London-wide ULEZ Integrated Impact Assessment (ULEZ Scheme IIA)

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Jacobs UK Limited

2nd Floor, Cottons Centre
Cottons Lane
London SE1 2QG
United Kingdom

T +44 (0)203 980 2000
[Website]

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Executive Summary

Introduction

This report summarises the findings from the Integrated Impact Assessment (IIA) of the proposed expansion of the Ultra Low Emission Zone (ULEZ) to outer London so that it applies London-wide. The IIA provides an integrated assessment of the potential positive and negative impacts of the Proposed Scheme on the environment, equalities, health and the economy. It also identifies measures to either enhance potential positive impacts or minimise negative ones.

Policy Context

The proposed expansion of the ULEZ sits within the context of the Mayor of London's strategic policies as set out in the Mayor's Transport Strategy[1] (MTS); the London Plan[2]; the London Health Inequalities Strategy[3]; and the London Environment Strategy[4] (LES).

The London Health and Equalities Strategy states that the Mayor's key ambition is for London to have the best air quality of any global city, with progress fastest in the most polluted areas, benefitting people most vulnerable to the effects of air pollution. The strategy highlights nitrogen dioxide and particulate matter as significant concerns for health.

The LES commits the Mayor to accelerate the attainment of legal limits for air quality in Greater London, including through the reduction of emissions from London's Transport Network by enabling Londoners to switch to more sustainable forms of travel.

The ULEZ is one of a range of measures in the Mayor's Transport Strategy used for reducing harmful air pollution from road transport including encouraging active travel (walking and cycling), shifting to cleaner vehicles such as electric vehicles and vehicle retrofits, road user charging, parking charges and traffic restrictions. Proposal 24 of the MTS commits the Mayor, through TfL, to introduce a central London ULEZ by 2019 and an expanded ULEZ covering inner London by 2021 and both commitments have been met. Proposal 20 of the MTS states that the current London road user charging (RUC) schemes will be kept under review, and changes made if they are needed.

Background to the Proposed Scheme

Low Emission Zone

Transport for London (TfL) has operated a London-wide Low Emission Zone (LEZ) that applies to the most polluting heavy diesel vehicles since 2008. Since 1 March 2021 the LEZ standard was tightened to Euro VI for HGVs, buses, coaches and other specialist vehicles. Vehicles that do not meet this standard face a charge of £100 per day. Vehicles that do not meet the previous (pre-2021) Euro IV standards are charged £300 per day. Lorries, specialist heavy vehicles or vans (over 3.5 tonnes) and buses, minibuses, and coaches (over 5 tonnes) do not need to pay the ULEZ charge. Large vans (up to 3.5 tonnes) and minibuses (up to 5 tonnes) that do not meet the LEZ Euro 3 for PM standard are charged £100 a day; these vehicles must also meet the ULEZ standards to travel within the ULEZ.

[1] https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf

[2] https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

[3] https://www.london.gov.uk/sites/default/files/health_strategy_2018_low_res_fa1.pdf

[4] https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf

Ultra Low Emission Zone

From when it was first introduced in April 2019 until October 2021, the ULEZ had the same boundary as the Congestion Charge Zone (CCZ). In October 2021 it was extended to inner London to cover all areas within, but not including, the North Circular (A406) and South Circular (A205) roads. The ULEZ operates 24 hours a day, 7 days a week, every day of the year, except Christmas Day.

All vehicles, unless exempt, need to meet the ULEZ standards or pay a £12.50 daily charge to drive inside the zone.

To meet the ULEZ standards, the vehicle must meet the required Euro emissions standard for the vehicle and emission type. The ULEZ standards are provided in Table 1.

Table 1: Dates from which newly registered vehicles must be compliant with ULEZ or pay a daily charge

Vehicle Type	Minimum Emission Standards	Date from which vehicles registered as new with DVLA must meet the emissions standard
Motorcycle, moped etc (Category L)	Euro 3	1 July 2007
Car and Small Van - Categories M1 and N1 (I)	Euro 4 (petrol) Euro 6 (diesel)	From 1 January 2006 From 1 September 2015
Large van and minibus (up to 3.5 tonnes) – Categories N1 (II and III) and M2	Euro 4 (petrol) Euro 6 (diesel)	From 1 January 2007 From 1 September 2016

London-wide ULEZ

In December 2021, TfL reported to the Mayor on four potential approaches to address the triple challenge of toxic air pollution, climate emergency and traffic congestion in London. After considering the potential approaches, on 4 March 2022, the Mayor announced that he had asked TfL to consult on the first option, expanding the ULEZ to outer London in 2023 (the ULEZ expansion area) so that it applies London-wide.

Figure 2-2 shows the existing ULEZ and LEZ boundaries and the proposed expanded ULEZ boundary.

Therefore, this impact assessment focuses on the expansion of the ULEZ London-wide (hereafter referred to as 'the Proposed Scheme'). The Proposed Scheme comprises:

- Expansion of the ULEZ to the wider outer London area (to the boundary of the LEZ, 96 per cent of Greater London)
- Charge level of £12.50 per day for vehicles not compliant with ULEZ standards (a continuation of the charge level currently applied to the existing inner London ULEZ)
- The same operating times as the existing ULEZ – 24 hours a day (midnight to midnight), seven days a week, every day except Christmas Day

- Identical emissions standards as the existing ULEZ
- Removal of the annual £10 per vehicle Auto Pay registration fee
- Increase the Penalty Charge from £160 to £180 for non-payment of the ULEZ charge

The proposals to remove the annual £10 per vehicle Auto Pay registration fee and to increase the Penalty Charge levels also apply to the Congestion Charge scheme, with the proposal to remove the annual £10 Auto Pay per vehicle registration fee also applying to the LEZ. The equality and economic impacts of these changes in relation to the Congestion Charge and LEZ are being considered separately by TfL, and relevant findings are summarised in the Proposed Congestion Charge and Low Emission Zone changes Impact Assessment.

There are several discounts, exemptions and reimbursements for the existing inner London ULEZ scheme that will remain in place and would mitigate some of the impacts associated with the implementation of the Proposed Scheme on certain people and businesses travelling within the ULEZ expansion area. The Mayor has made a commitment to help charities, small businesses, disabled people, and Londoners on lower incomes adapt to the potential London-wide ULEZ, through the introduction of a new scrappage scheme to help Londoners scrap their older, more polluting vehicles[5]. The size or the timing of the introduction of the fund has yet to be determined and so has not been assumed to be a part of the Proposed Scheme for the purposes of the impact assessment.

Upon the introduction of the Proposed Scheme TfL proposes to extend the existing grace periods (during which a 100 per discount applies) that apply to disabled or disabled passenger vehicle tax class vehicles and wheelchair accessible private hire vehicles (WAV PHVs)[6] fulfilling a private hire booking for two years, from October 2025 to October 2027. The grace period for community minibuses would also be extended for two years, from October 2023 to October 2025. These grace periods will apply on a London-wide basis to those stated dates so that those currently benefitting from them under the existing inner London ULEZ scheme effectively obtain an extension.

Approach to the IIA

The IIA process is a tool for identifying key impacts associated with the Proposed Scheme, including how negative impacts could be avoided or mitigated where possible, and how positive impacts could be enhanced. The IIA report brings together the findings of each of the assessments into one integrated document, where they are reported under three themes:

- Environment (incorporating the Environmental Assessment)
- People (incorporating the Health Impact Assessment and the Equality Impact Assessment)
- Economy (incorporating the Economic and Business Impact Assessment)

Overall impacts have been determined against two assessment parameters: scale and sensitivity:

- Scale: the extent to which London's environment, people, and the economy would be impacted (positively or negatively) by the proposals considering the numbers/proportion that would experience the impact within the area of assessment

[5] It is assumed that eligibility for a new ULEZ scrappage scheme would be limited to residents of and businesses operating in Greater London.

[6] WAV PHVs will only be exempt when carrying out a private hire booking for a TfL-licensed PHV operator. At all other times PHV owners will have to pay the charge if their designated wheelchair-accessible PHV does not meet the emissions standards and is not in the disabled or disabled passenger vehicle tax class.

- Sensitivity: this considers how those impacted might respond; whether they are able to absorb or adapt to the Proposed Scheme where negatively impacted

The primary study area for the assessment is the ULEZ expansion area (the area between the existing inner London ULEZ and the LEZ boundary) and areas adjacent to Greater London. However, the assessment of air quality related impacts are limited to the area covered by the London Area Emissions Inventory (LAEI) which includes Greater London and areas outside Greater London up to the M25 Motorway.

The overall impact is expressed on a rating from -3 to +3 (1 = minor; 2 = moderate; 3 = major). The impact rating is assessed mitigation measures committed to by TfL, such as the exemptions, discounts and reimbursements (including the extensions to the grace periods noted above).

Where impacts are identified, potential further mitigation or enhancement measures are identified for consideration by TfL.

Stakeholder Engagement

This assessment has been informed by a series of thematic stakeholder workshops held to discuss the potential impacts of the Proposed Scheme and to explore potential mitigation measures. Six workshops - Business and Economy; Environment; Equalities; Health; Taxis and Private Hire; and London boroughs, were held in March 2021. In addition, a separate discussion was held with members of TfL's Independent Disability Advisory Group (IDAG) to discuss the likely impacts of the changes on disabled people.

Forecast impact of the Proposed Scheme on travel patterns

The assessment has been informed by strategic traffic modelling undertaken by TfL to compare the situation in 2023 (the proposed year of implementation) with and without the Proposed Scheme. The model outputs comprise traffic demand (by mode of travel and journey purpose), road traffic emissions and air quality concentrations. The analysis is based upon forecast rates of vehicle compliance with the ULEZ standards for when the Proposed Scheme would be introduced. The forecast rates for outer London are: 91 per cent for private cars; 97 per cent for private hire vehicles (PHVs) and 82 per cent for light goods vehicles (LGVs). London-wide this equates to 92 per cent, 98 per cent and 85 per cent respectively.

In summary the model outputs indicate the following changes to travel demand arising from the Proposed Scheme:

- Private Motor Vehicles - the forecast impact is a 4.8 per cent reduction in total car trips both in trips entirely within the ULEZ expansion area and entering the ULEZ expansion area from outside London. This equates to a 1.7 per cent reduction in total car trips across Greater London. The greatest proportional reduction is in non-business and non-commuting purposes trips entering the ULEZ expansion area from outside London (-14.2 per cent)

- Light Goods Vehicles - the change in numbers of LGV trips within the expansion area or into the expansion area from outside Greater London as a result of the Proposed Scheme has not been modelled. However, the expected change is likely to be minimal at an aggregate level

- Private Hire Vehicles - trips by PHVs are forecast to increase by 1.8 per cent within the ULEZ expansion area with the Proposed Scheme

- Public Transport - trips within or into the ULEZ expansion area by bus or rail are forecast to increase by 1.5 per cent and 1.2 per cent respectively. London-wide this equates to 0.6 per cent increase in trips for bus and 0.3 per cent for rail

- Active Travel - walking and cycling trips within or into the ULEZ are forecast to increase by 1.9 per cent and 1.5 per cent respectively. London-wide this equates to around 0.7 per cent increase in active travel trips

Summary of Impacts and Potential Mitigation or Enhancement

A summary of each positive and negative impact and its overall rating is provided in Table 1 below, alongside existing and potential further mitigation or enhancement measures.

As noted above, the Mayor committed to providing support to low income and disabled Londoners through a scrappage scheme. The size of the fund and the timing of its implementation remain to be confirmed. Meanwhile, TfL is reviewing the effectiveness of the previous ULEZ scrappage scheme, that enabled over 15,000 polluting vehicles to be removed from London's roads, to inform the development of the future scheme, in addition to the findings of this IIA.

The IIA has also identified a range of potential further mitigation and enhancement measures for consideration by TfL that are set out in the IIA Report.

Table 1: Predicted impacts, committed and potential mitigation and enhancement measures

Objective	Description of Impact	Impact Rating	TfL Committed Mitigation	Potential Further Mitigation or Enhancement
Environment				
To contribute to a reduction in air pollutant emissions, exposure to air pollution and achieving compliance with legal limits.	The Proposed Scheme is estimated to have a moderate (NO_x) to minor (PM_{10} and $PM_{2.5}$) beneficial impact on road traffic emissions of air pollutants across Greater London.	Moderate Positive (NO_x) Minor Positive (PM_{10} and $PM_{2.5}$)	Not applicable	Not applicable
	The Proposed Scheme is estimated to have a minor (NO_2) to negligible ($PM_{2.5}$) beneficial impact on exposure to air pollution and achieving WHO Interim Targets across Greater London.	Minor Positive (NO_2) Neutral ($PM_{2.5}$)	Not applicable	Not applicable
	The Proposed Scheme is estimated to have a minor beneficial impact on compliance with legal limits across Greater London.	Minor Positive	Not applicable	Not applicable
To help tackle climate change through reducing greenhouse gas emissions and moving towards a zero carbon London by 2050	The Proposed Scheme is estimated to have a negligible beneficial impact on carbon emissions in Greater London.	Neutral	Not applicable	Not applicable
To protect and enhance the natural environment including biodiversity, flora and fauna	Decreases in NO_x concentrations will result in a negligible beneficial impact on nature conservation sites.	Neutral	Not applicable	Not applicable
To protect and enhance historic, archaeological, and socio-cultural environments	Potential for minor positive impact on cultural heritage assets from reduced risk of acid rain in London as a result of NO_x reductions.	Minor Positive	Not applicable	Not applicable

Objective	Description of Impact	Impact Rating	TfL Committed Mitigation	Potential Further Mitigation or Enhancement
	Neutral impact from reductions in PM emissions on the soiling of historic buildings.	Neutral	Not applicable	Not applicable
To promote sustainable resource use and waste management	Neutral impact due to anticipated additional tonnage of vehicles scrapped due to the Proposed Scheme representing a very small proportion of the total scrappage capacity within the M25 area.	Neutral	Not applicable	Not applicable
	Neutral impact on fly-tipping in those parts of outer London which would not fall within the London-wide ULEZ boundary.	Neutral	Not applicable	Not applicable
To protect and enhance built environment and streetscape	Localised minor landscape impacts of new street furniture in some rural areas.	Minor Negative	Where appropriate and possible, existing elements within the landscape should be utilised to support implementation of additional signage. Adherence to TfL streetscape guidance and good practice.	Sensitive site selection and installation.
	Neutral impact on the built environment or streetscape within urban/suburban areas of outer London as a result of the installation of new street furniture required for the Proposed Scheme.	Neutral	Not applicable	Not applicable
People				
To reduce emissions and concentrations of harmful atmospheric pollutants particularly in areas of poorest air quality; and reduce levels of exposure experienced by more vulnerable and disadvantaged groups	Improvements to air quality resulting in better health outcomes for Londoners. Disproportionately greater health benefits for **older people** and **children**, and differential benefits for **people with a range of long-term health conditions, children and older people** living in outer London.	Minor Positive	Not applicable	Not applicable
	No impact on health outcomes for **vulnerable populations** expected as a result of reduced Urban Heat Island (UHI) effects.	Neutral	Not applicable	Not applicable
To provide affordable and safe transport choices for all To maximise accessibility for all and maintain connectivity in and	Community severance impacts for people living in communities adjacent to the London-wide ULEZ boundary who are required to travel into outer London by non-compliant car to access employment, services and facilities. Disproportionate impact on **people with low incomes.**	Minor Negative	Not applicable	Collaborative working between TfL and local authorities adjacent to the GLA, for example, through holding regular meetings up to the implementation of the Proposed Scheme and for the first

Objective	Description of Impact	Impact Rating	TfL Committed Mitigation	Potential Further Mitigation or Enhancement
around London and enable sustainable transport choices				year of implementation to monitor the impacts of the Proposed Scheme.
	Neutral impact on **disabled people** travelling by car in outer London who qualify for Motability scheme and disabled vehicle tax exemption.	Neutral	Extension to grace period for disabled and disabled passenger vehicle tax class by two years to October 2027	
	Differential financial impact on **disabled people** who make journeys using non-compliant vehicles and do not qualify for Motability scheme and disabled vehicle tax class exemption.	Moderate Negative	Disabled people over state pension age whose vehicle does not have disabled vehicle tax class can apply directly to TfL for the grace period if they: 1) Are in receipt of Attendance Allowance and 2) Hold a Blue Badge	Undertake promotion of Access to Work scheme to support people with physical or mental health condition or disability to stay in work. Further improvements to step free access at stations would help improve access alternatives for those with a mobility impairment and it is recommended that this be explored by TfL. Eligibility criteria of a new scrappage scheme for cars should continue be targeted at people in receipt of non means tested disability benefits and TfL should work with disability groups to raise awareness.
	Disproportionate financial impact for **people on low incomes** who travel by non-compliant private vehicle in outer London to access employment (particularly in night time economy) or opportunities, and for **people with restricted mobility including pregnant and maternal women,** parents with young children, and **disabled people** who do not have a disabled vehicle tax class, due to their lesser capacity to switch to a compliant vehicle and/or to change mode.	Moderate Negative	Night bus network and return of the night tube/night overground post pandemic.	Promotion of Access to Work scheme to support people with physical or mental health condition or disability to stay in work. Greater promotion of car sharing and car clubs for those locations/trips that are difficult to serve by public transport and active travel.

Objective	Description of Impact	Impact Rating	TfL Committed Mitigation	Potential Further Mitigation or Enhancement
				A new scrappage scheme for cars should continue to be targeted at low income Londoners. As part of a new scrappage scheme for cars TfL should consider providing exclusive TfL and third party offers to successful grant recipients. These could include, for example, travelcard for bus and tram, car club membership, discounts for pushbikes, and e-bikes.
	Disproportionate impact on **women** taking children to school in outer London by non-compliant vehicle.	Minor Negative	STARS Scheme[7]	Promotion of car sharing for journeys to school where trips are difficult to serve by public transport and active travel.
	Potential differential impact on **young people and/or their carers and families on low incomes** due to implications of increased cost of providing dedicated SEN travel to schools in outer London.	Minor Negative	Extended grace period for not-for-profit community transport by 2 years to October 2025. Applies to eligible organisations (including state schools) outside Greater London.	Undertake further engagement with local education authorities to understand likely scale of impact on services provided via private contractors.
	Increased cost of operating LGVs on tradespeople, likely to be disproportionately experienced by **men and members of the Gypsy and Traveller community**, who rely on a non-compliant vehicle to undertake work in outer London.	Moderate Negative	Not applicable	TfL should consider greater targeting of new scrappage scheme for vans by focusing eligibility on micro businesses (up to 9 employees) to allow more business owners to benefit.
	Disproportionate impact on **Black, Asian and minority ethnic PHV drivers** working in outer London in a non-compliant vehicle.	Minor Negative	Not applicable	A new scrappage scheme for cars should continue to be targeted at low income Londoners. Some PHV operators offer support to drivers switching to cleaner vehicles.

[7] STARS – Sustainable Travel: Active, Responsible Safe is a TfL accredited scheme for London schools and nurseries. STARS inspires young Londoners to travel to school sustainably, actively, responsibly and safely by championing walking, scooting and cycling. See https://stars.tfl.gov.uk/About/About

Objective	Description of Impact	Impact Rating	TfL Committed Mitigation	Potential Further Mitigation or Enhancement
	Differential financial impact for some **people of different faiths** to access places of worship in Outer London by non-compliant vehicles.	Minor Negative	Not applicable	TfL should encourage faith organisations in outer London to adopt car sharing and active travel or, where available, greater use of compliant minibuses and car clubs for those unable to access by public transport or active travel.
	Differential impact on **vulnerable groups (e.g. refugees/asylum seekers, women, homeless people, and disabled people)** who rely on services provided by charities and community organisations undertaking activities using non-compliant vans and minibuses within outer London.	Minor Negative	Extended grace period for not-for-profit community transport by 2 years to October 2025.	Introduction of a new scrappage scheme for vans and charity minibuses.
	Differential impact on perceptions of safety for **women, disabled people, young people, transgender people, LGBT+ people and Black, Asian and minority ethnic people,** who travel by non-compliant private vehicle but cannot afford to upgrade to a compliant vehicle. These groups may be reluctant to use public transport due to perceptions of the risk to personal safety, and therefore may travel less.	Minor Negative	Existing TfL campaigns aimed at addressing the issues of sexual harassment and hate crimes on public transport should help to alleviate safety concerns.	Not applicable
To contribute to enhanced health and wellbeing for all within London and to reduce health inequalities across the city and between communities.	Differential impact of increased cost for some **older people, disabled people, people with underlying health conditions** and **people on low incomes** who travel by non-compliant private vehicles to access regular medical appointments at specialist facilities in outer London (and outer London residents accessing healthcare outside London), which may result in adverse health outcomes for these groups.	Minor Negative	NHS Patient Reimbursement Scheme. Disabled people over state pension age whose vehicle does not have disabled vehicle tax class can apply directly to TfL for the grace period if they: 1) Are in receipt of Attendance Allowance and 2) Hold a Blue Badge	TfL to work with CCGs and NHS Trusts to inform vulnerable patients of the NHS patient reimbursement scheme. For example, details of eligibility for reimbursements and discounts could be provided in all hospitals. A new scrappage scheme for cars should continue to be targeted at low income Londoners and people on non-means tested disability benefits.
	Differential impact of increased cost for some **pregnant and maternal women** who travel by private vehicle to access medical appointments at paediatric/maternity	Minor Negative	Some pregnant women (those who are clinically assessed as unable to use public transport to travel to appointments) are eligible for the	TfL should consider whether any changes to the eligibility criteria should be considered as part of a wider review of the reimbursement scheme.

Objective	Description of Impact	Impact Rating	TfL Committed Mitigation	Potential Further Mitigation or Enhancement
	centres in outer London, which may result in adverse health outcomes.		NHS Patient Reimbursement Scheme	
	Differential impact for **Black, Asian and minority ethnic people and women who work for the NHS in lower paid positions** who travel by non-compliant private vehicle to access employment in outer London.	Minor Negative		A new scrappage scheme for cars should continue to be targeted at low income Londoners. TfL should work with NHS Trusts to identify opportunities for enhancement of hospital Green Travel Plans to promote use of active travel and public transport amongst staff.
	Where employers do not reimburse care workers for upgrading their vehicle or paying the charge, this is likely to disproportionately impact on **Black, Asian and minority ethnic people and women** serving the outer London area as a result of the additional cost associated with the Proposed Scheme. This has the potential to result in stress and anxiety.	Moderate Negative	Not applicable	To inform further development of potential mitigation measures, TfL should engage with health and social care organisations during the consultation period to understand on whom the costs of compliance is likely to fall. A new scrappage scheme for cars should continue to be targeted at low income Londoners.
	Differential impact on people who receive domiciliary care, mobile healthcare services, and/or informal care in outer London – particularly **disabled people, older people, pregnant and maternal women, and people with underlying health conditions** - resulting in poorer health outcomes.	Moderate Negative	Not applicable	Mitigation measures would be informed by consultation with health and social care sectors as outlined above. Raise awareness of eligibility criteria of the new scrappage scheme for cars, for those who provide informal care to older and disabled people. Raise awareness of public transport options.

Objective	Description of Impact	Impact Rating	TfL Committed Mitigation	Potential Further Mitigation or Enhancement
	Differential impact on health (stress and anxiety and isolation) for **people on low incomes, older people, and disabled people** who do not qualify for the disabled vehicle tax class exemption, which could result in poor socio-economic and wellbeing outcomes.	Moderate Negative	Extension of wheelchair accessible private hire vehicle 100% discount to October 2027. Disabled people over state pension age whose vehicle does not have disabled vehicle' tax class can apply directly to TfL for the grace period if they: 1) Are in receipt of Attendance Allowance and 2) Hold a Blue Badge	TfL should facilitate discussions with stakeholders to support choices around options available (e.g. upgrading vehicle or changing mode). A new scrappage scheme for cars should continue to be targeted at on low income Londoners and people on non- means tested disability benefits. Provide targeted assistance with applications for new scrappage scheme where needed (informed by engagement with disabled groups).
Economy and Business				
To support the growth and creation of businesses in outer London, including small to medium sized enterprises (SMEs)	Contraction of potential local labour market due to fewer commuters entering Greater London and people in the ULEZ expansion area switching jobs to more accessible locations	Minor Negative	Promotion of public transport or active travel alternatives for commuting to work.	Promotion of car share schemes for commuting to work. Expansion of bike / e-scooter hire to enable people from outside Greater London traveling to rail stations in outer London to make onward journeys to their place of employment.
	Increased cost of operating LGVs for a significant proportion of tradespeople, street markets, delivery companies and similar.	Minor Negative	Not applicable	A new scrappage scheme encouraging the replacement of vans with compliant vans, cargo bikes and smaller battery powered delivery vehicles. TfL should consider greater targeting of a new scrappage scheme for vans by focusing eligibility on micro businesses (up to 9 employees) to allow more business owners to benefit.

Objective	Description of Impact	Impact Rating	TfL Committed Mitigation	Potential Further Mitigation or Enhancement
				Promote or incentivise greater use of shared delivery services for last mile deliveries using cargo bikes and similar.
	Increased labour market constraints at Heathrow Airport.	Minor Negative	Not applicable	Liaise with Heathrow Airport and relevant local authorities to explore opportunities outside proposed London-wide ULEZ boundary for park & ride sites catering for airport employees.
	London licensed taxis are exempt from ULEZ, London licensed PHVs almost 100 per cent compliant. Small impacts on taxi and PHVs licensed outside London minimized through efficient allocation of trips to ULEZ compliant vehicles	Neutral	Not applicable	Not applicable
To promote the vitality and viability of London's varied town centres	Loss of retail spend by those living outside Greater London	Minor Negative	Not applicable	Promotion of public transport access to major retail centres in outer London.
	Loss of night time economy spend by those living outside Greater London	Neutral	Not applicable	Not applicable

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Acronyms and abbreviations

Term	Definition
ATF	Authorised Treatment Facility
AQO	Air Quality Objective
CCZ	Congestion Charge Zone
CO_2	Carbon dioxide
EA	Environmental Assessment
EBIA	Economic and Business Impact Assessment
EQIA	Equalities Impact Assessment
ELV	End of Life Vehicles
GHG	Greenhouse Gases
GLA	Greater London Authority
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
HUDU	Healthy Urban Development Unit
IDAG	Independent Disability Advisory Group
IIA	Integrated Impact Assessment
IMD	Index of Multiple Deprivation
LAEI	London Atmospheric Emissions Inventory
LES	London Environment Strategy
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
LoHAM	London Highway Assignment Model
LSOA	Lower Super Output Area
LTN	Low Traffic Neighbourhoods
MoTiON	Model of Travel in London
MTS	Mayors Transport Strategy
NHS	National Health Service
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
PCG	Protected Characteristic Group
PHV	Private Hire Vehicle
PIP	Personal Independence Payment
PM	Particulate Matter
PM_{10}	Particulate Matter less than 10µm in diameter

Term	Definition
$PM_{2.5}$	Particulate Matter less than 2.5µm in diameter
PSED	Public Sector Equality Duty
PTAL	Public Transport Accessibility Level
RUC	Road User Charging
SEN	Special Educational Needs
TfL	Transport for London
STARS	Sustainable Travel: Active, Responsible Safe
TLRN	Transport for London Road Network
UHI	Urban Heat Island
ULEZ	Ultra Low Emission Zone
VKM	Vehicle kilometres
WAV	Wheelchair Accessible Vehicle
WHO	World Health Organization

1. Introduction

1.1 Overview

To reduce transport emissions by the amount required to address toxic air pollution, and to address the climate emergency and traffic congestion in London, the capital will have to shift away from using petrol and diesel vehicles and towards walking and cycling, greater public transport use and cleaner vehicles. As of January 2022, only two per cent of vehicles on the roads in London were electric.

Transport for London (TfL) proposes a London-wide expansion to the existing Ultra Low Emission Zone (ULEZ) scheme by extending it to outer London, to help London meet its legal requirements concerning air quality and further reduce carbon emissions and congestion in line with the Mayor's overall policy objectives.

On 4 March 2022, the Mayor announced that he intends to consult on proposals to extend the ULEZ from the existing boundary (along the inner boundaries of the North and South Circular roads) to cover almost all of Greater London (London-wide).

TfL commissioned Jacobs to undertake an Integrated Impact Assessment (IIA) to assess the likely impacts of the proposals. This IIA Report considers and documents the findings of the following assessment processes to provide a proportionate and integrated assessment:

- Environmental Assessment (EA)
- Health Impact Assessment (HIA)
- Equality Impact Assessment (EQIA)
- Economic and Business Impact Assessment (EBIA)

1.2 The Purpose of the IIA

The IIA process is a tool for identifying potential key impacts associated with the proposals for the ULEZ, including ways to avoid and mitigate adverse impacts and enhance beneficial impacts. This IIA report consolidates the findings of each of these assessments into one integrated document, where they are reported under three themes, namely:

- London's environment (incorporating the EA)
- London's people (incorporating the HIA and EQIA)
- London's economy (incorporating the EBIA)

The IIA informs the development of the proposals and ultimately the Mayor's decision on whether to introduce the proposed expansion to the ULEZ.

1.3 Structure of the IIA

The remainder of this report is structured as follows:

- Section 2 – provides a background to and the need for the proposed scheme, alternatives considered and a description of the assessed proposal
- Section 3 – explains the overall approach taken to the IIA and stakeholder engagement undertaken during the process
- Section 4 – provides a high-level summary of the predicted impacts of the proposal on travel patterns
- Section 5 – explains the findings of the environmental assessment of the proposals
- Section 6 – presents the findings of the economic and business impact assessment
- Section 7 – contains the findings of the equality and health impact assessments
- Section 8 – provides suggested mitigation and enhancement measures

The policy context and baseline data informing the IIA are provided in a separate London-wide ULEZ and MTS revision baseline report for ULEZ Scheme IIA and MTS IIA (Baseline Report).

1.4 Public Consultation

A revision to the Mayor's Transport Strategy (MTS) is required to facilitate the proposed expansion of ULEZ London-wide. The revision to the MTS, and an associated IIA, will be consulted upon in parallel to the

consultation on the proposed changes to ULEZ. The public consultation will commence on 20 May 2022 and run for 10 weeks.

2. Scheme Description

2.1 Policy context

National air quality standards are prescribed in law as Limit Values and Air Quality Objectives (AQOs). The UK Government's Clean Air Strategy (2019) strategy sets out the comprehensive action that is required from across all parts of government and society to meet these goals.

The proposed expansion of the ULEZ also sits within the context of the Mayor's strategic policies as set out in the Mayor's Transport Strategy[8] (MTS), the London Plan[9], the London Health Inequalities Strategy[10], and the London Environment Strategy[11] (LES).

The LES commits the Mayor to accelerating the attainment of legal limits for air quality in Greater London, including through the reduction of emissions from London's Transport Network by enabling Londoners to switch to more sustainable forms of travel.

The London Health and Equalities Strategy states that the Mayor's key ambition is for London to have the best air quality of any global city, with progress fastest in the most polluted areas, benefitting people most vulnerable to the effects of air pollution. Nitrogen dioxide and particulate matter are highlighted as significant concerns for health.

The ULEZ is one of a range of measures in the Mayor's Transport Strategy used for reducing harmful air pollution from road transport including encouraging active travel (walking and cycling), retrofitting vehicles, promoting electrification, road charging, parking charges and traffic restrictions. Proposal 24 of the MTS commits the Mayor, through TfL, to introduce a central London ULEZ by 2019 and an expanded ULEZ covering inner London by 2021 and both commitments have been met. Proposal 20 of the MTS states that the current RUC schemes will be kept under review, and changes made if they are needed.

In September 2021, the World Health Organization (WHO) updated its recommended guidelines for air pollutants and following the passage of the Environment Act 2021, the UK government is currently preparing secondary legislation considering these new guidelines. The Mayor has already made the case for these to be aligned with the new WHO interim targets. Considering the changing scientific and international standards, the Mayor and TfL have decided that they should aim for Air Quality standards that go beyond the existing legal limits of levels of pollution.

TfL has been undertaking a review of RUC initiatives in Greater London, taking account of the effectiveness of existing schemes in meeting policy objectives and emerging guidelines. The proposals for a London-wide ULEZ have emerged from this review.

2.2 Current scheme

The ULEZ was first introduced in central London in April 2019, replacing the first emissions control scheme, the Toxicity Charge (T-charge). T-charge was an emissions surcharge in Congestion Charge Zone (CCZ) introduced in October 2017. This operated Monday to Friday from 7am – 6pm and mandated a £10 T-Charge on top of the Congestion Charge for motorists driving a pre-Euro 4 vehicle in central London.

[8] https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf

[9] https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

[10] https://www.london.gov.uk/sites/default/files/health_strategy_2018_low_res_fa1.pdf

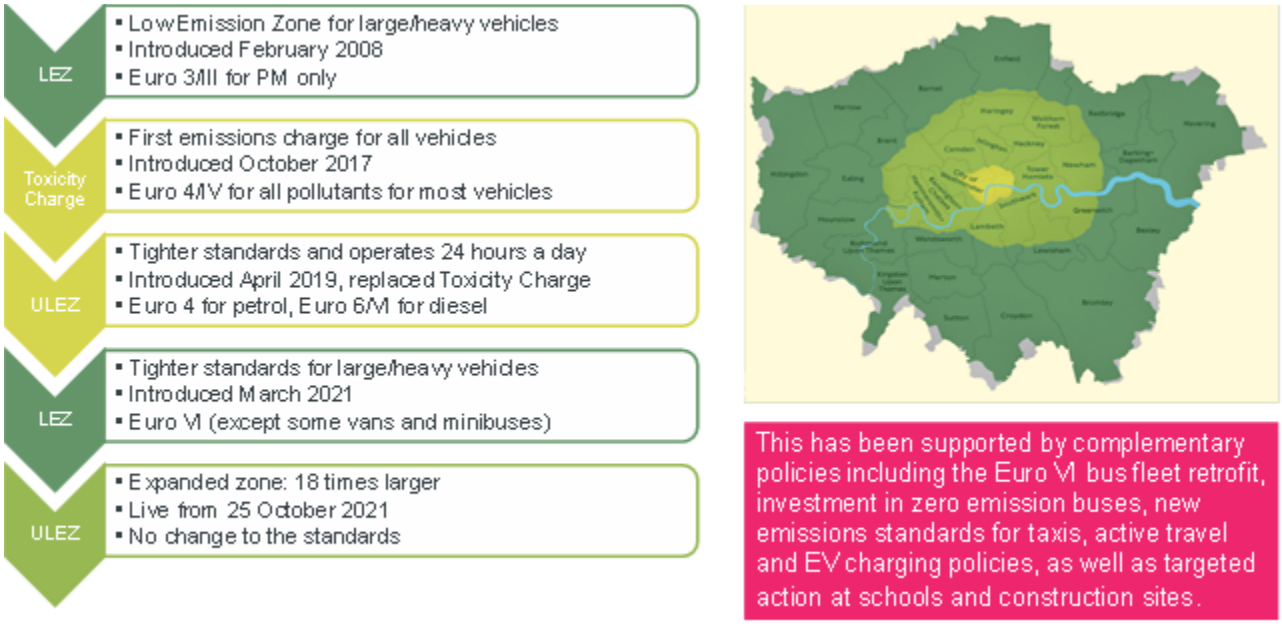
[11] https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf

From when it was first introduced in April 2019 until October 2021, the ULEZ also had the same central London boundary as the CCZ. In October 2021 it was extended to inner London to cover all areas within, but not including the North Circular (A406) and South Circular (A205) roads. The ULEZ operates 24 hours a day, 7 days a week, every day of the year, except Christmas Day.

London has operated a London-wide Low Emission Zone (LEZ) which applies to the most polluting heavy diesel vehicles since 2008. From 1 March 2021 the LEZ standard was tightened to Euro VI for HGVs, buses, coaches and other specialist vehicles. Vehicles that do not meet this standard face a charge of £100 per day. Vehicles that do not meet the previous (pre-2021) Euro IV standards are charged £300 per day. Lorries, vans, or specialist heavy vehicles (over 3.5 tonnes) and buses, minibuses, and coaches (over 5 tonnes) do not need to pay the ULEZ charge.

Figure 2-1 shows the respective boundaries of the T-Charge, LEZ, the original central London ULEZ and the ULEZ expansion to inner London which has been in place since October 2021.

Figure 2-1: Evolution of LEZ and ULEZ

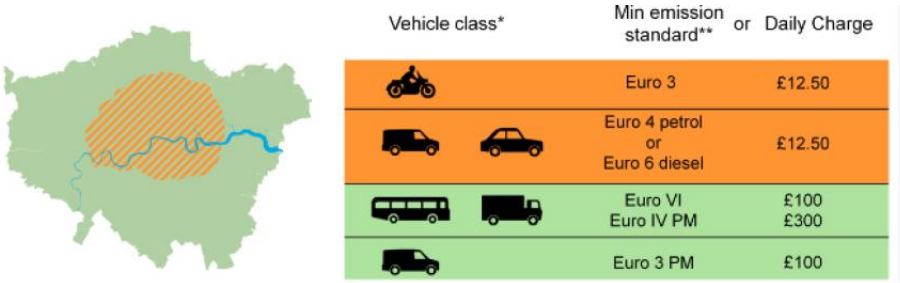


Cars, motorcycles, vans and other specialist vehicles (up to and including 3.5 tonnes) and minibuses (up to and including 5 tonnes) must meet the following minimum exhaust emission standards to travel within the zone or they are required to pay a daily ULEZ charge of £12.50:

- Euro 3 (NO_x) for motorcycles, mopeds, motorised tricycles and quadricycles
- Euro 4 (NO_x) for petrol cars, vans and other specialist vehicles (up to and including 3.5 tonnes gross vehicle weight (GVW)) and minibuses (up to and including 5 tonnes GVW)
- Euro 6 (NO_x and PM) for diesel cars, vans and other specialist vehicles (up to and including 3.5 tonnes) and minibuses (up to and including 5 tonnes GVW)

The current ULEZ and LEZ standards and associated charges for non-compliant vehicles are summarised in **Figure** .

Figure 2-2: ULEZ and LEZ Emissions Standards



** Vehicle Class is Illustrative only – other specialist vehicles are also affected*

*** Emission standard refers to NOx and PM unless specified*

Note: Orange = ULEZ; Green = LEZ

There is a range of discounts and exemptions which apply to the current inner London ULEZ, these are summarised in Table 2-1.

Table 2-1: ULEZ Discounts and Exemptions

- All vehicles that have a historic vehicle tax class are exempt from the ULEZ. This tax class excludes any vehicle used commercially (for example, coffee vans or street food vans). Vehicles constructed before 1 January 1973 are also exempt, regardless of whether used for commercial purposes
- Vehicles used by disabled people that are exempt from vehicle tax and have a 'disabled' or 'disabled passenger' taxation class until 26 October 2025. Disabled people over state pension age whose vehicle does not have disabled tax class can apply directly to TfL for this grace period if they are in receipt of Attendance Allowance and hold a Blue Badge
- Not-for-profit organisations that operate minibuses used for community transport can register for a temporary 100 per cent discount of the ULEZ charge until 29 October 2023
- TfL-licenced taxis, subject to progressively reduced age limits for Euro 3, 4, and 5 diesel vehicles. The final age limit will be 12 years, effective from 1 November 2022
- Private Hire Vehicles (PHVs) designated as wheelchair accessible vehicles fulfilling a private hire booking (until 26 October 2025)
- 100 per cent discount for some Showman's vehicles[12]

In addition, National Health Service (NHS) patients travelling in a vehicle that does not meet the ULEZ standards may be eligible to claim reimbursement of a daily ULEZ charge when travelling to a medical appointment, relating to establishing a diagnosis or to treatment provided if the patient:

i. has a compromised immune system or requires regular therapy, assessment or recurrent surgical intervention; and is clinically assessed as too ill, weak or disabled to travel to an appointment on public transport or
ii. is clinically assessed, in accordance with the advice of NHS for the time being applicable, as being at high or moderate risk from COVID-19[13]

[12] Further information on eligibility for discounts and exemptions can be found at: https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/discounts-and-exemptions

[13] The Mayor will consult on the following text to replace clause (ii) with 'during an epidemic or pandemic prevalent in Greater London, is clinically assessed as being too vulnerable to infection to travel to an appointment on public transport'.

2.3 The case for change

TfL's own analysis of the impacts of the central London ULEZ demonstrates the change in air quality over the first 10 months following its introduction (i.e. prior to the pandemic) which included the following changes in in the zone[14]:

- 44 per cent reduction in nitrogen dioxide (NO_2) concentrations
- 27per cent reduction in fine particulate matter ($PM_{2.5}$) concentrations
- 6 per cent reduction in carbon dioxide (CO_2) emissions

Between February 2017 and January 2020, on an average day there was a 71 per cent reduction in the number of older more polluting vehicles detected in the zone.

