Medway Council
Four Elms Hill
Air Quality Action Plan

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

June 2022

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Date	24/06/2022

Executive Summary

This Air Quality Action Plan (AQAP) has been produced as part of our statutory duties required by the Local Air Quality Management (LAQM) framework. It outlines the action we will take to improve air quality within the Four Elms Hill Air Quality Management Area (AQMA) between 2022-2027.

Medway declared the Four Elms Hill, Chattenden AQMA in 2017, following a Detailed Assessment published in 2016[1]. The Detailed Assessment included a dispersion modelling exercise which predicted that the nitrogen dioxide (NO_2) annual mean Air Quality Objective (AQO) of 40 μgm^{-3} was exceeded at several residential receptors along Four Elms Hill.

A source apportionment exercise showed that where receptors are located near to junctions, with a reduced traffic speed, emissions from Heavy Goods Vehicle (HGVs) represent the largest emission source followed by Light Goods Vehicle (LGVs) and diesel cars. Away from junctions however, the largest local emission source is diesel cars, followed by LGVs and HGVs.

Medway previously declared three AQMAs in 2010 (Central Medway AQMA, High Street Rainham AQMA and Pier Road Gillingham AQMA), and developed an AQAP presenting measures to improve the air quality within these AQMAs[2].

Further details on the declared AQMAs are presented on Defra's UK AIR website[3].

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[4,5].

[1] Air Quality Consultants. Detailed Assessment of Air Quality at Four Elms Hill, Chattenden for Medway Council, 2016. Available at: https://democracy.medway.gov.uk/mgconvert2pdf.aspx?id=37497
[2] Medway Council. Air Quality Action Plan, 2015. Available at: https://www.medway.gov.uk/downloads/file/1982/medway_air_quality_action_plan_2015
[3] https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=157
[4] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[5] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[6]. Medway Council is committed to reducing the exposure of people in Medway to poor air quality in order to improve health.

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

- Alternatives to private vehicle use
- Freight and delivery management
- Policy guidance and development control
- Promoting low emission transport
- Promoting travel alternatives
- Public information
- Transport planning and infrastructure
- Traffic management
- Vehicle fleet efficiency

Our priorities are to tackle emissions due to servicing and freight vehicles, and so we will explore the possibility to only allow zero emissions HGVs and LGVs travelling through the AQMA.

In this AQAP we outline how we plan to effectively tackle 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 Medway Council's direct influence.

Responsibilities and Commitment

This AQAP was prepared by Medway Council's Environmental Protection Team with the support and agreement of the following officers and departments:

- Planning;
- Transport and Parking;
- Climate Response; and
- Public Health.

This AQAP has been approved by:

<Details of high level Council members who have approved the AQAP>

[6] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Progress each year will be reported in the Annual Status Reports (ASRs) produced by Medway Council, as part of our statutory Local Air Quality Management duties.

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

environmental.protection@medway.gov.uk

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Introduction

This report outlines the actions that Medway Council will pursue between 2022-2027 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 Four Elms Hill area.

This Air Quality Action Plan (AQAP) has been developed in recognition of the legal requirement on the local authority to work towards the 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 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 Medway Council's air quality Annual Status Report (ASR).

Summary of Current Air Quality in Medway's Four Elms Hill AQMA

1.1 LAQM review and assessment

Air quality in Medway is reviewed annually as part of the LAQM review and assessment process. The 2021 ASR presents annual mean concentrations monitored in 2020[7].

Medway Council carries out LAQM reviewing and reporting duties in line with the requirements of the Environment Act 1995. All previous years' reports are available at www.kentair.org.

There are four diffusion tubes within the Four Elms Hill AQMA which monitor the annual mean concentration of NO_2. Details are presented in Table 2.1.

Table 2.1 – Details of Automatic Monitoring Sites

ID	Location	Type	X	Y	Distance to Relevant Exposure (m) [(1)]	Distance to kerb of nearest road (m) [(2)]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT22	Joy Lodge, Four Elms Hill	R	575488	171616	0.0	12.0	No	1.2
DT24	1A Main Road	K	575948	171847	2.2	0.5	No	2.6
DT32	6 Balls Cottages, Main Road	R	575903	171802	8.4	1.9	No	2.4
DT33	2 Broadwood Road	R	575971	171833	2.4	1.8	No	2.6

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).
(2) N/A if not applicable.

Monitored concentrations for the last six years are included in Table 2.2. Annual mean concentrations of NO_2 within the Four Elms Hill AQMA have been slightly declining over the past six years, however in 2019 concentrations still exceeded the annual mean AQO at three of the four monitoring locations within the AQMA.

7 Medway Council. 2021 Air Quality Annual Status Report, 2021

During the 2020 monitoring period, the UK was put into a national lockdown due to COVID-19 which resulted in reduced traffic for several months. As a result, measured concentrations decreased significantly at all sites during 2020. In 2020, diffusion tube site DT24 still recorded an annual mean concentration exceeding the annual mean AQO (44.5 μgm^{-3}). As seen in Table 2.2, site 24 has recorded annual mean concentrations significantly higher than the other three sites since monitoring started. This could be explained by the fact that the site is located closer to the kerb of the nearest road than the other three sites, as detailed in Table 2.1. Site DT24 is also located on the eastbound side of the A228 where vehicles are driving uphill, which is expected to result in higher emissions.

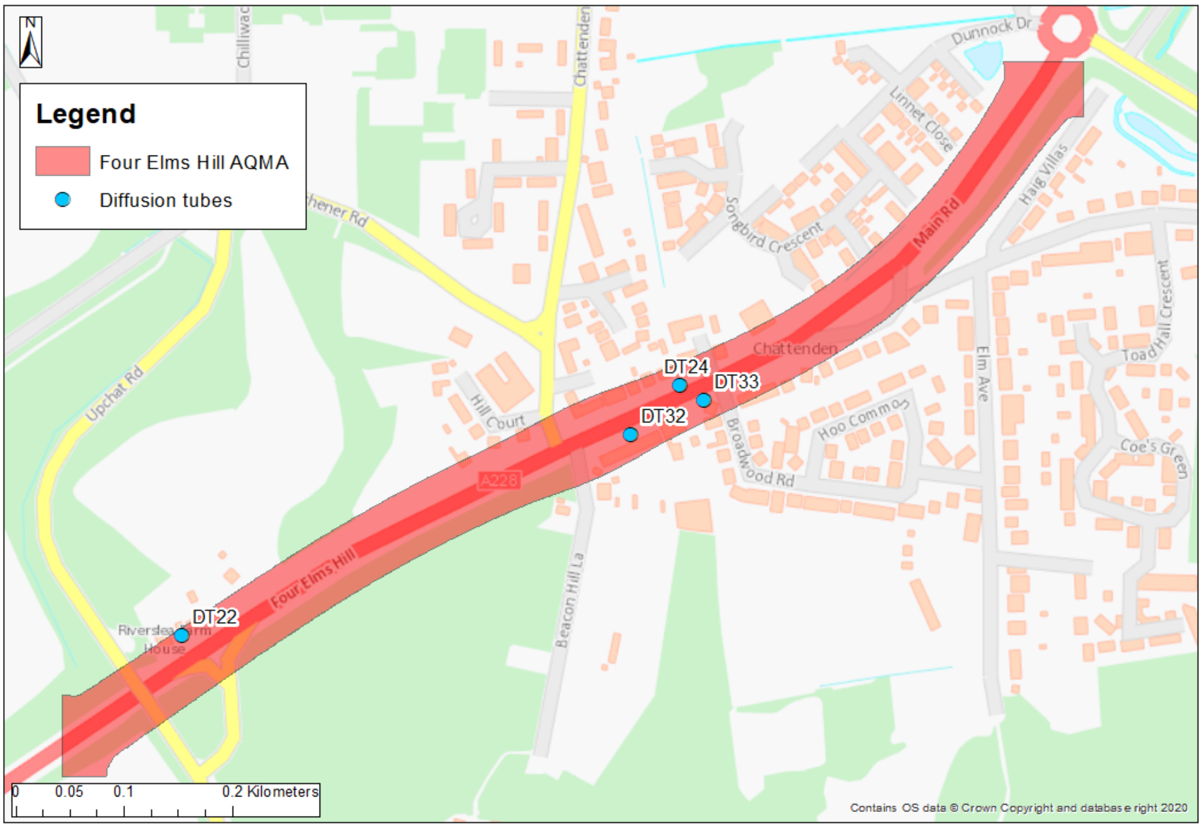
For further investigation, two additional diffusion tubes monitoring sites have been installed in line with the façade of the worst case receptor (1A Main Road) to see if turbulence is a factor in the high concentrations recorded at DT24. This will be reported through the 2023 ASR. An additional diffusion tube has also been put on a property on the new development near to Peninsula Way.

Table 2.2 – Annual mean concentration of NO_2 (μgm^{-3})

ID	Location	Annual mean concentration (μgm^{-3})					
		2015	2016	2017	2018	2019	2020
DT22	Joy Lodge, Four Elms Hill	31.0	29.0	31.0	28.0	27.2	23.4
DT24	1A Main Road	**52.0**	**50.9**	**50.8**	**49.4**	**53.2**	**44.5**
DT32	6 Balls Cottages, Main Road	-	-	**47.5**	**46.3**	**43.1**	38.9
DT33	2 Broadwood Road	-	-	**43.5**	**41.6**	**42.0**	36.6

Figure 2.1 represents the diffusion tube locations in relation to the Four Elms Hill AQMA.

Figure 2.1 – Map of Non-Automatic Monitoring Sites within Four Elms Hill AQMA



1.2 Defra background concentrations

Defra has made estimates of background pollution concentrations on a 1 km^2 grid for the UK for seven of the main pollutants, including NO_2, nitrogen oxides (NO_X), particulate matter with a diameter less than 10µm and 2.5µm (PM_{10} and $PM_{2.5}$). The latest estimates are using data for a base year of 2018, making projections for years from 2018 to 2030 inclusive[8].

Table 2.3 shows the estimated concentrations of the pollutants for 2019, 2024 and 2030 for the cells that will be used in the road dispersion modelling as presented in Section 6.

[8] Defra. Background maps, 2018. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/background-maps/

Table 2.3 – Defra mapped background annual mean pollutant concentrations (µgm^{-3})

Pollutant	Grid Cell	2019	2024	2030
NO_2	575500, 171500 (representative of AQMA diffusion tubes)	17.4	14.3	12.1
NO_X		24.4	19.5	16.2
PM_{10}		16.6	15.6	15.5
$PM_{2.5}$		11.0	10.2	10.0
NO_2	576500, 171500	15.2	12.8	11.2
NO_X		21.0	17.3	15.0
PM_{10}		15.5	14.5	14.3
$PM_{2.5}$		10.5	9.7	9.6

Medway Council's Air Quality Priorities for Four Elms Hill AQMA

1.3 Public Health Context

The impact of air quality upon health is unquestionable and has been a major driver in national and international attempts to reduce levels of air pollution. Pollutants such as NO_2, ozone, benzene, sulphur dioxide (SO_2) alongside PM_{10} and $PM_{2.5}$ and other chemicals or compounds by both chronic and acute exposure are linked to increased mortality and morbidity. Through their association with the development of cardiovascular disease[9], lung cancer[10], aggravation of asthma and other allergic illnesses[11], reduced quality of life[12] and contribution to low birthweight[13].

The distribution of harm from low air quality is not even. Air Quality is evidenced to impact those who reside in areas of deprivation to a greater extent and is also recognised as a contributor to widening health inequalities[14]. In Medway rates of long-term illness, emergency hospital admissions and death are higher in those who are more disadvantaged. Health outcomes are not only worse in those who are the most disadvantaged; the inequalities follow a gradient and as such the response also needs to follow a gradient. This means that interventions and measures should be made available to all, with increasing effort needed for those who are increasingly disadvantaged.

Medway council takes action to protect its residents health from potential harm emanating from low air quality in a variety of ways. This includes partnership work with colleagues in planning to mitigate potential for air quality related harm related to developments. As well as proactively through communication initiatives identified in the Medway Air Quality Communications Strategy. Such as undertaking targeted information campaigns to increase community awareness of means by which

[9] Shah et al. Global association of air pollution and heart failure: a systematic review and meta-analysis The Lancet 2013; 382 (9897): 1039 - 1048.
[10] Raaschou-Nielsen et al. Air pollution and lung cancer incidence in 17 European cohorts: prospective analyses from the European Study of Cohorts for Air Pollution Effects (ESCAPE) Lancet Oncology 2013; 14(9): 813-822.
[11] Krzyzanowski K.-D. (2005). Health effects of transport-related air pollution. World Health Organization.
[12] Department for Environment, Food and Agricultural Affairs. (2010). Air Pollution: Action in a Changing Climate. Department for Environment, Food and Agricultural Affairs.
[13] Pedersen et al. Ambient air pollution and low birthweight: a European cohort study (ESCAPE) Lancet Respiratory Medicine 2013; 1(9): 695-704.
[14] WHO (2013) Review of evidence on health aspects of air pollution-REVIHAAP Project Technical Report. Available at: http://www.euro.who.int/pubrequest

individuals can reduce their exposure and contributions to poor air quality, or manage their long term health conditions which may otherwise leave greater susceptibility to harm from low air quality. Such initiatives underpin priority actions of the Joint Health and Wellbeing strategy (2018-2023) to encourage self-management of long term conditions and shape the environment to make healthy choices easier.

1.4 Planning and Policy Context

1.4.1 National policy

The National Planning Policy Framework (NPPF)[15] provides guidance as to how planning can take account of the impact of new development on air quality. Paragraph 181 of the NPPF states that "*Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of AQMA and Clean Air Zones, and the cumulative impacts from individual sites in local areas*" and "*Planning decisions should ensure that any new development in AQMA and Clean Air Zones is consistent with the local air quality action plan"*.

To support the delivery of the NPPF, Defra has produced National Planning Policy Guidance (NPPG), including one specifically referring to air quality[16]. The NPPG states in Paragraph 005 (Reference ID: 32-005-20191101) "*Whether air quality is relevant to a planning decision will depend on the Proposed Development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the Proposed Development would be particularly sensitive to poor air quality in its vicinity*."

The Government's Clean Air Strategy[17] published in 2019 sets out the comprehensive actions required across all parts of government and society to

[15] Ministry of Housing, Communities and Local Government (2019) National Planning Policy Framework
[16] Ministry of Housing, Communities and Local Government (2019) National Planning Practice Guidance – Air quality
[17] Defra. Clean Air Strategy, 2019. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf

improve air quality. The strategy explains that under the current framework, local authorities produce AQAP when local air quality monitoring has identified concentration exceedances against maximum limits. Compliance with maximum limits however does not incentivise prevention. New legislation therefore will seek to shift this focus towards prevention. This will enable early action to be taken by local authorities to avoid exceedances against future targets set by national government. This new approach will be instrumental for the government to achieve its objective of improving public health and the environment.

1.4.2 Local plan

Medway Council actively manages the effects of new developments on air quality within its area through the Medway Local Plan (2003)[18] Policy BNE24 'Air Quality', to ensure that new developments do not exacerbate existing air quality issues.

Medway Council is currently preparing its emerging Local Plan 2021 – 2037[19]. The plan recognises the Hoo peninsula as an opportunity for growth, and that there is a need to plan for sustainable community development providing the services and infrastructure they need alongside the delivery of new housing and jobs. Large sites at Grain and Kingsnorth are important to Medway's portfolio of employment land. As part of the implementation of the Local Plan, a large area of residential and employment land has been attributed for development on the Hoo Peninsula, which will lead to additional traffic on Four Elms Hill.

As part of the Housing Infrastructure Fund (HIF), £170 million of funding has been secured to deliver strategic transport and environmental projects on the Hoo Peninsula[20]. The HIF current proposals[21] are intended to address the challenge of getting on and off the peninsula and include the following transport related improvements:

- An upgrade of the existing road network with the provision of new infrastructure including slip roads, junctions and interchanges on the A228 and

[18] Medway. Medway Local Plan, 2003. Available at: https://www.medway.gov.uk/info/200149/planning_policy/146/current_planning_policies/3

[19] Medway. New Medway Local Plan. Available at https://www.medway.gov.uk/info/200149/planning_policy/519/new_medway_local_plan

[20] Medway. Hoo New Routes to Good Growth, January 2021. Available at: https://www.medway.gov.uk/downloads/file/5586/hif_consultation_proposals_-_january_2021

[21] Medway. Future Hoo Consultation 2021 Second round, December 2021. Available at: https://futurehoo.medway.gov.uk/dist/pdf/hif-brochure-second-round-lo-res.pdf

A289 and wider highway improvements, as well as a new relief road to access the peninsula via Woodfield Way; and

- a new train station and reinstated passenger service on the Grain branch line.

