Supplementary Committee Agenda

Epping Forest District Council

Cabinet
Monday, 13th March, 2023

Place:	Council Chamber, Civic Offices, High Street, Epping
Time:	7.00 pm
Democratic Services:	A. Hendry (Democratic Services) DD Tel: (01992) 564246

13. DRAFT AIR QUALITY ACTION PLAN (Pages 3 - 104)

Draft Air Quality Action Plan 2023-2028 – (C-045-2022-23).

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Epping Forest District Council
Draft Air Quality Action Plan

In fulfilment of Part IV of the Environment Act 1995
Local Air Quality Management

2023

Information	Epping Forest District Council Details
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Report Reference Number	EFDCAQAP2023
Date	March 2023

Executive Summary

This draft Air Quality Action Plan (AQAP) has been produced as part of our statutory duties required by the Local Air Quality Management framework. It outlines the action we will take to improve air quality in Epping Forest District Council between 2023 to 2028.

This action plan replaces the previous action plan which ran from 2012 to 2014. Projects delivered since the last action plan include:

- Optimising traffic flow through the Bell Common junction by adjusting the traffic signal timings
- Reduction of maximum speed through Epping Forest to 40 mph (to include the B1393 approaching the AQMA at Bell Common)
- Implementing anti idling legislation throughout the district
- Promoting clean air days
- Increasing monitoring throughout the District
- Introducing demand responsive transport (DRT)

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3]. Epping Forest District Council is committed to

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

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reducing the exposure of people in the district to poor air quality in order to improve health.

We have developed actions that can be considered under 6 broad topics:

- Alternatives to private vehicle use/ promoting low/zero emission transport
- Environmental Permitting and other regulatory measures
- Freight and Delivery Management
- Policy Guidance and Development Management
- Promoting Low Emission Plant
- Public health, awareness raising and monitoring

In this AQAP we outline how we plan to address air quality issues within our control. However, we recognise that there are a large number of air quality policy areas that are outside of our influence (such as vehicle emissions standards agreed in Europe), but for which we may have useful evidence, and so we will continue to work with regional and central government on policies and issues beyond the Council's direct influence.

Responsibilities and Commitment

This AQAP was prepared by the Environmental Health team of Epping Forest District Council with the support and agreement of the following internal and external departments:

- Planning Team, Epping Forest District Council (EFDC)
- Licensing, EFDC
- Procurement, EFDC Building Regulations, EFDC
- Public Health, Community, Culture & Wellbeing, EFDC
- Sustainable Travel Team, EFDC
- Communications Team, EFDC
- Environmental Health, EFDC
- Highways Department, Essex County Council (ECC)
- Public Health, (Wellbeing, Public Health and Communities) ECC
- Sustainable Transport Team, ECC
- Trading Standards, ECC
- Qualis Group

This AQAP will be subject to an annual review. Progress each year will be reported in the Annual Status Reports (ASRs) produced by Epping Forest District Council, as part of our statutory Local Air Quality Management duties.

If you have any comments on this AQAP please send them to Environmental Health at:

Civic Offices,
High Street,
Epping,
Essex,
CM16 4BZ

Telephone: 01992564000

Email: EnvironmentalHealth@eppingforestdc.gov.uk

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1 Introduction

This report outlines the actions that Epping Forest District Council will deliver between 2023 to 2028 in order to reduce concentrations of air pollutants and exposure to air pollution; thereby positively impacting on the health and quality of life of residents and visitors to the district.

It has been developed in recognition of the legal requirement on the local authority to work towards Air Quality Strategy (AQS) objectives under Part IV of the Environment Act 1995 and relevant regulations made under that part and to meet the requirements of the Local Air Quality Management (LAQM) statutory process.

This Plan will be reviewed every five years at the latest and progress on measures set out within this Plan will be reported on annually within Epping Forest District Council's air quality Annual Status Report (ASR).

2 Summary of Current Air Quality in Epping Forest District Council

Air quality in the district is generally good with only small pockets of elevated concentrations of pollution related to vehicle emissions, which are limited to congested high street areas and busy junctions. The Council continues to monitor air quality at 42 locations across the District, using nitrogen dioxide as the key indicator. Appendix E of this document includes a summary of the pollutants of concern and monitoring data for the District.

Our monitoring shows that nitrogen dioxide concentrations across the district has for most of the monitoring locations in the District improved slightly. A significant improvement was experienced in 2020, however, it is most likely that this improvement is due to the national lockdown initiated by government in response to the COVID-19 pandemic, as these trends have been seen nationally.

The Council retains one small Air Quality Management Area (AQMA) near the B1393 / Theydon Road junction at Epping, Bell Common. The concentration of nitrogen dioxide measured during 2020 was 32.5µg/m^3, significantly below both the 60µg/m^3 concentration which is used to indicate that the hourly objective is likely to be exceeded, and the 40µg/m^3 annual mean objective. In normal circumstances this would indicate that Council should consider the revocation of this management area, however as traffic volumes have returned to normal, it is not appropriate to consider such an action at present.

In January 2020 four additional nitrogen dioxide diffusion tube monitoring locations were set up. Two of these were close to residential receptors in the vicinity of Rectory Lane Loughton which experiences high volumes of traffic, and the other two were close to Nazeing crossroads, where queuing traffic is commonplace. As monitoring for these locations commenced during the pandemic, it is too early to make any conclusions with regards to pollution concentrations for these locations, however, monitoring has suggested that NO_2 concentrations at these locations are below the annual objective.

Further details with regards to our AQMA and pollution monitoring can be found on our Annual Status Reports found in https://essexair.org.uk/

3 The Environment Act 2021

The UK Government's Environment Act 2021 requires the Government to set legally binding environmental targets for England in four priority areas including air quality, as well as an additional target on fine particulate matter ($PM_{2.5}$), as this is considered to be the air pollutant of greatest harm to human health. In March 2022, the Government published a consultation on what the targets should look like.

Both of the proposed air quality targets relate to $PM_{2.5}$ and are:

- An annual mean concentration target – a target of 10 micrograms per cubic metre (µg m3) to be met across England by 2040.
- A population exposure reduction target – a 35% reduction in population exposure by 2040 (compared to a base year of 2018).

Defra will be setting out the role that local authorities will play in meeting the national $PM_{2.5}$ targets in a revised National Air Quality Strategy which will be published in 2023.

The Council does not currently monitor for $PM_{2.5}$ and is awaiting further guidance from Defra with regards to $PM_{2.5.}$ The current requirement is to work towards reducing emissions/concentrations of $PM_{2.5}$ with no set annual mean concentration yet in place. Our Air Quality Focus Areas (AQFA) as discussed in section 4.2 of this document is our current approach at addressing exposure to $PM_{2.5}$.

4 Epping Forest District Council's Air Quality Priorities

The main pollution sources in our District continue to be vehicle emissions and emissions from buildings both domestic and commercial. Whilst the majority of the district experiences good air quality and complies with the current air quality standards set by the government, it's important to acknowledge that there is no safe exposure limit for certain pollutants like fine particulates.

The World Health Organization (WHO) has recently updated its guideline values which are lower than the air quality standards set out by our Government. We therefore aim to continue to improve air quality in our District and set an ambitious goal to work towards the WHO values.

To help us do this, we have set out priority measures within this AQAP that include:

1. Alternatives to private vehicle use/ promoting low/zero emission transport
2. Environmental Permitting and other regulatory measures
3. Freight and Delivery Management
4. Policy Guidance and Development Management
5. Promoting Low Emission Plant
6. Public health, awareness raising and monitoring

These are supported by the Council's Corporate Objectives:

- Reduce our carbon footprint across the district and within our council by working to reduce emissions, offsetting pollution by increasing tree planting including through new housing developments and community initiatives.
- Ensure all residents have the opportunity to lead healthy and fulfilling lives by delivering the objectives of the joint Health and Wellbeing Strategy and working with our colleagues in the NHS.

This draft Air Quality Action Plan (2023-2028) has been produced as part of our statutory duties under the Environment Act 1995, as required by the Local Air Quality Management (LAQM) framework.

4.1 Public Health Context

Air pollution is one of the largest environmental risk to public health in the UK. The annual mortality of human-made air pollution in the UK is roughly equivalent to between 28,000 and 36,000 deaths every year.[4] It is estimated that between 2017 and 2025 the total cost to the NHS and social care system of air pollutants (fine particulate matter and nitrogen dioxide), for which there is more robust evidence for an association, will be £1.6 billion.[5] Air pollution can cause and worsen health effects in all individuals, particularly society's most vulnerable populations. Long-term exposure to air pollution can cause chronic conditions such as cardiovascular and respiratory diseases as well as lung cancer, leading to reduced life expectancy. Short-term increases in levels of air pollution can also cause a range of health impacts, including effects on lung function, exacerbation of asthma, increases in respiratory and cardiovascular hospital admissions and mortality. Air pollution can affect anyone's health; nevertheless, some individuals can be more susceptible than others. These include children, the elderly, individuals with existing cardiovascular or respiratory diseases, pregnant women, communities in areas of higher pollution, such as close to busy roads and low-income communities.[6]

The Public Health Outcomes Framework (PHOF) examines indicators that help to understand trends in public health. It also enables local authorities to benchmark and compare their own outcomes with other local authorities. For example, one indicator looks at the health impacts of air pollution: the fraction (%) of mortality attributable to long-term exposure to $PM_{2.5}$. This is calculated using modelled $PM_{2.5}$ levels. Based on the PHOF indicator as seen in table 4.1(a) below, Epping Forest District is above the England average of 5.1% under the old method for assessing this indicator at 5.9%. The district is also above the England average of 5.6% using the new method for assessing this indicator at 6.1%.

4 https://www.gov.uk/government/publications/air-pollution-applying-all-our-health/air-pollution-applying-all-our-health

5 https://www.gov.uk/government/publications/air-pollution-applying-all-our-health/air-pollution-applying-all-our-health

6 https://www.gov.uk/government/publications/air-pollution-applying-all-our-health/air-pollution-applying-all-our-health

Table 4.1(a): Fraction (%) of mortality attributable to long-term exposure to $PM_{2.5}$ for Epping Forest using old and new method

Indicator	Period	Epping For			England			
		Recent Trend	Count	Value	Value	Worst/ Lowest	Range	Best/ Highest
Fraction of mortality attributable to particulate air pollution								
Fraction of mortality attributable to particulate air pollution (old method)	2019	–	-	5.9%	5.1%	2.6%		7.0%
Fraction of mortality attributable to particulate air pollution (new method)	2020	–	-	6.1%	5.6%	3.0%		7.8%

Whilst the District is above the England average for mortality attributable to long-term exposure to $PM_{2.5}$, the percentage has reduced since 2018 as seen in table 4.1(b) below. This is in line with reductions seen nationally.

Table 4.1(b): Trend of fraction (%) of mortality attributable to long-term exposure to $PM_{2.5}$ using the new method for Epping Forest in the past 3 years

Period	Epping Forest					East of England	England
		Count	Value	95% Lower CI	95% Upper CI		
2018	○	-	8.0%	-	-	7.6%	7.1%
2019	○	-	8.1%	-	-	7.6%	7.1%
2020	○	-	6.1%	-	-	5.8%	5.6%

Table 4.1(c) below, shows where Epping Forest District Council stands in comparison to neighbouring boroughs with regards to mortality attributable to long-term exposure to $PM_{2.5}$ using the new method for neighbouring authorities. Whilst the District does not have the highest mortality attributable to long-term exposure to $PM_{2.5}$ as compared to neighbouring authorities, it does still have a high value. Furthermore, as more research confirms the negative health impacts associated with exposure to particulates, the Council acknowledges that more needs to be done both on a local and national scale to reduce particulate exposure. Our actions in table 6.1 below demonstrate what the council is doing to reduce particulate emissions and exposure in our District.

Table 4.1(c): Trend of fraction (%) of mortality attributable to long-term exposure to $PM_{2.5}$ using the new method for neighbouring authorities

Authority	2020 value (%) new method	2020 England Value
London Borough of Waltham Forest	7.4%	5.6%
London Borough of Redbridge	7.2%	5.6%
London Borough of Enfield	6.9%	5.6%
Thurrock Council	6.5%	5.6%
Basildon Borough Council	6.2%	5.6%
Castle Point Borough Council	6.1%	5.6%
Epping Forest District Council	6.1%	5.6%
Southend-on-Sea City Council	6.1%	5.6%
Brentwood Borough Council	6.0%	5.6%
Chelmsford City Council	5.9%	5.6%
Colchester City Council	5.9%	5.6%
Harlow Council	5.9%	5.6%
Rochford District Council	5.9%	5.6%
Braintree District Council	5.7%	5.6%
Maldon District Council	5.7%	5.6%
Tendring District Council	5.6%	5.6%
Uttlesford District Council	5.5%	5.6%

4.2 Air Quality Focus Areas for $PM_{2.5}$

In addition to implementing actions to improve air quality within our AQMA, the Council has also created air quality focus areas (AQFA) for $PM_{2.5}$ exposure. AQFA's have normally been locations that not only exceed the EU annual mean limit value for NO_2 but are also locations with high human exposure. We wanted to use a similar concept to create focus areas for $PM_{2.5}$ as that is the pollutant used in the Public Health Indicator for assessing mortality attributable to long-term exposure.

Under the Strategic Health Asset Planning and Evaluation (SHAPE) platform, The UK Health Security Agency has developed a pilot indicator to represent population level vulnerability to air pollution at Lower-layer Super Output Areas level. This is a ranking of the level of vulnerability from low (1-2) to high (9-10) decile scores. This is based on the population characteristics (% of young people (<16 years) and older adults (65+ years)), Levels of Deprivation (Index of multiple deprivation score), location of vulnerable populations (any hospitals, schools, care homes and childcare facilities) and the concentration of air pollution (NO_2 and $PM_{2.5}$) modelled for 2018.

Based on SHAPE's air pollution vulnerability indicator for $PM_{2.5}$, we have chosen locations with the highest scores 9 and 10 as our AQFA's. These are represented in figure 4.2 below with the darkest shades. As seen below, most of the areas with the highest pollution vulnerability scores are also the areas closest to main roads such as the M11, M25.

As this is a pilot indicator, we are conducting district wide air quality modelling which will help to confirm the results from the SHAPE platform. The modelling will be completed by April 2023 and the pollution vulnerability map will be updated accordingly.

A full list of districts with a high pollution vulnerability score is provided in Appendix A.

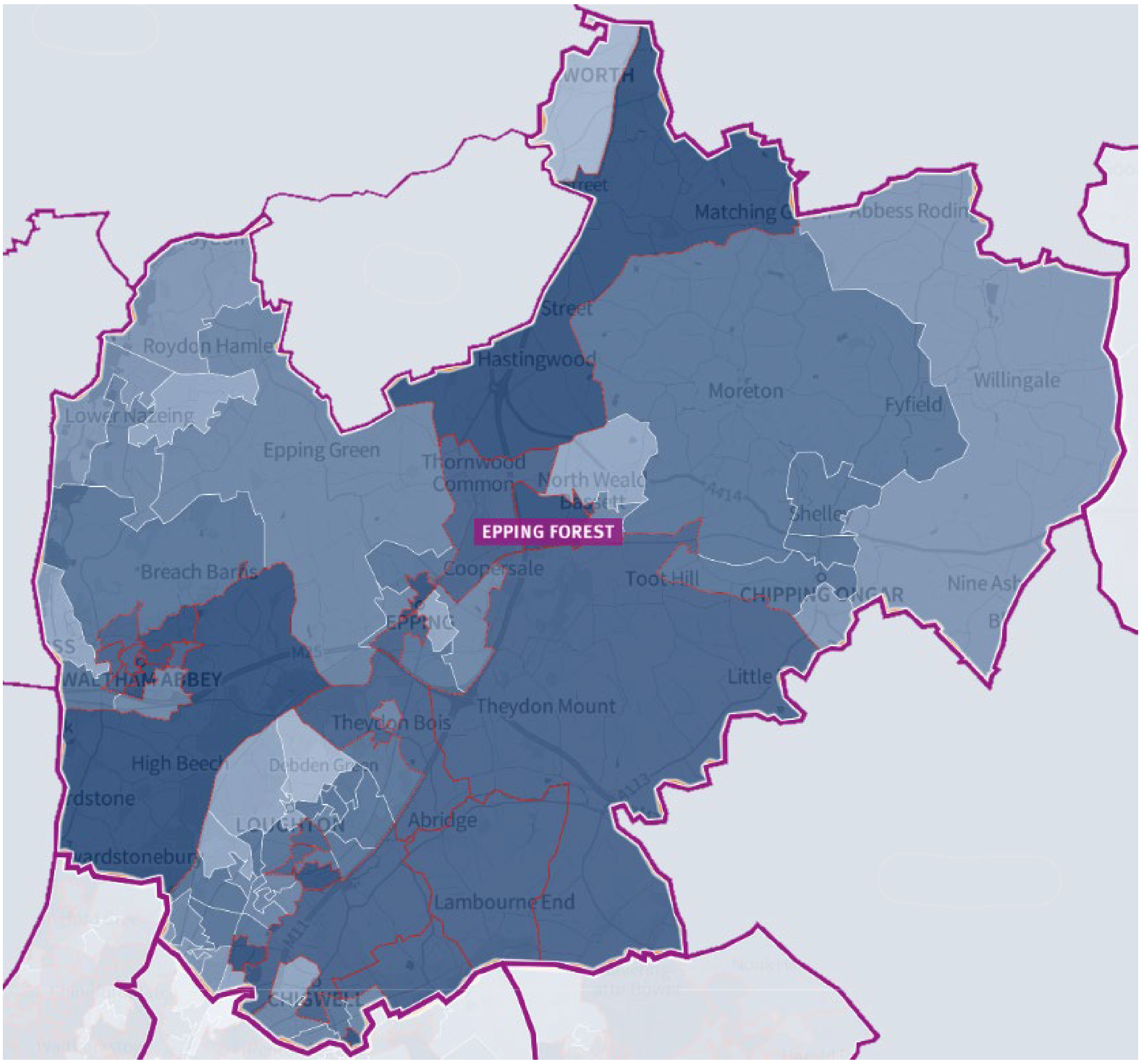

Figure 4.2: Air Pollution Vulnerability Indicator for $PM_{2.5}$

4.3 Planning and Policy Context

The planning regime continues to be a main tool for the Council with regards to improving air quality. Whilst our Local Plan has yet to be adopted and is currently being reviewed by the planning inspector, the Council has ensured that air quality both with regards to human health and the Epping Forest Special Area of Conservation (EFSAC) is a material consideration within the planning regime. Most large applications require an air quality assessment (detailed or screening) to ensure that new developments are not contributing to poor air quality in the district, as well as, not introducing new receptors to areas of poor air quality. A Habitats Regulation Assessment (HRA) is also required to ensure developments do not negatively impact on the EFSAC.

Whilst a London policy, the Council is also looking at air quality neutral options to address both vehicle and building emissions from new developments. This will ensure that new developments do not negatively impact on local air quality or contribute to an increasing pollution baseline, also known as creeping pollution baseline. This not only benefits air quality in the district, but also helps with regards to the Council's commitment to become carbon neutral by 2030.

The Council is also focussing on construction impacts and working to reduce emissions from site by working with developers to ensure robust measures are put in place via planning conditions to limit emissions from the demolition, earthworks, construction and track out phases of a development. Whilst we can currently address emissions from construction activities, we have no powers with regards to emissions from non-road mobile machinery (NRMM). Legislation from central government with respect to this matter would be greatly welcomed. Emissions from NRMM, during all phases of a development, can significantly impact upon local air quality. We are however, encouraging developers within their construction management plans to adopt measures within the London Plan that require specific emission standards from NRMM's.

4.4 Source Apportionment

The AQAP measures presented in this report are intended to be targeted towards the main sources of emissions within the District; these are vehicle and building emissions.

In 2021 the Council commissioned Bureau Veritas to produce a detailed modelling and source apportionment assessment to support the update of this Air Quality Action Plan. The detailed modelling assessment focussed on the road network within and around the Epping Forest AQMA to establish concentrations and determine the sources that contribute to pollutant concentrations within the AQMA. It assessed NO_2, PM_{10} and $PM_{2.5}$ concentrations.

Amongst its conclusions, the assessment determined that:

- the main pollution source contributing to the AQMA came from vehicle emissions
- the background concentrations show that for NO_x, motorway emissions account for around half of background concentrations
- within the AQMA, congestion accounted for 81.9% of NO_x contributions from the road and that traffic smoothing measures would help to reduce this pollution contribution
- petrol cars were the most prevalent vehicles on the road within the AQMA, with 46.6% of all vehicles within the assessment being petrol cars
- the NO_x source apportionment exercise demonstrated that diesel cars and diesel light good vehicles (LGVs) were the primary contributors to local road NO_x concentrations within the AQMA
- PM_{10} and $PM_{2.5}$ concentrations within the AQMA are largely made up of residual background sources. For both pollutants, the greatest road contributor was identified as being Diesel Cars, followed by Petrol cars and Diesel LGVs
- 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 air quality objectives (AQO) by 2026.

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Whilst the assessment concluded that the AQMA should comply with the AQO by 2024 without any measures, the Council will still be delivering air pollution reduction measures to ensure that our District not only complies with the air quality standards but also works towards the World Health Organization air quality guidelines and helps towards our Climate Change Action Plan as well as improving air quality around the Epping Forest Special Area of Conservation.