In the first month of operation of the ULEZ expansion (to the North and South Circular Roads) in 2021 there was 91 per cent compliance with vehicle standards, and the combined impact of the ULEZ expansion and tightened LEZ, is expected to reduce NO_x emissions by 30 per cent in its first year (by October 2022). As a result, Greater London is now on track to meet legal air quality limits for NO_2 by 2025 at the latest.

Levels of air pollution are lower in outer London than in inner London. However, traffic volumes have grown in outer London over the past two years and the greatest number of life years lost to air pollution in 2019 were in outer London boroughs. This reflects, at least in part, the higher proportion of older people, who are more vulnerable in outer London. Compared with inner London, outer London also has a higher proportion of children who are also vulnerable to the effects of poor air quality.

Furthermore, even though Greater London is now on track to meet the minimum limits set out in law for NO_2 by 2025, the state of scientific research and thinking in this area has moved on. In 2021, the WHO updated its recommended guidelines for air pollutants. For NO_2 the WHO tightened the recommended annual average guideline to 10 $\mu g/m^3$ (the previous WHO guideline was 40 $\mu g/m^3$ which is also the legal annual average limit). For $PM_{2.5}$ it tightened the recommended annual average guideline to 5 $\mu g/m^3$, while retaining 10 $\mu g/m^3$ as its lowest Interim Target, which the Mayor of London has committed to meet by 2030 (the legal annual average limit is 20 $\mu g/m^3$). All Londoners live in areas exceeding the newly revised WHO recommended guideline for $PM_{2.5}$

London continues to face a triple challenge of improving air quality for all Londoners, reducing carbon emissions and cutting congestion.

A report published in February 2022 by Element Energy and commissioned by the Mayor of London set out the scale of the action that would be required to move London towards a greener future and net zero carbon emissions by 2030.

To achieve these goals one of the key measures would have to be a new kind of RUC system implemented by the end of the decade at the latest. Such a system could replace all existing road user charges – such as the Congestion Charge and the ULEZ - with a simple and fair scheme where drivers pay per mile, with different rates depending on how polluting vehicles are, distance driven, and location of journeys made.

The Mayor recognises that London could benefit from more sophisticated types of technology to introduce this type of scheme and has therefore asked Transport for London to start exploring how it could be developed, for implementation later. However, there are meaningful steps that can be taken now, in the interim, before such a scheme is able to come online. One of those is the proposed expansion of ULEZ.

Given the urgency of the climate crisis, and the damaging impact of toxic air pollution on Londoner's health, the Mayor believes that real gains and progress can be made now and is therefore proposing a further

[14] Transport for London (2020) Central London Low Emission Zone – Ten Month Report, April 2020 https://www.london.gov.uk/sites/default/files/ulez_ten_month_evaluation_report_23_april_2020.pdf

expansion of the ULEZ to encourage Londoners, and those who drive within London, to shift from polluting cars to cleaner vehicles, public transport, and sustainable active travel, such as walking and cycling.

2.4 Alternatives considered

The Mayor has considered a range of alternatives, presented to him by TfL, that could be taken forward to consultation. These include:

- Extending the ULEZ to cover almost all the whole of Greater London
- Implementing a low-level daily Clean Air Charge for all but the cleanest vehicles
- A combined ULEZ expansion and Clean Air Charge
- Introducing a Greater London Boundary Charge for vehicles driving into London

A preliminary assessment of the potential of the four approaches was undertaken to understand their impacts, including impacts on air quality, traffic volumes and CO_2 emissions

The Mayor considered the benefits and drawbacks of each of the four approaches and concluded that the proposal for a London-wide ULEZ in 2023 was the optimal approach to develop further and take to public and stakeholder consultation due to its higher impact on emissions whilst limiting the number of people impacted by the charge.

2.5 Description of proposals for consultation

The Mayor's preferred option for consultation is to expand the ULEZ in out London to the London LEZ boundary in 2023 so it applies London Wide. Figure 2-2 shows the existing ULEZ and LEZ boundaries and the proposed expanded ULEZ boundary.

Therefore, this impact assessment is focused on the expansion of the ULEZ London-wide (hereafter referred to as 'the Proposed Scheme'). The Proposed Scheme comprises:

- Expansion of the ULEZ to the wider outer London area (to the boundary of the LEZ, 96 per cent of Greater London)
- Charge level of £12.50 per day for vehicles not compliant with ULEZ standards (a continuation of the charge level currently applied to the existing inner London ULEZ)
- The same operating times as the existing ULEZ – 24 hours a day (midnight to midnight), seven days a week, every day except Christmas Day
- Identical emissions standards as the existing ULEZ
- Removal of the annual £10 per vehicle Auto Pay registration fee
- Increase in the Penalty Charge (from £160 to £180) for failure to pay the ULEZ charge. Drivers may be issued with a Penalty Charge Notice (PCN) if:
  - Their vehicle does not meet the ULEZ standards, and they are not exempt or registered for a 100% discount
  - The vehicle does not meet the ULEZ standards, and the driver has not paid the correct charge by midnight on the third charging day after travelling in the zone
  - The driver paid the charge for an incorrect number plate (vehicle registration mark) or incorrect day of travel
  - The driver paid by post less than 10 days before the date of travel

The proposals to remove the annual £10 Auto Pay registration fee per vehicle and to increase the Penalty Charge levels also apply to the Congestion Charge scheme, with the proposal to remove the annual £10 Auto Pay vehicle registration fee also applying to the LEZ. The equality and economic impacts of these changes in relation to the Congestion Charge and LEZ are being considered separately by TfL and a cross-reference to this assessment will be made in the Final ULEZ IIA Report.

The Mayor has made a commitment to help charities, small businesses, disabled people, and Londoners on lower incomes adapt to the potential London-wide ULEZ. Upon the introduction of the Proposed Scheme, TfL propose to extend the existing grace periods (100 per discount) which would apply from expansion launch to:

- Disabled and disabled passenger vehicle tax class vehicles by 2 years from October 2025 until October 2027
- Wheelchair accessible private hire vehicles (WAV PHVs), fulfilling a private hire booking, by 2 years from October 2025 until October 2027
- Community minibuses for 2 years from October 2023 until October 2025

These grace periods will apply on a London-wide basis to the dates stated, so that those currently benefitting from them under the existing inner London ULEZ scheme effectively obtain an extension.

For the purposes of this assessment, it is assumed that the other discounts, reimbursements and exemptions listed in Table 2.1 have remained applicable and have been considered in terms of how they may contribute towards the mitigation of potential impacts.

For the London-wide ULEZ proposal the Mayor is considering a large-scale and targeted vehicle scrappage scheme to support Londoners, including, for example, those on low incomes, disabled people, charities and businesses[15].

The IIA has considered whether any further measures would be helpful to mitigate identified negative impacts or enhance positive impacts.

The remainder of this report uses the following terms to refer to the existing ULEZ and the proposed expansion:

i. **Existing ULEZ**: the scheme currently in operation including the central London ULEZ introduced in 2019 and the subsequent extension to the North and South Circular roads introduced in 2021
ii. **Proposed Scheme (London-wide ULEZ)**: the proposed expansion of the ULEZ to the LEZ boundary and the associated changes to Auto Pay and Penalty Charges, which are the subject of this IIA
iii. **ULEZ expansion area**: the additional geographical area that would be covered by ULEZ because of the Proposed Scheme

[15] It is assumed that eligibility for a new ULEZ scrappage scheme would be limited to residents of and businesses operating in Greater London.

3. Approach to the IIA

3.1 Overview of the IIA Process

An integrated assessment needs to be undertaken within a coherent assessment framework, which enables the interdependencies between the different assessments to be identified and addressed. In this section we set out our overarching approach to the IIA, in terms of the framework to be employed.

An IIA provides an integrated assessment of the potential impacts and identification of mitigation measures and interventions to ameliorate any negative impacts and enhance beneficial impacts of the Proposed Scheme. This IIA comprises the following assessments:

- Environmental Assessment (EA)
- Equalities Impact Assessment (EQIA)
- Health Impact Assessment (HIA)
- Economic and Business Impact Assessment (EBIA)

A single assessment framework is employed to allow all impacts to be assessed together, rather than individually.

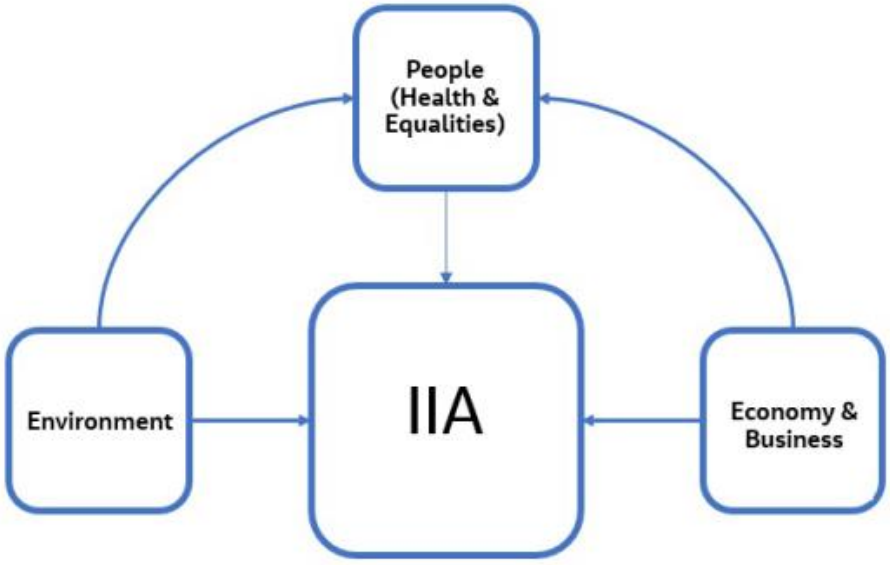


Figure 3-1: Relationship between IIA components

3.2 IIA Framework and Methodology

3.2.1 IIA Framework and Scope

The IIA framework is objective-led, with the starting point being the IIA objectives employed for the assessment of the original central London ULEZ scheme in 2019 and its subsequent expansion in 2021. These objectives have been reviewed in the context of:

- Their applicability/relevance to the significantly expanded geographical scope of the Proposed Scheme
- The IIA framework used to assess the MTS (2018)

Given the nature of the Proposed Scheme, it is considered that a small number of changes to the previous ULEZ IIA Framework objectives would be beneficial to better reflect relevant policy commitments by the Mayor as

well as the economic context of outer London (compared with central and inner London). These changes (highlighted in red text in Table 2-2) comprise:

- The explicit acknowledgment of the reduction of health inequalities within the health objective
- The explicit acknowledgement of the target to achieve net zero carbon emissions by 2050 in the climate objective[16]
- The replacement of 'enhance' with 'advance' in the Equality and Inclusion objective to reflect the wording used in the Public Sector Equality Duty in relation to equality of opportunity
- The replacement of the economic objective 'To provide an environment which will help to attract and retain internationally mobile businesses' which is not considered directly applicable to London and adjacent areas, with a new objective: 'To promote the vitality and viability of London's varied town centres'

The full list of proposed IIA objectives and associated topics for the Proposed Scheme are provided in Table 3-1.

Table 3-1: Proposed IIA Topics and Objectives

IIA Topic	Proposed IIA Objective	Scoped In/Out
Environment		
Air quality	To contribute to a reduction in air pollutant emissions, exposure to air pollution and compliance with legal limits To reduce emissions and concentrations of harmful atmospheric pollutants, particularly in areas of poorest air quality and reduce levels of exposure experienced by more vulnerable and disadvantaged groups.	In
Carbon	To help tackle climate change through reducing greenhouse gas emissions and moving towards a zero carbon London by 2050	In
Noise	To reduce disturbance from general traffic noise.	Out
Historic Environment	To protect and enhance historic, archaeological, and socio-cultural environments	In
Materials and Waste	To promote sustainable resource use and waste management	In
Natural Capital and Natural Environment	To protect and enhance the natural environmental incl. biodiversity, flora and fauna	In
Design	To protect and enhance built environment and streetscape	In
People		
Health and health inequalities	To contribute to enhanced health and wellbeing for all within London and reduce health inequalities across the city and between communities.	In
Accessibility	To maximise accessibility for all and maintain connectivity in and around London and enable sustainable transport choices, including walking and cycling.	In
Protected Characteristics and Deprivation (Equality and Inclusion)	To advance equality and social inclusion	In

[16] The IIA acknowledges the Mayor's ambition to achieve net zero by 2030, but as this is not embedded in the MTS, it would be premature to include this as an objective for the IIA.

IIA Topic	Proposed IIA Objective	Scoped In/Out
Safety and Crime	To provide affordable and safe transport choices for all.	In
Economy		
Employment	To support the growth and creation of businesses in outer London, including small to medium sized enterprises (SMEs)	In
London's wider economy	To promote the vitality and viability of London's varied town centres.	In

Noise

To have a noticeable, or perceptible effect on noise levels, the volume of road traffic must either increase by a minimum of 25 per cent, or decrease by 20 per cent (Highways Agency, 2011). This would equate to a noise change of 1dB in the short term (i.e. upon scheme opening). Changes in traffic speed or the proportion of HGVs along the routes may also cause a 1dB, or perceptible, change in noise level. The implementation of the Proposed Scheme is not expected to significantly alter the vehicle kilometres travelled, the total number of vehicles or the speed of vehicles within the zone. Consequently, noise levels within the zone are not expected to be affected by the introduction of the scheme.

Furthermore, the anticipated change in vehicle fleet composition is considered to have negligible effect on noise, given the high levels of compliance (assumed to be over 90 per cent when the Proposed Scheme is scheduled to launch).

Also given the fact that HGVs are already subject to the London-wide LEZ and would not therefore be impacted by the Proposed Scheme then no impact on noise is anticipated and on this basis the noise topic is scoped out of the IIA.

Vehicle Types

The scope of the assessment includes all vehicles which would be subject to the ULEZ standards. This includes private cars, light goods vehicles (LGVs) up to 3.5 tonnes, powered two-wheelers, PHVs and minibuses.

TfL licenced taxis are scoped out of the assessment by virtue of their exemption from the charge. Heavy goods vehicles (over 3.5 tonnes), including buses (TfL and non-TfL licenced) and coaches are already subject to the LEZ standards London-wide and the Proposed Scheme would not change these standards. Therefore, these vehicle types are also scoped out of the assessment.

Study Area

The primary study area for the assessment is the ULEZ expansion area (the area between the existing inner London ULEZ and the LEZ boundary) and areas adjacent to Greater London. However, the assessment of air quality related impacts is limited to the area covered by the LAEI which includes Greater London (the 32 London boroughs and the City of London), as well as areas outside Greater London up to the M25 Motorway.

3.2.1.1 Determining scale and rating of impacts

Each of the four assessments (Economic, Health, Equality and Environment) identify impacts against the relevant IIA objectives as short and medium term:

- Short term – year 1 (2023) of operation
- Medium term – from year 2 (2024) to year 4 (2026), which is assumed to be the duration of the scheme
- Long term – not applicable on the assumption that the Mayor is investigating how TfL could replace the ULEZ with a 'smarter' road charging scheme within this timeframe

Overall impacts are determined against two assessment parameters: breadth (scale and distribution) and sensitivity:

- Scale: the extent to which London's environment, people, and economy could be impacted (positively or negatively) by the proposals considering the numbers/proportion that would experience the impact within the area of assessment. Where quantitative data is not available this is based on judgement
- Sensitivity: this considers how the receptors (e.g., people, environmental assets, or economic sectors) impacted can accommodate the impact; whether they are able to absorb or adapt to the Proposed Scheme where negatively impacted. If the impacted receptor group has no alternatives and, as such, would be greatly impacted by the proposal, then it is sensitive to the change. Where they can continue to function as normal, sensitivity would be low

Table 3-2 sets out how the sensitivity and the scale of impact interact to determine the overall impact rating.

Table 3-2: Impact rating matrix

		Scale of Impact			
		No Change /Negligible	Low	Medium	High
Sensitivity of Group	High	Neutral	Minor or moderate	Moderate or major	Major
	Medium	Neutral	Minor	Moderate	Moderate or major
	Low	Neutral	Neutral or minor	Minor or moderate	Minor or moderate

The overall impact is expressed on a rating from -3 to +3 (Table 3-). The impact rating is assessed taking account of mitigation measures committed to by TfL, such as the exemptions, discounts and reimbursements (including the extensions to the grace periods noted above). Duration is reported as a separate parameter.

Detailed methodologies for the individual assessments (Environment, Economy and Business, Health and Equality) are provided in Appendix B.

Table 3-3: Scale and Rating of Impacts

Scale of Overall Impact	+3	+2	+1	0	-1	-2	-3
Rating	Major Positive	Moderate positive	Minor positive	Neutral	Minor negative	Moderate negative	Major negative

3.2.1.2 Traffic Forecasts

The assessment is informed by strategic traffic modelling undertaken by TfL to compare the situation with and without the Proposed Scheme. Model of Travel in London (MoTiON) is a multi-modal strategic transport model of London and the surrounding area. MoTiON can model how many trips there are likely to be, their origins and destinations and their modes of transport.

For use in this IIA, MoTiON has a base year of 2016 and a reference (future) year of 2023 (the implementation year). Observed data for 2019 is also used to inform the assessment where relevant. TfL analysis of forecast vehicle compliance with and without the ULEZ standards is an input into the model and individual vehicle routing decisions and congestion are determined by London Highway Assignment Model (LoHAM). All model runs are based on a £12.50 daily charge. The model outputs from both 2023 model runs (i.e. with and without the Proposed Scheme) comprise traffic demand, road traffic emissions and air quality concentrations. These outputs inform the following assessments:

- Air Quality, Climate Change, Biodiversity and Health – modelled change in emissions and concentrations.
- Town centres – change in volume of shopping/leisure trips within/into the extended ULEZ area
- Outer London businesses – changes in volume of business trips and commuting
- Active Travel – changes in mode of transport (from private vehicle to other modes)
- Social Inclusion - reduction in journey numbers (by trip purpose)

The proposed changes to the Auto Pay registration fee and the Penalty Charge for non-payment are not included in the model. The impacts of these are assessed separately.

The geographic scope of individual impact assessments varies depending on the nature of the impact. This is outlined in the individual method statements in Appendix B. Where it is available and applicable, monitoring, evaluation and experience from the existing ULEZ scheme has informed the assessment – considering the differences in geographic, economic and socio-demographic context.

3.2.1.3 Cumulative impacts

The IIA has considered the likelihood of cumulative impacts on the environment, economy, or people from other RUC schemes (in operation or with formal approval to proceed) in combination with the Proposed Scheme. The following schemes have been considered:

- **Congestion Charge** - any driver passing through the CCZ would already have to pay the existing ULEZ charge if they had a non-compliant vehicle
- **Existing ULEZ** – the introduction of the Proposed Scheme will only require a single daily payment by drivers of non-compliant vehicles. i.e. the charge will be paid only once irrespective of which part of London is driven within or through
- **Low Emission Zone** – already applies across most of Greater London, so there will be no additional charge for lorries or specialist heavy vehicles which are not required to pay the ULEZ charge. A small number of vans (N1 class 2 or 3) and minibuses (M2) which are pre-Euro 3 would need to pay both the LEZ and ULEZ charges. Those which are Euro 3, 4 or 5 will only need to pay the ULEZ charge

The Silvertown Tunnel is expected to open in 2025. Once the new Silvertown Tunnel opens, drivers will have to pay a charge for using either the Blackwall or Silvertown Tunnels. The exact level of charge is yet to be determined. As the RUC scheme falls within the existing ULEZ boundary there will be no cumulative impacts arising from the proposed expansion of ULEZ London-wide.

The **Heathrow drop off charge,** introduced on 1 November 2021 has also been considered. This is a £5 charge for all vehicles (except TfL licenced taxis) entering the airport terminal drop-off areas. The charge was made applicable to TfL licenced taxis from 1 April 2022. Employees of Heathrow have a 1-year grace period. After this grace period ends, it is likely that employees driving to work (or lift sharing) will go to the staff car park and use staff shuttle buses from there.

All passengers arriving by car or PHV/taxi have the option to be dropped off in long stay car parks and use the free shuttle buses to access the terminals. Taking account of the alternative opportunities for arriving at the airport by car, PHV or taxi without incurring the charge, as well as the 100 per cent discount for blue badge holders at Heathrow, it is not considered that this would have a cumulative impact.

In conclusion it is not considered that any cumulative impacts are likely to result from the implementation of the Proposed Scheme alongside other existing or planned road user charging schemes.

3.3 Stakeholder Engagement

A series of six thematic IIA stakeholder workshops have been held with stakeholders to explore anticipated impacts of the Proposed Scheme and potential mitigation/enhancement measures, including for example amendments to the existing discount and exemptions. The six themed workshops addressed:

- Business and Economy
- Environment
- Health
- Equality
- Taxis and PHVs
- London boroughs

In addition, a separate discussion was held with members of TfL's Independent Disability Advisory Group (IDAG).

All workshops were held online using Microsoft Teams. A full list of the organisations invited, those that attended, and a summary of the key points raised is included as Appendix C. Some of these organisations subsequently provided additional information via email which has informed the IIA.

Key points raised by stakeholders in the Business and Economics workshop:

- It was highlighted by some organisations that the ULEZ extension has resulted in a reduction of trips to inner London. However, other organisations highlighted that the high compliance with the recent ULEZ extension (October 2021) means that traffic levels are not reducing as much as anticipated, and congestion issues remain
- It was recognised that good public transport is essential and concerns that high compliance is not providing the forecast revenues for TfL to deliver these improvements
- Concerns over public transport accessibility in outer London, particularly orbital routes
- Concern that vehicle fleets will not be able to be upgraded in time, with the proposed extension approximately a year away. Reasons given include a lack of supply vehicles, shortage of charging infrastructure and cost of investing in ULEZ compliant vehicles
- It was noted that liaison with local authorities outside Greater London would be beneficial. The benefits of ULEZ should be promoted widely
- It was suggested that extension of the scrappage scheme outside of Greater London, to neighbouring authorities who will be affected, should be considered

Key points raised by stakeholders in the Environment IIA workshop:

- It was noted that the ULEZ has minimal impact on vehicle kilometres, noting Mayor of London's desire to see a 27 per cent reduction

- There is a concern over the 2030 Net Zero target and the slowness in reaching this goal and calls for acceleration of a Zero Emissions City
- The ULEZ does not go far enough in phasing out diesel vehicles and there is a need to reduce the number of diesel cars. It was noted that the emissions standards were set in 2014 and that this should be reviewed as newer vehicles, particularly diesel, still create negative impacts and emit pollutants
- The ULEZ consultation should be publicised widely, including outside the Greater London boundary. This will enable a wide range of views to be heard
- If the M25 is to be used as an alternative there may be the potential for worsening of congestion at junctions if vehicles divert
- It was recommended that further TfL engagement be undertaken with strategic transport bodies surrounding Greater London

Key points raised by stakeholders in the Equalities workshop:

- Public transport is not fully accessible, and this is a particular issue in outer London. It was also highlighted that there is poor access from east to west of the city by public transport, with private car being the only viable option for some trips. Dial-a-ride and taxi card were noted as potential solutions, though these are only available for leisure/social trips rather than journeys to work
- It was suggested that distance-based road user charging should be prioritised as a fair method of charging
- There are a range of specialist services in outer London (e.g. Stanmore Hospital) which are accessed by people from outside Greater London. In addition, it was highlighted that patient transport often has excessive wait times, and therefore people opt to drive to appointments. The use of private car to access hospital appointments gives independence to many younger disabled people
- Concerns were raised that the previous ULEZ scrappage scheme grant of £2,000 did not cover the cost of buying a compliant vehicle. It was also highlighted that many people did not know about the scrappage scheme and have missed out previously
- Concerns were raised over the financial implications of ULEZ, specifically for disabled people and in light of the cost of living crisis
- Concerns were raised around potential for LGBT+ people feeling as though they are forced onto public transport in outer London. LGBT+ members may have feelings of discomfort or feel unsafe, particularly at night
- Request for Blue Badge exemption from ULEZ charges. Congestion Charge has exemption for two vehicles per day for Blue Badge holders, who can nominate vehicles used by carers

Key points raised by stakeholders in the Health workshop:

- Health improvements have been seen in London because of better air quality from interventions such as the ULEZ. Whilst tangible changes have been delivered, it was also noted that far more can be done
- Domiciliary care providers were negatively impacted by the ULEZ. It was noted that the domiciliary care sector requires a (low paid) mobile workforce who undertake site visits by car to patients. This sector is already labour constrained. Outer London has a larger older population, and the carers operating in these areas are more likely to be impacted which may in turn affect the service users
- Questions were raised as to whether TfL services have capacity for uplift in passengers
- Concerns were raised around electric vehicle access due to high costs and barriers such as charging. In addition, it was also noted that there is no standardised mileage/ULEZ reimbursement allowance in the care sector, as this varies by care provider
- There are road safety issues in outer London and improvements to infrastructure such as new cycle lanes to promote active travel is required, as in some locations this is a barrier to uptake
- It was noted that regular cross-boundary trips are required for care visits. Discounts and exemptions for care workers to mitigate financial impacts, and knock-on effects for service users, was requested Exemptions for carers should be simple and accessible

Key points raised by stakeholders in the London boroughs workshop:

- Further extension will help with the active travel agenda, especially in Low Traffic Neighbourhoods (LTNs)
- Concerns regarding public transport in outer London were raised. It was noted that a lot of traffic is radial and that that radial public transport is poor, particularly in outer London
- Improvements to public transport in outer London are needed for it to be considered as a viable alternative to the car. It was suggested that revenues be reinvested into public transport
- There may be an impact on the low-paid who would have to make daily cross-boundary journeys from outside of London into the expanded ULEZ
- There is a need to engage with local authorities outside of the Greater London boundary, especially those with major employment centres (E.g. NHS hospitals)

- The expansion of ULEZ will make travelling for disabled people unaffordable, resulting in perfectly good vehicles being scrapped with no means of replacing them
- It was noted that the grace period for charity minibuses runs out in October 2023, and feedback indicates that charities are finding it difficult to fund vehicle upgrades
- Concern raised that previous ULEZ scrappage scheme fund ran out quickly
- There was concern that it is unlikely there will be any scrappage schemes or mitigation outside of the Greater London boundary
- The current ULEZ is not considered to be effective enough, and concerns were raised regarding the speed of a future roll out. Why will it take so long to adopt a more sophisticated road user charging scheme, for example based on distance travelled?
- It was noted that EVs are driven on average 30 per cent more than Internal Combustion Engine (ICE) vehicles. With the increase in electric vehicles, concerns were raised regarding the likely increase in vehicle kilometres and increased congestion
- There are concerns as to whether businesses, particularly industrial, will relocate so as not to be impacted by the ULEZ scheme

Key points raised by stakeholders in the Taxi and Private hire workshop:

- Concerns regarding the impact to older people raised specifically, and how they may be isolated by charges, especially as they are more likely to have an older non-compliant vehicle
- Affordability of vehicle upgrades is an issue and there is a concern surrounding the high cost of electric vehicles
- There are issues with existing Electric Vehicle (EV) charging infrastructure. It was also highlighted that the cost of electricity is more than the petrol/diesel equivalent in some places
- There is a particular impact on self-employed contractors who have been financially hit by charges as they pay the charge, not the business they are contracted to
- Those outside of London may not be aware of plans and may only find out once the scheme is launched and they are charged
- It was highlighted that private hire vehicles can build in additional charges into their fares and that taxis cannot. This reduces their profit if they must pay several charges (e.g. Heathrow charge and ULEZ if they are from outside London)

4. Forecast changes to travel demand

4.1 Introduction

To understand the potential impact that the Proposed Scheme would have on travel patterns, TfL has undertaken analysis using outputs from MoTiON. The impacts have been assessed by comparing two forecast scenarios:

- The 2023 reference case representing the current ULEZ scheme
- The 2023 Proposed Scheme (expanded ULEZ) forecast scenario

The analysis has focused on the impacts of trips starting and ending within the ULEZ expansion area and trips entering the ULEZ expansion area from outside Greater London as this is the study area defined for this assessment. Further information on London-wide figures is available in the TfL consultation report 'Our proposals to help improve air quality, tackle the climate emergency, and reduce congestion'. Table 4- presents the vehicle compliance assumptions used in the analysis as well as reference to the London-wide figures.

Table 4-1. TfL vehicle compliance rate assumptions, outer London, 2023 reference case

Vehicle type	Overall compliance, outer London, 2023	Overall compliance, London-wide 2023
Private Cars	91%	92%
PHV	97%	98%
LGV	82%	85%

This section of the report summarises the key outputs from this analysis to provide a basis for the subsequent impact assessment.

It is worth noting that the impacts presented here are based on a scenario that assumes travel behaviour has broadly returned to a pre-pandemic situation and compliance rate as set out in **Table 4-** is achieved. Further work has been undertaken by TfL to try and account for the range of uncertainty including different compliance paths (e.g. higher and lower pre-compliance and when the final compliance rate is achieved). An alternative scenario has also been modelled where travel behaviour is different to a pre-pandemic situation (e.g. longer lasting impacts from the pandemic such as more remote working).

4.2 Private Motor Vehicles

Table 4 shows the daily number of trips by private car into the area covered by the Proposed Scheme in 2023 and the forecast change in trips following its implementation, by journey purpose.

Table 4-2. Daily private car trips to outer London in 2023

	Baseline 24hr Total	Baseline - Compliant	Baseline - Non Compliant	Absolute impact of Proposed Scheme - Total	% impact of Proposed Scheme Total
Business: outer to outer	298,000	270,000	28,000	-13,000	-4.2%
Business: Outside Greater London to outer London	92,000	83,000	9,000	400	-0.4%
Commute: outer to outer	559,000	507,000	53,000	-9,000	-1.7%
Commute: Outside Greater London to outer London	188,000	171,000	18,000	-3,000	-1.6%
Shopping: outer to outer	436,000	395,000	41,000	-28,000	-6.4%
Shopping: Outside Greater London to outer London	42,000	38,000	4,000	-3,000	-8.1%
Education, Escort, Other: Outer to Outer	1,872,000	1,695,000	176,000	-111,000	-5.9%
Education, Escort, Other: Outside Greater London to	277,000	251,000	26,000	-13,000	-4.7%

outer London					
Total: Outer to Outer	3,166,000	2,868,000	298,000	-161,000	-5.1%
Total: Outside Greater London to outer London	599,000	543,000	56,000	-20,000	-3.3%

The forecast impact is a 5.1 per cent reduction in car trips entirely within outer London and 3.3 per cent reduction in car trips entering outer London from outside Greater London. For comparison this equates to a 1.7 per cent reduction in car trips across Greater London. The greatest proportional reduction is in shopping trips entering outer London from outside Greater London (-8.1 per cent). The greatest absolute reduction is in education, escort or other purposes trips entirely within outer London (-111,000). Business trips into the expansion area reduce by the smallest proportion (-0.4 per cent).

The following tables provide an indication of the distribution of car trips entering outer London from outside Greater London. Table 4-3 and Table 4-4 resent the borough-level movements with the highest numbers of daily entries to outer London from outside Greater London, by business, commute, shopping and other journey purposes respectively.

Table 4-3. 2023 car trips to outer London from outside Greater London under the existing ULEZ and with the Proposed Scheme - Business

Rank	Origin	Destination	Trips - ULEZ	Trips – Proposed Scheme	% change
1	Essex	Havering	3,800	3,800	-0.8%
2	Herts	Barnet	3,200	3,100	-1.3%
3	Kent	Bexley	3,000	3,000	-1.3%
4	Surrey	Croydon	2,900	2,900	-0.9%
5	Surrey	Hounslow	2,800	2,800	-1.7%
6	Kent	Bromley	2,700	2,700	0.0%
7	Bucks	Hillingdon	2,600	2,600	-1.1%
8	Surrey	Sutton	2,500	2,500	-0.6%
9	Surrey	Kingston	2,200	2,100	-1.9%
10	Herts	Hillingdon	2,100	2,100	-1.4%

Table 4-4. 2023 Car trips to outer London from outside Greater London, under the existing ULEZ and with the Proposed Scheme – Other

Rank	Origin	Destination	Trips - ULEZ	Trips – Proposed Scheme	% change
1	Essex	Havering	20,500	19,800	-3.6%
2	Kent	Bexley	16,900	16,100	-5.0%
3	Herts	Barnet	14,400	13,700	-5.1%
4	Surrey	Kingston	14,000	13,200	-5.4%
5	Surrey	Croydon	12,400	11,900	-4.0%
6	Surrey	Sutton	12,000	11,400	-4.9%
7	Herts	Harrow	11,700	11,000	-5.8%
8	Herts	Enfield	11,400	10,900	-5.0%
9	Kent	Bromley	10,700	10,300	-3.8%
10	Essex	Redbridge	9,800	9,400	-4.3%

For both business and commuter trips, the most frequently occurring combination of origin and destination is from Essex to Havering. Kent to Bexley accounts for the greatest proportion of shopping trips into outer London from outside Greater London. For most combinations of origins and destination, the numbers of business trips change very little with the Proposed Scheme.

4.3 LGV

The Proposed Scheme is not expected to impact the forecast numbers of LGV trips within the expansion area or into the expansion area from outside Greater London. Table 4- shows the daily number of highway trips by LGVs into outer London in 2023 under the existing ULEZ. There are a significant number of non-compliant trips, and these would have a cost for businesses under the Proposed Scheme.

Table 4-5. Daily trips by LGVs to outer London in 2023

	Baseline 24hr Total	Baseline - Compliant	Baseline - Non Compliant
Total: Outer to Outer	434,000	356,000	78,000
Total: Outside Greater London to Outer	158,000	129,000	28,000

4.4 Taxis and PHVs

Table 4 shows the daily number of highway trips by PHV into outer London in 2023 under the existing ULEZ and the forecast change in trip numbers with the Proposed Scheme in operation.

Table 4-6. Impact of Proposed Scheme on daily trips by PHVs to outer London in 2023

	Baseline 24hr Total	Baseline - Compliant	Baseline - Non-Compliant	Absolute impact of Proposed Scheme - Total	% Impact of Proposed Scheme Total
Total: Outer to Outer	122,000	119,000	3,000	2,000	1.8%
Total: Outside Greater London to Outer	8,000	8,000	0	00	1.6%

Trips by PHVs are forecast to increase by 1.8 per cent within outer London and by 1.6 per cent into outer London from outside Greater London following implementation of the Proposed Scheme. Trips to Heathrow airport are excluded from the analysis.

4.5 Public Transport (and Active Modes)

Table 4 shows the forecast daily number of public transport (rail/Underground (LU) or bus) trips into outer London in 2023 under the existing ULEZ and the change in trip numbers with the Proposed Scheme in operation.

Table 4-7. Impact of Proposed Scheme on daily trips to outer London in 2023 by bus and rail

	Baseline 24hr total - bus	Baseline 24hr total – rail/ LU	Absolute impact of Proposed Scheme - bus	Absolute impact of Proposed Scheme – rail/ LU	% Impact of Proposed Scheme - bus	% Impact of Proposed Scheme – rail/ LU
Business: Outer to Outer	97,000	52,000	1,000	1,000	0.0%	1.2%
Business: Outside Greater London to Outer	3,000	17,000	0	0	1.3%	1.3%
Commute: Outer to Outer	286,000	113,000	4,000	2,000	1.1%	1.2%
Commute: Outside Greater London to Outer	17,000	36,000	0	0	0.5%	0.6%
Shopping: Outer to Outer	326,000	16,000	8,000	0	2.5%	2.2%
Shopping: Outside Greater London to Outer	10,000	4,000	0	0	1.4%	0.4%
Education, Escort, Other: Outer to Outer	970,000	131,000	13,000	2,000	1.3%	1.3%
Education, Escort, Other: Outside Greater London to Outer	37,000	30,000	0	0	1.0%	0.4%
Total: Outer to Outer	1,680000	312,000	26,000	4,000	1.5%	1.4%
Total: Outside Greater London to Outer	56,000	82,000	1,000	1,000	1.0%	0.7%

Trips within the ULEZ expansion by bus or rail are forecast to increase by 1.5 per cent and 1.0 per cent respectively and trips into the ULEZ extension from outside Greater London by bus or rail are forecast to increase by 1.4 per cent and 0.7 per cent respectively. For comparison, London-wide this equates to an increase of 0.6 per cent of bus trips and 0.3 per cent of rail trips. The greatest proportional increases are forecast for shopping trips within the ULEZ extensions which increase by 2.5 per cent for bus and 2.2 per cent for rail.

Table 4-8 shows the daily number of walk and cycle trips into outer London in 2023 under the existing ULEZ and the impact on the number of these trips with the Proposed Scheme in operation.

Table 4-8. Impact of Proposed Scheme on daily walk and cycle trips in 2023

	Baseline 24hr total - walk	Baseline 24hr total - cycle	Absolute impact of Proposed Scheme - walk	Absolute impact of Proposed Scheme - cycle	% Impact of Proposed Scheme - walk	% Impact of Proposed Scheme - cycle
Business: Outer to Outer	68,000	16,000	1,000	0	1.2%	1.2%
Business: Outside Greater London to Outer	0	0	0	0	1.3%	1.3%
Commute: Outer to Outer	208,000	54,000	2,000	1,000	1.1%	1.2%
Commute: Outside Greater London to Outer	1,000	4,000	0	0	0.5%	0.6%
Shopping: Outer to Outer	436,000	22,000	11,000	1,000	2.5%	2.3%
Shopping: Outside Greater London to Outer	1,000	0	0	0	1.8%	2.7%
Education, Escort, Other: Outer to Outer	2,419,000	110,000	46,000	2,000	11.9%	1.55%
Education, Escort, Other: Outside Greater London to Outer	10,000	1,000	0	0	1.4%	1.00%
Total: Outer to Outer	715,000	97,000	14,000	1,000	2.00%	1.5%
Total: Outside Greater London to Outer	3,792,000	288,000	73,000	4,000	1.9%	1.5%

With the Proposed Scheme walking and cycling trips within the ULEZ expansion area are forecast to increase by 2.0 per cent and 1.5 per cent respectively. Walking and cycling trips into the ULEZ expansion area from outside Greater London are forecast to increase by 1.9 per cent and 1.5 per cent respectively. This equates to around 0.7 per cent increase in London-wide active travel trips. For both walking and cycling, the greatest absolute increases in trips are forecast for Education, Escort and Other purposes trips within outer London. The greatest proportional increases of 2.5 per cent and 2.3 per cent respectively are forecast for shopping trips within the expanded ULEZ area.

5. Environment

This section of the report presents the assessment of environmental impacts against each relevant IIA objective, which has been undertaken in accordance with the methodology set out in Appendix B.

5.1 Objective: To contribute to a reduction in air pollutant emissions, exposure to air pollution and compliance with legal limits

5.1.1 Pollutants of concern

Emissions from motor vehicle exhausts contain several air pollutants including oxides of nitrogen (NO_x) and particulate matter (PM). The quantity of each pollutant emitted depends upon the type of vehicle, quantity and type of fuel used, engine size, speed of the vehicle and emissions abatement equipment fitted. Emissions of PM also occur through the interaction of vehicle tyres with the road surface and from use of braking systems. Once emitted, the pollutants are diluted and dispersed in the ambient air.

All combustion processes produce oxides of nitrogen, for which NO_x is the collective term. Oxides of nitrogen comprise nitric oxide (NO) and nitrogen dioxide (NO_2), with the former readily converted to the latter by oxidation. NO_2 can cause inflammation of the airways and long-term exposure can affect lung function and aggravate respiratory conditions such as asthma. Since NO readily converts to NO_2, it is necessary to reduce emissions of NO_x to manage NO_2 concentrations.

PM is formed of tiny particles that can get into the lungs and blood and be transported around the body, lodging in the heart, brain and other organs. PM can have short-term health impacts over a single day when concentrations are elevated, and long-term impacts from lower-level exposure over the life course. Effects are amplified in vulnerable groups including young children, older people, and those suffering from breathing problems like asthma. PM is classified according to size, either as PM_{10} (particles of ≤10µm (micrometres) in diameter) or $PM_{2.5}$ (particles of ≤2.5µm diameter, which are 200 times smaller than a grain of sand).

5.1.2 Relevant air quality thresholds

Pollutant concentrations in the air can be measured or modelled and then compared with statutory AQOs, Limit Values and non-statutory WHO guidelines. It is important to recognise the difference between Limit Values (for which compliance is determined at a national level by Government) and AQOs (for which compliance is determined at a local level by local authorities under the Local Air Quality Management regime). Whilst AQOs and Limit Values for some pollutants are set at the same concentration value (e.g. 40 µg/m^3, as an annual mean for both NO_2 and PM_{10}), the means of determining compliance are fundamentally different.

Although WHO guidelines are not in themselves legally binding, they are quantitative health-based recommendations for air quality which can be used to inform legislation and policy. In 2021, the WHO updated its recommended guidelines for air pollutants. For $PM_{2.5}$ it tightened the recommended annual average guideline to 5 µg/m^3, while retaining 10 µg/m^3 as an Interim Target, which the Mayor of London has committed to meet by 2030 (the corresponding UK Limit Value is 20 µg/m^3). For NO_2, the WHO tightened the recommended annual average guideline to 10 µg/m^3 along with Interim Targets of 20ug/m^3 and 30ug/m^3, which are much tighter compared to (the previous WHO guideline which was 40 µg/m^3 and remains the annual average AQO / Limit Value). These changes to WHO guidelines underscore that, despite the significant progress made to-date in improving air quality within London, accelerated additional action is needed to protect human health even though in many parts of London it has been possible to achieve existing legal minimum standards.