1.4.3 2015 Air Quality Action Plan

Medway also works to manage local air quality through the implementation of the Medway 2015 AQAP[2] (covering Central Medway AQMA, High Street Rainham AQMA and Pier Road Gillingham AQMA), and the supporting Medway Air Quality Communications Strategy. Medway Council is also working with Public Health colleagues to prioritise action on air quality in its area to help reduce the health burden from air pollution. The 2015 AQAP is planned to be reviewed in 2023/2024.

1.4.4 Air quality planning guidance

In conjunction with the Kent and Medway Air Quality Partnership, Medway produced in 2016 its Air Quality Planning Guidance[22], to deal with planning applications that could impact air quality. The guidance was produced in response to changes in national planning policy, through the National Planning Policy Framework (NPPF). The guidance uses a method for assessing the air quality impacts of a development which includes the quantification of impacts, calculation of damage costs, and the identification of mitigation measures to be implemented to negate the impact of development on air quality. The guidance provides clarity and consistency of approach for developers, the local planning authority and local communities.

1.4.5 Climate change action plan

After declaring a climate emergency in 2019, Medway published its climate change action plan in 2021[23]. The action plan makes clear link between reduction in carbon emissions and improvement in air quality. Measure 6 of the climate change action plan aims to reduce emissions from road transport by promoting and facilitating uptake of electric and ultra-low emissions vehicles, encouraging modal shift through enhanced sustainable infrastructure, and tackling congestion hotspots. Progress to this measure will significantly improve air quality as well as reduce carbon emissions.

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[22] Medway. Air Quality Planning Guidance, 2016. Available at: https://www.medway.gov.uk/downloads/file/2335/medways_air_quality_planning_guidance

[23] Medway. Climate Change Action Plan, 2021. Available at: https://www.medway.gov.uk/climatechangeplan

1.4.6 Bus Service Improvement Plan

Medway recently published a draft Bus Service Improvement Plan (BSIP) 2021-2026[24]. In order to improve air quality, the plan commits to continue to seek additional funding from government and other available sources to improve fleet standards, whether that be retrofitting to Euro VI, or contributions towards the costs of new low or zero-emission vehicles thus allowing timely improvements to Medway AQMAs.

1.4.7 Local Transport Plan

Medway adopted its Local Transport Plan in 2011[25]. The Plan sets a strategy to deliver transport intervention that contribute to improving air quality. Key interventions focus on more efficient management of the highway network and car parks, together with highway improvements that focus on congestion and air quality hotspots, thereby improving the reliability and environmental impact of the transport network.

1.5 Source Apportionment

The measures presented in this AQAP are intended to be targeted towards the predominant sources of emissions within the Four Elms Hill area.

As part of the Detailed Assessment published in 2016[1], a source apportionment exercise was carried out for year 2015 with 56 sensitive residential receptors selected to provide an overview of source contributions affecting pollutant concentrations. As part of developing this AQAP, the source apportionment exercise was updated for year 2019 in line with Box 7.5 of the LAQM TG(16). Traffic data was provided by Sweco and presented in Table C.1 within Appendix C. Traffic flows were split for the following vehicle types:

- Cars;
- LGVs;
- HGVs; and
- Buses.

[24] Medway. Summary: draft bus service improvement plan (BSIP) for Medway 2021 to 2026, 2021. Online available at: https://www.medway.gov.uk/downloads/file/6019/summary_draft_bus_service_improvement_plan_bsip_for_medway_2021_to_2026

[25] Medway. Local Transport Plan 2011-2026, 2011. Online available at: https://www.medway.gov.uk/downloads/file/1995/local_transport_plan_2011-2026

Defra's Emissions Factors Toolkit (EFT) v10.1[26] was used to determine emission source apportionment from the vehicle types listed above[27]. Car emissions were further split between petrol and diesel using default emissions included within the EFT. The emission apportionment of the nearest road link for each of the 56 receptor was determined. The locations of the receptors are shown in Table 3.1, 3.2 and 3.3.

[26] Defra. Emission Factor Toolkit. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/#:~:text=The%20Emissions%20Factors%20Toolkit%20%28EFT%29%20is%20published%20by,of%20their%20duties%20under%20the%20Environmental%20Act%201995.
[27] Defra has since released the EFT v11. It is understood that v11 does not include significant changes in default emissions up to 2030.

Figure 3.1 – Modelled Receptors 1/3

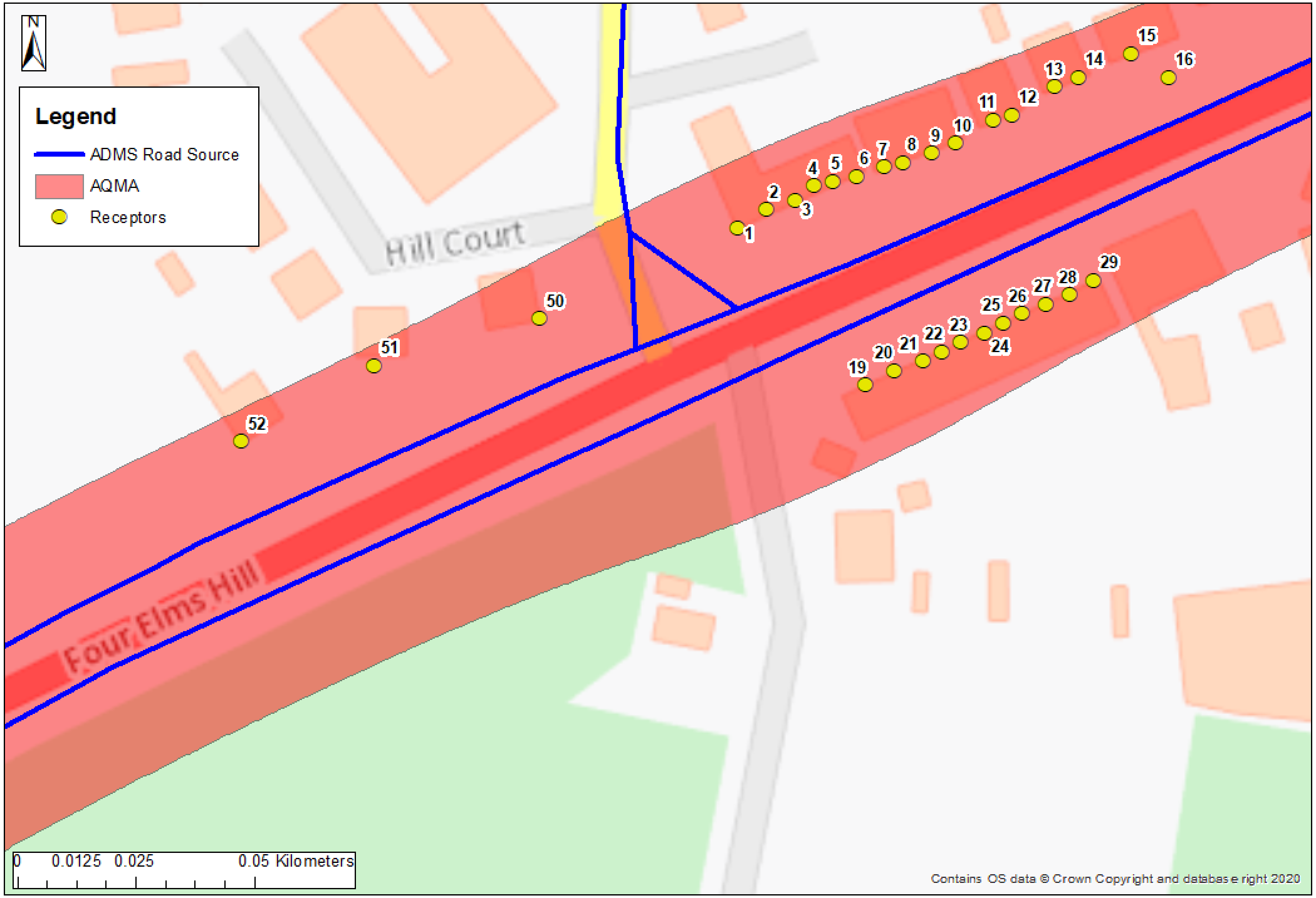

Figure 3.2 – Modelled Receptors 2/3

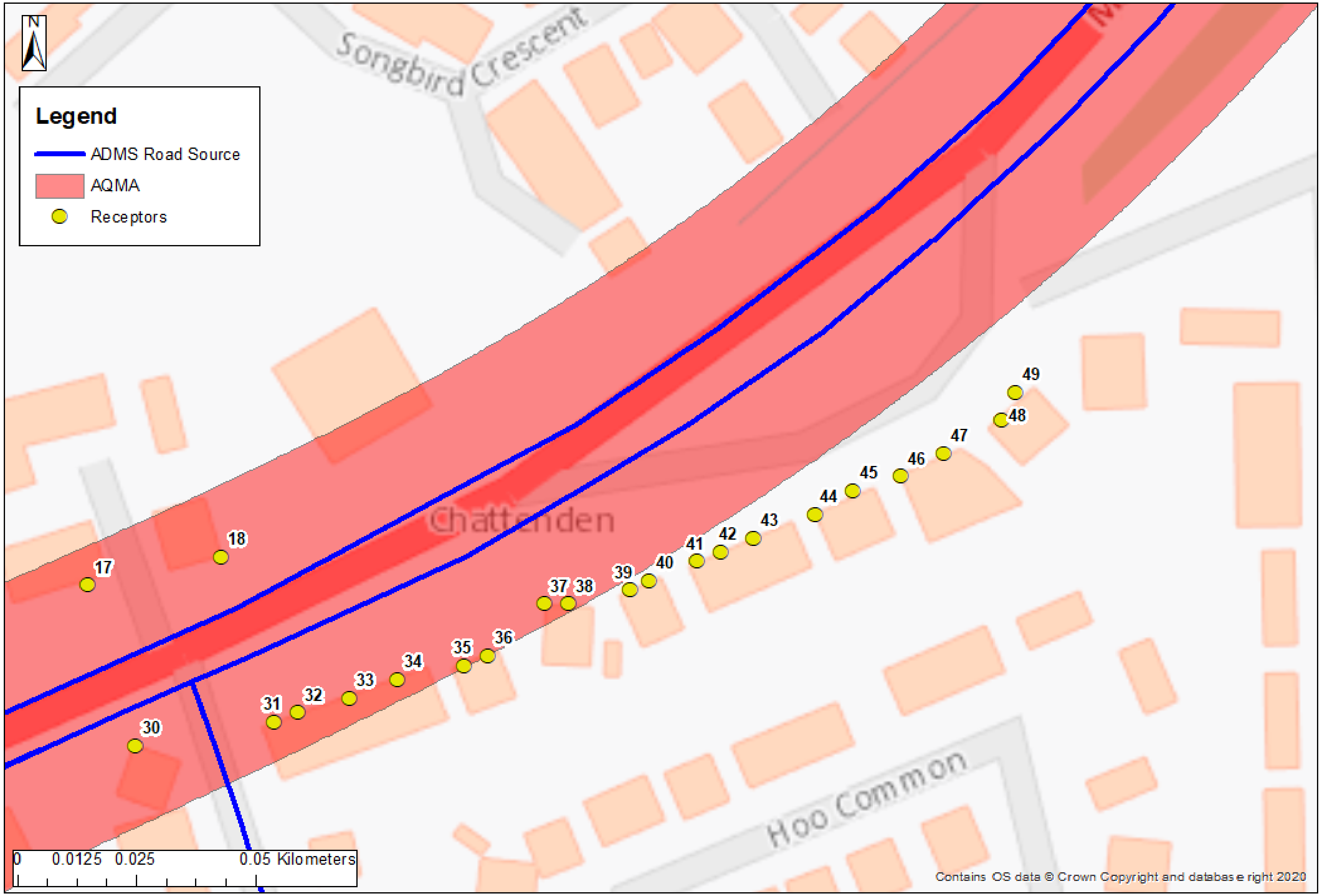

Figure 3.3 – Modelled Receptors 3/3

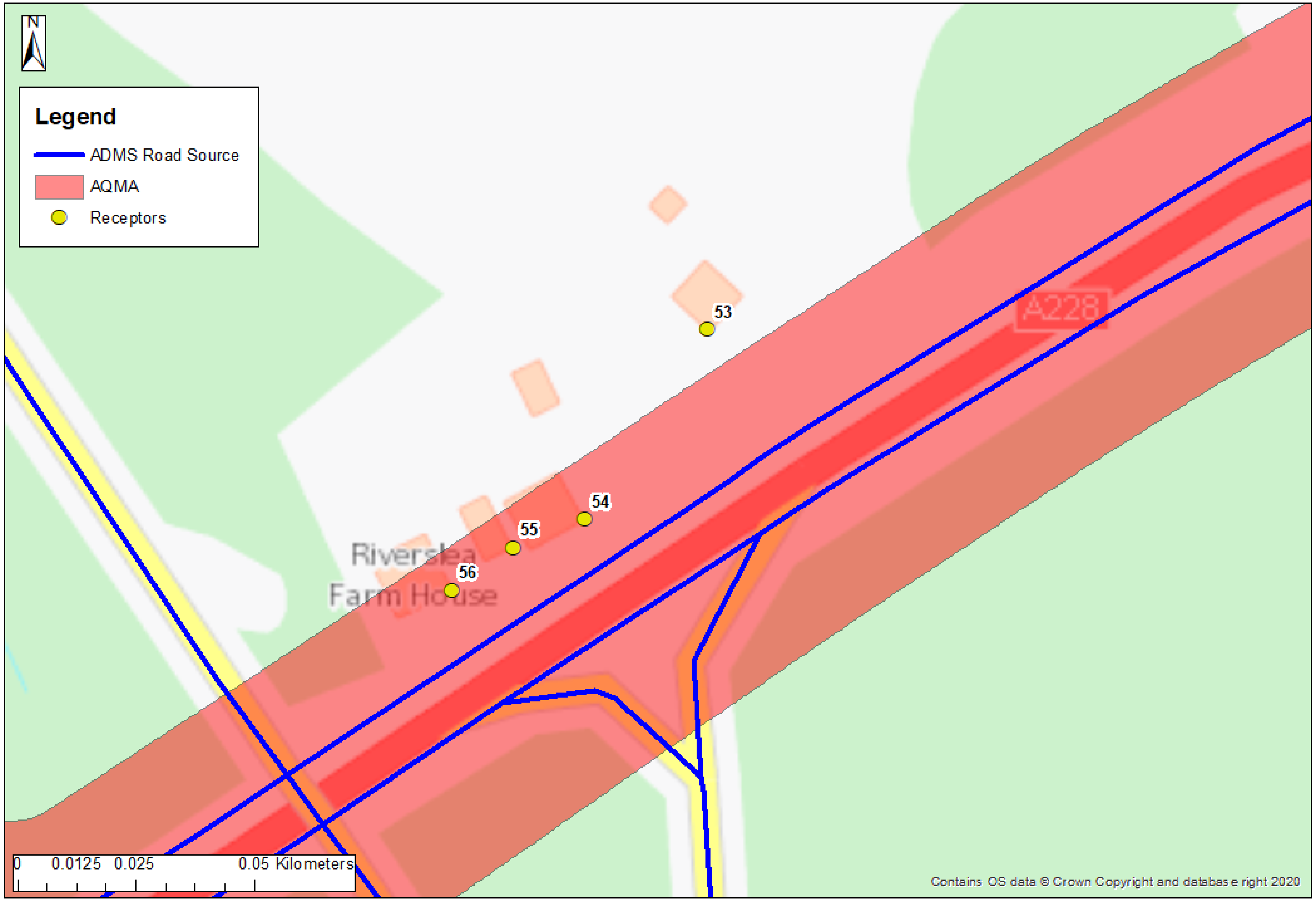

Figure 3.4 shows the relative contribution of each source type to the total predicted 2019 annual mean NO_2 concentrations at the 56 receptor locations modelled.

The figure showed that the most significant component at all receptors, other than the ambient background concentrations, was emissions from diesel cars, HGVs and LGVs.

Where receptors are located near to junctions, with a reduced traffic speed, emissions from HGVs represent the largest emission source followed by LGVs and diesel cars. Away from junctions however, the largest local emission source is diesel cars, followed by LGVs and HGVs. The emission source apportionment is influenced by traffic speed.

