within the AQMA.

The NO_x source apportionment exercise demonstrates a largely consistent ranking of contributing vehicle classes exhibited throughout all scenarios (Diesel Cars, Diesel LGVs, Rigid HGVs and Buses), where Diesel Cars are the main contributors to total road NO_x concentrations within the Bishop's Stortford AQMA.

Whilst comparing modelled contributions at identified receptor locations within the AQMA against the max receptor within the AQMA, Diesel Cars were observed to have a very similar influence to total road NO_x concentrations within the AQMA. This is the case for all the other vehicle types, with only buses showing a large decrease in percentage contribution at the max receptors when compared the average across the AQMA.

Overall this suggests volume of traffic and "street canyon" effects and congestion to the main junction of A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road is considered to be the key contributor to elevated levels of NO_2 annual mean concentrations within the AQMA.

6.1.4 Bishop's Stortford Congested Roads

The results within the Bishop's Stortford AQMA illustrated that the key source of NOx emissions within the AQMA is from congested roads. On average 82% of emissions within the AQMA derive from congested roads.

6.1.5 Bishop's Stortford Future Recommendations

Following the completion of the detailed modelling assessment, the following recommendations are made:

- Continue to monitor NO_2 across the AQMA, with the expansion of monitoring along Hockerill Street to the mini-roundabout further east.

- Based on source apportionment results, any future intervention measures should be targeted at reducing vehicle emissions from all vehicle types, Diesel Cars and LGVs, which are both observed to be the two largest contributors to total vehicle emissions in areas of exceedance.

- Measures to reduce congestion at the main junction of the A1060 London Road, A1250 Hockerill Road, B1383 Stansted Road and A1250 Dunmow Road would also help to reduce emissions of NO_2 in the Bishop's Stortford AQMA.

6.2 Hertford AQMA

6.2.1 Hertford Predicted Concentrations

The model suggests that the 40µg/m^3 NO_2 annual mean AQS objective is exceeded at a total 9 (9.2%) receptor locations, with 10 (10.2%) further locations within 10 % of the objective.

The highest annual mean NO_2 concentration was recorded at Receptor 26 with a concentration of 50.6µg/m^3. Receptor 26 is located at the residential flats immediately fronts onto the Gascoyne Way Parliament Street Roundabout Junction, susceptible to congestion due to the convergence of high capacity and town centre roads, particularly Gascoyne Way.

The empirical relationship given in LAQM.TG(22)[2] states that exceedance of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60µg/m^3 or above. Given the NO_2 annual mean concentration recorded at Receptor 26 is below the hourly exceedance indicator (60µg/m^3), an exceedance of the hourly NO_2 AQS objective is unlikely at this location.

In addition, on review of the annual mean NO_2 concentration isopleth presented in Figure 5-4 covering the modelled domain, there are no relevant locations with a modelled annual mean NO_2

concentration above 60µg/m^3, which suggests that an exceedance of the hourly NO_2 AQS objective is unlikely across the modelled area.

Based on these results, the following observations were made:

- Areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to roadside locations particularly at junctions along the main road running through Hertford, Gascoyne Way, London Road, Ware Road and Hertingfordbury Road. These roads are dual carriageways running through Hertford with a high AADT.

- Additionally, areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to the minor roads north of the main dual carriageway, including Parliament Street, Mill Bridge, Cowbridge, St Andrew Street, North Road, Cross Lane and the A119. This is primarily due to the narrow streets and high buildings on either side resulting in “street canyon” effects.

6.2.2 Hertford Estimated Year of Compliance

Using the recommended method in TG(22)[2], the estimated year of compliance within the AQMA should no additional measures be put in place is 2024 and will be below 10% of the AQO by 2026.

A reduction of approximately 33.7% in Road NO_x at the worst-case receptor is required to meet the AQO for annual mean NO_2

6.2.3 Hertford Source Apportionment

To help inform the development of measures as part of the AQAP, a NO_x source apportionment exercise was undertaken to provide an understanding of any potential similarities in vehicle emission contributors within the AQMA.

The NO_x source apportionment exercise demonstrates a largely consistent ranking of contributing vehicle classes exhibited throughout all scenarios (Diesel Cars, Diesel LGVs, Rigid HGVs and Buses), where Diesel Cars are the main contributors to total road NO_x concentrations across the Hertford AQMA.

Whilst comparing modelled contributions at identified receptor locations within the AQMA against the max receptor within the AQMA, Diesel Cars were observed to have a very similar influence to total road NO_x concentrations within the AQMA. This is the case for all the other vehicle types, with diesel LGVs and buses showing a decrease in percentage contribution at the max receptors when compared the average across the AQMA and Rigid HGVs an increase.

This suggests volume of traffic on the main roads such as Gascoyne Way is the key contributor to elevated levels of NO_2 annual mean concentrations within the AQMA.

6.2.4 Hertford Congested Roads

The results within the Hertford AQMA illustrate that the key source of NO_x emissions is on average not from congested roads. While the worst-case receptor is located adjacent to a roundabout which would experience some queueing, the majority of receptors are located along free-flowing roads. Only 38% of NOx emissions across the AQMA are associated with congested roads.

6.2.5 Hertford Future Recommendations

Following the completion of the detailed modelling assessment, the following recommendations are made:

- Continue to monitor NO_2 across the AQMA, with the expansion of automatic monitoring within the three-way junction of Parliament Street, Old Cross and St Andrews Street.

- Based on source apportionment results, any future intervention measures should be targeted at reducing vehicle emissions from all vehicle types, Diesel Cars and LGVs, which are both observed to be the two largest contributors to total vehicle emissions in areas of exceedance.

- Measures to reduce congestion at the three-way junction at Parliament Street, Old Cross and St Andrews Street will help to reduce NO_2 emissions as well as reducing vehicle volume on Gascoyne Way.

6.3 Sawbridgeworth AQMA

6.3.1 Sawbridgeworth Predicted Concentrations

The model suggests that the 40µg/m^3 NO_2 annual mean AQS objective is exceeded at a total 5 (2.1%) receptor locations, with 3 (1.2%) further locations within 10 % of the objective.

The highest annual mean NO_2 concentration was recorded at Receptor 11 with a concentration of 55.8µg/m^3. Receptor 59 is located along a façade of a residential property which immediately fronts onto the double mini-roundabout junctions between London Road, Station Road, Cambridge Road and West Road. The receptor is located just after a set of traffic lights and just before the mini roundabout.

The empirical relationship given in LAQM.TG(22)[2] states that exceedance of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60µg/m^3 or above. Given the NO_2 annual mean concentration recorded at Receptor 59 is below the hourly exceedance indicator (60µg/m^3), an exceedance of the hourly NO_2 AQS objective is unlikely at this location.

In addition, on review of the annual mean NO_2 concentration isopleth presented in Figure 5-6 covering the modelled domain, there are no relevant locations with a modelled annual mean NO_2 concentration above 60µg/m^3, which suggests that an exceedance of the hourly NO_2 AQS objective is unlikely across the modelled area.

Based on these results, the following observations were made:

- Areas of exceedance or near exceedance of the annual mean NO_2 AQS objective were concentrated to roadside locations particularly near junctions where London Road and Cambridge Road meet, confirming vehicular traffic to be the main contributor to elevated levels of NO_2 concentrations within the Sawbridgeworth AQMA.

- Concentrations of NO_2 that exceeded the AQO were limited to the main central parts of the road and did not ‘spill’ onto residential receptors that were set back from the road.

6.3.2 Sawbridgeworth Estimated Year of Compliance

Using the recommended method in TG(22)[2], the estimated year of compliance within the AQMA should no additional measures be put in place is 2026 and will be below 10% of the AQO by 2028.

A reduction of approximately 40.6% in Road NO_x at the worst-case receptor is required to meet the AQO for annual mean NO_2.

6.3.3 Sawbridgeworth Source Apportionment

To help inform the development of measures as part of the AQAP, a NO_x source apportionment exercise was undertaken to provide an understanding of any potential similarities in vehicle emission contributors within the AQMA.

The NO_x source apportionment exercise demonstrates a largely consistent ranking of contributing vehicle classes exhibited throughout all scenarios (Diesel Cars, Diesel LGVs, Rigid HGVs and Buses), where Diesel Cars are the main contributors to total road NO_x concentrations across the Sawbridgeworth AQMA.

Whilst comparing modelled contributions at identified receptor locations within the AQMA against the max receptor within the AQMA, Diesel Cars were observed to have a very similar influence to total road NO_x concentrations within the AQMA. This is the case for all the other vehicle types, with only Rigid HGVs and buses showing a slight increase in percentage contribution at the max receptors when compared the average across the AQMA

The volume of traffic and congestion at the main junctions along London Road and Cambridge Road is the main contributor to elevated levels of NO_2 annual mean concentrations within the AQMA.

6.3.4 Sawbridgeworth Congested Roads

The results within the Sawbridgeworth AQMA show that the majority of the AQMA is below 40µg/m³ NO_2 with modelled and monitored exceedances being limited to the junction of London Road and Cambridge Road. As such, a review of the areas of exceedance has been completed and is shown below. While across the AQMA congestion is not a major contributor, at areas which exceed the AQMA, the congested roads account for 93% of Total Road NOx.

6.3.5 Sawbridgeworth Future Recommendations

Following the completion of the detailed modelling assessment, the following recommendations are made:

- Continue to monitor NO_2 across the AQMA, with the expansion of monitoring along both Cambridge Road and inclusion of monitoring on London Road.

- Based on source apportionment results, any future intervention measures should be targeted at reducing vehicle emissions from all vehicle types, Diesel Cars and LGVs, which are both observed to be the two largest contributors to total vehicle emissions in areas of exceedance.

- Measures to reduce congestions at reducing vehicle volume on both London Road and Cambridge Road will help to reduce NO_x emissions.