Furthermore, following passage of the Environment Act 2021, the UK Government is currently consulting on a new legally binding Annual Mean Concentration Target for $PM_{2.5}$ of 10 µg/m^3, which is to be met across England by 2040[17]. This is much later than the 2030 date the Mayor has committed to meet.

Whilst both short term (e.g. hourly or daily mean) and long term (i.e. annual mean) air quality thresholds have been set for some air pollutants (e.g. NO_2), this assessment has focussed solely on annual mean air

[17] https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets/

quality thresholds, as it is these thresholds which are most likely to be exceeded in UK urban areas. The air quality thresholds relevant to this assessment are set out in Table 5-1.

Table 5-1. Relevant annual mean air quality thresholds

Pollutant	Annual mean air quality threshold (µg/m^3)						
	Air Quality Objective	Limit Value	WHO Interim Target [a]				WHO Guideline
			1	2	3	4	
NO_2	40	40	40	30	20	-	10
PM_{10}	40	40	70	50	30	20	15
$PM_{2.5}$	25	20	35	25	15	10	5

[a] Interim targets are defined as an air pollutant concentration associated with a specific decrease of health risk. Interim targets serve as incremental steps in the progressive reduction of air pollution towards the air quality guideline levels and are intended for use in areas where air pollution is high. In other words, they are air pollutant levels that are higher than the air quality guideline levels, but which authorities in highly polluted areas can use to develop pollution reduction policies that are achievable within realistic time frames. The interim targets should be regarded as steps towards ultimately achieving air quality guideline levels, rather than as end targets.

5.1.3 Changes in emissions of air pollutants

Changes in road traffic emissions of NO_x, by vehicle type, which are estimated to occur in 2023 because of the Proposed Scheme within central, inner, outer and Greater London and within the extents of 'non-Greater London' local authorities covered by the LAEI, respectively, are summarised in Table 5-2.

Table 5-2. Estimated changes in 2023 road traffic NO_x emissions within central, inner, outer and Greater London and relevant non-Greater London local authorities

Area	Estimated change in 2023 road traffic NO_x emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
Central London	-1,425 (-4.5%)	-55 (-0.1%)	-635 (-1.6%)	5 (<0.1%)	35 (0.1%)	-2,075 (-0.9%)
Inner London	-24,020 (-3.4%)	-500 (-0.2%)	-12,305 (-2.5%)	-260 (-0.1%)	-135 (-0.1%)	-37,220 (-2.0%)
Outer London	-238,760 (-9.5%)	675 (0.4%)	-84,190 (-6.6%)	-150 (<0.1%)	-385 (-0.1%)	-322,805 (-6.9%)
Greater London	-264,205 (-8.2%)	120 (<0.1%)	-97,130 (-5.4%)	-405 (-0.1%)	-485 (-0.1%)	-362,105 (-5.4%)
Non-Greater London [a]	-175,430 (-8.1%)	65 (0.1%)	-38,205 (-3.3%)	-5 (<0.1%)	55 (0.1%)	-213,520 (-5.5%)

SOURCE: Estimated road traffic NO_x emissions by vehicle type for major roads provided by TfL.

Note: Values presented in kilogrammes per annum in table above are rounded to the nearest 5 kilogrammes.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

The results in Table 5-2 indicate that the greatest absolute and relative changes in road traffic NO_x emissions because of the Proposed Scheme are estimated to occur in outer London, with road traffic emissions estimated to decrease by 6.9 per cent within this area (a moderate reduction). This reduction is primarily associated with reduced emissions from cars (as a result of both reductions in road traffic movements (see

Figure 5-1) and improvements to the vehicle fleet in response to the Proposed Scheme) and LGVs (as a result of improvements to the vehicle fleet in response to the Proposed Scheme). Road traffic NO_x emissions for other vehicle types are estimated to be relatively unaffected by the Proposed Scheme because either these vehicles are compliant with relevant emission standards or are assumed to pay the ULEZ charge.

Smaller reductions in road traffic NO_x emissions, which are again primarily associated with reduced emissions from cars and LGVs, are also estimated to occur in central London (-0.9 per cent, a negligible change) and inner London (-2.0 per cent, a minor change). Road traffic NO_x emissions across Greater London are estimated to decrease by -5.4 per cent because of the Proposed Scheme, which can be described as a moderate decrease.

A moderate reduction (-5.5 per cent) in road traffic NO_x emissions (from cars and LGVs) is also estimated to occur in areas within the air quality study but outside of the Greater London boundary as result of both reductions in traffic flows and improvements to the vehicle fleet in response to the Proposed Scheme. This indicates that reductions in road traffic NO_x emissions have the potential to occur in areas immediately outside of the extended ULEZ boundary because of the Proposed Scheme.

Estimated changes in road traffic NO_x emissions within London boroughs and the extents of 'non-Greater London' local authorities within the air quality study area, respectively, are summarised in Appendix D. This data indicates that a reduction in road traffic NO_x emissions is estimated to occur in each of the London boroughs / local authorities included within the air quality study area.

Changes in road traffic emissions of PM_{10}, by vehicle type, which are estimated to occur in 2023 because of the Proposed Scheme within central, inner, outer and Greater London and within the extents of 'non-Greater London' local authorities covered by the LAEI, respectively, are summarised in Table 5-3.

Table 5-3. Estimated changes in 2023 road traffic PM_{10} emissions within central, inner, outer and Greater London and relevant non-Greater London local authorities

Area	Estimated change in 2023 road traffic PM_{10} emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
Central London	-60 (-1.2%)	-5 (-0.1%)	-5 (-0.1%)	-5 (-0.2%)	<5 (<0.1%)	-75 (-0.3%)
Inner London	570 (0.4%)	-75 (-0.4%)	-250 (-0.5%)	-75 (-0.2%)	-20 (-0.1%)	155 (0.1%)
Outer London	-8,080 (-2.0%)	130 (0.7%)	-1,540 (-1.4%)	-10 (<0.1%)	-5 (<0.1%)	-9,500 (-1.4%)
Greater London	-7,565 (-1.4%)	55 (0.1%)	-1,790 (-1.1%)	-85 (-0.1%)	-25 (<0.1%)	-9,415 (-1.0%)
Non-Greater London [a]	-3,195 (-1.3%)	10 (0.1%)	-785 (-1.2%)	-5 (<0.1%)	<5 (<0.1%)	-3,975 (-0.9%)

SOURCE: Estimated road traffic PM_{10} emissions by vehicle type for major roads provided by TfL.

Note: Values presented in kilogrammes per annum in table above are rounded to the nearest 5 kilogrammes.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

The results in Table 5-3 indicate that the greatest absolute and relative changes in road traffic PM_{10} emissions because of the Proposed Scheme are estimated to occur in outer London, with road traffic emissions estimated to decrease by -1.4 per cent within this area (a minor reduction). This reduction is primarily associated with reduced emissions from cars (because of reductions in road traffic movements (see Figure 5-1) and improvements to the vehicle fleet in response to the Proposed Scheme) and LGVs (as a result of improvements to the vehicle fleet in response to the Proposed Scheme). Road traffic PM_{10} emissions for other vehicle types are estimated to be relatively unaffected by the Proposed Scheme because either these vehicles are compliant with relevant emission standards or are assumed to pay the ULEZ charge.

The relative magnitude of estimated changes in road traffic PM_{10} emissions is smaller than that for NO_x, because non-exhaust emissions (e.g. from brake and tyre wear), which make up a sizeable proportion of road traffic PM_{10} emissions, are unaffected by improvements to the vehicle fleet in response to the Proposed Scheme and only affected by changes in traffic flows.

Negligible changes in road traffic PM_{10} emissions, which are again primarily associated with changes in both exhaust and non-exhaust emissions from cars and LGVs, are estimated to occur in central London (a -0.3 per cent reduction) and inner London (a -0.1 per cent increase). An increase in PM_{10} emissions is estimated to occur in inner London due to a negligible increase in traffic flows (due to an increase in vehicle movements within this area which were previously discouraged by the existing ULEZ boundary (see Figure 5-1).

Road traffic PM_{10} emissions across Greater London are estimated to decrease by -1.0 per cent because of the Proposed Scheme, which is considered to be a minor decrease. A negligible reduction (-0.9 per cent) in road traffic PM_{10} emissions (from cars and LGVs) is also estimated to occur in areas within the air quality study but outside of the Greater London boundary area as result of both reductions in traffic flows and improvements to the vehicle fleet in response to the Proposed Scheme. This indicates that reductions in road traffic PM_{10} emissions have the potential to occur in areas immediately outside of the extended ULEZ boundary because of the Proposed Scheme.

Estimated changes in road traffic PM_{10} emissions within London boroughs and the extents of 'non-Greater London' local authorities within the air quality study area, respectively, are summarised in Appendix D. This data indicates that a reduction in road traffic PM_{10} emissions is estimated to occur in each of the London boroughs / local authorities included within the air quality study area, except for Haringey and Newham where negligible increases in PM_{10} emissions (0.3 per cent and 0.1 per cent, respectively) are estimated to occur as a result of increases in emissions from cars due to increased traffic flows (again due to an increase in vehicle movements within this area which were previously discouraged by the existing ULEZ boundary (see Figure 5-1).

Changes in road traffic emissions of $PM_{2.5}$, by vehicle type, which are estimated to occur in 2023 because of the Proposed Scheme within central, inner, outer and Greater London and within the extents of 'non-Greater London' local authorities covered by the LAEI, respectively, are summarised in Table 5-4.

Table 5-4. Estimated changes in 2023 road traffic $PM_{2.5}$ emissions within central, inner, outer and Greater London and relevant non-Greater London local authorities

Area	Estimated change in 2023 road traffic $PM_{2.5}$ emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
Central London	-40 (-1.4%)	<5 (-0.1%)	-5 (-0.2%)	<5 (-0.2%)	<5 (<0.1%)	-50 (-0.4%)
Inner London	35 (0.1%)	-40 (-0.4%)	-195 (-0.8%)	-40 (-0.2%)	-10 (-0.1%)	-245 (-0.2%)
Outer London	-6,090 (-2.7%)	70 (0.7%)	-1,480 (-2.4%)	-5 (>-0.1%)	-5 (>-0.1%)	-7,505 (-2.0%)
Greater London	-6,095 (-2.0%)	30 (0.1%)	-1,675 (-1.9%)	-45 (-0.1%)	-15 (<0.1%)	-7,805 (-1.5%)
Non-Greater London [a]	-2,735 (-1.9%)	5 (0.1%)	-735 (-1.8%)	<5 (<0.1%)	<5 (<0.1%)	-3,465 (-1.4%)

SOURCE: Estimated road traffic $PM_{2.5}$ emissions by vehicle type for major roads provided by TfL.

Note: Values presented in kilogrammes per annum in table above are rounded to the nearest 5 kilogrammes.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

The results in Table 5-4 indicate that the greatest absolute and relative changes in road traffic $PM_{2.5}$ emissions because of the Proposed Scheme are estimated to occur in outer London, with road traffic emissions estimated to decrease by -2.0 per cent within this area (a minor reduction). This reduction is primarily associated with reduced emissions from cars (because of reductions in road traffic movements (see Figure 5-1) and improvements to the vehicle fleet in response to the Proposed Scheme) and LGVs (as a result

of improvements to the vehicle fleet in response to the Proposed Scheme). Road traffic $PM_{2.5}$ emissions for other vehicle types are estimated to be relatively unaffected by the Proposed Scheme because either these vehicles are compliant with relevant emission standards or are assumed to pay the ULEZ charge.

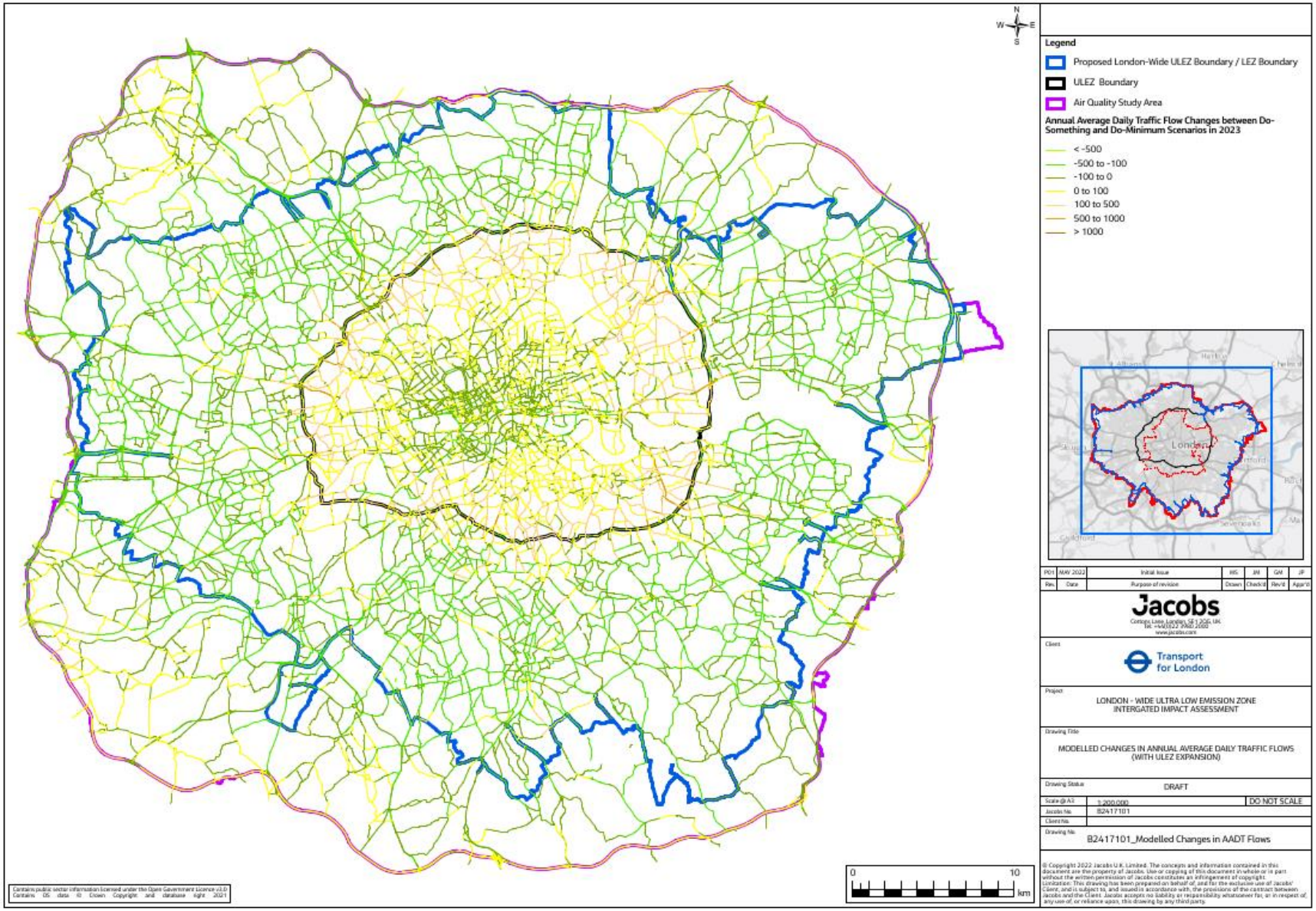
As for PM_{10}, the relative magnitude of estimated changes in road traffic $PM_{2.5}$ emissions is smaller than that for NO_x, because non-exhaust emissions (e.g. from brake and tyre wear), which make up a sizeable proportion of road traffic $PM_{2.5}$ emissions, are unaffected by improvements to the vehicle fleet in response to the Proposed Scheme and only by changes in traffic flows.

Negligible reductions in road traffic $PM_{2.5}$ emissions, which are again primarily associated with reductions in both exhaust and non-exhaust emissions from cars and LGVs, are estimated to occur in central London and inner London (-0.4 per cent and -0.2 per cent respectively). Road traffic $PM_{2.5}$ emissions across Greater London are estimated to decrease by 1.5 per cent because of the Proposed Scheme, which can be described as a minor decrease.

A minor reduction (-1.4 per cent) in road traffic $PM_{2.5}$ emissions (from cars and LGVs) is also estimated to occur in areas within the air quality study area but outside of the Greater London boundary area as result of both reductions in traffic flows (see Figure 5-1) and improvements to the vehicle fleet in response to the Proposed Scheme. This indicates that reductions in road traffic $PM_{2.5}$ emissions have the potential to occur in areas immediately outside of the expanded ULEZ boundary because of the Proposed Scheme.

Estimated changes in road traffic $PM_{2.5}$ emissions within London boroughs and the extents of 'non-Greater London' local authorities within the air quality study area, respectively, are summarised in Appendix D. This data indicates that a reduction in road traffic PM_{10} emissions is estimated to occur in each of the London boroughs / local authorities included within the air quality study area, except for Haringey where a negligible increase in $PM_{2.5}$ emissions (< 0.1 per cent) is estimated to occur as a result of increases in emissions from cars due to increased traffic flows (again due to an increase in vehicle movements within this area which were previously prevented by the existing ULEZ boundary (see Figure 5-1).

Figure 5-1: Modelled Changes in Annual Average Daily Traffic Flows within Air Quality Study Area because of the Proposed Scheme



5.1.4 Changes in exposure to air pollution

Modelled annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations in 2023 with and without the Proposed Scheme, are shown in Figure 5-2 to Figure 5-7, respectively. These figures indicate that:

- the annual mean NO_2 AQO of 40 µg/m^3 is modelled to be achieved across most of the air quality study area, apart from small areas of central and inner London, along major roads and in the vicinity of other major emission sources (e.g. Heathrow Airport), both with and without the Proposed Scheme
- the lowest annual mean WHO NO_2 Interim Target of 20 µg/m^3 is modelled to be exceeded across central and inner London and along major roads, both with and without the Proposed Scheme
- annual mean PM_{10} concentrations are modelled to be well within the AQO of 40 µg/m^3 across the whole of the air quality study area, both with and 'without' the Proposed Scheme. As a result, this pollutant is not considered further within this section
- the lowest annual mean WHO $PM_{2.5}$ Interim Target of 10 µg/m^3 is modelled to be exceeded within central London, the majority of inner London and some areas of outer London, both with and 'without' the Proposed Scheme. Compared to NO_2, these exceedances are not isolated solely to areas adjacent to major roads and other major emission sources, illustrating that concentrations of this pollutant are influenced by a much wider range of emission sources (e.g. residential combustion)

Changes in annual mean NO_2 and $PM_{2.5}$ concentrations, which are modelled to occur in 2023 because of the Proposed Scheme, are shown in Figure 5-8 to Figure 5-9, respectively. These figures indicate that:

- the Proposed Scheme is modelled to result in small reductions in annual mean NO_2 concentrations within the air quality study area, with the largest reductions occurring adjacent to major roads (where the highest concentrations occur)
- the Proposed Scheme is modelled to result in negligible reductions in annual mean $PM_{2.5}$ concentrations within the air quality study area. However, there are modelled to be areas just within the existing ULEZ boundary adjacent to major roads where negligible increases are modelled to occur because of an increase in traffic flows (which were previously discouraged by the existing ULEZ boundary)

Population weighted annual average NO_2 and $PM_{2.5}$ concentrations, which are estimated to occur in 2023 with and without the Proposed Scheme (and the resulting change) within central, inner, outer and Greater London and within the extents of 'non-Greater London' local authorities covered by the LAEI, respectively, are summarised in Table 5-5.

Table 5-5. Estimated 2023 population weighted NO_2 and $PM_{2.5}$ concentrations within central, inner, outer and Greater London and relevant non-Greater London local authorities

Area	Population weighted 2023 annual mean concentration in µg/m^3				Change in µg/m^3 (and % change 'with' Proposed Scheme vs. 'without' Proposed Scheme)	
	Without Proposed Scheme		With Proposed Scheme			
	NO_2	$PM_{2.5}$	NO_2	$PM_{2.5}$	NO_2	$PM_{2.5}$
Central London	30.8	12.0	30.6	12.0	-0.2 (-0.7%)	>-0.1 (-0.1%)
Inner London	24.4	10.5	24.2	10.5	-0.2 (-1.0%)	>-0.1 (-0.1%)
Outer London	20.2	9.6	19.9	9.6	-0.3 (-1.4%)	>-0.1 (-0.1%)
Greater London	22.2	10.1	22.0	10.1	-0.3 (-1.3%)	>-0.1 (-0.1%)
Non-Greater London [a]	17.3	8.9	17.1	8.9	-0.2 (-1.1%)	>-0.1 (-0.1%)

SOURCE: Population weighted 2023 annual mean concentrations for central, inner, outer and Greater London were provided by TfL, whilst values for non-Greater London were calculated by Jacobs using output area average pollutant concentrations and population data provided by TfL.

Note: Concentrations presented above are rounded to one decimal place, however, the percentages presented have been calculated using non-rounded values.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

The results in Table 5-5 indicate that the Proposed Scheme is modelled to result in a minor reduction (-1.3 per cent) in the average exposure of the population of Greater London to NO_2 and negligible reductions (-

0.1 per cent) in average exposure to $PM_{2.5}$. Similar changes are modelled to occur within central, inner and outer London, as well within the extents of 'non-Greater London' local authorities covered by the LAEI.

It should be noted that the average exposure of the population in central and inner London to NO_2 and $PM_{2.5}$ is modelled to exceed the lowest WHO Interim Targets for these pollutants (20 µg/m^3 and 10 µg/m^3, respectively), both with and without the Proposed Scheme. The average exposure of the population to NO_2 in outer London is also modelled to exceed the lowest WHO Interim Target for this pollutant (20 µg/m^3) without the Proposed Scheme, however, the Proposed Scheme is modelled to reduce this value to be just below the lowest WHO Interim Target. As shown in Table 5-6, this reduction is estimated to result in over 340,000 additional people in Greater London meeting the lower WHO Interim Target of 20ug/m^3 because of the Proposed Scheme.

In Table 5-5, modelled concentrations have been combined with population data and averaged over large areas to summarise changes in exposure to air pollution at a population level. Larger reductions in pollutant concentrations will, however, occur near to busy roads (where the highest pollutant concentrations typically occur and exposure to pollution is highest). In order to demonstrate this, the proportion of major road links adjacent to which exceedances of the annual mean WHO NO_2 Interim Targets of 30 µg/m^3 and 20 µg/m^3, respectively, which are estimated to occur in 2023, both with and without the Proposed Scheme (and the resulting change), within central, inner, outer and Greater London and within the extents of 'non-Greater London' local authorities covered by the LAEI, respectively, are summarised in Table 5-6.

Table 5-6: Proportion of major roads estimated to achieve annual mean NO_2 WHO Interim Targets in 2023 within central, inner, outer and Greater London and relevant non-Greater London local authorities

Area	Proportion of major roads estimated to achieve WHO NO_2 Interim Target of 30 µg/m^3 in 2023			Proportion of major roads estimated to achieve WHO NO_2 Interim Target of 20 µg/m^3 in 2023		
	Without Proposed Scheme	With Proposed Scheme	Change 'with' Proposed Scheme vs. 'without' Proposed Scheme	Without Proposed Scheme	With Proposed Scheme	Change 'with' Proposed Scheme vs. 'without' Proposed Scheme
Central London	8.6%	10.0%	1.4%	0.0%	0.0%	0.0%
Inner London	78.0%	79.6%	1.6%	0.0%	0.0%	0.0%
Outer London	93.5%	94.9%	1.4%	18.6%	23.2%	4.6%
Greater London	85.9%	87.3%	1.4%	12.4%	15.4%	3.0%
Non-Greater London [a]	24.5%	24.7%	0.2%	14.4%	15.5%	1.1%

SOURCE: Estimated proportion of major roads expected to achieve WHO NO_2 Interim Targets provided by TfL.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

The results in Table 5-6 indicate that the Proposed Scheme will result in a small increase in the proportion of major roads which will achieve the WHO NO_2 Interim Targets of 20 and 30 µg/m^3, respectively, with the largest modelled increase (4.6 per cent) estimated to occur in the proportion of roads in outer London meeting the lowest WHO NO_2 Interim Target.

Modelled changes in population weighted NO_2 and $PM_{2.5}$ concentrations within London boroughs and the extents of 'non-Greater London' local authorities within the air quality study area, respectively, are summarised in Appendix D. This data indicates that all London Boroughs and 'non-Greater London' local authorities covered by the LAEI are modelled to experience small to negligible reductions in population weighted NO_2 and negligible reductions in population weighted $PM_{2.5}$ concentrations.

Populations which are modelled to be exposed to pollutant concentrations in excess of the annual mean NO_2 AQO (40 µg/m^3), lowest WHO interim NO_2 guideline (20 µg/m^3) and lowest WHO interim $PM_{2.5}$ guideline

(10 µg/m^3) in 2023 with and without the Proposed Scheme (and the resulting change) within central, inner, outer and Greater London and within the extents of 'non-Greater London' local authorities covered by the LAEI, respectively, are summarised in Table 5-7.

Table 5-7. Estimated populations exposed to annual mean NO_2 and $PM_{2.5}$ concentrations more than relevant thresholds in 2023 within central, inner, outer and Greater London and relevant non-Greater London local authorities

Area	Population exceeding air quality threshold in 2023 (% of total population)						Change in population (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)		
	Without Proposed Scheme			With Proposed Scheme					
	NO_2		$PM_{2.5}$	NO_2		$PM_{2.5}$	NO_2		$PM_{2.5}$
	AQO: 40 µg/m^3	Lowest WHO Interim Target: 20 µg/m^3	Lowest WHO Interim Target: 10 µg/m^3	AQO: 40 µg/m^3	Lowest WHO Interim Target: 20 µg/m^3	Lowest WHO Interim Target: 10 µg/m^3	AQO: 40 µg/m^3	Lowest WHO Interim Target: 20 µg/m^3	Lowest WHO Interim Target: 10 µg/m^3
Central London	800 (0.4%)	218,300 (100.0%)	218,300 (100.0%)	800 (0.4%)	218,300 (100.0%)	218,300 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Inner London	1,700 (<0.1%)	3,854,200 (100.0%)	3,326,500 (86.3%)	1,700 (<0.1%)	3,853,600 (100.0%)	3,313,000 (86.0%)	0 (0.0%)	-600 (>-0.1%)	-13,500 (-0.4%)
Outer London	-	2,702,300 (52.8%)	770,200 (15.1%)	-	2,360,200 (46.1%)	739,500 (14.5%)	-	-342,100 (-6.7%)	-30,700 (-0.6%)
Greater London	2,500 (<0.1%)	6,774,800 (73.7%)	4,315,000 (47.0%)	2,500 (<0.1%)	6,432,200 (70.0%)	4,270,800 (46.5%)	0 (0.0%)	-342,600 (-3.7%)	-44,200 (-0.5%)
Non-Greater London [a]	-	23,430 (2.5%)	2,403 (0.3%)	-	19,506 (2.1%)	2,403 (0.3%)	-	-3,924 (-0.4%)	0 (0.0%)

SOURCE: Populations exceeding air quality thresholds for central, inner, outer and Greater London were provided by TfL, whilst values for non-Greater London were calculated by Jacobs using output area average pollutant concentrations and population data provided by TfL.

Note: Populations presented above are rounded to the nearest hundred, however, the percentages presented have been calculated using non-rounded values.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

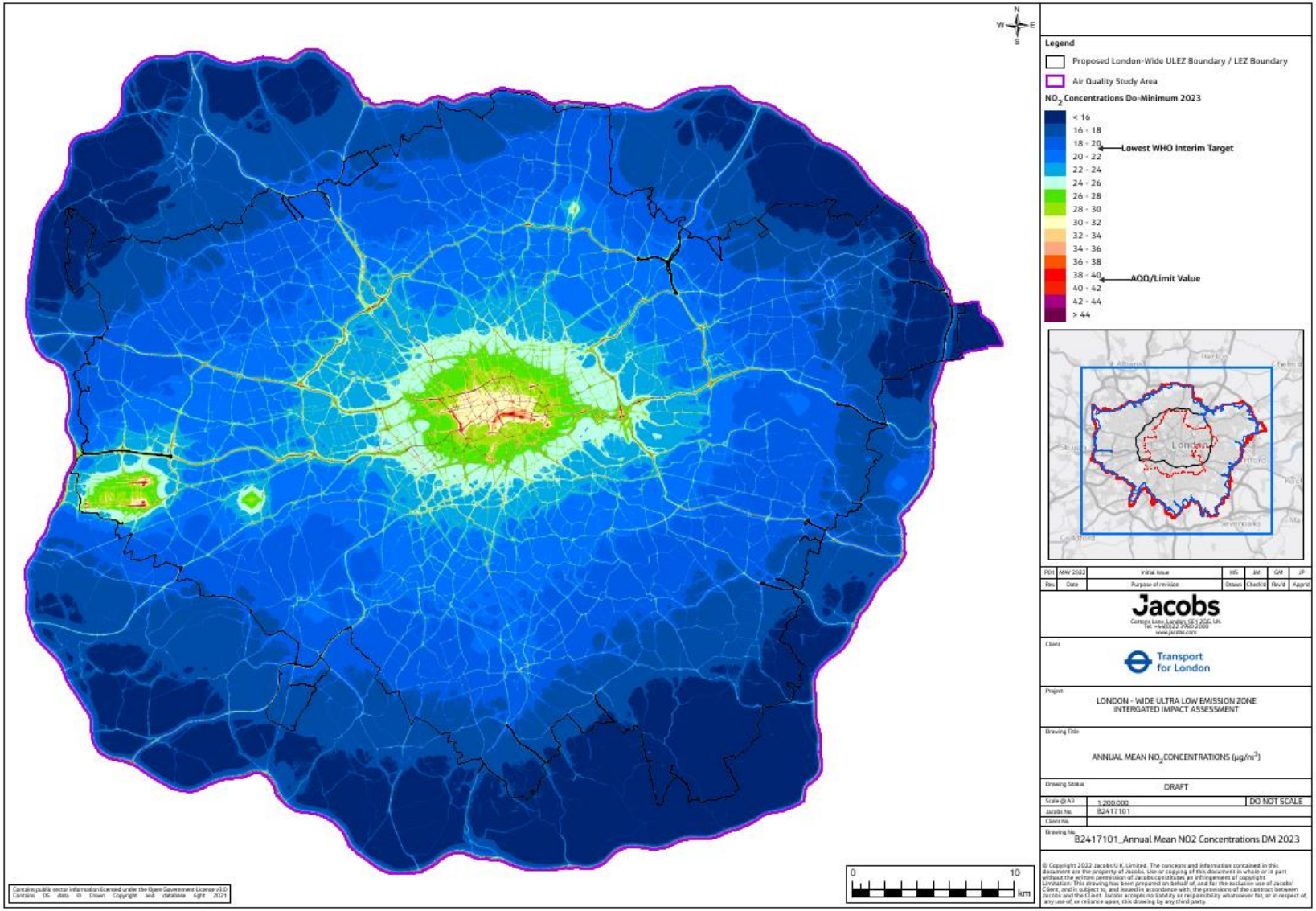
The results in Table 5-7 indicate that the Proposed Scheme is modelled to have no impact on the population of Greater London modelled to exceed the annual mean NO_2 AQO in 2023 (although it should be noted that less than 0.1 percent of the population of Greater London is modelled to exceed the annual mean NO_2 AQO in 2023 without the Proposed Scheme).

The entirety of the population of both central and inner London and over 50 per cent of the population of outer London are, however, modelled to be exposed to annual mean NO_2 concentrations more than the lowest WHO Interim Target for this pollutant. The Proposed Scheme is modelled to result in a -6.7 per cent reduction in the population of outer London exposed to annual mean NO_2 concentrations more than the threshold – representing over 340,000 people.

The Proposed Scheme is also modelled to have a negligible beneficial impact (a -0.5 per cent reduction) on the population of Greater London modelled to exceed the lowest annual mean WHO Interim $PM_{2.5}$ Target in 2023, albeit that this represents over 44,000 people.

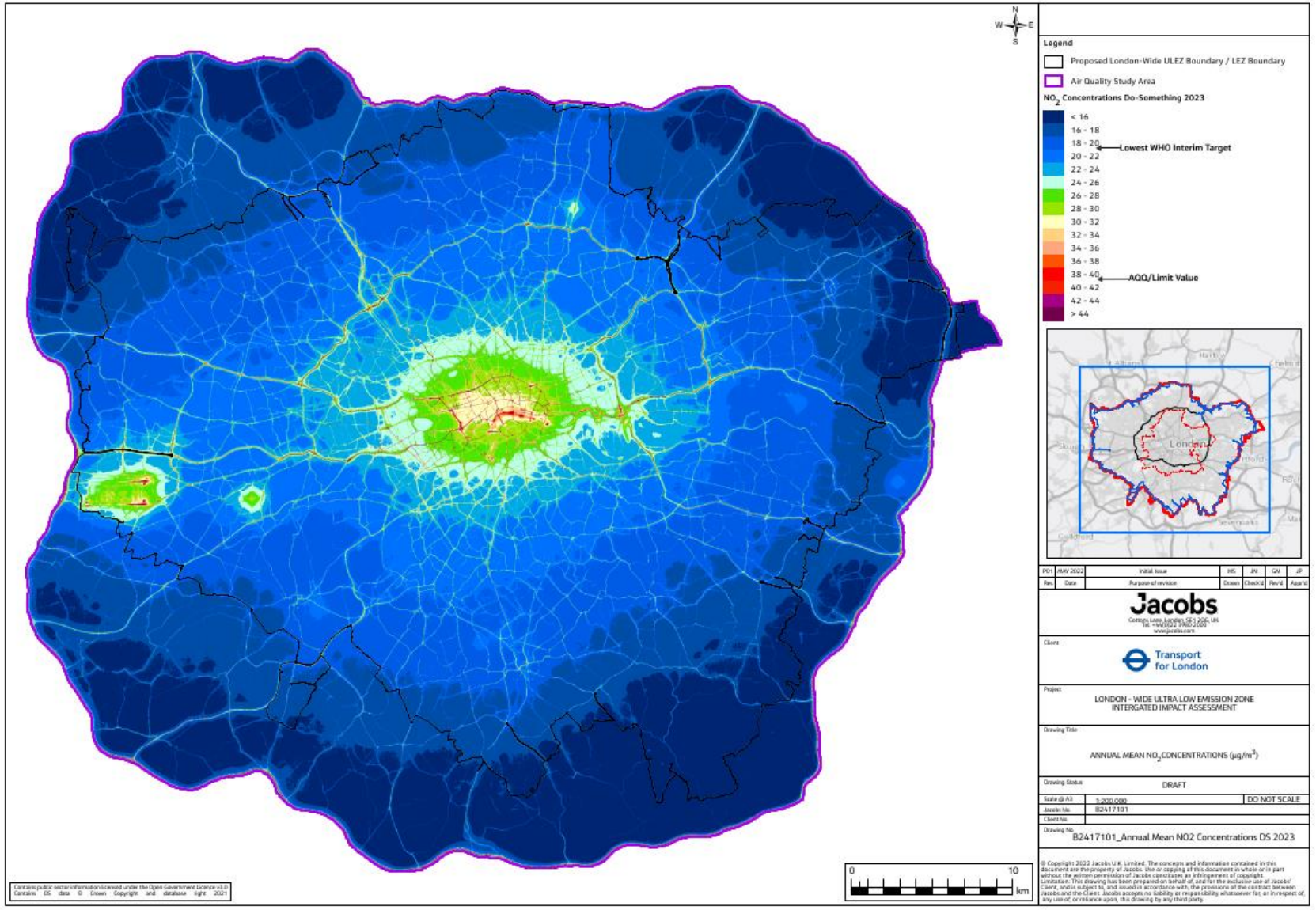
Populations which are modelled to be exposed to pollutant concentrations in excess of the annual mean NO_2 AQO (40 µg/m^3), and lowest WHO interim NO_2 guideline (20 µg/m^3) and lowest WHO interim $PM_{2.5}$ guideline (10 µg/m^3) in 2023 with and without the Proposed Scheme (and the resulting change) within London boroughs and the extents of 'non-Greater London' local authorities within the air quality study area, respectively, are summarised in Appendix D. This data indicates that the majority of London Boroughs are modelled to experience small to moderate reductions in the population modelled to exceed the lowest annual mean WHO Interim NO_2 Target in 2023 and small to negligible reductions in the population modelled to exceed the lowest annual mean WHO Interim $PM_{2.5}$ Target in 2023.