The full detailed modelling and source apportionment assessment can be found in Appendix B of this AQAP. Additionally, all our ASR's can be found on the Essex Air website: https://essexair.org.uk

4.5 Greater London Authority's proposed Ultra Low Emission Zone expansion

In the summer of 2022, the Greater London Authority (GLA) via Transport for London (TfL) consulted on the possibility of expanding the Ultra Low Emission Zone (ULEZ) to cover most of the Great London area. Whilst the consultation information was detailed, it failed to demonstrate that our AQMA would not be negatively impacted by the proposed expansion. Because of this, the 2024 estimated date of compliance of our AQMA may be delayed to a later date. Monitoring of our AQMA will continue until a time that we are certain that levels are below the objectives. Revocation of our AQMA will not occur until we have confirmed with Defra that it is the appropriate step to take. Our full response to the GLA's proposed ULEZ expansion is included in Appendix C.

5 Development and Implementation of Epping Forest District Council's Air Quality Action Plan

5.1 Consultation and Stakeholder Engagement

In developing this AQAP, we have worked with other local authorities, agencies, businesses and the local community to improve local air quality. Schedule 11 of the Environment Act 1995 requires local authorities to consult the bodies listed in table 5.1. In addition, we have promoted the public consultation via:

- Council website
- local newspaper
- emails
- social media (Instagram/Facebook/Twitter)
- questionnaires via survey monkey
- paper copies of the draft AQAP and survey provided upon request and at reception in the Civic Offices

The response to our consultation stakeholder engagement is given in Appendix D.

Table 5.1 – Consultation Undertaken

Yes/No	Consultee
Yes	the Secretary of State
Yes	the Environment Agency
Yes	the highways authority
Yes	all neighbouring local authorities
Yes	other public authorities as appropriate, such as Public Health officials
Yes	bodies representing local business interests and other organisations as appropriate

5.2 Steering Group

In the production of this Air Quality Action P, the following stakeholders contributed to the creation of the measures within table 6.1.

Internal:

- Planning Team, Epping Forest District Council (EFDC)
- Licensing, EFDC
- Procurement, EFDC
- Public Health, Community, Culture & Wellbeing, EFDC
- Sustainable Travel Team, EFDC
- Communications Team, EFDC
- Environmental Health, EFDC

External:

- Highways Department, Essex County Council (ECC)
- Public Health, (Wellbeing, Public Health and Communities) ECC
- Sustainable Transport Team, ECC
- Trading Standards, ECC
- Qualis Group

6 Air Quality Action Plan Measures

Table 6.1 below shows Epping Forest District Council's AQAP measures. It contains:

- a list of the actions that form part of the plan
- the responsible individual and departments/organisations who will deliver this action
- estimated cost of implementing each action (overall cost and cost to the local authority)
- expected benefit in terms of pollutant emission and/or concentration reduction
- the timescale for implementation
- how progress will be monitored

NB: Please see future ASRs for regular annual updates on implementation of these measures

Table 6.1 – Air Quality Action Plan Measures

Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress
Category A - Alternatives to private vehicle use/ promoting low/zero emission transport									
A01	Continue providing a demand responsive transport service (DRT)	Ongoing	Epping Forest District Council ❖ Sustainable Transport Team ❖ Epping Forest Community Transport Essex County Council	Epping Forest District Council (subsidized) and fare revenue	No	High	Reduced private vehicle usage Reduced tailpipe and brake wear emissions Reduced traffic congestion	Passenger numbers	
A02	Promote Essex Car Share Scheme (Liftshare)	Ongoing	Epping Forest District Council ❖ Communications Team ❖ Sustainable Transport Team ❖ Environmental Health Essex County Council	Essex County Council Epping Forest District Council	No	Low	Reduced private vehicle usage Reduced tailpipe and brake wear emissions Reduced traffic congestion	User uptake	
A03	Review the Council's grey fleet and where feasible reduce its usage	2024	Epping Forest District Council ❖ Fleet Operations Team ❖ Contracts and Technical Services Team	Epping Forest District Council	No	Medium	Reduced grey vehicle usage Reduced emissions to air Reduced traffic congestion	Review completed by 2024 with summary of possible options	
A04	Review the Council fleet and move towards cleaner vehicles when possible	2024	Epping Forest District Council ❖ Fleet Operations Team ❖ Contracts and Technical Services Team Qualis Group	Epping Forest District Council Qualis Group	No	High	Cleaner vehicle fleet Fewer emissions to air	Review completed by 2024 with summary of possible options Qualis Group to move to electric/hybrid by 2025	

Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress
A05	Work with ECC to ensure schools have travel plans and encourage the use of Modeshift STARS programme		Epping Forest District Council ❖ Sustainable Transport Team ❖ Public Health Team and Wellbeing Team Essex County Council ❖ Sustainable Travel Team	Essex County Council Epping Forest District Council	No	Medium	Fewer vehicles driving children to school Reduced air pollution around schools and surrounding areas Reduced road congestion	Number of schools enlisted in the Modeshift Stars programme	
A06	Support and influence Essex County Council's Epping Forest District Cycling Action Plan	Ongoing	Epping Forest District Council ❖ Sustainable Transport Team ❖ Communications Team Essex County Council ❖ Sustainable Travel Team	Essex County Council Epping Forest District Council	No	Medium	Uptake in cycling and reduction in private vehicle use Reduced emissions to air from vehicles	Ensure the cycling strategy is promoted on the Council's website and signposted in other promotional materials	
A07	Improve experiences of EFDC staff working remotely to reduce the need to commute and travel for business	Ongoing	Epping Forest District Council ❖ ICT	Epping District Council	No	High	Fewer employees driving for/to work Reduced road congestion Fewer emissions to air from vehicles	Increase in the number of officers able to fully access council systems whilst out in the District.	Working remotely includes working from home as well as working within the District without the need to commute to the office to collect/update files.
A08	Work with ECC and developers to ensure the provision of infrastructure to support walking, cycling and	Ongoing	Epping Forest District Council ❖ Planning Team ❖ Sustainable Transport Team Essex County Council ❖ Sustainable Travel Team	Essex County Council Epping Forest District Council	No	High	Reduced vehicle congestion Fewer emissions to air from vehicles	Increase in trips by means other than private vehicle	

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Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress
	public transport use								
A09	Promote car free days	Ongoing	Epping Forest District Council ❖ Environmental Health ❖ Sustainable Transport Team ❖ Communications Team	Epping Forest District Council	No	Low	Reduced vehicle congestion Reduced emission to air from vehicles	One car free day event delivered per year	
Category B – Environmental Permitting and other regulatory measures									
B01	Continuing environmental permitting activities throughout the District	Ongoing	Epping Forest District Council ❖ Environmental Health	Epping Forest District Council Business operator permit fees	No	Medium	Reduced particulates and solvent emissions to air	All permitted activities inspected within their required timeframe	
B02	Continue to promote and enforce anti idling	Ongoing	Epping Forest District Council ❖ Environmental Health	Epping Forest District Council	No	Low	Reduced vehicles idling in the District	Minimum 1 anti idling event per year	Aim to get residents, associations and businesses involved as well. Prioritize schools and idling hot spot areas.
B03	Review and consult on Hackney Carriage/Private Hire policy to include a transitional requirement for minimum euro 6 emission vehicles and encourage low/zero	2024	Epping Forest District Council ❖ Licensing Team ❖ Sustainable Travel Team ❖ Environmental Health	Epping Forest District Council	No	Low	Reduced emissions to air from taxi fleet operating in our District	Review with conclusions and recommendations completed by 2024	

Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress

Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress
	emission vehicles.								
B04	Ensure Smoke Control areas are promoted within the District and enforce when necessary	ongoing	Epping Forest District Council ❖ Environmental Health ❖ Communications Team	Epping Forest District Council	No	Low	Fewer emissions from wood burners and open fires	At least 2 social media campaigns per year	
B05	Work with colleagues in Trading Standards to ensure the Domestic Solid Fuels Regulations are complied with	2023	Essex County Council ❖ Trading Standards Epping Forest District Council ❖ Environmental Health	Essex County Council Epping Forest District Council	No	Low	Compliance with the Domestic Solid Fuels Regulations Fewer emissions to air from wood burners and open fires	Pass intelligence of any premises suspected of supplying non-compliant fuel to Trading Standards	
Category C - Freight and Delivery Management									
C01	Introduce a Local Plan policy requiring submission and implementation of Routing Management Plans (for construction and operational phases) to manage the sustainable delivery of goods and materials	2023 onwards	Epping Forest District Council ❖ Environmental Health ❖ Planning Directorate ❖ Developers Essex County Council ❖ Highways Team	Epping Forest District Council Developers Essex County Council	No	Low	Lower vehicle emissions Fewer vehicle trips Cleaner vehicle engines	Routing Management plan submitted as part of planning application for large developments	

Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress
C02	Work with ECC to lower bus emissions	ongoing	Essex County Council ❖ Sustainable Transport Team ❖ Epping Forest District Council ❖ Sustainable Travel Team	Essex County Council DfT	No	High	Reduced public transport emissions in the District	Bus fleet at least euro 6 compliant by 2028	Follow up on the Essex County Council Bus Service Improvement Plan 2021 to 2026
C03	Register fleet with FORS (Fleet Operators Recognition Scheme)	2023	Qualis Group ❖ Fleet Operations Team	Qualis Group	No	Low	Fuel efficiency and fewer vehicle emissions	Number of drivers who use the system	FORS is an over-arching scheme that encompasses all aspects of safety, fuel efficiency, economical operations and vehicle emissions. FORS is a voluntary accreditation scheme that helps improve operators' performance in each of these areas
Category D - Policy Guidance and Development Management									
D01	Ensure air quality is taken into account as a material consideration in planning decision making	ongoing	Epping Forest District Council ❖ Planning Team ❖ Environmental Health	Epping Forest District Council	No	Low	Fewer emissions from new developments	Planning Guidance on air quality produced The number of Air Quality Assessments submitted in accordance with the Planning Application Local Validation Checklist	

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Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress
D02	Assess the feasibility of introducing air quality neutral planning guidance for developments	2023	Epping Forest District Council ❖ Planning Team ❖ Environmental Health	Epping Forest District Council	No	Low	Fewer emissions from new developments	Air quality neutral planning guidance produced	
D03	Ensure large developments have and follow a construction management plan	Ongoing	Epping Forest District Council ❖ Planning Team ❖ Environmental Health ❖ Planning Enforcement	Epping Forest District Council	No	Low	Fewer emissions to air from construction activities and associated plant	Fewer resident complaints 100% of developments having a CMP when required	
D04	Assess the feasibility of introducing a non road mobile machinery (NRMM) emissions planning guidance for large developments	2023	Epping Forest District Council ❖ Environmental Health ❖ Planning Team	Epping Forest District Council	No	Low	Fewer emissions from construction plant	Feasibility exercise completed by 2023	
D05	Limit parking spaces for new developments in sustainable locations, ensure that provision of EV charge points is maximised, cycle storage and associated facilities are provided in accordance with ECC standards	Ongoing	Epping Forest District Council ❖ Planning Team ❖ Sustainable Travel Team ❖ Building Regulations Team Essex County Council	Epping Forest District Council Essex County Council	No	Low	Fewer vehicle emissions to air	Production of an electric vehicle charging point strategy	

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D06	Encourage the uptake of zero emission / net zero carbon technology in new developments	ongoing	Epping Forest District Council ➢ Planning Team ➢ Climate Change Team ➢ Environmental Health	Epping Forest District Council	No	Low	Fewer emissions from new developments	Number of planning applications where the submitted Sustainability Checklist states that a Medium or High Quality rating will be achieved	
D07	Support the measures within the Council's Interim Air Pollution Mitigation Strategy	Ongoing	Epping Forest District Council ➢ Planning Team ➢ Environmental Health	Epping Forest District Council	No	Low	Reduction in vehicle emissions	Monitoring around the EFSAC shows decreased pollution levels	The measures are specific to the health of the Epping Forest Special Area of Conservation, however, as NO2 is a pollutant of concern for the EFSAC, improvements in local air quality around the EFSAC are also expected.
D08	Support the measures within the Council's Climate Change Action Plan as well as the Essex Climate Action Plan	Ongoing	Epping Forest District Council ➢ Planning Team ➢ Climate Change Team ➢ Environmental Health	Epping Forest District Council	No	Low	Reduction in vehicle and building emissions	Calculation of emission reductions	There is cross-over between the measures AQAP and the Climate Change Action Plan as well as the Essex Climate Action Plan as they support actions to fewer fossil fuel emissions in the District
D09	Secure the provision and implementation of Travel Plans in accordance with Local Plan policy	Ongoing	Epping Forest District Council ❖ Planning Team ❖ Sustainable Transport Team	Epping Forest District Council	No	High	Reduced vehicle congestion Fewer emissions to air from vehicles	Increase in number of trips by means other than private vehicle	

Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress
Category E - Promoting Low Emission Plant									

Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress
E01	Increase the amount of public EV charge points in the District	ongoing	Epping Forest District Council ❖ Sustainable Travel Team Essex County Council ❖ Sustainable Transport Team	Essex County Council Epping Forest District Council	No	High	Fewer vehicle emissions to air	Adoption of Epping Forest District Electric Vehicle Charging Strategy DfT EV public charger statistics figure to increase annually	
E02	Assess the suitability of installing cleaner energy and heating technology on council owned sites	ongoing	Epping Forest District Council ❖ Building Services ❖ Qualis Group	Epping Forest District Council Qualis Group	No	High	Fewer emissions from Council owned sites Improve energy efficiency ratings	Number of properties fitted with associated cleaner technology	Cleaner energy technology can include but is not limited to: heat pumps, solar PV and solar thermal
E03	Maintain council utilities under renewable energy tariffs	Ongoing	Epping Forest District Council ❖ Facilities Management Team	Epping Forest District Council	No	Low	Fewer emissions from Council owned facilities	Reviewed every year to confirm renewable energy tariffs	Electricity tariffs held with EDF under the Crown Commercial Services Framework have been on 100% Renewable tariffs for a couple of years. Due to recent increases, this has been moved to a Zero Carbon for Business tariff, which is renewable energies and nuclear.
E04	Work with local residents associations, businesses, schools, and housing associations to bid for zero emission technology	Ongoing	Epping Forest District Council ❖ Private Sector Housing Team ❖ Climate Change Team ❖ Environmental Health Qualis Group Essex County Council	Epping Forest District Council Qualis Group Essex County Council	No	Low	Fewer emissions from Council housing, schools and businesses	Min 1 bid per year (where bids are available)	Relevant to Qualis Commercial and Qualis Management – review fleet, office locations, site offices for developments, logistics management, delivery and collection of materials plans.

E05	Installation of energy efficiency measures in low income, low efficiency homes using grant funding	Ongoing	Epping Forest District Council ❖ Building Services ❖ Climate Change Team Qualis Group	Epping Forest District Council	No	High	Fewer building emissions to air	Number of measures installed per year	
E06	Assess if procurement policies can include a preference for zero/low emission suppliers/products	2023 onwards	Epping Forest District Council ❖ Procurement and Contracts ❖ Environmental Health Qualis Group	Epping Forest District Council	No	Low	Fewer emissions to air and lower carbon emissions	Assessment completed by end of 2023, if feasible procurement document updated by 2028	
Category F - Public health, awareness raising and monitoring									
F01	Work with our Public Health colleagues to increase awareness of air quality around our District	2023 onwards	Epping Forest District Council ❖ Community, Culture & Wellbeing Team ❖ Environmental Health ❖ Communications Team Essex County Council ❖ Public Health Team	Epping Forest District Council Essex County Council	No	Low	Increased public awareness, reduced exposure to poor air quality, decrease in pollution contribution	At least one public awareness campaign per year	
F02	Ensure the Director of Public Health signs off on Annual Status Reports and Air Quality Action Plans	Ongoing	Essex County Council ❖ Public Health, Wellbeing and Communities Team	Essex County Council	No	Low	Ensures colleagues in ECC who share public health responsibilities are aware of air quality in our District and part of the air quality dialogue	Reports signed off when needed	1 ASR is produced and signed off annually 1 AQAP is produced and signed off every 5 years

Measure No.	Measure	Timescale	Organisations Involved	Funding Source	Defra AQ Grant Funding	Cost Low - <£5K Medium - £5-20K High - £20K +	Expected Benefit	Key Performance Indicator	Comments / Potential Barriers / Progress
F03	Conduct air quality audits at schools around our District	2023 onwards	Epping Forest District Council ❖ Environmental Health ❖ Community, Culture & Wellbeing Team	Epping Forest District Council Essex County Council	No	Medium	Fewer children exposed to poor air quality	Audits completed by 2028	Similar to GLA school audit programme
F04	Ensure air quality is included in the JSNA	Ongoing	Essex County Council ❖ Public Health Team	Essex County Council	No	Low	Air quality integrated into public health programmes	Every JSNA to include an air quality component for Epping Forest District	
F05	Continue to monitor air quality throughout the District for both human health and the EFSAC	Ongoing	Epping Forest District Council ❖ Environmental Health ❖ Planning Team	Epping Forest District Council	No	High	Air quality data available for our District to assess our progress with regards to the air quality objectives	Data capture rate 90% or higher	

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values’
AQFA	Air Quality Focus Area
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
AQO	Air Quality Objectives
AQS	Air Quality Strategy
ASR	Air Quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DRT	Demand Responsive Transport
EU	European Union
EFSAC	Epping Forest Special Area of Conservation
EFDC	Epping Forest District Council
ECC	Essex County Council
FORS	Fleet Operator Recognition Scheme
GLA	Greater London Authority
HRA	Habitats Regulation Assessment

JSNA	Joint Strategic Needs Assessment
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NRMM	Non Road Mobile Machinery
PHOF	Public Health Outcomes Framework
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
SHAPE	Strategic Health Asset Planning and Evaluation
TfL	Transport for London
WHO	World Health Organization
$\mu g/m^3$	The concentration of an air pollutant (eg. Nitrogen dioxide) is given in micrograms (one-millionth of a gram) per cubic metre air

Appendix A: Wards with High Pollution Vulnerability Score for $PM_{2.5}$

Ward Name
Hastingwood, Matching & Sheering Village
Epping Lindsey & Thornwood Common
North Weald Bassett
Epping Hemnall
Passingford
Lambourne
Chigwell Row
Chigwell Village
Grange Hill
Buckhurst Hill East
Loughton Alderton
Loughton St Mary's
Theydon Bois
Waltham Abbey High Beach
Waltham Abbey Paternoster
Waltham Abbey Honey Lane

Appendix B: Detailed Modelling and Source Apportionment

Epping Forest District Council

Source Apportionment Assessment

November 2021

Move Forward with Confidence

Document Control Sheet

Identification	
Client	Epping Forest District Council
Document Title	Source Apportionment Study
Bureau Veritas Ref No.	AIR12173979

Contact Details		
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Configuration				
Version	**Date**	**Author**	**Reason for Issue/Summary of Changes**	**Status**
1.0	11/10/21	D Clampin	Issued to client for comment	Draft
2.0	5/11/21	D Clampin	Inclusive of comments	First

	Name	Job Title	Signature
Prepared By	D Clampin	Senior Consultant	
Approved By	E Haymer	Senior Consultant	

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Executive Summary

Purpose of Assessment

Bureau Veritas has been commissioned by Epping Forest District Council (the Council) to complete a Detailed Modelling and Source Apportionment Assessment to support the update of their Air Quality Action Plan (AQAP). Currently there is one Air Quality Management Area (AQMA) within Epping Forest, declared in 2008 as a result of exceedances of the 40 µg/m^3 annual mean and 200 µg/m^3 1-hour objectives for Nitrogen Dioxide (NO_2). This AQMA is located near the B1393/Theydon Road junction at Epping, Bell Common. The aim of this Detailed Modelling Assessment is to increase the Councils' understanding of pollutant concentrations within the Epping Forest District AQMA, in order to provide technical input into their forthcoming AQAP.

The Detailed Modelling Assessment focusses on the road network within and around the Epping Forest AQMA to establish concentrations and determine the sources that contribute to pollutant concentrations within the AQMA. The area was modelled using the advanced atmospheric dispersion model ADMS-Roads (Version 5.0.0.1) and latest emissions from the Emissions Factors Toolkit (Version 10.1), with annual mean NO_2 concentration outputs produced at two discrete receptor locations, and across a receptor grid.

Assessment Findings

The highest annual mean concentration of NO_2 was recorded at R1 with a concentration of 52.2 µg/m^3. This is slightly higher than the adjacent recorded monitoring which recorded 48 µg/m^3 as a result of a slightly lower modelling height and its position relative to the road but still demonstrated an exceedance of the air quality objective limit of 40µg/m^3.

The empirical relationship given in LAQM.TG(16)[1] states that exceedances of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60 µg/m^3 or above at a location of relevant exposure (Table 2-1). Given the NO_2 annual mean concentration recorded at all receptors is below 60 µg/m^3, exceedances of the hourly NO_2 AQS objective are unlikely.

PM_{10} and $PM_{2.5}$ concentrations have also been predicted as part of the modelling assessment. No modelled receptors recorded concentrations in exceedance of either of the annual mean objectives for these pollutants. The highest modelled PM_{10} concentration was 20.6 µg/m^3 at R1. The highest modelled $PM_{2.5}$ concentration was 12.9 µg/m^3 at R1.

Estimated Year of Compliance

Using the recommended method in TG(16), 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. It should be noted that this estimate is based on assumptions that were correct prior to the COVID-19 pandemic which is likely to affect behaviour and vehicle fleet predictions, so this result should be treated with some caution.