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Appendices

Appendix A - ADMS Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in the Defra's LAQM.TG(22)[2] guidance as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the proposed development site. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including uncertainties associated with:

- Background concentration estimates;
- Source activity data such as traffic flows and emissions factors;
- Monitoring data, including locations; and
- Overall model limitations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

Model setup parameters and input data were checked prior to running the models in order to reduce these uncertainties. The following were checked to the extent possible to ensure accuracy:

- Traffic data;
- Distance between sources and monitoring as represented in the model;
- Speed estimates on roads;
- Background monitoring and background estimates; and
- Monitoring data.

The traffic data for this assessment has been collated using a combination of data provided by the highways department at Hertfordshire County Council through their COMET transport Model, survey point survey data and DfT traffic count data, as outlined in Section 4.1.

During 2019, concentrations of NO_2 were monitored at 35 sites across East Herts District Council, comprising 34 diffusion tube sites and one continuous monitor (EH79) 7 of the 34 diffusion tube sites are triplicate locations, all undertaken at roadside/kerbside locations. All Diffusion tubes within each respective AQMA was used within the separate model verifications. The following monitoring locations were used in each respective verification

Bishop's Stortford – EH12, EH31, EH32, EH17, EH35, EH36 EH19, EH39 and EH40. EH18, EH37 and EH38.

Hertford AQMA - EH25, EH28, EH48, EH79, EH42, EH43, EH44, EH79, EH80, EH81, EH30, EH41, EH52 and EH86.

Sawbridgeworth AQMA – EH57 and EH91.

Full details of the diffusion tubes and automatic monitoring station locations and results are shown in Figure 3-1, Figure 3-2 and Figure 3-3.

Three separate verifications were undertaken for each of the three AQMAs.

Bishop's Stortford AQMA - NO_2 Verification calculations

The verification of the modelling output was performed in accordance with the methodology provided in Chapter 7 of LAQM.TG(22)[2].

Verification for each AQMA was completed using the 2019 (2018 reference year) Defra background mapped concentrations for the relevant 1km x 1km grid squares within EHDC (i.e. those within which the model verification locations are located), as displayed in Table B.1 of the Appendices.

Table A.1 below shows an initial comparison of the monitored and unverified modelled NO_2 results for the year 2019, in order to determine if verification and adjustment was required.

Table A.1 – Comparison of Unverified Modelled and Monitored NO_2 Concentrations

Site ID	Background NO_2	Monitored total NO_2 (µg/m³)	Unverified Modelled total NO_2 (µg/m³)	Difference (modelled vs. monitored) (%)
EH19 EH39 EH40	13.5	59.1	30.52	-48.36
EH18 EH37 EH38	13.5	36.1	19.25	-46.68
EH17 EH35 EH36	13.5	59.5	29.82	-49.88
EH12 EH31 EH32	13.5	43.8	26.35	-39.84

The data in the table above shows that the model was solely under predicting at all verification points, with the highest under prediction between the modelled and monitored concentrations observed at EH17, EH35, EH36 (-49.88 %). At this stage all model inputs were checked to ensure their accuracy, this includes road and monitoring sire geometry, traffic data, link emission rates, 2019 monitoring results, background concentrations and modelling features such as "street canyons". Following a level of QA/QC completed upon the model, no further improvement of the modelled results could be obtained on this occasion. The difference between modelled and monitored concentrations was greater than -25% at all locations, therefore adjustment of the results was necessary. The relevant data was then gathered to allow the adjustment factor to be calculated.

Model adjustment needs to be undertaken based for NO_x and not NO_2. For the Council operated monitoring results used in the calculation of the model adjustment, NO_x was derived from NO_2; these calculations were undertaken using a spreadsheet tool available from the LAQM website[21].

[21] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

Table A.2 provides the relevant data required to calculate the model adjustment based on regression of the modelled and monitored road source contribution to NO_x.

Figure A.1 provides a comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x, and the equation of the trend line based on linear regression through zero. The Total Monitored NO_x concentration has been derived by back-calculating NO_x from the NO_x/NO_2 empirical relationship using the spreadsheet tool available from Defra's website. The equation of the trend lines presented in Figure A.1 gives an adjustment factor for the modelled results of 3.064

Table A.2 – Data Required for Adjustment Factor Calculation – Bishop's Stortford AQMA

Site ID	Monitored total NO_2 (μg/m³)	Monitored total NO_x (μg/m³)	Background NO_2 (μg/m³)	Background NO_x (μg/m³)	Monitored road contribution NO_2 (total - background) (μg/m³)	Monitored road contribution NO_x (total - background) (μg/m³)	Modelled road contribution NO_x (excludes background) (μg/m³)
EH19 EH39 EH40	59.1	120.2	13.5	18.3	45.6	101.95	33.3
EH18 EH37 EH38	36.1	63.6	13.5	18.3	22.6	45.33	10.7
EH17 EH35 EH36	59.5	121.3	13.5	18.3	46.0	103.03	31.8
EH12 EH31 EH32	43.8	81.3	13.5	18.3	30.3	63.02	24.7

Figure A.1 – Bishop's Stortford AQMA Comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x

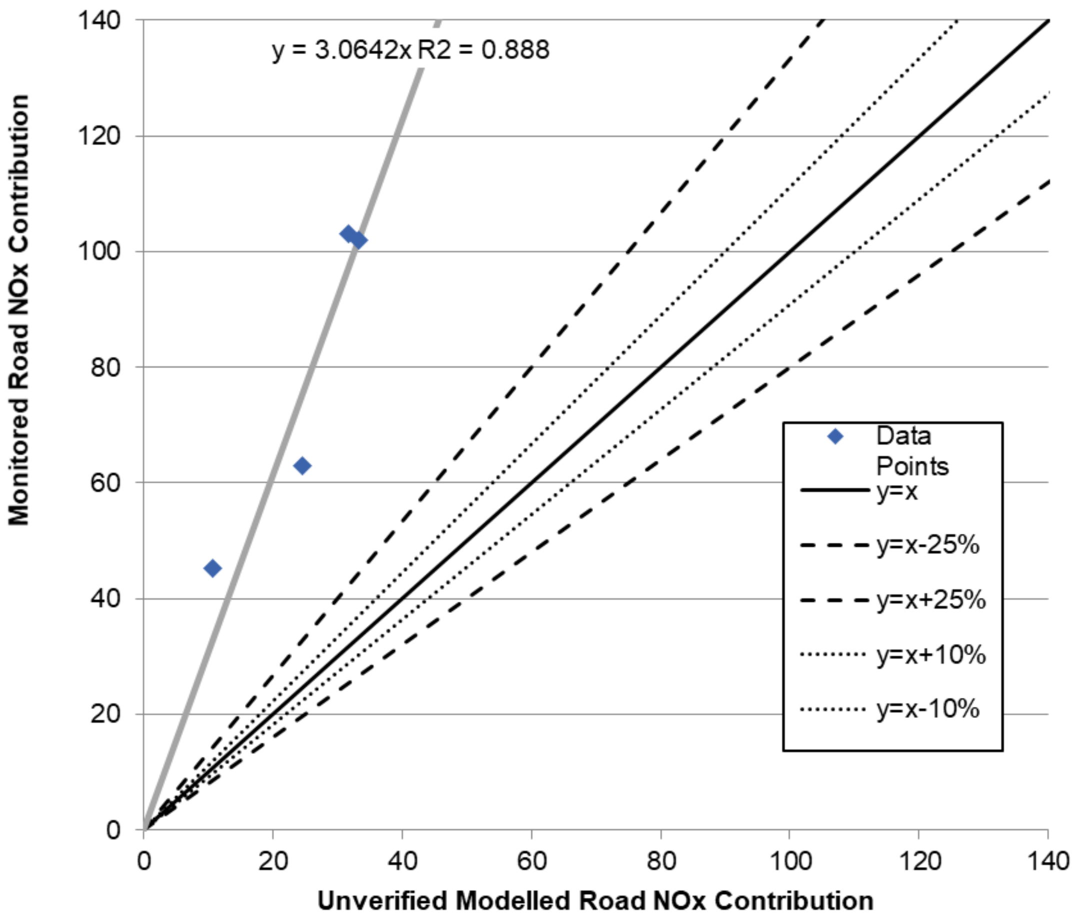

Table A.3 – Bishop's Stortford Adjustment Factor and Comparison of Verified Results against Monitoring Results

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NOx	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m^3)	Adjusted modelled total NO_x (including background NO_x) (µg/m^3)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m^3)	Monitored total NO_2 (µg/m^3)	Difference (adjusted modelled NO_2 vs. monitored NO_2) (%)
CM1	3.06	3.064	101.95	120.23	59.1	59.10	0.00
DT4	4.23		32.84	51.11	30.31	36.10	-16.04
DT5	3.24		97.49	115.77	57.44	59.50	-3.46
DT6	2.55		75.59	93.86	48.96	43.80	11.78

Figure A.2 – Bishop's Stortford Comparison of the Verified Modelled Total NO_2 versus Monitored NO_2