Figure 3.4 – Relative Contribution of Each Source Type to the Total Predicted 2019 Annual Mean NO_2 Concentration at Receptor Locations (µg/m³)

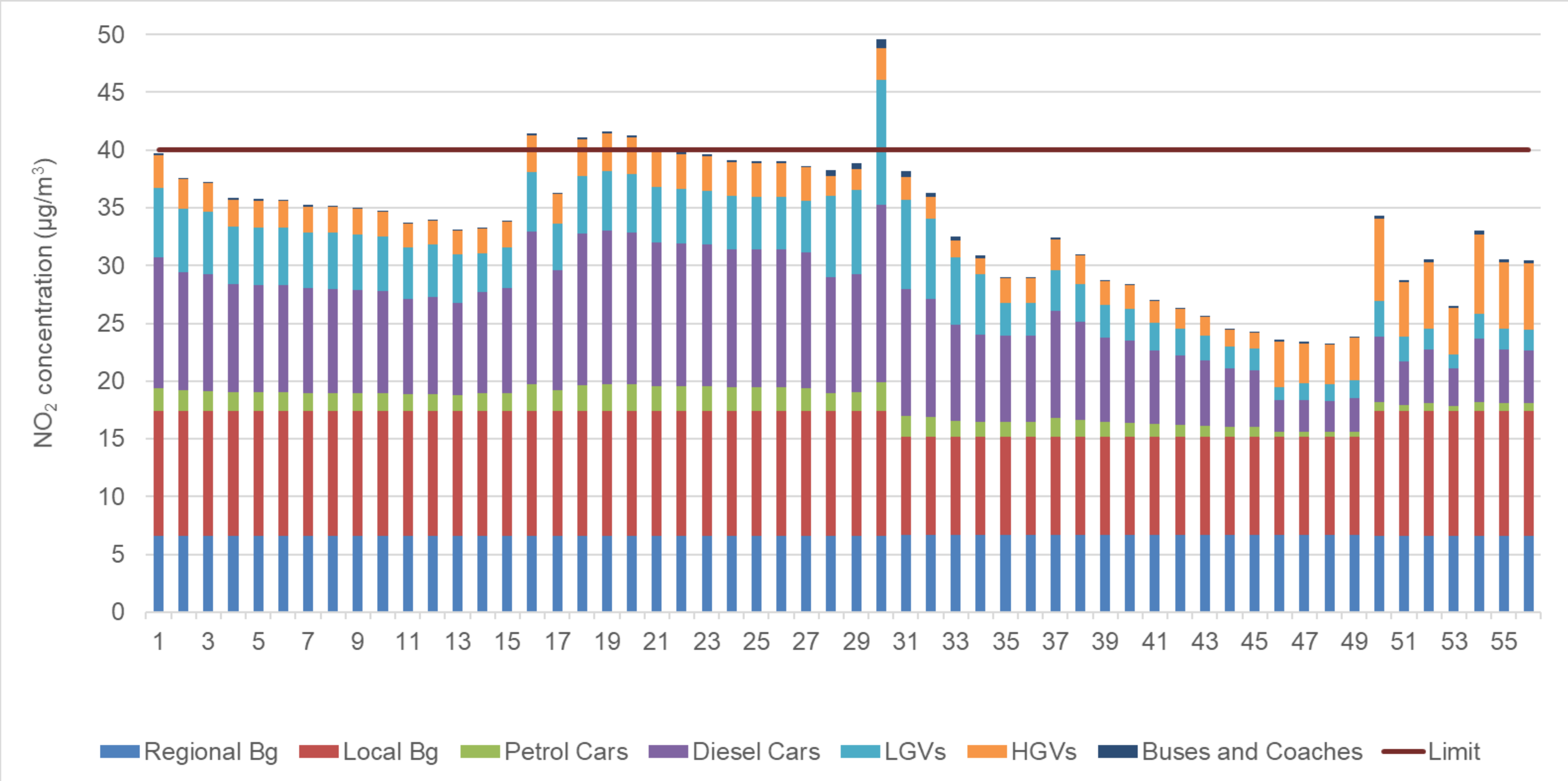

Table 3.1 sets out the percentage contribution from emission sources at the five receptor locations where exceedances of the annual mean AQO of 40 µg/m^3 were predicted. The highest concentration predicted in 2019 was 49.6 µg/m^3 at Receptor 30 situated southwest of the junction between Four Elms Hill and Broadwood Road. At Receptor 30, the highest contribution is predicted to be from HGVs, followed by diesel cars, LGVs, petrol cars and buses.

Table 3.1 – 2019 Predicted Annual Mean NO_2 concentrations (µg/m^3) and Source Contribution (%)

Receptor	Annual NO_2 (µg/m^3)	Regional Bg (%)	Local Bg (%)	Petrol Cars (%)	Diesel Cars (%)	LGVs (%)	HGVs (%)	Buses/ Coaches (%)
16	**41.5**	15.9%	26.0%	5.2%	29.5%	15.8%	7.3%	0.3%
18	**41.1**	16.0%	26.2%	2.9%	19.2%	10.6%	24.2%	0.9%
19	**41.7**	15.8%	25.9%	5.5%	31.3%	12.1%	8.9%	0.4%
20	**41.3**	16.0%	26.1%	5.4%	31.1%	12.0%	8.9%	0.4%
30	**49.6**	13.3%	21.8%	2.9%	19.2%	10.6%	24.2%	0.9%

1.6 Required Reduction in Emissions

Table 3.2 sets out the required reduction in local emissions of NO_X that would be required at the five receptor locations where exceedances were predicted, in order for the annual mean NO_2 AQO to be achieved.

The degree of improvement needed in order for the annual mean NO_2 objective to be achieved is defined by the difference between the highest measured or predicted concentration and the objective level (40 µg/m^3). The highest NO_2 concentration was predicted at receptor 30 (49.6 µg/m^3), requiring a reduction of 9.6 µg/m^3 in order for the objective to be achieved.

In terms of describing the reduction in emissions required, it is more useful to consider NO_X. The required reduction in local NO_X emission has been calculated in line with guidance presented in Box 7.6 of LAQM.TG(16). Table 3.2 sets out the required reduction in local emissions of NO_X that would be required at the five receptor locations where exceedances of the annual mean AQO are predicted.

Table 3.2 shows that at receptor 30, where the highest annual mean concentrations was predicted, a reduction of 32.9% in local road traffic emissions would be required in order to achieve the objective. Annual mean concentrations at the four other receptors where exceedances are predicted are below 42 µg/m^3 and the required reduction in local road traffic at these receptors ranges from 5.1% to 7.7%,

Table 3.2 – Improvement in Annual Mean NO_2 Concentrations and road NO_X Concentration Required to Meet the Objective (2015)

Receptor	Required reduction in annual mean NO_2 concentration (µg/m^3)	Required reduction in emissions of NO_X from local roads (%)
16	1.5	6.9%
18	1.1	5.1%
19	1.7	7.7%
20	1.3	6.0%
30	9.6	32.9%

1.7 Key Priorities

Based on the outcome of the source apportionment exercise, and taking into account the receptor with the highest predicted NO_2 annual mean concentration in 2019, the key priority sources for the Four Elms Hill AQMA are:

- Priority 1 – Emissions from HGVs;
- Priority 2 – Emissions from diesel cars; and
- Priority 3 – Emissions from LGVs.

Development and Implementation of Medway's Four Elms Hill AQAP

1.8 Consultation and Stakeholder Engagement

In developing this AQAP, we have worked with the local community and relevant Medway Council departments to improve local air quality. We have undertaken the following stakeholder engagement:

- Residents engagement survey in February 2019;
- Medway Council internal workshop in July 2019; and
- Follow up Medway Council internal workshop in September 2021.

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

Schedule 11 of the Environment Act 1995 requires local authorities to consult the bodies listed in Table 4.1.

Table 4.1 – 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

1.9 Steering Group

Following the publication of Medway's first AQAP, a Steering Group, chaired by the Assistant Director of Front Line Services, was established in 2016 to provide oversight, and facilitate further development of the measures included. The Steering Group consists of representatives from key council services including, amongst others, Environmental Protection, Public Health, Planning and Integrated Transport, who have agreed to work together with the shared goal of seeking to improve air quality in Medway through behavioural, strategic and infrastructure change.

As reported in Medway's ASR, the Air Quality Steering Group has continued to meet on a quarterly basis up until the end of 2019. Frequency of meetings, membership, terms of reference will be reviewed by the group as part of the Four Elms Hill AQAP.

AQAP Measures

Table 5.1 shows the proposed Four Elms Hill 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;
- expected benefit in terms of pollutant emission and/or concentration reduction;
- the timescale for implementation; and
- how progress will be monitored.

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

Table 5.1 – Air Quality Action Plan Measures

No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	KPI	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Several road improvements proposed as part of HIF. This includes: • New junction off the A289. • Relief road from Upchat roundabout to the A228 Main Rd roundabout. • Improvements to Four Elms roundabout. • New railway station on Hoo peninsula.	Traffic Management	Strategic highway improvements	MC	TBC	TBC	Reduced congestion within AQMA	Low	Not started	TBC	
2	Explore opportunities to support electrification of the bus fleet travelling on Hoo peninsula through the AQMA. Emissions from buses/coaches contribute up to 1.3% of NO_2 annual mean concentrations at properties where annual mean AQO is exceeded.	Vehicle Fleet Efficiency	Vehicle Retrofitting programmes	MC	TBC	TBC	% of EV buses travelling through AQMA	Low: Reduction in annual mean NO_2 concentrations up to 0.6 μgm^{-3} at properties within AQMA	Not started	TBC	
3	Explore opportunities to support implementation of zero emissions only HGVs and LGVs travelling on Hoo peninsula through AQMA. Emissions from HGV/LGV contribute up to 39.1% of NO_2 annual mean concentrations at properties where annual mean AQO is exceeded.	Vehicle Fleet Efficiency	Vehicle Retrofitting programmes	MC	TBC	TBC	% of electric HGV and LGV travelling through AQMA	High: Reduction in annual mean NO_2 concentrations up to 19.4 μgm^{-3} at properties within AQMA	Not started	TBC	
4	Explore opportunities to introduce Park and Ride shuttle buses to shopping hubs such as Bluewater and Hempstead Valley.	Alternatives to private vehicle use	Bus based Park & Ride	MC	TBC	TBC	Number of shuttle users	Low	Not started	TBC	

No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	KPI	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
5	Promote and incentivise car sharing on Hoo peninsula using apps, points system. Emissions from cars contribute up to 36.8% of NO_2 annual mean concentrations at properties where annual mean AQO is exceeded (diesel cars only, contribute up to 31.3%).	Alternatives to private vehicle use	Car Clubs	MC	TBC	TBC	Number of car club users	Medium	Not started	TBC	
6	Improve facilities (medical, leisure, supermarket) within Hoo peninsula to remove need to travel through AQMA.	Alternatives to private vehicle use	Other: Avoid need to travel through AQMA	MC	TBC	TBC	Reduced congestion within AQMA	Medium	Not started	TBC	
7	Explore feasibility to introduce a depot outside Hoo peninsula for goods to be dropped off and transported onto Hoo by zero emissions vehicles.	Freight and Delivery Management	Freight Consolidation Centre	MC	TBC	TBC	Reduced congestion within AQMA	High	Not started	TBC	
8	Development and implementation of Hoo Peninsula Area Wide Travel Plan. Commitment from new commercial/industrial developments to implement Hoo Peninsula travel plan which could include fleet standard and on number of trips. Ensure new developments support cycle/walking schemes. Explore feasibility of introducing a central contribution fund by developers to explore sustainable transport technologies.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	MC	TBC	TBC		High	Work commissioned	Hoo Peninsula Travel Plan to be completed by summer 2022	

No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	KPI	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
9	Continue to increase availability of EV infrastructure on development and public spaces in line with Medway's Air Quality Planning Guidance.	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	MC	Ongoing	Ongoing	Number of EV infrastructure within peninsula	Medium	Ongoing	TBC	
10	Build communal work-hubs with fast internet for workers / rent a desk (draft Medway Local Plan proposes to include community spaces including for example coworking space). Enable ultrafast internet speeds to encourage working from home.	Promoting Travel Alternatives	Encourage / Facilitate home-working	MC	TBC	TBC	Number of residents switching to work-hub or WFH.	Low	MC discussing with developers	TBC	
11	Cycle scheme funding for bikes. Introduce regular and electric bike hire services. Dedicated cycle park on peninsula to encourage uptake of cycling. Tour de Hoo - encourage cycling/ marketing of cycle routes/ competitions for children. Promote Saxon Shore Way - walking / cycling route. Segregated safer cycle and walkways / tree or vegetation buffer to separate. Walking bus for school children.	Promoting Travel Alternatives	Promotion of cycling and walking	MC	TBC	TBC	Number of bike users within AQMA	Low	Not started	TBC	
12	Explore feasibility and opportunities of water-based transport, such as water taxis between riverside urban areas.	Promoting Travel Alternatives	Promote use of rail and inland waterways	MC	TBC	TBC	Number or rail/waterway users.	Medium	Not started	TBC	

No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	KPI	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
13	Raise awareness of health and financial impacts of poor air quality.via communication campaigns. This will include communication on anti-idling (targeting local schools) and encouraging off peak travelling.	Public Information	Via the Internet	MC	TBC	TBC		Low	Not started	TBC	
14	Explore opportunities to introduce emerging technologies to monitor air quality and traffic flows, in order to support road improvement schemes. This could include air quality sensors within AQMA, intelligent road stud scheme at Main Road roundabout, enforcement cameras to monitor HGV movement.	Traffic Management	Strategic highway improvements	MC	TBC	TBC	Reduced congestion within AQMA	Medium	Not started	TBC	
15	Explore opportunities to encourage larger uptake of public transport versus single private vehicle.	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	MC	TBC	TBC	Number of public transport users	Medium	Not started	TBC	
16	Investigate the impact of traffic speed on air quality in the AQMA and the feasibility of speed limit changes and/or enforcement to reduce emissions	Traffic Management	Strategic highway improvements	MC	TBC	TBC		Medium	Not started	TBC	

Dispersion modelling of selected measures

1.10 Methodology

A dispersion modelling exercise was undertaken using ADMS-Roads to estimate the potential air quality benefit from three selected measures. Full details on the methodology are included in Appendix C, and detailed results are presented in Appendix D.

Traffic data comprising Annual Average Daily Traffic (AADT) flows of different vehicle types, was obtained from Sweco for the following scenarios:

- 2016 Baseline (a site specific conversion factor for 2019 was provided);
- 2037 Reference Case (including committed developments); and
- 2037 Local plan with Mitigations (including HIF relief road).

The following three measures were selected for modelling:

HIF Relief Road

Annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted using traffic data corresponding to the implementation of the Local Plan, which includes the construction of the HIF relief road. As part of the implementation of the Local Plan, a large area of residential and employment land has been attributed for development on the Hoo Peninsula, which will lead to additional traffic on Four Elms Hill. The HIF relief road will alleviate some of this additional traffic however it is not currently proposed for HGVs and buses to have access to the relief road.

Zero emissions buses only through AQMA

Annual mean concentrations were predicted using traffic data corresponding to the implementation of the Local Plan including the relief road. Emissions from buses were adjusted as follow:

- NO_X emissions were removed; and
- PM_{10} and $PM_{2.5}$ exhaust emissions were removed but emissions from brake, tyre and road abrasion were retained.

Zero emissions LGVs and HGVs only through AQMA

Annual mean concentrations were predicted using traffic data corresponding to the implementation of the Local Plan including the relief road. In order to highlight reductions in pollution that can be achieved and represent a scenario where only zero emissions HGVs and LGVs are allowed into the AQMA, emissions from HGVs and LGVs were adjusted as follow:

- NO_X emissions were removed; and
- PM_{10} and $PM_{2.5}$ exhaust emissions were removed but emissions from brake, tyre and road abrasion retained.

In summary, the following scenarios were assessed using ADMS-Roads:

HIF Relief Road

- 2024 Local Plan with Mitigations based on 2037 traffic data, 2024 emission factors and predicted background concentrations [2024 LP];
- 2030 Local Plan with Mitigations based on 2037 traffic data, 2030 emission factors and predicted background concentrations [2030 LP];

Zero emissions buses only through AQMA

- 2024 Local Plan with Mitigations, with zero emissions buses, based on 2037 traffic data, 2024 emission factors and predicted background concentrations [2024 LP];
- 2030 Local Plan with Mitigations, with zero emissions buses, based on 2037 traffic data, 2030 emission factors and predicted background concentrations [2030 LP];

Zero emissions LGVs and zero emissions HGVs only through AQMA

- 2024 Local Plan with Mitigations, with zero emissions LGVs and HGVs, based on 2037 traffic data, 2024 emission factors and predicted background concentrations [2024 LP];
- 2030 Local Plan with Mitigations, with zero emissions LGVs and HGVs , based on 2037 traffic data, 2030 emission factors and predicted background concentrations [2030 LP].