Figure 5-2. Modelled 2023 Annual Mean NO_2 Concentrations within Air Quality Study Area 'without' Proposed Scheme



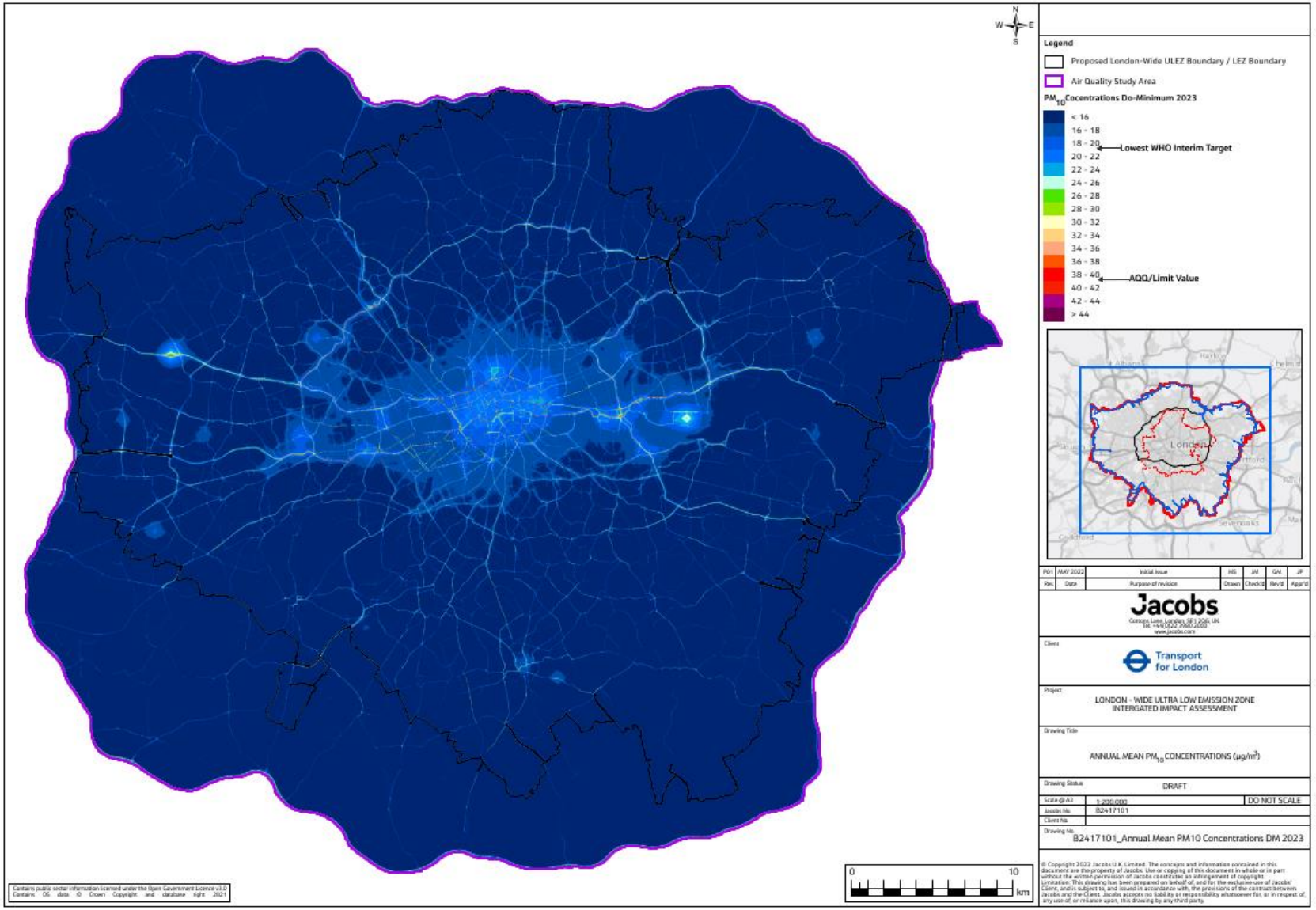
SOURCE: Modelled annual mean NO_2 concentrations at 20m resolution produced by Imperial College London and provided by TfL

Figure 5-3. Modelled 2023 Annual Mean NO_2 Concentrations within Air Quality Study Area 'with' Proposed Scheme



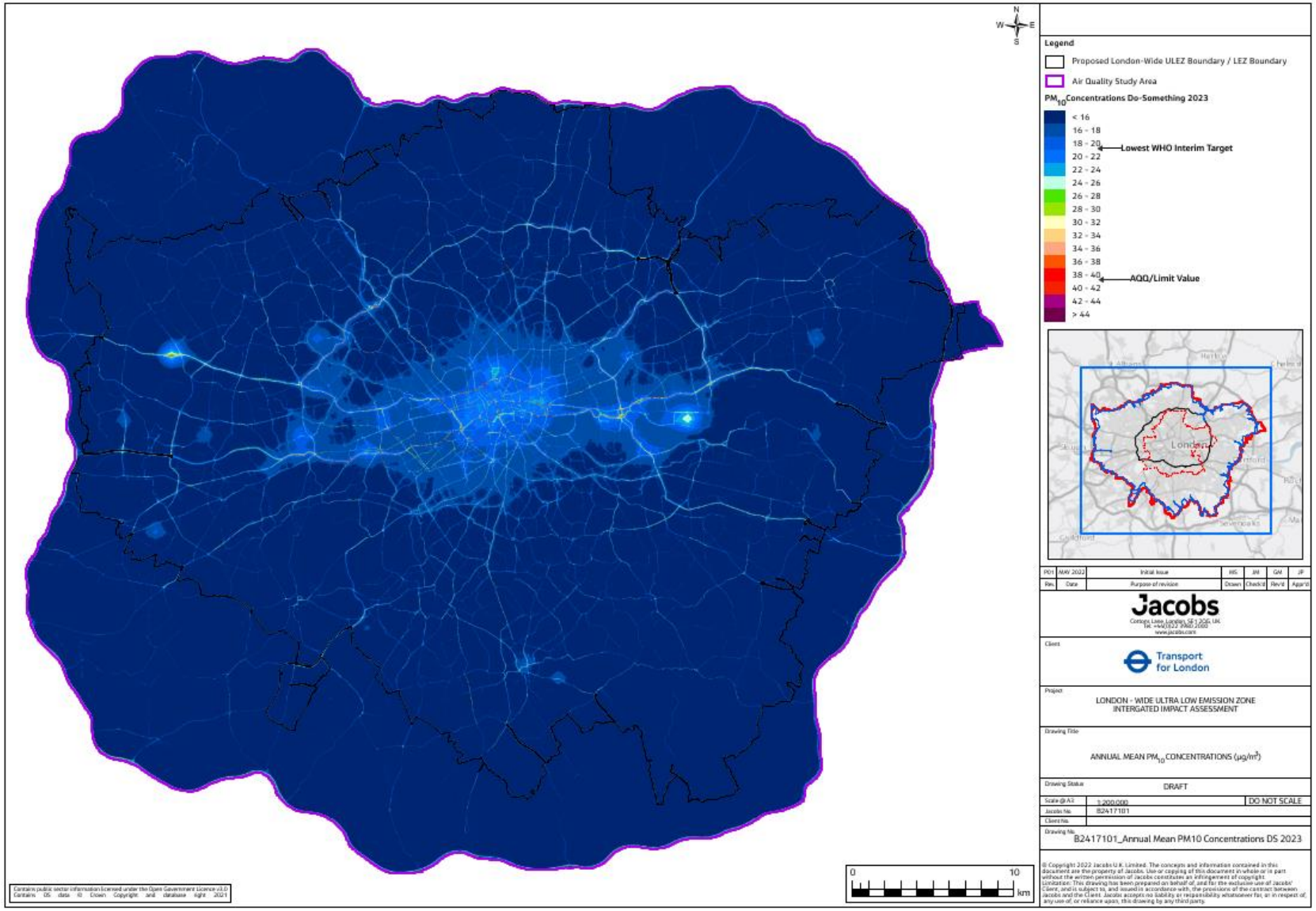
SOURCE: Modelled annual mean NO_2 concentrations at 20m resolution produced by Imperial College London and provided by TfL

Figure 5-4. Modelled 2023 Annual Mean PM_{10} Concentrations within Air Quality Study Area 'without' Proposed Scheme



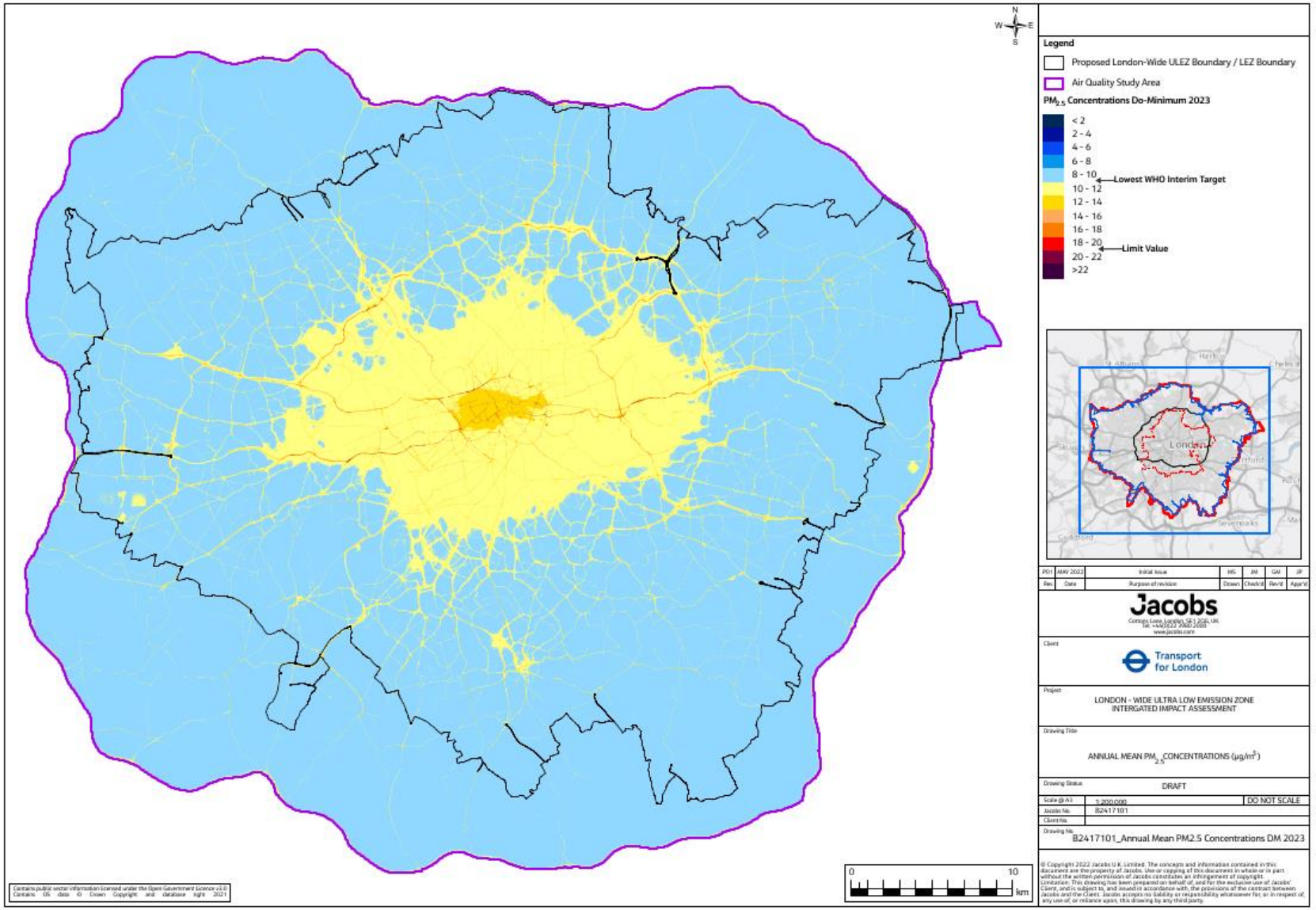
SOURCE: Modelled annual mean PM_{10} concentrations at 20m resolution produced by Imperial College London and provided by TfL

Figure 5-5. Modelled 2023 Annual Mean PM_{10} Concentrations within Air Quality Study Area 'with' Proposed Scheme



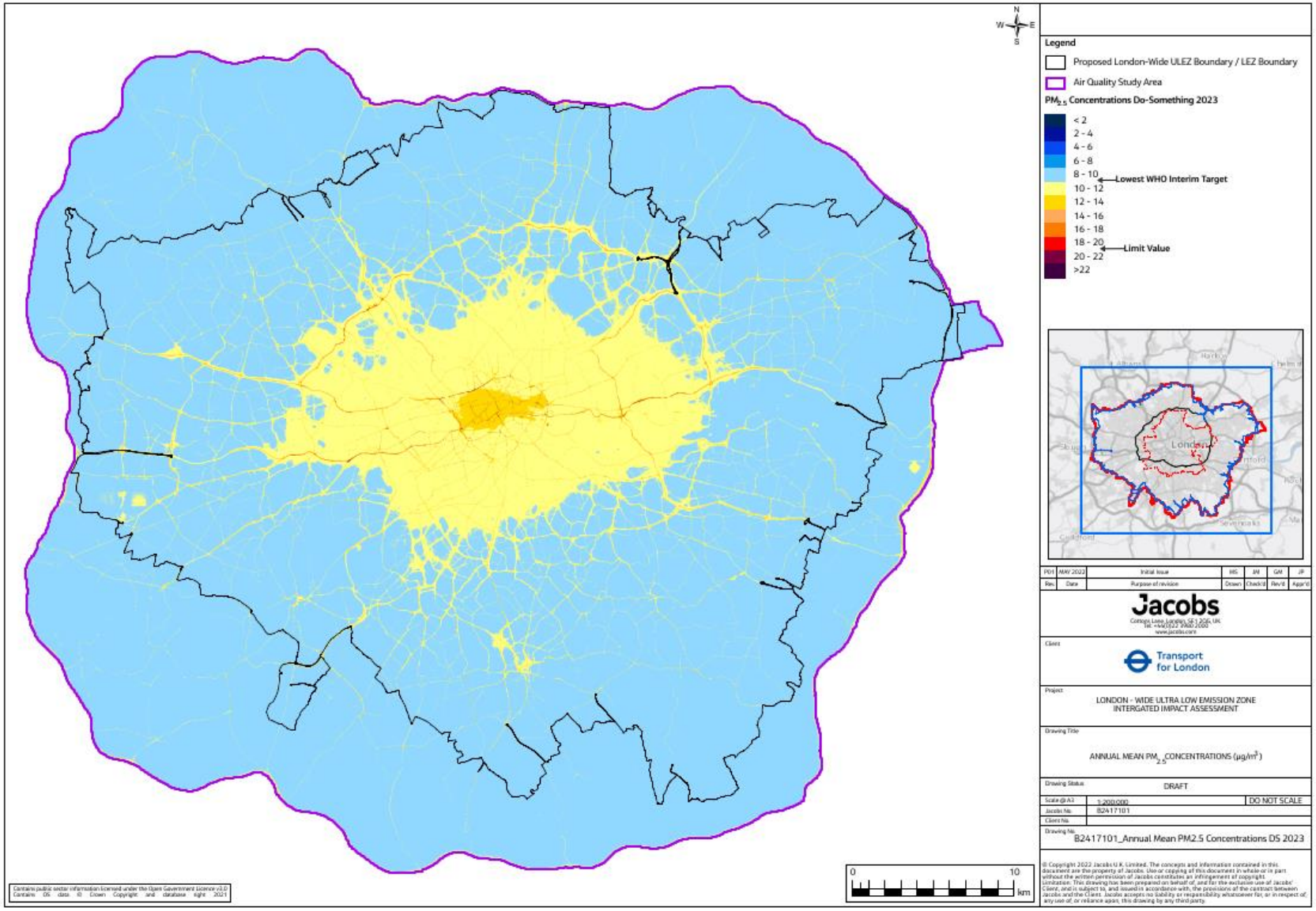
SOURCE: Modelled annual mean PM_{10} concentrations at 20m resolution produced by Imperial College London and provided by TfL

Figure 5-6. Modelled 2023 Annual Mean $PM_{2.5}$ Concentrations within Air Quality Study Area 'without' Proposed Scheme



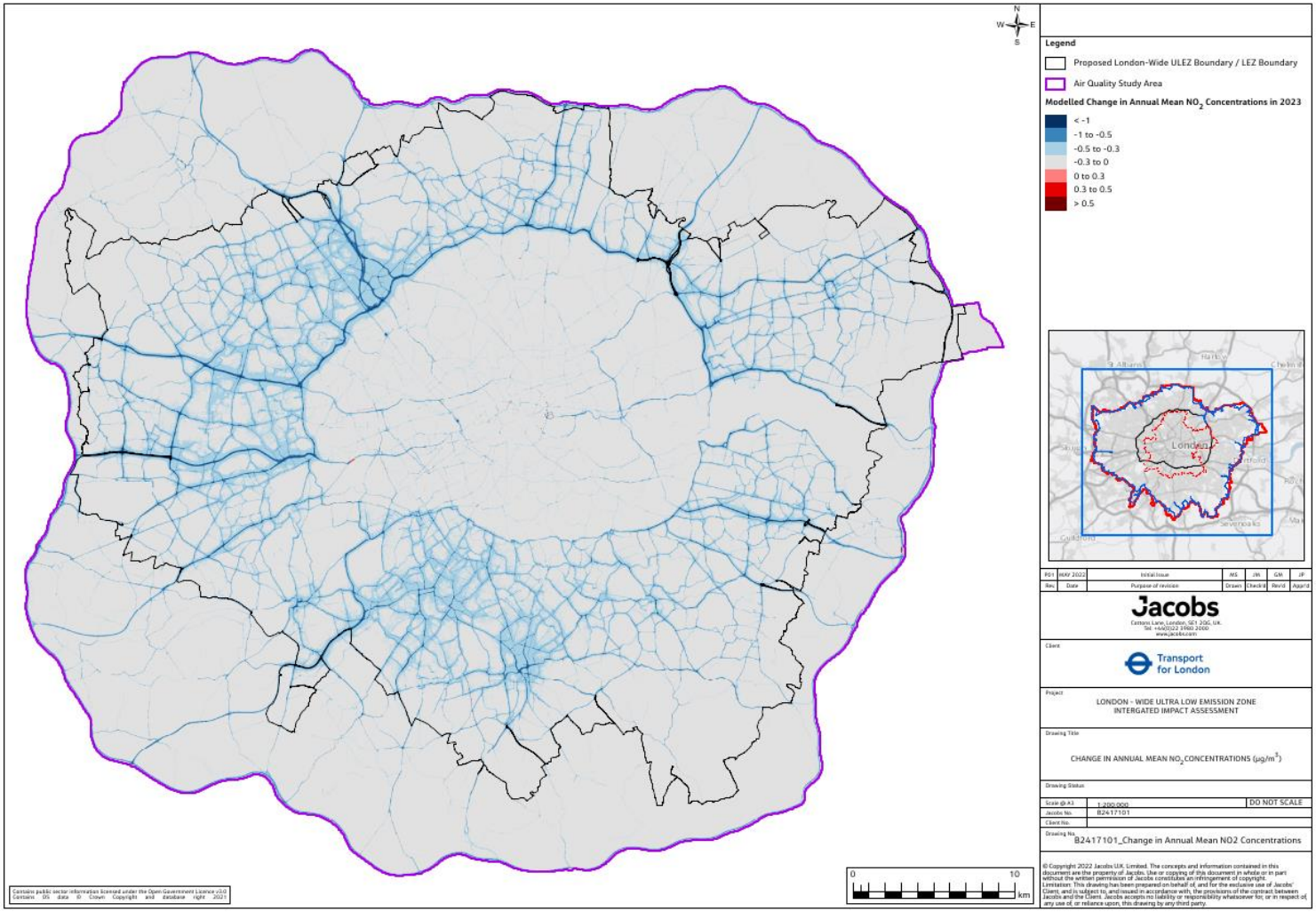
SOURCE: Modelled annual mean $PM_{2.5}$ concentrations at 20m resolution produced by Imperial College London and provided by TfL

Figure 5-7. Modelled 2023 Annual Mean $PM_{2.5}$ Concentrations within Air Quality Study Area 'with' Proposed Scheme



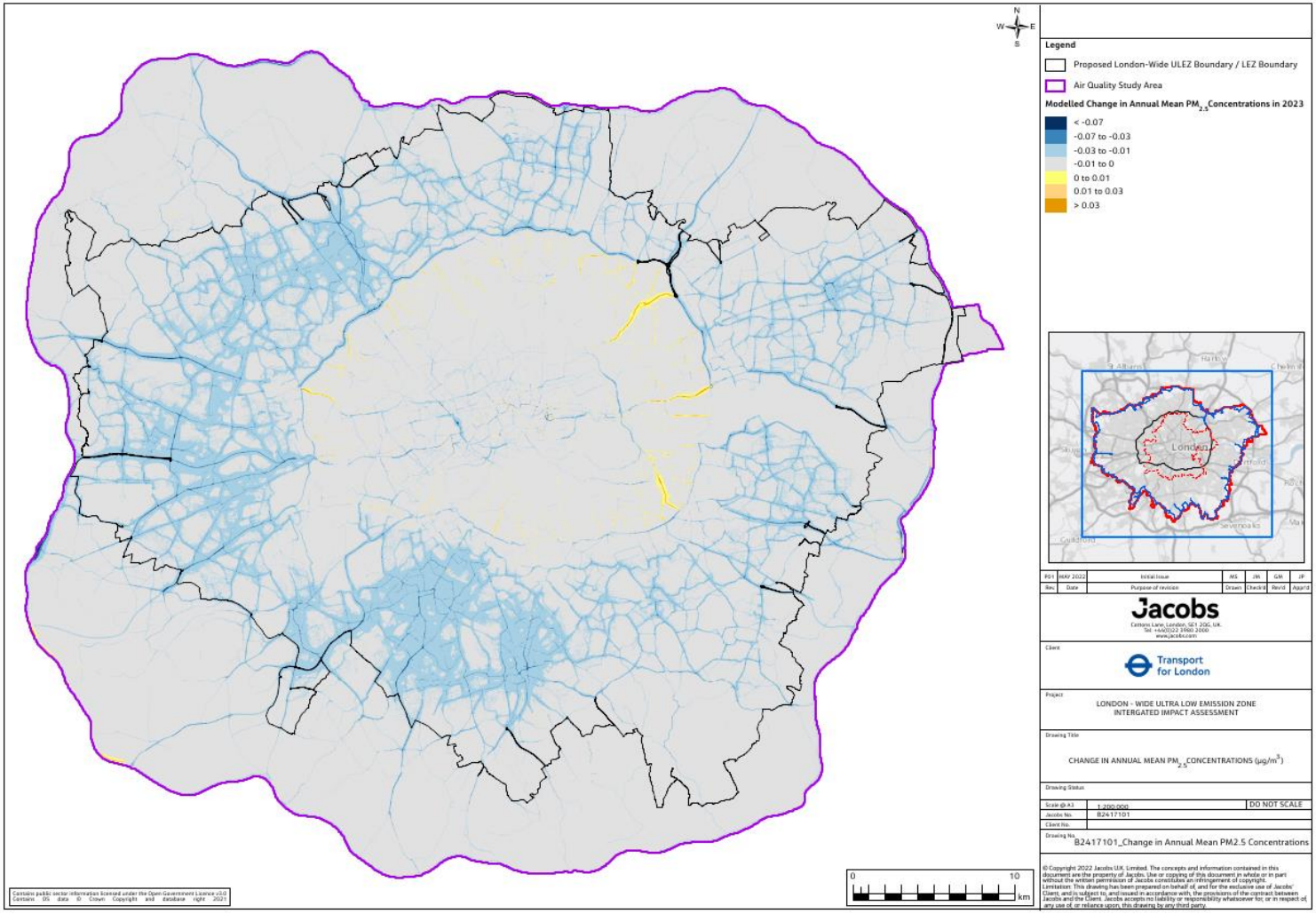
SOURCE: Modelled annual mean $PM_{2.5}$ concentrations at 20m resolution produced by Imperial College London and provided by TfL

Figure 5-8. Modelled Change in 2023 Annual Mean NO_2 Concentrations within Air Quality Study Area because of the Proposed Scheme



SOURCE: Derived from modelled annual mean NO_2 concentrations at 20m resolution produced by Imperial College London and provided by TfL

Figure 5-9. Modelled Change in 2023 Annual Mean $PM_{2.5}$ Concentrations within Air Quality Study Area because of the Proposed Scheme



SOURCE: Derived from modelled annual mean $PM_{2.5}$ concentrations at 20m resolution produced by Imperial College London and provided by TfL

5.1.5 Compliance with legal limits

The proportion of major road links adjacent to which exceedances of the annual mean NO_2 Limit Value are estimated to occur in 2023, both with and without the Proposed Scheme (and the resulting change), within central, inner, outer and Greater London and within the extents of 'non-Greater London' local authorities covered by the LAEI, respectively, are summarised in Table 5-8.

Table 5-8: Proportion of major roads estimated to achieve annual mean NO_2 Limit Value in 2023 within central, inner, outer and Greater London and relevant non-Greater London local authorities

Area	Proportion of major roads estimated to achieve annual mean NO_2 Limit Value in 2023		
	Without Proposed Scheme	With Proposed Scheme	Change 'with' Proposed Scheme vs. 'without' Proposed Scheme
Central London	84.1%	84.8%	0.7%
Inner London	97.7%	97.9%	0.2%
Outer London	99.7%	99.9%	0.2%
Greater London	98.6%	98.7%	0.1%
Non-Greater London [a]	99.4%	99.4%	<0.1%

SOURCE: Estimated proportion of major roads expected to achieve annual mean NO_2 Limit Value provided by TfL.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

The results in Table 5-8 indicate that the annual mean NO_2 Limit Value will be achieved adjacent to the majority of major roads in Greater London, either 'with' or 'without' the Proposed Scheme in 2023. The Proposed Scheme is modelled to have a small beneficial impact on compliance with legal limits in Greater London, with this contribution being important in ensuring compliance is achieved with the annual mean NO_2 Limit Value in the shortest possible time, in conjunction with other measures aimed at improving air quality in London.

5.1.6 Summary of impacts

The Proposed Scheme is estimated to have a moderate to small beneficial impact on emissions of road traffic emissions of air pollutants, a small beneficial impact on exposure to air pollution and a small beneficial impact on compliance with legal limits.

The impact of the Proposed Scheme on air quality in Greater London is considered an important first step towards achieving compliance with WHO Interim Targets. For example, the Proposed Scheme is modelled to result in over 342,000 additional people meeting the lowest WHO Interim Target for NO_2 in 2023 and over 44,000 additional people meeting the lowest WHO Interim Target for $PM_{2.5}$. It is also important to recognise that the whilst the magnitude of the modelled impact of the Proposed Scheme on exposure to pollution is small, these impacts will be experienced by the entire population of Greater London (as well as people living immediately outside of the expanded ULEZ boundary).

These impacts are considered likely to be medium term in nature as the benefits of the Proposed Scheme are expected to slowly reduce over time as older vehicles are gradually replaced with newer vehicles and compliance rates increase.

5.1.7 Mitigation

No adverse impacts have been identified; therefore, no mitigation is required.

5.2 Objective: To help tackle climate change through reducing greenhouse gas emissions and moving towards a zero carbon London by 2050

Earth absorbs energy from the Sun and re-emits this energy as thermal infrared radiation. Greenhouse Gases (GHGs) in the atmosphere absorb this radiation, preventing it from escaping into space. The higher the concentration of GHGs in the atmosphere, the more heat energy is retained, and the higher global temperatures become. Due to human activities, the concentration of GHGs in the atmosphere has increased dramatically, leading to global warming. This warming leads to numerous indirect impacts (including hotter, drier summers; warmer, wet winters; and more frequent and intense extreme weather events) as the climate responds to the increased atmospheric temperature.

There are seven GHGs that directly contribute to climate change (i.e. carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF_3) and sulphur hexafluoride (SF_6)). Emissions of GHGs are typically expressed in terms of CO_2 equivalent (CO_2e), which signifies the amount of CO_2 which would have the equivalent global warming impact of the GHGs under consideration. As a result, GHG emissions are typically referred to as 'carbon' emissions. Within this assessment only CO_2 emissions have been considered as this is the primary GHG emitted by road traffic.

The UK's Climate Change Act 2008 commits the UK to reducing carbon emissions to 'net zero' by 2050. The Climate Change Act 2008 also requires the Secretary of State to set legally binding carbon budgets over five-year periods and to ensure that net UK carbon emissions do not exceed these budgets. Whilst both the MTS and LES commit to making London's transport network zero emission by 2050, the Mayor of London has set a target for London to be net zero carbon by 2030.

5.2.1 Changes in carbon emissions

Changes in road traffic emissions of CO_2, by vehicle type, which are estimated to occur in 2023 because of the Proposed Scheme within central, inner, outer and Greater London and within the extents of 'non-Greater London' local authorities covered by the LAEI, respectively, are summarised in Table 5-9.

Table 5-9. Estimated changes in 2023 road traffic CO_2 emissions within central, inner, outer and Greater London and relevant non-Greater London local authorities

Area	Estimated change in 2023 road traffic CO_2 emissions in tonnes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
Central London	-240 (-0.7%)	-15 (>-0.1%)	25 (0.1%)	-25 (-0.1%)	-10 (>-0.1%)	-265 (-0.2%)
Inner London	5,300 (0.8%)	-335 (-0.3%)	-365 (-0.2%)	-340 (-0.1%)	-5 (>-0.1%)	4,260 (0.3%)
Outer London	-26,745 (-1.4%)	375 (0.4%)	15 (<0.1%)	-150 (>-0.1%)	-160 (>-0.1%)	-26,665 (-0.8%)
Greater London	-21,685 (-0.8%)	30 (<0.1%)	-320 (<0.1%)	-515 (-0.1%)	-180 (>-0.1%)	-22,675 (-0.4%)
Non-Greater London [a]	-43,240 (-3.4%)	25 (<0.1%)	125 (<0.1%)	225 (>0.1%)	<5 (<0.1%)	-42,860 (-1.6%)

SOURCE: Estimated road traffic CO_2 emissions by vehicle type for major roads provided by TfL.

Note: Values presented in tonnes per annum in table above are rounded to the nearest 5 tonnes.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

The results in Table 5-9 indicate that the greatest absolute and relative changes in road traffic CO_2 emissions because of the Proposed Scheme are estimated to occur in non-Greater London areas, with road traffic emissions estimated to decrease by -1.6 per cent within these areas (a 'small' reduction). This reduction is primarily associated with reduced emissions from cars (as a result of reductions in road traffic movements). A

smaller reduction in road traffic CO_2 emissions is estimated to occur in Greater London than in non-Greater London areas, despite reductions traffic flows, as the Proposed Scheme is assumed to result in an increase in the proportion of petrol cars in Greater London (which tend to have higher CO_2 emissions than diesel cars) due to the ULEZ emission standard for diesel cars being more stringent. Road traffic CO_2 emissions for other vehicle types are estimated to be relatively unaffected by the Proposed Scheme because either these vehicles are compliant with relevant emission standards or are assumed to pay the ULEZ charge.

Negligible changes in road traffic CO_2 emissions, which are again primarily associated with changes in emissions from cars, are estimated to occur in central London (a -0.2 per cent reduction), inner London (a 0.3 per cent increase) and outer London (a -0.8 per cent reduction). An increase in CO_2 emissions is estimated to occur in inner London due to a negligible increase in traffic flows (due to an increase in vehicle movements within this area which were previously prevented by the existing ULEZ boundary).

Estimated changes in road traffic CO_2 emissions within London boroughs are summarised in Appendix D. These data indicate that a reduction in road traffic CO_2 emissions is estimated to occur in the majority of London boroughs, except for Camden, Greenwich, Hackney, Hammersmith and Fulham, Haringey, Lambeth, Lewisham, Newham, Southwark and Waltham Forest where a negligible increases in CO_2 emissions (ranging from < 0.1 per cent to 0.7 per cent) are estimated to occur. These increases are estimated to occur as a result of increases in emissions from cars due to increased traffic flows in some areas (due to an increase in vehicle movements which were previously discouraged by the existing ULEZ boundary (see **Figure 5-1**)) and an assumed increase in the proportion of petrol cars as a result of the Proposed Scheme, which have higher CO_2 emissions than diesel cars.

5.2.2 Summary of impact

The Proposed Scheme is estimated to have a negligible beneficial impact on carbon emissions across Greater London.

5.2.3 Mitigation

No adverse impacts have been identified; therefore, no mitigation is required.

5.3 Objective: To protect and enhance the natural environment including biodiversity, flora and fauna

Assessment

As explained in the Baseline Report, changes in air quality can impact on biodiversity receptors. These impacts can vary from habitat to habitat. Some of the most sensitive types of habitats and the respective impacts of NO_x on them are summarised in Table 5-10.

Table 5-10: Types of sensitive habitats and the respective impact of NO_x

Type of habitat	Impact of NO_x
Broadleaved, mixed and yew woodland, natural coniferous woodland and ancient and semi-natural woodland	Elevated nitrogen deposition to woodlands can affect soil processes (e.g. soil acidification, nitrogen immobilisation and accumulation, mineralisation, nitrification, nitrate leaching and litter decomposition), tree growth, nutrition and sensitivity to biotic and abiotic stress, and biodiversity[18].
Acid grasslands	Acid grasslands are among the most thoroughly studied habitats with regards to nitrogen deposition.

[18] Bobbink, R., Hornung, M. & Roelofs, J.G.M. (1996). Empirical nitrogen critical loads for natural and semi-natural ecosystems. In: Manual on methodologies and criteria for mapping critical levels and geographical areas where exceeded, UNECE Convention on Long-range Transboundary Air Pollution. Berlin: Federal Environment Agency.

Type of habitat	Impact of NO_x
	National and European surveys have demonstrated clear declines in species richness of acid grasslands with increasing levels of nitrogen deposition[19]. Surveys have also found changes in species composition and changes in soil chemistry, primarily related to acidification[20].
Heathlands	Heathlands were one of the first ecosystems in which the deleterious impacts of nitrogen deposition were recognised, with heathlands in areas of high nitrogen deposition showing increasing dominance by competitive grasses at the expense of common heather[20].

Section 5.1 discusses the decreases in road traffic NO_x emissions which is estimated to occur in 2023 following introduction of the Proposed Scheme, with a 5.4 per cent reduction estimated to occur in Greater London (compared to the 'without scheme' scenario).

In addition to the air quality thresholds presented in section 5.1.2 in the context of human health, there is also a separate annual average AQO for NO_x (30µg/m^3), which is specifically for the protection of vegetation.

Figure 5 Baseline Report shows location of the designated sites within the study area. **Table 5-11** below shows the percentage of each designation type's area that is above the NO_x AQO (i.e. 100 per cent means that the whole of the site type is exceeding the AQO) in 2023, both with and without the Proposed Scheme.

As highlighted in Table 5-11, the Proposed Scheme is modelled to result in marginal reductions in the total area exceeding the NO_x AQO across all designation types compared to without the Proposed Scheme. Local nature reserves are modelled to experience the greatest reduction in the total area above the NO_x AQO because of the Proposed Scheme, with an estimated 0.7 per cent reduction compared to the without scheme scenario. This is followed by special areas of conservation and sites of special scientific interest which are modelled to experience 0.4 and 0.3 per cent reductions in area exceeding the NO_x AQO, respectively, because of the Proposed Scheme.

It can be seen that the Proposed Scheme would have a negligible positive impact on habitats sensitive to nitrogen deposition within Greater London.

[19] Stevens & Duprè et al. (2010). Nitrogen deposition threatens species richness of grasslands across Europe. Environmental Pollution, 158 (9), pp. 2940-2945.

[20] Stevens et al. (2006). Loss of forest diversity in relation to nitrogen deposition in the UK: regional trends and potential controls. Global Change Biology, 12, 1823-1833.

Table 5-11: Total area (and percentage of area) of ecological designated site types forecast to exceed **NO_x** AQO (30 µg/m^3) in 2023 with and without Proposed Scheme

Designation Type	Total area above 30 µg/m^3 in 2023 (ha) (percentage of total)		
	Without Scheme	With Scheme	Change
Ancient Woodland	147 (2.3%)	140 (2.2%)	-6 (-0.1%)
Local Nature Reserves	185 (4.3%)	153 (3.6%)	-32 (-0.7%)
National Nature Reserves	16 (0.9%)	13 (0.7%)	-3 (-0.2%)
Ramsar	6 (0.9%)	5 (0.8%)	-1 (-0.1%)
Sites of Special Scientific Interest	172 (2.1%)	148 (1.8%)	-25 (-0.3%)
Special Areas of Conservation	68 (2.4%)	57 (2.0%)	-11 (-0.4%)
Special Protection Areas	6 (0.9%)	5 (0.8%)	-1 (-0.1%)
Note: Areas presented above are rounded to the nearest hectare, however, the percentages presented have been calculated using non-rounded values.			

Summary of impacts

Decreases in annual mean NOx concentrations would result in a negligible positive impact on nature conservation sites in the medium term.

Mitigation

No adverse impacts have been identified; therefore, no mitigation is required.

5.4 Objective: To protect and enhance historic, archaeological, and socio-cultural environments

Assessment

It is not anticipated that archaeological remains would be disturbed as the Proposed Scheme would not require any construction, demolition, or otherwise intrusive works. Therefore, only historic buildings and historic landscapes are the focus of this assessment as these can be impacted by changes in traffic volumes, flows and vehicle fleet composition, which have been linked to building degradation.

Atmospheric particles can be deposited on exposed surfaces of buildings leading to darkening, known as 'soiling', which can be a visual nuisance[21]. As the reductions are so small, there would be neutral impacts to historic buildings and landscapes from PM soiling.

Levels of NO_x emissions in London pose a threat to cultural heritage assets as a result of pollutants that are principally responsible for causing acid rain. Almost all materials are affected by the deposition of acid, but the degree of damage tends to vary. Assessing NO_x emissions from vehicular traffic and quantifying their impact on historic buildings is challenging as it is difficult to isolate the effects of NO_x from vehicular traffic alone, as acid rain can be caused by other sources at greater distances. In addition, the interactions between building materials and pollutants are very complex and multi-variable. The deposition of pollutants onto surfaces depends on atmospheric conditions of the pollutants, the climate and microclimate around the surface. Once the pollutants are on the surface, the interactions will vary depending on the amount of exposure, reactivity of the materials and amount of moisture present.

[21] Watt, J. (2007). Middlesex University, UK Cult-Strat Workshop, Paris, March 2007

Across London, NO_x emissions have fallen by an estimated 14 per cent between 2016 and 2019, with the most significant reductions occurring within central and inner London, within which NO_x emissions are estimated to have reduced by 19 per cent. NO_x emissions associated with road transport across London is also estimated to have reduced, by more than 25 per cent between 2016 and 2019, with an almost 50 per cent reduction estimated within central London. This is mostly attributable to the impact of the ULEZ in central London[22]. The Proposed Scheme would result in further decreases in road traffic NO_x emissions as identified in section 5.1.3. As noted in section 5.1.3, there is an estimated 1.0 and 1.5 per cent reduction in road traffic PM_{10} and $PM_{2.5}$ emissions within the Greater London area, respectively, because of the Proposed Scheme.

Reductions in NO_x emissions from road traffic in London would be a minor contributor to the overall total NO_x emissions that have an influence on the risk of acid rain within Greater London.

Summary of impacts

- Reduction in road traffic PM emissions because of the implementation of the Proposed Scheme would have a neutral impact on the soiling of historic buildings
- Reduction in road traffic NO_x emissions because of the implementation of the Proposed Scheme would have a minor positive impact on cultural heritage assets in the short to medium term

Mitigation

No adverse impact, therefore, no mitigation is required.

5.5 Objective: To promote sustainable resource use and waste management

The principal impact of the Proposed Scheme would be in waste generation, through the scrappage of non-compliant vehicles, to be replaced with compliant ones. There would be some impacts on resource use due to the differing material demands of low and zero emission vehicles. Potential impacts of the Proposed Scheme for illegal 'fly tipping' are also considered.

The assessment therefore focuses on the estimated number of vehicles that would be scrapped as part of the proposed restrictions and the capacity within the Greater London area to manage this this demand.

In the development of the Proposed Scheme, the following assumptions have been used:

- The impacts on waste materials relates to those vehicles scrapped above the amount resulting from the natural turnover of vehicles which would take place in the baseline
- Under the London-wide ULEZ 1.9 per cent of LGVs and 5.4 per cent of cars would be replaced by the owner due to non-compliance with the ULEZ standards. Note that a retrofitting option would not apply to cars
- Of those vehicles which are sold due to non-compliance, it is assumed that 25 per cent would be scrapped (in addition to the baseline rate of scrappage), with the remaining 75 per cent being sold on to another owner. This applies to all vehicle types

Impact on scrappage and treatment facilities

Based on a light vehicle stock comprising 2.6 million registered cars and 209,000 registered LGVs in the Greater London area[23], there would be approximately 124,400 tonnes of light vehicles sent for treatment per year in a baseline scenario, based on average vehicle weights, as outlined in the Baseline Report. Once TfL's behavioural assumptions on light vehicles following implementation of the Proposed Scheme are factored in, this number increases to around 161,000 tonnes per annum (i.e. an additional 36,600 tonnes). This post-implementation figure would most likely peak in the first year of implementation, as a batch of vehicles are replaced, and then reduce each year due to natural replacement of vehicles and a reducing pool of non-compliant vehicles.

The Proposed Scheme is estimated to generate an average of an additional 36,600 tonnes per annum in the first few years after implementation. This post-implementation figure would most likely peak in the first year of implementation, as a batch of vehicles are replaced and then reduce each year due to natural replacement of vehicles and a reducing pool of non-compliant vehicles.

[22] Greater London Authority, (2020). Air Quality in London 2016 - 2020. [Online] [Accessed: 14/04/22] Available from: Air Quality in London 2016 - 2020 | London City Hall

[23] Department for Transport (2020). Licensed Vehicles – Type, Borough – London Datastore. [online] Available at: <https://data.london.gov.uk/dataset/licensed-vehicles-type-0> [Accessed 6 April 2022].

According to the Environment Agency "End-of-life vehicles (ELV) Authorised Treatment Facilities Register - England", as of April 2022 there were 55 facilities permitted to deal with correct disposal of ELVs within the M25 area. ELV facilities fall under two main types of EA permit that allow the dismantling of vehicles within a maximum quantity of waste accepted per year at either 25,000 or 75,000 tonnes per year, per site. This leaves a range of assumed capacity for ELVs within the M25 of 1,375,000 tonnes per year using the low 25,000 value and 4,125,000 tonnes per year using the higher 75,000 value. However, many sites that treat ELVs also accept scrap metal so some of this capacity would be occupied by scrap and the vehicle capacity figure would be lower.

Applying an average annual increase in scrappage of 36,000 tonnes, this would represent between 0.9 per cent – 2.7 per cent of ELV treatment facility capacity. If the additional scrappage volume in the first year were double the average, this would temporarily increase to 1.8 per cent – 5.2 per cent.

Furthermore, because of the historically high prices for second-hand vehicles, owners of non-compliant vehicles may be more likely to choose to sell on their vehicle rather than scrap it thereby mitigating any additional short-medium term demand on treatment capacity.

The estimated volume of waste material can therefore be viewed as a maximum figure (or worst-case scenario). The impact of Proposed Scheme on resource use and waste generated is negligible in terms of tonnage, and therefore existing ELV infrastructure can be used to ensure wastes, especially more harmful hazardous wastes, are recycled or recovered.

Under the ELV directive, there is a target for a minimum of 95 per cent recycling and recovery of ELVs, so the legislation is already well designed to mitigate any increases in hazardous or non-hazardous waste generated from increased scrappage because of the implementation of the proposal.

The Proposed Scheme would not apply to areas which lie between the LEZ boundary and the Greater London boundary. These are equivalent to approximately 4 per cent of the total area of Greater London. In these areas there may be a risk of increased illegal dumping ('fly tipping') of waste material by residents or businesses for whom travelling to their London borough licensed waste management facility in Greater London would incur the daily ULEZ charge. Given the high proportion of ULEZ compliant vehicles, and the number of owners of non-compliant vehicles who would willingly break the law, the likely impact is negligible in the wider outer London context.

Summary of impact

- The Proposal Scheme is likely to result in a negligible impact on the amount of material waste generated
- The Proposed Scheme could have a negligible impact on fly-tipping in outer London

Mitigation

No further mitigation is recommended.

5.6 Objective: To protect and enhance built environment and streetscape

With existing ULEZ infrastructure in place, TfL has advised that no new signage poles or cameras would need to be installed into the landscape in the area within the existing ULEZ boundary. To enforce the London-wide ULEZ, a new fleet of enforcement cameras and signs would be introduced, with the cameras covering the network from the North and South Circular Roads out to and including the LEZ boundary. The signs would cover the same geographical area, along with a radial distance outside of the LEZ boundary to provide advanced warning. As such, it is likely that additional infrastructure may be required on the approach into the Proposed Scheme. The quantities of additional or modified infrastructure cited below are currently approximations to be validated during design.