Source Apportionment

To help inform the development of measures as part of a future AQAP, a source apportionment exercise was undertaken to provide an understanding of any potential similarities in vehicle emission contributors within the AQMA. The source apportionment exercise has considered concentrations of oxides of Nitrogen (NO_x) and Particulate Matter measuring 10 microns and below (PM_{10}) and 2.5 microns and below ($PM_{2.5}$).

Petrol Cars were the most prevalent vehicles on the road within the AQMA, 46.6% of all vehicles were petrol cars. The fleet makeup, as determined by the ANPR survey, also indicated that vehicles using High Road Epping were made up of older vehicles than the default fleet assumption within the EFT derived from the National Air Emissions Inventory (NAEI).

The background concentrations show that for NO_x, motorway emissions account for around half of background concentrations.

The NO_x source apportionment exercise demonstrates Diesel Cars and Diesel Light Good Vehicles (LGVs) being the primary contributors to local road NO_x concentrations within the AQMA. The split between overall car, LGV and Heavy Good Vehicles (HGV) emissions was roughly equal with each contributing around a third to total road NOx.

An assessment of queueing traffic showed that, within the AQMA, congestion accounts for 81.9% of NO_x contributions from the road. This is to be expected as the receptors is located adjacent to traffic lights. Should any traffic smoothing measures such as replacing the lights with a roundabout be introduced, this is likely to reduce pollutant concentrations within the AQMA.

PM_{10} and $PM_{2.5}$ concentrations within the AQMA are largely made up of residual background sources. For both pollutants, the greatest road contributor was identified as being Diesel Cars, followed by Petrol cars and Diesel LGVs.

1 Introduction

Bureau Veritas has been commissioned by Epping Forest District Council (the Council) to complete a Source Apportionment Assessment to update their outdated Air Quality Action Plan (AQAP). Currently there is one Air Quality Management Area (AQMA) within Epping Forest, declared as a result of exceedances of the 40 µg/m^3 annual mean and 200 µg/m^3 1-hour objectives for Nitrogen Dioxide (NO_2). This AQMA is located near the B1393/Theydon Road junction at Epping, Bell Common.

In order to provide technical input into an updated AQAP that will cover the area within the existing AQMA boundary, the air quality modelling has been completed using 2019 traffic data, 2019 monitoring data and the latest Local Air Quality Management (LAQM) tools. This report details the findings of this updated analysis, and provides recommendation on matters related to NO_2 exceedances, in order to inform the update of 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 the Council to provide for a focused consideration on updating measures as part of the revision of the AQAP.

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 new AQMA, 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). Particulate Matter (PM_{10} and $PM_{2.5}$) emissions have also been considered for completeness.

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(16))[1], have been used.

[1] LAQM Technical Guidance LAQM.TG(16) – April 2021. 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[2] (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[3] has been adopted and replaces all previous air quality Directives, except the 4th Daughter Directive[4]. 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[5] 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[2].

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(16)[1] 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 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[6], to achieve compliance with EU Limit Values. This sets out Government policies for bringing NO_2 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

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

[3] 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.

[4] 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.

[5] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.
[6] Defra, DfT (2017), UK plan for tackling roadside nitrogen dioxide concentrations

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 short term.
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 ($PM_{2.5}$)	25 µg/m³	Annual Mean	2020

2.2 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995[7] 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, CO, Pb, NO_2, SO_2 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[8] 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.

[7] http://www.legislation.gov.uk/ukpga/1995/25/part/IV
[8] Local Air Quality Management Policy Guidance LAQM.PG(16). April 2016. 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

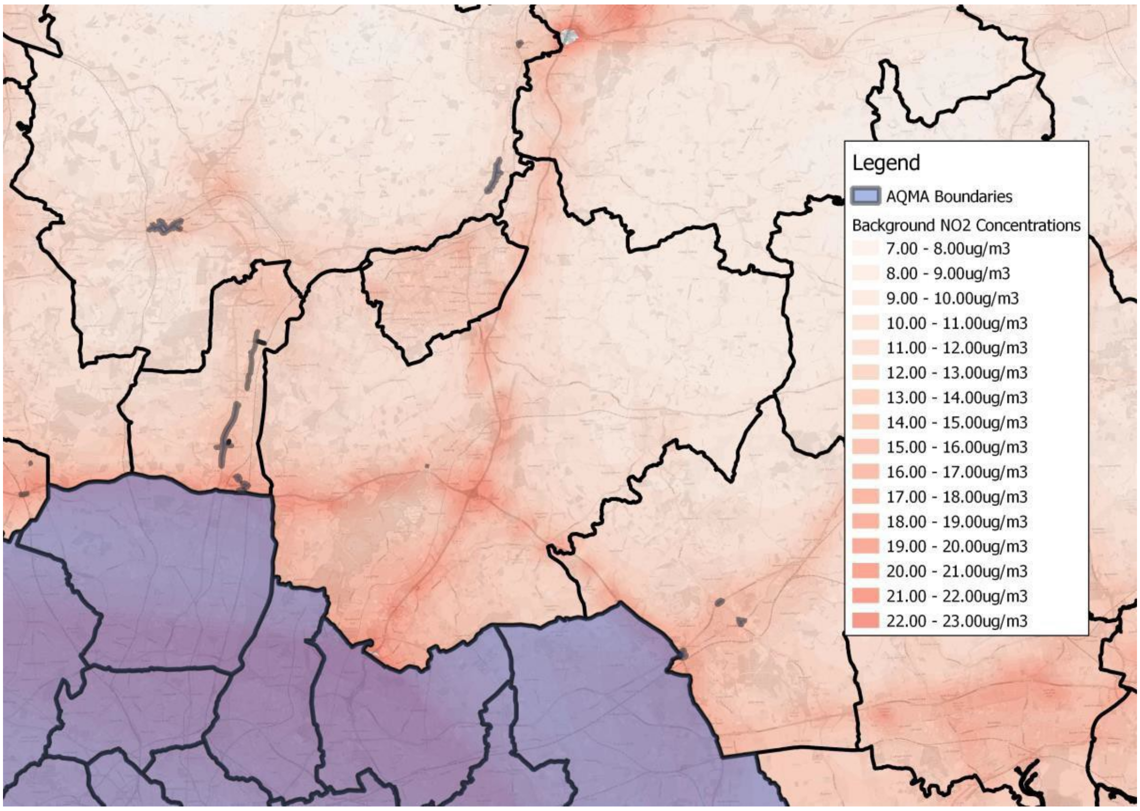
The Council currently has one AQMA (AQMA Epping Forest District Council No.2 2012), declared in 2008 for the exceedance of the NO_2 annual mean UK AQS objective of 40 µg/m^3 and 1-hour mean objective. The AQMA, as shown in Figure 3-2, is located near the B1393/Theydon Road junction at Epping, Bell Common.

The most recent AQAP for this AQMA was published in 2012. Monitoring within the district has shown that concentrations of NO_2 are generally declining. In the most recently available Annual Status Report (ASR), the only monitored exceedance of the NO_2 annual mean AQS objective was within the existing AQMA.

Every local authority that has an active AQMA, is required under Part IV of the Environment Act 1995 and Part III of the Environment (NI) Order 2002 to provide an AQAP as a means to address the areas of poor air quality that have been identified within the AQMA. Nonetheless, the specifications for this tender only detail the requirement for source apportionment study to be undertaken. As a result, the proposal herein has focussed on the proposed scope for a source apportionment study.

From an initial review of background annual mean NO_2 concentrations as shown in Figure 3-1, the M25 and M11 corridors are key contributors to pollutant concentrations within the district as pictured below, the darker red highlighting the higher concentrations.

Figure 3-1 – Background NO_2 Concentrations in EFDC



3.2 Review of Air Quality Monitoring

3.2.1 Local Air Quality Monitoring

During 2019, the latest available year of baseline monitoring, the Council's non-automatic monitoring programme consisted of recording NO_2 concentrations using a network of passive diffusion tubes at 42 sites across Epping Forest District. No automatic (continuous) monitoring took place within the District during 2019.

Between 2015 and 2020 there have been exceedances of the annual mean AQS objective at Sites; 1, 3 and 11 as set out in the latest ASR available for EFDC[9]. During 2019, there was only one recorded exceedance of the annual mean AQS objective for NO_2 at Site 3: Bell Vue which monitored 48 µg/m³.

The details of the diffusion tube monitoring within Epping for 2019 used for the purpose of the modelling assessment are shown in Table 3-1, and monitored concentrations for 2015-2019 are presented in Table 3-2.

Table 3-1 – Epping Forest District Council LAQM Diffusion Tube Monitoring

Site ID	Site Location	Site Type	In AQMA	OS Grid Ref X	OS Grid Ref Y	Monitoring Height (m)
3	Epping: Bell Vue	Roadside	Y	544928	201281	2
33	Epping: Copped Hall, Bell Common	Roadside	N	544709	201139	2

Table 3-2 – Relevant Epping Forest District Council LAQM Diffusion Tube Monitoring

Site ID	Valid Data Capture for 2019 (%)	Annual Mean NO_2 Concentration (µg/m³)				
		2015	2016	2017	2018	2019
1	100.0	39	**48**	**45**	39	39
11	100.0	**45**	**42**	39	39	34
3	100.0	**63**	**64**	**64**	**55**	**48**
33	75.0	-	-	-	-	31
Notes All values reported are bias adjusted as required and represent the monitoring location (i.e. absence of distance correction calculations)						

The only monitored exceedance of the annual average NO_2 limit was at location 3 which has recorded an exceedance every year since 2015. Monitoring at site 33 commenced in 2019 so there are no historical data available for this site.

The empirical relationship given in LAQM.TG(16)[1] states that exceedances of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60 µg/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 past 2017 at location 3.

Epping Forest District Council AQMA boundary and the relevant 2019 council-operated monitoring locations are presented in Figure 3-2.

[9] https://www.eppingforestdc.gov.uk/wp-content/uploads/2021/02/2020-Annual-Status-Report.pdf

Figure 3-2 – Epping Forest District Council AQMA Boundary

3.3 Defra Background Concentration Estimates

Defra maintains a nationwide model of existing and future background air pollutant concentrations at a 1 km x 1 km 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 2018 (the year in which comparisons between modelled and monitoring are made)[10]. 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.

Pollutant background concentrations used for the purposes of this assessment have been obtained from the Defra supplied background maps for the relevant 1 km x 1 km 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 3-3. All of the mapped background concentrations presented are well below the respective annual mean AQS objectives.

Table 3-3 – Defra Background Pollutant Concentrations in the AQMA

Grid Square (E,N)	2019 Annual Mean Background Concentration (µg/m³) [1]			
	Total Background NO_x	Total Background NO_2	Total Background PM_{10}	Total Background $PM_{2.5}$
544500, 201500	25.2	18.1	17.9	11.1
Note: [1] Values obtained from the 2019 Defra Mapped Background estimates for the relevant 1km x 1km grid squares covering the modelled domain				

[10] 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 used to model a 2019 baseline 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(16)[1] have been used.

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

- Prediction of NO_2 concentrations at the two existing receptors within the AQMA 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 regard to the existing AQMA boundary.

4.1 Traffic Inputs

Traffic flows and vehicle class compositions for the 2019 baseline scenario were taken from the following sources:

- Epping High Road - Provided by Epping Forest District Council as ANPR data allowing for detailed understanding of vehicle splits at the junction of the AQMA for 2019.
- M25 - The Department for Transport (DfT) traffic count point database for traffic for 2019.

Traffic speeds were modelled at either the relevant speed limit for each road or, where available, monitored vehicle speeds provided. Where appropriate, vehicle speeds have been reduced in accordance with LAQM TG(16)[1] to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue. Congestion has been modelled at the junction by the AQMA by modelling the traffic speed at 5 km/h.

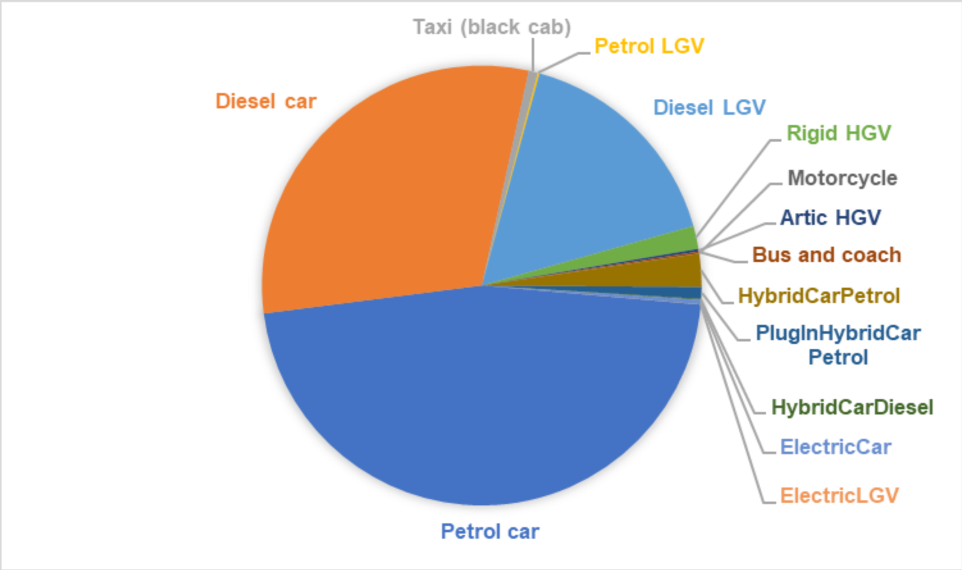
The Emissions Factors Toolkit (EFT) version 10.1 developed by Defra[11] has been used to determine vehicle emission factors for input into the ADMS-Roads model, based upon the traffic data inputs.

Details of the traffic flows used in this assessment including vehicle splits and Euro Class distribution are provided in Table B. 1 of the Appendices. The modelled road network is presented in Figure 4-4.

The traffic data provided by Aecom has been provided broken down by vehicle type and Euro class. The split of each vehicle type is shown in Figure 4-1below.

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

Figure 4-1 – Proportion of Vehicles on Epping High Road



A comparison of the observed Euro vehicles and the default UK fleet has been undertaken and is included below:

Figure 4-2 – Comparison of Observed ANPR data with UK Default Vehicle Fleet – Cars and LGVs

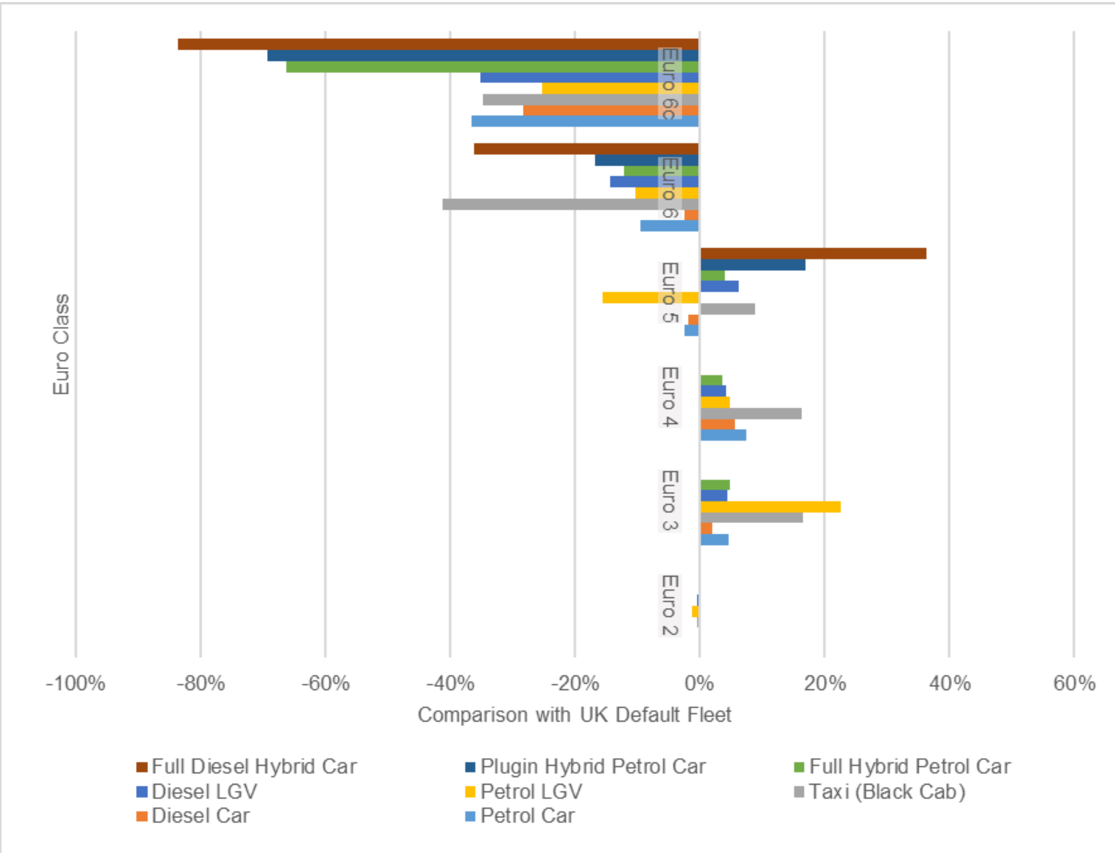
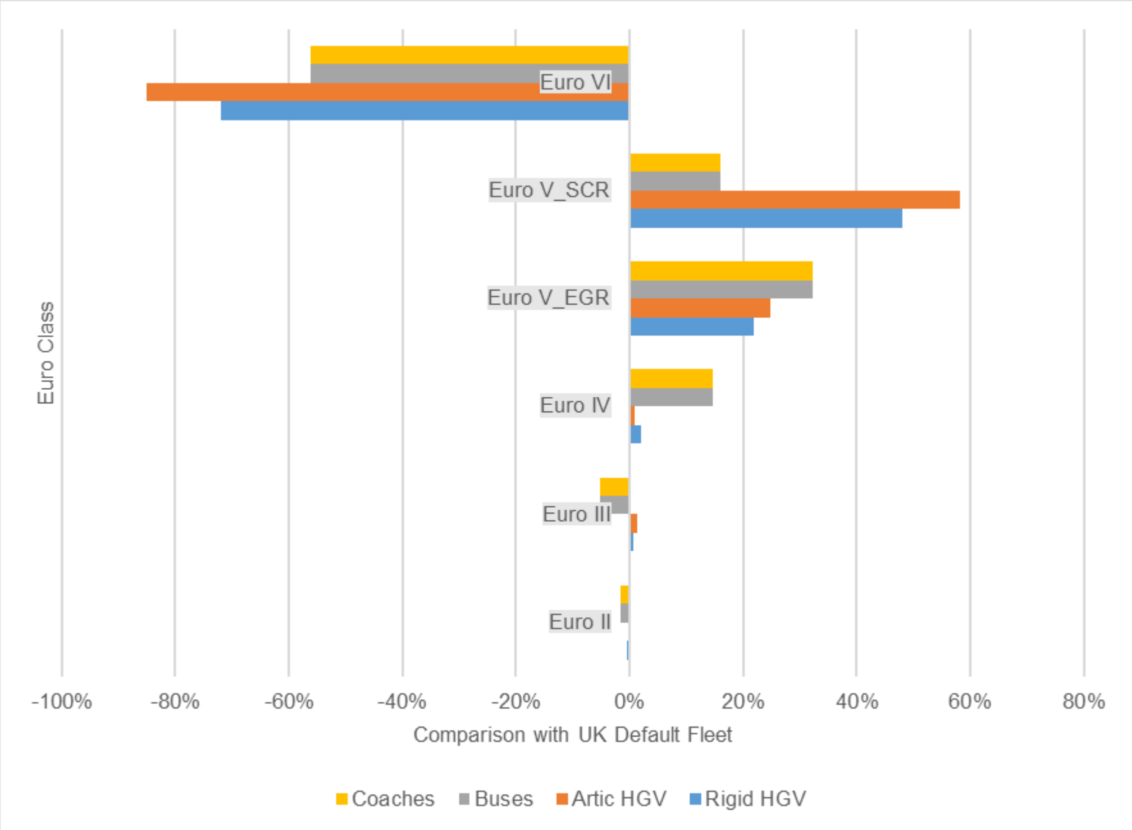


Figure 4-3 – Comparison of Observed ANPR data with UK Default Vehicle Fleet – HGVs



As shown above, the observed fleet typically contains more older vehicles (Euro 5 and below) than the default UK fleet and fewer new Euro 6 vehicles for all vehicle types.

The AQMA is located within 250 m of Bell Common Tunnel on the M25. Emissions from this tunnel will be considered using the Roads Tunnel module within ADMS Roads.

4.2 Sensitive Receptors

A total of two discrete receptors were included within the assessment to represent locations of relevant exposure at the two properties within the AQMA. Details of the receptors are presented within Table 4-1 and their locations are illustrated in Figure 4-5.

A receptor was included at ground floor at both properties within the AQMA.

Concentrations were also modelled across a regular gridded area, at a standardised 'breathing zone' height of 1.5 m, 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.