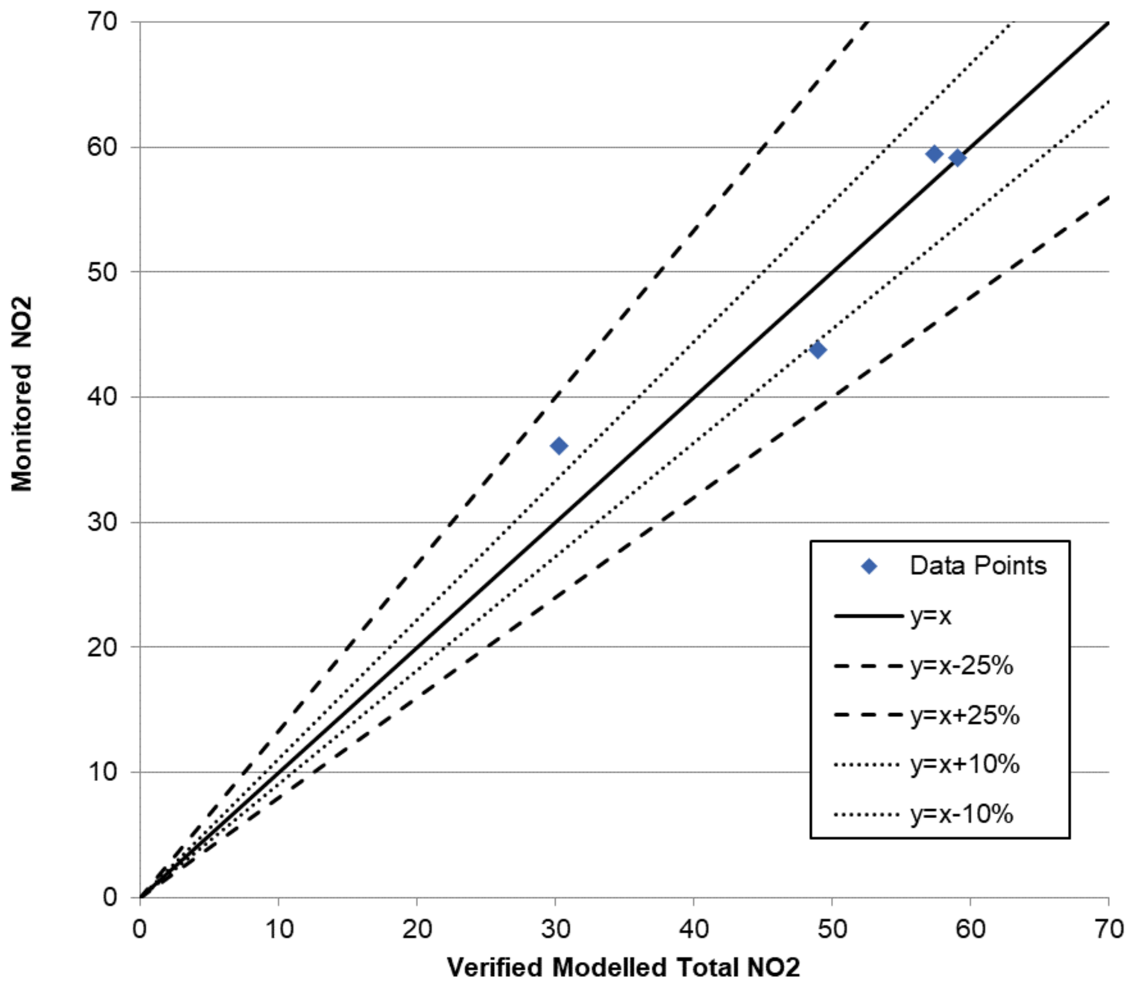

Table A.3 and Figure A.2 show the ratios between monitored and modelled NO_2 for each monitoring location after using the calculated adjustment factor. LAQM.TG(22)[2] states that:

"In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations, ideally within 10%."

The sites show good agreement between the ratios of monitored and modelled NO_2,

A factor of 3.064 reduces the Root Mean Square Error (RMSE) from a value of 23.9 to 4.0, which is in line with the guidance value of 4 µg/m^3 as stated within LAQM.TG(22).

The 3.064 Bishop's Stortford adjustment factor was applied to the road contribution NOx concentrations predicted by the model to arrive at the final NO_2 concentrations in and around the Bishop's Stortford AQMA.

Hertford AQMA - NO_2 Verification calculations

The verification of the modelling output was performed in accordance with the methodology provided in Chapter 7 of LAQM.TG(22)[2].

Verification for each AQMA was completed using the 2019 (2018 reference year) Defra background mapped concentrations for the relevant 1km x 1km grid squares within EHDC (i.e. those within which the model verification locations are located), as displayed in Table B.1 of the Appendices.

Table A.4 below shows an initial comparison of the monitored and unverified modelled NO_2 results for the year 2019, in order to determine if verification and adjustment was required.

Table A.4 – Comparison of Unverified Modelled and Monitored NO_2 Concentrations

Site ID	Background NO_2	Monitored total NO_2 (µg/m^3)	Unverified Modelled total NO_2 (µg/m^3)	Difference (modelled vs. monitored) (%)
EH79	15.1	33.0	22.0	-33.5
EH84	15.1	31.5	19.7	-37.5
EH52	15.1	28.7	18.2	-36.5
EH41	16.1	40.8	23.8	-41.8
EH30	15.1	37.3	23.3	-37.5
EH25	15.1	41.8	24.6	-41.3
EH28 EH48 EH49	15.1	34.7	23.2	-33.2
EH42 EH43 EH44	15.1	41.4	23.8	-42.5

The data in the table above shows that the model was solely under predicting at all verification points, with the highest under prediction between the modelled and monitored concentrations observed at EH42, EH43, EH44 (-42.5 %). At this stage all model inputs were checked to ensure their accuracy, this includes road and monitoring sire geometry, traffic data, link emission rates, 2019 monitoring results, background concentrations and modelling features such as street canyons. Following a level of QA/QC completed upon the model, no further improvement of the modelled results could be obtained on this occasion. The difference between modelled and monitored concentrations was greater than -25% at all locations, therefore adjustment of the results was necessary. The relevant data was then gathered to allow the adjustment factor to be calculated.

Model adjustment needs to be undertaken based for NO_x and not NO_2. For the Council operated monitoring results used in the calculation of the model adjustment, NO_x was derived from NO_2; these calculations were undertaken using a spreadsheet tool available from the LAQM website[22].

[22] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

Table A.5 provides the relevant data required to calculate the model adjustment based on regression of the modelled and monitored road source contribution to NO_x.

Figure A.1Figure A.3 provides a comparison of the Modelled Road Contribution NOx versus Monitored Road Contribution NO_x, and the equation of the trend line based on linear regression through zero. The Total Monitored NO_x concentration has been derived by back-calculating NO_x from the NO_x/NO_2 empirical relationship using the spreadsheet tool available from Defra's website. The equation of the trend lines presented in Figure A.3 gives an adjustment factor for the modelled results of 3.073

Table A.5 – Data Required for Adjustment Factor Calculation – Hertford AQMA

Site ID	Monitored total NO_2 (µg/m^3)	Monitored total NO_x (µg/m^3)	Background NO_2 (µg/m^3)	Background NO_x (µg/m^3)	Monitored road contribution NO_2 (total - background) (µg/m^3)	Monitored road contribution NO_x (total - background) (µg/m^3)	Modelled road contribution NO_x (excludes background) (µg/m^3)
EH79	33.0	56.1	15.1	20.7	17.9	35.5	13.0
EH84	31.5	52.9	15.1	20.7	16.4	32.3	8.7
EH52	28.7	47.1	15.1	20.7	13.6	26.4	5.9
EH41	40.8	72.9	16.1	22.4	24.7	50.5	14.4
EH30	37.3	65.5	15.1	20.7	22.2	44.8	15.6
EH25	41.8	75.7	15.1	20.7	26.7	55.1	18.1
EH28 EH48 EH49	34.7	59.8	15.1	20.7	19.6	39.1	15.4
EH42 EH43 EH44	41.4	74.8	15.1	20.7	26.3	54.1	16.6

Figure A.3 – Herford AQMA Comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x

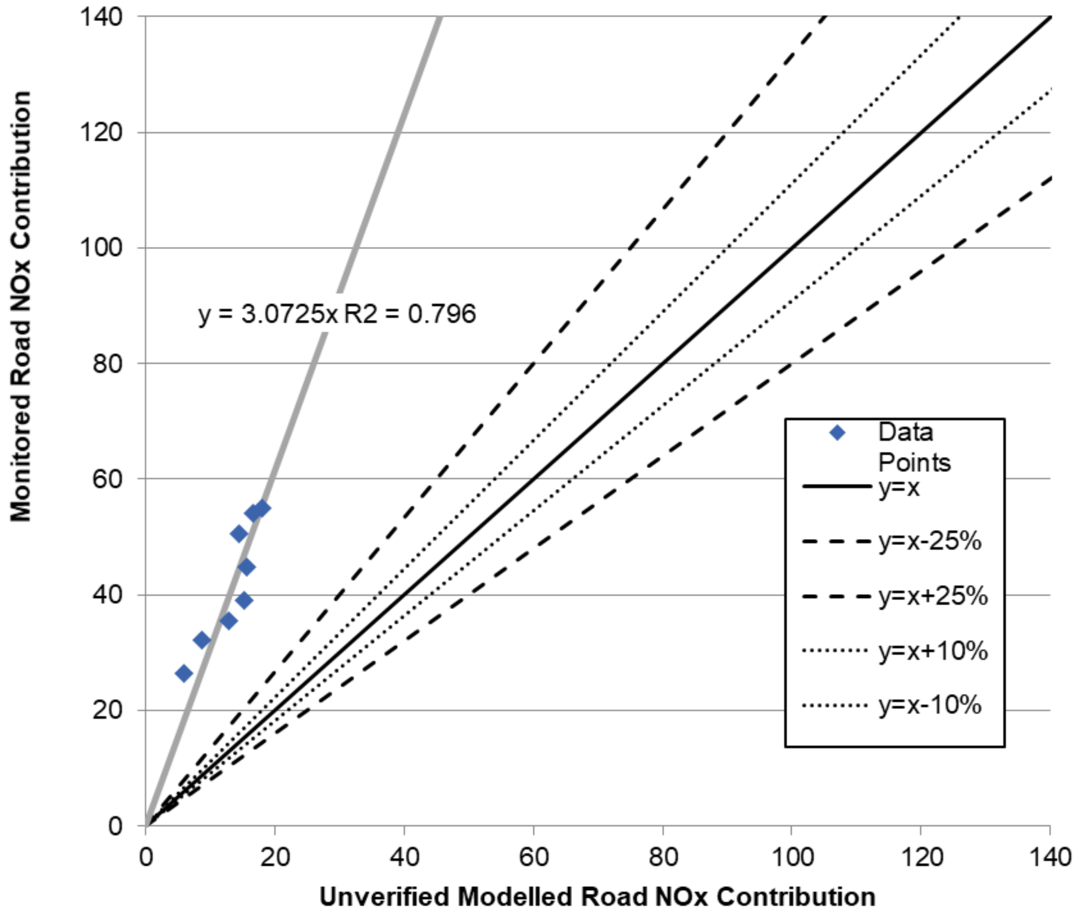

Table A.6 – Hertford Adjustment Factor and Comparison of Verified Results against Monitoring Results