Scenarios were modelled with EFT emissions and background concentrations for 2024 in line with the HIF relief road initially proposed opening year[28]. This is however

[28] Since undertaking the road dispersion model, the relief road has had an updated proposed opening year of 2025.

a worst-case assumption as future traffic flows used, which account for significant development in the area in accordance with the emerging Local Plan, are for 2037. Measure scenarios were also modelled using emissions and background for 2030 (the latest year for which EFT and background data is available) for comparison as this represents a more realistic scenario.

Annual mean concentrations of NO_2 as well as PM_{10} and $PM_{2.5}$ for indication were predicted at the same 56 receptors identified in the 2016 Detailed Assessment[1]. Their locations are presented in Figure 3.1, 3.2 and 3.3.

1.11 Results

Full detailed results are presented in Appendix D. Table D1, D2 and D3 presents the predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$, predicted at all receptors. Concentrations were predicted in 2024, in line with the HIF relief road initially proposed opening year[29], however this is a worst-case assumption as traffic data used is for 2037. Concentrations were also predicted for 2030 which corresponds to a more realistic assumption for vehicle emissions.

HIF Relief Road

In 2024 with the Local Plan and the HIF Relief Road implemented, exceedances of the NO_2 annual mean AQO of 40 μgm^{-3} are predicted at over half of the modelled receptors. One exceedance of 60 μgm^{-3} (68.5 μgm^{-3}) is also predicted at receptor 30, which suggests that the NO_2 hourly mean of 200 μgm^{-3} not to be exceeded more than 18 times a year could also be exceeded at this receptor.

In 2030, with the Local Plan and the HIF Relief Road implemented two exceedances of the annual mean AQO are predicted, the highest concentration predicted is 51.9 μgm^{-3} at receptor 30. The other exceedance predicted is 42.7 μgm^{-3} at receptor 18. These results suggests that without further measures implemented, concentrations could exceed the annual mean AQO and potentially the hourly mean AQO within the AQMA.

[29] Since undertaking the road dispersion model, the relief road has had an updated proposed opening year of 2025.

This is however a worst-case assumption as future traffic flows used, which account for significant development in the area in accordance with the emerging Local Plan, are for 2037.
Predicted annual concentrations of PM_{10} and $PM_{2.5}$ remain below the annual mean AQO of 40 μgm^{-3} and 20 μgm^{-3} at all receptors in 2024 and 2030.

Zero emissions buses only through AQMA

In 2024 with zero emissions buses only travelling through the AQMA, exceedances of the NO_2 annual mean AQO of 40 μgm^{-3} are still predicted at a large number of receptors. Receptor 30 is still predicted to experience a concentration over 60 μgm^{-3} (68.3 μgm^{-3}) suggesting that the NO_2 hourly mean could be exceeded at this receptor. In 2030, two exceedances of the AQO are still predicted at receptors 18 and 30 (42.5 μgm^{-3} and 51.7 μgm^{-3}, respectively).

This is however a worst-case assumption as future traffic flows used, which account for significant development in the area in accordance with the emerging Local Plan, are for 2037.

The significance of the reduction in concentration with the implementation of zero emissions only buses was determined using the Institute of Air Quality Management (IAQM) guidance on planning for air quality[30], which takes into account the % change of concentration relative to the AQO, as well as the resulting concentration.
Implementing zero emissions buses only travelling through the AQMA had little impact on the predicted annual mean concentrations. In 2024, predicted reductions in NO_2 concentrations range from 0.1 μgm^{-3} to 0.4 μgm^{-3}. In IAQM terms these reductions are Negligible at 39 out of 56 receptors. They are Slight Beneficial at 1 receptor; and Moderate Beneficial at 19 receptors (including receptor 30).
In 2030, reductions range from 0.1 μgm^{-3} to 0.4 μgm^{-3} and are considered Negligible at all receptors except at receptors 1 and 19 where they are considered Slight Beneficial.

Predicted annual concentrations of PM_{10} and $PM_{2.5}$ remain below the annual mean AQO of 40 μgm^{-3} and 25 μgm^{-3} at all receptors in 2024 and 2030.

[30] IAQM. Land-Use Planning & Development Control: Planning For Air Quality, 2017. Available at: http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Zero emissions LGVs and HGVs only through AQMA

The modelled scenario with zero emissions LGVs and HGVs allowed to travel through the AQMA had the largest impact on predicted annual mean concentrations. In 2024, concentrations were predicted to be below the annual mean AQO of 40 μgm^{-3} at all receptors, with the highest NO_2 concentration predicted to be 31.8 μgm^{-3} at receptor 30.

In 2030, the highest NO_2 concentration predicted was 22.6 μgm^{-3} also at receptor 30. In 2024, the predicted NO_2 reductions range from 8.9 μgm^{-3} to 36.7 μgm^{-3}. In IAQM terms these reductions are considered Moderate Beneficial at all receptors.
In 2030, reductions range from 5.5 μgm^{-3} to 29.3 μgm^{-3} and are considered as Moderate Beneficial at all receptors.
Predicted annual concentrations of PM_{10} and $PM_{2.5}$ remain below the annual mean AQO of 40 μgm^{-3} and 20 μgm^{-3} at all receptors in 2024 and 2030.

Glossary of Terms

Abbreviation	Description
AADT	Average Annual Daily Traffic flows
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'
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
AQS	Air Quality Strategy
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
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

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[2] Medway Council. Air Quality Action Plan, 2015. Available at: https://www.medway.gov.uk/downloads/file/1982/medway_air_quality_action_plan_2015

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[4] Environmental equity, air quality, socioeconomic status and respiratory health, 2010

[5] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

[6] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

[7] Medway Council. 2021 Air Quality Annual Status Report, 2021

[8] Defra. Background maps, 2018. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/background-maps/

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[10] Raaschou-Nielsen et al. Air pollution and lung cancer incidence in 17 European cohorts: prospective analyses from the European Study of Cohorts for Air Pollution Effects (ESCAPE) Lancet Oncology 2013; 14(9): 813-822.

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[12] Department for Environment, Food and Agricultural Affairs. (2010). Air Pollution: Action in a Changing Climate. Department for Environment, Food and Agricultural Affairs.

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[14] WHO (2013) Review of evidence on health aspects of air pollution-REVIHAAP Project Technical Report. Available at: http://www.euro.who.int/pubrequest

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[24] IAQM. Land-Use Planning & Development Control: Planning For Air Quality, 2017. Available at: http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Appendix A: Response to Consultation

Table A.1 – Summary of Responses to Consultation and Stakeholder Engagement on the AQAP

Consultee	Category	Response
Engagement survey in February 2019	Local residents	Many comments highlighted that Four Elms Hill is the only route to access Hoo. Majority agreed that development planning should be a priority, facilities within the peninsula are inadequate therefore people need to travel through the AQMA to access services including schools and medical facilities. A majority agreed that public transport should be encouraged. A majority also agreed that low emissions vehicles should be a priority. A small majority agreed that promoting walking and cycling should be a priority. It was highlighted that it is currently not safe to do so as the route is too busy.
Medway Council workshop in July 2019	Medway Council	Stakeholders identified a long list of measures to include within AQAP.
Follow up Medway Council workshop in September 2021	Medway Council	Follow-up discussion to determine if measures identified in 2019 were still suitable.
Defra's AQAP appraisal (Reference AQAP22-1168)	Defra	Revisions made following Defra's appraisal. Revisions includes the update of the source apportionment exercise, the update of the ADMS-Roads model verification year to 2019 in order to include two further monitoring sites.
Other consultees	Responders to online questionnaire	Additional measure included in response to comments on speeding, see Measure 16 in Table 5.1.

Appendix B: Reasons for Not Pursuing Action Plan Measures

Table B.1 – Action Plan Measures Not Pursued and the Reasons for that Decision

Action category	Action description	Reason action is not being pursued (including Stakeholder views)
Traffic Management	Timed road use restrictions at peak hours for HGVs / off-peak deliveries	Not a viable option for the A228 as it is a strategic route serving a major port and significant commercial land uses, and represents the only route on and off the Peninsula. This would be met with significant opposition from large employers such as Amazon and enforcement would be extremely challenging. It could also result in HGVs attempting to use unsuitable routes, for example via the B2000.
Traffic Management	Average speed cameras on Four Elms Hill	Potential reduction in traffic speed could increase congestion and emissions.
Transport Planning and Infrastructure	Cablecar between Upnor & St Mary's island	Likely to become a tourist attraction and may increase car use through AQMA. Public transport links would need to be improved prior to implementation.
Transport Planning and Infrastructure	Introduce a tramline	Issue with space available and high costs associated with running a tramline.

Appendix C: Modelling methodology

Annual average concentrations in air of NO_X, PM_{10} and $PM_{2.5}$ have been determined using the ADMS-Roads version 5.0 atmospheric dispersion model[31].

Annual mean concentrations of NO_2 were derived from the model-predicted NO_X concentrations, through application of the NO_X to NO_2 conversion tool version 8.1 developed for LAQM purposes, which takes into account the interaction between NO_X and background O_3[32].

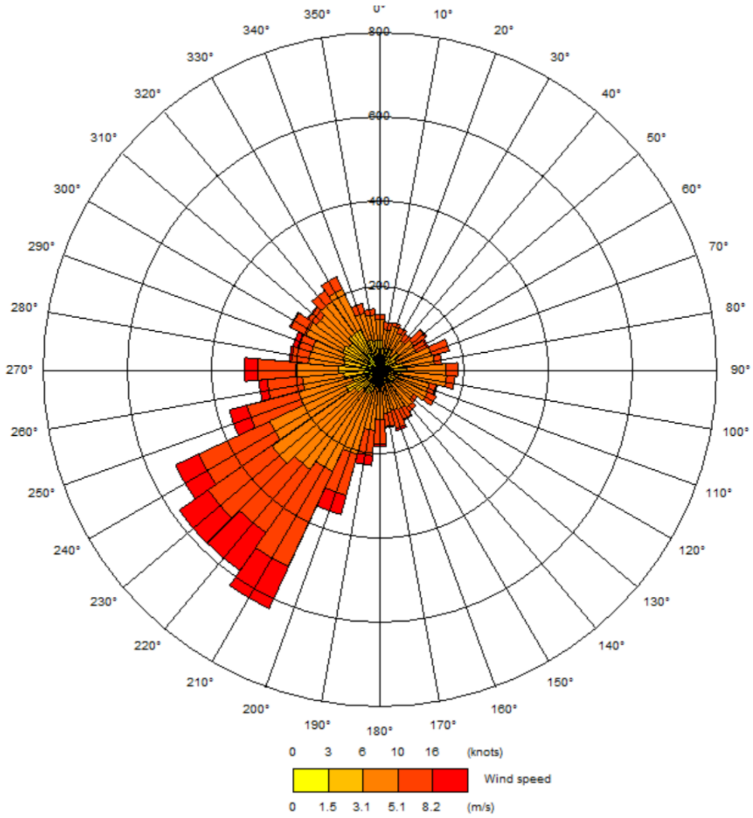
The modelling assessment requires source, emissions, meteorological and other site-specific data. For modelling traffic impacts, one year of data is used and model verification is carried out following Defra's guidance.

Meteorological data

Detailed dispersion modelling requires hourly sequential meteorological data from a representative synoptic observing station. Hourly sequential meteorological data was obtained for the year 2019 for Southend meteorological station, which is considered to provide representative data for the AQMA. The station is located approximately 20km to the north east of the site. The meteorological data for 2019 has been used with monitoring data from 2019 in the traffic assessment and model verification. Figure C1 summarises the hourly wind speed and wind direction for the meteorological data as a wind rose. The windrose shows a predominance of winds from the south-west which is the usual pattern observed in the south of England.

[31] CERC. ADMS-Roads. Available at : www.cerc.co.uk/environmental-software/ADMS-Roads-model.html
[32] AEA Technology (2013). *NO_x to NO_2 Calculator version 4.1.* http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

Figure C1 Southend wind rose for 2019



The road network

Traffic data comprising AADT of different vehicle types, was obtained from Sweco for the following scenarios:

- 2016 Baseline (a site specific factor was provided to calculate a 2019 baseline scenario);
- 2037 Reference Case (which includes all committed developments without the Local Plan); and
- 2037 Local plan with Mitigations.

Future scenarios were modelled with EFT emissions and background concentrations for 2024 in line with the HIF relief road initially proposed opening year[33]. This is however a worst-case assumption as future traffic flows used are for 2037. They were also modelled using emissions and background for 2030 (the latest year for which EFT and background data is available) for comparison as this represents a more realistic scenario.

[33] Since undertaking the road dispersion model, the relief road has had an updated proposed opening year of 2025.

Emissions for 2024 and 2030 were calculated using the latest emissions factors from Defra's EFT v10.1[34], which is used to predict emissions which are imported into ADMS-Roads. Particulate generated due to brake and tyre wear are also included in the EFT.

In summary the following scenarios were assessed:

- 2019 Baseline used for model verification and source apportionment based on 2019 traffic data, 2019 emission factors and predicted background concentrations [2019 baseline];
- 2024 Reference case, based on 2037 traffic data, 2024 emission factors and predicted background concentrations [2024 RC];
- 2030 Reference case, based on 2037 traffic data, 2030 emission factors and predicted background concentrations [2030 RC].

HIF Relief Road

- 2024 Local Plan with Mitigations based on 2037 traffic data, 2024 emission factors and predicted background concentrations [2024 LP];
- 2030 Local Plan with Mitigations based on 2037 traffic data, 2030 emission factors and predicted background concentrations [2030 LP].

Zero emissions buses only through AQMA

- 2024 Local Plan with Mitigations, with zero emissions buses, based on 2037 traffic data, 2024 emission factors and predicted background concentrations [2024 LP];
- 2030 Local Plan with Mitigations, with zero emissions buses, based on 2037 traffic data, 2030 emission factors and predicted background concentrations [2030 LP].

Zero emissions LGVs and HGVs only through AQMA

- 2024 Local Plan with Mitigations, with zero emissions LGVs and HGVs, based on 2037 traffic data, 2024 emission factors and predicted background concentrations [2024 LP];

[34] Defra. Emission Factor Toolkit. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/#:~:text=The%20Emissions%20Factors%20Toolkit%20%28EFT%29%20is%20published%20by,of%20their%20duties%20under%20the%20Environmental%20Act%201995.

- 2030 Local Plan with Mitigations, with zero emissions LGVs and HGVs, based on 2037 traffic data, 2030 emission factors and predicted background concentrations [2030 LP].

Figure C2 shows the road links that have been modelled and Table C1 shows the traffic data used in the modelling. Traffic data comprising AADT and numbers of different vehicle types, was obtained from Sweco.