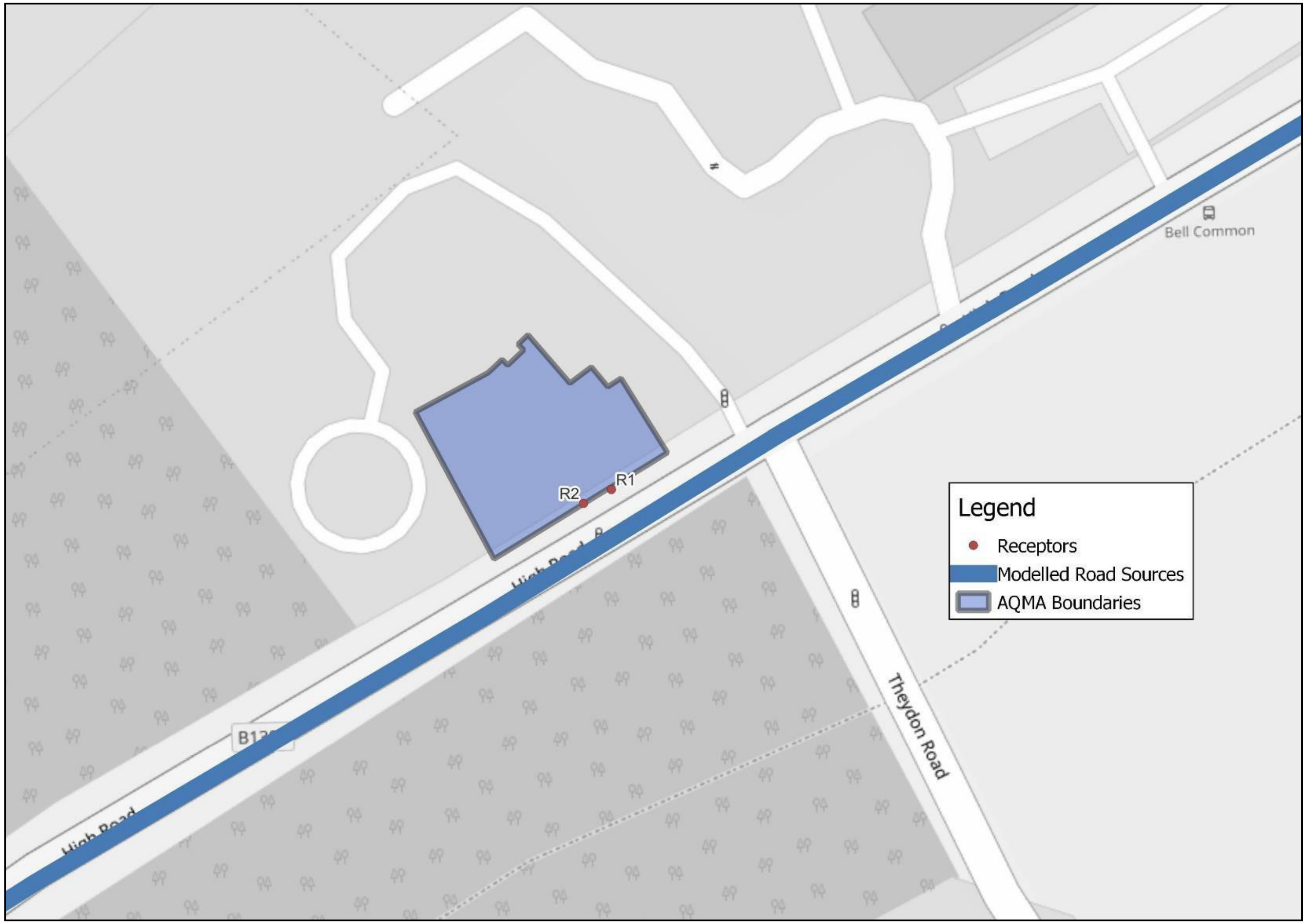
Table 4-1 – Discrete Receptor Locations

Receptor ID	X	Y	Height
R1	544928	201281	1.5
R2	544925	201279	1.5

Figure 4-4 – Modelled Road Network

Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors.

Figure 4-5 – Modelled Receptors



Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors.

4.3 General Model Inputs

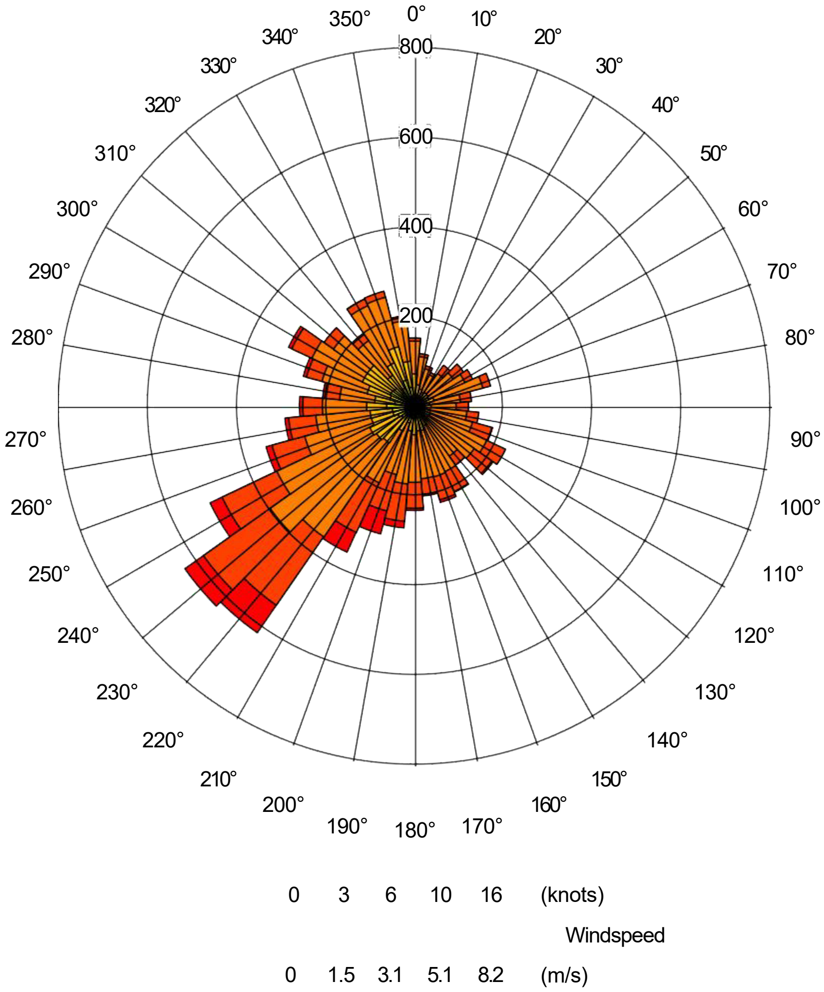
A site surface roughness value of 0.5 m was entered into the ADMS-roads model, consistent with the parkland/open suburbia. In accordance with CERC's ADMS Roads User Guide[12], a minimum Monin-Obukhov length of 10 m was used for the ADMS Road model to reflect the topography of the model domain.

One year of hourly sequential meteorological data from a representative synoptic station is required by the dispersion model. 2019 meteorological data from Stansted Airport weather station has been used in this assessment. The station is located approximately 23 km north of the AQMA 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, representative of the Stansted airfield location and surrounding buildings.

Within the modelled domain a review of topography was undertaken to establish whether it was required to include modelled road gradients. Following this review, it was considered to not be required.

A wind rose for this site for the year 2019 is shown in Figure 4-6.

Figure 4-6 – Wind rose for Stansted Data 2019



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

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 0.75 m/s. It is recommended in LAQM.TG(16)[1] 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(16)[1] recommends that meteorological data should have a 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 8,666 lines of usable hourly data out of the total 8,760 for the year, i.e. 98.9% usable data. This is therefore suitable for the dispersion modelling exercise.

4.4 Bell Common Tunnel

To account for the emissions from Bell Common Tunnel, the Road Tunnel Module within ADMS has been used. This involves creating an additional input file to account for emissions from both the entrance and exit of the Tunnel. The inputs for Bell Common Tunnel are included below. This has been completed in line with the CERC ADMS User Guide[12].This module has been validated using monitoring data gathered at Bell Common tunnel.

Table 4-2 – Additional Input File Tunnel Inputs

Name	Bell Common Tunnel
X1	544555.3
Y1	201054.4
X2	545066.2
Y2	200992.4
NumTrafficDir	2
BoreDepth1	8
PortalBaseElev1	0
OutflowRoad1	M25 E of BCT
OutflowWidth1	32
OutflowWall1	No
BoreDepth2	8
PortalBaseElev2	0
OutflowRoad2	M25 W of BCT
OutflowWidth2	32
OutflowWall2	No

4.5 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(16)[1], using the NO_x to NO_2 conversion tool developed on behalf of Defra. This tool also uses the total background NO_x and NO_2 concentrations. This assessment has used version 8.1 (August 2020) of the NO_x to NO_2 conversion tool[13]. The road contribution is then added to the appropriate NO_2 background concentration value to obtain an overall total NO_2 concentration.

The same process has been applied to provide annual mean concentrations for PM_{10} and $PM_{2.5}$. As no Particulate Matter monitoring was available within the study area, the verification factor used for NO_2 has been applied.

In addition to annual mean concentrations, NO_x source apportionment was carried out for the following vehicle classes:

- Cars
- Taxis
- Light-Goods Vehicles (LGVs);
- Rigid Heavy-Goods Vehicles (HGVs)
- Articulated HGVs;
- Bus and Coaches;
- Motorcycles;
- Full Hybrid Petrol Cars;
- Plug-in Hybrid Petrol Cars;
- Full Hybrid Diesel Cars;
- Battery Electric Vehicle (EV) Cars; and,
- Battery EV LGVs.

Verification of the ADMS-Roads assessment has been undertaken using a number of local authority diffusion tube monitoring locations. 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 – ADMS Model Verification.

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

4.6 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).

4.7 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[14]. 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.

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 used the latest EFT version 10.1 and associated tools published by Defra to help minimise any associated uncertainty when forming conclusions from the results.

All tools used within the modelling process and baseline year of assessment used are based on assumptions prior to the COVID-19 pandemic. All assumptions made are based on the best understanding at the time of writing but there is the potential for behaviours to change in future as a result of a shift towards more flexible working or changes in uptake of newer vehicles.

[14] 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.

5 Results

5.1 Modelled Concentrations

5.1.1 Baseline 2019 NO_2 Concentrations

The assessment has considered emissions of NO_2 from road traffic at the two existing receptor locations within the AQMA.

Table 5-1 provides a summary of the modelled receptors.

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

Receptor ID	Modelled Annual Mean Concentration		
	NO_2	PM_{10}	$PM_{2.5}$
R1	52.2	20.6	12.9
R2	50.5	20.5	12.9
AQO	**40**	**40**	**20**

The modelled NO_2 results are slightly higher than the monitored concentration as a result of the difference in heights modelled and their positions relative to the road. The monitoring is located at 2 m height and the receptors at 1.5 m to represent typical ground floor windows.

Modelled concentrations of both PM_{10} and $PM_{2.5}$ are below the relevant national objectives.

Short Term

The empirical relationship given in LAQM.TG(16)[1] states that exceedances of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60 µg/m³ or above at a location of relevant exposure (Table 2-1). Given the NO_2 annual mean concentration recorded at all receptors is below 60 µg/m³, exceedances of the hourly NO_2 AQS objective are unlikely.

Contour Plots

Modelled contour plots for total NO_2, PM_{10} and $PM_{2.5}$ annual mean concentrations are included below inclusive of both road and background concentrations at the modelled study area. Where there are exceedances of the relevant objective for NO_2 these areas are highlighted in green.

The contour plot is representative of gridded output from the ADMS model showing how the model has dispersed pollutants based on the sources input. This shows the spatial extent of pollutant concentrations as assumed in the model. The contour plots are inclusive of the model outputs and background concentrations and are subject to the same assumptions around verification and conversion from NO_x to NO_2.

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Figure 5-1 – Annual Mean NO_2 Concentration Isopleth

Figure 5-2 – Annual Mean PM_{10} Concentration Isopleth

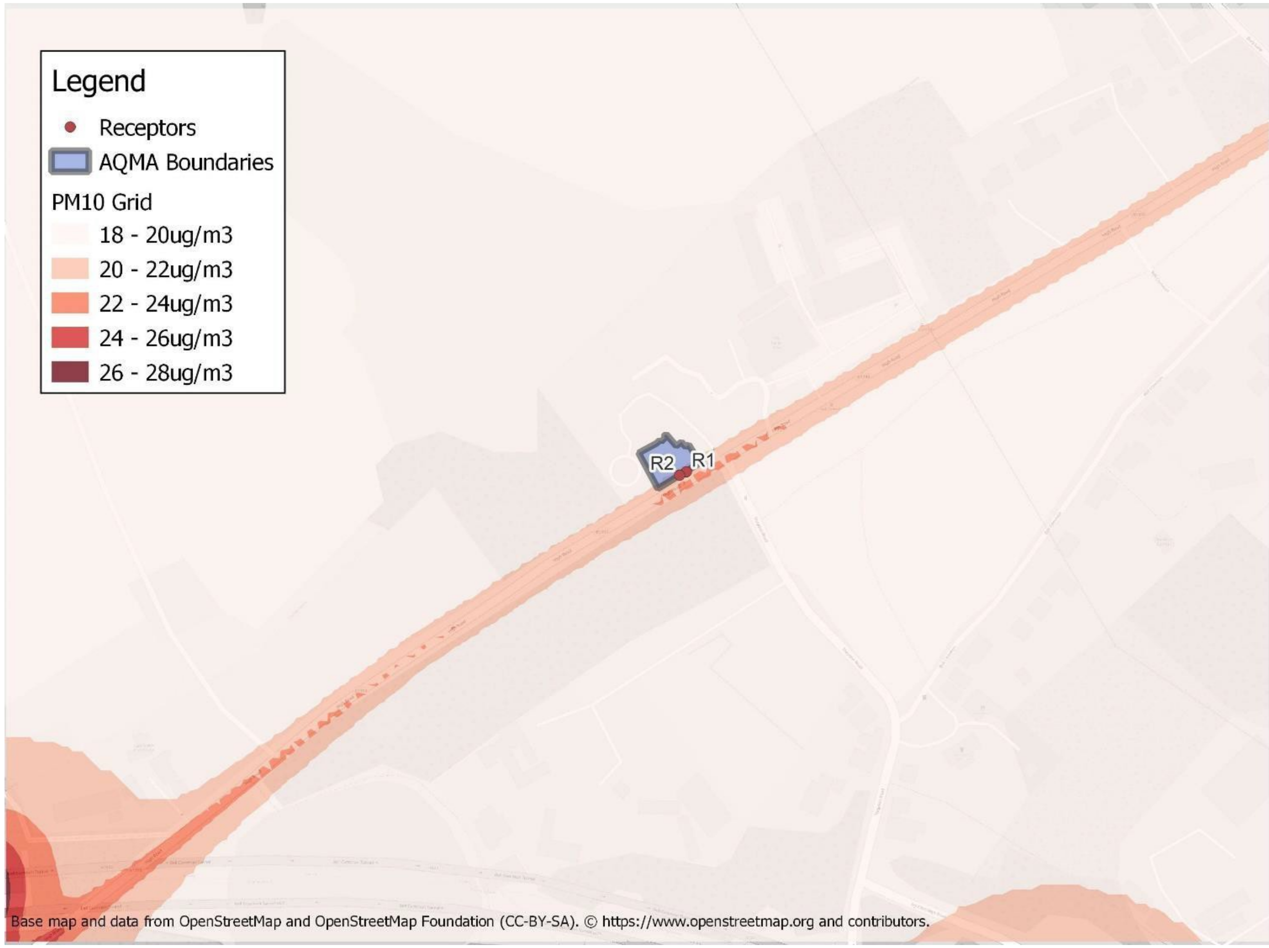

Figure 5-3 – Annual Mean $PM_{2.5}$ Concentration Isopleth

5.1.2 Required Reduction in Emissions

In line with the methodology presented in Box 7.6 of TG(16)[1], the necessary reduction in Road NO_x and NO_2 emissions required to bring the current AQMA into compliance is calculated below, as shown in Table 5-2. This has been completed at the maximum annual mean concentration location, either monitored or modelled, for the existing AQMA. The TG(16) procedure calculates the required reduction of road NO_x to achieve a total NO_2 concentration of 40 µg/m^3.

Table 5-2 – Required Reduction in NO_x and NO_2

Metric	Value (Concentrations as µg/m^3)
Worst-Case Relevant Exposure NO_2 Concentration	52.2
Equivalent NO_x Concentration	99.1
Background NO_x	25.2
Background NO_2	18.1
Road NO_x - Current	73.9
Road NO_2 - Current	34.1
Road NO_x - Required (to achieve NO_2 concentration of 39.9 µg/m^3)	44.5
Road NO_2 - Required (to achieve NO_2 concentration of 39.9 µg/m^3)	21.8
Required Road NO_x Reduction	29.4
Required Road NO_2 Reduction	12.3
Required % Reduction NOx	39.8%

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 which should be treated with caution as it is expected that these will change as a result of the COVID-19 pandemic. 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(16)[1] 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.

As a worst-case approach, the projection is based upon the monitoring from 2019 predicted as having the maximum annual mean NO_2 concentration at R1. The appropriate roadside NO_2 projection factors, as provided on the LAQM Support website[15], are then applied to this

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

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 receptor location.

The projected NO_2 annual mean concentrations following the above approach are presented in Table 5-3.

Table 5-3 – Projected Annual Mean NO_2 Concentrations

Receptor 1							
2019 Annual Mean Concentration (µg/m³)	Predicted Annual Mean Concentration (µg/m³)						
	2020	2021	2022	2023	2024	2025	2026
52.2	**49.6**	**46.8**	**44.2**	**41.9**	39.7	37.6	35.8
In **bold**, exceedance of the NO_2 annual mean AQS objective of 40µg/m³ Vehicle Adjustment Factor = Rest of UK (HDV <10%)							

Table 5-3 indicates that the first year by which Receptor 1 will be exposed to a concentration below the annual mean NO_2 AQS objective will be 2024 at the very earliest. Concentrations are expected to be below 10% of the annual mean NO_2 AQS objective at the very earliest by 2026.

It should be noted that these calculations are made based on assumptions which were correct prior to the COVID-19 pandemic and so the results should be treated with caution.

5.3 Source Apportionment

5.3.1 Background Source Apportionment

The Defra maps provide high level source apportionment for a number of different emissions sources. For the background map square within which the AQMA is located the breakdown of sources is shown below for NO_x, PM_{10} and $PM_{2.5}$.

'Other' sources are defined as per the Background Maps user guide as 'ships, off-road and other emissions. 'Point Sources' are those which come are defined as emissions of a known amount from a known location (e.g. a power station) but do not fall under the 'Industry' source category.

Secondary PM is defined as any inorganic and organic aerosol sources of particulate matter and 'Residual + Salt is inclusive of Sea Salt, calcium and iron rich dusts and regional primary PM and residual non-characterised sources.