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NOx	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m^3)	Adjusted modelled total NO_x (including background NO_x) (µg/m^3)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m^3)	Monitored total NO_2 (µg/m^3)	Difference (adjusted modelled NO_2 vs. monitored NO_2) (%)
EH79	2.73	3.073	39.9	60.5	35.1	33.0	6.2
EH84	3.72		26.6	47.3	28.8	31.5	-8.6
EH52	4.49		18.1	38.8	24.6	28.7	-14.4
EH41	3.50		44.3	66.8	38.1	40.8	-6.7
EH30	2.87		48.0	68.7	38.7	37.3	3.8
EH25	3.05		55.5	76.2	42.0	41.8	0.5
EH28 EH48 EH49	2.55		47.2	67.9	38.4	34.7	10.5
EH42 EH43 EH44	3.26		51.0	71.7	40.1	41.4	-3.3

Figure A.4 – Hertford Comparison of the Verified Modelled Total NO_2 versus Monitored NO_2

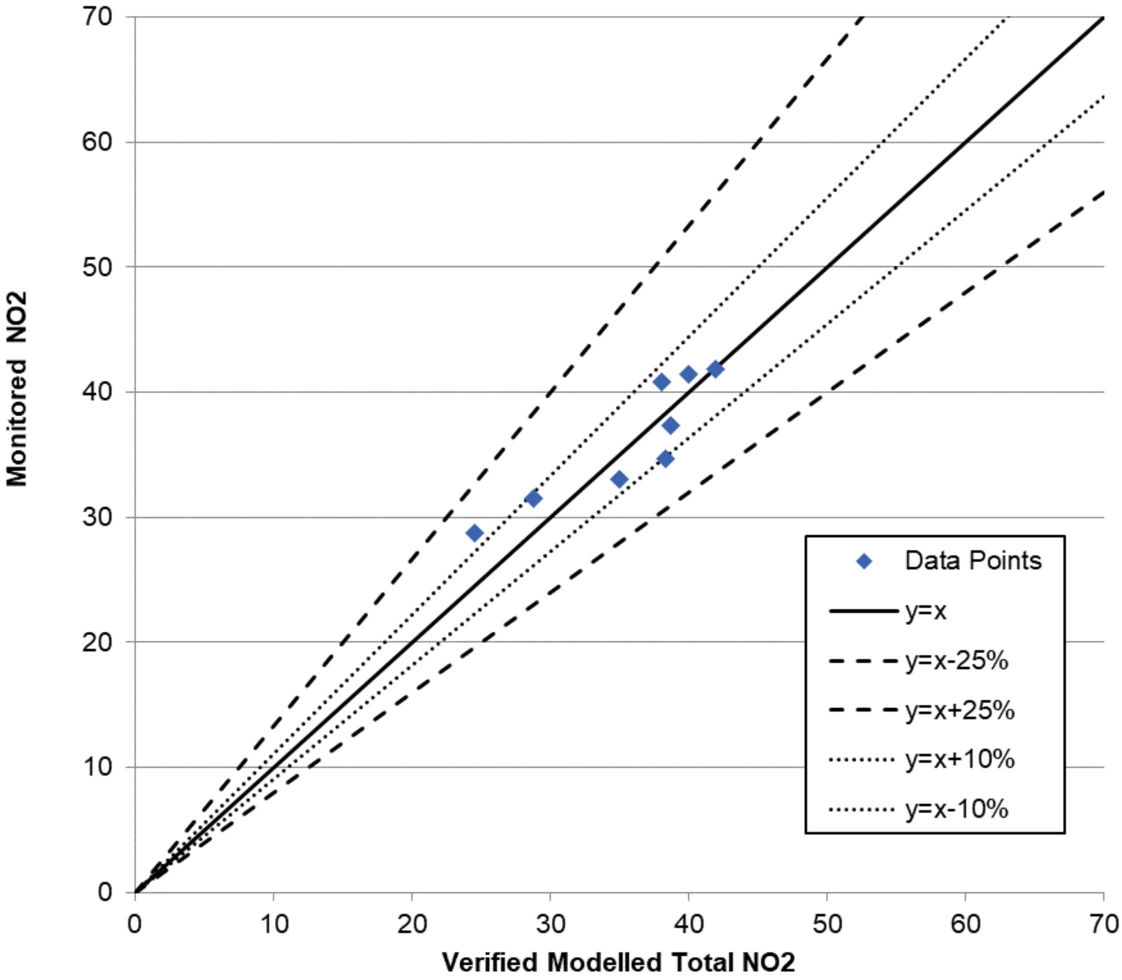

Table A.6 and Figure A.4 show the ratios between monitored and modelled NO_2 for each monitoring location after using the calculated adjustment factor. LAQM.TG(22)[2] states that:

"In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations, ideally within 10%."

The sites show good agreement between the ratios of monitored and modelled NO_2,

A factor of 3.073 reduces the Root Mean Square Error (RMSE) from a value of 14.1 to 2.6, which is in line with the guidance value of 4 µg/m^3 as stated within LAQM.TG(22)[2].

The 3.073 Hertford adjustment factor was applied to the road contribution NOx concentrations predicted by the model to arrive at the final NO_2 concentrations in and around the Hertford AQMA

Sawbridgeworth AQMA - NO_2 Verification calculations

The verification of the modelling output was performed in accordance with the methodology provided in Chapter 7 of LAQM.TG(22)[2].

Verification for each AQMA was completed using the 2019 (2018 reference year) Defra background mapped concentrations for the relevant 1km x 1km grid squares within EHDC (i.e. those within which the model verification locations are located), as displayed in Table B.1 of the Appendices.

Table A.7 below shows an initial comparison of the monitored and unverified modelled NO_2 results for the year 2019, in order to determine if verification and adjustment was required.

Table A.7 – Comparison of Unverified Modelled and Monitored NO_2 Concentrations

Site ID	Background NO_2	Monitored total NO_2 (µg/m^3)	Unverified Modelled total NO_2 (µg/m^3)	Difference (modelled vs. monitored) (%)
EH91	11.9	39.5	16.9	-57.2
EH57	11.9	50.4	22.0	-56.3

The data in the table above shows that the model was solely under predicting at all verification points, with the highest under prediction between the modelled and monitored concentrations observed at EH91 (-57.2 %). At this stage all model inputs were checked to ensure their accuracy, this includes road and monitoring sire geometry, traffic data, link emission rates, 2019 monitoring results, background concentrations and modelling features such as “street canyons”. Following a level of QA/QC completed upon the model, no further improvement of the modelled results could be obtained on this occasion. The difference between modelled and monitored concentrations was greater than -25% at all locations, therefore adjustment of the results was necessary. The relevant data was then gathered to allow the adjustment factor to be calculated.

Model adjustment needs to be undertaken based for NO_x and not NO_2. For the Council operated monitoring results used in the calculation of the model adjustment, NO_x was derived from NO_2; these calculations were undertaken using a spreadsheet tool available from the LAQM website[23].

Table A.8 provides the relevant data required to calculate the model adjustment based on regression of the modelled and monitored road source contribution to NO_x.

Figure A.5 provides a comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x, and the equation of the trend line based on linear regression through zero. The Total Monitored NO_x concentration has been derived by back-calculating NO_x from the NO_x/NO_2 empirical relationship using the spreadsheet tool available from Defra’s website. The equation of the trend lines presented in Figure A.5 gives an adjustment factor for the modelled results of 4.660

Table A.8 – Data Required for Adjustment Factor Calculation – Sawbridgeworth AQMA

Site ID	Monitored total NO_2 (µg/m^3)	Monitored total NO_x (µg/m^3)	Background NO_2 (µg/m^3)	Background NO_x (µg/m^3)	Monitored road contribution NO_2 (total - background) (µg/m^3)	Monitored road contribution NO_x (total - background) (µg/m^3)	Modelled road contribution NO_x (excludes background) (µg/m^3)
EH91	39.5	72.2	11.9	15.9	27.6	56.3	9.3
EH57	50.4	98.6	11.9	15.9	38.5	82.7	19.1

[23] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

Figure A.5 – Sawbridgeworth AQMA Comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x