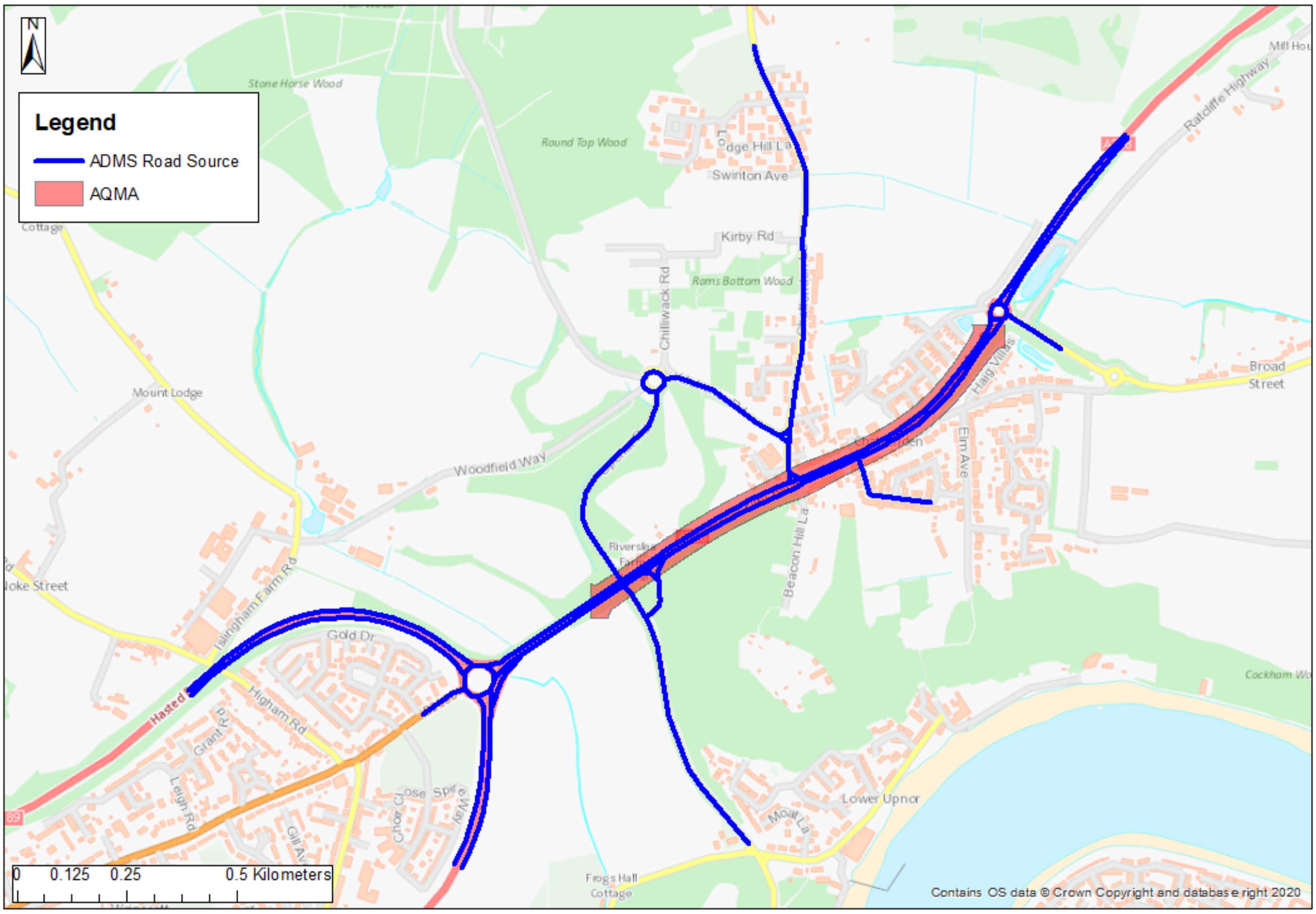
Table C1 ADMS-Roads input data

ID	Name	2019 AADT	2019 Car %	2019 LGV %	2019 HGV %	2019 Bus and Coach %	2019 Speed kph	2037 RC AADT	2037 RC Car %	2037 RC LGV %	2037 RC HGV %	2037 RC Bus and Coach %	2037 RC Speed kph	2037 LP AADT	2037 LP Car %	2037 LP LGV %	2037 LP HGV%	2037 LP Bus and Coach %	2037 LP Speed kph
3139	Wulfere Way	14339	84.5	10.6	4.3	0.6	92	13684	85.1	11.0	3.3	0.6	92	14900	82.9	11.1	5.7	0.3	68
6045	Peninsula Way E	9375	79.8	14.5	5.7	0.0	95	17183	65.4	27.3	7.3	0.0	95	19185	59.6	28.9	11.5	0.0	96
6314	Wulfere Way	19383	86.3	9.7	4.0	0.0	93	18760	76.2	17.6	6.1	0.0	86	24636	76.3	17.4	6.3	0.0	68
6385	Peninsula Way E	10239	84.3	10.6	5.1	0.0	95	19548	69.3	23.9	6.8	0.0	93	25405	63.4	26.7	9.9	0.0	96
7411	Chattenden Ln	1837	84.4	9.9	3.1	2.6	35	2156	81.0	12.7	4.2	2.1	34	947	77.5	12.4	5.3	4.9	34
7422	Chattenden Ln	2835	89.0	10.6	0.5	0.0	31	2543	81.7	15.8	2.5	0.0	30	521	64.4	31.2	4.4	0.0	30
21061	Wulfere Way	23353	87.1	8.0	4.6	0.2	95	25521	84.9	10.7	4.2	0.2	95	28035	82.1	12.2	5.6	0.2	68
21064	Hasted Rd	16814	85.3	10.1	4.6	0.0	96	22476	76.1	17.9	6.0	0.0	96	25517	66.5	22.7	10.8	0.0	68
22139	Hasted Rd	15703	85.6	10.8	3.6	0.0	85	17393	80.5	15.7	3.8	0.0	93	26184	70.6	20.9	8.6	0.0	68
26670	Main Rd Chattenden	15817	84.4	11.6	3.9	0.1	54	23818	72.4	21.7	5.9	0.1	54	29787	63.6	26.7	9.6	0.0	50
27057	Main Rd Chattenden	17531	87.3	8.6	4.0	0.1	55	25763	74.5	19.4	6.0	0.1	54	34906	68.8	22.1	9.1	0.1	55
27058	Main Rd Chattenden	17531	87.3	8.6	4.0	0.1	54	25763	74.5	19.4	6.0	0.1	54	34906	68.8	22.1	9.1	0.1	53
27060	Peninsula Way	15817	84.4	11.6	3.9	0.1	55	23818	72.4	21.7	5.9	0.1	0	29787	63.6	26.7	9.6	0.0	54

36674	Upchat Rd	1239	63.3	11.1	20.1	5.5	84	1970	79.6	7.8	9.3	3.4	82	256	26.8	4.0	43.4	25.8	83
36683	Upchat Rd	928	99.6	0.4	0.0	0.0	89	1259	99.2	0.7	0.0	0.0	87	2751	86.9	12.7	0.4	0.0	91
38674	Four Elms Hill	14847	83.3	11.6	4.5	0.6	95	23459	72.0	21.4	6.1	0.4	95	30241	64.0	26.1	9.6	0.3	68
38675	Four Elms Hill	14818	83.5	11.6	4.5	0.4	96	23431	72.1	21.5	6.1	0.3	96	30213	64.0	26.2	9.6	0.2	87
38678	Four Elms Hill	8271	77.1	15.1	6.7	1.1	84	15542	66.0	25.8	7.6	0.6	85	19068	56.8	29.3	13.5	0.5	68
38679	Four Elms Hill	14818	83.5	11.6	4.5	0.4	92	23431	72.1	21.5	6.1	0.3	90	30213	64.0	26.2	9.6	0.2	86
38680	Four Elms Hill	17015	86.7	8.6	4.6	0.1	94	26707	74.8	19.0	6.1	0.1	93	34698	68.6	22.1	9.2	0.1	94
38682	Four Elms Hill	17327	84.3	9.3	5.9	0.5	95	27419	74.0	19.1	6.6	0.3	89	32205	66.7	22.8	10.2	0.3	68
42213	Four Elms Hill	9054	90.9	3.9	5.2	0.0	95	11875	84.5	10.2	5.3	0.0	93	13135	81.1	13.4	5.5	0.0	68
132643	Main Rd Chattenden	17015	86.7	8.6	4.6	0.1	53	26707	74.8	19.0	6.1	0.1	53	34698	68.6	22.1	9.2	0.1	53
891590	Peninsula Way	17531	87.3	8.6	4.0	0.1	54	25763	74.5	19.4	6.0	0.1	0	34906	68.8	22.1	9.1	0.1	54
132612+18989	Hoo Rd	10148	77.0	13.5	7.4	2.0	38	15227	78.4	14.7	5.6	1.3	38	8854	75.1	13.6	9.0	2.3	38
132655+6920	Main Rd Hoo	11156	90.2	7.3	2.2	0.3	47	14278	88.3	8.5	3.0	0.2	44	16922	72.7	23.0	4.1	0.2	48
18562+18565	Kitchener Rd	449	87.8	9.9	2.3	0.0	30	1400	87.3	10.1	2.5	0.0	33	524	63.3	31.0	5.6	0.0	33
18568+18569	Kitchener Rd	2557	82.3	7.3	6.0	4.5	32	3000	86.3	5.6	4.5	3.7	31	328	42.3	24.1	0.0	33.6	31

2039907+18564	Kitchener Rd	3007	83.1	7.7	5.5	3.8	34	4400	86.7	7.0	3.8	2.5	32	4309	85.7	10.5	1.2	2.6	33
2647+2646	Upchat Rd	2311	76.8	8.3	7.1	7.8	36	4021	84.8	7.0	4.0	4.3	36	5133	77.1	18.3	1.2	3.4	36
2655+201907	Upchat Rd	1651	77.9	9.5	9.8	2.8	37	2372	83.9	7.9	6.3	1.9	35	6283	85.5	11.3	2.5	0.7	36
36683+36674	Upchat Rd	2167	78.8	6.5	11.5	3.2	89	3229	87.3	5.1	5.7	2.0	87	3008	81.8	11.9	4.1	2.2	91
7412+7423	Chattenden Ln	4672	87.2	10.3	1.5	1.0	34	4699	81.4	14.4	3.3	1.0	34	1469	72.8	19.0	5.0	3.1	34
7414+7425	Chattenden Ln	4387	86.7	10.4	1.8	1.1	34	4347	83.3	12.8	2.9	1.1	34	944	78.1	12.4	4.7	4.9	34
7416+7427	Chattenden Lane	6944	85.0	9.3	3.4	2.3	34	7325	84.5	9.8	3.5	2.1	34	1265	68.7	15.5	3.5	12.3	34

Figure C2 Modelled Road Links



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)**Error! Bookmark not defined.** guidance as an accepted dispersion model.

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

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

- background concentration estimates;
- meteorological data;
- source activity data such as traffic flows and emissions factors;
- model input parameters such as surface roughness length, minimum monin-obukhov length;
- 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;
- road widths;
- distance between sources and monitoring as represented in the model;
- speed estimates on roads;
- source types, such as elevated roads and street canyons;
- selection of representative meteorological data;
- background monitoring and background estimates; and
- monitoring data.

Suitable local monitoring data for the purpose of verification is available for annual 2019 mean NO_X/NO_2 concentrations as shown in Figure C3. Their details are presented in Table C2 below.

Table C2 Local monitoring data suitable for ADMS-roads model verification

Location	2019 Annual Mean NO_2 (μgm^{-3})	X (m)	Y (m)
DT22	27.2	575488	171616
DT24	53.2	575950	171847
DT32	43.1	575903	171802
DT33	42.0	575971	171833

Verification calculations

The verification of the modelling output was performed in accordance with the methodology provided in Annex 3 of LAQM.TG(16). Table C3 shows that there was systematic under prediction of monitored concentrations for all diffusion tubes.

Table C3 Verification, modelled versus monitored

Site	2019 Modelled Annual Mean NO_2 (μgm^{-3})	2019 Monitored Annual Mean NO_2 (μgm^{-3})	% (Modelled- Monitored)/ Monitored
DT22	22.2	27.2	-18.2%
DT24	29.4	53.2	-44.7%
DT32	28.8	43.1	-33.2%
DT33	28.4	42.0	-32.5%

Table C4 shows the comparison of modelled road-NO_X, a direct output from the ADMS-Roads modelling, with the monitored road-NO_X, determined from the LAQM NO_X to NO_2 conversion tool.

Table C4 Comparison of modelled and monitored road NO_X to determine verification factor

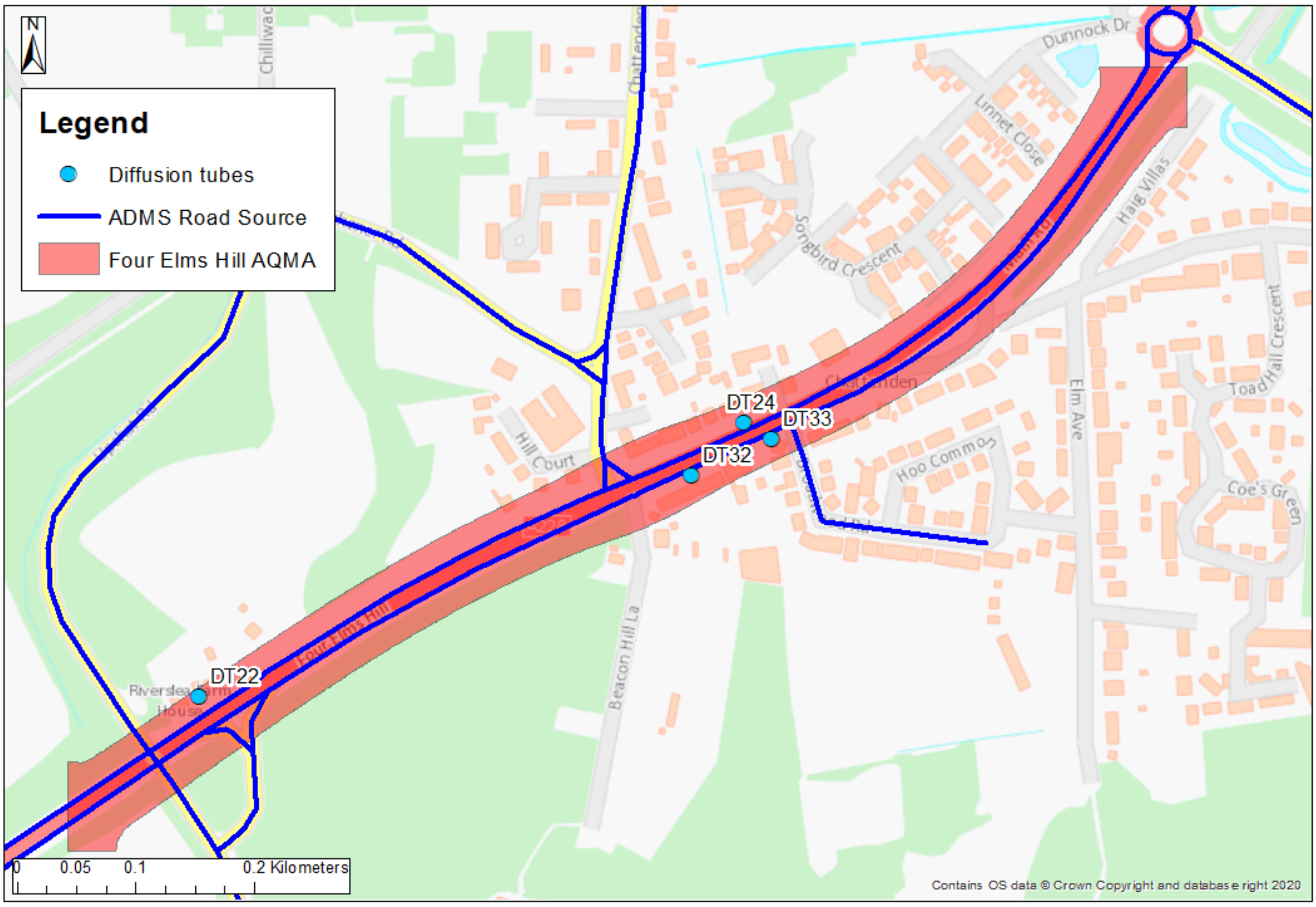
Site	2019 Modelled Annual Mean Road NO_X (μgm^{-3})	2019 Monitored Annual Mean Road NO_X (μgm^{-3})	Ratio
DT22	9.2	19.0	2.06
DT24	23.5	78.4	3.33
DT32	22.3	53.6	2.41
DT33	21.3	51.1	2.39

Table C5 shows the comparison of the modelled NO_2 concentration calculated by multiplying the modelled road NO_X by the regression adjustment factor of 2.7 and using the LAQM's NO_X to NO_2 conversion tool to calculate the total adjusted modelled NO_2.