Boundary signs will notify drivers that they are entering the London-wide ULEZ, with around 1,250 boundary signs required in total for the Proposed Scheme, which would be over double the 582 boundary signs currently situated along the north and south circular roads as part of the ULEZ 2021 scheme. Of the approximately 1250 boundary signs required around 625 will be modified existing LEZ signs. The remainder would be additional signs on new posts.

The Proposed Scheme would also require around 1,450 non-boundary signs, an increase of 332 from the 1118 currently installed non-boundary signs as part of the 2021 ULEZ scheme. Of these 1,450, around 325 would be advanced signs across both directional and information and would be located on roads outside of the

Greater London area. Additionally, of these 325, 100 would require major installation requiring bespoke design[24].

All existing ULEZ boundary, advanced informational and directional signs would be removed as part of the Proposed Scheme.

Any additional highways furniture (i.e. signage poles, signs, cameras) which involves construction has the potential to cause adverse effects on trees and other mature vegetation. Adverse circumstances could arise where removal or damage of vegetation occurs, for example damaged roots due to foundation work. Potential works therefore must follow the requirements of BS8545[25].

The installation of new street signage has the potential to increase the impacts of street clutter within and around the boundary of the ULEZ extension, including areas which may be rural in character. Where additional tall streetscape elements such as camera poles are proposed this presents the potential for anticipated visual impacts on the landscape, especially when introduced to areas that are highly sensitive.

As the LEZ and London-wide ULEZ would share the same boundary, TfL would take a combined signage approach as part of the Proposed scheme. This combined approach would provide the opportunity to re-use as much existing LEZ/ULEZ infrastructure as possible and would allow for greater re-use of existing posts and foundations as the shape and size is similar to the existing ULEZ/LEZ signposts. This would help to reduce street clutter and promote ease of scheme understanding. TfL would replace existing poles only when it is essential or unavoidable. New signage should follow a similar appearance to the ULEZ signage that is currently displayed, exhibiting a similar character to what already exists within the landscape.

New cameras, new camera poles and an upgrade to the existing cameras would also be included within the streetscape elements. To maintain the same ratio of cameras per km, an estimated 2,000 additional cameras would be required as part of the ULEZ extension. The type and location of cameras is almost entirely governed by the function they are required to perform and the areas of view they are required to cover.

There is potential for adverse impacts on the appearance and character of the landscape; however, in some instances practicality would need to outweigh the landscape impacts to ensure compliance is maintained within the expanded ULEZ. TfL would follow a hierarchical approach and aim to make the best use of the traffic signal junction population to mount new cameras for the Proposed Scheme, thereby helping to reduce clutter to the streetscape environment.

TfL generally locates cameras and signage away from existing vegetation so that camera footage is not obscured by foliage. However, there may be some sites where cameras must be installed near vegetation because of the nature of the locations that need to be monitored. In such instances, TfL will assess the locations and ensure that the streetscape will not be adversely impacted, especially if additional infrastructure is required on Metropolitan Open Land, Green Belt or Conservation Areas. TfL's 'Streetscape Guidance' emphasises the importance of "Ensuring the safe and reliable operation of London's Road network for all users while reducing congestion and clutter"[26].

TfL's streetscape guidance mentions that the finish of signposts should coordinate with similar street furniture within its local surroundings. Every new pole element that is proposed within the landscape should be assessed separately in relation to its surrounding environment. The character of the environment and the visual quality should also be considered when assessing the landscape.

TfL will undertake measures to minimise the impact on the landscape when constructing trenches for utilities/electrical wiring components of the cameras. It is also more cost effective for TfL to place utilities near to a source of power to reduce labour and material costs, which in turn has the potential to reduce the impact on the landscape.

Summary of impacts

Within majority of outer London it is considered that there would be a neutral impact on the built environment or streetscape as the required new street furniture is unlikely to have a significant effect in an urban area.

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[25] BS8545 Trees: from nursery to independence in the landscape recommendations. A British Standard to assist people involved in planning, designing, resourcing, producing, planting and managing new trees in the landscape.

[26] Transport for London (2017). Streetscape Guidance. [Online] [Accessed: 03/05/2022] Available from: http://content.tfl.gov.uk/streetscape-guidance-.pdf

There is potential for localised minor negative impacts on the built environment and streetscape in the more sensitive rural environments, however this would be locationally specific and dependant on:

- Size of the structures/signage
- How many are needed (and the distance between them)
- Whether they are lit
- Whether the infrastructure is in a sensitive location (i.e. the character of the setting and what sensitive receptors are close by)
- Implementation of good practice site selection (i.e. avoid removal of hedgerows/trees) to avoid altering the character of the setting

Mitigation

In addition to the implementation of TfL's streetscape guidance, sensitive site selection and installation should be adhered to in rural areas.

5.7 Summary

IIA Objective	Description of Impact	Duration (Short or Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
To contribute to a reduction in air pollutant emissions, exposure to air pollution and compliance with legal limits	The Proposed Scheme is estimated to have a moderate (NO_x) to minor (PM_{10} and $PM_{2.5}$) beneficial impact on road traffic emissions of air pollutants across Greater London.	Medium	Medium (NOx) Low (PM_{10} and $PM_{2.5}$)	High	Moderate Positive (NO_x) Minor Positive (PM_{10} and $PM_{2.5}$)	Not applicable	Not applicable
	The Proposed Scheme is estimated to have a minor (NO_2) to negligible ($PM_{2.5}$) beneficial impact on exposure to air pollution and achieving WHO Interim Targets across Greater London.	Medium	Low (NO_2) Neutral ($PM_{2.5}$)	High	Minor Positive (NO_2) Neutral ($PM_{2.5}$)	Not applicable	Not applicable
	The Proposed Scheme is estimated to have a minor impact on compliance with legal limits across Greater London.	Medium	Low	High	Minor Positive	Not applicable	Not applicable
To help tackle climate change through reducing greenhouse gas emissions and	The Proposed Scheme is estimated to have a negligible positive impact on	Medium	Negligible	High	Neutral	Not applicable	Not applicable

IIA Objective	Description of Impact	Duration (Short or Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
moving towards a zero carbon London by 2050	carbon emissions in Greater London.						
To protect and enhance the natural environment including biodiversity, flora and fauna	Decreases in NOx concentrations will result in a negligible positive impact on nature conservation sites.	Medium	Negligible	High	Neutral	Not applicable	Not applicable
To protect and enhance historic, archaeological, and socio-cultural environments	Potential for minor positive impact on cultural heritage assets from reduced risk of acid rain in London as a result of NO_x reductions.	Medium	Low	High	Minor positive	Not applicable	Not applicable
	Neutral impact from reductions in PM emissions on the soiling of historic buildings.	Medium	Negligible	Low	Neutral	Not applicable	Not applicable
To promote sustainable resource use and waste management	Neutral impact due to anticipated additional tonnage of vehicles scrapped due to the Proposed Scheme comprising a very small proportion of the total scrappage capacity within the M25 area.	Short	Low	Low	Neutral	Not applicable	Not applicable

IIA Objective	Description of Impact	Duration (Short or Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
	Neutral impact on fly-tipping in those parts of outer London which would not fall within the London-wide ULEZ boundary.	Short - medium	Negligible	High	Neutral	Not applicable	Not applicable
To protect and enhance built environment and streetscape	Localised minor landscape impacts of new street furniture in some rural areas.	Short - medium	Low	High	Minor negative	Where appropriate and possible, existing elements within the landscape should be utilised to support implementation of additional signage. Adherence to TfL streetscape guidance and good practice.	Sensitive site selection and installation.
	Neutral impact on the built environment or streetscape within urban/suburban areas of outer London as a result of the installation of new street furniture required for the Proposed Scheme.	Short - medium	Negligible	Low	Neutral	Not applicable	Not applicable

6. People (Health and Equality)

6.1 Introduction

Overview of assessment

This section assesses the potential for impacts on health and equality because of the Proposed Scheme. The public Sector Equality Duty (PSED) requires public bodies to have due regard to the need to eliminate discrimination, advance equality of opportunity and foster good relations between different people when carrying out their activities.

The EQIA assesses the impact of the implementation of the Proposed Scheme on people with protected characteristics as defined in the Equality Act 2010. Specifically, the following protected characteristic groups (PCGs) are considered in the EQIA: age, disability, sex, race, pregnancy and maternity, gender reassignment, religion and belief, and sexual orientation. Although not specified in the Equality Act 2010, impacts on socio-economically deprived people, single parents, and refugees/asylum seekers are considered as vulnerable groups that may be disproportionately or differentially[27] impacted. Gypsy and Traveller communities fall within the protected characteristic of 'race'. Primarily, the EQIA identifies the potential impacts on PCGs and vulnerable groups because of changes in air quality and as a result of accessibility to different modes of transport, and how this facilitates access to key services. TfL has undertaken an impact assessment of changes affecting the Congestion Charge and Low Emission Zone, which considers the Auto Pay and PCN elements of the Proposed Scheme, the relevant findings of which have been used to inform this IIA.

The HIA focuses on access to health and social care services; health and wellbeing benefits from any changes in air quality and an increase in active travel; potential for social exclusion/isolation as a result of barriers to transport; and stress and anxiety resulting from the Proposed Scheme. Disproportionate and differential impacts on PCGs and vulnerable groups are also considered within the HIA.

This section identifies how the Proposed Scheme aligns with the following relevant IIA objectives:

- **To enhance equality and social inclusion:**
  - **To reduce emissions and concentrations of harmful atmospheric pollutants particularly in areas of poorest air quality; and reduce levels of exposure experienced by more vulnerable and disadvantaged groups**
  - **To maximise accessibility for all and maintain connectivity in and around London and enable sustainable transport choices**
  - **To provide affordable and safe transport choices for all**
- **To contribute to enhanced health and wellbeing for all within London, and to reduce health inequalities.**

There is a substantial degree of overlap between the HIA and EQIA elements of the People assessment, as many health and wellbeing impacts would disproportionately affect PCGs and other vulnerable groups. The IIA has set out the impacts of the Proposed Scheme in relation to the health determinants and consider each of these in relation to the potential for disproportionate or differential impacts on PCGs and other vulnerable groups. However, it is recognised that not all equality impacts are linked to health; therefore, where equality

[27] A differential equality effect is one which affects members of a protected group differently from the rest of the general population because of specific needs or a recognised sensitivity or vulnerability associated with their protected characteristic.

impacts on PCGs and other vulnerable groups not related to health are identified, these are reported separately.

The policy and legislative context and baseline data that informs the People assessment is found in the separate Baseline Report.

6.2 Objective: To reduce emissions and concentrations of harmful atmospheric pollutants particularly in areas of poorest air quality; and reduce levels of exposure experienced by more vulnerable and disadvantaged groups

6.2.1 Air quality and health outcomes

Overview of air quality assessment

As discussed in the Baseline Report, the links between air pollution and health effects are well established. The main pollutants of concern associated with vehicle emissions are PM and NO_2, which are linked to effects on lung function and other respiratory problems.

As identified in Section 5.2, implementation of the Proposed Scheme would reduce NO_x and $PM_{2.5}$ emissions compared to the baseline by 5.4 per cent and 1.5 per cent, respectively, and average exposure to NO_2 and $PM_{2.5}$ by 1.3 per cent and 0.1 per cent, respectively, across Greater London.

This forecast reduction in emissions of and exposure to air pollutants because of the Proposed Scheme would bring about important reductions in the adverse health impacts caused by air pollution. An analysis of the health effects has been undertaken by Ricardo Plc using an Impact Pathway Approach to quantify the mortality benefits (avoided life years lost (LYL)) and avoided hospital admissions. The results are summarised in this section, with further details and the full methodology provided in Appendix E.

Hospital admissions and life years lost

To provide an indication of the health effects of implementing the combined package, Ricardo used nine health impact pathways to calculate the reduction of hospital admissions for the assessment year (2023) and LYL associated with improved air quality. These are described in **Table 6-1**.

Table 6-1: Health impact pathways used to quantify the health effects of the Proposed Scheme

Health impact pathways	Unit of measurement	Indicator
Mortality associated with long-term exposure to $PM_{2.5}$	LYL	Chronic mortality $PM_{2.5}$ (LYL)
Mortality associated with long-term exposure to NO_2	LYL	Chronic mortality NO_2 (LYL)
Respiratory hospital admissions associated with acute exposure to NO_2	Number of hospital admissions (HAs)	Respiratory HA NO_2
Respiratory hospital admissions associated with acute exposure to $PM_{2.5}$	Number of HAs	Respiratory HA $PM_{2.5}$
Cardio-vascular hospital admissions associated with acute exposure to $PM_{2.5}$	Number of HAs	Cardiovascular disease HA $PM_{2.5}$

Health impact pathways	Unit of measurement	Indicator
Coronary heart disease (CHD) associated with acute exposure to $PM_{2.5}$	Incidence (number of new cases)	Incidences of CHD
Lung-cancer associated with acute exposure to PM2.5	Incidence (number of new cases)	Incidences of lung-cancer $PM_{2.5}$
Stroke associated with acute exposure to PM2.5	Incidence (number of new cases)	Incidences of stroke $PM_{2.5}$
Asthma (small children) associated with acute exposure to NO_2	Incidence (number of new cases)	Incidences of asthma – small children NO_2
Asthma (older children) associated with acute exposure to NO_2	Incidence (number of new cases)	Incidences of asthma – older children NO_2
Asthma (older children) associated with acute exposure to $PM_{2.5}$	Incidence (number of new cases)	Incidences of asthma – older children $PM_{2.5}$
Productivity	Pounds (£)	Productivity

The estimated health impacts in relation to changes in concentrations of NO_2 and $PM_{2.5}$ for the year 2023 are presented in Table 6-1 and Table 6-2[28]. These tables show the health 'burden' associated with the absolute levels of pollutant concentrations under the Without Scheme (i.e. no change to existing ULEZ) and Proposed Scheme scenarios, and the health benefit (change in burden) calculated as the difference between the Without Scheme and the Proposed Scheme).

Hospital admissions show the burden or relative change in burden in the study year (2023) associated with the pollutant change in that year. Chronic mortality values reflect the total burden or change in burden in LYL over a 100-year assessment period, associated with the change in pollution in the initial assessment year (2023).

Table 6-2: Results of air quality health impacts analysis for NO_2 for the Without Scheme and Proposed Scheme scenario in 2023 for the central case

Scenario	Geographical Area	NO_2			
		Chronic mortality (LYL)	Respiratory Hospital Admissions	Incidences of asthma – small children	Incidences of asthma – older children
Without Scheme	Central London	3,576	443	3,022	583
	Inner London	4,229	524	3,574	689
	Outer London	9,255	1,146	7,821	1,508
	Greater London	17,060	2,112	14,416	2,780
Proposed Scheme	Central London	3,543	439	2,994	577
	Inner London	4,184	518	3,536	682
	Outer London	9,118	1,129	7,705	1,486
	Greater London	16,846	2,086	14,236	2,745
Proposed Scheme Change in Burden	Central	-32	-4	-27	-5
	Inner	-45	-6	-38	-7
	Outer	-137	-17	-115	-22
	Greater London	-214	-26	-181	-35

[28] The tables presented here are for the central case only. Low and high sensitivity cases have also been calculated using the low and high concentration response functions (CRFs) for mortality, and are presented in Appendix E.

As shown in **Table 6-3**, from reductions in concentration in NO_2 it is estimated there would be fewer LYL with the Proposed Scheme in place across Greater London, at a lesser burden of 214 in comparison to the Without Scheme scenario. Outer London generally would experience the greatest health benefits, with a lesser burden of 137 in relation to LYL, and 115 and 22 in relation to asthma in small children and older children respectively, with the Proposed Scheme in place.

Table 6-3: Results of air quality health impacts analysis for $PM_{2.5}$ for the Without Scheme and Proposed Scheme scenario in 2023 for the central case

Scenario	Geographical Area	$PM_{2.5}$						
		Chronic mortality LYL	Respiratory Hospital Admissions	Cardiovascular disease HA	Incidences of CHD	Incidences of stroke	Incidences of lung cancer	Incidences of asthma - older children
Without Scheme	Central London	12,877	309	173	202	249	118	3,143
	Inner London	16,215	389	218	254	313	148	3,958
	Outer London	38,050	913	513	596	735	348	9,288
	Greater London	67,142	1,610	904	1,052	1,297	614	16,390
Proposed Scheme	Central London	12,868	309	173	202	249	118	3,141
	Inner London	16,205	389	218	254	313	148	3,956
	Outer London	38,010	912	512	596	734	348	9,279
	Greater London	67,083	1,609	904	1,051	1,296	614	16,376
Proposed Scheme Change in Burden	Central	-8	-0.20	-0.11	-0.13	-0.16	-0.08	-2.07
	Inner	-10	-0.25	-0.14	-0.16	-0.20	-0.09	-2.52
	Outer	-40	-0.96	-0.54	-0.63	-0.78	-0.37	-9.80
	Greater London	-59	-1.41	-0.79	-0.92	-1.14	-0.54	-14.40

As shown in **Table 6-3**, health benefits from reductions in $PM_{2.5}$ are relatively small. It is estimated there would be fewer LYL with the Proposed Scheme in place across Greater London, at a lesser burden of 59 in comparison to the Without Scheme scenario. Reductions in the burden in relation to HAs from respiratory and cardiovascular disease and incidences of CHD, stroke, lung cancer are nominal with the Proposed Scheme in place. There would be a lesser burden of incidences of asthma in older children across Greater London of approximately nine, with most of these benefits experienced in outer London.

The results air quality health impacts analysis indicates that the Proposed Scheme delivers positive health benefits relative to the Without Scheme scenario. For example, through the reductions in concentrations achieved in 2023, the Proposed Scheme is estimated to achieve a London-wide reduction of 214 life-years lost associated with exposure to NO_2. It is important to note that not all the mortality benefits will fall in that year: this health impact is associated with reductions in chronic exposure and these impacts are modelled to accrue over the 100-year period following the concentration change through the life-tables approach.

Monetisation of health impacts

In addition to quantifying the LYL and hospital admissions associated with the implementation of the Proposed Scheme, the economic benefit (i.e. the value in monetary terms) associated with reductions in air pollution have been estimated. The valuation of health improvements captures several economic effects, including the direct impact on the utility of the affected individual (commonly captured by the 'willingness-to-pay' of the individual to avoid the detrimental health outcome), reduction in medical costs and increase in

productivity. Monetising the health impacts in this way allows the economic benefits of improved health outcomes to be compared with the costs of implementing the Proposed Scheme.

When valuing chronic mortality, the concept of the 'Value of a life year' (VOLY) was applied to the number of avoided life-years lost under the implementation of the Proposed Scheme to estimate a monetary benefit. The results were then compared with the 'Without Scheme' scenario and are summarised in Table 6-4 and Table 6-5. In regard to hospital admissions avoided (i.e. reduction in burden on health care services), the monetary value includes the resource cost (e.g. NHS cost), opportunity cost (lost productivity) and disutility associated with an admission.

Table 6-4: Central case 2023 Proposed Scheme health benefit for changes in NO_2 concentrations (i.e. valuation of relative impact, 2020 prices (£)).

Geographical Area	Monetised Health Benefit (£) (NO_2)			
	Respiratory HA	Chronic mortality LYL	Incidences of asthma - older children	Incidences of asthma - small children
Central London	£41,238	£1,416,418	£4,415	£14,915
Inner London	£57,694	£1,981,606	£6,177	£20,867
Outer London	£174,882	£6,006,693	£18,723	£63,252
Greater London	£273,814	£9,404,717	£29,315	£99,034

Table 6-5: Central case 2023 Proposed Scheme health benefit for changes in $PM_{2.5}$ concentrations (i.e. valuation of relative impact, 2020 prices (£)).

Geographical Area	Monetised health benefit (£) ($PM_{2.5}$)							
	Chronic mortality LYL	Respiratory HA	Cardiovascular HA	Incidences of CHD	Incidences of stroke	Incidences of lung cancer	Incidences of asthma - older children	Productivity
Central London	£373,055	£2,104	£1,206	£36,226	£17,133	£4,775	£1,742	£24,442
Inner London	£454,182	£2,561	£1,469	£44,104	£20,858	£5,814	£2,121	£29,758
Outer London	£1,765,047	£9,953	£5,708	£171,396	£81,060	£22,593	£8,243	£115,645
Greater London	£2,592,285	£14,618	£8,383	£251,725	£119,051	£33,181	£12,106	£169,845

Table 6-4 and Table 6-6 illustrate that for all health pathways, outer London experiences the greatest health benefits in monetary terms in comparison to central and inner London from reductions in NO_2 and $PM_{2.5}$ pollutant concentrations.

Under the core set of health pathways assessed for the Proposed Scheme, the improved health outcomes associated with reduced air pollution in 2023 for Greater London are estimated to have a total monetised benefit of £13.0m associated with the single year change in concentrations in 2023. The greatest benefit is shown through reductions in mortality (all impacts are in 2020 prices and discounted to 2023).

The Proposed Scheme would continue to deliver air quality benefits for several years beyond 2023, however these have not been modelled. The magnitude of these benefits would, however, reduce over time due to natural improvements in the vehicle fleet, meaning that the levels of vehicle compliance with emissions standards would increase.

Summary of health effects of pollutant emissions

Implementation of the Proposed Scheme would bring about important reductions in the health impacts associated with vehicle emissions. Indirect effects of reduced air pollution on active travel levels are addressed in Section 6.4.2.

The improvements in health outcomes with the Proposed Scheme implemented are greatest in outer London where the biggest reductions in population weighted mean concentrations of NO_2 and $PM_{2.5}$ are seen, and lowest in central and inner London where HGV and LGV vehicles restrictions are already included in the baseline (e.g. the Congestion Charge zone and existing ULEZ boundary).

The improved health outcomes – reductions in LYL, hospital admissions, and incidences of certain diseases - associated with reduced air pollutant emissions from the implementation of the Proposed Scheme are estimated to have a total monetised benefit of £13.0m across Greater London in comparison to the without scheme scenario.

6.2.2 Air quality and health inequalities

The air quality improvements arising from the Proposed Scheme (as described in Section 5); would have an impact on communities across the Greater London and adjacent areas. As set out in the Baseline Report, children, older people and pregnant women are more sensitive to the effects of air pollution than the general population. Air pollution is linked to inequalities in health outcomes, with different socio-economic and ethnic groups experiencing disproportionate impacts. People from more deprived communities are vulnerable to poor air quality as they are more likely to have existing respiratory and cardiovascular diseases and tend to live in substandard housing in poorer quality environments where air pollution is worse. There are exceptions where affluent populations tend to live in more trafficked areas (Royal College of Physicians, 2016). Similar trends are also seen for Black, Asian and ethnic minority groups.

This section considers the aforementioned PCGs and vulnerable groups and identifies whether they are likely to be disproportionately impacted by the changes in pollutant concentrations arising from the Proposed Scheme. As explained in Section 3, the assessment of changes in pollutant concentrations is focussed on the changes in levels of NO_2 and $PM_{2.5}$ in relation to the AQOs.

Socio-economically deprived communities

To determine the impact of changes in air quality on the most deprived communities in the Greater London, the average concentrations of NO_2 and $PM_{2.5}$ across the LSOAs in each of the deciles on the Index of Multiple Deprivation (IMD) were calculated. Approximately 1.5 million people live in the two most deprived deciles in Greater London. Overall levels of deprivation across the Greater London and adjacent areas are shown on Map 1 in the Baseline Report.

Table 6-6 shows that in the cases of average concentrations for NO_2 and $PM_{2.5}$, the average concentrations in the Baseline Year (2019) and under the Without Scheme and Proposed Scheme scenarios are higher in the least deprived deciles than the most deprived, indicating higher trafficked environments. The table illustrates that on average, all deciles would experience an air quality improvement because of the Proposed Scheme due to a reduction in average concentrations of NO_2. Changes in the average concentration of NO_2 are relatively similar across all deciles of deprivation. The LSOAs in the deciles towards the more deprived end of the scale would experience a slightly greater percentage reduction in average NO_2 concentrations than the least deprived, with deciles 5 to 8 experiencing the most benefits at a reduction of 0.29 per cent from the 'Without Scheme' scenario. The least deprived decile experiences the fewest benefits.

There would be small reductions in the average concentration on $PM_{2.5}$ across all deciles, with no discernible variation between deciles of differing levels of deprivation.

Table 6-6: Average concentrations of NO_2 and $PM_{2.5}$ for IMD deciles for the Baseline Year, Without Scheme and Proposed Scheme scenarios

	Baseline Year (2019)		Without Scheme (2023)		Proposed Scheme (2023)		% Change (Without Scheme vs Proposed Scheme)	
	Average conc. of NO_2	Average conc. of $PM_{2.5}$	Average conc. of NO_2	Average conc. of $PM_{2.5}$	Average conc. of NO_2	Average conc. of $PM_{2.5}$	Average conc. of NO_2	Average conc. of $PM_{2.5}$
1 (least deprived)	29.9	11.0	23.2	10.3	22.9	10.2	-0.26	-0.01
2	29.6	11.0	23.1	10.2	22.8	10.2	-0.27	-0.01
3	29.2	10.9	22.8	10.2	22.5	10.2	-0.27	-0.01
4	29.1	10.9	22.7	10.1	22.4	10.1	-0.28	-0.01
5	28.3	10.8	22.1	10.0	21.8	10.0	-0.29	-0.01
6	28.1	10.7	22.0	10.0	21.7	10.0	-0.29	-0.01
7	27.3	10.6	21.3	9.9	21.1	9.9	-0.29	-0.01
8	27.4	10.6	21.5	9.9	21.2	9.9	-0.29	-0.01
9	25.8	10.4	20.4	9.7	20.1	9.7	-0.28	-0.01
10 (most deprived)	24.7	10.2	19.6	9.5	19.3	9.5	-0.27	-0.01

Black, Asian and minority ethnic communities

To determine the impact of changes in air quality on Black, Asian and minority ethnic communities within Greater London, the population-weighted average concentrations of NO_2 and $PM_{2.5}$ for different ethnic groups was calculated for the baseline year, under the Without Scheme and Proposed Scheme scenarios.

Table 6-7 illustrates that on average, all ethnic groups would experience an air quality improvement because of the Proposed Scheme due to a reduction in average concentrations of NO_2. Changes in the average concentration of NO_2 is relatively similar across all ethnic groups, with Asian people expected to experience the greatest benefit, with a reduction in NO_2 concentration of 0.29 per cent. There would also be small reductions in the average concentration on $PM_{2.5}$ across all ethnic groups.

Table 6-7: Population-weighted average concentrations of NO_2 and $PM_{2.5}$ for ethnic groups in the Greater London for the Baseline Year, Without Scheme and Proposed Scheme scenarios

		Ethnic Group				
		Asian	Black	Mixed	Other	White
Baseline Year	**NO_2**	28.55	28.83	28.84	29.94	27.95
	$PM_{2.5}$	10.79	10.86	10.86	11.02	10.72

		Ethnic Group				
		Asian	Black	Mixed	Other	White
Without Scheme	NO_2	22.32	22.48	22.49	23.26	21.86
	$PM_{2.5}$	10.06	10.12	10.12	10.25	9.99
Proposed Scheme	NO_2	22.03	22.21	22.21	22.98	21.59
	$PM_{2.5}$	10.05	10.11	10.11	10.25	9.98
% Change (Without Scheme vs. Proposed Scheme)	NO_2	-0.29	-0.27	-0.28	-0.28	-0.28
	$PM_{2.5}$	-0.01	-0.01	-0.01	-0.01	-0.01

Schools, hospitals, care homes, and Gypsy and Traveller Sites

An analysis of the impact of the Proposed Scheme on the concentration of pollutants at schools, hospitals, and care homes has been carried out. These facilities are used disproportionately by sensitive groups, such as the young at schools, older people at care homes, and pregnant women, the very young, people with disabilities and long-term illnesses and older people at hospitals.

Analysis of changes in pollutant concentrations has also been undertaken for known Gypsy and Traveller Sites, as shown on Map 3 in the Baseline Report. This protected characteristic ethnic sub-group is more likely to experience health inequalities and have disproportionately poorer health outcomes than the general population (as reported in the Baseline Report).

An assessment of the number of these sensitive receptor sites for which the annual mean concentration of NO_2 and $PM_{2.5}$ exceeds the AQO before and after the implementation of the Proposed Scheme, has been carried out, and the results are shown in Table 6-8. An assessment of the sensitive receptor sites in relation to exceedances of the interim WHO guidelines for NO_2 has also been undertaken and the result are shown in Table 6-9. The study area considered for the EQIA/HIA is that used by the air quality assessment, which comprises Greater London as well as the area within the M25 but outside of the Greater London boundary (shown in Tables 6-8 and 6-9 as non-GLA), to determine whether there would be any adverse impacts in this area.

Table 6-8: Sensitive receptor sites exceeding the AQOs for NO_2 and $PM_{2.5}$ in the Greater London and non-Greater London for the Baseline Year, Without Scheme and Proposed Scheme scenarios

			Baseline Year (2019)		Without Scheme (2023)		Proposed Scheme (2023)	
Receptor	Location	No. of Receptors	Receptors experiencing annual mean conc. of NO_2>40ugm^{-3}	Receptors experiencing annual mean conc. of $PM_{2.5}$ >10 ugm^{-3}	Receptors experiencing annual mean conc. of NO_2>40ugm^{-3}	Receptors experiencing annual mean conc. of $PM_{2.5}$ >10 ugm^{-3}	Receptors experiencing annual mean conc. of NO_2>40ugm^{-3}	Receptors experiencing annual mean conc. of $PM_{2.5}$ >10 ugm^{-3}
Schools	GLA	3256	51	2869	0	1432	0	1421
	Non-GLA	387	0	3	0	0	0	0

			Baseline Year (2019)		Without Scheme (2023)		Proposed Scheme (2023)	
Receptor	Location	No. of Receptors	Receptors experiencing annual mean conc. of NO_2>40ugm^{-3}	Receptors experiencing annual mean conc. of $PM_{2.5}$ >10 ugm^{-3}	Receptors experiencing annual mean conc. of NO_2>40ugm^{-3}	Receptors experiencing annual mean conc. of $PM_{2.5}$ >10 ugm^{-3}	Receptors experiencing annual mean conc. of NO_2>40ugm^{-3}	Receptors experiencing annual mean conc. of $PM_{2.5}$ >10 ugm^{-3}
Hospital	GLA	284	9	257	0	148	0	148
	Non-GLA	14	0	2	0	0	0	0
Care Homes	GLA	525	1	435	0	154	0	150
	Non-GLA	59	0	5	0	0	0	0
Gypsy and Traveller Sites	GLA	30	1	24	0	17	0	17
	Non-GLA	0	0	0	0	0	0	0

Table 6-9: Sensitive receptor sites exceeding the interim WHO guidelines for NO_2 in the Greater London and non-Greater London for the Baseline Year, Without Scheme and Proposed Scheme scenarios

			Baseline Year (2019)		Without Scheme (2023)		Proposed Scheme (2023)	
Receptor	Location	No. of Receptors	Receptors experiencing annual mean conc. of NO_2>30ugm^{-3}	Receptors experiencing annual mean conc. of NO_2>20ugm^{-3}	Receptors experiencing annual mean conc. of NO_2>30ugm^{-3}	Receptors experiencing annual mean conc. of NO_2>20ugm^{-3}	Receptors experiencing annual mean conc. of NO_2>30ugm^{-3}	Receptors experiencing annual mean conc. of NO_2>20ugm^{-3}
Schools	GLA	3256	1022	3219	106	2369	91	2224
	Non-GLA	387	0	256	0	9	0	8
Hospital	GLA	284	113	278	49	227	46	215
	Non-GLA	14	0	10	0	1	0	0
Gypsy and Traveller Sites	GLA	30	12	30	1	22	1	21
	Non-GLA	0	0	0	0	0	0	0
Care Homes	GLA	525	86	518	0	334	0	304
	Non-GLA	59	0	48	0	1	0	1

As the data in Tables 6-8 shows, none of the schools, hospitals, care homes or Gypsy and Traveller Sites within Greater London or outside London areas are predicted to have exceedances of NO_2 by the year 2023 in the Without Scheme and Proposed Scheme scenarios. With the Proposed Scheme, however, there would be improvements in relation to exceedances of the AQO for $PM_{2.5}$ at some sensitive receptors. Eleven fewer schools and four fewer care homes within Greater London would experience annual mean concentrations of $PM_{2.5}$ that exceed the AQO of 10 ugm^{-3} with the Proposed Scheme in place than without.

The data in Table 6-9 shows that with the Proposed Scheme, 30 fewer care homes sites, 145 fewer hospitals, and one less Gypsy and Traveller site within Greater London would experience an exceedance of the interim WHO guidelines of annual mean concentration of NO_2 of >20ugm^{-3} than without the Proposed Scheme.

There would also be slightly fewer sensitive receptors exceeding the interim WHO guidelines of an annual mean concentration of NO_2 of >30ugm^{-3} with the Proposed Scheme in place compared to without.

The data presented also illustrates that there would be no adverse impacts on pollutant concentrations at sensitive receptors outside the Greater London boundary with the Proposed Scheme implemented.

Summary of impacts

Compared to the without scheme scenario, with the Proposed Scheme implemented all socio-economic groups would benefit from reductions in average concentrations of NO_2 and $PM_{2.5}$, including approximately 1.5 million people living in the bottom two deciles of deprivation in Greater London. Changes in the average concentration of NO_2 are relatively similar across all deciles of deprivation, however the least deprived decile experiences the fewest benefits with greater benefits seen towards the middle to most deprived deciles.

All ethnic groups will benefit from reductions in average concentrations of NO_2 and $PM_{2.5}$. Population-weighted data shows that Asian people would experience a slightly greater benefit than other ethnic groups from reductions in average concentrations of NO_2.

The data shows that the predicted air quality improvements would have benefits that would be relatively evenly distributed across the population, with negligible disproportionate benefits for deprived communities and Asian people. Generally the air quality benefits, particularly in relation to reductions in average concentrations of NO_2 would have health benefits for most people living in Greater London.

With the Proposed Scheme in place, there would be a reduction in the number of schools and care homes showing exceedances of the AQO for $PM_{2.5}$ (11 and four respectively, when compared to the Do-Minimum scenario). Additionally, with the Proposed Scheme, 30 fewer care homes sites, 145 fewer hospitals, and 1 less Gypsy and Traveller site within Greater London would experience an exceedance of the interim WHO guidelines of annual mean concentration of NO_2 of >20ugm^{-3} than without the Proposed Scheme. This would disproportionately benefit the PCGs more likely to use these facilities, such as children, older people, disabled people, pregnant women and people with underlying heath conditions, and people residing at the Gypsy and Traveller site would also benefit.

It is also considered that there is potential for a disproportionate health benefit from air quality improvements for older people and children living in outer London. This is due to the higher percentage of people aged over 65 and children aged 0 – 15 in these boroughs than in inner London, as reported in the Baseline Report.

While the data does not illustrate a noticeable disproportionate benefit for people living in deprived areas or for Black, Asian and minority ethnic groups, the benefits are distributed evenly amongst all socio-economic and ethnic groups. The Air Pollution and Inequalities in London: 2019 Update Report (Logika, 2019) explains how recent policies to improve air pollution have also reduced the inequality in exposure between different socio-economic and ethnic groups. The Proposed Scheme is an important policy mechanism in the realisation of the MTS's air quality/equality objective and is expected to contribute towards the improvement of health outcomes and reduction of health inequalities for all population groups.

Mitigation

No further mitigation is recommended.

6.2.3 Climate

As described in the Baseline Report, the environmental and societal effects that are predicted to result from a changing climate present a substantial risk to London and are likely to have negative impacts on the health of the population, particularly for PCGs and vulnerable groups such as disabled people, older people, people with underlying health issues, and people living in deprived areas. Effects such as the Urban Heat Island (UHI)

compounds and intensifies the impacts of climate change resulting in hotter summers and heatwaves and preventing night time cooling. The UHI effect is most intense at night and is mainly experienced within the central London area.

Whilst there are many factors that contribute to UHI, transport is a major contributor. Vehicles generate a large amount of heat through their exhaust emissions, radiant heat and tyre-road surface friction. As there is a higher density of vehicles in urban areas, this contributes to the UHI and its associated health effects.

The assessment presented in section 5.3 reported that that the greatest absolute and relative changes in road traffic CO_2 emissions because of the Proposed Scheme are estimated to occur in outer London, with road traffic emissions estimated to decrease by 2.0 per cent within this area (a 'small' reduction). This reduction is primarily associated with reduced emissions from cars (as a result of both reductions in road traffic movements and improvements to the vehicle fleet in response to the Proposed Scheme) and LGVs (as a result of improvements to the vehicle fleet in response to the Proposed Scheme). Overall, the proposed scheme is estimated to have a small beneficial impact on carbon emissions.

Due to the barely perceptible nature of the climate benefits and considering that outer London is less susceptible to the UHI effect, it is unlikely that there would be a measurable health benefit associated with a reduction in the UHI. Therefore, the overall impact is expected to be neutral. However, by reducing CO_2 emissions and contributing to net zero, the Proposed Scheme would help mitigate the impacts of climate change in London and the knock-on impacts on health and health inequalities related to extreme weather, drought, heat and flooding.

Summary of Impact

Neutral impact of carbon emissions on human health.

Mitigation

No further mitigation is recommended.

6.3 Objective: To provide affordable and safe transport choices for all

Objective: To maximise accessibility for all and maintain connectivity in and around London and enable sustainable transport choices

It is considered that there is a strong overlap between these two objectives, as providing affordable and safe transport choices facilitates accessibility and connectivity throughout the city. Therefore, these two objectives are assessed together, though it is recognised that accessibility and connectivity are important in their own right and these specific elements of the objective are drawn out where relevant.

Population groups, equality groups and vulnerable groups that could potentially be differentially or disproportionately impacted by the Proposed Scheme in relation to accessibility to transport are identified in Table 6-10.

Table 6-10: Population groups, equality groups and vulnerable groups considered in the assessment of these objectives

Population group / equality group / vulnerable group	Sub-Group
People living in areas outside Greater London adjacent to the Greater London boundary	Communities that may experience severance[29] impacts due to the need to cross the ULEZ boundary by car to access employment, services and facilities in outer London.
Disabled people	People with disabilities reliant on non-compliant cars
Socio-economically deprived	People on lower incomes who own a non-compliant car and/or have limited access to public transport, who work unsocial hours or use their vehicle for business purposes (e.g. tradespeople).
Women	Members of this group, particularly those on low incomes, that rely on non-compliant car to take children to school in outer London
Low income families	Members of these groups whose children travel by non-compliant minibus to attend secondary school / SEN schools within outer London
Low income couples and single parents with young children	Parents with young children who rely on non-compliant cars and who may struggle to use public transport
Pregnant and maternal women	Members of this group who drive non-compliant cars but have restricted mobility and may find it more difficult to travel by public transport or active modes
Women, refugees/asylum seekers, homeless people, disabled people	People who rely on transportation/services provided by charitable organisations
Men	Members of this group that rely on non-compliant cars and vans for economic activities in outer London
Gypsy and Traveller community	Members of this group that rely on non-compliant cars and vans for economic activities in outer London
People from different religious faiths	Members of these groups that rely on non-compliant cars and minibuses to access places of worship in outer London
Women, LGBT+, transgender people, disabled people, Black, Asian and minority ethnic people, young people	Members of these groups who may fear for their personal safety when travelling by public transport, particularly at night time

People living in areas adjacent to the proposed London-wide ULEZ boundary

There is potential for communities outside but adjacent to the boundary of the Proposed Scheme to be disproportionately impacted, as the charge could create severance between residents in these areas and facilities or places of work within the ULEZ expansion area. Residents of these communities are more likely to regularly access employment, services and facilities in outer London than those living further from the boundary.

[29] The term 'community severance' describes the effects of transport infrastructure or motorised traffic as a physical or psychological barrier separating one built-up area from another built-up area or open space (Anciaes, Jones and Mindell, 2015).

The Proposed Scheme would increase the cost of driving into outer London for residents and businesses that do not own compliant vehicles, and this may lead to social isolation and reduced access to opportunities particularly for some PCGs and vulnerable groups such as older people, disabled people, and people on low incomes who are unable to access public transport or use active modes of travel.

It is considered that in areas where there are naturally occurring barriers such as the River Thames and parks/greenspace between Greater London and the surrounding areas that these impacts would be less likely to arise. There are more likely to be severance impacts on communities which straddle the boundary of the Proposed Scheme as a continuous urban area. Examples, include:

- Bexley (outer London) and Dartford (non GLA)
- Sutton/Cheam (outer London) and Ewell/Stoneleigh (non-GLA)
- Kingston (outer London) and Hinchley Wood/Esher (non-GLA)
- Heathrow (outer London) and Stanwell (non-GLA)
- Enfield (outer London) and Waltham Cross (non-GLA)

Summary of Impact

Overall, a short-to-medium term minor negative impact is predicted on people living outside the Proposed Scheme in urban or suburban areas which would straddle the London-wide ULEZ boundary. This would disproportionately impact on people on low incomes due to their lesser capacity to upgrade to a compliant vehicle or to pay the charge.