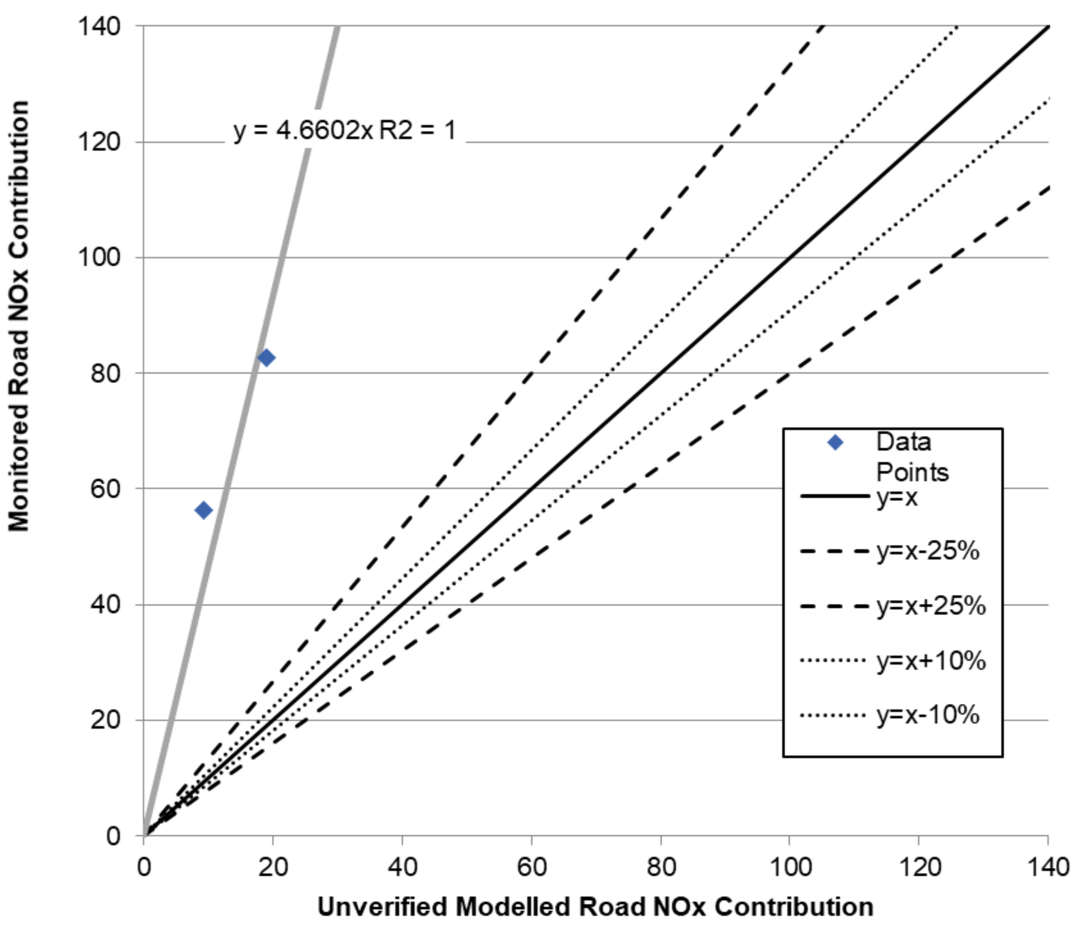

Table A.9 – Sawbridgeworth Adjustment Factor and Comparison of Verified Results against Monitoring Results

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NOx	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m^3)	Adjusted modelled total NO_x (including background NO_x) (µg/m^3)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m^3)	Monitored total NO_2 (µg/m^3)	Difference (adjusted modelled NO_2 vs. monitored NO_2) (%)
EH91	6.08	4.660	43.2	59.0	33.6	39.5	-14.8
EH57	4.33		89.1	105.0	52.9	50.4	4.9

Figure A.6 – Sawbridgeworth Comparison of the Verified Modelled Total NO_2 versus Monitored NO_2

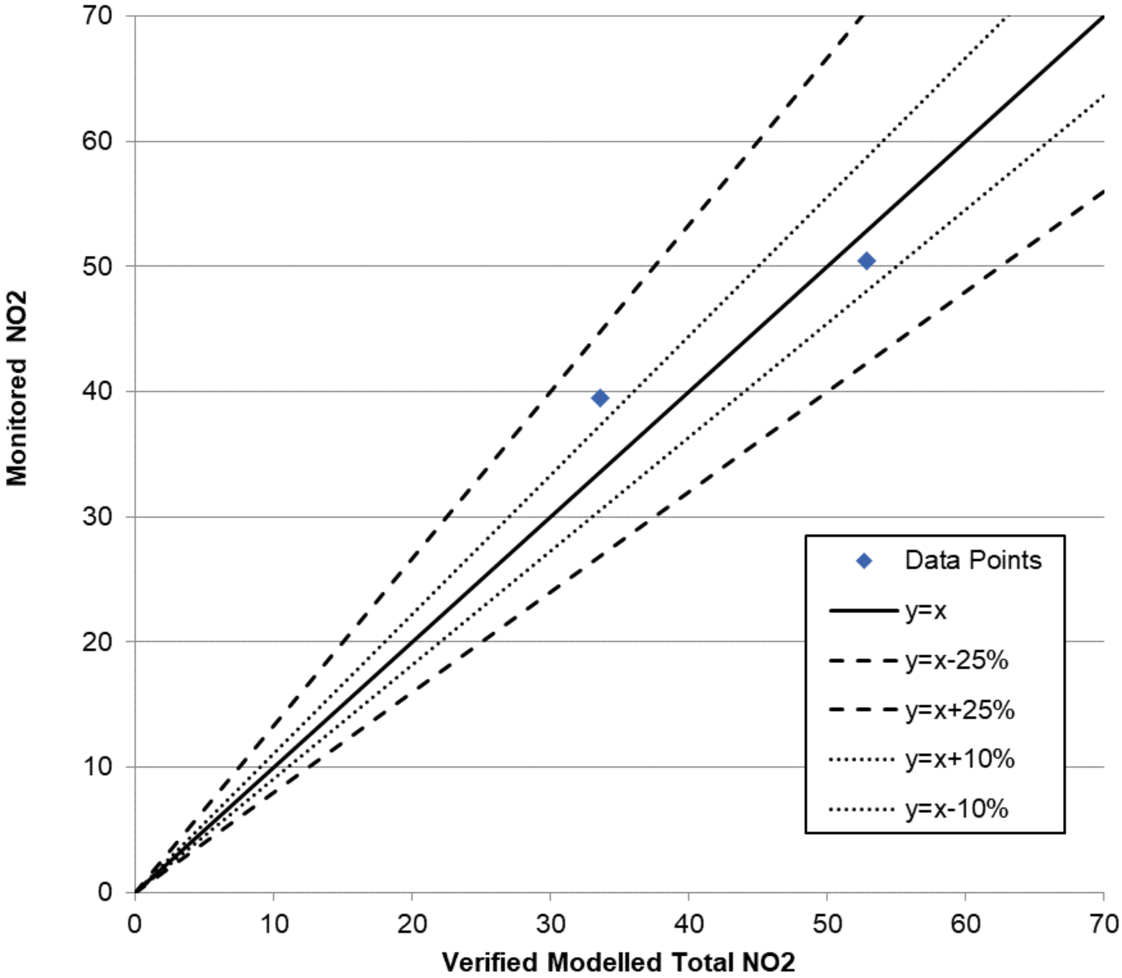

Table A.9 and Figure A.6 show the ratios between monitored and modelled NO_2 for each monitoring location after using the calculated adjustment factor. LAQM.TG(22)[2] states that:

"In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations, ideally within 10%."

The sites show good agreement between the ratios of monitored and modelled NO_2,

A factor of 4.660 reduces the Root Mean Square Error (RMSE) from a value of 25.6 to 4.0, which is in line with the guidance value of 4 µg/m^3 as stated within LAQM.TG(22)[2].

The 4.660 Sawbridgeworth adjustment factor was applied to the road contribution NOx concentrations predicted by the model to arrive at the final NO_2 concentrations in and around the Sawbridgeworth AQMA

Appendix B – Background Concentrations Used

Table B.1 – Defra Background Pollutant Concentrations Covering the Modelled Domain

2019 Annual Mean Background Concentration (µg/m³) [1]					
Grid Reference (x)	Grid Reference (Y)	Total Background NOx	Total Background NO_2	Total Background PM_{10}	Total Background $PM_{2.5}$
Sawbridgeworth AQMA					
548500	215500	15.3	11.5	14.9	9.7
548500	214500	15.9	11.9	14.7	9.7
547500	214500	14.7	11.1	14.9	9.7
Bishop's Stortford AQMA					
549500	221500	18.3	13.5	15.0	9.9
Hertford AQMA					
533500	212500	22.5	16.1	16.8	11.8
532500	212500	20.7	15.1	15.1	10.3
531500	212500	17.4	13.0	14.9	10.1

Note:
[1] Values obtained from the 2019 Defra Mapped Background estimates for the relevant 1km x 1km grid squares covering the modelled domain

Appendix C – Traffic Inputs

Table C.1 – Traffic Data used in the Detailed Assessment

Source	Traffic Point	Modelled Road Link Name		AADT	HGV (%)	Average Speed (kph)
Bishop's Stortford AQMA						
Manual Survey Count Point Data	N/A	1asd1	London Road SD	15239	2.3	20
Manual Survey Count Point Data	N/A	1asd2	London Road SD	15239	2.3	20
Manual Survey Count Point Data	N/A	1a	London Road	15239	2.3	32
Manual Survey Count Point Data	N/A	2asd1	Dunmow Road SD	16166	2.6	20
Manual Survey Count Point Data	N/A	2asd2	Dunmow Road SD	16166	2.6	20
Manual Survey Count Point Data	N/A	2a	Dunmow Road	16166	2.6	32
Manual Survey Count Point Data	N/A	3asd1	Stansted Road SD	11183	1.6	20
Manual Survey Count Point Data	N/A	3a	Stansted Road	11183	1.6	32
Manual Survey Count Point Data	N/A	4asd1	Hockerill Street SD	16651	1.9	20
Manual Survey Count Point Data	N/A	4asd2	Hockerill Street	16651	1.9	20
Hertford AQMA						
DFT Traffic Data 2019	36684	1a	Ware Road	10487	2.5	10
DFT Traffic Data 2019	36684	1b	Ware Road	10487	2.5	48
DFT Traffic Data 2019	36684	1bsd1	Ware Road SD Split	5244	2.5	10
DFT Traffic Data 2019	36684	1bsd2	Ware Road SD Split	5244	2.5	10
DFT Traffic Data 2019	26442	2a	London Road A414	37743	3.3	64
DFT Traffic Data 2019	26442	2asd1	London Road A414 SD	37743	3.3	20
DFT Traffic Data 2019	26442	RA1	Ware Road/Gascoyne Way/London Road Roundabout	37743	3.3	20
DFT Traffic Data 2019	37131	3asd1	Gascoyne Way West of London Road SD	37036	3.2	20
DFT Traffic Data 2019	37131	3a	Gascoyne Way West of London Road	37036	3.2	64
DFT Traffic Data 2019	37131	3asd2	Gascoyne Way West of London Road SD	37036	3.2	20
DFT Traffic Data 2019	37131	RA3	Gascoyne Way/Hale Road/Parliament Street Roundabout	37036	3.2	20
COMET Transport Model (2014)	N/A	4asd1	Hale Road SD	10858	2.6	20
COMET Transport Model (2014)	N/A	4a	Hale Road	10858	2.6	48
COMET Transport Model (2014)	N/A	5asd1	Parliament Street SD	10417	1.8	20
COMET Transport Model (2014)	N/A	5a	Parliament Street	10417	1.8	48
COMET Transport Model (2014)	N/A	6asd1	Old Cross Road SD	9863	1.9	15
COMET Transport Model (2014)	N/A	7a	Cowbridge	9863	1.9	48
COMET Transport Model (2014)	N/A	7asd2	Cowbridge SD	9863	1.9	20
COMET Transport Model (2014)	N/A	7b	Cowbridge	9863	1.9	48
COMET Transport Model (2014)	N/A	8asd1	St Andrew Street SD	6168	2.1	10