Table C5 Comparison of adjusted modelled NO_2 and modelled NO_2

Site	2019 Background NO_2 Concentration (μgm^{-3})	2019 Adjusted Modelled Annual Mean NO_2 (μgm^{-3})	2019 Monitored Annual Mean NO_2 (μgm^{-3})	% (Adjusted Modelled-Monitored)/ Monitored
DT22	17.4	30.1	27.2	10.5%
DT24	17.4	47.2	53.2	-11.2%
DT32	17.4	45.8	43.1	6.3%
DT33	17.4	44.8	42.0	6.6%

Figure C3 Diffusion tubes used in verification



Appendix D: Modelling results

Table D1 NO_2 Annual Mean concentrations (μgm^{-3})

ID	2019 Baseline	2024 RC	2024 LP	2024 Zero emissions Buses	Zero emissions Buses Change	IAQM impact	2024 Zero emissions HGV LGV	Zero emissions HGV LGV Change	IAQM impact	2030 RC	2030 LP	2030 Zero emissions Buses	Zero emissions Buses Change	IAQM impact	2030 Zero emissions HGV LGV	Zero emissions HGV LGV Change	IAQM impact
1	39.7	**40.0**	**50.5**	**50.0**	-0.44	Moderate Beneficial	24.6	-25.86	Moderate Beneficial	29.7	38.4	38.0	-0.37	Slight Beneficial	18.2	-20.12	Moderate Beneficial
2	37.6	37.7	**47.6**	**47.27**	-0.37	Moderate Beneficial	23.94	-23.70	Moderate Beneficial	27.9	36.0	35.7	-0.31	Negligible	17.8	-18.19	Moderate Beneficial
3	37.3	37.4	**47.3**	**47.0**	-0.33	Moderate Beneficial	24.0	-23.26	Moderate Beneficial	27.6	35.6	35.3	-0.27	Negligible	17.9	-17.72	Moderate Beneficial
4	35.8	35.6	**44.7**	**44.4**	-0.31	Moderate Beneficial	23.5	-21.23	Moderate Beneficial	26.2	33.5	33.2	-0.26	Negligible	17.5	-15.93	Moderate Beneficial
5	35.7	35.4	**44.4**	**44.1**	-0.30	Moderate Beneficial	23.7	-20.78	Moderate Beneficial	26.0	33.1	32.8	-0.24	Negligible	17.6	-15.46	Moderate Beneficial
6	35.7	35.2	**44.1**	**43.8**	-0.28	Moderate Beneficial	23.9	-20.15	Moderate Beneficial	25.7	32.5	32.3	-0.22	Negligible	17.8	-14.76	Moderate Beneficial
7	35.2	34.5	**42.8**	**42.5**	-0.26	Moderate Beneficial	24.0	-18.84	Moderate Beneficial	25.0	31.3	31.1	-0.21	Negligible	17.8	-13.47	Moderate Beneficial
8	35.2	34.3	**42.4**	**42.2**	-0.24	Moderate Beneficial	24.1	-18.30	Moderate Beneficial	24.7	30.8	30.6	-0.19	Negligible	17.9	-12.87	Moderate Beneficial
9	35.0	33.9	**41.8**	**41.6**	-0.23	Moderate Beneficial	24.3	-17.53	Moderate Beneficial	24.3	30.0	29.9	-0.18	Negligible	18.0	-12.04	Moderate Beneficial
10	34.8	33.6	**41.3**	**41.1**	-0.21	Moderate Beneficial	24.3	-16.99	Moderate Beneficial	24.0	29.5	29.3	-0.17	Negligible	18.0	-11.50	Moderate Beneficial
11	33.7	32.4	39.6	39.4	-0.20	Slight Beneficial	23.7	-15.89	Moderate Beneficial	23.2	28.3	28.1	-0.16	Negligible	17.7	-10.63	Moderate Beneficial
12	34.0	32.7	**40.0**	39.8	-0.19	Negligible	24.0	-16.06	Moderate Beneficial	23.4	28.5	28.4	-0.15	Negligible	17.8	-10.69	Moderate Beneficial
13	33.1	31.8	38.9	38.7	-0.19	Negligible	23.3	-15.56	Moderate Beneficial	22.9	27.9	27.8	-0.14	Negligible	17.4	-10.48	Moderate Beneficial

14	33.3	32.1	39.4	39.2	-0.18	Negligible	23.4	-15.98	Moderate Beneficial	23.1	28.4	28.2	-0.14	Negligible	17.5	-10.88	Moderate Beneficial
15	33.9	33.0	**41.1**	**40.9**	-0.18	Negligible	23.5	-17.57	Moderate Beneficial	24.0	30.0	29.8	-0.14	Negligible	17.5	-12.44	Moderate Beneficial
16	**41.5**	**41.9**	**53.6**	**53.4**	-0.19	Negligible	27.8	-25.82	Moderate Beneficial	30.2	39.2	39.0	-0.15	Negligible	20.1	-19.09	Moderate Beneficial
17	36.3	36.9	**47.9**	**47.7**	-0.19	Negligible	23.8	-24.05	Moderate Beneficial	27.4	36.3	36.1	-0.16	Negligible	17.7	-18.61	Moderate Beneficial
18	**41.1**	**42.6**	**56.2**	**56.0**	-0.20	Moderate Beneficial	26.3	-29.92	Moderate Beneficial	31.6	**42.7**	**42.5**	-0.17	Negligible	19.2	-23.52	Moderate Beneficial
19	**41.7**	**42.3**	**53.7**	**53.5**	-0.25	Moderate Beneficial	28.3	-25.39	Moderate Beneficial	30.4	39.3	39.1	-0.21	Slight Beneficial	20.5	-18.79	Moderate Beneficial
20	**41.3**	**41.5**	**52.4**	**52.2**	-0.23	Moderate Beneficial	28.6	-23.82	Moderate Beneficial	29.5	37.7	37.5	-0.19	Negligible	20.6	-17.08	Moderate Beneficial
21	**40.0**	39.8	**49.9**	**49.7**	-0.22	Moderate Beneficial	28.0	-21.89	Moderate Beneficial	28.1	35.6	35.4	-0.17	Negligible	20.3	-15.26	Moderate Beneficial
22	39.8	39.5	**49.3**	**49.1**	-0.20	Moderate Beneficial	28.1	-21.17	Moderate Beneficial	27.7	34.8	34.7	-0.16	Negligible	20.4	-14.48	Moderate Beneficial
23	39.7	39.2	**48.8**	**48.6**	-0.19	Negligible	28.2	-20.57	Moderate Beneficial	27.4	34.2	34.1	-0.16	Negligible	20.4	-13.83	Moderate Beneficial
24	39.1	38.5	**47.7**	**47.5**	-0.19	Negligible	28.0	-19.71	Moderate Beneficial	26.8	33.3	33.1	-0.15	Negligible	20.3	-13.02	Moderate Beneficial
25	39.1	38.3	**47.4**	**47.2**	-0.18	Negligible	28.0	-19.36	Moderate Beneficial	26.6	32.9	32.8	-0.14	Negligible	20.3	-12.63	Moderate Beneficial
26	39.0	38.3	**47.2**	**47.1**	-0.18	Negligible	28.1	-19.10	Moderate Beneficial	26.5	32.7	32.6	-0.14	Negligible	20.4	-12.34	Moderate Beneficial
27	38.6	37.8	**46.6**	**46.4**	-0.17	Negligible	27.9	-18.64	Moderate Beneficial	26.2	32.2	32.0	-0.13	Negligible	20.2	-11.95	Moderate Beneficial
28	38.3	37.4	**46.0**	**45.9**	-0.16	Negligible	27.7	-18.32	Moderate Beneficial	25.9	31.8	31.7	-0.13	Negligible	20.1	-11.69	Moderate Beneficial

29	38.9	38.0	**46.8**	**46.6**	-0.16	Negligible	28.1	-18.65	Moderate Beneficial	26.2	32.2	32.1	-0.13	Negligible	20.4	-11.87	Moderate Beneficial
30	**49.6**	**52.4**	**68.5**	**68.3**	-0.24	Moderate Beneficial	31.8	-36.73	Moderate Beneficial	38.7	**51.9**	**51.7**	-0.19	Negligible	22.6	-29.33	Moderate Beneficial
31	38.2	**40.1**	**51.6**	**51.4**	-0.20	Moderate Beneficial	24.4	-27.17	Moderate Beneficial	30.2	39.6	39.5	-0.16	Negligible	18.1	-21.53	Moderate Beneficial
32	36.3	37.7	**48.6**	**48.4**	-0.18	Negligible	23.8	-24.79	Moderate Beneficial	28.2	37.0	36.9	-0.15	Negligible	17.7	-19.29	Moderate Beneficial
33	32.5	32.9	**41.9**	**41.8**	-0.15	Negligible	22.2	-19.69	Moderate Beneficial	24.4	31.4	31.3	-0.12	Negligible	16.8	-14.62	Moderate Beneficial
34	30.9	30.8	39.0	38.9	-0.14	Negligible	21.6	-17.43	Moderate Beneficial	22.8	29.0	28.9	-0.10	Negligible	16.4	-12.56	Moderate Beneficial
35	29.0	28.7	36.2	36.1	-0.12	Negligible	20.6	-15.64	Moderate Beneficial	21.4	27.0	26.9	-0.10	Negligible	15.8	-11.25	Moderate Beneficial
36	29.0	28.7	36.3	36.1	-0.13	Negligible	20.5	-15.78	Moderate Beneficial	21.5	27.2	27.1	-0.10	Negligible	15.7	-11.44	Moderate Beneficial
37	32.4	32.9	**42.8**	**42.7**	-0.16	Negligible	22.2	-20.62	Moderate Beneficial	24.7	32.6	32.4	-0.13	Negligible	16.8	-15.80	Moderate Beneficial
38	31.0	31.3	**40.5**	**40.3**	-0.15	Negligible	21.4	-19.09	Moderate Beneficial	23.6	30.8	30.7	-0.12	Negligible	16.3	-14.56	Moderate Beneficial
39	28.8	28.6	36.6	36.5	-0.13	Negligible	20.2	-16.40	Moderate Beneficial	21.7	27.8	27.7	-0.10	Negligible	15.6	-12.28	Moderate Beneficial
40	28.4	28.1	35.9	35.7	-0.13	Negligible	20.0	-15.82	Moderate Beneficial	21.3	27.2	27.1	-0.10	Negligible	15.5	-11.76	Moderate Beneficial
41	27.0	26.4	33.1	33.0	-0.11	Negligible	19.4	-13.70	Moderate Beneficial	19.9	25.0	24.9	-0.09	Negligible	15.1	-9.87	Moderate Beneficial
42	26.4	25.6	31.9	31.8	-0.11	Negligible	19.1	-12.74	Moderate Beneficial	19.3	24.0	23.9	-0.09	Negligible	14.9	-9.02	Moderate Beneficial
43	25.6	24.6	30.4	30.3	-0.10	Negligible	18.8	-11.64	Moderate Beneficial	18.6	22.8	22.7	-0.08	Negligible	14.7	-8.05	Moderate Beneficial

44	24.5	23.3	28.3	28.2	-0.09	Negligible	18.2	-10.09	Moderate Beneficial	17.6	21.2	21.1	-0.06	Negligible	14.4	-6.77	Moderate Beneficial
45	24.3	22.9	27.8	27.7	-0.09	Negligible	18.1	-9.68	Moderate Beneficial	17.4	20.8	20.7	-0.06	Negligible	14.4	-6.42	Moderate Beneficial
46	23.6	22.2	26.8	26.7	-0.08	Negligible	17.8	-9.03	Moderate Beneficial	17.0	20.1	20.0	-0.07	Negligible	14.1	-5.98	Moderate Beneficial
47	23.4	22.0	26.5	26.4	-0.08	Negligible	17.6	-8.89	Moderate Beneficial	16.8	20.0	19.9	-0.06	Negligible	14.1	-5.90	Moderate Beneficial
48	23.3	21.9	26.5	26.4	-0.08	Negligible	17.5	-8.96	Moderate Beneficial	16.8	20.0	20.0	-0.06	Negligible	14.0	-6.04	Moderate Beneficial
49	23.9	22.6	27.5	27.5	-0.08	Negligible	17.9	-9.68	Moderate Beneficial	17.3	20.8	20.7	-0.06	Negligible	14.2	-6.60	Moderate Beneficial
50	34.4	33.6	**41.5**	**41.1**	-0.40	Moderate Beneficial	23.1	-18.32	Moderate Beneficial	24.5	30.5	30.2	-0.33	Negligible	17.4	-13.13	Moderate Beneficial
51	28.8	27.0	32.1	31.9	-0.22	Negligible	20.7	-11.43	Moderate Beneficial	19.7	23.1	22.9	-0.17	Negligible	15.8	-7.26	Moderate Beneficial
52	30.5	29.3	35.7	35.4	-0.27	Negligible	21.5	-14.17	Moderate Beneficial	21.3	25.9	25.7	-0.20	Negligible	16.4	-9.51	Moderate Beneficial
53	26.5	24.5	28.5	28.3	-0.24	Negligible	19.1	-9.45	Moderate Beneficial	18.2	21.2	21.0	-0.17	Negligible	14.9	-6.31	Moderate Beneficial
54	33.0	31.1	35.6	35.3	-0.32	Negligible	22.9	-12.73	Moderate Beneficial	21.7	24.9	24.7	-0.23	Negligible	17.2	-7.74	Moderate Beneficial
55	30.5	28.2	31.8	31.5	-0.29	Negligible	21.5	-10.29	Moderate Beneficial	19.9	22.3	22.1	-0.20	Negligible	16.3	-5.98	Moderate Beneficial
56	30.4	28.0	31.3	31.0	-0.29	Negligible	21.5	-9.85	Moderate Beneficial	19.7	21.9	21.7	-0.20	Negligible	16.3	-5.54	Moderate Beneficial

Exceedance of the NO_2 annual mean AQO of 40 μgm^{-3} are presented in bold and greyed out.

Table D2 PM_{10} Annual Mean concentrations (μgm^{-3})

ID	2019 Baseline	2024 RC	2024 LP	2024 Zero emissions Buses	Zero emissions Buses Change	IAQM impact	2024 Zero emissions HGV LGV	Zero emissions HGV LGV Change	IAQM impact	2030 RC	2030 LP	2030 Zero emissions Buses	Zero emissions Buses Change	IAQM impact	2030 Zero emissions HGV LGV	Zero emissions HGV LGV Change	IAQM impact
1	18.5	20.3	21.7	21.7	<0.0	Negligible	21.4	-0.31	Negligible	20.0	21.4	21.4	<0.0	Negligible	21.2	-0.25	Negligible
2	18.4	20.0	21.4	21.4	<0.0	Negligible	21.2	-0.29	Negligible	19.8	21.2	21.2	<0.0	Negligible	21.0	-0.23	Negligible
3	18.4	20.1	21.6	21.6	<0.0	Negligible	21.3	-0.29	Negligible	19.9	21.4	21.4	<0.0	Negligible	21.1	-0.23	Negligible
4	18.3	19.9	21.4	21.4	<0.0	Negligible	21.1	-0.27	Negligible	19.7	21.1	21.1	<0.0	Negligible	20.9	-0.21	Negligible
5	18.3	20.0	21.6	21.6	<0.0	Negligible	21.3	-0.26	Negligible	19.8	21.3	21.3	<0.0	Negligible	21.1	-0.20	Negligible
6	18.4	20.2	21.9	21.9	<0.0	Negligible	21.6	-0.25	Negligible	20.0	21.6	21.6	<0.0	Negligible	21.4	-0.19	Negligible
7	18.4	20.4	22.1	22.1	<0.0	Negligible	21.8	-0.24	Negligible	20.1	21.8	21.8	<0.0	Negligible	21.6	-0.17	Negligible
8	18.5	20.5	22.3	22.3	<0.0	Negligible	22.1	-0.23	Negligible	20.3	22.0	22.0	<0.0	Negligible	21.9	-0.17	Negligible
9	18.5	20.7	22.5	22.5	<0.0	Negligible	22.3	-0.23	Negligible	20.4	22.2	22.2	<0.0	Negligible	22.1	-0.16	Negligible
10	18.5	20.7	22.6	22.6	<0.0	Negligible	22.4	-0.23	Negligible	20.5	22.3	22.3	<0.0	Negligible	22.2	-0.16	Negligible
11	18.4	20.4	22.2	22.2	<0.0	Negligible	22.0	-0.22	Negligible	20.2	22.0	22.0	<0.0	Negligible	21.8	-0.15	Negligible
12	18.5	20.6	22.4	22.4	<0.0	Negligible	22.2	-0.22	Negligible	20.3	22.2	22.2	<0.0	Negligible	22.0	-0.15	Negligible