Mitigation

- Collaborative working between TfL and local authorities adjacent to Greater London, for example, through holding regular meetings up to the implementation of the Proposed Scheme and for the first year of implementation to monitor the impacts of the Proposed Scheme

Disabled people (reliant on non-compliant cars)

Many disabled people in London are reliant on travelling by car (either as a driver or passenger) to travel around the city due to the nature of their disability and a lack of accessibility to other modes. Disabled people in the UK meeting the qualification criteria are eligible for the Blue Badge scheme which helps the holder park (on-street) close to a destination, as a driver or passenger. Some organisations (e.g. charities) also qualify on a discretionary basis if they transport people with such disabilities. As of the year ending March 2021, there were 247,000 Blue Badge holders in London.[30]

For the existing ULEZ scheme, Blue Badge holders need to pay the ULEZ charge unless their vehicle meets the ULEZ standards or is registered with the DVLA as having a disabled vehicle tax class. Keepers of vehicles registered in this tax class benefit from a grace period where they are exempt from paying the ULEZ charge until October 2025, and as part of the Proposed Scheme this grace period will be extended to October 2027. This is valid as long as their vehicle doesn't change tax class. This also applies to vehicles in the disabled passenger vehicle tax class which are used by organisations to provide transport for disabled people. In 2020, 77,100 disabled tax-exempt cars and 6,500 exempt 'other' vehicles were registered in London. [31] Disabled people over State Pension Age, who are not eligible to register their vehicle in the disabled vehicle tax class, can register their vehicle with TfL for the same grace period if they are in receipt of Attendance Allowance and are a Blue Badge holder.

The eligibility criteria for the Motability scheme are the same as those for the disabled vehicle tax class; therefore, disabled people with Motability vehicles are exempt from meeting ULEZ standards for the existing

[30] Department for Transport (2022) Blue Badge Statistics, England 2021. Available at: https://www.gov.uk/government/statistics/blue-badge-scheme-statistics-2021/blue-badge-scheme-statistics-england-2021

[31] Department for Transport (2020). Licensed Vehicles – Numbers, Borough. Available at: https://data.london.gov.uk/dataset/licensed-vehicles-numbers-borough%20Accessed%20May%202020.

scheme until October 2027. Information received through Motability UK confirmed that the scheme only leases new vehicles, and scheme leases are usually three years for standard productions cars and five years for Wheelchair Accessible Vehicles (WAVs). Cars and WAVs leased under the Motability scheme will therefore likely be compliant with the standards for the ULEZ and will not be subject to a charge.

Overall, a neutral impact on disabled people who qualify for the Motability scheme and disabled tax exemption, and older people (over state pension age) who are in receipt of Attendance Allowance and hold a Blue Badge, is expected.

It is recognised that some Blue Badge holders may not qualify for disabled vehicle tax exemptions. When people are assessed for Personal Independence Payment (PIP), people with mobility issues can get the mobility component of PIP at either a standard or enhanced rate. People with mobility issues who score between 8 and 11 points in total, qualify for the standard rate of the PIP mobility component. People need to score 12 points to qualify for the enhanced rate and qualify for a disabled vehicle tax exemption.

Disabled people who do not qualify for the Motability scheme or disabled vehicle tax exemption for their vehicles would be disproportionately impacted by the Proposed Scheme, as it is likely to be more difficult for them to switch mode or to upgrade to a compliant vehicle, due to financial constraints and/or the vehicle adaptations required. Disabled people may not be able to use active modes, and encounter significant barriers when using public transport, as discussed in the Baseline Report. For example, 11 per cent of rail and tube stations in outer London have only partial step free access, and 41 per cent have no step free access at all. Buses are more accessible, with all TfL bus routes served by low-floor vehicles, with a dedicated space for one wheelchair user and an access ramp. Buses can also be lowered to reduce the step-up from the pavement.

There are existing TfL initiatives in place to assist disabled people using public transport in the city. The TfL Accessible Travel in London report (2019a) highlights the support available when travelling around London and planning a journey such as the Travel Mentoring services – a free mentoring service run by TfL that can provide guidance and support for travel around London. One mobility aid user stated that *'Since I've taken the TfL Travel Mentoring service, my world has opened up. It has increased my confidence and allowed me to travel independently across London'* [32].

There are TfL mobile phone applications available which aim to provide passengers, particularly disabled people, guidance on routes and accessibility when planning their journeys. The TfL Go app and Journey Planner give the best routes between stations, bus stops, piers, places of interest, addresses or postcodes. Passengers can set the time they want to travel and whether they want to take the fastest route or the one with fewest changes or least walking involved. Passengers can select 'accessibility and travel options' to say whether they can use stairs or escalators, which types of transport they like to use and how far they are prepared to walk. If they are unlikely to be able to manage the step or gap onto a train, they can select the option marked 'I need step-free access to the train, bus etc'.

For those disabled people who cannot switch mode, there is the potential to upgrade to a compliant vehicle. During stakeholder engagement it was raised by Inclusion London UK that the funding for the car scrappage scheme for the existing ULEZ scheme (now closed), equivalent to £2,000, did not provide adequate financial support to disabled people to enable them to adapt to the existing ULEZ, and may have therefore resulted in further financial hardship.

Summary of Impact

Overall, a short-to-medium term moderate disproportionate and differential moderate negative impact on disabled people and older people who rely on transport by a non-compliant vehicle and who do not qualify for the Motability scheme or the disabled vehicle tax exemption.

Mitigation

[32] Accessible travel in London, TfL (2019a) Available at: https://content.tfl.gov.uk/accessible-travel-web.pdf

- TfL should work with disability groups to raise awareness of the scrappage scheme for people in receipt of disability benefits
- Eligibility criteria of a new scrappage scheme for cars should continue be targeted at people in receipt of non means tested disability benefits and TfL should work with disability groups to raise awareness
- Further improvements to step free access at stations would help improve access alternatives for those with a mobility impairment and it is recommended that this be explored by TfL
- Undertake promotion of the Access to Work scheme, a government programme which can help people with a physical or mental health condition or disability find and stay in employment and includes money towards any extra travel costs to and from work if you can't use available public transport, or if you need help to adapt your vehicle

Socio-economically deprived (reliant on non-compliant car)

As discussed in the People section of the Baseline Report, the cost of living has been increasing across the UK since early 2021 and in March 2022, inflation reached its highest recorded level since 1992, affecting the affordability of goods and services for households. According to a House of Commons Report published in April 2022[33], 83 per cent of adults in the UK reported an increase in their cost of living in March 2022. According to the research, low income households spend a larger proportion than average on energy and food so would be more affected by price increases. The Resolution Foundation estimates that an extra 1.3 million people will fall into absolute poverty in 2023, including 500,000 children[34]. The assessment of the financial impact of the Proposed Scheme on people on low incomes – and groups more likely to be living in poverty, such as disabled people - has therefore considered the rising cost of living in the UK when considering the scale of impact and the limited capacity of this group to shoulder an additional cost in the current economic climate.

As part of the Proposed Scheme it is proposed to increase the level of the Penalty Charge for non-payment of the ULEZ charge from £160 (discounted to £80 if paid within 14 days) to £180 (discounted to £90 if paid within 14 days). It is worth noting in this context that most vehicles will comply with the ULEZ standards and therefore no charge will be payable. The impact of this proposal would be experienced by drivers with vehicles which do not comply with the emissions standards, who do not pay the ULEZ charge and who are issued with PCNs for non-payment of charges; it may particularly affect those who are on low incomes or facing economic hardship. This could also impact on people with protected characteristics who are more likely to be on low incomes (e.g. women, disabled people, older people and Black, Asian and minority ethnic groups).

Penalties can be avoided if customers are registered for Auto Pay, for which, as part of this proposal, the £10 registration and annual renewal fee per vehicle are being removed. Auto Pay and Fleet Auto Pay help make the process of paying the Congestion Charge, ULEZ and LEZ easier and remove the risk of a PCN being issued for non-payment. By signing-up, customers are automatically billed monthly for the number of charging days their vehicle(s) is/are used within the CCZ, ULEZ and LEZ, and now will not have to pay the annual £10 fee.

Representation and appeals processes are in place for drivers to challenge the Penalty Charge if they believe it was issued incorrectly or unfairly or there were mitigating circumstances.

Customers that are signed up for Auto Pay cannot inadvertently forget to pay the charge and thereby incur a PCN and its associated cost. Having the opportunity for customers to sign up for Auto Pay free of charge gives them more opportunity to avoid receiving a PCN. It is considered that Auto Pay and removal of the registration and renewal fee as part of the Proposed Scheme would adequately mitigate the negative impact of an increase in PCN levels for people on low incomes and may have a positive impact for people who may otherwise forget to pay the charge and risk receiving a PCN.

[33] UK Parliament (2022). Rising cost of living in the UK. Available at: https://commonslibrary.parliament.uk/research-briefings/cbp-9428/ Accessed May 2022

[34] Ibid.

Due to the costs associated with purchasing and running a car or a van, vehicle ownership among socio-economically deprived groups in England is lower than among the more affluent groups. ONS sample data from the year 2018 shows that by gross income decile group, the highest ten per cent are 2.7 times more likely to own a car or van than the lowest ten per cent.[35] For those people who are socio-economically deprived or on low incomes who do own cars, which are non-compliant with the ULEZ standards, the Proposed Scheme may have an adverse financial impact.

Map 6 and Map 7 in the Baseline Report illustrate the existing levels of compliance[36] across all vehicles and in relation to cars, respectively, within the Greater London relative to income deprivation. As shown the levels of compliance of registered vehicles within the existing ULEZ boundary are generally high, at over 72 per cent, with areas of lower compliance in the north and east of inner London which correspond with areas of high deprivation (e.g. Hackney, Newham). Outer London has large areas with lower levels of compliance (62 – 72 per cent), which also correspond with areas of high deprivation in the north and east (including Hounslow, Ealing, Brent, Barking and Dagenham, north Croydon, southern Kingston upon Thames, south Havering and north Bexley) The lowest levels of compliance (58-67 per cent) are shown in Hounslow.

There have been increasing levels of car compliance since the original ULEZ scheme was implemented, and overall car compliance (in vehicle kilometres) is expected to be high (>90 per cent) when the Proposed Scheme is in place. Baseline data suggests that car compliance is likely to be lower in the most deprived areas of London[37].

In most areas of inner London covered by the existing ULEZ, low income residents unable to afford to purchase a compliant car would have good access to public transport alternatives; however, this is not always the case across outer London and in adjacent areas. Figure 6-1 illustrates the Public Transport Accessibility

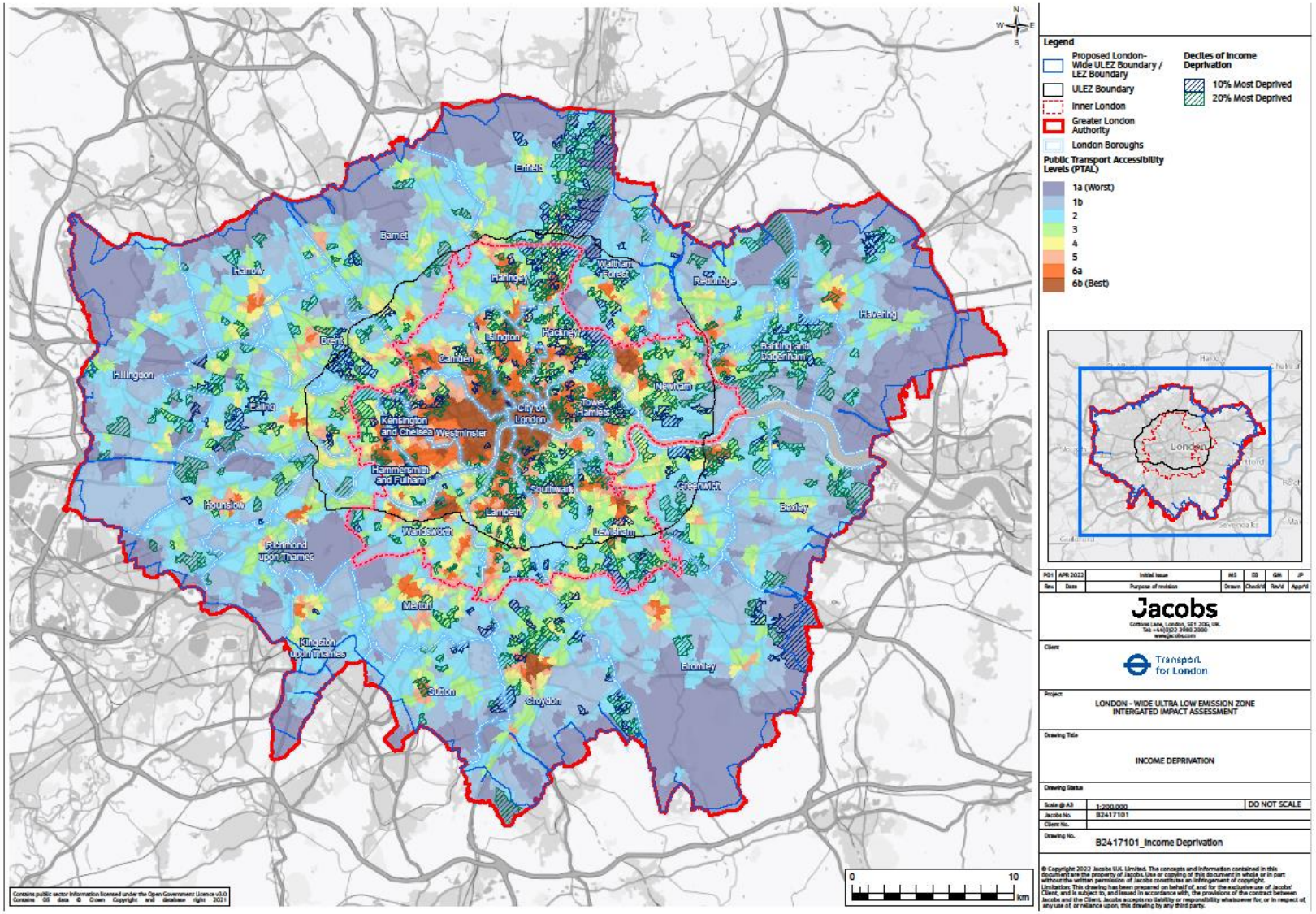
Level (PTAL) scores for the Greater London and illustrates how these relate to the 20 per cent most deprived IMD zones. For inner London the bottom 20 per cent most deprived areas still have relatively high levels of access to public transport, while in outer London there are much larger areas with low PTAL scores in areas of high deprivation, particularly in east London and north London.

[35] Office for National Statistics (2019). Percentage of households with cars by income group. Link

[36] Compliance data used in the assessment is from 2020 and is therefore likely to be an underestimate of existing levels; it is expected that compliance rates would have increased between 2020 and 2021.

[37] Two measures of compliance are included here. The main measure (which has fed in to TfL's modelling) is compliance by vehicle kilometres, and this is generally higher than compliance by the location the vehicle is registered to. This is likely due to non-compliant vehicles being used less frequently than compliant vehicles.

Figure 6-1: Public Transport Accessibility Levels in Greater London in relation to Income Deprivation



As well as lower PTAL scores, services and jobs are more spread out in outer London than they are in inner London, therefore making it more difficult for people to walk and cycle to these locations. Where public transport and active travel is less accessible in outer London and the adjacent areas, those on low incomes unable to afford a compliant car may find it more difficult to change their mode of travel to adapt.

This is likely to be a particular issue for Londoners on low incomes who work unsocial hours (e.g. as part of the night time economy) and may have greater reliance on travelling to work by car if they live in an area of low public transport accessibility. Night time services on London's public transport system are less commonplace in outer London and the adjacent areas.

The increasing price of second-hand Euro 4+ petrol cars and Euro 6 diesel cars may be a potential issue for those within lower income households looking to switch to a compliant vehicle. One in give second-hand cars in the UK cost more than new models, and the average price of a used car on Auto Trader's marketplace had increased 29 per cent over the last year, according to its latest figures in February 2022, with average used car prices are up more than £4,200 in just six months.[38] Research by the AA indicated a 57 per cent price increase in the UK's most popular vehicles since 2019[39], with the most significant increase in demand for nearly new vehicles.

The large increase in cost is mostly as a consequence of the semiconductor shortage which has affected the car manufacturing motor industry. The short supply of chips has caused a new car production bottleneck, with outputs slumping by more than a third as manufacturers struggle to source components. This cost has then been passed onto consumers.

Disabled people, low income couples and single parents with young children may also be disproportionately impacted by the Proposed Scheme as they cannot easily change mode due to being persons of reduced mobility (PRM). Disabled people and parents with young children can struggle to use public transport as there is often limited space and it can be difficult to get on and off with wheelchairs and pushchairs when services are crowded. As described above, 41 per cent of tube and rail stations in outer London have no step free access at all. This would be a particular impact for disabled people who do not qualify for the disabled vehicle tax exemption and families who cannot afford to switch to a compliant vehicle.

Summary of Impact

Overall, there is likely to be a short-to-medium term disproportionate moderate negative impact for people on low incomes who travel by a non-compliant private vehicle in outer London to access employment or opportunities, due to their lesser capacity to switch to a compliant vehicle and/or to change mode. This could also have the same impact on low income couples, parents with young children and disabled people for the same reasons.

Mitigation

- Undertake promotion of Access to Work scheme to support people with physical or mental health condition or disability to stay in work
- Greater promotion of car sharing and car clubs for those locations/trips that are difficult to serve by public transport
- A new scrappage scheme for cars should continue to be targeted at low income Londoners

As part of a new scrappage scheme for cars TfL should consider providing exclusive TfL and third party offers to successful grant recipients. These could include, for example, travelcard for bus and tram, car club membership, discounts for pushbikes, and e-bikes.

Single parents and low income families (access to education)

[38] The Guardian (2022) One in five secondhand cars in UK cost more than new models. Available at: https://www.theguardian.com/business/2022/feb/20/one-in-five-secondhand-cars-in-uk-cost-more-than-new-models

[39] BBC (2021) Second hand car prices surge amid new car shortage. Available at: https://www.bbc.co.uk/news/business-58993851

As set out in the Baseline Report, evidence shows that parents are more likely to use the car for school trips as it is more convenient, particularly for parents that are 'trip chaining' – i.e. continuing onto another location after the school runs. In the book 'Invisible Women', Caroline Criado-Perez sets out how women are more likely to 'trip-chain' due to the additional burden of unpaid household work that falls on women, such as doing the school run, grocery shopping, or caring for an older family member.[40] Criado-Perez gives the example of London where women are three times more likely to take children to school than men[41]. As a result, if they cannot afford to upgrade their vehicles more women may be forced to pay the charge or use alternative modes of travel that may be far less convenient for multiple destinations. Therefore, a short-to-medium term disproportionate minor negative impact on women undertaking the school run by non-compliant car is expected.

Secondary schools tend to have larger catchment areas and may use minibuses to transport pupils to school on a daily basis. As part of the Proposed Scheme, not-for-profit organisations that operate minibuses used for community transport, including for education purposes (excluding private schools), could register for a temporary 100 per cent discount of the ULEZ charge until October 2025. However, the grace period is only applicable to local authority owned vehicles, therefore there could be an impact on schools that utilise contractors to provide pupil transportation. It is assumed that the discount would apply to the majority of local authority secondary schools, therefore a neutral impact is expected for secondary school children travelling by minibus for education purposes.

Children travelling to Special Educational Needs (SEN) schools and secondary schools with dedicated SEN provision may be differentially impacted by the Proposed Scheme as the minibuses used to transport them may not be operated by the local authority but by private contractors. Private minibuses are not eligible for the grace period, there may therefore be a financial impact on education authorities or schools that are unable to upgrade to compliant vehicles as a result of the Proposed Scheme, which may have a knock-on impact on the pupils that attend, as well as their families Any increase of the costs of SEN school transport by minibuses within outer London or across the Greater London boundary may have a differential effect on those children from low income families if the increase is passed onto parents/carers.

Additionally, low income parents/carers who drive their children to SEN schools in a non-compliant vehicle and are less able to switch mode due to the specific needs of the child, or upgrade their vehicle for financial reasons, would be financially impacted by the charge.

Summary of Impact

Overall, a short-to-medium term differential minor negative impact on young people attending SEN schools and their parents/carers is expected, particularly those on low incomes. This is a differential impact due to SEN children having fewer travel options available than non-SEN children (e.g. independent travel by public transport or active modes).

Mitigation

- A new scrappage scheme for cars should continue to be targeted at low income Londoners
- Promotion of car sharing for journeys to school where trips are difficult to serve by public transport and active travel
- Undertake further engagement with local education authorities to understand likely scale of impact on services provided via private contractors

Access to employment within outer London

People accessing employment within outer London by non-compliant vehicle would experience a financial impact arising from the Proposed Scheme. This adverse impact may be disproportionately experienced by those employed in lower paid jobs in service and/or the night time economy. These people are more likely to

[40] Women's Budget Group (2020). 'Invisible Women': a mind-blowing exposure of a male-centred world (review).Available at: https://wbg.org.uk/blog/invisible-women-a-mind-blowing-exposure-of-a-male-centred-world-review/

[41] Ibid.

work unsociable hours and be required to travel at times when public transport is less frequent and/or accessible.

People who rely on a non-compliant vehicle to undertake their work in outer London – e.g. tradespeople such as joiners, plumbers and builders – would also be impacted by the Proposed Scheme. People working in this sector use their vehicles multiple times on a daily basis and require use of a vehicle to transport materials; they cannot undertake these journeys by active travel or public transport. Of all skilled trades professionals working in the UK construction sector just 1 per cent are women[42]. There would therefore be a short term disproportionate moderate negative impact on men working in these professions on low incomes who may struggle with the cost of upgrading. The impact is expected to be short-term as people working in this sector would be encouraged to upgrade to continue undertaking their work and avoid paying the charge.

Manual labour such as gardening, scrapping metal, building, and market trading are common types of employment within the Gypsy and Traveller community, many of which rely on the use of a private vehicle[43]. Gypsies and travellers are therefore also likely to experience a short term disproportionate moderate negative impact as a result of additional costs for trade businesses reliant on vans. The impact is expected to be short-term as this group would be encouraged to upgrade to continue undertaking their work and avoid paying the charge.

As set out in the EBIA, the Proposed Scheme is expected to have a neutral impact on London's taxi and PHV providers due to taxis being exempt from the ULEZ charges and the PHV compliant rate being estimated at 97 per cent by 2023 and rising to 100 per cent by 2026.

Summary of Impact

There is a short-term, minor disproportionate negative impact expected for Black, Asian and minority ethnic people and men working as PHV drivers due to the higher representation of these protected groups within the sector. However, this is expected to reduce to neutral in the medium term as PHVs become fully compliant with the standards.

Mitigation

- A new scrappage scheme for cars and motorcycles should continue to be targeted at low income Londoners
- Some PHV operators offer support to drivers switching to cleaner vehicles
- TfL should consider greater targeting of a new scrappage scheme for vans by focusing eligibility on micro businesses (up to 9 employees) to allow more business owners to benefit

Women, refugees/asylum seekers, homeless people, disabled people (access to services undertaken by charitable organisations and community groups)

Access to basic services and social infrastructure is important for enhancing equality outcomes and for health and wellbeing, particularly for PCGs and vulnerable people who may require additional support to integrate into the community. The Proposed Scheme would impose an additional cost on charitable organisations that provide support to vulnerable people within outer London. This may include providing transportation to hostels for rough sleepers or safe refuge for refugees and asylum seekers, victims of domestic abuse, as well as soup kitchens or food banks that rely on motorised transport for heavy equipment and supplies.

As part of the Proposed Scheme, the grace period for the 100 per cent discount for minibuses operated by not-for profit organisations, including charities and community organisations, would be extended to 2025.

[42] Construction News (2022). Percentage of women in skilled trades shows little change in a decade. Available at: https://www.constructionnews.co.uk/agenda/inspire-me/percentage-of-women-in-skilled-trades-shows-little-change-in-a-decade-18-03-2022/

[43] Equality and Human Rights Commission (2019). Inequalities experienced by Gypsy and Traveller Communities. Available at: https://www.equalityhumanrights.com/sites/default/files/research_report_12inequalities_experienced_by_gypsy_and_traveller_communities_a_review.pdf

For the existing ULEZ scheme, in the year 2021, 839 reimbursement claims for minibuses were received, and a further 158 up to the beginning of April 2022. However, not all activities undertaken by charitable organisations use minibuses for their services; many use vans to transport supplies rather than people, e.g. donations for food banks.

Therefore, a medium term minor differential negative impact on charities and community organisations undertaking activities using non-compliant vans within outer London and the vulnerable groups who rely on their services (e.g. refugees/asylum seekers, women, homeless people, disabled people) is expected, in the period after the grace period comes to an end in 2025.

Local interest groups using community facilities (e.g. community centres), such as Community Councils, parent and toddler groups, or addiction support groups may also be impacted by the Proposed Scheme. However, it is considered that the magnitude of impact would be very low due to the likelihood that people accessing these facilities would live locally and would therefore be able to use public transport or active travel or be eligible for the disabled tax vehicle exemption. A neutral impact on community groups operating within outer London is therefore expected.

Mitigation

Introduction of a new scrappage scheme for vans and charity minibuses

People from different religious faiths (access to places of worship in outer London)

People of different religious faiths living in outer London and areas adjacent to the Greater London may require use of a non-compliant car to attend religious services at places of worship within outer London and therefore be subject to a financial impact of the Proposed Scheme. Additionally, some faith groups may travel collectively by non-compliant minibus to attend places of worship. Older people may experience this impact disproportionately as they are more likely to regularly attend religious services than younger people and to rely on community transport to reach these.

Survey data collected across three years TfL's London Travel Demand Surveys (2017/18-2019/20) provides a sample size of approximately 700 respondents. The responses collated from the sample shows that 2 per cent of car trips made by outer London residents are for worship or other religious purposes; 24 per cent of these trips could be walked in less than 20 minutes (<2km) and 82 per cent could be cycled (<10km). It is therefore considered that the majority ofmost religious facilities within outer London are accessed by people who live locally and would therefore be able to use active travel to access these.

However, it is important to note that around a third of car trips made by outer London residents are <2km, (compared with 24 per cent for religious purposes) so trips for religious purposes tend to be longer than the average car trip. This supports the assumption that people are more likely to travel by car to access places of worship that serve larger catchment areas due to being nationally or regionally significant. When compared to inner London, in outer London there are few places of worship that meet these criteria; however, the Sikh temple (Gurdwara Sri Guru Singh Sabha) in Southall is a notable example.

Those groups who are unable to shift to using active travel or public transport would face a disproportionate adverse impact as a result of the Proposed Scheme. This would include older people, disabled people, and parents with small children.

Summary of Impact

Due to the relatively low scale of impact, overall, a short-to-medium term differential minor negative impact on religious groups accessing places of worship in outer London by non-compliant car is expected.

Mitigation

TfL should encourage faith organisations in outer London to adopt car sharing or, where available, greater use of compliant minibuses and care clubs for those unable to access by public transport or active travel

6.3.1 Safety and Crime

The Proposed Scheme would be enforced by a network of cameras situated at entry and exit points to the scheme boundary and at key locations within outer London. There is unlikely to be any change in the level of surveillance that could deter illegal driving and other antisocial behaviour, nor would the implementation of the Proposed Scheme be likely to cause any increase in levels of crime. However, should the Proposed Scheme be implemented it is likely that the London Metropolitan Police would request access to some of the newly installed TfL ANPR cameras, where this is considered proportionate and justified (as is the case already for the central London camera network, and would also be the case in inner London). Therefore, the proposed scheme could have a beneficial impact in improving the London Metropolitan Police's ability to prevent and detect crime, though whether this is likely to have a deterrent effect is uncertain.

While it is considered that the Proposed Scheme would not have an impact on actual levels of crime, some people who may consider shifting to using public transport or active travel instead of upgrading to a compliant vehicle may be reluctant to do so if they perceive the alternative mode to be less safe. Fear and perceptions of crime can act as a deterrent against people using public transport even if the actual levels of crime are low. TfL data indicates that during 2019/20, an average of eleven million passengers travelled on TfL's public transport services each day, with very few of them ever experiencing or witnessing crime. For every one million passenger journeys there were eleven reported crimes, the majority of these being theft offences[44].

Women, LGBT+, transgender people, disabled people, Black, Asian and minority ethnic people, young people

Fear of crime within the general population is not expected to be influenced by the Proposed Scheme, however, some groups may experience these fears disproportionately which could prevent them from switching from private vehicle to alternative travel modes. In 2017/18, on average 30 per cent of Londoners reported feeling very or quite worried about their personal security when using public transport[45]. This was particularly relevant for disabled people (37 per cent), young people (16-24 years old) (35 per cent), women (34 per cent) and black, Asian and minority ethnic people (33 per cent) (Transport for London b 2019b). During stakeholder engagement it was raised that there could be concern among the LGBT+ community if they feel they are being forced onto public transport, particularly in outer London, as members of this PCG often feel uncomfortable or unsafe using this mode, particularly at night. This would be a particular challenge in outer London where public transport provision is less comprehensive than in inner London. As set out in the Baseline Report, women cite crime and personal safety as a barrier to using public transport more often, as well as concerns about anti-social behaviour and sexual harassment[46].

It is recognised that tube stations and rail stations in outer London and in the adjacent areas are less busy than those in inner London, and some services operate less frequently. As a result, people with the protected characteristics outlined above may have longer to wait at quiet stations – predominantly during off-peak times - which may contribute to feelings of unease regarding their personal safety. As set out in section 4.5, with the Proposed Scheme in place trips within or into outer London by bus or rail are forecast to increase by 1.5 per cent and 1.2 per cent respectively. This is not considered to be a significant mode shift towards public transport as a result of the Proposed Scheme, therefore it is unlikely that it would make stations busier and that people would then feel more comfortable.

TfL are aware of the experiences of different groups on public transport and have taken steps to try to ensure people feel safe when using this mode. In June 2021, TfL launched their 'Hands Up' campaign, the address the issue of hate crime on public transport. The campaign is based on the definition of hate used by police forces and the Crown Prosecution Service. A hate crime is a criminal offence that is motivated by hate and hostility

[44] Transport for London (2020). 2019/2020 Crime Bulletin. Available at: https://content.tfl.gov.uk/tfl-crime-and-antisocial-behaviour-bulletin-201920.pdf

[45] TfL (2019a). Travel in London: Understanding our Diverse Communities 2019. Available at: https://content.tfl.gov.uk/travel-in-london-understanding-our-diverse-communities-2019.pdf

[46] Department for Transport (2019). Transport and inequality. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/953951/Transport_and_inequality_report_document.pdf

towards a person because of their disability, transgender identity, race, sexual orientation, religion or any other actual or perceived difference. This can include offences such as physical violence, sexual offences, verbal abuse and criminal damage.[47]The campaign included a social media hashtag for TfL customers – particularly Black, Asian and minority ethnic people, LGBT+ people and disabled people - to highlight their lived experiences of hate crime as well as a personal storytelling via blogs and social films featuring TfL staff.

In October 2021, TfL launched a new campaign to address the issue of sexual harassment on public transport. This campaign, launched in partnership with the Rail Delivery Group, British Transport Police, Metropolitan police Service and women's safety groups emphasised a 'zero tolerance approach to all forms of unwanted sexual behaviour and sexual harassment on London's public transport network'. The press release outlines seven distinct categories of sexual harassment which are not tolerated on public transport. The campaign is intended form 'part of a joined-up national approach to addressing sexual harassment' and promote consistent messaging across the rail network[48].

In the short-term, some people may not feel safe travelling by public transport in outer London and the adjacent areas, where they have previously travelled by non-compliant vehicle and are unable to upgrade for financial or other reasons. The Proposed Scheme has limited potential to result in mode shift towards public transport, meaning that the scale of the impact would be low. Additionally, there are existing TfL campaigns aimed at targeting hate crime and sexual harassment, which should help to alleviate fears regarding personal safety, and the impact would be short term as it is assumed these groups would become more comfortable travelling by public transport over time.

Summary of Impact

Overall, a short-term differential minor negative impact on perceptions of safety for women, disabled people, young people, transgender people, LGBT+ people and Black, Asian and minority ethnic people is expected, reducing to neutral in the medium term as people become used to the change in mode.

Mitigation

Existing TfL campaigns aimed at addressing the issues of sexual harassment and hate crimes on public transport should help to alleviate safety concerns

6.4 Objective: To contribute to enhanced health and wellbeing for all within London and to reduce health inequalities across the city and between communities.

6.4.1 Access to health and social care

This section discusses the different PCGs and vulnerable groups, and people residing in particular areas, that may be disproportionately impacted by the Proposed Scheme in relation to access to health and social care services.

Patients accessing healthcare in outer London

NHS Clinical Commissioning Groups (CCGs) commission most of the hospital and community NHS services in the local areas for which they are responsible, and all GP practices belong to a CCG. Figure 6-2 shows the boundaries of the NHS CCGs across Greater London and surrounding areas. As shown, there are a number of CCGs that straddle the existing ULEZ boundary and outer London, and so there may be the requirement for

[47] Sexual harassment is not generally considered to be a hate crime unless it is motivated by hostility based on one of the aforementioned categories. However, TfL have launched a separate campaign to address the issue of sexual harassment on public transport, discussed above.

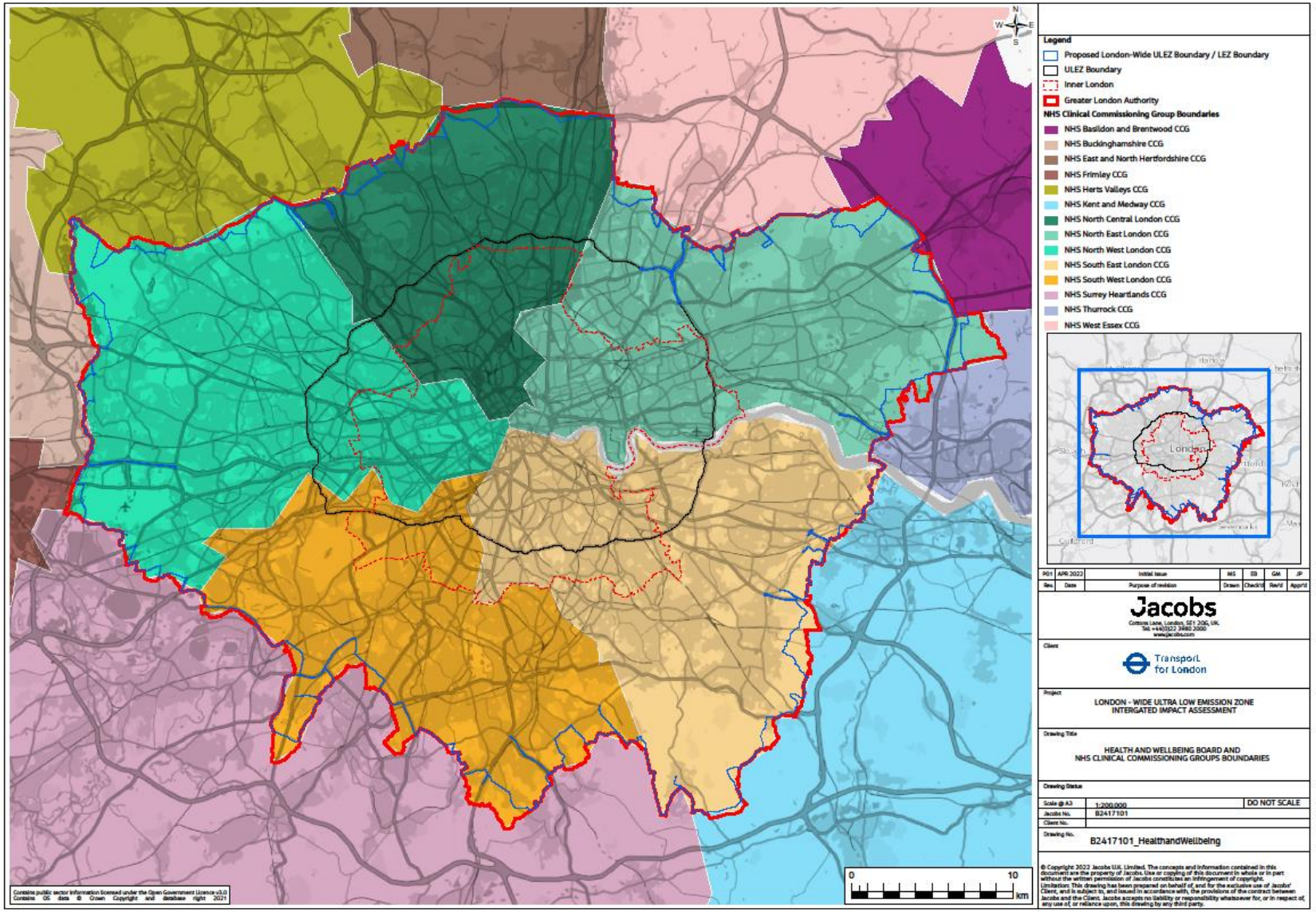
[48] Transport for London (2021). New campaign launches to stamp out sexual harassment on public transport. Available at: https://tfl.gov.uk/info-for/media/press-releases/2021/october/new-campaign-launches-to-stamp-out-sexual-harassment-on-public-transport

people travelling across the existing ULEZ boundary to pay a charge if accessing primary care[49] by a non-compliant vehicle. The boundaries for the CCGs align with that of the Greater London boundary and it is assumed that the majority of people living in areas adjacent to Greater London would not be impacted on by the Proposed Scheme when accessing primary care as they would not be required to cross the boundary. In accordance with Patient Choice[50], however, there may be some patients who attend a GP practice that is outside their CCG and may be required to cross from outer London to the adjacent areas or vice versa.

[49] Primary care is often the first point of contact for people in need of healthcare, usually provided by professionals such as GPs, dentists and pharmacists (NHS Providers, n.d).

[50] All primary medical services contracts have consistent contractual terms that provide practices the option to register out of area without obligations to provide: i) Home visits; (ii) Immediately necessary treatment following accident or emergency when the patient patient to attnd); or, Other such services provided by the contractor, which for clinical or practical reasons it is not reasonable to expect the patient to attend their registered practice, e.g. this could include follow up care following hospital discharge. (NHS England, 2015)

Figure 6-2: Health and Wellbeing Board and NHS Clinical Commissioning Group Boundaries



With the Proposed Scheme in place, people living in outer London would be required to pay a charge if choosing to drive a non-compliant vehicle to access primary care. During stakeholder engagement it was noted by the Net Zero Network for NHS E&I region that following the expansion of ULEZ in 2021, they did not record a noticeable impact on patients as a result of the changes. However, it was also noted that this could be different with the boundary extended to outer London, where people are more reliant on private cars to access primary care.

People accessing secondary healthcare[51] in outer London area are also likely to be impacted by the Proposed Scheme. There may be greater scale of impact than in relation to primary healthcare, as people are more likely to have to travel longer distances to reach specialist treatment, and there are fewer choices as to where this treatment is available.

If people are dissuaded from accessing primary or secondary healthcare due to the financial cost incurred by the Proposed Scheme, this could result in missed appointments and late diagnosis, and overall poorer health outcomes. This could have a disproportionate negative impact on older people, disabled people, and people with underlying health conditions who require access to healthcare more frequently and to attend appointments in person.

There are currently reimbursements in place for NHS patients accessing healthcare facilities travelling in a vehicle which does not meet the ULEZ standards if they are:

(i) a patient who:

  (a) has a compromised immune system or requires regular therapy, assessment or recurrent surgical intervention; and

  (b) is clinically assessed as too ill, weak or disabled to travel to an appointment on public transport; or

(i) a patient who is clinically assessed, in accordance with the advice of National Health Service for the time being applicable, as being high or moderate risk from COVID-19.

Under the Proposed Scheme the Mayor will consult on the replacement of clause (ii) with the following:

(ii) a patient who, during an epidemic or pandemic prevalent in Greater London, is clinically assessed as being too vulnerable to infection to travel to an appointment on public transport

It is assumed that some older people, disabled people and people with underlying health conditions will be eligible for NHS reimbursements under these criteria. However, it was noted during stakeholder engagement that many people with disabilities and health conditions are unaware of the reimbursements available. Additionally, it was highlighted that the process of applying for reimbursements for both the ULEZ and congestion charge could be simplified. The reimbursement scheme may not be as effective in helping people on low incomes who may struggle to pay the charge upfront, particularly disabled people who are more likely to be in poverty, as discussed above. The NHS trust or hospital manages the claim and reimburses the patient. If the patient paid the charge using Auto Pay, the charge is reimbursed into their Auto Pay account as a credit. Between the years of 2020 and 2021, a total of 3,635 NHS reimbursement claims were accepted.