Table 5-4 – NO_x Background Source Apportionment

	Motorway	Trunk Road	Primary Road	Minor Road	Industry	Domestic	Aircraft	Rail	Other	Point Sources	Rural
NO_x Concentration (µg/m³)	11.0	<0.1	1.6	1.5	1.1	1.4	<0.1	<0.1	0.4	0.6	7.7
Percent of Background NO_x	43.4	0.1	6.2	6.1	4.3	5.5	<0.1	0.2	1.5	2.2	30.5

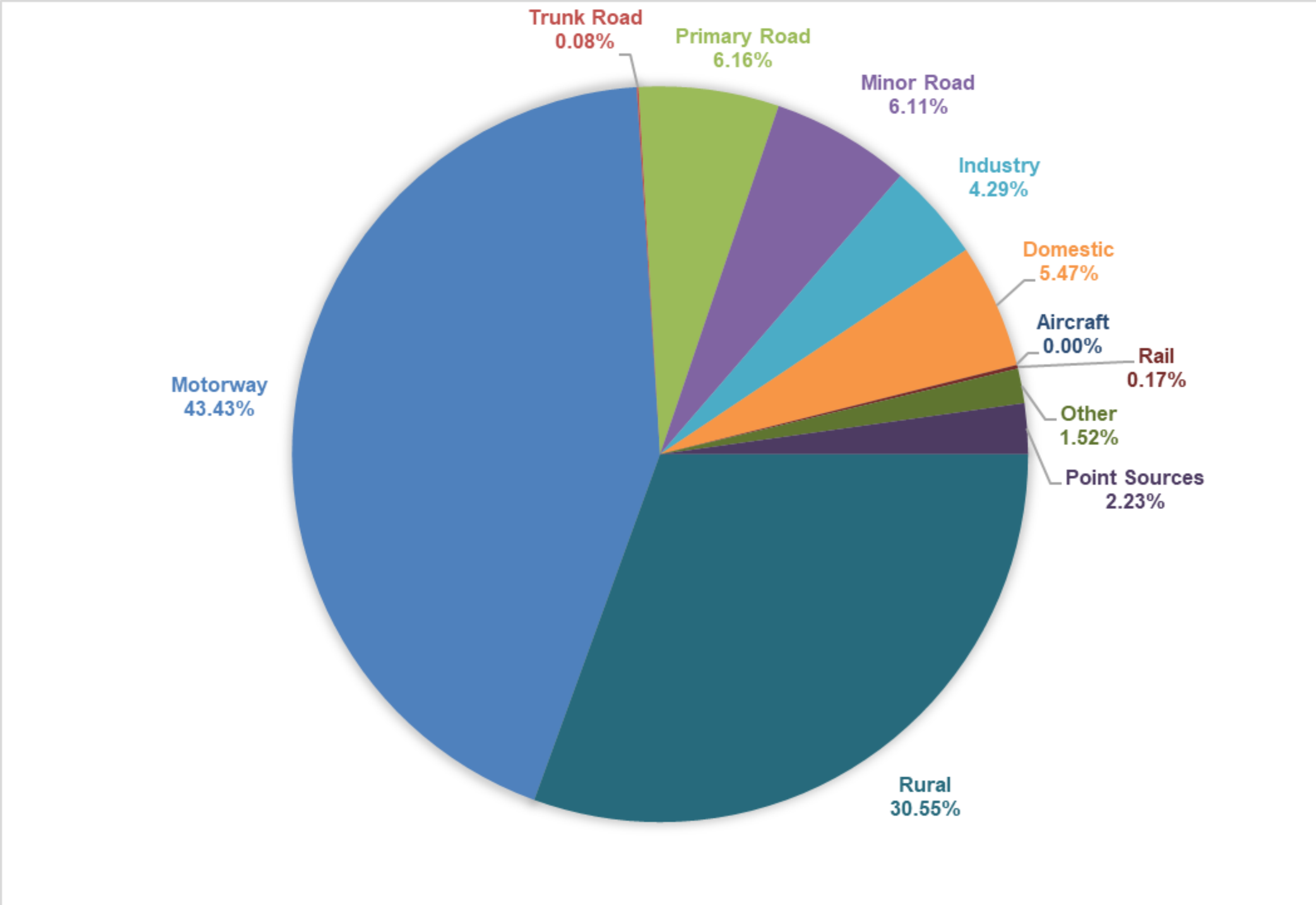

Table 5-5 – PM_{10} and PM_{25} Background Source Apportionment

	Motorway	Trunk Road	Primary Road	Minor Road	Brake & Tyre Wear	Road Abrasion	Industry	Domestic	Rail	Other	PM Secondary	Residual & Salt	Point Sources
PM_{10} Concentration (µg/m³)	<0.1	<0.1	<0.1	<0.1	0.3	0.2	0.7	0.5	<0.1	<0.1	7.3	8.7	<0.1
Percent of Background PM_{10}	0.5	<0.1	<0.1	<0.1	1.5	1.3	3.9	2.9	<0.1	0.3	40.7	48.6	0.2
$PM_{2.5}$ Concentration (µg/m³)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.5	<0.1	<0.1	6.2	3.6	<0.1
Percent of Background $PM_{2.5}$	0.7	<0.1	<0.1	0.2	1.3	1.1	2.5	4.7	<0.1	0.5	56.1	32.5	0.3

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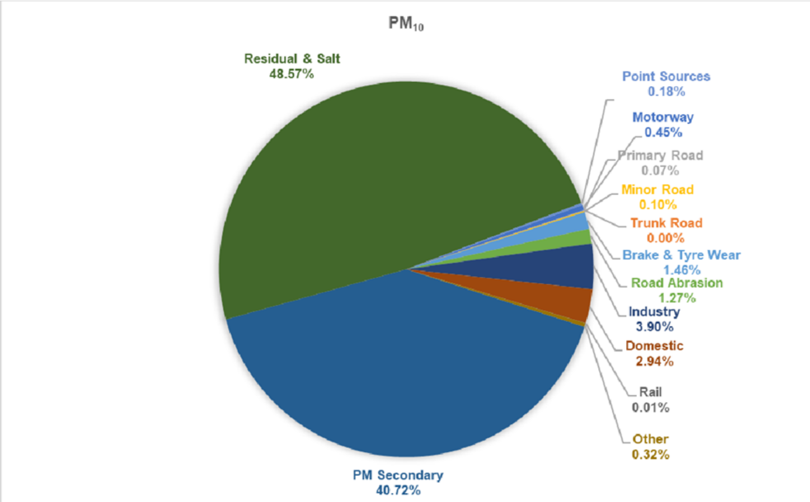
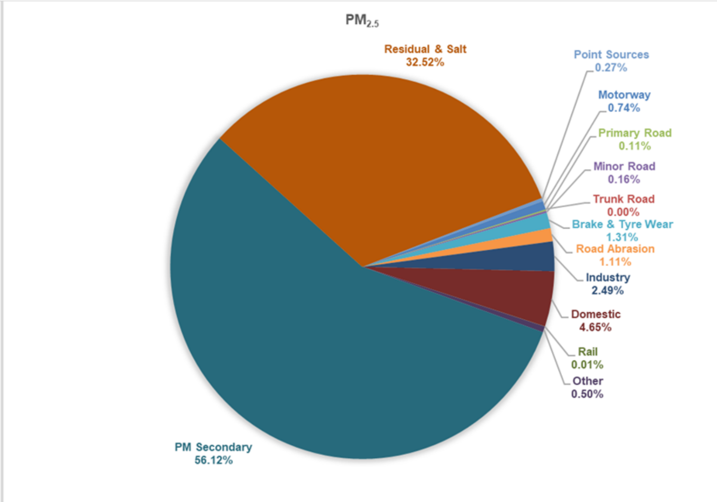




As shown above, the motorway makes up around 43% of the background NO_x concentration within the grid square containing the AQMA. PM_{10} and $PM_{2.5}$ concentrations are mainly made up of Residual and secondary emissions.

5.3.2 Vehicle Type and Age

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:

- Cars
- Taxis
- Light-Goods Vehicles (LGVs);
- Rigid Heavy-Goods Vehicles (HGVs)
- Articulated HGVs;
- Bus and Coaches;
- Motorcycles;
- Full Hybrid Petrol Cars;
- Plug-in Hybrid Petrol Cars;
- Full Hybrid Diesel Cars;
- Battery Electric Vehicle (EV) Cars; and,
- Battery EV LGVs.

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.

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.

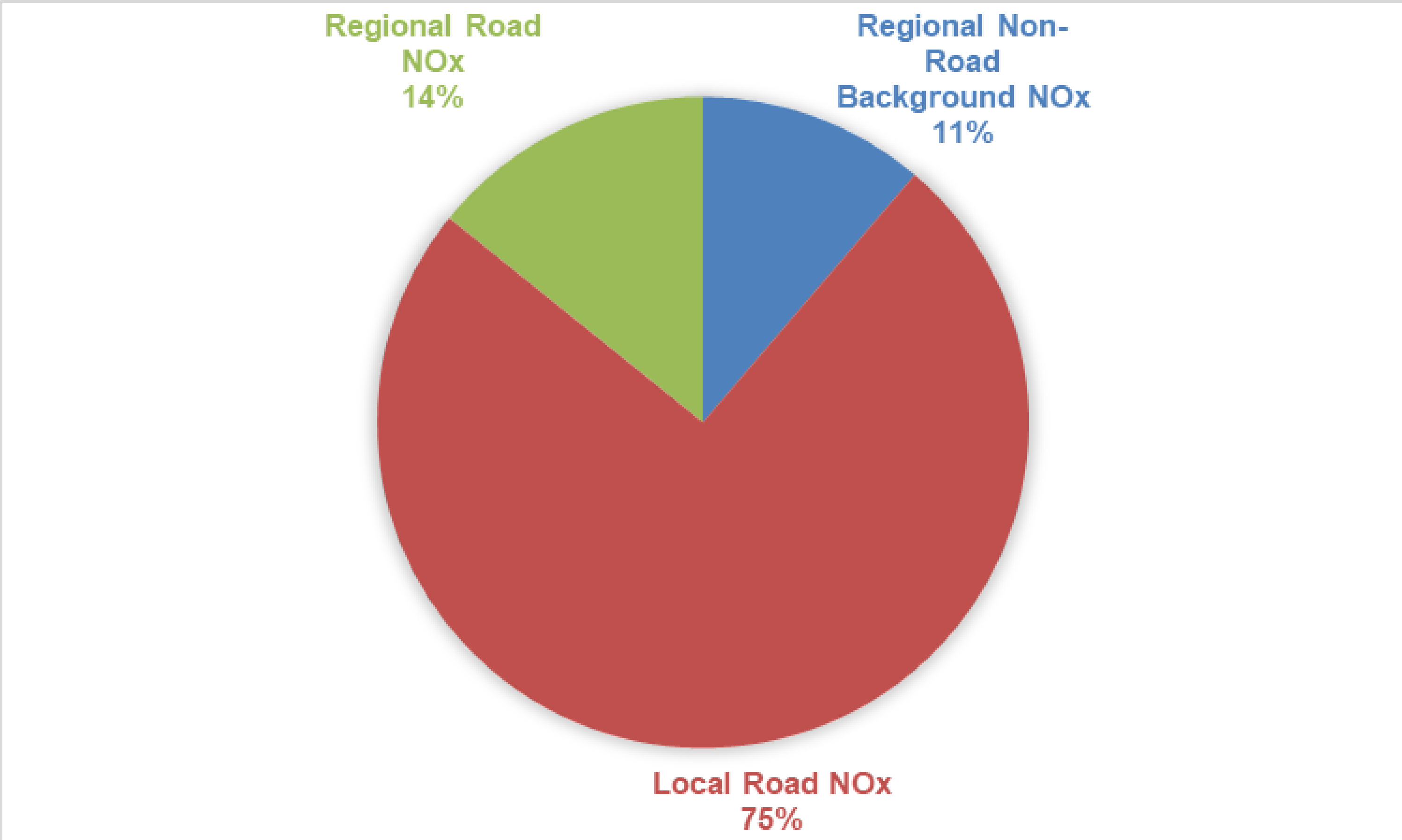
The source apportionment study has also included PM_{10} and $PM_{2.5}$.

The age of vehicles has been determined by accounting for the 'Euro Class' they are assigned.

Table 5-6 – Detailed Source Apportionment of NO_x Concentrations at R1

Results	All Vehicles	Petrol Car	Diesel Car	Taxis	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses/ Coaches	Motorcycle	Full Hybrid Petrol Cars	Plug-in Hybrid Petrol Cars	Full Hybrid Diesel Cars	Battery EV Cars	Battery EV LGVs	Background
NO_x Concentration (µg/m^3)	73.9	3.3	21.1	0.8	<0.1	23.0	19.7	4.1	1.9	<0.1	0.1	<0.1	0.1	0.0	0.0	25.2
Percentage of Total NO_x	74.5%	3.3%	21.3%	0.8%	<0.1%	23.2%	19.8%	4.2%	1.9%	<0.1%	0.1%	<0.1%	0.1%	0.0%	0.0%	25.5%
Percentage Contribution to Road NO_x	100%	4.4%	28.5%	1.1%	<0.1%	31.1%	26.6%	5.6%	2.5%	<0.1%	0.1%	<0.1%	0.1%	0.0%	0.0%	

Figure 5-4 – Source Apportionment of NO_x Concentrations – High Level



'Regional Road' – Emissions from roads not included in the model
'Local Road' – Emissions from roads included within the model
'Regional Non-Road' – All other emissions

Figure 5-5 – Detailed Source Apportionment of NO_x Concentrations – All Sources

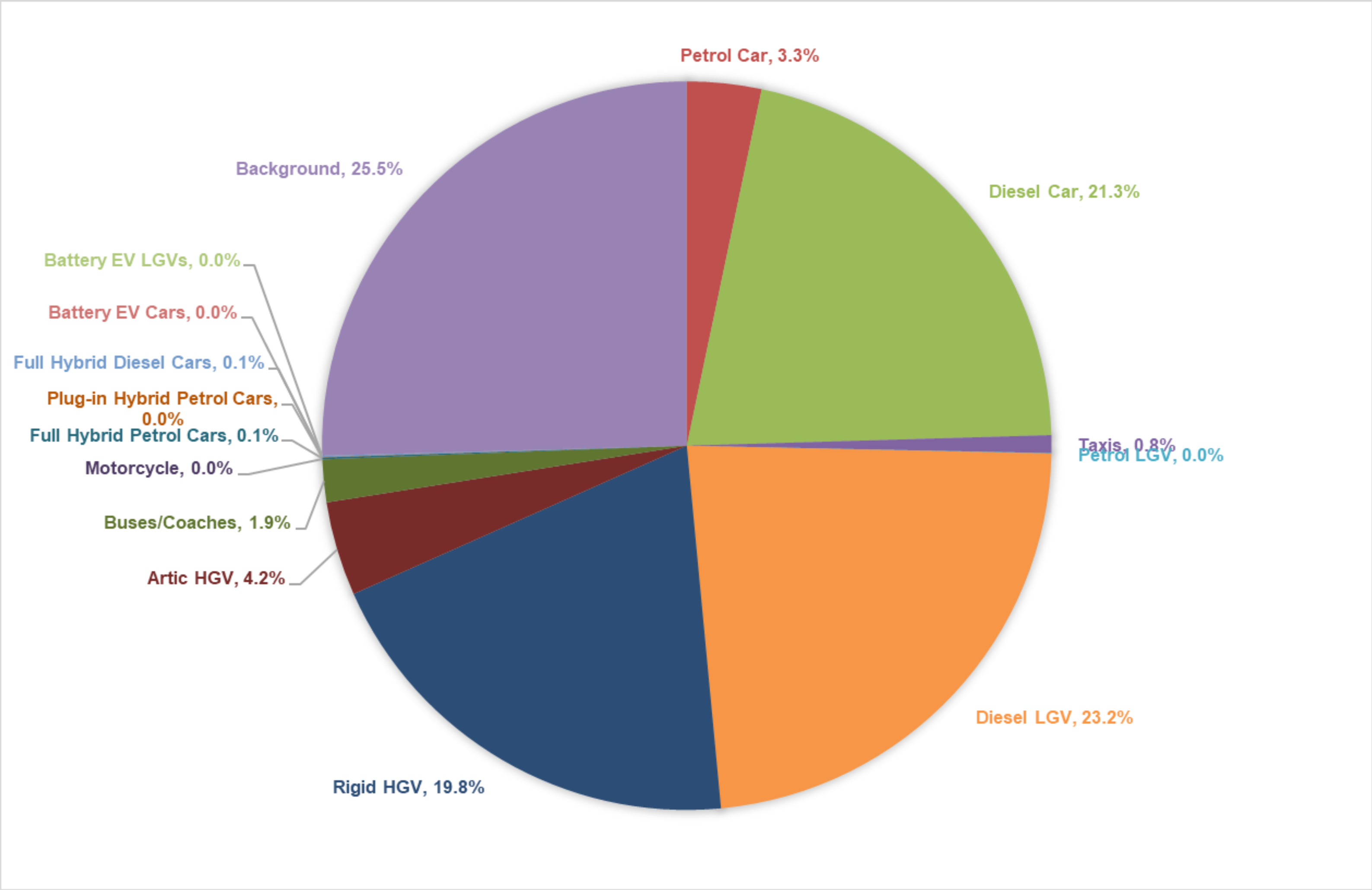


Figure 5-6 – Detailed Source Apportionment of NO_x Concentrations – Road Sources

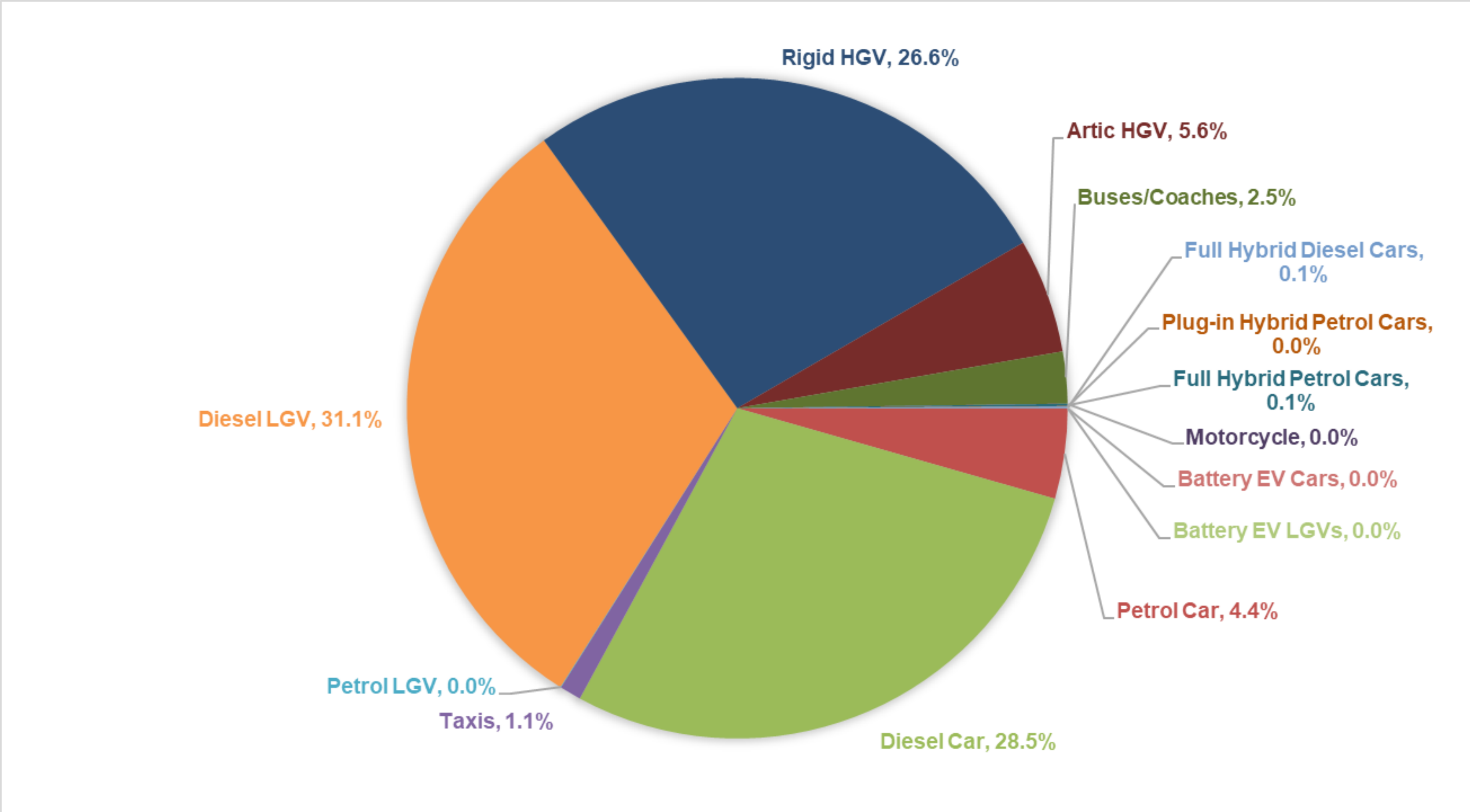


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Table 5-7 – Detailed Source Apportionment of PM_{10} Concentrations at R1

Results	All Vehicles	Petrol Car	Diesel Car	Taxis	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses/Coaches	Motorcycle	Full Hybrid Petrol Cars	Plug-in Hybrid Petrol Cars	Full Hybrid Diesel Cars	Battery EV Cars	Battery EV LGVs	Background
PM_{10} Concentration (μg/m³)	2.7	0.8	0.8	<0.1	<0.1	0.6	0.3	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	17.9
Percentage of Total PM_{10}	13.2%	4.0%	3.8%	0.1%	<0.1%	2.9%	1.2%	0.7%	0.1%	<0.1%	0.2%	0.1%	<0.1%	<0.1%	<0.1%	86.8%
Percentage Contribution to Road PM_{10}	100%	30.1%	28.9%	0.9%	0.2%	22.1%	9.3%	5.5%	0.7%	<0.1%	1.5%	0.5%	0.1%	0.2%	<0.1%	

Figure 5-7 – Detailed Source Apportionment of PM_{10} Concentrations – All Sources