13	18.3	20.2	21.9	21.9	<0.0	Negligible	21.7	-0.21	Negligible	20.0	21.6	21.6	<0.0	Negligible	21.5	-0.14	Negligible
14	18.4	20.2	21.9	21.9	<0.0	Negligible	21.7	-0.21	Negligible	20.0	21.7	21.7	<0.0	Negligible	21.5	-0.14	Negligible
15	18.3	20.1	21.8	21.8	<0.0	Negligible	21.6	-0.22	Negligible	19.9	21.6	21.6	<0.0	Negligible	21.4	-0.15	Negligible
16	19.1	22.2	24.7	24.7	<0.0	Negligible	24.5	-0.29	Negligible	22.0	24.4	24.4	<0.0	Negligible	24.2	-0.20	Negligible
17	18.3	19.8	21.4	21.4	<0.0	Negligible	21.2	-0.29	Negligible	19.6	21.2	21.2	<0.0	Negligible	20.9	-0.23	Negligible
18	18.7	20.9	23.0	23.0	<0.0	Negligible	22.6	-0.35	Negligible	20.6	22.7	22.7	<0.0	Negligible	22.4	-0.29	Negligible
19	19.1	22.4	25.0	25.0	<0.0	Negligible	24.7	-0.27	Negligible	22.1	24.7	24.7	<0.0	Negligible	24.5	-0.20	Negligible
20	19.3	22.7	25.4	25.4	<0.0	Negligible	25.2	-0.28	Negligible	22.4	25.2	25.2	<0.0	Negligible	25.0	-0.21	Negligible
21	19.2	22.6	25.3	25.3	<0.0	Negligible	25.0	-0.27	Negligible	22.3	25.0	25.0	<0.0	Negligible	24.8	-0.20	Negligible
22	19.2	22.7	25.4	25.4	<0.0	Negligible	25.2	-0.27	Negligible	22.4	25.2	25.2	<0.0	Negligible	25.0	-0.20	Negligible
23	19.3	22.8	25.6	25.6	<0.0	Negligible	25.3	-0.28	Negligible	22.5	25.3	25.3	<0.0	Negligible	25.1	-0.20	Negligible
24	19.2	22.7	25.5	25.5	<0.0	Negligible	25.2	-0.27	Negligible	22.5	25.2	25.2	<0.0	Negligible	25.0	-0.20	Negligible
25	19.3	22.8	25.6	25.6	<0.0	Negligible	25.4	-0.27	Negligible	22.6	25.4	25.4	<0.0	Negligible	25.2	-0.20	Negligible
26	19.3	22.9	25.8	25.8	<0.0	Negligible	25.5	-0.27	Negligible	22.7	25.5	25.5	<0.0	Negligible	25.3	-0.20	Negligible
27	19.3	22.8	25.6	25.6	<0.0	Negligible	25.4	-0.27	Negligible	22.6	25.3	25.3	<0.0	Negligible	25.1	-0.20	Negligible

28	19.2	22.7	25.5	25.5	<0.0	Negligible	25.2	-0.27	Negligible	22.5	25.2	25.2	<0.0	Negligible	25.0	-0.20	Negligible
29	19.3	23.0	25.8	25.8	<0.0	Negligible	25.6	-0.27	Negligible	22.7	25.6	25.6	<0.0	Negligible	25.4	-0.20	Negligible
30	19.6	23.4	26.3	26.3	<0.0	Negligible	26.0	-0.29	Negligible	23.1	26.0	26.0	<0.0	Negligible	25.8	-0.22	Negligible
31	17.4	19.4	21.2	21.2	<0.0	Negligible	20.9	-0.22	Negligible	19.2	20.9	20.9	<0.0	Negligible	20.7	-0.17	Negligible
32	17.3	19.3	21.0	21.0	<0.0	Negligible	20.8	-0.22	Negligible	19.0	20.8	20.8	<0.0	Negligible	20.6	-0.17	Negligible
33	17.1	18.7	20.4	20.4	<0.0	Negligible	20.2	-0.21	Negligible	18.5	20.2	20.2	<0.0	Negligible	20.0	-0.16	Negligible
34	17.0	18.5	20.2	20.2	<0.0	Negligible	20.0	-0.20	Negligible	18.3	19.9	19.9	<0.0	Negligible	19.8	-0.15	Negligible
35	16.8	18.0	19.5	19.4	<0.0	Negligible	19.3	-0.18	Negligible	17.8	19.2	19.2	<0.0	Negligible	19.1	-0.13	Negligible
36	16.8	17.9	19.3	19.3	<0.0	Negligible	19.2	-0.17	Negligible	17.7	19.1	19.1	<0.0	Negligible	19.0	-0.12	Negligible
37	17.0	18.4	20.1	20.1	<0.0	Negligible	19.9	-0.16	Negligible	18.2	19.8	19.8	<0.0	Negligible	19.7	-0.11	Negligible
38	16.9	18.1	19.6	19.6	<0.0	Negligible	19.4	-0.15	Negligible	17.9	19.3	19.3	<0.0	Negligible	19.2	-0.11	Negligible
39	16.7	17.6	18.9	18.9	<0.0	Negligible	18.8	-0.14	Negligible	17.4	18.7	18.7	<0.0	Negligible	18.6	-0.10	Negligible
40	16.7	17.6	18.9	18.9	<0.0	Negligible	18.8	-0.14	Negligible	17.4	18.7	18.7	<0.0	Negligible	18.6	-0.11	Negligible
41	16.6	17.4	18.7	18.7	<0.0	Negligible	18.5	-0.14	Negligible	17.2	18.4	18.4	<0.0	Negligible	18.3	-0.10	Negligible
42	16.6	17.3	18.5	18.5	<0.0	Negligible	18.4	-0.14	Negligible	17.2	18.3	18.3	<0.0	Negligible	18.2	-0.10	Negligible

43	16.5	17.2	18.4	18.4	<0.0	Negligible	18.3	-0.13	Negligible	17.0	18.2	18.2	<0.0	Negligible	18.1	-0.10	Negligible
44	16.4	17.0	18.1	18.1	<0.0	Negligible	18.0	-0.12	Negligible	16.8	17.9	17.9	<0.0	Negligible	17.8	-0.09	Negligible
45	16.4	17.0	18.1	18.1	<0.0	Negligible	17.9	-0.12	Negligible	16.8	17.9	17.9	<0.0	Negligible	17.8	-0.08	Negligible
46	16.4	16.8	17.8	17.8	<0.0	Negligible	17.7	-0.11	Negligible	16.6	17.6	17.6	<0.0	Negligible	17.5	-0.08	Negligible
47	16.3	16.7	17.7	17.7	<0.0	Negligible	17.6	-0.11	Negligible	16.5	17.5	17.5	<0.0	Negligible	17.4	-0.08	Negligible
48	16.3	16.6	17.6	17.6	<0.0	Negligible	17.5	-0.10	Negligible	16.5	17.4	17.4	<0.0	Negligible	17.3	-0.07	Negligible
49	16.4	16.8	17.8	17.8	<0.0	Negligible	17.7	-0.11	Negligible	16.6	17.6	17.6	<0.0	Negligible	17.5	-0.07	Negligible
50	18.2	19.8	21.4	21.4	<0.0	Negligible	21.2	-0.19	Negligible	19.6	21.1	21.1	<0.0	Negligible	21.0	-0.13	Negligible
51	17.9	18.9	20.1	20.1	<0.0	Negligible	20.0	-0.15	Negligible	18.7	19.9	19.9	<0.0	Negligible	19.8	-0.10	Negligible
52	18.0	19.2	20.6	20.6	<0.0	Negligible	20.4	-0.18	Negligible	19.0	20.4	20.4	<0.0	Negligible	20.3	-0.12	Negligible
53	17.5	18.0	18.9	18.9	<0.0	Negligible	18.7	-0.14	Negligible	17.8	18.7	18.7	<0.0	Negligible	18.6	-0.10	Negligible
54	18.4	20.4	22.2	22.2	<0.0	Negligible	22.0	-0.18	Negligible	20.2	21.9	21.9	<0.0	Negligible	21.8	-0.12	Negligible
55	18.2	19.7	21.1	21.1	<0.0	Negligible	21.0	-0.16	Negligible	19.4	20.9	20.9	<0.0	Negligible	20.8	-0.10	Negligible
56	18.2	19.7	21.2	21.2	<0.0	Negligible	21.1	-0.16	Negligible	19.5	21.0	21.0	<0.0	Negligible	20.9	-0.10	Negligible

Table D3 $PM_{2.5}$ Annual Mean concentrations (μgm^{-3})

ID	2019 Baseline	2024 RC	2024 LP	2024 Zero emissions Buses	Zero emissions Buses Change	IAQM impact	2024 Zero emissions HGV LGV	Zero emissions HGV LGV Change	IAQM impact	2030 RC	2030 LP	2030 Zero emissions Buses	Zero emissions Buses Change	IAQM impact	2030 Zero emissions HGV LGV	Zero emissions HGV LGV Change	IAQM impact
1	12.8	12.8	13.6	13.6	<0.0	Negligible	13.3	-0.15	Negligible	12.6	13.4	13.4	<0.0	Negligible	13.2	-0.23	Negligible
2	12.7	12.6	13.5	13.5	<0.0	Negligible	13.2	-0.11	Negligible	12.4	13.2	13.2	<0.0	Negligible	13.0	-0.21	Negligible
3	12.7	12.7	13.6	13.6	<0.0	Negligible	13.3	-0.35	Negligible	12.5	13.3	13.3	<0.0	Negligible	13.1	-0.21	Negligible
4	12.6	12.6	13.4	13.4	<0.0	Negligible	13.2	-0.29	Negligible	12.4	13.2	13.2	<0.0	Negligible	13.0	-0.19	Negligible
5	12.7	12.6	13.5	13.5	<0.0	Negligible	13.3	-0.28	Negligible	12.4	13.3	13.3	<0.0	Negligible	13.1	-0.19	Negligible
6	12.7	12.8	13.7	13.7	<0.0	Negligible	13.4	-0.28	Negligible	12.6	13.4	13.4	<0.0	Negligible	13.3	-0.18	Negligible
7	12.8	12.8	13.8	13.8	<0.0	Negligible	13.5	-0.25	Negligible	12.6	13.5	13.5	<0.0	Negligible	13.4	-0.17	Negligible
8	12.8	12.9	13.9	13.9	<0.0	Negligible	13.7	-0.25	Negligible	12.7	13.7	13.7	<0.0	Negligible	13.5	-0.16	Negligible
9	12.9	13.0	14.0	14.0	<0.0	Negligible	13.8	-0.24	Negligible	12.8	13.8	13.8	<0.0	Negligible	13.6	-0.16	Negligible
10	12.9	13.0	14.1	14.1	<0.0	Negligible	13.8	-0.23	Negligible	12.8	13.8	13.8	<0.0	Negligible	13.7	-0.16	Negligible
11	12.8	12.8	13.8	13.8	<0.0	Negligible	13.6	-0.23	Negligible	12.7	13.6	13.6	<0.0	Negligible	13.5	-0.15	Negligible
12	12.8	12.9	14.0	14.0	<0.0	Negligible	13.7	-0.23	Negligible	12.7	13.7	13.7	<0.0	Negligible	13.6	-0.15	Negligible
13	12.7	12.7	13.7	13.7	<0.0	Negligible	13.5	-0.22	Negligible	12.5	13.4	13.4	<0.0	Negligible	13.3	-0.14	Negligible
14	12.7	12.7	13.7	13.7	<0.0	Negligible	13.5	-0.21	Negligible	12.5	13.5	13.5	<0.0	Negligible	13.3	-0.14	Negligible
15	12.7	12.7	13.6	13.6	<0.0	Negligible	13.4	-0.22	Negligible	12.5	13.4	13.4	<0.0	Negligible	13.3	-0.15	Negligible
16	13.4	13.9	15.3	15.3	<0.0	Negligible	15.0	-0.20	Negligible	13.6	15.0	15.0	<0.0	Negligible	14.8	-0.22	Negligible
17	12.6	12.5	13.5	13.5	<0.0	Negligible	13.2	-0.21	Negligible	12.3	13.2	13.2	<0.0	Negligible	13.0	-0.21	Negligible
18	13.0	13.2	14.3	14.3	<0.0	Negligible	14.0	-0.21	Negligible	12.9	14.1	14.1	<0.0	Negligible	13.8	-0.27	Negligible

19	13.5	13.9	15.4	15.4	<0.0	Negligible	15.1	-0.31	Negligible	13.7	15.1	15.1	<0.0	Negligible	14.9	-0.22	Negligible
20	13.6	14.1	15.6	15.6	<0.0	Negligible	15.4	-0.27	Negligible	13.9	15.4	15.4	<0.0	Negligible	15.2	-0.22	Negligible
21	13.5	14.0	15.5	15.5	<0.0	Negligible	15.2	-0.34	Negligible	13.8	15.3	15.3	<0.0	Negligible	15.1	-0.21	Negligible
22	13.6	14.1	15.6	15.6	<0.0	Negligible	15.3	-0.29	Negligible	13.9	15.4	15.4	<0.0	Negligible	15.2	-0.20	Negligible
23	13.6	14.2	15.7	15.7	<0.0	Negligible	15.4	-0.30	Negligible	13.9	15.5	15.5	<0.0	Negligible	15.3	-0.20	Negligible
24	13.6	14.1	15.7	15.7	<0.0	Negligible	15.4	-0.28	Negligible	13.9	15.4	15.4	<0.0	Negligible	15.2	-0.20	Negligible
25	13.6	14.2	15.7	15.7	<0.0	Negligible	15.5	-0.28	Negligible	14.0	15.5	15.5	<0.0	Negligible	15.3	-0.20	Negligible
26	13.6	14.2	15.8	15.8	<0.0	Negligible	15.5	-0.28	Negligible	14.0	15.5	15.5	<0.0	Negligible	15.3	-0.20	Negligible
27	13.6	14.2	15.7	15.7	<0.0	Negligible	15.4	-0.28	Negligible	13.9	15.5	15.5	<0.0	Negligible	15.3	-0.19	Negligible
28	13.5	14.1	15.6	15.6	<0.0	Negligible	15.4	-0.27	Negligible	13.9	15.4	15.4	<0.0	Negligible	15.2	-0.19	Negligible
29	13.6	14.2	15.8	15.8	<0.0	Negligible	15.6	-0.27	Negligible	14.0	15.6	15.6	<0.0	Negligible	15.4	-0.20	Negligible
30	13.9	14.6	16.2	16.2	<0.0	Negligible	15.8	-0.27	Negligible	14.3	15.9	15.9	<0.0	Negligible	15.7	-0.28	Negligible
31	12.4	12.5	13.5	13.5	<0.0	Negligible	13.2	-0.27	Negligible	12.3	13.2	13.2	<0.0	Negligible	13.0	-0.19	Negligible
32	12.3	12.4	13.4	13.4	<0.0	Negligible	13.1	-0.27	Negligible	12.2	13.1	13.1	<0.0	Negligible	13.0	-0.19	Negligible
33	12.1	12.1	13.0	13.0	<0.0	Negligible	12.8	-0.36	Negligible	11.9	12.8	12.8	<0.0	Negligible	12.6	-0.16	Negligible
34	12.0	12.0	12.9	12.9	<0.0	Negligible	12.7	-0.26	Negligible	11.8	12.7	12.7	<0.0	Negligible	12.5	-0.15	Negligible
35	11.8	11.7	12.5	12.5	<0.0	Negligible	12.3	-0.25	Negligible	11.5	12.3	12.3	<0.0	Negligible	12.1	-0.13	Negligible
36	11.8	11.6	12.4	12.4	<0.0	Negligible	12.2	-0.22	Negligible	11.5	12.2	12.2	<0.0	Negligible	12.1	-0.12	Negligible
37	12.0	11.9	12.8	12.8	<0.0	Negligible	12.6	-0.20	Negligible	11.7	12.6	12.6	<0.0	Negligible	12.5	-0.14	Negligible
38	11.9	11.7	12.5	12.5	<0.0	Negligible	12.4	-0.17	Negligible	11.5	12.3	12.3	<0.0	Negligible	12.2	-0.13	Negligible
39	11.7	11.5	12.2	12.2	<0.0	Negligible	12.0	-0.17	Negligible	11.3	12.0	12.0	<0.0	Negligible	11.9	-0.11	Negligible

40	11.7	11.4	12.2	12.2	<0.0	Negligible	12.0	-0.19	Negligible	11.3	12.0	12.0	<0.0	Negligible	11.9	-0.11	Negligible
41	11.6	11.3	12.0	12.0	<0.0	Negligible	11.9	-0.17	Negligible	11.2	11.8	11.8	<0.0	Negligible	11.7	-0.10	Negligible
42	11.6	11.3	12.0	11.9	<0.0	Negligible	11.8	-0.16	Negligible	11.1	11.8	11.8	<0.0	Negligible	11.7	-0.10	Negligible
43	11.5	11.2	11.9	11.9	<0.0	Negligible	11.7	-0.15	Negligible	11.1	11.7	11.7	<0.0	Negligible	11.6	-0.10	Negligible
44	11.4	11.1	11.7	11.7	<0.0	Negligible	11.6	-0.14	Negligible	10.9	11.5	11.5	<0.0	Negligible	11.4	-0.08	Negligible
45	11.4	11.1	11.7	11.7	<0.0	Negligible	11.6	-0.14	Negligible	10.9	11.5	11.5	<0.0	Negligible	11.4	-0.08	Negligible
46	11.3	11.0	11.5	11.5	<0.0	Negligible	11.4	-0.13	Negligible	10.8	11.4	11.4	<0.0	Negligible	11.3	-0.08	Negligible
47	11.3	10.9	11.5	11.5	<0.0	Negligible	11.4	-0.12	Negligible	10.8	11.3	11.3	<0.0	Negligible	11.2	-0.07	Negligible
48	11.3	10.9	11.4	11.4	<0.0	Negligible	11.3	-0.11	Negligible	10.7	11.2	11.2	<0.0	Negligible	11.2	-0.07	Negligible
49	11.3	11.0	11.5	11.5	<0.0	Negligible	11.4	-0.11	Negligible	10.8	11.3	11.3	<0.0	Negligible	11.3	-0.07	Negligible
50	12.6	12.5	13.4	13.4	<0.0	Negligible	13.2	-0.10	Negligible	12.3	13.2	13.2	<0.0	Negligible	13.0	-0.14	Negligible
51	12.2	12.0	12.7	12.7	<0.0	Negligible	12.5	-0.10	Negligible	11.8	12.5	12.5	<0.0	Negligible	12.4	-0.09	Negligible
52	12.3	12.2	13.0	12.9	<0.0	Negligible	12.8	-0.11	Negligible	12.0	12.7	12.7	<0.0	Negligible	12.6	-0.12	Negligible
53	11.9	11.5	12.0	12.0	<0.0	Negligible	11.9	-0.20	Negligible	11.3	11.8	11.8	<0.0	Negligible	11.7	-0.09	Negligible
54	12.7	12.8	13.8	13.8	<0.0	Negligible	13.6	-0.15	Negligible	12.6	13.6	13.6	<0.0	Negligible	13.5	-0.12	Negligible
55	12.5	12.4	13.2	13.2	<0.0	Negligible	13.1	-0.17	Negligible	12.2	13.0	13.0	<0.0	Negligible	12.9	-0.10	Negligible
56	12.5	12.4	13.2	13.2	<0.0	Negligible	13.1	-0.12	Negligible	12.3	13.1	13.0	<0.0	Negligible	13.0	-0.10	Negligible

Appendix E: Source apportionment

As part of the Detailed Assessment[1], a source apportionment exercise was initially carried out for year 2015 in line with Technical Guidance LAQM.TG16 Chapter 7. 56 sensitive residential receptors were selected to provide an overview of source contributions.