Source	Traffic Point	Modelled Road Link Name		AADT	HGV (%)	Average Speed (kph)
COMET Transport Model (2014)	N/A	8a	St Andrew Street	6168	2.1	48
DFT Traffic Data 2019	37131	9asd1	Gascoyne Way East of Hertingfordbury Road SD	37036	3.2	32
DFT Traffic Data 2019	37131	9a	Gascoyne Way East of Hertingfordbury Road	37036	3.2	20
DFT Traffic Data 2019	37131	9b	Gascoyne Way East of Hertingfordbury Road	37036	3.2	64
DFT Traffic Data 2019	37131	9bsd1	Gascoyne Way East of Hertingfordbury Road SD	37036	3.2	32
DFT Traffic Data 2019	37131	RA2	Hertingfordbury Road/Gascoyne Way/A119 Corss Lane Roundabout	37036	3.2	32
DFT Traffic Data 2019	78223	10asd1	A119 Cross Lane SD	15805	0.6	32
DFT Traffic Data 2019	78223	10a	A119 Cross Lane	15805	0.6	48
DFT Traffic Data 2019	78221	11asd1	Hertingfordbury Road SD	30277	3.7	20
DFT Traffic Data 2019	78221	11a	Hertingfordbury Road	30277	3.7	64
COMET Transport Model (2014)	N/A	12a	Mill Bridge	10863	2.2	48
COMET Transport Model (2014)	N/A	12asd1	Mill Bridge SD	10863	2.2	15
COMET Transport Model (2014)	N/A	13asd1	North Road SD	8642	3.0	20
COMET Transport Model (2014)	N/A	13a	North Road	8642	3.0	48
Sawbridgeworth AQMA						
DFT Traffic Data 2019	46197	R1	London Road/Cambridge Road Mini Roundabout - South	18107	2.2	20
DFT Traffic Data 2019	46197	R1a	London Road/Cambridge Road Mini Roundabout - South	18107	2.2	20
DFT Traffic Data 2019	46197	R2	London Road/Cambridge Road Mini Roundabout - North	18107	2.2	20
DFT Traffic Data 2019	46197	R2a	London Road/Cambridge Road Mini Roundabout - North	18107	2.2	20
DFT Traffic Data 2019	46197	1asd1	Cambridge Road SD	18107	2.2	20
DFT Traffic Data 2019	46197	1a	Cambridge Road	18107	2.2	48
Manual Survey Count Point Data	77983	2asd1	Station Road SD	6286	2.1	20
Manual Survey Count Point Data	77983	2a	Station Road	6286	2.1	48
DFT Traffic Data 2019	26197	3asd1	London Road SD	15886	2.0	20
DFT Traffic Data 2019	26197	3a	London Road	15886	2.0	48
DFT Traffic Data 2019	26197	3asd2	London Road SD	15886	2.0	20
DFT Traffic Data 2019	26197	3b	London Road	15886	2.0	48
Manual Survey Count Point Data	77983	4asd1	West Road SD	3098	1.1	20
Manual Survey Count Point Data	77983	4a	West Road	3098	1.1	48
Notes						
Traffic flows and vehicle class compositions were taken from the DfT traffic count point database, COMET Transport Models produce by Hertford County Council and Manual Count Point Surveys undertaken						

Source	Traffic Point	Modelled Road Link Name	AADT	HGV (%)	Average Speed (kph)
Traffic speeds were modelled at either the relevant speed limit for each road. Where appropriate, vehicle speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue – in accordance with LAQM TG(22)[2]					

Appendix D – Receptor Locations and Corresponding Modelled Predictions

Table D.1 – Predicted 2019 Annual Mean Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at Discrete Receptor Locations

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
Bishop's Stortford AQMA							
R1	549352	221357	1.5	4, Limes Crescent, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5JA,	18.93	15.85	10.42
R2	549336	221343	1.5	All Saints Church, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	22.42	16.46	10.77
R3	549310	221340	1.5	35, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	30.26	17.90	11.62
R4	549306	221327	1.5	31, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	31.69	18.17	11.78
R5	549300	221314	1.5	25, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	33.41	18.49	11.97
R6	549320	221313	1.5	33, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	24.71	16.85	11.00
R7	549295	221304	1.5	23, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	33.01	18.40	11.91
R8	549310	221294	1.5	Percival Court, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DX,	26.07	17.07	11.14
R9	549285	221282	1.5	21, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	36.28	18.94	12.25
R10	549280	221272	1.5	25, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	41.69	19.84	12.80
R11	549273	221260	1.5	27, Stansted Road, Hockerill, Bishop's	42.25	19.92	12.85

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
				Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,			
R12	549294	221277	1.5	8, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	39.75	19.61	12.65
R13	549289	221267	1.5	10, Stansted Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DR,	41.73	19.85	12.81
R14	549294	221203	1.5	7, Joscelyn's Yard, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5GW,	32.09	17.89	11.64
R15	549314	221218	1.5	15, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	55.06	23.53	15.02
R16	549323	221218	1.5	15, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	53.12	22.88	14.63
R17	549332	221216	1.5	Wilton Place, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	52.33	23.03	14.72
R18	549343	221216	1.5	Wilton Place, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	51.83	22.92	14.65
R19	549356	221215	1.5	Wilton Place, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	51.99	22.99	14.69
R20	549369	221215	1.5	Wilton Place, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	54.91	23.83	15.19
R21	549340	221207	1.5	Wilton Place, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	54.92	23.27	14.86
R22	549354	221207	1.5	54, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire,	54.94	23.50	14.99

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (μg/m³)		
					NO_2	PM_{10}	$PM_{2.5}$
				Hertfordshire, England, CM23 5HE,			
R23	549380	221214	1.5	37, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	52.45	22.99	14.69
R24	549398	221214	1.5	43, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	51.51	22.84	14.60
R25	549408	221202	1.5	Thrale, Hillside Avenue, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HS,	34.11	18.14	11.78
R26	549423	221223	1.5	49, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	26.15	17.05	11.13
R27	549437	221223	1.5	51, Dunmow Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HE,	25.88	17.07	11.14
R28	549448	221223	1.5	1, Manor Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5HU,	26.04	17.13	11.17
R29	549460	221189	1.5	Conewood Manor, Clayponds, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5JN,	21.46	16.30	10.68
R30	549224	221240	1.5	Zoo, Hockerill Street, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DW,	51.67	21.75	13.95
R31	549218	221241	1.5	Zoo, Hockerill Street, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DW,	50.55	21.47	13.79
R32	549223	221229	1.5	Zoo, Hockerill Street, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 2DW,	55.05	22.26	14.26
R33	549260	221210	1.5	Fox, London Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	57.13	23.76	15.14

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
R34	549259	221203	1.5	Fox, London Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	55.07	23.29	14.86
R35	549257	221195	1.5	Hockerill Court, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5SB,	58.10	24.23	15.42
R36	549255	221187	1.5	Hockerill Court, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5SB,	53.48	23.11	14.75
R37	549254	221180	1.5	Hockerill Court, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 5SB,	53.16	23.01	14.69
R38	549250	221169	1.5	Hairy Wolves, London Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	43.49	20.37	13.12
R39	549249	221140	1.5	17, London Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	32.50	18.22	11.83
R40	549247	221130	1.5	21, London Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	32.05	18.14	11.79
R41	549245	221119	1.5	29, London Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	32.19	18.18	11.81
R42	549244	221104	1.5	33, London Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	30.87	17.96	11.67
R43	549244	221091	1.5	37, Grange Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	29.38	17.75	11.54
R44	549243	221082	1.5	37, Grange Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	28.65	17.64	11.47
R45	549243	221070	1.5	39, London Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	28.66	17.66	11.48
R46	549243	221058	1.5	37, Grange Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	28.18	17.58	11.43

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
R47	549224	221042	1.5	37, Grange Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	21.81	16.40	10.74
R48	549225	221031	1.5	Thomas Heskin Court, Station Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	22.09	16.45	10.77
R49	549224	221019	1.5	Thomas Heskin Court, Station Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	20.80	16.22	10.63
R50	549248	221027	1.5	2, Grange Road, Hockerill, Bishop's Stortford, East Hertfordshire, Hertfordshire, England, CM23 3EE,	23.88	16.78	10.96
Hertford AQMA							
R1	533311	212846	1.5	37, Ware Road, Foxholes, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 7EB,	22.96	18.13	12.56
R2	533292	212838	1.5	31, Ware Road, Foxholes, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 7EB,	23.51	18.24	12.62
R3	533269	212828	1.5	25, Ware Road, Foxholes, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 7EB,	23.96	18.32	12.67
R4	533253	212821	1.5	19, Ware Road, Foxholes, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 7EB,	24.84	18.49	12.77
R5	533195	212779	4	30, Ware Road, Foxholes, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 7EB,	23.95	18.22	12.62
R6	533150	212766	1.5	22, Ware Road, Foxholes, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 7EB,	29.80	19.15	13.17
R7	533135	212761	1.5	18, Ware Road, Foxholes, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 7EB,	32.11	19.18	13.21
R8	533125	212758	1.5	14, Ware Road, Foxholes, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 7EB,	34.65	19.30	13.30
R9	533114	212755	1.5	6, Ware Road, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1QA,	35.57	19.36	13.34