It is acknowledged that many GP and other health specialist appointments can now be held over the phone or by video call, negating the need to travel. However, there is a still high demand for face to face appointments and disabled people, older people and people with long-term illnesses are more likely to need to see a professional in person due to having more specialist needs. As the reimbursement scheme only applies to secondary care, patients who have further to travel to their GP surgeries could be dissuaded from making the trip if they have to pay the charge.

Summary of Impact

Older people, disabled people and people with underlying health conditions who are traveling by non-compliant private vehicle to access medical appointments in outer London would experience a differential

[51] Secondary care, which is sometimes referred to as 'hospital and community care', can either be planned (elective) care such as a cataract operation, or urgent and emergency care such as treatment for a fracture. (NHS Providers, n.d).

and disproportionate short-medium term moderate negative impact, as they are more likely to require access to healthcare and on a more frequent basis. These impacts could result in adverse health outcomes if patients are less inclined to access medical treatment due to the cost incurred by the Proposed Scheme.

Mitigation

- TfL to work with CCGs and NHS Trusts to inform vulnerable patients of the NHS patient reimbursement scheme. For example, details of eligibility for reimbursements and discounts could be provided in all hospitals
- A new scrappage scheme for cars should continue to be targeted at low income Londoners and people on non-means tested disability benefits

Pregnancy and Maternity

Pregnant women and parents with young children may be disproportionately impacted by the Proposed Scheme as they are more likely to access healthcare services for regular appointments. It is also noted that in general, pregnant women may be less able to travel by public transport than the general population, due to the propensity for them to suffer with conditions such as sciatica, and are therefore more reliant on car/PHV.

There are 33 paediatric and maternity centres in outer London as listed on the NHS online service directory and shown on Map 1 in the Baseline Report. Of these, 19 are located in areas with a PTAL[52] score of 2 or below indicating low levels of public transport accessibility surrounding these hospitals, and are listed in Table 6-1.

[52] Public Transport Accessibility Levels (PTALs) are a detailed measure of the accessibility of any point in Greater London to the public transport network, taking into account walk access time and service availability. Each lower super output area (LSOA) is graded between 1a and 6b with 1a being very poor access and 6b excellent access to public transport.

Figure 6-3: Paediatric and Maternity Centres in Greater London

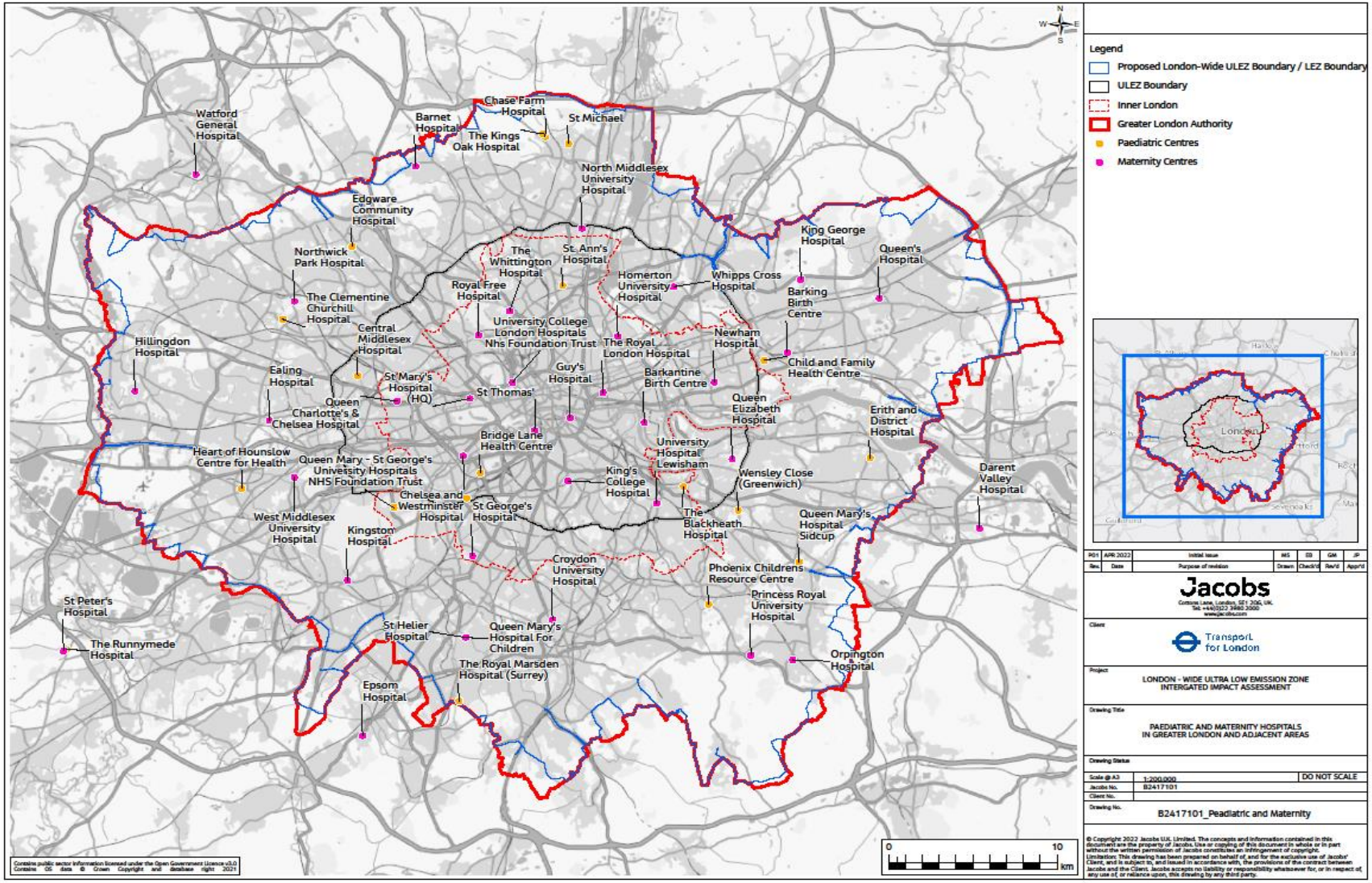


Table 6-11: Paediatric and Maternity Centres in outer London with PTAL score of 2 or lower

Type	Centre Name	PTAL Score
Paediatric	Chase Farm Hospital	1b
	Ealing Hospital	1b
	The Clementine Churchill Hospital	1b
	The Kings Oak Hospital	1b
	The Royal Marsden Hospital	1b
	Central Middlesex Hospital	2
	Queen Mary's Hospital for Children	2
	Queen Mary's Hospital Sidcup	2
	St Helier Hospital	2
	St Michael	2
Maternity	Princess Royal University Hospital	1a
	Ealing Hospital	1b
	Orpington Hospital	1b
	Barking Birth Centre	2
	Erith and District Hospital	2
	Queen Mary's Hospital for Children	2
	Queen Mary's Hospital Sidcup	2
	St Helier Hospital	2
	St Michael	2

The impact on pregnant women and mothers would be related to their requirement for access to paediatric and maternity centres in outer London by private vehicle for pre-and/or post-natal care. These types of specialist care facilities can serve large areas and be far for patients to travel, meaning car may be the only choice of mode. Women who are pregnant or have young children and who typically travel to these centres by car may find it more difficult if they own a non-compliant car, and cannot afford to replace their vehicle/pay the charge and have to travel on public transport, PHV or taxi. Those women living in areas adjacent to Greater London where public transport may not be as accessible or frequent could be particularly impacted. In comparison to inner London hospitals, generally there is more parking available and at cheaper rates at outer London hospitals. For example, St. Bartholomew's Hospital and University College Hospital offer parking only for Blue Badge holders, and Guy's Hospital and St. Thomas's Hospital charge £3.20 per hour in inner London. In outer London, The King's Oak and Erith and District Hospital offer free parking, Chase Farm Hospital charges £2 for up to 1 hour, and Orpington Hospital and Princess Royal University Hospital charges £1.50 per hour. This is another reason why women may favour private vehicles for travelling to hospital appointments in outer London.

Summary of Impact

Under the existing NHS Reimbursement scheme criteria not all pregnant women are eligible (only those who are considered unable to travel by public transport). Therefore, there is likely to be a short-medium term, differential minor negative impact for pregnant women and parents with young children who are travelling by a non-compliant vehicle to access medical appointments in outer London.

Mitigation

TfL may choose to consider whether any changes to the eligibility criteria should be considered as part of a wider review of the reimbursement scheme.

NHS staff

There is potential for impacts on NHS staff (including support staff, e.g. janitors and cleaners) travelling to places of employment (e.g. hospitals, care homes) by private vehicle within outer London. During stakeholder engagement it was noted that there were concerns in outer London that NHS staff would be pushed out of living and working in hospitals and care homes in Greater London by the Proposed Scheme. People in outer London are more dependent on private vehicles because public transport access is not as comprehensive in outer London, meaning there are fewer transport choices available for accessing employment. NHS staff often work unsocial hours and public transport may not be available at the times of day they require to travel.

Summary of Impact

Overall, there is likely to be a short-to-medium term, minor negative impact for NHS staff who are travelling by non-compliant private vehicle to access employment in outer London. As outlined in the Baseline Report, Black, Asian and minority ethnic people and women make up a higher percentage of the NHS workforce than white people and men, respectively, and also are more likely to hold lower paid positions. Therefore, this impact would disproportionately impact Black, Asian and minority ethnic people and women.

Mitigation

- A new scrappage scheme for cars should continue to be targeted at low income Londoners
- NHS England requires Trusts to have a Green Travel Plan which includes interventions that encourage staff, patients and visitors to reduce vehicle use. It is recommended that TfL work with NHS Trusts to identify opportunities for enhancement of hospital Green Travel Plans to promote use of active travel and public transport amongst staff, patients and visitors

Domiciliary care workers and mobile health staff

Many social care workers and health staff (such as district nurses, health visitors and midwives) working in the community need to travel around outer London in their own vehicles to deliver social and health care services to older people, people with disabilities, and other PCGs and vulnerable groups.

For domiciliary care workers employed by an agency or local council it is less certain that in all cases the costs of upgrading to a compliant vehicle or paying the fee will be incurred by the employer. Information provided through stakeholder engagement with the Homecare Association (the UK's membership body for homecare provider organisations) highlighted that their members reported that following the 2021 ULEZ expansion they have not received any increase in rates from commissioners in London to reflect additional costs related to this, or to support care workers/care providers with transitioning to compliant modes of transport.

While providers in central and inner London may be able to provide care using a combination of active travel and public transport, transport links in outer London and the areas adjacent to Greater London are not as accessible and services are not as regular, and often the distances to travel between service users are longer. Using public transport instead of car is also likely to increase the travel time between home visits, which with acute staff shortages means that less care can be delivered if care workers are spending more time travelling. Additionally, care workers' rotas can be fragmented, and many are on minimum wage or National Living Wage. They are at risk of being underpaid if their travel time is not fully covered and their time for travelling to/from places of employment will not be covered so if journey times are longer, they would be disproportionately disadvantaged by the Proposed Scheme.

Staff working in homecare in the outer London may need to upgrade their own vehicles to make them ULEZ compliant or be willing and able to cycle between homes, which may not be feasible due to the distances involved. Care workers are generally low-paid and therefore less likely to afford to upgrade to a compliant vehicle.

As a result of these barriers, the pool of available care workers attending to outer London may shrink, thereby having a knock-on effect on the service users requiring care. Written correspondence received from the Homecare Association during stakeholder engagement stated that, *'If commissioning rates in London remain lower than the rest of the country (and well below what is needed) this could, consequently, increase the risk that the capacity in the market decreases (either due to financial viability or staff shortages) with knock on impacts decreasing the level of care being provided to those who need it; increasing the number of people who are being supported informally (and pressures on the unpaid carers supporting them); and increasing pressures on the NHS (a significant proportion of hospital discharge delays relate to availability of appropriate care services for a person once they are back home).'*

Overall, there is likely to be a short-to-medium term, moderate negative impact on care workers and health staff currently serving the outer London area as a result of the additional cost associated with the Proposed Scheme, where employers do not reimburse staff for paying the charge. This has the potential to result in stress and anxiety for care workers due to financial uncertainty and job insecurity. As outlined in the Baseline Report, Black, Asian and minority ethnic people and women make up a higher percentage of the care workforce than white people and men, respectively, and would therefore experience a disproportionate impact.

Summary of Impact

For the aforementioned reasons, there is likely to be a short-to-medium term, differential moderate negative impact on people who receive domiciliary care and other mobile health services in outer London – particularly disabled people, older people, people with underlying health conditions-- resulting in poorer health outcomes. A lack of consistent, reliable care due to staff shortages would disproportionately impact on disabled people, older people, pregnant women, and people with underlying health conditions who are more likely to receive care than other groups.

Mitigation

To inform further development of potential mitigation measures, TfL should engage with health and social care organisations during the consultation period to understand on whom the costs of compliance is likely to fall.

Informal carers

The Kings Fund estimates that local authorities only fund approximately 25 per cent of adult social care requests they receive from residents[53], so it may be assumed that the remaining 75 per cent either pay for their own care entirely or rely on family/friends. Research by the King's Fund also found that unpaid carers provide the equivalent of four million paid care workers to the social care system[54]. The proportion of provision of unpaid care for the boroughs within outer London is described**Error! Reference source not found.Error! Reference source not found.** in the Baseline Report.

There is potential for people travelling by non-compliant vehicles to provide informal care to family/friends residing in outer London to be financially impacted by the Proposed Scheme. This impact is expected to be lesser than the impact on care workers who cannot easily switch mode as they are required to travel by vehicle to visit multiple service users several days a week. However, it is acknowledged that the cost of upgrading a vehicle or the inconvenience of switching mode could dissuade people from visiting family/friends to provide informal care, impacting on those who rely on the care.

Summary of Impact

Overall, there is likely to be a short-to-medium term differential minor negative impact on people who rely on informal care in outer London, resulting in social isolation and poorer health outcomes. This would

[53] Kings Fund (2021). Social Care 360. Available at: https://www.kingsfund.org.uk/publications/social-care-360

[54] Ibid

disproportionately impact on disabled people, older people, and people with underlying health conditions who are more likely to receive informal care than other groups.

Mitigation

To inform further development of potential mitigation measures, TfL should engage with health and social care organisations during the consultation period to understand on whom the costs of compliance is likely to fall.

6.4.2 Active Travel

As set out in the Baseline Report, active travel is the main source of physical activity for Londoners, and physical activity helps to reduce the risk of developing over 20 chronic conditions and diseases, including some cancers, heart disease, type 2 diabetes, and depression. This is why a priority within the MTS is to increase the proportion of Londoners who travel actively so that, by 2041, all Londoners will achieve the minimum requirement of 20 minutes of active travel each day that is needed to stay healthy.

The Proposed Scheme may encourage people who have previously opted to travel by non-compliant vehicle into and around outer London to adopt walking or cycling to their destination instead of upgrading to a compliant vehicle or paying the charge. This may be more likely to occur for people on low incomes who cannot afford to upgrade their vehicle. As set out in section 4, with the Proposed Scheme walking and cycling trips within the ULEZ expansion area are forecast to increase by 2.0 per cent and 1.5 per cent respectively. Walking and cycling trips into the ULEZ expansion area from outside Greater London are forecast to increase by 1.9 per cent and 1.5 per cent respectively. This equates to around 0.7 per cent increase in London-wide active travel trips.

There would also be more walking and cycling trips as stages of trips for which public transport is the main mode. Trips within the ULEZ expansion by bus or rail are forecast to increase by 1.5 per cent and 1.0 per cent respectively and trips into the ULEZ extension from outside Greater London by bus or rail are forecast to increase by 1.4 per cent and 0.7 per cent respectively. For comparison, London-wide this equates to an increase of 0.6 per cent of bus trips and 0.3 per cent of rail trips. It is expected that walking or cycling would form part of these trips. Most other factors that contribute significantly towards people's willingness to undertake active travel, such as the level of safety, distance, affordability and storage of bicycles, and the amenity of routes, are likely to remain the same with the Proposed Scheme in place. There would be improvements to air quality which could result in a modest shift towards active transport, which cannot be quantified. However, many other factors such as noise levels, severance and amenity of the urban realm are likely to remain unchanged, due to reductions in traffic levels as a result of the Proposed Scheme being relatively minor.

During stakeholder workshops it was noted by Living Streets that there is a need to encourage uptake of sustainable transport alongside the implementation of the Proposed Scheme rather than focusing on the transition to compliant vehicles, due to the health and societal benefits associated with lower levels of congestion, such as improved neighbourhood amenity and increased physical activity from active travel. London Living Streets noted that the change in policy offers the opportunity to consider travel behaviour more widely between now and the Proposed Scheme coming into force, to better facilitate an increase in uptake of active travel.

There are a number of TfL initiatives currently in place that aim to meet the goal of the MTS that by 2041, 80 per cent of journeys are to be made by walking, cycling and public transport. The Cycling Action Plan sets out how TfL intends to achieve the goals of the MTS, including the building of more than 450km of new cycleway routes by 2024; safety improvements at 73 of the most dangerous junctions on London's road network; improving cycle parking across London; and rolling out initiatives in schools and for the wider population to remove barriers and change perceptions about cycling. Initiatives include online resources such as 'Cycle Skills' which are available free to anyone living, working or studying in London, and provide a range of training sessions created to help Londoners ride confidently on their bikes.

TfL's Walking Action Plan sets out how walking is the mode that is most important in the realisation of the aims of the MTS. The Walking Action Plan contributes to the aims set out in the MTS for outer London by identifying opportunities for new walking trips; improving walking access to town centres and transport interchanges, including rail and Underground; reducing the impact of traffic and making local streets better places to walk and spend time; and targeting trips to school with a focus on reducing car use and increasing walking. The Walking Action Plan sets out that, as most walking in London occurs as part of a longer public transport journey, improving and expanding the public transport is a key means by which to increase levels of walking.

TfL adopted 'School Streets' implemented by using Experimental Traffic Orders to close the carriageway to traffic outside schools at set times, originally to facilitate social distancing in response to Covid-19. However, the approach also reduces congestion around schools, making the streets safer and encouraging uptake of active travel by schoolchildren. The STARS programme, TfL's accreditation scheme for London schools and nurseries, has also had an impact on facilitating mode shift to active travel. STARS inspires young Londoners to travel to school sustainably, actively, responsibly, and safely by championing walking, scooting and cycling. STARS supports pupils' wellbeing, helps to reduce congestion at the school gates and improve road safety and air quality.

Low Traffic Neighbourhoods (LTNs) were also rolled out in response to the Covid-19 pandemic, to allow more space for walking and cycling to allow people to travel safely. LTNs prevent cars, vans and other vehicles from using quiet roads as shortcuts and were created through funding from the DfT. While not a TfL policy, LTNs contribute towards the Mayor's active travel targets through encouraging mode shift, resulting in improvements to the environment and in the health of Londoners. The Liveable Neighbourhoods programme[55] also gives boroughs the opportunity to bid for funding for long-term schemes that encourage walking, cycling, and use of public transport; examples include creating green spaces, implementing cycling infrastructure, widening walking routes and redesigning junctions.

As highlighted, there are a number of TfL policies aimed at increasing uptake of active travel and facilitating placemaking benefits that would be complemented by the Proposed Scheme. Additional mitigation measures that could reduce impacts on low income groups and also provide enhancement to active travel outcomes are proposed in relation to the scrappage scheme.

Summary of Impact

Overall, due to the limited potential for the Proposed Scheme to facilitate a mode shift to active travel that would have a discernible impact on health outcomes, the impact on health at a population level is expected to be neutral.

Enhancement measures

- As part of a scrappage scheme for cars TfL should consider providing exclusive offers to successful grant recipients. These could include, for example, travelcards for bus and tram vouchers, for pushbikes, e-bikes and car club membership
- To provide alternative travel choices in areas of lower public transport accessibility TfL should investigate the extension of (e) cycle and e-scooter hire schemes to outer London
- It is recommended that TfL further promote existing active travel messaging campaigns focused on the health and wellbeing benefits of these modes

6.4.3 Stress and anxiety

The financial impact of the Proposed Scheme has the potential to result in stress and anxiety for those who may not easily be able to upgrade to a compliant vehicle, switch mode or pay the charge. This section focuses on the stress and anxiety experienced by people on low incomes travelling by non-compliant vehicle who

[55] It should be noted that the Liveable Neighbourhoods programme is currently paused pending confirmation of TfL's long-term funding package, and no further bids are being accepted at this time.

cannot easily switch mode due to financial hardship, and also by bureaucratic barriers faced by disabled people that may be exacerbated by the Proposed Scheme.

A blog post dated 1 February 2022 on the Mayor's website highlighted how the cost of living crisis is having a confounding impact on Londoners living on or close to the poverty line. A report by the Greater London Authority and polling by YouGov found that:

- *'Nearly 80 per cent of Londoners have seen an increase in their cost of living over the last six months, with food and energy bills leading the rise in costs. This is particularly difficult for the poorest households who devote a higher share of their household budget to gas bills…*
- *34 per cent of Londoners have struggled to pay their household bills in the last six months, with 13 per cent struggling to make ends meet, going without essentials or relying on credit.*
- *More than 70 per cent of Londoners are worried about future increases to living costs over the next year, with those whose household income is less than £20,000 per year, are renting from local authorities and housing associations, or have a health problem or disability most likely to be concerned..'*[56]

From April 2022 energy prices rose again as Ofgem announced an increase in the level of the energy price cap by an around 45 per cent, which could drive more Londoners into fuel poverty[57].

The additional cost of the Proposed Scheme – either from paying the charge or for upgrading to a compliant vehicle - for people already struggling financially could have detrimental effects on their mental wellbeing through creating stress and anxiety. There is a growing body of evidence of a link between lower socio-economic status and poor mental health; as set out in the Marmot Review[58], children and adults living in households in the lowest 20 per cent income bracket in Great Britain are two to three times more likely to develop mental health problems than those in the highest.

Personal finances are consistently identified as a major source of difficulty and distress by people using mental health services; 1 in 3 people with a serious mental health condition is thought to be in debt[59]. A survey undertaken in 2019 by the Greater London Authority found that that nearly 40 per cent of Londoners owe money on unsecured debt, either through loans, credit cards or household bills, and that a quarter of this group of Londoners – equivalent to 600,000 people – find keeping up with their debt a serious burden[60]. It is likely that these figures will have worsened as the cost of living crisis has developed since the pandemic and particularly over the last year. The Mayor has recently funded a 24-hour debt helpline to provide assistance to people struggling with the cost of living crisis; it is noted that the number of Londoner's contacting the service has increased 250 per cent in the last 12 months[61].

Overall, there is likely to be a short-to-medium term disproportionate moderate negative impact on stress and anxiety for people on low incomes travelling by non-compliant vehicle and unable to easily switch mode.

As highlighted during stakeholder engagement, there are many Blue Badge holders who rely on the use of private cars on a daily basis which do not meet the ULEZ standards and do not qualify for the disabled vehicle tax class exemption and may therefore be financially impacted by the Proposed Scheme.

People with disabilities are more likely to experience poverty and inequality than people who are not disabled. Information provided through stakeholder engagement with Inclusion UK highlighted that poverty can be compounded by higher costs of living for disabled people; they often have higher energy costs as they

[56] Mayor of London (2022). Mayor urges the government to tackle the spiralling cost of living. Available at: https://www.london.gov.uk/press-releases/mayoral/mayor-urges-government-to-tackle-cost-of-living

[57] Ibid.

[58] Marmot, M., Allen, J., Goldblatt, P., Boyce, T., McNeish D., Grady, M. and Geddes, I. (2010). Fair society, healthy lives: Strategic review of health inequalities in England post-2010, The Marmot Review

[59] Knott, L, and Cox, J. (2015) Poverty and Mental Health. Available at: https://patient.info/doctor/poverty-and-mental-health

[60] Mayor of London (2019). Survey of Londoners reveals city's social and economic challenges. Available at: https://www.london.gov.uk/press-releases/mayoral/four-in-10-owe-money-on-unsecured-debt

[61] Mayor of London (2022). Mayor funds 24-hour debt hotline as cost of living spirals. Available at: https://www.london.gov.uk/press-releases/mayoral/mayor-funds-24-hour-debt-helpline

require to run the heating more to cope with lower mobility or weaker immune systems, and/or to charge essential medical and mobility equipment.

The financial hardship currently experienced by disabled people due to the cost of living crisis in the UK may be exacerbated by the Proposed Scheme, for those who do not qualify for the disabled vehicle tax class exemption. Financial hardship can result in high levels of stress and anxiety, worsening health outcomes for people with disabilities.

Additionally, during stakeholder engagement it was highlighted by Disability Rights UK that the administrative aspect of the reimbursements and exemptions for the ULEZ and congestion charge was adding to the bureaucratic barriers experienced by disabled people. A research paper by Campbell and Maynard set out that *'The bureaucracy which surrounds the provision of services, or the funding of support for many disabled people, particularly those who need a high level of personal care, is significant, and in many instances unnecessary.'*[62] The report highlighted that this bureaucracy often seems to restrict legitimate claims for support, and surmounting these barriers poses additional stress and strain, risking the health of disabled people.

Summary of Impact

Overall, there is likely to be a short-to-medium term differential moderate negative impact on stress and anxiety for disabled people who do not qualify for the disabled vehicle tax class exemption as a result of financial hardship and bureaucratic barriers.

Mitigation

- Facilitate discussions with stakeholders to support choices around options available (e.g. upgrading vehicle or changing mode). A new scrappage scheme for cars should continue to be targeted at on low income Londoners and people on non- means tested disability benefits
- Provide targeted assistance with applications for new scrappage scheme where needed (informed by engagement with disabled groups)

6.4.4 Social exclusion and isolation

The Proposed Scheme has the potential to cause and/or exacerbate social exclusion for different groups who rely on private vehicles to travel in outer London. Social exclusion is more likely to be experienced by some groups than others, such as people on low incomes, disabled people, and older people for various reasons, and these groups are the focus of this section.

A study undertaken by the Joseph Rowntree Foundation found that people on low incomes can experience social exclusion due to a lack of involvement in the labour market, as well as through poverty, service exclusion and exclusion from social relations through not being able to afford to participate, thereby resulting in fewer opportunities for social interaction. Lack of accessibility to public services (such as libraries, sports facilities and evening classes) and private services (such as corner shops, banks and pubs) is also an issue, and is particular apparent for those aged over 65 (29 per cent reported a lack of access to two or more services compared with 21 per cent for those aged 33 – 65) [63]. Similarly, people with long term illnesses were more likely to report a lack of access to two or more services than the general population (30 per cent compared to 21 per cent)[64].

Older people living in London can be more likely to experience social exclusion as it may be more difficult to build stable relationships where there is a high flow of people coming in and out of the city, higher levels of

[62] Campbell, S. and Maynard, A. (2000). Bureaucratic Barriers to Normal Day-to Day Activities. Available at: https://disability-studies.leeds.ac.uk/wp-content/uploads/sites/40/library/Campbell-bureaucratic-barriers.pdf

[63] Joseph Rowntree Foundation (2000). Poverty and Social Exclusion in Britain. Available at: https://www.jrf.org.uk/sites/default/files/jrf/migrated/files/185935128x.pdf

[64] Ibid.

crime and antisocial behaviour, and greater anonymity [65]. Additionally, older people may also have mobility issues preventing them from easily travelling around the city and accessing places to interact.

Many people with disabilities rely on private vehicle to participate in society - to access employment and opportunities, and for leisure purposes - and it may not be feasible for them to switch to public transport or active travel, or bear the cost of upgrading their vehicle. A report by disability charity Scope found that nearly half of disabled people feel excluded from society and day to day life.[66]

As a result, this group of disabled people may experience a disproportionate level of financial hardship as a result of the Proposed Scheme; or instead, choose to stay at home rather than pay the charge, leading to social exclusion and isolation. Being excluded from society due to a lack of available transport could mean that people with disabilities have fewer opportunities to access education and employment opportunities, thereby confounding their susceptibility to poverty. A recent study found that people with disabilities experience loneliness and social isolation at much higher rates than the general population, and that the prevalence of loneliness was highest among disabled adults who are younger, economically inactive, living in rented or other accommodation, living alone and with low levels of access to environmental assets[67]. Loneliness can result in poor wellbeing outcomes and can also exacerbate existing mental health problems.

Summary of Impact

Overall, there is likely to be a short-to-medium term differential and disproportionate moderate negative impact on social exclusion and isolation for people on low incomes, older people, and disabled people who do not qualify for the disabled vehicle tax class exemption and rely on the use of their own (or nominated driver's) non-compliant vehicles. This may result in disproportionately poorer socio-economic and wellbeing outcomes for these groups.

Mitigation

- Facilitate discussions with stakeholders to support choices around options available (e.g. upgrading vehicle or changing mode)
- Provide guidance to assist people in determining the course of action (e.g. upgrading vehicle or changing mode) that makes the most financial sense for their circumstances
- A new scrappage scheme for cars should continue to be targeted at on low income Londoners and people on non- means tested disability benefits
- Provide targeted assistance with applications for new scrappage scheme where needed (informed by engagement with disabled groups)

[65] Clifton, J (2011). Social isolation among older Londoners. Available at: https://www.bristol.gov.uk/documents/20182/34732/IPPR+Social-isolation+among+Londoners.pdf

[66] Each Other (2018). 49% if Disabled People Feel Excluded from Society. Available at: https://eachother.org.uk/49-of-disabled-people-feel-excluded-from-society/#:~:text=Nearly%20half%20of%20disabled%20people,report%20by%20disability%20charity%20Scope.

[67] Emerson, E., Fortune, N., Llewellyn, G., & Stancliffe, R. (2021). Loneliness, social support, social isolation and wellbeing among working age adults with and without disability: Cross-sectional study. Disability and health journal, 14(1), 100965. https://doi.org/10.1016/j.dhjo.2020.100965

6.5 Summary

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
To reduce emissions and concentrations of harmful atmospheric pollutants particularly in areas of poorest air quality; and reduce levels of exposure experienced by more vulnerable and disadvantaged groups	Improvements to air quality resulting in better health outcomes for Londoners. Disproportionately greater health benefits for **older people** and **children**, and differential benefits for **people with a range of long-term health conditions, children and older people** living in outer London.	Short to medium	Low	Medium	Minor Positive	Not applicable	Not applicable
	No impact on health outcomes for **vulnerable populations** expected as a result of reduced Urban Heat Island (UHI) effects.	N/A	N/A	N/A	Neutral	Not applicable	Not applicable
To provide affordable and safe transport choices for all **To maximise accessibility for all and maintain connectivity in and**	Community severance impacts for people living in communities adjacent to the London-wide ULEZ boundary who are required to travel into outer London by non-compliant car to access employment, services and facilities. Disproportionate impact on **people with low incomes.**	Short to medium	Low	Medium	Minor	Not applicable	Collaborative working between TfL and local authorities adjacent to the GLA, for example, through holding regular meetings up to the implementation of the Proposed Scheme and for the first year of implementation to monitor the impacts of the Proposed Scheme.

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
around London and enable sustainable transport choices	Neutral impact on **disabled people** travelling by car in outer London who qualify for Motability scheme and disabled vehicle tax exemption.	N/A	No change	High	Neutral	Extension to grace period for disabled and disabled passenger vehicle tax class by two years to October 2027	
	Differential financial impact on **disabled people** who make journeys using non-compliant vehicles and do not qualify for Motability scheme and disabled vehicle tax class exemption.	Short to medium	Low	High	Moderate Negative	Disabled people over state pension age whose vehicle does not have disabled vehicle tax class can apply directly to TfL for the grace period if they: 1) Are in receipt of Attendance Allowance and 2) Hold a Blue Badge	Undertake promotion of Access to Work scheme to support people with physical or mental health condition or disability to stay in work. Further improvements to step free access at stations would help improve access alternatives for those with a mobility impairment and it is recommended that this be explored by TfL. Eligibility criteria of a new scrappage scheme for cars should continue be targeted at people in receipt of non means tested disability benefits and TfL should work with disability groups to raise awareness.
	Disproportionate financial impact for **people on low incomes** who travel by non-compliant private vehicle in outer London to access employment (particularly in	Short-to-medium	Medium	High	Moderate Negative	Night bus network and return of the night tube/night overground post pandemic.	Promotion of Access to Work scheme to support people with physical or mental health condition or disability to stay in work. Greater promotion of car sharing and car clubs for those locations/trips that are

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
	night time economy) or opportunities, and for **people with restricted mobility including pregnant or maternal women,** and **disabled people** who do not have a disabled vehicle tax class, due to their lesser capacity to switch to a compliant vehicle and/or to change mode.						difficult to serve by public transport and active travel. A new scrappage scheme for cars should continue to be targeted at low income Londoners. As part of a new scrappage scheme for cars TfL should consider providing exclusive TfL and third party offers to successful grant recipients. These could include, for example, travelcard for bus and tram, car club membership, discounts for pushbikes, and e-bikes.
	Disproportionate impact on **women** taking children to school in outer London by non-compliant vehicle.	Short-to-medium	Low	Medium	Minor Negative	STARS scheme	Promotion of car sharing for journeys to school where trips are difficult to serve by public transport and active travel.
	Potential differential impact on **young people and disabled people and/or their carers and families on low incomes** due to implications of increased cost of providing dedicated SEN travel to schools in outer London.	Short-to-medium	Low	High	Minor Negative	Extended grace period for not-for-profit community transport by 2 years to October 2025. Applies to eligible organisations (including state schools) outside Greater London.	Undertake further engagement with local education authorities to understand likely scale of impact on services provided via private contractors.

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
	Increased cost of operating LGVs on tradespeople likely to be disproportionately experienced by **men and members of the Gypsy and Traveller community**, who rely on a non-compliant vehicle to undertake work in outer London.	Short	Medium	Medium	Moderate Negative	Not applicable	TfL should consider greater targeting of new scrappage scheme for vans by focusing eligibility on micro businesses (up to 9 employees) to allow more business owners to benefit.
	Disproportionate impact on **Black, Asian and minority ethnic PHV drivers** working in outer London in a non-compliant vehicle.	Short	Low	Medium	Minor Negative	Not applicable	A new scrappage scheme for cars should continue to be targeted at low income Londoners. Some PHV operators offer support to drivers switching to cleaner vehicles.
	Differential impact on **vulnerable groups (e.g. refugees/asylum seekers, women, homeless people, and disabled people)** who rely on services provided by charities and community organisations undertaking activities using non-compliant vans and minibuses within outer London.	Short-to-medium	Low	Medium	Minor Negative	Extended grace period for not-for-profit community transport by 2 years to October 2025.	Introduction of a new scrappage scheme for vans and charity minibuses.
	Differential financial impact for some **people of different faiths** who access places of worship in	Short-to-medium	Low	Medium	Minor Negative	Not applicable	TfL should encourage faith organisations in outer London to adopt car sharing and active travel or, where available, greater

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
	Outer London by non-compliant vehicle.						use of compliant minibuses and car clubs for those unable to access by public transport or active travel.
	Differential impact on perceptions of safety for **women, disabled people, young people, transgender people, LGBT+ people and Black, Asian and minority ethnic people,** who travel by non-compliant private vehicle but cannot afford to upgrade to a compliant vehicle. These groups may be reluctant to use public transport due to perceptions of the risk to personal safety, and therefore may travel less.	Short	Low	Medium	Minor Negative	Existing TfL campaigns aimed at addressing the issues of sexual harassment and hate crimes on public transport should help to alleviate safety concerns.	Not applicable
To contribute to enhanced health and wellbeing for all within London and to reduce health inequalities across the city and between communities.	Differential impact of increased cost for some **older people, disabled people and people with underlying health conditions** who travel by non-compliant private vehicles to access regular medical appointments at specialist facilities in outer London (and outer London residents accessing healthcare outside London), which may result in	Short	Low	High	Moderate Negative	NHS Patient Reimbursement Scheme. Disabled people over state pension age whose vehicle does not have disabled vehicle tax class can apply directly to TfL for the grace period if they: 1)	TfL to work with CCGs and NHS Trusts to inform vulnerable patients of the NHS patient reimbursement scheme. For example, details of eligibility for reimbursements and discounts could be provided in all hospitals. A new scrappage scheme for cars should continue to be targeted at low income Londoners and people on non-means tested disability benefits.

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
	adverse health outcomes for these groups.					Are in receipt of Attendance Allowance and 2) Hold a Blue Badge	
	Differential impact of increased cost for some **pregnant and maternal women** who travel by non-compliant private vehicle to access medical appointments at paediatric/maternity centres in outer London, which may result in adverse health outcomes.	Short	Low	High	Minor Negative	Some pregnant women (those who are clinically assessed as unable to use public transport to travel to appointments) are eligible for the NHS Patient Reimbursement Scheme	TfL should consider whether any changes to the eligibility criteria should be considered as part of a wider review of the reimbursement scheme.
	Differential impact for **Black, Asian and minority ethnic people and women** who work for the NHS in lower paid positions who travel by non-compliant private vehicle to access employment in outer London.	Short	Low	Medium	Minor Negative	Not applicable	A new scrappage scheme for cars should continue to be targeted at low income Londoners. TfL should work with NHS Trusts to identify opportunities for enhancement of hospital Green Travel Plans to promote use of active travel and public transport amongst staff.

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
	Where employers do not reimburse care workers for upgrading their vehicle or paying the charge, this is likely to disproportionately impact on **Black, Asian and minority ethnic people and women** serving the outer London area as a result of the additional cost associated with the Proposed Scheme. This has the potential to result in stress and anxiety.	Short-to-medium	Low	High	Moderate Negative	Not applicable	To inform further development of potential mitigation measures, TfL should engage with health and social care organisations during the consultation period to understand on whom the costs of compliance is likely to fall. A new scrappage scheme for cars should continue to be targeted at low income Londoners.
	Differential impact on people who receive domiciliary care, mobile healthcare services, and/or informal care in outer London – particularly **disabled people, older people, pregnant and maternal women, and people with underlying health conditions** - resulting in poorer health outcomes.	Short-to-medium	Low	High	Moderate Negative		Mitigation measures would be informed by consultation with health and social care sectors as outlined above. Raise awareness of eligibility criteria of the new scrappage scheme for cars, for those who provide informal care to older and disabled people. Raise awareness of public transport options.
	Differential impact on health (stress and anxiety and	Short-to-medium	Low	High	Moderate Negative	Extension of wheelchair accessible	TfL should facilitate discussions with stakeholders to support choices around

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
	isolation) for **people on low incomes, older people, and disabled people** who do not qualify for the disabled vehicle tax class exemption, which could result in poor socio-economic and wellbeing outcomes.					private hire vehicle 100% discount to October 2027. Disabled people over state pension age whose vehicle does not have disabled vehicle tax class can apply directly to TfL for the grace period if they: 1) Are in receipt of Attendance Allowance and 2) Hold a Blue Badge	options available (e.g. upgrading vehicle or changing mode). A new scrappage scheme for cars should continue to be targeted at on low income Londoners and people on non- means tested disability benefits. Provide targeted assistance with applications for new scrappage scheme where needed (informed by engagement with disabled groups).

7. Business and Economy

7.1 Introduction

The e
conomic assessment is against two objectives, namely:

- To support the growth and creation of businesses in outer London, including small to medium sized enterprises (SMEs)
- Town centres – promoting the vitality and viability of London's varied town centres

The assessment is based on the behavioural change of people and businesses as a result of the Proposed Scheme.

There is considerable volatility in the economy at present as a result of Russia's invasion of the Ukraine. This has led to a surge in energy prices, some supply chain issues and significant increases in inflation. In addition, there have been changes in the economy due to the impacts of Covid-19. This includes the accelerated uptake of online retail, home delivery of meals and streaming services all of which have had an impact on town centre activities. It is not clear how these changes will play out between now and the introduction of the Proposed Scheme. They may be a much bigger factor in reducing car use and leading people to give up car ownership or they may lead to people being unable to afford to replace a non-compliant vehicle with consequences for where they choose to work or shop. Businesses are also being impacted by higher supplier costs and in some sectors of the economy labour shortages which are increasing wage pressures. Again, it is not clear how these factors will play out in the medium term and hence the cumulative impacts of any additional costs incurred by businesses as a result of the Proposed Scheme.

7.2 Objective: To support the growth and creation of businesses in outer London, including small to medium sized enterprises (SMEs)

Assessment

Labour market

The EBIA Baseline, presented in the Baseline Report, highlights that a significant proportion of people in outer London commute by car with the majority doing so who are travelling between London Boroughs in outer London. This is even more the case for those commuting into outer London from outside Greater London.

Around 560,000 commuting trips are made by London residents travelling to destinations within outer London. Some 60,000 (10.7 per cent) of these trips are predicted to be made by non-compliant vehicles. The Proposed Scheme would potentially lead people to switch modes or change jobs to one that they can access more readily by an alternative mode of transport. This potential level of job switching out of a total workforce of 1.6m in outer London needs to be put into the context of an average 15 per cent employee turnover rate a year. That is, around a quarter of a million people will move jobs, enter or leave the labour market each year in outer London.