As part of developing this AQAP, the source apportionment exercise was updated using 2019 traffic data as provided by Sweco. Defra's Emission Factor Toolkit (EFT v10.1)[35] was used to determine emission source apportionment from the vehicle types listed above. Car emissions were further split between petrol and diesel using default emissions included within the EFT. The emission apportionment of the nearest road link for each of the 56 receptors was determined using EFT as presented in Table E1.

[35] Defra. Emission Factor Toolkit. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/#:~:text=The%20Emissions%20Factors%20Toolkit%20%28EFT%29%20is%20published%20by,of%20their%20duties%20under%20the%20Environmental%20Act%201995.

Table E1 Predicted NO_2 2019 emission source contribution at the road link nearest to each receptor (output from the EFT) (μgm^{-3})

ID	Nearest road link	Petrol Cars (%)	Diesel Cars (%)	LGVs (%)	HGVs (%)	Buses/Coaches (%)
1	26670_junction	5%	33%	18%	42%	2%
2	26670_junction	5%	33%	18%	42%	2%
3	26670_ junction	5%	33%	18%	42%	2%
4	26670	9%	51%	27%	13%	1%
5	26670	9%	51%	27%	13%	1%
6	26670	9%	51%	27%	13%	1%
7	26670	9%	51%	27%	13%	1%
8	26670	9%	51%	27%	13%	1%
9	26670	9%	51%	27%	13%	1%
10	26670	9%	51%	27%	13%	1%
11	26670	9%	51%	27%	13%	1%
12	26670	9%	51%	27%	13%	1%
13	26670	9%	51%	27%	13%	1%
14	26670	9%	51%	27%	13%	1%
15	26670	9%	51%	27%	13%	1%
16	26670	9%	51%	27%	13%	1%
17	26670_ junction	5%	33%	18%	42%	2%
18	26670_ junction	5%	33%	18%	42%	2%
19	132643	9%	54%	21%	15%	1%
20	132643	9%	54%	21%	15%	1%
21	132643	9%	54%	21%	15%	1%
22	132643	9%	54%	21%	15%	1%
23	132643	9%	54%	21%	15%	1%
24	132643	9%	54%	21%	15%	1%
25	132643	9%	54%	21%	15%	1%
26	132643	9%	54%	21%	15%	1%
27	132643	9%	54%	21%	15%	1%
28	132643	9%	54%	21%	15%	1%
29	132643	9%	54%	21%	15%	1%
30	132643_ junction	5%	33%	13%	47%	2%
31	27058_ junction	5%	35%	14%	44%	2%
32	27058	10%	55%	21%	14%	1%

33	27058	10%	55%	21%	14%	1%
34	27058	10%	55%	21%	14%	1%
35	27058	10%	55%	21%	14%	1%
36	27058	10%	55%	21%	14%	1%
37	27058_ junction	5%	35%	14%	44%	2%
38	27058_ junction	5%	35%	14%	44%	2%
39	27057_ junction	5%	35%	14%	44%	2%
40	27057_ junction	5%	35%	14%	44%	2%
41	27057	10%	55%	21%	13%	1%
42	27057	10%	55%	21%	13%	1%
43	27057	10%	55%	21%	13%	1%
44	27057	10%	55%	21%	13%	1%
45	27057	10%	55%	21%	13%	1%
46	27057	10%	55%	21%	13%	1%
47	27057	10%	55%	21%	13%	1%
48	27057	10%	55%	21%	13%	1%
49	27057	10%	55%	21%	13%	1%
50	38679	8%	48%	33%	9%	2%
51	38679	8%	48%	33%	9%	2%
52	38679	8%	48%	33%	9%	2%
53	38674	8%	48%	34%	8%	2%
54	38674	8%	48%	34%	8%	2%
55	38674	8%	48%	34%	8%	2%
56	38674	8%	48%	34%	8%	2%

Table E2 presents the predicted NO_2 2019 annual mean concentrations split by vehicle type at each of the receptors. Table E3 presents the predicted NO_2 2019 percentage source contribution by vehicle type at each of the receptors.

Table E2 Predicted NO_2 2019 Annual Mean concentrations and source contribution (μgm^{-3})

ID	**Regional background**	**Local Background**	**Petrol Cars**	**Diesel Cars**	**LGVs**	**HGVs**	**Buses and Coaches**	**Total**
1	6.6	10.8	1.1	7.4	4.1	9.4	0.3	39.7
2	6.6	10.8	1.0	6.7	3.7	8.5	0.3	37.6
3	6.6	10.8	1.0	6.6	3.6	8.3	0.3	37.3
4	6.6	10.8	1.6	9.4	5.0	2.3	0.1	35.8
5	6.6	10.8	1.6	9.3	5.0	2.3	0.1	35.7
6	6.6	10.8	1.6	9.3	5.0	2.3	0.1	35.7
7	6.6	10.8	1.6	9.1	4.8	2.3	0.1	35.2
8	6.6	10.8	1.6	9.0	4.8	2.2	0.1	35.2
9	6.6	10.8	1.6	8.9	4.8	2.2	0.1	35.0
10	6.6	10.8	1.5	8.8	4.7	2.2	0.1	34.8
11	6.6	10.8	1.4	8.3	4.4	2.1	0.1	33.7
12	6.6	10.8	1.5	8.4	4.5	2.1	0.1	34.0
13	6.6	10.8	1.4	8.0	4.3	2.0	0.1	33.1
14	6.6	10.8	1.4	8.1	4.3	2.0	0.1	33.3
15	6.6	10.8	1.5	8.4	4.5	2.1	0.1	33.9
16	6.6	10.8	2.1	12.2	6.5	3.0	0.1	**41.5**
17	6.6	10.8	0.9	6.3	3.5	7.9	0.3	36.3
18	6.6	10.8	1.2	7.9	4.3	10.0	0.4	**41.1**
19	6.6	10.8	2.3	13.1	5.0	3.7	0.2	**41.7**
20	6.6	10.8	2.2	12.9	5.0	3.7	0.2	**41.3**
21	6.6	10.8	2.1	12.2	4.7	3.5	0.2	40.0
22	6.6	10.8	2.1	12.1	4.6	3.4	0.2	39.8
23	6.6	10.8	2.1	12.0	4.6	3.4	0.2	39.7
24	6.6	10.8	2.0	11.7	4.5	3.3	0.2	39.1
25	6.6	10.8	2.0	11.7	4.5	3.3	0.2	39.1
26	6.6	10.8	2.0	11.7	4.5	3.3	0.2	39.0
27	6.6	10.8	2.0	11.4	4.4	3.3	0.2	38.6
28	6.6	10.8	2.0	11.3	4.3	3.2	0.2	38.3
29	6.6	10.8	2.0	11.6	4.5	3.3	0.2	38.9
30	6.6	10.8	1.6	10.6	4.2	15.1	0.6	**49.6**
31	6.7	8.5	1.2	8.1	3.2	10.1	0.5	38.2

32	6.7	8.5	2.0	11.6	4.5	2.9	0.2	36.3
33	6.7	8.5	1.7	9.5	3.6	2.3	0.1	32.5
34	6.7	8.5	1.5	8.6	3.3	2.1	0.1	30.9
35	6.7	8.5	1.3	7.6	2.9	1.9	0.1	29.0
36	6.7	8.5	1.3	7.6	2.9	1.9	0.1	29.0
37	6.7	8.5	0.9	6.1	2.4	7.5	0.3	32.4
38	6.7	8.5	0.8	5.6	2.2	6.9	0.3	31.0
39	6.7	8.5	0.7	4.8	1.9	5.9	0.3	28.8
40	6.7	8.5	0.7	4.6	1.8	5.8	0.3	28.4
41	6.7	8.5	1.1	6.5	2.5	1.6	0.1	27.0
42	6.7	8.5	1.1	6.2	2.4	1.5	0.1	26.4
43	6.7	8.5	1.0	5.7	2.2	1.4	0.1	25.6
44	6.7	8.5	0.9	5.1	2.0	1.2	0.1	24.5
45	6.7	8.5	0.9	5.0	1.9	1.2	0.1	24.3
46	6.7	8.5	0.8	4.6	1.8	1.1	0.1	23.6
47	6.7	8.5	0.8	4.5	1.7	1.1	0.1	23.4
48	6.7	8.5	0.8	4.5	1.7	1.1	0.1	23.3
49	6.7	8.5	0.8	4.8	1.8	1.2	0.1	23.9
50	6.6	10.8	1.3	8.2	5.6	1.5	0.3	34.4
51	6.6	10.8	0.9	5.5	3.8	1.0	0.2	28.8
52	6.6	10.8	1.0	6.3	4.4	1.2	0.2	30.5
53	6.6	10.8	0.7	4.4	3.1	0.8	0.2	26.5
54	6.6	10.8	1.2	7.5	5.3	1.3	0.4	33.0
55	6.6	10.8	1.0	6.3	4.4	1.1	0.3	30.5
56	6.6	10.8	1.0	6.2	4.4	1.1	0.3	30.4

Exceedance of the NO_2 annual mean AQO of 40 µgm^{-3} are presented in bold and greyed out.

Table E3 Predicted NO_2 2019 Annual Mean concentrations and source contribution (%)

ID	Regional background (%)	Local Background (%)	Petrol Cars (%)	Diesel Cars (%)	LGVs (%)	HGVs (%)	Buses and Coaches (%)
1	16.6%	27.2%	2.8%	18.7%	10.3%	23.6%	0.9%
2	17.5%	28.7%	2.7%	17.9%	9.8%	22.6%	0.8%
3	17.7%	28.9%	2.6%	17.8%	9.8%	22.4%	0.8%
4	18.4%	30.1%	4.6%	26.1%	14.0%	6.5%	0.3%
5	18.5%	30.2%	4.6%	26.1%	14.0%	6.5%	0.3%
6	18.5%	30.2%	4.6%	26.1%	13.9%	6.5%	0.3%
7	18.7%	30.6%	4.5%	25.7%	13.8%	6.4%	0.3%
8	18.8%	30.7%	4.5%	25.7%	13.7%	6.4%	0.3%
9	18.9%	30.8%	4.5%	25.5%	13.7%	6.4%	0.3%
10	19.0%	31.0%	4.4%	25.4%	13.6%	6.3%	0.3%
11	19.6%	32.0%	4.3%	24.6%	13.2%	6.1%	0.3%
12	19.4%	31.7%	4.3%	24.8%	13.3%	6.2%	0.3%
13	19.9%	32.6%	4.2%	24.1%	12.9%	6.0%	0.3%
14	19.8%	32.4%	4.2%	24.3%	13.0%	6.0%	0.3%
15	19.5%	31.8%	4.3%	24.7%	13.2%	6.2%	0.3%
16	15.9%	26.0%	5.2%	29.5%	15.8%	7.3%	0.3%
17	18.2%	29.7%	2.6%	17.4%	9.5%	21.9%	0.8%
18	16.0%	26.2%	2.9%	19.2%	10.6%	24.2%	0.9%
19	15.8%	25.9%	5.5%	31.3%	12.1%	8.9%	0.4%
20	16.0%	26.1%	5.4%	31.1%	12.0%	8.9%	0.4%
21	16.5%	27.0%	5.3%	30.4%	11.7%	8.7%	0.4%
22	16.6%	27.1%	5.3%	30.3%	11.7%	8.6%	0.4%
23	16.6%	27.2%	5.3%	30.2%	11.6%	8.6%	0.4%
24	16.9%	27.6%	5.2%	29.9%	11.5%	8.5%	0.4%
25	16.9%	27.6%	5.2%	29.9%	11.5%	8.5%	0.4%
26	16.9%	27.6%	5.2%	29.9%	11.5%	8.5%	0.4%
27	17.1%	27.9%	5.2%	29.6%	11.4%	8.4%	0.4%
28	17.2%	28.2%	5.1%	29.4%	11.3%	8.4%	0.4%
29	17.0%	27.7%	5.2%	29.7%	11.5%	8.5%	0.4%
30	13.3%	21.8%	3.2%	21.4%	8.5%	30.6%	1.3%
31	17.5%	22.2%	3.1%	21.2%	8.3%	26.4%	1.2%

32	18.4%	23.4%	5.6%	32.0%	12.3%	7.9%	0.4%
33	20.6%	26.1%	5.1%	29.3%	11.2%	7.2%	0.4%
34	21.7%	27.5%	4.9%	28.0%	10.7%	6.9%	0.4%
35	23.0%	29.3%	4.6%	26.2%	10.1%	6.5%	0.4%
36	23.1%	29.3%	4.6%	26.2%	10.0%	6.4%	0.4%
37	20.6%	26.2%	2.8%	18.7%	7.3%	23.3%	1.1%
38	21.6%	27.4%	2.7%	17.9%	7.0%	22.3%	1.0%
39	23.3%	29.5%	2.5%	16.6%	6.5%	20.7%	0.9%
40	23.6%	29.9%	2.4%	16.4%	6.4%	20.4%	0.9%
41	24.8%	31.5%	4.2%	24.1%	9.3%	5.9%	0.3%
42	25.4%	32.2%	4.1%	23.3%	9.0%	5.7%	0.3%
43	26.1%	33.1%	3.9%	22.4%	8.6%	5.5%	0.3%
44	27.3%	34.7%	3.7%	20.9%	8.1%	5.1%	0.3%
45	27.6%	35.0%	3.6%	20.6%	7.9%	5.0%	0.3%
46	28.3%	36.0%	3.4%	19.6%	7.6%	4.8%	0.3%
47	28.6%	36.3%	3.4%	19.3%	7.5%	4.7%	0.3%
48	28.7%	36.5%	3.4%	19.1%	7.4%	4.7%	0.3%
49	28.0%	35.6%	3.5%	20.0%	7.7%	4.9%	0.3%
50	19.2%	31.4%	3.9%	23.9%	16.4%	4.3%	0.9%
51	22.9%	37.5%	3.1%	19.1%	13.2%	3.5%	0.7%
52	21.6%	35.3%	3.4%	20.8%	14.3%	3.8%	0.7%
53	24.9%	40.7%	2.6%	16.4%	11.6%	2.9%	0.8%
54	20.0%	32.7%	3.6%	22.6%	15.9%	4.0%	1.1%
55	21.6%	35.3%	3.3%	20.6%	14.5%	3.6%	1.0%
56	21.7%	35.4%	3.3%	20.5%	14.5%	3.6%	1.0%