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
R10	533103	212752	1.5	4, Ware Road, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1QA,	35.95	19.40	13.37
R11	533138	212785	4	3a, Ware Road, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1QA,	25.61	18.30	12.67
R12	532997	212610	1.5	Gwynns Walk, Greencoates, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8AP,	42.09	20.02	13.20
R13	533033	212581	1.5	18 Gwynns Walk, Folly Island, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 8AD,	39.53	21.07	14.30
R14	533063	212559	1.5	14 Gwynns Walk, Folly Island, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 8AD,	34.85	20.65	14.02
R15	533076	212548	1.5	9 Gwynns Walk, Folly Island, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 8AD,	33.11	20.37	13.86
R16	533090	212536	1.5	6 Gwynns Walk, Folly Island, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 8AD,	31.05	19.96	13.62
R17	533105	212524	1.5	3 Gwynns Walk, Folly Island, Hertford, Little Amwell, East Hertfordshire, Hertfordshire, England, SG13 8AD,	30.25	19.83	13.54
R18	533115	212564	1.5	19a London Road, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 7LE,	38.36	21.85	14.70
R19	533138	212540	1.5	23 London Road, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 7LE,	45.48	23.95	15.90
R20	533157	212529	1.5	27 London Road, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 7LE,	44.01	23.58	15.68
R21	533196	212510	1.5	35 London Road, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 7LE,	35.23	21.24	14.34
R22	532827	212530	1.5	All Saints Church with Saint John, Gascoyne Way, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8AF,	37.36	20.42	13.36

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
R23	532734	212499	1.5	35 Church Street, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1EN,	33.51	19.14	12.63
R24	532699	212492	1.5	8, Church Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1EJ,	28.52	17.67	11.80
R25	532730	212426	1.5	3, Queen's Road, Horns Mill Estate, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8AZ,	30.92	18.03	12.01
R26	532666	212402	1.5	2, Queens Road, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8AF,	50.55	21.85	14.29
R27	532558	212389	1.5	25, Castle Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HD,	33.83	18.67	12.38
R28	532483	212334	1.5	30 Pimilco Court, Peg's Lane, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8FQ,	37.19	19.06	12.63
R29	532504	212278	1.5	7 Pimilco Court, Peg's Lane, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8FQ,	22.19	16.43	11.07
R30	532525	212205	1.5	Bentley House, Peg's Lane, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8FQ,	21.36	16.46	11.08
R31	532583	212261	1.5	Richard Hale Lodge, Hale Road, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8EN,	25.96	17.49	11.68
R32	532478	212376	1.5	37-41, Castle Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HD,	36.41	18.91	12.54
R33	532422	212356	1.5	3, West Street, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8EU,	35.48	18.75	12.45
R34	532405	212374	1.5	1, Westall Mews, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8EU,	38.44	19.48	12.87
R35	532433	212385	1.5	Water Lane House, Caslte Street, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8EU,	48.83	21.37	14.00
R36	532404	212413	1.5	12, Gascoyne Way, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HH,	41.04	21.08	13.75

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
R37	532383	212393	1.5	7, Westall Mews, Hertford, East Hertfordshire, Hertfordshire, England, SG13 8EU,	32.66	18.93	12.51
R38	532330	212496	1.5	Bridges Court, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	36.63	20.36	13.31
R39	532311	212514	1.5	8 Bridges Court, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	38.69	20.93	13.65
R40	532199	212563	1.5	1 North Road, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	38.61	20.92	13.64
R41	532175	212565	1.5	5 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	35.85	20.13	13.19
R42	532066	212562	1.5	14 Hertingfordbury Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	33.53	19.06	12.59
R43	532013	212550	1.5	36 Hertingfordbury Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	48.61	22.61	14.67
R44	532009	212485	1.5	Maple Lodge, Horn's Mill, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LW,	30.17	18.22	12.11
R45	531970	212547	1.5	52 Hertingfordbury Road, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	36.96	19.87	12.97
R46	531952	212541	1.5	56 Hertingfordbury Road, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	30.12	18.18	11.99
R47	531936	212539	1.5	60 Hertingfordbury Road, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	26.63	17.50	11.58
R48	531919	212533	1.5	64 Hertingfordbury Road, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	24.93	17.25	11.43
R49	531906	212527	1.5	68 Hertingfordbury Road, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	24.02	17.15	11.37
R50	531890	212520	1.5	72 Hertingfordbury Road, Hertford, Hertingfordbury,	23.34	17.07	11.32

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
				East Hertfordshire, Hertfordshire, England, SG14 1JX,			
R51	531873	212510	1.5	76 Hertingfordbury Road, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	23.46	17.14	11.36
R52	531848	212493	1.5	80 Hertingfordbury Road, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1JX,	23.92	17.29	11.44
R53	531826	212477	1.5	4 Seale Road, Horn's Mill, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LB,	24.64	17.48	11.55
R54	531860	212458	1.5	12 Riversmeet, A414, Horn's Mill, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1NL,	28.93	18.51	12.14
R55	531918	212460	1.5	3, Riversmeet, Horn's Mill, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LE,	21.88	16.74	11.13
R56	531791	212422	1.5	152 Hertingfordbury Road, A414, Horn's Mill, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1NL,	31.49	19.18	12.52
R57	532600	212475	1.5	18 Castle Street, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HU,	29.00	17.71	11.83
R58	532619	212479	4	17a Castle Street, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HU,	27.80	17.49	11.70
R59	532575	212545	4	14a Parliament Street, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HU,	22.77	16.72	11.23
R60	532557	212611	4	10 The Wash, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1BE,	22.87	16.77	11.26
R61	532475	212648	1.5	3 Town Mill Mews, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HX,	27.89	17.23	11.56
R62	532461	212654	1.5	Town Mill Mews, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HX,	30.38	17.55	11.75
R63	532470	212671	4	4 Old Cross Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HX,	26.57	17.01	11.43

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m³)		
					NO_2	PM_{10}	$PM_{2.5}$
R64	532447	212681	4	9b Old Cross Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HX,	23.84	16.62	11.19
R65	532417	212771	1.5	4, Cowbridge, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1RD,	23.71	17.12	11.46
R66	532423	212745	1.5	3, Cowbridge, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1RD,	22.83	16.86	11.32
R67	532307	212812	1.5	29, Cowbridge, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1RD,	23.99	16.76	11.27
R68	532338	212815	1.5	Cowbridge, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1QY,	25.92	17.14	11.49
R69	532441	212667	4	4a Saint Andrews Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HP,	40.07	18.56	12.39
R70	532439	212656	4	1b Saint Andrews Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HP,	40.90	18.66	12.45
R71	532406	212656	4	12 Saint Andrews Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HP,	29.14	18.23	12.11
R72	532406	212645	4	6a Saint Andrews Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HP,	29.40	18.33	12.16
R73	532349	212628	1.5	2a Saint Andrews Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HP,	30.27	18.65	12.35
R74	532358	212622	4	27 Saint Andrews Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HP,	29.51	18.46	12.24
R75	532258	212570	1.5	58 Saint Andrews Street, Folly Island, Hertford, East Hertfordshire, Hertfordshire, England, SG14 1HP,	30.59	18.77	12.40
R76	532206	212581	1.5	8, Ebenezer Court, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	31.26	18.96	12.52
R77	532160	212607	1.5	The Cottage, North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire,	25.25	17.39	11.62

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m³)		
					NO_2	PM_{10}	$PM_{2.5}$
				Hertfordshire, England, SG14 1LR,			
R78	532157	212581	1.5	5a North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	30.75	18.78	12.42
R79	532130	212585	1.5	9a North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	29.34	18.37	12.18
R80	532125	212607	1.5	6 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	27.25	17.86	11.89
R81	532110	212585	1.5	17 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	28.46	18.10	12.03
R82	532081	212591	1.5	31 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	27.99	17.88	11.90
R83	532058	212595	1.5	33 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	28.37	17.81	11.87
R84	532035	212600	1.5	35 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	29.26	17.87	11.91
R85	532017	212604	1.5	37 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	30.53	18.11	12.05
R86	532002	212608	1.5	39 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	34.53	18.95	12.54
R87	532102	212617	1.5	4 Swallow Court, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	25.40	17.35	11.60
R88	532080	212621	1.5	8 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	25.77	17.36	11.60
R89	532058	212628	1.5	2 Nightingale Court, Folly Island, Hertford,	26.03	17.26	11.55

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m³)		
					NO_2	PM_{10}	$PM_{2.5}$
				Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,			
R90	532040	212632	1.5	13 Nightingale Court, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	26.80	17.34	11.60
R91	531978	212602	1.5	43 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	27.45	17.69	11.70
R92	531976	212629	1.5	43 North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	25.38	17.36	11.50
R93	531997	212650	1.5	10c North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	26.13	17.54	11.60
R94	531986	212663	1.5	3 Rockleigh, Horn's Mill, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LS,	24.35	17.21	11.41
R95	531966	212679	1.5	16b North Road, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	23.63	17.08	11.33
R96	531941	212691	1.5	2 Sele House, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	26.40	17.71	11.69
R97	531918	212705	1.5	5 Sele House, Folly Island, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1LR,	27.00	17.85	11.77
R98	531895	212682	1.5	33 Florence Court, Hertford, Hertingfordbury, East Hertfordshire, Hertfordshire, England, SG14 1ND,	19.03	16.11	10.77
Sawbridgeworth AQMA							
R1	548402	215826	1.5	12, Cherry Gardens, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9DW,	18.92	16.38	10.62
R2	548390	215813	1.5	10, Cherry Gardens, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9DW,	19.82	16.58	10.73
R3	548379	215800	1.5	8, Cherry Gardens, Sawbridgeworth, East Hertfordshire,	21.01	16.83	10.88