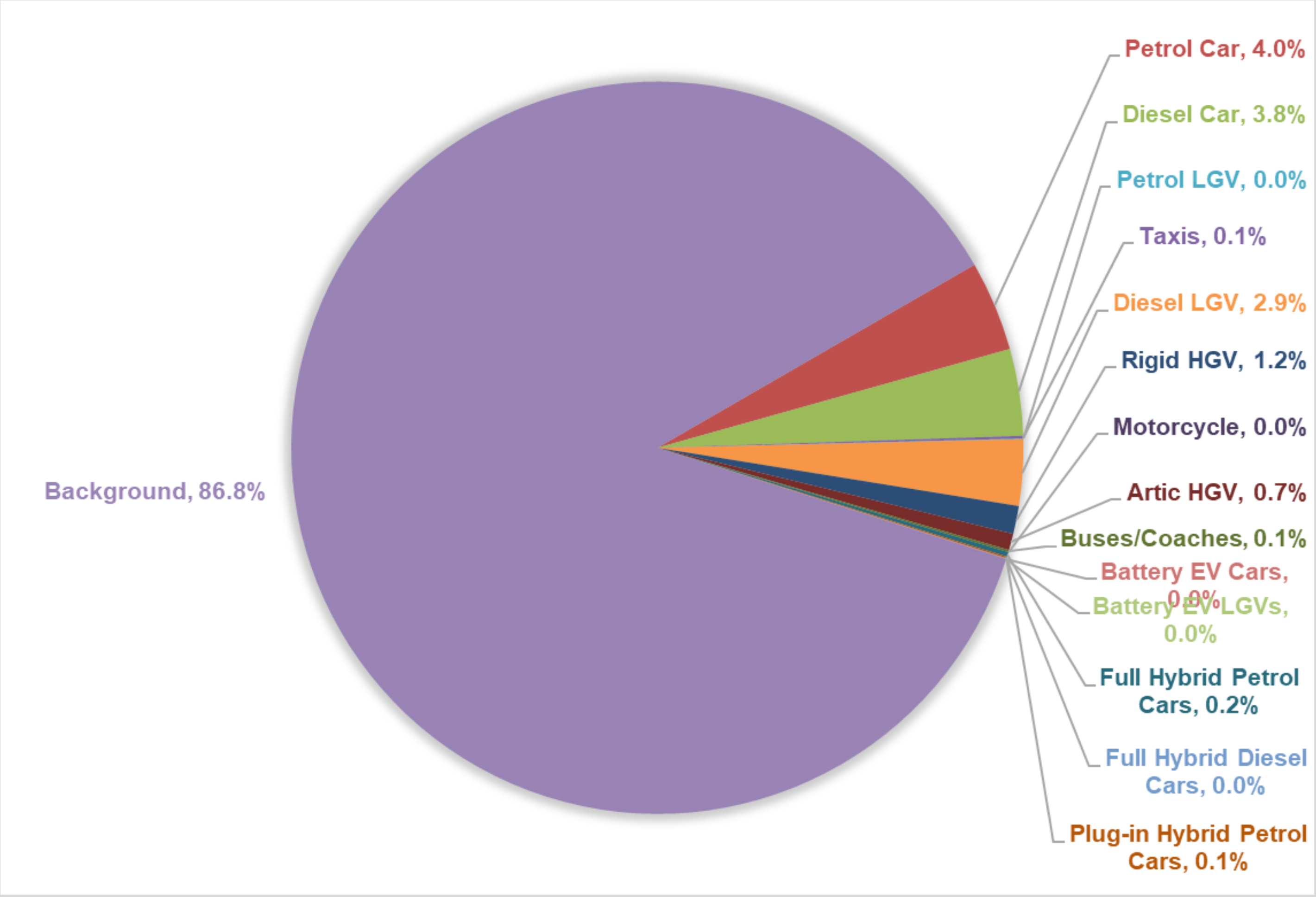

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Figure 5-8 – Detailed Source Apportionment of PM_{10} Concentrations – Road Sources

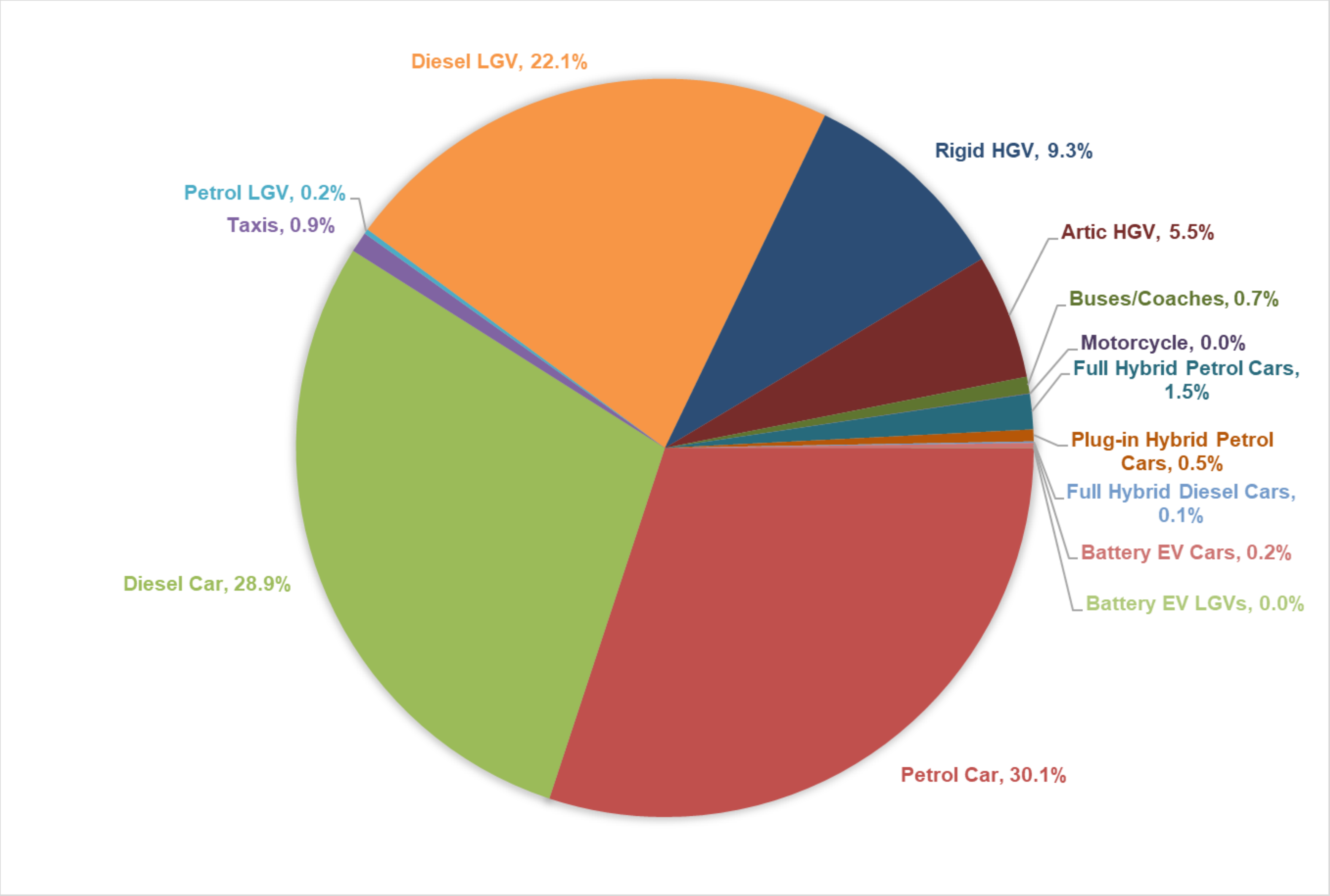

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Table 5-8 – Detailed Source Apportionment of $PM_{2.5}$ Concentrations at R1

Results	All Vehicles	Petrol Car	Diesel Car	Taxis	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses/Coaches	Motorcycle	Full Hybrid Petrol Cars	Plug-in Hybrid Petrol Cars	Full Hybrid Diesel Cars	Battery EV Cars	Battery EV LGVs	Background
$PM_{2.5}$ Concentration (µg/m³)	1.8	0.5	0.6	<0.1	<0.1	0.4	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	11.1
Percentage of Total $PM_{2.5}$	14.3%	3.8%	4.3%	0.2%	<0.1%	3.4%	1.5%	0.8%	0.1%	<0.1%	0.2%	0.1%	<0.1%	<0.1%	<0.1%	85.7%
Percentage Contribution to Road $PM_{2.5}$	100%	26.3%	30.1%	1.1%	0.2%	23.7%	10.2%	5.4%	0.8%	<0.1%	1.4%	0.4%	0.1%	0.2%	<0.1%	

Figure 5-9 – Detailed Source Apportionment of $PM_{2.5}$ Concentrations – All Sources

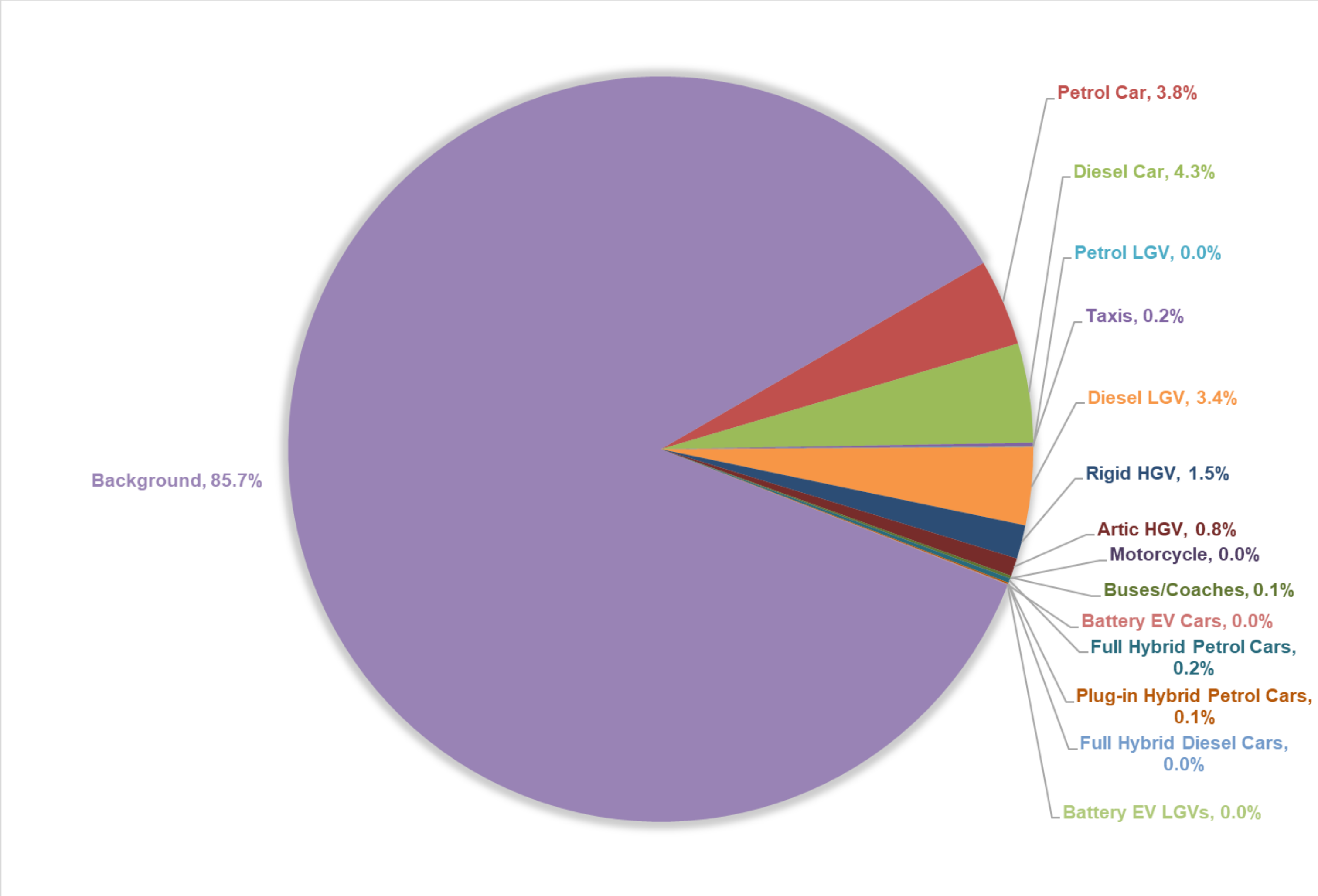

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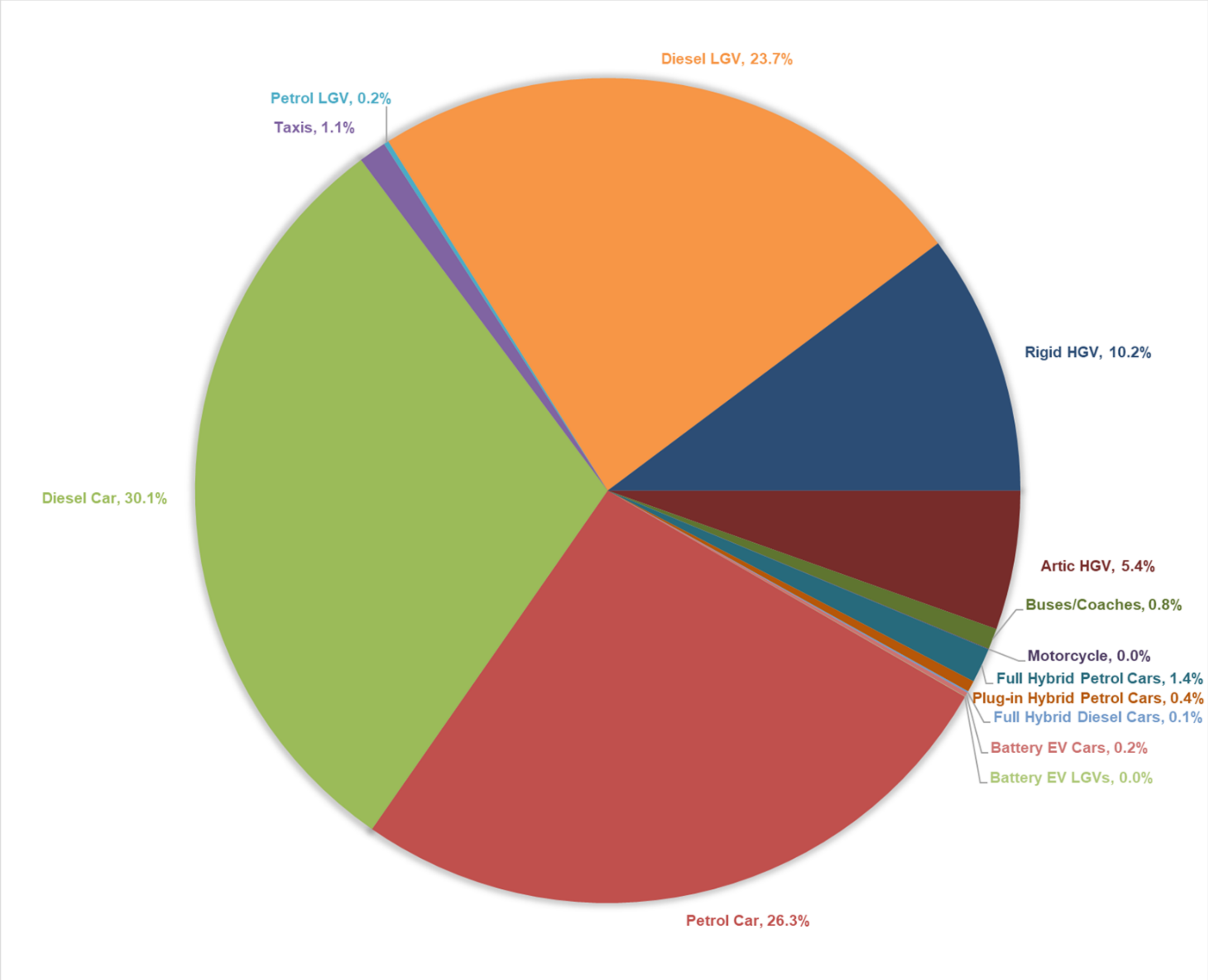
Figure 5-10 – Detailed Source Apportionment of $PM_{2.5}$ Concentrations – Road Sources



NO_x

The following observations can be made:

- Road traffic accounts for 73.9 µg/m³ (74.5%) of total NO_x (99.1 µg/m³), with background accounting for 25.2 µg/m³ (25.5%);
- Of the total road NO_x, the contribution of Petrol and Diesel Cars (32.%), Petrol and Diesel LGVs (31.1%) and Rigid and Artic HGVs including Buses and Coaches (34.8%) are split fairly evenly making up the total road NO_x;
- Of the cars included in the model, Diesel cars account for 28.5% of Road NO_x where Petrol cars account for only 4.4% and Taxis 1.1%;
- Of the LGVs, Diesel LGVs account for 31.1% of road NO_x emissions and Petrol LGVs >0.1%;
- Rigid HGVs account for 26.6% of Road NOx compared to Articulated HGVs which account for only 5.6% and Buses/Coaches only 2.5%
- Motorcycles are found to contribute <1%; and
- Hybrid Vehicles account for only 0.2% of Road NO_x.

The NO_x source apportionment exercise demonstrates Diesel Cars and LGVs being the primary contributors to road NO_x concentrations within the AQMA.

PM_{10} and $PM_{2.5}$

PM_{10} and $PM_{2.5}$ concentrations within the AQMA are largely made up of residual background sources. For both pollutants, the greatest road contributor was identified as being Diesel Cars, followed by Petrol cars and Diesel LGVs.

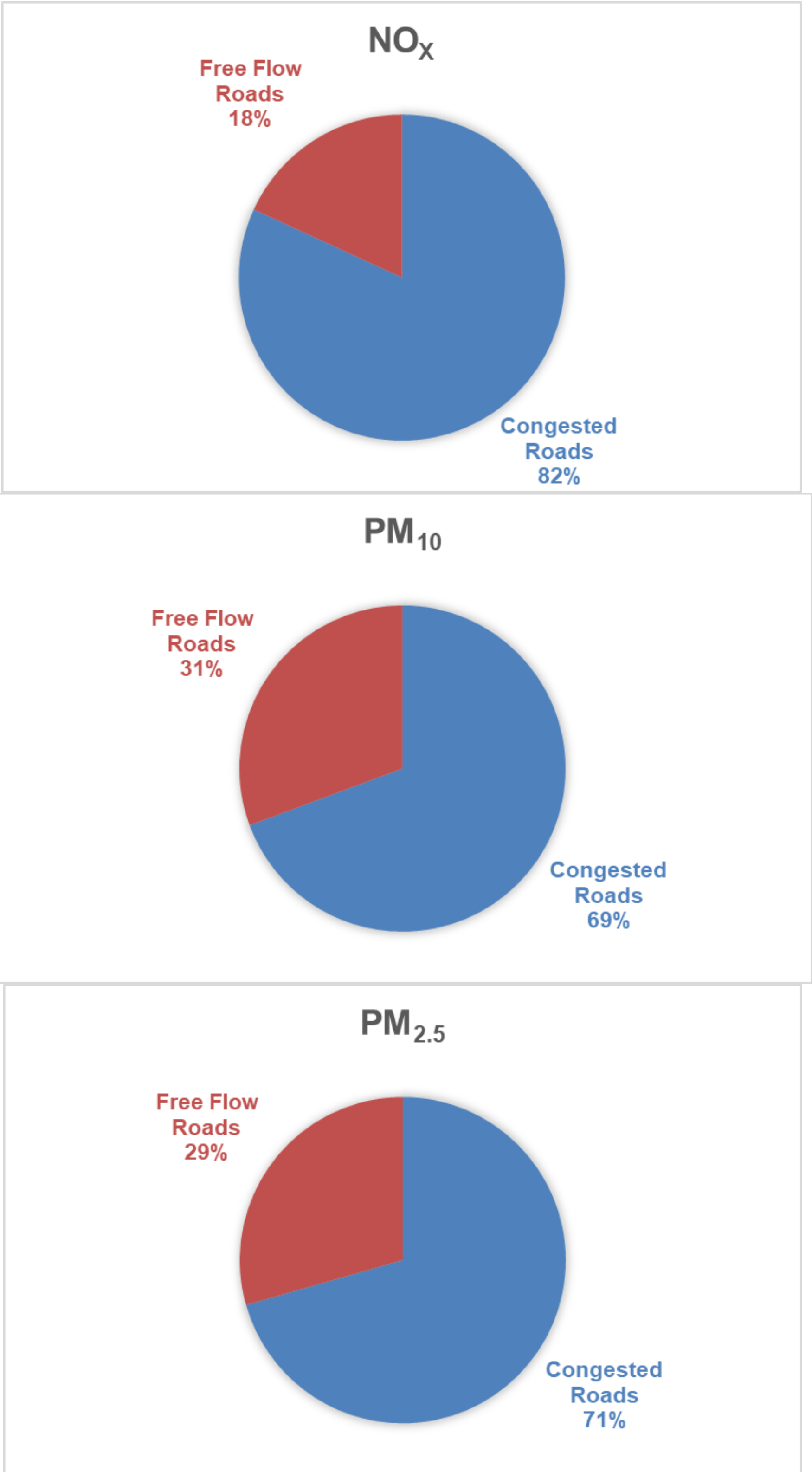
5.3.3 Congestion in AQMA

To achieve a verified model, the link within the AQMA has been modelled at 5 km/h in line with TG(16) to be representative of congestion and queueing traffic at this junction where vehicles are stopped as a result of traffic lights. The contribution from those links which have been modelled at slower speeds as a result of congestion and those with free-flowing traffic are compared below.

Pollutant		Congested Roads	Free Flowing Roads
NO_x	Total Road NO_x (µg/m³)	60.5	13.4
	Percent of Total Road NO_x	81.9	18.1
PM_{10}	Total Road PM_{10} (µg/m³)	1.10	0.49
	Percent of Total Road PM_{10}	69.3	30.7
$PM_{2.5}$	Total Road $PM_{2.5}$ (µg/m³)	0.76	0.32
	Percent of Total Road $PM_{2.5}$	70.6	29.4

It should be noted that the receptor used as representative of the worst-case location within the AQMA is located closest to a road with congestion, so it is to be expected that this would account for the majority of contributions to the total concentration.

Figure 5-11 – Source Apportionment of Road Congestion



6 Conclusions

The dispersion modelling exercise undertaken has provided the following updated perspective on NO_2 challenges within the Epping Forest AQMA.

6.1 Predicted Concentrations

All of receptors reporting NO_2 annual mean concentrations to be above or within 10% of the AQS objective limit are either located within the existing AQMA or are concentrated to roadside locations of junctions where key arterial roads meet and form the main transportation network within the region.

The highest annual mean concentration of NO_2 was recorded at R1 with a concentration of 52.2 μg/m³. This is slightly higher than the adjacent recorded monitoring which recorded 48 μg/m³ as a result of a slightly lower modelling height and its position relative to the road.

The empirical relationship given in LAQM.TG(16)[1] states that exceedances of the 1-hour mean objective for NO_2 is only likely to occur where annual mean concentrations are 60 μg/m³ or above at a location of relevant exposure. Given the NO_2 annual mean concentration recorded at all receptors is below 60 μg/m³, exceedances of the hourly NO_2 AQS objective are unlikely.

PM_{10} and $PM_{2.5}$ concentrations have also been predicted as part of the modelling assessment. No modelled receptors recorded concentrations in exceedance of either of the annual mean objectives for these pollutants. The highest modelled PM_{10} concentration was 20.6 μg/m³ at R1. The highest modelled $PM_{2.5}$ concentration was 12.9 μg/m³ at R1.

6.2 Estimated Year of Compliance

Using the recommended method in TG(16), 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.

6.3 Source Apportionment

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

Petrol Cars were the most prevalent vehicles on the road within the AQMA, 46.6% of all vehicles were petrol cars. The fleet makeup, as determined by the ANPR survey, also indicated that vehicles using High Road Epping were made up of older vehicles than the default fleet assumption within the EFT derived from the National Air Emissions Inventory (NAEI).

The NO_x source apportionment exercise demonstrates Diesel Cars and Diesel LGVs being the primary contributors to road NO_x concentrations within the AQMA. The split between overall car, LGV and HGV emissions was roughly equal with each contributing around a third to total road NO_x.

An assessment of queueing traffic showed that, within the AQMA, congestion accounts for 81.9% of NO_x contributions from the road. Should any traffic smoothing measures be introduced, this is likely to reduce pollutant concentrations within the AQMA.

PM_{10} and $PM_{2.5}$ concentrations within the AQMA are largely made up of residual background sources. For both pollutants, the greatest road contributor was identified as being Diesel Cars, followed by Petrol cars and Diesel LGVs..

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(16)[1] guidance as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the AQMA. 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 GCC and DfT traffic count data, as outlined in Section 4.1.

The details of the LAQM monitoring sites considered for the purposes of model verification are presented in Table A.1 below.

Table A.1 – Local Monitoring Data Available for Model Verification

Site ID	OS Grid Reference		2019 Annual Mean NO_2 Concentration (μg/m^3)	2019 Data Capture (%)
	X	Y		
3	544928	201281	48.0	100
33	544709	201139	31.0	100

NO_2 Verification Calculations

The verification of the modelling output was performed in accordance with the methodology provided in Chapter 7 of LAQM.TG(16)[1]. For the verification and adjustment of NO_x/NO_2, the 2019 monitoring data presented in Table A.1 was used.

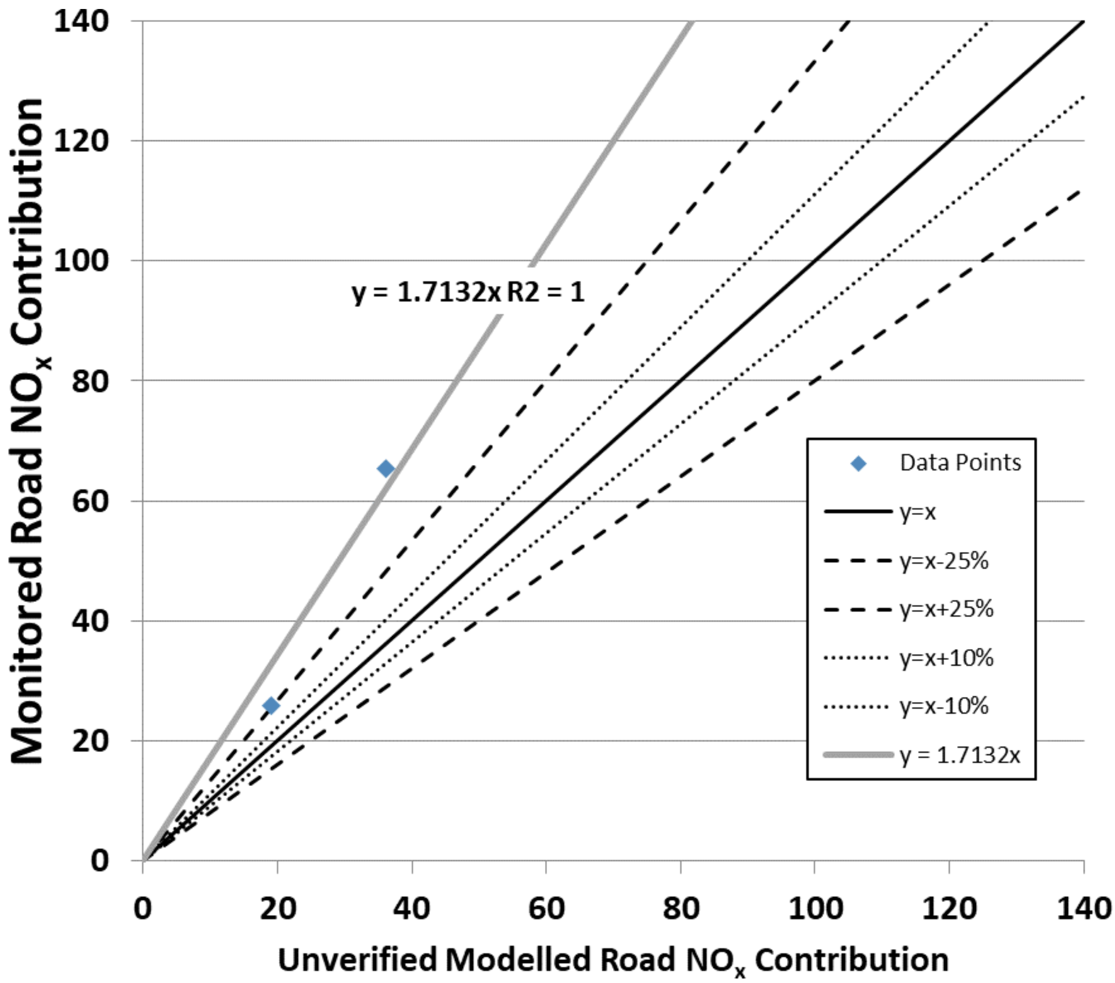
Verification was completed using the 2019 (2018 reference year) Defra background mapped concentrations for the relevant 1 km x 1 km grid squares within Epping Forest (i.e. those within which the model verification locations are located), as displayed in Table 3-3.

Table A.2 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. Figure A-1 shows this data graphically.

Table A.2 – 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) (%)
3	15.3	48.0	36.1	-24.8
33	15.3	31.0	28.0	-9.8

Figure A-1 – Unverified Comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x



The data in the table above show that the model was under predicting at both verification points, with the highest under prediction between the modelled and monitored concentrations observed at Site 3 (-24.8 %). 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 almost 25% at the monitoring location within the AQMA, 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 on 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[16].

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

Verification (AQMA)

Table A.3 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-2 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 gives an adjustment factor for the modelled results of 1.713.

Table A.3 – Data Required for Adjustment Factor Calculation

Site ID	Monitored total NO2 (µg/m3)	Monitored total NOx (µg/m3)	Background NO2 (µg/m3)	Background NOx (µg/m3)	Monitored road contribution NO2 (total - background) (µg/m3)	Monitored road contribution NOx (total - background) (µg/m3)	Modelled road contribution NOx (excludes background) (µg/m3)
3	48.0	90.6	18.1	25.2	29.9	65.4	36.1
33	31.0	51.1	18.1	25.2	12.9	25.9	19.1

Figure A-2 – Comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x

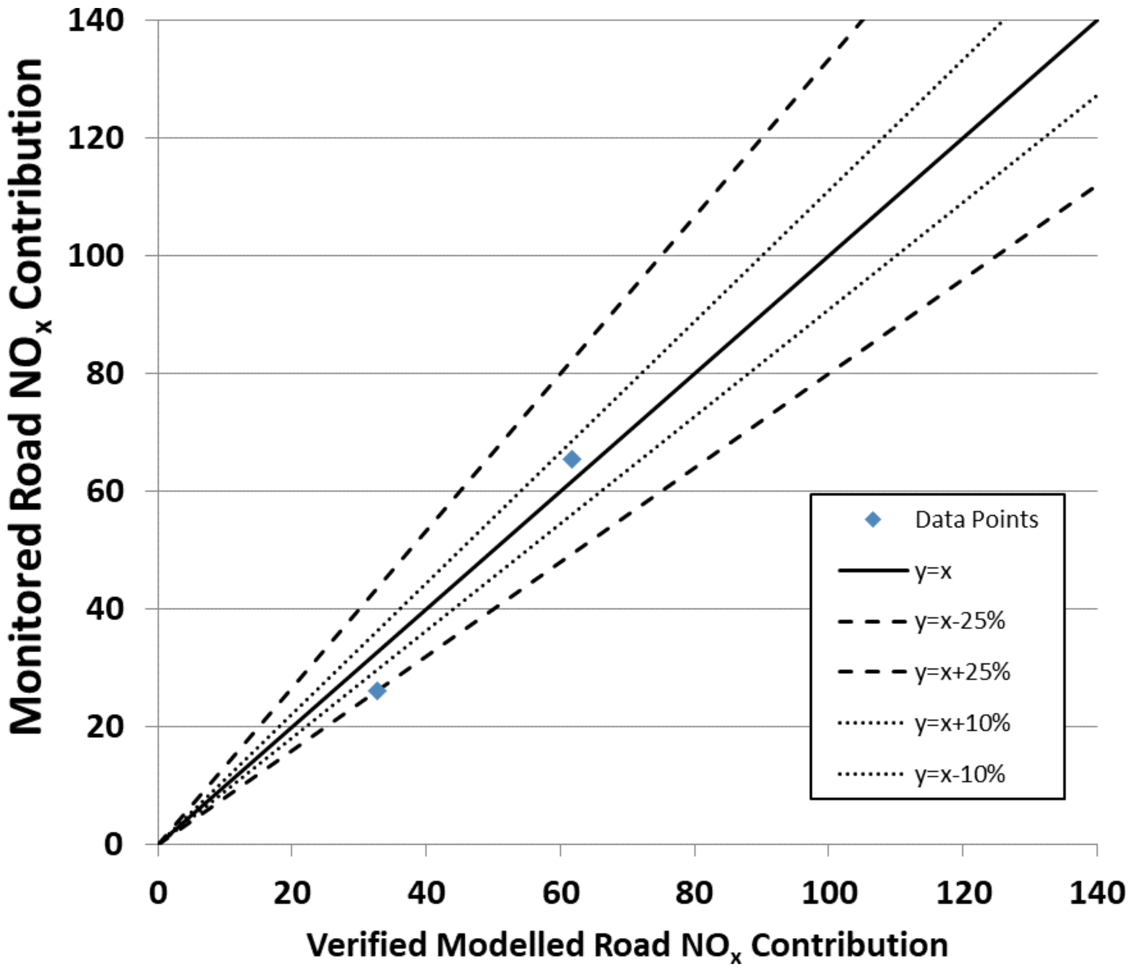


Table A.4 – Adjustment Factor and Comparison of Verified Results against Monitoring Results

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/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	Difference (adjusted modelled NO_2 vs. monitored NO_2) (%)
3	1.81	1.713	61.8	87.0	47.3	48.0	-1.4
33	1.36		32.7	57.9	34.5	31.0	11.4

Figure A-3 – Comparison of the Verified Modelled Total NO2 versus Monitored NO2

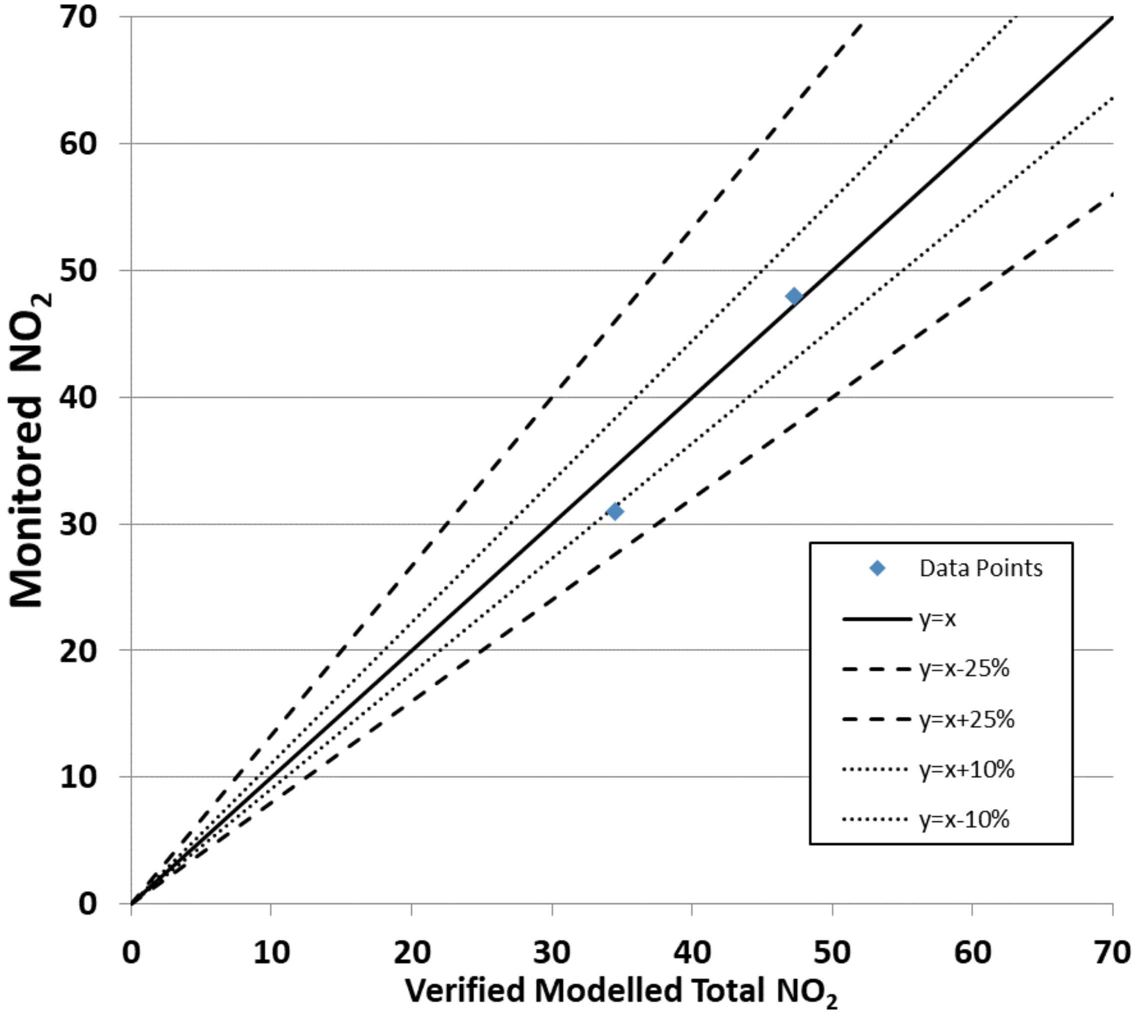


Table A.4 and Figure A-3 show the ratios between monitored and modelled NO_2 for each monitoring location after using the calculated adjustment factor. LAQM.TG(16)[1] states that:

"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, It can be seen that the verification point within the AQMA is within ±10% tolerance as detailed in LAQM.TG(16). and is less than 1% different. Monitoring at Site 33 is just outside of 10% difference and within the acceptable 25% tolerance.

A factor of 1.713 reduces the Root Mean Square Error (RMSE) from a value of 40.4 to 2.5, which is in line with the guidance value of 4 µg/m^3 as stated within LAQM.TG(16).

The adjustment factor was applied to the road contribution NO_x and PM concentrations predicted by the model to arrive at the final NO_2 concentrations in the AQMA.

Appendix B – Traffic Inputs

Table B. 1 – Traffic Data used in the Detailed Assessment - ANPR Data provided by AECOM for High Road Epping

Modelled Road Link	AADT	% Petrol Car	% Diesel Car	% Taxi (black cab)	% LGV	% Rigid HGV	% Artic HGV	% Bus and Coach	% Motorcycle	% Full Hybrid Petrol Cars	% Plug-In Hybrid Petrol Cars	% Full Hybrid Diesel Cars	% Battery EV Cars	% Battery EV LGV	Speed (km/h)
High Rd Epping Sth	25237	46.58	30.47	0.67	16.54	1.69	0.20	0.14	0.01	2.43	0.86	0.08	0.32	0.02	64
High Rd Epping Sth SD	25237	46.58	30.47	0.67	16.54	1.69	0.20	0.14	0.01	2.43	0.86	0.08	0.32	0.02	5
High Rd Epping Nth	25237	46.58	30.47	0.67	16.54	1.69	0.20	0.14	0.01	2.43	0.86	0.08	0.32	0.02	64
High Rd Epping Nth SD	25237	46.58	30.47	0.67	16.54	1.69	0.20	0.14	0.01	2.43	0.86	0.08	0.32	0.02	5

Notes

Traffic speeds were modelled at either the relevant speed limit for each road or where available monitored vehicle speeds

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(16)[1]

Table B. 2 – Traffic Data used in the Detailed Assessment – Euro Compositions on High Road Epping

Cars & LGVs	Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Euro 6c
Petrol Car	-	-	0.00	0.09	0.22	0.25	0.44	-
Diesel Car	-	-	-	0.04	0.16	0.33	0.46	-
Taxi (Black Cab)	-	-	-	0.19	0.29	0.40	0.12	-
Petrol LGV	-	-	-	0.29	0.20	0.14	0.37	-
Diesel LGV	-	-	-	0.07	0.17	0.36	0.40	-
Full Hybrid Petrol Car	-	-	-	0.05	0.08	0.21	0.67	-
Plugin Hybrid Petrol Car	-	-	-	-	-	0.24	0.76	-
Full Diesel Hybrid Car	-	-	-	-	-	0.42	0.58	
E85 Bioethanol Car	-	-	0.00	0.04	0.15	0.27	0.17	0.37
LPG Car		-	0.00	0.04	0.15	0.27	0.17	0.37
Full Hybrid Petrol LGV					0.17	0.32	0.24	0.27
Plug-In Hybrid Petrol LGV	-					0.39	0.29	0.33
E85 Bioethanol LGV	-	-	0.01	0.06	0.15	0.30	0.22	0.25
LPG LGV		-	0.01	0.06	0.15	0.30	0.22	0.25
HGVs and Buses	**Pre-Euro I**	**Euro I**	**Euro II**	**Euro III**	**Euro IV**	**Euro V_EGR**	**Euro V_SCR**	**Euro VI**
Rigid HGV	-	-	-	0.05	0.07	0.27	0.62	
Artic HGV	-	-	-	0.02	0.02	0.28	0.68	
Buses	-	-	-	0.03	0.22	0.39	0.36	
Coaches	-	-	-	0.03	0.22	0.39	0.36	
B100 Rigid HGV			0.01	0.04	0.05	0.05	0.14	0.72
B100 Artic HGV			0.00	0.01	0.01	0.03	0.10	0.85
Biodiesel Buses		-	0.02	0.08	0.08	0.07	0.20	0.56
Biodiesel Coaches		-	0.02	0.08	0.08	0.07	0.20	0.56
Hybrid Buses - Single Decker					-	0.20	0.61	0.19
Hybrid Buses - Double Decker					-	0.20	0.61	0.19
Hybrid Buses - Articulated					-	0.20	0.61	0.19
Motorcycles	**Pre-Euro 1**	**Euro 1**	**Euro 2**	**Euro 3**	**Euro 4**	**Euro 5**		
0-50cc	-	-	0.33	0.67	-	-		
2-stroke - 50-100cc	-	-	0.33	0.67	-	-		
4-stroke - 50-150cc	-	-	0.33	0.67	-	-		

4-stroke - 150-250cc	-	-	0.33	0.67	-	-
4-stroke - 250-750cc	-	-	0.33	0.67	-	-
4-stroke - >750-cc	-	-	0.33	0.67	-	-

Table B. 3 – Traffic Data used in the Detailed Assessment – M25 data sourced from DfT

Modelled Road Link	AADT	% Car	% LGV	% HGV	% Bus and Coach	% Motorcycle	Speed(kph)
M25 W of BCT	140908	64.7	20.3	14.6	0.2	0.3	112
M25 E of BCT	140908	64.7	20.3	14.6	0.2	0.3	112.00
Bell Common Tunnel	140908	64.7	20.3	14.6	0.2	0.3	112.00

Notes

Traffic speeds were modelled at either the relevant speed limit for each road or where available monitored vehicle speeds

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(16)[1]

Euro Compositions along the M25 are based on the default included within the EFT

Appendix C: Epping Forest District Council Response to TfL Consultation on Proposals to Extend the Ultra Low Emission Zone (ULEZ)

Epping Forest District Council

Epping Forest District Council Response to TfL Consultation on Proposals to Extend the Ultra Low Emission Zone (ULEZ) London-wide From 29 August 2023

Background

Population and transportation in Epping Forest District

Epping Forest District is in the south-west of Essex abutting both Hertfordshire and Greater London, specifically the London boroughs of Waltham Forest, Enfield, Redbridge, and Havering. Based on ONS data from 2021, the District has a population of around 135,000.

The south–west of the District is served by the London Underground Central Line (both the main line and the 'Hainault via Newbury Park' loop). Epping Station is the eastern terminus and there are 7 other stations in service in the District. There is one national railway station in the District – at Roydon on the Liverpool Street to Stansted and Cambridge line, although other railway stations (Broxbourne, Sawbridgeworth, Harlow Town and Harlow Mill) are close to, and accessible from, the District. The Central Line used to run further than Epping through stations at North Weald and Blake Hall to the end of the line at Ongar. Blake Hall station closed in 1981 with the line closing in 1994.