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
				Hertfordshire, England, CM21 9DW,			
R4	548342	215758	1.5	132 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	33.98	19.80	12.59
R5	548335	215734	1.5	128 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	33.83	19.76	12.57
R6	548331	215719	1.5	126 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	33.03	19.57	12.46
R7	548328	215703	1.5	120 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	31.77	19.27	12.28
R8	548328	215684	1.5	116 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	28.42	18.48	11.83
R9	548323	215670	1.5	112 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	29.33	18.69	11.95
R10	548319	215656	1.5	108 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	29.62	18.76	11.99
R11	548315	215640	1.5	106, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	30.21	18.90	12.07
R12	548301	215610	1.5	104, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	33.71	19.73	12.55
R13	548265	215616	1.5	2 School Lane , Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	18.33	16.25	10.54
R14	548261	215604	1.5	4 School Lane, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	18.60	16.31	10.57
R15	548291	215591	1.5	98, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	34.96	20.03	12.73
R16	548286	215580	1.5	94, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	35.17	20.08	12.76

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
R17	548281	215566	1.5	90, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	34.00	19.80	12.59
R18	548277	215559	1.5	86, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	35.08	20.06	12.74
R19	548270	215543	1.5	82, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	35.00	20.04	12.73
R20	548264	215527	1.5	78, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	34.53	19.92	12.66
R21	548257	215510	1.5	74, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	35.15	20.07	12.75
R22	548239	215547	1.5	67, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	19.38	16.47	10.67
R23	548227	215527	1.5	63, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	18.41	16.26	10.55
R24	548224	215506	1.5	59, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	19.93	16.59	10.74
R25	548252	215497	1.5	70, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	34.40	19.89	12.64
R26	548246	215481	1.5	66, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	33.76	19.73	12.55
R27	548240	215468	1.5	62, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	35.50	20.15	12.80
R28	548214	215481	1.5	55, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	19.50	16.49	10.68
R29	548204	215463	1.5	49, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	18.64	16.31	10.57
R30	548237	215452	1.5	46, Cambridge Road, Sawbridgeworth, East Hertfordshire,	31.85	19.27	12.29

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
				Hertfordshire, England, CM21 9BU,			
R31	548232	215446	1.5	40, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	35.96	20.26	12.86
R32	548230	215429	1.5	38, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	33.40	19.64	12.50
R33	548227	215413	1.5	36, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	34.00	19.78	12.58
R34	548199	215425	1.5	41 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	19.86	16.56	10.72
R35	548196	215404	1.5	37 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	20.03	16.59	10.74
R36	548260	215390	1.5	4 Cutforth Rd, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9EA,	19.72	16.52	10.70
R37	548223	215382	1.5	26a Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	34.69	19.94	12.67
R38	548223	215371	1.5	22 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	33.29	19.59	12.47
R39	548195	215383	1.5	35 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	20.50	16.69	10.79
R40	548225	215357	1.5	20 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	30.28	18.87	12.06
R41	548223	215343	1.5	18 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	30.72	18.97	12.11
R42	548223	215330	1.5	16 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	29.81	18.74	11.98
R43	548195	215356	1.5	27 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	21.64	16.92	10.93

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
R44	548193	215342	1.5	23 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	21.52	16.89	10.91
R45	548190	215318	1.5	19 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	21.02	16.76	10.84
R46	548224	215304	1.5	14 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	28.96	18.52	11.85
R47	548224	215299	1.5	12 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	29.03	18.52	11.86
R48	548185	215294	1.5	15 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	19.94	16.50	10.69
R49	548226	215282	1.5	3 Naseby Lodge, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	28.24	18.30	11.73
R50	548227	215268	1.5	1 Naseby Lodge, Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	28.32	18.27	11.72
R51	548186	215279	1.5	15 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	20.44	16.58	10.74
R52	548186	215266	1.5	13 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	21.01	16.66	10.79
R53	548186	215257	1.5	9 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	21.48	16.72	10.82
R54	548190	215238	1.5	7 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	24.70	17.24	11.13
R55	548224	215237	1.5	8 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	32.22	18.86	12.08
R56	548192	215229	1.5	5 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	27.34	17.65	11.38

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
R57	548188	215212	1.5	3 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	30.52	18.02	11.61
R58	548224	215206	1.5	4 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	35.16	18.90	12.13
R59	548208	215188	1.5	2 Cambridge Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9BU,	55.88	22.76	14.45
R60	548239	215154	1.5	3 Barn Court Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	34.42	18.65	11.99
R61	548218	215145	1.5	8 Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	39.50	19.55	12.53
R62	548230	215139	1.5	14a Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	33.04	18.42	11.85
R63	548254	215127	1.5	16 Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	27.28	17.48	11.29
R64	548252	215148	1.5	1 Barn Court Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	31.75	18.20	11.72
R65	548267	215141	1.5	2 Walnutt Cottages Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	28.90	17.77	11.46
R66	548280	215136	1.5	4 Walnutt Cottages Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	26.27	17.50	11.28
R67	548294	215130	1.5	6 Walnutt Cottages Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	24.77	17.33	11.18
R68	548283	215113	1.5	20 Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	22.84	16.91	10.93
R69	548303	215107	1.5	24 Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	21.92	16.81	10.87
R70	548321	215101	1.5	32 Station Road, Sawbridgeworth, East Hertfordshire,	21.69	16.80	10.87

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
				Hertfordshire, England, CM21 9QW,			
R71	548341	215094	1.5	40 Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	21.06	16.70	10.81
R72	548361	215088	1.5	58 Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	20.45	16.59	10.74
R73	548321	215122	1.5	3 Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	22.68	17.00	10.98
R74	548339	215115	1.5	5 Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	22.13	16.92	10.93
R75	548372	215088	1.5	2 The Old Chapel, Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9QW,	20.82	16.68	10.79
R76	548452	215096	1.5	27, Station Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9PX,	20.84	16.72	10.81
R77	548159	215181	1.5	5, West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	24.84	17.03	11.02
R78	548144	215188	1.5	11, West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	20.87	16.42	10.66
R79	548131	215195	1.5	17 West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	19.23	16.22	10.53
R80	548154	215205	1.5	2 Alice Cottage, West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	23.11	16.80	10.88
R81	548125	215221	1.5	2, West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	17.76	16.00	10.40
R82	548109	215203	1.5	21 West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	17.85	16.05	10.43
R83	548098	215229	1.5	8 West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	16.62	15.83	10.30

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m³)		
					NO_2	PM_{10}	$PM_{2.5}$
R84	548087	215210	1.5	31 West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	17.12	15.94	10.36
R85	548071	215215	1.5	39 West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	16.86	15.90	10.34
R86	548059	215219	1.5	3 Atherton End, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	16.75	15.89	10.33
R87	548046	215247	1.5	20 West Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 0BP,	15.08	15.55	10.14
R88	548198	215147	1.5	98, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	54.65	22.51	14.30
R89	548177	215140	1.5	105, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JJ,	34.10	18.60	11.96
R90	548192	215125	1.5	92, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	44.02	20.47	13.07
R91	548186	215103	1.5	82, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	38.49	19.89	12.69
R92	548166	215104	1.5	99, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	27.40	17.79	11.45
R93	548162	215086	1.5	95, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	26.21	17.75	11.42
R94	548154	215058	1.5	89, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	25.69	17.73	11.40
R95	548174	215060	1.5	70, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	33.29	19.45	12.40
R96	548149	215043	1.5	87, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	25.31	17.67	11.36
R97	548170	215021	1.5	56, London Road, Sawbridgeworth, East Hertfordshire,	27.17	18.08	11.60

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
				Hertfordshire, England, CM21 9JS,			
R98	548140	215001	1.5	75, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	24.29	17.45	11.24
R99	548132	214963	1.5	4 The Maples, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	23.69	16.96	11.08
R100	548120	214924	1.5	4 Kings Head Court, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	23.36	16.58	10.88
R101	548122	214827	1.5	Eversley, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	33.53	19.15	12.35
R102	548100	214855	1.5	37 Sayesbury, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	20.91	16.25	10.67
R103	548094	214793	1.5	43, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	25.03	17.36	11.30
R104	548081	214757	1.5	39, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	26.26	17.66	11.48
R105	548074	214737	1.5	53 London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	27.86	18.02	11.69
R106	548100	214714	1.5	The Middle House, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	22.73	16.88	11.03
R107	548092	214700	1.5	Frodsham The Drive, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	23.38	17.03	11.11
R108	548084	214672	1.5	11 Bell mead Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	22.14	16.76	10.96
R109	548040	214670	1.5	21, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	22.91	16.93	11.06
R110	548043	214614	1.5	13 Copper Court London Road, Sawbridgeworth, East Hertfordshire,	27.03	17.85	11.59

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m³)		
					NO_2	PM_{10}	$PM_{2.5}$
				Hertfordshire, England, CM21 9JS,			
R111	548016	214624	1.5	17, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	22.12	16.76	10.96
R112	547999	214595	1.5	5, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	21.08	16.93	10.85
R113	548014	214574	1.5	2c Springhall Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	31.52	18.89	12.19
R114	547990	214575	1.5	Vale Cottage, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	23.15	17.38	11.11
R115	548003	214542	1.5	1, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	25.33	17.47	11.37
R116	547980	214516	1.5	6, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	27.88	18.43	11.72
R117	547923	214474	1.5	16 Brook Lane, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	23.87	17.54	11.20
R118	547938	214458	1.5	34 Willow Court, London Road, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	28.65	18.61	11.82
R119	547914	214422	1.5	18 Newton Drive, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	28.49	18.58	11.80
R120	547889	214384	1.5	20 Newton Drive Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	27.33	18.31	11.65
R121	547869	214417	1.5	7 The Crest, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	18.23	16.32	10.50
R122	547835	214356	1.5	1 High Tree Close, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	25.00	17.79	11.35
R123	547655	214197	1.5	15 Falconers Park, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	15.39	15.73	10.16

Receptor ID	X	Y	Height	Closest address/post code	2019 Annual Mean Concentration (µg/m^3)		
					NO_2	PM_{10}	$PM_{2.5}$
R124	547616	214145	1.5	19 Falconers Park, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	14.87	15.63	10.10
R125	547602	214094	1.5	2 Falconers Cottage, Sawbridgeworth, East Hertfordshire, Hertfordshire, England, CM21 9JS,	17.14	16.10	10.37