Some areas of the District have relatively good transport links with both the M11 and M25 motorways running through the area and the A406 being a short distance from the south of the District. However, in the rural areas there are accessibility issues for some without private transport, especially in outlying villages. In addition, making east-west trips across the District by public transport is extremely challenging.

Around half of the District's working residents commute out of the District for work, with the largest proportion travelling to London.

Air quality in the District

Air quality in the District in relation to human health is generally good with nitrogen dioxide (NO_2) and particulates (PM_{10}) levels below the UK legal limit value for these pollutants. The District does have one air quality management area (AQMA) declared for exceedances of the 1 hour mean and annual mean for NO_2 near the B1393/ Theydon Road junction at Epping, Bell Common attributed to vehicle emissions. Source apportionment work conducted by Bureau Veritas on behalf of the Council in December 2021 concluded that by 2024, our AQMA for NO_2 will be in compliance with the air quality limit values. It further concluded that NO_2 concentrations will be below 10% of the air quality limit value by 2026.

The District, together with the London Boroughs of Waltham Forest and Redbridge, also has a Special Area of Conservation (SAC) which is an international designation applied to sites whose habitats and species have significant ecological importance. The Epping Forest SAC (EFSAC) is sensitive to pollutants which include oxides of nitrogen (NO_x) and ammonia (NH_3) and because of this, there are pollutant critical levels set for these pollutants. With respect to the EFSAC, vehicle tailpipe emissions are the main source of pollution (with catalytic convertors being the primary source of NH_3). It is known that much of the EFSAC is in an unfavourable condition. Under the UK legislation the Council is a competent authority with a duty to ensure that plans and projects can only be permitted where there will be no adverse effect either alone or in combination with other plans and projects on the Forest. This is a matter which has been the subject of considerable and ongoing discussion as part of the examination into the Council's emerging Local Plan in order to shape an appropriate policy framework to mitigate the effect of new development on the EFSAC. In addition, to support the delivery of new development Epping Forest District Council has produced an Air Pollution Mitigation Strategy (which is currently an Interim Strategy), which provides a list of measures to be implemented in order to mitigate any effects on the EFSAC. One such measure, should it be demonstrated to be necessary through on-site monitoring and subsequent air quality modelling, is the creation of an EFSAC specific Clean Air Zone.

As part of the work to assess air pollution impacts on the EFSAC, ANPR data was obtained to assess fleet composition. It found that in terms of euro class split, the 2019 ANPR data showed that the car and LGV fleet using the roads through the EFSAC is for the main part newer than that in the EFT outer London fleet, but older than the EFT UK average outside of London. Older vehicles with less rigorous euro standards are typically more prevalent in the local vehicle fleet for both 2017 and 2019 ANPR surveys.

Climate Change Emergency

Epping Forest District Council declared a climate emergency in September 2019 and made a commitment to do everything within its power to become a carbon neutral District by 2030. A Climate Change Action Plan has recently been adopted by the Council. Actions to address air quality and climate change are closely linked, so many of the measures in our Climate Change Action Plan will also support improvements in air quality in the District and have beneficial effects on both human health and the EFSAC. As 65% of the District's carbon emissions come from on road transport sources, maximising opportunities to make it easier for residents and businesses to transition to using Ultra Low Emissions Vehicles (ULEV's), encouraging sustainable transport choices and reducing the number of journeys made by vehicles is a major component of this Plan.

Response to the ULEZ expansion consultation

Epping Forest District Council welcomes the opportunity to respond to this consultation. As seen from our background information above, we share a common goal of improving air quality and reducing carbon emissions. With the south of our District bordering three London boroughs and being in close proximity to the A406, the expansion of the ULEZ will undoubtedly have a direct impact on our District. Having reviewed the consultation documents, in principle we support the aims of the expansion put forth by TfL but also have concerns that TfL and the Mayor of London need to address.

Concern 1: Traffic displacement

Insufficient information has been provided to demonstrate that Epping Forest District would not be impacted by drivers avoiding the ULEZ boundary. The present ULEZ has a clear boundary (A406) which allows drivers to avoid the ULEZ whilst also avoiding residential roads however, the proposed new boundary is not as defined and provides more opportunities for drivers to divert to residential roads and use alternative routes to get to their destinations. Additionally, there is a concern that drivers from both our District and outside who currently drive into London may decide to park near a tube station in our District to avoid paying to enter the London wide ULEZ. This in turn can result in increased vehicle movements in our District and the creation of congestion and pollution hot spots.

Action requested:

We ask that TfL model for this or at least provide additional information to demonstrate whether the hypothesis of traffic displacement is valid and if so, propose measures to mitigate the negative impacts. Without this information, Epping Forest District Council would not be able to support the ULEZ expansion.

Concern 2: Creation of pollution corridor

We do not believe that the mitigation measures put forth in our Interim Air Pollution Mitigation Strategy were fully taken into consideration by TfL when modelling the impacts of the proposed ULEZ expansion. One such measure, a clean air zone in conjunction with the proposed ULEZ expansion may create a pollution corridor in the areas of the District caught between the two boundaries.

Action requested:

We ask that TfL model for this or at least provide further information to demonstrate if the hypothesis of a pollution corridor is valid and if so, propose measures to mitigate the negative impacts. Without this information, Epping Forest District Council would not be able to support the ULEZ expansion.

Concern 3: Impact on our air quality management area

Whilst the modelling produced by TfL goes up to the M25 boundary, our AQMA is just outside of this boundary and we are therefore not able to assess the impact of the expansion on our AQMA. The additional information provided to us by TfL states that the scheme is not expected to increase NOx emissions on any road links within Epping Forest or within the Epping Forest Areas but the way the data is presented suggests that the data for the A roads, B roads, etc, have been averaged. It is therefore difficult to assess if the ULEZ expansion will increase NO_2 levels in and around our AQMA and delay the time it will take to revoke it.

Action requested:

We ask that TfL provide more detailed information regarding the proposed ULEZ expansion's impact on our AQMA and whether this expansion will delay the time it will take for our AQMA to be revoked. Without this information, Epping Forest District Council would not be able to support the ULEZ expansion.

Concern 4: Impact on the Epping Forest Special Area of Conservation

The ULEZ may influence people to upgrade their vehicles or switch from diesel to petrol. Whilst this may be beneficial with regards to reducing NO_2 and particulate tail pipe emissions, it may result in an increase in ammonia levels as ammonia is a product released by catalyst-equipped petrol vehicles and selective catalytic reduction (SCR) on both light and heavy-duty diesel vehicles. Ammonia is a pollutant of concern for the EFSAC. The additional information provided by TfL states that while ammonia emissions have not been modelled, the baseline proportion of electric vehicles in their model inputs are considerably higher than that assumed in the modelling undertaken to inform the Habitats Regulations Assessment 2021 (HRA 2021) undertaken to support the main modifications to our emerging Local Plan and our Interim Air Pollution Mitigation Strategy. Therefore TfL have suggested that ammonia levels are expected to result in an earlier achievement of the targets set out in the HRA 2021 and the Interim Air Pollution Mitigation Strategy. We feel that a baseline proportion of EV's in the range of 40-50% from 2030 is optimistic and feel that instead there will be an increase in petrol vehicles. This is supported by the follow up response provided by TfL that acknowledges a potential increase in the proportion of compliant petrol vehicles. This is a matter of importance as there is a need under the Habitats and Species Regulations to take a 'precautionary' approach. The HRA 2021 and Interim Air Pollution Mitigation Strategy set out that, based on current available information, a 30% reduction in petrol cars (such that 12-15% of all vehicles using roads through the EFSAC are ULEVs by that year) would need to be achieved by 2033 in addition to any Clean Air Zone to be able to demonstrate no adverse effect on the integrity of the EFSAC as a result of

Local Plan development. The EFSAC ANPR data collected in 2019 also showed that the proportion of the vehicle fleet was 43.8% petrol car as opposed to 31.5% of diesel cars.

Action requested:

We ask that TfL model for the impact of the ULEZ expansion on the EFSAC in relation to ammonia concentrations. Without this information, Epping Forest District Council would not be able to support the ULEZ expansion.

Concern 5: Impact on the current public transport system and road network

Over the past years, TfL has reduced service within our District. The time between tube trains has been increased and some bus routes have been reduced or removed. Should residents decide to use public transport instead of drive, this will add further strain on the public transport system in our District. Conversely, as a result of service reductions some residents may use their cars rather than public transport. This undermines modal shift objectives and could exacerbate vehicle queue lengths within the EFSAC and around our AQMA which could potentially impact on the achievement of our air quality targets.

Action requested:

We ask that TfL keep the provision of public transport in our District under review to ensure that residents and people who commute to and from our District for work, education and leisure are not negatively affected should commuter usage increase as a result of the ULEZ expansion; and to avoid an increase in vehicular traffic in our District.

Concern 6: Insufficient time and scrappage scheme

It appears that the scrappage scheme proposed to support the ULEZ expansion will only be available to London residents. Additionally, the implementation target date of August 2023 will provide little time for residents and businesses to plan for purchasing a new vehicle, especially during the current difficult economic period. The current delays of receiving new vehicles due to production issues caused by the pandemic, global shortage of key microprocessor chips and the war in Ukraine should also be taken into consideration.

Action requested:

We ask that TfL and the Mayor of London expand the scrappage scheme radius to boroughs/Districts that directly border the Greater London border to maximise the effectiveness of the scheme. We also ask that a sunset period extending past the August 2023 implementation date is offered to residents and businesses who reside/operate in boroughs/Districts that directly border Greater London.

Concern 7: Poor provision of EV charge points in TfL car parks

There are 8 London Underground Line stations within the District (Epping, Theydon Bois, Debden, Loughton, Buckhurst Hill, Roding Valley, Chigwell and Grange Hill). Presently the TfL car park at Theydon Bois is the only one that offers charging points for taxis.

Action requested:

We ask that TfL install EV charge points for taxis and public use at their car parks situated in our District.

Appendix D: Response to Consultation

A four week consultation took place between 20th January and 17th February 2023 to seek comments on our draft Air Quality Action plan (AQAP). The consultation was promoted via social media, direct email, the council website and sent to local news outlets. Hard copies of the draft AQAP and survey were also provide upon request via direct contact with Environmental Health and at the Civic Offices reception.

From Facebook engagement, 1,569 people engaged with the posts. This included liking, sharing, selecting to read more of the post, etc. 1,564 people clicked on the link to the consultation webpage.

The survey focused on the 6 priority themes of the AQAP and their respective actions. Participants were asked how they felt on each action by selecting: Strongly Disagree, Disagree, Unsure, Agree, Strongly Agree and were also given an option to provide further feedback for each theme in a text box. A total of 112 responses were made via the survey monkey platform and 2 were submitted via email. The results of the survey monkey are as follows:

Theme 1: Alternatives to private vehicle use/ promoting low/zero emission transport

With regards to the nine actions proposed within this theme, a total of 108 people responded to this theme. Of these 108, 34.25% either strongly disagreed or disagreed with the proposed actions, whilst 50.87% either agreed or strongly agreed with the proposed actions and 14.88% were unsure.

Theme 2: Environmental Permitting and other regulatory measures

With regards to the five actions proposed within this theme, a total of 104 people responded to this theme. Of these 104, 26.29% either strongly disagreed or disagreed with the proposed actions, whilst 52.38% either agreed or strongly agreed with the proposed actions and 21.33% were unsure.

Theme 3: Freight and Delivery Management

With regards to the four actions proposed within this theme, a total of 100 people responded to this theme. Of these 100, 23.82% either strongly disagreed or disagreed with the proposed actions, whilst 54.34% either strongly agreed or agreed with the proposed actions and 4% were unsure.

Theme 4: Policy Guidance and Development Management

With regards to the nine proposed actions within this theme, a total of 96 people responded to this theme. Of these 96, 29.36% either strongly disagreed or disagreed with the proposed actions, whilst 50.98% either strongly agreed or agreed with the proposed actions and 19.65% were unsure.

Theme 5: Promoting Low Emission Plant

With regards to the 6 actions proposed within this theme, a total of 95 people responded to this theme. Of these 95, 22.24% either strongly disagreed or disagreed with the proposed actions, whilst 65.32% either strongly agreed or agreed and 12.43% were unsure.

Theme 6: Public health, awareness raising and monitoring

With regards to the 5 actions proposed within this theme, a total of 93 people responded to this theme. Of these 93, 21.08% either strongly disagreed or disagreed with the proposed measures, whilst 61.08% either strongly agreed or agreed and 17.85% were unsure.

Written feedback included within the survey monkey varied, however, many participants were concerned with the lack of public transport within the District, especially in rural areas. Because of this, there was concern with regards to measures that influenced limiting car use. There was also concern with regards to limiting parking spaces in new developments resulting in increased parking on neighbouring residential roads. Many were against staff being offered annual car checks and thought these were MOT's. Whilst the measure is not an annual MOT but rather a car safety check that can result in a more efficient vehicle, this measure has been removed from the action plan. There was also concern with regards to cycling provision, citing that roads are not safe enough for cyclists at the moment and infrastructure is needed first in order to support a transition to cycling.

In addition to the survey monkey, we also received 10 written responses to the consultation. Their feedback has been incorporated into the final Air Quality Action Plan document where feasible.

Demographics

At the end of the survey, participants were asked to provide some details about themselves to help us assess the reach of our consultation. Below is a summary of the results:

Gender:
41.05% female
41.05% male
1.05% transgender
1.05% stated other
15.79% preferred not to say

Age:

Under 18	0.0%
18-24	1.16%
25-34	4.65%
35-44	19.77%
45-54	19.77%
55-64	32.56%
65-74	15.12%
75-84	5.81%
85+	1.16%

Which district do you live, study and or work in:
Abridge: 2
Buckhurst Hill: 5
Chigwell: 9
Chipping Ongar: 2
Epping: 23
Epping Upland: 1
Essex: 3
Grange Hill: 1
Harlow: 1
Loughton: 13
Matching Green: 1
Nazeing: 1
North Weald: 3
Ongar: 2
Passingford: 1

Roydon: 1
Rye Hill Road: 2
Sewardstone: 1
Stapleford Abbotts: 1
Theydon Bois: 7
Waltham Abbey: 13

Appendix E: Summary of Pollutants of Concern and Monitoring Data for the District

For the purpose of this document, the pollutants of concern are:

Pollutant	Composition	Sources	Effects
Particulates	PM_{10} is particulate matter smaller than 10 micrometres (µm, or one thousandth of a mm) in diameter. $PM_{2.5}$ is that smaller than 2.5µm. PM_{10} is considered the threshold below which particles can be drawn into the lungs. Smaller $PM_{2.5}$ is considered an even greater health risk due to being able to get deeper into the lungs and bloodstream.	Particulate matter is made up from a wide range of substances. It has both man-made and naturally occurring sources. In our district, road vehicles, burning activities, and construction works are main sources of particulates.	Strongly linked to health problems, including asthma, cancer and cardiovascular illness. Day to day variations in particulate pollution levels are strongly associated with variations in daily deaths, hospital admissions for respiratory and cardiovascular diseases and asthma.
Oxides of nitrogen	NO_x refers to the combination of NO and NO_2 (nitrogen monoxide and nitrogen dioxide). During hot and sunny weather, NO_x and volatile organic compound (VOCs) emissions (primarily produced by vehicles and industrial processes using solvents), react in the atmosphere to form ground level ozone. Ozone is one of the main constituents of photochemical smog, with higher concentrations in summer when sunlight and temperatures are higher.	In our district, gas boilers and road vehicles are big sources of NO_2.	NO_2 has been strongly linked with emphysema, bronchitis, and heart disease. It is also linked with reduced lung function in children. Overloading of nitrogen has also been connected with the degradation of sensitive habitats and deteriorating biodiversity.

UK Air Quality Objectives and Pollutants

Pollutant	Objective	Averaging Period
Particulate Matter (PM_{10})	50µg/m^3 not to be exceeded more than 35 times a year	24-hour mean
	40µg/m3	Annual mean
Particulate Matter ($PM_{2.5}$)	Work towards reducing fine particulate matter (PM2.5)	Annual mean
Nitrogen dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40µg/m3	Annual mean

District Monitoring Results

The Council monitors nitrogen dioxide (NO_2) with passive diffusion tubes throughout the District. At present, the Council has 42 monitoring locations. Below is a summary of our monitoring locations and results from 2017 to 2021. All our monitoring is reported to Defra annually through our annual status reports (ASR). To view these reports, please go to Essex Air https://essexair.org.uk/

Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
1a, 1b, 1c	544234	192236	Kerbside	100.0	100.0	**45.3**	39.2	38.9	30.0	29.6
2a, 2b, 2c	545555	201732	Urban Background	100.0	100.0	27.6	24.5	23.9	18.1	17.9
3a, 3b, 3c	544928	201281	Roadside	100.0	100.0	**64.5**	**54.8**	**47.6**	32.5	**41.0**
4a, 4b, 4c	546196	202355	Roadside	100.0	100.0	30.8	28.3	28.2	21.3	20.0
5a, 5b, 5c	546058	202193	Roadside	100.0	100.0	35.7	35.9	33.5	24.0	24.8
6a, 6b, 6c	547838	206819	Urban Background	100.0	100.0	26.0	21.8	20.1	16.1	16.9
7a, 7b	542505	196668	Roadside	100.0	100.0	27.0	25.4	22.4	17.4	17.9
8a, 8b	542664	196868	Roadside	100.0	100.0	26.3	23.2	21.2	16.8	17.9
9a, 9b, 9c	542339	196360	Roadside	100.0	100.0	32.8	32.4	28.0	21.2	20.4
10a, 10b	542373	196478	Roadside	100.0	100.0	37.6	32.0	28.3	21.7	22.3
11a, 11b	543091	197316	Roadside	100.0	100.0	38.6	38.8	34.4	28.0	28.8
12a, 12b, 12c	549648	203671	Urban Background	100.0	100.0	18.4	16.0	15.1	11.5	12.1
13a, 13b, 13c	540919	209956	Roadside	100.0	100.0	23.2	22.7	20.5	16.1	16.8
14a, 14b, 14c	539711	208662	Urban Background	100.0	100.0	17.6	17.0	15.8	13.4	13.2
15a, 15b	537727	196187	Roadside	100.0	100.0	32.7	30.3	27.2	22.6	23.2
17a, 17b, 17c	541320	200020	Urban Background	100.0	82.2	30.3	27.9	25.7	17.0	21.4
18a, 18b	537808	200644	Roadside	100.0	100.0	28.1	24.6	23.8	18.9	19.6
19a, 19b	538386	199557	Roadside	100.0	100.0	25.8	27.1	26.0	20.4	22.2
20a, 20b, 20c	538710	199860	Roadside	100.0	100.0	33.1	30.5	30.2	22.5	24.6
21a, 21b	538954	199973	Urban Background	100.0	100.0	30.1	26.8	28.2	21.0	20.8
22a, 22b	541719	193979	Roadside	100.0	100.0	30.9	28.7	25.2	19.4	21.5
23a, 23b, 23c	540902	194240	Roadside	100.0	100.0	31.9	29.2	25.7	20.1	20.6
25a, 25b, 25c	541913	194020	Roadside	100.0	100.0		37.3	33.3	26.1	27.1
26a, 26b, 26c	555253	202921	Roadside	100.0	92.1		38.3	33.4	27.8	31.3
27a, 27b, 27c	555125	203944	Roadside	100.0	100.0		26.7	24.2	18.3	18.7
31a, 31b, 31c	546196	201563	Other	100.0	100.0	-	-	37.9	25.3	28.2
32a, 32b, 32c	544709	201139	Roadside	100.0	100.0	-	-	30.9	23.2	22.2
33a, 33b, 33c	544238	192212	Roadside	100.0	100.0	-	-	30.3	25.0	23.4
34a, 34b, 34c	544268	192247	Roadside	100.0	100.0	-	-	21.6	16.9	17.5
35a, 35b, 35c	544183	192231	Roadside	100.0	100.0	-	-	34.9	24.3	25.5
36a, 36b, 36c	555231	202875	Roadside	100.0	100.0	-	-	34.1	24.7	26.1
37a, 37b, 37c	555253	202964	Roadside	100.0	100.0	-	-	28.4	19.8	21.3
38a, 38b, 38c	555265	203108	Roadside	100.0	100.0	-	-	30.0	19.5	21.6
39a, 39b, 39c	546107	202254	Roadside	100.0	100.0	-	-	34.9	22.6	22.6
40a, 40b, 40c	545991	202095	Roadside	100.0	100.0	-	-	33.0	24.3	21.7
41a, 41b, 41c	546075	202253	Roadside	100.0	100.0	-	-	34.9	22.7	23.9
42a, 42b, 42c	533015	205995	Roadside	100.0	100.0	-	-	-	23.0	22.3
43a, 43b, 43c	539084	206058	Roadside	100.0	100.0	-	-	-	21.0	21.7
44a, 44b, 44c	543989	196472	Roadside	100.0	100.0	-	-	-	16.9	17.0
45a, 45b, 45c	544119	196133	Roadside	100.0	100.0	-	-	-	17.9	18.6
46a, 46b, 46c	541301	199731	Roadside	100.0	100.0	-	-	-	-	28.1