Around 190,000 car commuting trips occur each day from outside Greater London into outer London of which 20,000 (10.5 per cent) are estimated to be made by vehicles that are non-compliant with the ULEZ standards. Given the tight labour market and the lack of alternative modes of transport in many cases there is a risk that a significant proportion of these individuals may seek employment elsewhere putting further pressure on employers. It should be noted, however, that there are over 230,000 unemployed people in London and at 4.6 per cent the unemployment rate is one of the highest in the UK. Unemployment is also around 1.3 percentage points higher in outer London than inner London. The impact on employment in the health and education sectors is covered in the People section (Section 6).

It is anticipated that the Proposed Scheme would have in aggregate a minor negative impact on employers in outer London due to a small potential loss of individuals from outside Greater London who are willing to work in outer London and potentially a greater turnover of employees who are resident in outer London. This could

be particularly the case where borough-to-borough commuter travel is predominately by car (Table 7 and Table 7), which also indicates that public transport on these flows might not be competitive or attractive to users. These tables suggest that it is employers in Bexley, Bromley, Croydon, Harrow, Havering and Hounslow that will be most impacted.

Table 7-1. 2023 Car trips between outer London boroughs, under the existing ULEZ and with the Proposed Scheme - Commute

Rank	Origin	Destination	Trips - ULEZ	Trips – Proposed Scheme	% change
1	Bexley	Greenwich	10,800	10,800	-0.5%
2	Greenwich	Bexley	10,800	10,700	-0.5%
3	Hounslow	Hillingdon	8,700	8,700	-0.3%
4	Hillingdon	Hounslow	8,500	8,500	-0.3%
5	Barking	Havering	7,500	7,400	-1.3%
6	Havering	Barking	7,400	7,300	-1.3%
7	Bromley	Croydon	7,000	7,000	-0.6%
8	Brent	Harrow	6,800	6,700	-0.9%
9	Harrow	Brent	6,700	6,600	-1.0%
10	Croydon	Bromley	6,600	6,600	-0.7%

Table 7-2. 2023 Car trip to outer London from outside Greater London, under the existing ULEZ and with the Proposed Scheme - Commute

Rank	Origin	Destination	Trips - ULEZ	Trips – Proposed Scheme	% change
1	Essex	Havering	11,600	11,400	-1.7%
2	Kent	Bexley	11,200	11,000	-1.9%
3	Herts	Barnet	10,900	10,700	-1.8%
4	Surrey	Kingston	10,900	10,700	-1.6%
5	Surrey	Hounslow	10,700	10,500	-1.8%
6	Surrey	Sutton	9,300	9,100	-1.6%
7	Surrey	Croydon	9,000	8,900	-0.9%
8	Herts	Harrow	8,700	8,600	-1.9%
9	Herts	Enfield	8,300	8,200	-1.6%
10	Kent	Bromley	7,800	7,600	-1.6%

Businesses that operate outside standard working hours and in locations less accessible by public transport would be the most impacted especially those in the transport and distribution sectors and a range of building support services.

LGVs

LGVs are widely used by delivery companies and tradespeople, many of whom are either self-employed or work for SMEs. The predicted compliance rate for LGVs is around 80 per cent in 2023 in outer London. As highlighted in the Baseline Report there are considerable flows of LGVs from outside Greater London into outer London. Stakeholder feedback suggests that some businesses and tradespeople with non-compliant vehicles no longer serve customers within the existing ULEZ area as the cost of doing so makes them uncompetitive. It is envisaged that this may be repeated with some businesses and tradespeople from outside Greater London no longer serving the London market. If this reduces the level of competition this is likely to increase costs to customers.

For those businesses with non-compliant vehicles based in outer London the impact would depend on the sector and level of competition (especially with larger companies that are more likely to have compliant vehicles). Stakeholder feedback highlighted that major leasing companies' fleets were 100 per cent compliant. Overall demand for the services provided will not change but there would be changes in who provides those services. It is estimated that the general increase in the cost of doing business for those firms with non-compliant vehicles would be of the order of £18m per year (2023 to 2030), within the context of Greater London's annual economy of £503bn[68].

It has been estimated that there are around 30,000 non-compliant LGVs travelling within the ULEZ expansion area and from outside Greater London into the ULEZ expansion area each day. Assuming none of the LGV trips are deferred or avoid the ULEZ expansion area as a result of the Proposed Scheme, then 34 per cent of non-compliant LGV trips are assumed to be liable for the charge, with the remaining 66 per cent upgrading their vehicles. Using this assumption, a ULEZ daily charge of £12.50 and an average net cost of £13,300 to upgrade to a compliant LGV, it is estimated the total cost for businesses with non-compliant LGVs between 2023 to 2030 would amount to £359m. Of this, £96m would impact businesses outside Greater London and the remaining £263m would be borne by businesses within the ULEZ expansion area.

In relation to business trips made by cars, it has been assumed virtually all these vehicles would be compliant, given company fleet cars are usually replaced every 3-5 years.

Stakeholders noted the long lead time for delivery of electric vehicles as a barrier in their take-up. Supply issues for components has led to long delivery times for new electric and internal combustion engine vehicles of 18-24 months. This has led to a knock on impact in the second-hand market as larger operators have not been replacing their fleets in their typical four-year cycle. Trade reports stated that 18-month-old vans were being sold for more than the list price of new vehicles. BCA Auctions reported in that year-on-year values for February 2022 were up by £1,015 (10.8 per cent) compared to February 2021. There has also been a shift to smaller vans, due to rising fuel costs.

It is anticipated that in aggregate the Proposed Scheme would have no material impact on London's economy but a minor negative impact on SMEs in certain sectors of the economy, including tradespeople, street markets, and self-employed delivery drivers.

Business to consumer activity

Some businesses provide services direct to the public, for example, car repair and servicing, and may be impacted by the Proposed Scheme. For example, stakeholders noted that businesses within the existing ULEZ had lost business from customers outside the zone who had non-compliant vehicles. A similar boundary impact can be expected with the Proposed Scheme for individuals in a similar situation from outside Greater London transferring their custom elsewhere.

Taxis/PHVs

TfL-licensed taxi and wheelchair accessible PHVs are not subject to the ULEZ. For TfL licensed PHVs the compliance rate by 2023 is estimated to be 97 per cent rising to almost 100 per cent by 2026. Given the very high rates of compliance no material impact is anticipated to occur to the sector as a whole. There are around 1.35 registered PHV drivers per registered PHV. Drivers of non-compliant vehicles who are unable to replace them do potentially have the possibility of sharing a vehicle with another registered driver.

Taxis and PHVs licensed outside Greater London are treated as normal cars for ULEZ purposes. Stakeholders advised that some drivers had moved their registration outside Greater London due to less restrictive licensing standards. A large number of taxis/PHVs enter Greater London - around 250,000 a day - specifically to drop off or pick up passengers at Heathrow Airport. A high proportion of these are non-compliant given the dominance of diesel vehicles. In terms of London's economy the impact is expected to be marginal. Taxi/PHV firms may be able to allocate compliant vehicles for trips into Greater London or spread the ULEZ charge over a number of trips.

It is anticipated that in aggregate the Proposed Scheme would have a neutral impact on TfL-licensed taxis and PHVs and a neutral impact on London's economy.

[68] ONS, Regional Economic Activity by Gross Domestic Product, UK: 1998 to 2019

Heathrow Airport

As highlighted in the Baseline Report, Heathrow airport is the biggest employment centre in outer London with high levels of car use by employees. It is estimated that around 6 per cent of employees at Heathrow would be impacted by the Proposed Scheme with half of these living outside Greater London. This latter group may be more likely to switch jobs to avoid having to enter Greater London. With a buoyant labour market at the present time, employers at Heathrow may struggle to recruit unless wage levels are raised.

It is considered that the Proposed Scheme would have a minor negative impact on the Heathrow Airport area due to the high proportion of commuters travelling in by car from outside Greater London.

Airline passengers are less likely to be impacted as only a quarter arrive by car. Given the level of parking charges, price of airline tickets, and the nature of destinations served from the airport it is unlikely that the small proportion of passengers who may be liable to pay for bringing a non-compliant vehicle to Heathrow would change airport as a result of the Proposed Scheme.

Summary of Impacts

The Proposed Scheme would have in aggregate a minor negative impact on employers in outer London

The Proposed Scheme would have no material impact on London's economy but a minor negative impact on SMEs in certain sectors of the economy, including tradespeople, street markets, and self-employed delivery drivers.

The Proposed Scheme would have a neutral impact on TfL-licensed taxis and PHVs and a neutral impact on London's economy.

The Proposed Scheme would have a minor negative impact on the Heathrow Airport area due to the high proportion of commuters travelling in by car from outside Greater London.

Mitigation

In relation to the labour market, potential mitigation includes:

- Promotion of car sharing for those locations/trips that are difficult to serve by public transport
- Expansion of last mile links (e.g. bike hire/ e-scooters) to enable people from outside Greater London traveling to rail stations in outer London to make onward journeys to their place of employment
  Liaise with Heathrow Airport and relevant local authorities to explore opportunities outside proposed London-wide ULEZ boundary for park & ride sites catering for airport employees

To mitigate the impact on users or owners of LGVs, potential options include:

- Scrappage scheme aimed at replacing LGVs with cargo bikes and smaller battery powered delivery vehicles
- Promote or incentivise greater use of shared delivery services for last mile deliveries using cargo bikes and similar

7.3 Objective: To promote the vitality and viability of London's varied town centres

Assessment

The assumed compliance rate for cars in outer London in 2023 is 90 per cent rising to 95 per cent by 2026. Individuals who are travelling within outer London to a town centre in outer London who do not have a compliant vehicle can:

- Replace their vehicle with a compliant car
- Change mode and continue travelling to the same destination
- Change mode and change destination

- Switch to use of online services for retail and entertainment

While those travelling from outside Greater London to destinations within outer London area can also travel to another destination outside Greater London.

Retail

Based on the EBIA Baseline, presented within the Baseline Report, only 4 per cent of retail trips wholly within outer London would be impacted by the Proposed Scheme on its introduction. Transport modelling estimates that once the Proposed Scheme is in operation around three quarters of those trips are no longer made by car, of which two-thirds switch to other modes. This suggests there is some trip suppression which may be accounted for by a switch to online retail and home delivery and the modelling suggests there is also a switch of some trips into the existing ULEZ as there is no longer a disincentive to making those trips compared to outer London.

Overall, the modelling suggests there may be a two per cent reduction of retail trips within outer London in the first year of operation of the Proposed Scheme. This would decline as compliance rates increase. However, it is unlikely that spend on retail items would decline because of the Proposed Scheme, instead where and perhaps on what they spend would change instead. All the major outer London retail centres are well served by public transport with the exception of Purley Way which is heavily car dependent. Overall, while there may be some displacement of spend within Greater London, it is not anticipated to have any material impact on Greater London's town centres as a whole.

For retail trips from outside Greater London into outer London, some 8 per cent of these are expected to be via non-compliant vehicles in 2023. With the introduction of the Proposed Scheme around 60 per cent of those non-compliant trips are forecast to be lost with almost no mode shift (mainly due to the lack of alternatives and preference for using a car). It is expected these trips would transfer to other retail centres outside Greater London or move to home delivery.

Table 7-3. 2023 Car trips to outer London boroughs with the existing ULEZ and with the Proposed Scheme – Shopping

Rank	Origin	Destination	Trips - ULEZ	Trips – Proposed Scheme	% change
1	Brent	Barnet	4,600	4,600	-0.7%
2	Barnet	Brent	4,600	4,500	-0.7%
3	Greenwich	Bexley	3,900	3,800	-1.3%
4	Bexley	Greenwich	3,800	3,800	-1.6%
5	Bromley	Croydon	3,800	3,700	-2.2%
6	Croydon	Bromley	3,700	3,600	-2.2%
7	Brent	Harrow	3,400	3,300	-2.3%
8	Harrow	Brent	3,300	3,300	-2.5%
9	Hillingdon	Harrow	2,400	2,400	-3.1%
10	Harrow	Hillingdon	2,400	2,300	-3.0%

Table 7-4. 2023 Car trips to outer London boroughs from outside Greater London, under the existing ULEZ and with the Proposed Scheme – Shopping

Rank	Origin	Destination	Trips - ULEZ	Trips – Proposed Scheme	% change
1	Kent	Bexley	3,700	3,600	-4.0%
2	Surrey	Kingston	3,300	3,000	-6.9%
3	Herts	Barnet	3,200	3,000	-5.4%
4	Kent	Bromley	3,000	2,900	-4.2%
5	Herts	Harrow	2,400	2,300	-4.7%
6	Surrey	Sutton	2,400	2,300	-4.2%

7	Essex	Havering	1,900	1,800	-4.8%
8	Surrey	Croydon	1,600	1,500	-5.4%
9	Herts	Enfield	1,600	1,500	-7.3%
10	Herts	Hillingdon	1,200	1,200	-4.9%

Based on the estimated proportion of spend arising from outside Greater London at major outer London town centres in outer London, and the proportion of those trips that may be lost, Table 7-1 shows the potential loss of retail spend at each of these centres. It also shows potential job loses based on one job per £100k of retail spend. In total 230 jobs may be at risk due to retail spend transferring to locations outside Greater London. This is out of total retail employment in outer London of over 160,000. As a higher proportion of vehicles become compliant by 2026, this impact would roughly half assuming people return to their previous shopping patterns.

Table 7-5: Estimated retail spend that might be displaced from Greater London to outside Greater London in 2023.

Centre	Retail spend £m	Potential loss of revenue from outside Greater London £m	Potential loss of jobs
Bexleyheath	250	0.3-0.8	3-8
Brent Cross	580	0-0.3	0-3
Bromley	580	0.6-1.7	6-17
Croydon	650	0.6-1.9	6-19
Ealing	400	0-0.2	0-2
Enfield	250	0.1-0.2	1-2
Harrow	320	1.0-2.1	10-21
Hounslow	470	1.4-3.1	14-31
Ilford	310	0.2-0.3	2-3
Kingston	800	2.4-5.2	24-52
Purley Way	200	0.2-0.6	2-6
Richmond	280	0.1-0.3	1-3
Romford	440	1.3-2.9	13-29
Sutton	320	0.3-1.0	3-10
Uxbridge	370	1.1-2.4	11-24
Wimbledon	310	0.2-0.3	2-3

Source: Jacobs based on Consumer Expenditure and Comparison Goods Floorspace Need In London 2017

There are also cross boundary trips to smaller centres outer London as highlighted in the Baseline Report. However, even the centres with the highest proportion of car-based trips (i.e. Cheam Village and Stanmore) would expect to see just a 1 per cent potential drop in turnover as a result of the Proposed Scheme. While around 20 per cent of trips to them are by people travelling from outside Greater London, only half of these are by car and of the latter 90 per cent would be compliant with the ULEZ standards. Hence a worst-case scenario would be the 10 per cent of trips made by car travelling from outside Greater London might divert to a non-Greater London destination leading to a 1 per cent overall reduction in spend.

It is anticipated the Proposed Scheme would have a minor negative impact on some town centre retail activity in outer London due to the potential loss of spend from non-Greater London residents.

Night time economy

The night time leisure economy in outer London town centres consists of a range of activities some of which are more likely to be dependent on private car users than others. The catchment areas of these activities vary from the very local to more regional. For example, Romford's nightclubs serve a wide catchment area including outside Greater London but few of its patrons will be private car users. On the other hand outer London's major theatres may have an equally large catchment area with a significant number of customers arriving by car. All the major night time economy town centres are well served by public transport and while

the range of destinations served is less comprehensive, they are also all served by a number of 24 hour Night Bus routes.

For trips within outer London it is anticipated that people who have a non-compliant vehicle would switch mode and or destination or move to home delivery or streaming services. The overall impact on the night time economy in town centres is therefore anticipated to be marginal as overall the vast majority of trips would already be made by compliant vehicles or modes.

There is limited data on trips from outside Greater London to outer London for night time economy activities. It is anticipated that those activities that are more likely to attract patrons from outside Greater London are multiplex cinemas, theatres, major sports venues and similar which are not well represented outside Greater London. Visitors to these venues may also visit bars and restaurants but these are not the primary reason for such trips. Given that the strong draw of these attractions, fewer competing locations outside Greater London and the relative charge of bringing in a non-compliant vehicle against the total costs of a night out, it is not expected to have a material impact on the overall night time leisure economy of outer London town centres as a result of the Proposed Scheme.

Summary of Impact

The Proposed Scheme would have a neutral impact on night time economy of town centres in outer London.

Mitigation

No further mitigation is recommended.

7.4 Summary

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
To support the growth and creation of businesses in the ULEZ expansion area, including small to medium sized enterprises (SMEs)	Contraction of potential local labour market due to fewer commuters entering Greater London and people in the ULEZ expansion area switching jobs to more accessible locations.	Medium	Low	High	Minor Negative	Promotion of public transport or active travel alternatives for commuting to work.	Promotion of car share schemes for commuting to work. Expansion of bike / e-scooter hire to enable people from outside Greater London traveling to rail stations in outer London to make onward journeys to their place of employment.
To support the growth and creation of businesses in the ULEZ expansion area, including small to medium sized enterprises (SMEs)	Increased cost of operating LGVs for a significant proportion of tradespeople, street markets, delivery companies and similar.	Medium	Low	High	Minor Negative	Not applicable	A new scrappage scheme encouraging the replacement of vans with compliant vans, cargo bikes and smaller battery powered delivery vehicles. TfL should consider greater targeting of a new scrappage scheme for vans by focusing eligibility on micro businesses (up to 9 employees) to allow more business owners to benefit.

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
							Promote or incentivise greater use of shared delivery services for last mile deliveries using cargo bikes and similar.
	Increased labour market constraints at Heathrow Airport.	Short	Low	High	Minor Negative	Not applicable	Liaise with Heathrow Airport and relevant local authorities to explore opportunities outside proposed London-wide ULEZ boundary for park & ride sites catering for airport employees.
	London licensed taxis are exempt from ULEZ, London licensed Private Hire Vehicles (PHVs) almost 100 per cent compliant. Small impacts on taxi and PHVs licensed outside London. minimized through efficient allocation of trips to ULEZ compliant vehicles.	Short	Low	Low	Neutral	Not applicable	Not applicable

IIA Objective	Description of Impact	Duration (Short, Medium)	Scale (Low, Medium, High)	Sensitivity (Low, Medium, High)	Impact Rating (Major, Moderate, Minor, Neutral)	TfL Committed Mitigation	Potential Mitigation/ Enhancement
To promote the vitality and viability of London's varied town centres	Loss of retail spend by those living outside Greater London.	Short	Low	Low	Minor Negative	Not applicable	Promotion of public transport access to major retail centres in outer London.
To promote the vitality and viability of London's varied town centres	Loss of night time economy spend by those living outside Greater London	Short	Low	Low	Neutral	Not applicable	Not applicable

8. Potential mitigation and enhancement

8.1.1 Proposed mitigation

As summarised in Section 2 (Table 2-1) there are a number of discounts, exemptions and reimbursements in place for the existing ULEZ scheme that would remain in place and would mitigate the financial impacts associated with the implementation of the Proposed Scheme on certain people and businesses travelling within the ULEZ expansion area. These include the following extensions to grace periods currently effective under the existing ULEZ:

- Extend the existing (100 per cent discount) grace period for disabled and disabled passenger vehicle tax class vehicles by two years from October 2025 to October 2027
- Extend the existing (100 per cent discount) grace period for WAV PHVs by two years from October 2025 to October 2027
- Extend the existing (100 per cent discount) grace period for Community minibuses by two years from October 2023 to October 2025

The above measures have all been taken into account in assessing the impacts of the Proposed Scheme.

8.1.2 Potential further mitigation measures

To reduce the impacts identified in this IIA potential further mitigation has been identified for consideration by TfL as described in the Summary tables at the end of Sections 5, 6 and 7 of this report.

Scrappage scheme

For the existing ULEZ the Greater London funded a scrappage scheme at a cost of £61m, which enabled over 15,200 polluting vehicles to be removed from London's roads[69]. The level of grant and number of cars, motorbikes, vans and minibuses scrapped is set out in Table 8-1.

Table 8-1 Previous ULEZ scrappage scheme

Vehicle Type	Grant available	Vehicles scrapped
Cars and motorbikes	£1,000-£2,000	9,831
Vans and minibuses	£7,000 - £9,500	5,253

The scheme is now closed, but the Mayor has stated that he is considering a large-scale and targeted vehicle scrappage scheme to support Londoners, including, for example, those on low incomes, disabled people, charities and businesses. This report includes the following suggestions for the design of a future scrappage scheme to be introduced in support of a London-wide ULEZ:

- A new scrappage scheme for cars should continue to be targeted at on low income Londoners and people on non- means tested disability benefits
- TfL should work with disability groups to raise awareness of a new scrappage scheme
- TfL should consider greater targeting of a new scrappage scheme for vans by focusing eligibility on micro businesses (up to 9 employees) to allow more business owners to benefit
- Raise awareness of eligibility criteria of the scrappage scheme for cars, for those who provide informal care to older and disabled people
- Provide targeted assistance with applications for new scrappage scheme where needed (informed by engagement with disabled groups)

Potential further mitigation

Throughout the development of the Proposed Scheme, and specifically informed by IIA stakeholder engagement, a wide range of potential further mitigation measures have been considered by TfL. The following measures identified in Sections 6, 7 and 8 should be given further consideration by TfL:

[69] Further information on the previous scrappage schemes, including eligibility criteria, can be found at: https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/car-and-motorcycle-scrappage-scheme

- Collaborative working between TfL and local authorities adjacent to the GLA, for example, through holding regular meetings up to the implementation of the Proposed Scheme and for the first year of implementation to monitor the impacts of the Proposed Scheme
- Further improvements to step free access at stations would help improve access alternatives for those with a mobility impairment and it is recommended that this be explored by TfL
- Undertake promotion of Access to Work scheme
- Greater promotion of car sharing for those locations/trips that are difficult to serve by public transport.
- Undertake further engagement with local education authorities to understand likely scale of impact on services provided via private contractors
- Encourage faith organisations in outer London to adopt car sharing and active travel or, where available, greater use of compliant minibuses and car clubs for those unable to access by public transport or active travel
- Work with CCGs and NHS Trusts to inform vulnerable patients of the NHS patient reimbursement scheme. For example, details of eligibility for reimbursements and discounts could be provided in all hospitals
- Consider whether any changes to the eligibility criteria should be considered as part of a wider review of the reimbursement scheme
- Work with NHS Trusts to identify opportunities for enhancement of hospital Green Travel Plans to promote use of active travel and public transport amongst staff
- Liaise with Heathrow Airport and relevant local authorities to explore opportunities outside proposed London-wide ULEZ boundary for park & ride sites catering for airport employees

To inform further development of potential mitigation measures in relation to impacts on formal and informal health and social care, TfL should engage with health and social care organisations during the consultation period to understand on whom the costs of compliance is likely to fall.

A range of other potential measures have been considered by determined to not be feasible for the reasons provided in Table 8-2.

Table 8-2 Suggestion mitigation measures not considered feasible.

Suggested Mitigation Measure	Relevant Impacts	Feasibility
Where a business can demonstrate that they have a compliant vehicle on order – provide temporary 100% discount from the ULEZ charge whilst awaiting delivery	Increased cost of operating LGVs for a significant proportion of tradespeople, street markets, delivery companies and similar	Likely to introduce a considerable and disproportionate administrative burden on TfL. Length of advance notice of introduction of Proposed Scheme should provide sufficient time for businesses to source compliant vehicles, notwithstanding current supply chain delays in vehicle manufacturing sector.
Improved public transport links both between outer London boroughs and from outside Greater London to outer London, particularly to serve Heathrow	Labour market impacts arising from additional costs of community by car for owners of non-compliant vehicles choosing not to work in London.	Committed investment such as Crossrail will go some way to help but significant improvement to orbital links is not feasible in current financial climate, given funding constraints and reduced fare revenues from public transport.
Give exemption to Blue Badge holders	Differential impacts on health (stress, anxiety, isolation) for disabled people who do not quality for disabled vehicle tax exemption.	Blue Badge holders receive a 100 per cent discount to the Congestion Charge in recognition of the fact they may be dependent on using a private vehicle and therefore cannot avoid the Congestion Charge. However, it is proposed that Blue Badge holders do not receive a discount for London-wide ULEZ because while Blue Badge holders may need to use a private vehicle, they do have a choice over using or nominating a ULEZ-compliant vehicle. Removing the incentive for vehicles that may transport Blue Badge holders to switch to cleaner vehicles would undermine the benefits of the scheme. There are already existing exemptions

Suggested Mitigation Measure	Relevant Impacts	Feasibility
		and mitigations which apply to many Blue Badge holders.
Extend eligibility for scrappage grants to Blue Badge Holders	Differential impacts on health (stress, anxiety, isolation) for disabled people who do not quality for disabled vehicle tax exemption.	To include all BB holders, TfL would need to define which vehicle they could scrap. For fraud prevention and to target those impacted by the scheme, scrappage can only be offered to vehicles registered in London. This would not be an effective mitigation for BB holders as only those with their own vehicles would be eligible, and only those who live in London.
Investigate whether scrappage payments whether be treated as non-taxable so they do not count towards savings and affect eligibility for means tested benefits		In developing the previous scrappage scheme TfL and Greater London Authority colleagues had discussions with Department for Work and Pensions regarding whether the car and motorcycle scrappage grant payment would be considered as income or treated as savings. The outcome of these discussions was that that grant would be treated as savings. To ignore lump-sum payments in means-testing for individual benefits would require the Government to make changes to rules and/or regulations across each means-tested benefit. TfL therefore included the warning regarding means-tested benefits and savings on its website to ensure that applicants were not caught out and could make an informed decision on whether or not to proceed with the scrappage application. With a finite amount of funding available, a scrappage scheme will be most effective when funds are targeted at those who will be disproportionately impacted and less able to avoid the charge without mitigation / support.
Extend eligibility for scrappage scheme for cars to eligible emergency services workers and health and social care workers providing domiciliary care	Mitigation for employees requiring vehicles for travel to work and/or for business purposes, including disproportionate impact on women and Black, Asian and minority ethnic people working in health and social care. **Disproportionate impact on disabled people and older people** if increased cost of travel affects provision of formal domiciliary care.	Extending scrappage scheme to include all emergency workers and/ or health and social care workers and/ or domiciliary care workers would be difficult to administer for a number of reasons. The categories are not well defined, and proof of eligibility would be difficult.
Extension of scrappage scheme eligibility to informal carers not in receipt of Carer's Allowance	**Disproportionate impact on disabled people and older people** if increased cost of travel	Informal carer is not a well defined term, and proof of eligibility would be difficult.

Suggested Mitigation Measure	Relevant Impacts	Feasibility
	affects provision of informal domiciliary care.	
Improved security on late night public transport and at public transport hubs including taxi ranks	Potential impacts on night time economy in outer London town centres	Longer term ambition but not feasible in current financial climate, given funding constraints and reduced fare revenues from public transport.

8.1.3 Enhancement measures

A wide range of TfL initiatives currently in place in relation to active travel and Healthy Streets will further enhance the positive air quality and associated impacts of the Proposed Scheme. These include the roll out of LTNs, school streets and the STARS programme through reducing traffic on residential streets, making them more attractive and safer to walk and cycle on and improving physical and mental health through increased physical activity and social cohesion.

In order to further encourage more sustainable travel behaviour and help reduce air pollution the following enhancement measures are recommended for consideration by TfL:

- As part of a new scrappage scheme for cars TfL should consider providing exclusive TfL and third party offers to successful grant recipients. These could include, for example, travelcard for bus and tram, car club membership, discounts for pushbikes, and e-bikes
- A new scrappage scheme for vans should offer the opportunity to replace non-compliant vehicles with cargo bikes and smaller battery powered delivery vehicles
- Promote or incentivise greater use of shared delivery services for last mile deliveries using cargo bikes and similar
- To provide alternative travel choices in areas of lower public transport accessibility TfL should investigate the extension of (e) cycle and e-scooter hire schemes to outer London
- Further promotion of existing active travel messaging campaigns focused on the health and wellbeing benefits of these modes

9. Glossary

Term	Definition
Accessibility	The ease with which all passengers can gain access to TfL services.
Active, efficient and sustainable modes	Active, efficient and sustainable modes are defined in the Mayor's Transport Strategy as walking, cycling and public transport.
Base year	Year from which changes to transport demand are assessed.
Black, Asian and Minority Ethnic people	In this classification, black, Asian and minority ethnic comprises all Mixed, Asian, Black and Other (non-white) ethnicities.
Connectivity	The general term for how easy it is for people to get to places, jobs, homes and services.
Congestion Charge	The London Congestion Charge is a fee charged on most cars and motor vehicles being driven within the Congestion Charge Zone in central London at certain times of day.
Cumulative impacts	The assessment of cumulative impacts considers the effects of multiple projects (inter-project) and/or impacts of the Proposed Changes (intra-project) on receptors.
Differential effect	A differential equality effect is one which affects members of a protected group differently from the rest of the general population because of specific needs or a recognised sensitivity or vulnerability associated with their protected characteristic.
Disabled people	People who have, as defined by the Equality Act 2010, a physical or mental impairment that has a 'substantial' and 'long-term' negative effect on a person's ability to do normal daily activities. The social model of disability defines disability as the effect of the barriers, discrimination and disadvantages faced by disabled people, not the impact of their specific impairment.
Health determinant	Health determinants are the range of personal, social, economic and environmental factors which determine the health status of individuals or populations. A change to a single health determinant can affect the health status of different individuals or communities depending on their characteristics and sensitivity to change.
Health inequalities	Health inequalities are systematic, avoidable and unfair differences in mental or physical health between groups of people. These differences affect how long people live in good health and are mostly a result of differences in people's homes, education and childhood experiences, their environments, their jobs and employment prospects, their access to good public services and their habits.
Health outcome	A health outcome is a change in the health status of an individual, group or population which is attributable to a planned intervention or series of interventions (e.g. the Proposed Changes).
Healthy Streets Approach	The Mayor and TfL's approach to prioritising people and their health in decision-making to create a healthy, inclusive and safe city for all. The approach makes London a more attractive place to walk, cycle and use public transport, and reduces the dominance of motorised transport.
Inclusive design	The creation of environments that everyone can use – confidently, independently and with choice and dignity – to access, and benefit from, the full range of opportunities available. Inclusive design avoids separation or segregation and is made up of places and spaces that acknowledge diversity and difference, meeting the needs of everyone in society.
Killed or Serious Injured (KSI)	A standard metric used to measure levels of road safety.
Low Emission Zone (LEZ)	A charging zone across most of Greater London for heavy goods vehicles that do not meet emissions standards for particulate matter.

Term	Definition
Macro-economic	Relating to the branch of economics concerned with large-scale or general economic factors, such as interest rates and national productivity.
Mitigation	Taking measures to reduce or remove identified impacts
Mode Share	The relative use of each mode of transport. The calculation of mode share in the strategy is based on trips.
Protected Characteristic Group (PCGs)	Defined in the Equality Act (201). Specifically, relates to the following characteristics: age, disability, sex, race, pregnancy and maternity, gender reassignment, religion and belief, and sexual orientation.
Public realm	The **public realm** is commonly defined as any space that is free and open to everyone. The London Plan describes it as 'the space between and within buildings that is publicly accessible, including streets, squares, forecourts, parks and open spaces.'
Public Sector Equality Duty	The public sector Equality Duty (PSED) requires public bodies to have due regard to the need to eliminate discrimination, advance equality of opportunity and foster good relations between different people when carrying out their activities.
Receptor	In this context, an element that is susceptible to being affected (either directly or indirectly) by the Proposed Scheme, e.g. people, environmental assets, businesses etc..
Reference Case	Transport forecast that takes into account central macro economic forecasts representing the impact of the coronavirus pandemic, but does not assume any behavioural change.
Severance	The perceived division that can occur within a community when it becomes separated by a major traffic artery. It may result from the difficulty of crossing a heavily trafficked existing road or as a result of a physical barrier created by the road itself.
Social integration	The building of strong communities where all Londoners can lead interconnected lives and play an active part in their city and the decisions that affect them. This can only be achieved by working to prevent, identify and remove inequalities and barriers that prevent people from engaging in their communities and wider society, while recognising the important role played by interaction and participation in overcoming these.
Vision Zero	An approach to road danger reduction that works towards the elimination of road traffic deaths and serious injuries by reducing the dominance of motor vehicles on London's streets by 2041.

Appendix A. Quantitative Health Assessment

LONDON-WIDE ULTRA LOW EMISSION ZONE INTEGRATED IMPACT ASSESSMENT

Air quality health impact assessment (AQHIA)

Report for: TfL

Ref. PSFW2:94202 TPIM / Task 53

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Ricardo Energy & Environment, Gemini Building, Fermi Avenue, Harwell, Oxfordshire, OX11 0QR, UK | +44(0)1235 75 3000 | ee.ricardo.com
Registered company no. 08229264 | VAT no. GB 212 8365 24

Customer:
Transport for London (TfL)

Customer reference:
PSFW2:94202 TPIM / Task 53

Contact:
David Birchby,
Bright Building, Manchester Science Park, Pencroft Way, Manchester M15 6GZ
T: +44 1235 753555
E: david.birchby@ricardo.com

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Author:
Jacob Sendall

Approved by:
David Birchby

Signed

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1. INTRODUCTION

The analysis described in the following sections was carried out as part of the Health Impact Assessment (HIA) of the Proposed Scheme. The focus of this part of the HIA was on the impacts of air quality on the health of the population of Greater London.

Modelled concentrations of various pollutants for a 2023 Do-Minimum scenario (i.e. without scheme) and with Proposed Scheme scenario were provided by TfL. These were used to calculate the impacts of the Proposed Scheme on human health. The following sections describe the methodology used and the results. The initial sections focus on quantification of the health effects, which is followed by the valuation of the health effects and finally a summary of the conclusions.

TfL provided modelled annual mean concentrations of nitrogen dioxide (NO_2) and particulate matter less than 2.5 µm in diameter ($PM_{2.5}$) for a Do-Minimum scenario and a with Proposed Scheme scenario for the year 2023. These modelled concentrations at 20m resolution were averaged to Output Area (OA) level[1]. OAs were assigned to boroughs and Central, Inner and Outer London regions by Ricardo. Where OAs straddle across more than one borough or region, they were assigned to the area containing the greatest proportion of the OA by area. Central London comprises of the boroughs of Camden, Islington, Kensington and Chelsea, Lambeth, Southwark, Westminster and the City of London as described in the London Plan 2011[2].

2. HOW DOES AIR QUALITY IMPACT HEALTH?

The understanding of the effect that air pollution has on human health has increased considerably in the last 20 years, largely through the findings of many epidemiological studies undertaken for populations in various parts of the world (for example, see recent systematic reviews of the impact on mortality of long-term exposure to PM[3] and NO_2 and Ozone (O_3)[4], and from short-term exposure to air pollution[5] undertaken by the World Health Organization (WHO)). It had previously been recognised that air pollution episodes with very high levels of ambient air pollution are associated with clear and measurable increases in adverse health effects. More recent studies also reveal smaller increases in adverse health effects at the current levels of ambient air pollution typically present in urban areas. The health effects associated with short-term (acute) exposure include premature mortality (deaths brought forward), respiratory and cardio-vascular hospital admissions, exacerbation of asthma and other respiratory symptoms.

The evidence for these health effects from acute exposure are strongest for particulates (usually reported in terms of fine particulates (PM_{10} and $PM_{2.5}$)) and for ozone. For these pollutants, the relationships revealed by epidemiological studies are widely accepted as causal (see for example the systematic reviews published by the WHO, and also the body of work produced by UK-based COMEAP over the last 15 years[6]).

Studies also strongly suggest that long-term (chronic) exposure to fine particulates ($PM_{2.5}$) may also damage human health and that these impacts (measured through changes in life expectancy) are substantially greater than the effects of acute exposure described above. There is also increasing evidence that chronic exposure to NO_2 may be important but the evidence for an association that is suitable for quantification of the impacts is less strong than for particulates[7].

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[1] The 2011 Classification for Output Areas (2011 OAC) is a hierarchical geodemographic classification across the UK which identifies areas of the country with similar characteristics.

[2] http://www.london.gov.uk/sites/default/files/LP2011%20Chapter%202.pdf

[3] https://www.sciencedirect.com/science/article/pii/S0160412020319292?via%3Dihub

[4] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7549128/

[5] https://www.sciencedirect.com/science/article/pii/S0160412020318316?via%3Dihub

[6] https://www.gov.uk/government/groups/committee-on-the-medical-effects-of-air-pollutants-comeap

[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/411756/COMEAP_The_evidence_for_the_effects_of_nitrogen_dioxide.pdf

3. HOW ARE THE HEALTH IMPACTS OF AIR QUALITY QUANTIFIED?

3.1 OVERVIEW

This quantification of health impacts as a result of changes in air pollution follows the widely recognised Impact Pathway Approach (IPA). For each impact pathway, the concentration response function (CRF) (which defines a given health impact per unit change in the ambient concentration of a pollutant) is multiplied by:

- the underlying risk rate of the health outcome (for example, number of hospital admissions per 100,000 persons per increase in $\mu g/m^{-3}$);
- size of the affected population; and
- the change in population-weighted mean pollutant concentrations of the relevant averaging time.

This provides a quantitative estimate of the health impact in terms of the relevant health outcome.

The Department of Environment, Food and Rural Affairs (Defra) has produced guidance[8] to steer the assessment of air quality impacts on health and the valuation of associated economic costs. This guidance was designed to support evidence gathering to inform policy development or evaluation in the UK. Following this guidance, Defra produce a set of damage costs for air pollution[9], which summarise the impacts per tonne of emission. The assessment of health impacts in this report draws heavily on this guidance and is broadly consistent with the approaches used to produce the latest set of Defra damage costs (with slight variations as noted in the methodology section below), but also combined with London-specific data, where available, to estimate borough and London-wide health impacts.

3.2 IMPACT PATHWAYS INCLUDED IN THE ANALYSIS AND SELECTION OF CRFS

CRFs are used in the IPA to link a given change in air pollutant concentration to a change in a specific health outcome. Defra's air pollution appraisal guidance sets out a peer-reviewed set of CRFs (peer review undertaken by COMEAP) to be used when appraising the impacts of changes in air quality following the Impact Pathway Approach. Consistent with Defra's guidance, nine health impact pathways have been included in central assessment. These are:

- Chronic mortality
- Cardio-vascular hospital admissions
- Respiratory hospital admissions
- Coronary Heart Disease (CHD)
- Stroke
- Lung Cancer
- Asthma (older children)
- Asthma (small children)
- Productivity.

The epidemiological evidence base is always changing and improving. Indeed, since the last set of Defra damage costs were produced, there have been a number of new studies presenting evidence on the relationship between air pollution and health impacts. A key set of studies were the systematic review undertaken by the WHO to underpin their updated Air Quality Guidelines in 2021: of note was that they recommended adopting an updated, slightly higher CRF for chronic mortality effects of exposure to particulates. As such, for this analysis, this new updated relationship is used. The CRF for

[8] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/197900/pb13913-impact-pathway-guidance.pdf
[9] https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance

other pathways have also been updated on the basis of targeted literature review of more recent studies.

The CRFs used in the central analysis are presented in the table below. Both the Defra and COMEAP recommendations include low and high sensitivities around the central CRF value for the mortality pathways. The central, low and high CRF values have been combined with central, low and high valuations to provide a range of overall valuations in addition to a central value (in addition, and as noted below, several additional impact pathways for which the CRF is considered more uncertain are also included only in the high sensitivity).

Table 1: CRFs used in this analysis

Impact Pathway	Pollutant	CRF (%change in risk rate per 10 µg/m^{-3} change in pollutant concentration)	Source
Chronic mortality	$PM_{2.5}$	8% (CI* 6% - 9%)	WHO Systematic review 2021
Respiratory hospital admissions	$PM_{2.5}$	0.96% (CI* -0.63% - 2.58%)	Atkinson et al (2014)
Cardio-vascular hospital admissions	$PM_{2.5}$	0.9% (CI* -0.26% - 1.53%)	Atkinson et al (2014)
Asthma (Older Children)	$PM_{2.5}$	1.48% (CI* -1.22% - 1.97%)	PHE / Defra
CHD	$PM_{2.5}$	19% (CI* 1% -42%)	COMEAP 2022[10]
Stroke	$PM_{2.5}$	11% (CI* -1% -25%)	COMEAP 2022[11]
Lung Cancer	$PM_{2.5}$	9% (CI* 4% -14%)	PHE / Defra
Chronic Mortality	NO_2	2.3% (CI* 0.8% -3.7%)	COMEAP 2018 / Defra
Respiratory hospital admissions	NO_2	0.57% (CI* 0.33% -0.82%)	Mills et al (2015)
Asthma (older children)	NO_2	1.03% (CI* 1% -1.06%)	PHE / Defra
Asthma (small children)	NO_2	1.08% (CI* 1.01% -1.12%)	PHE / Defra

* 95% Confidence Interval

COMEAP have also made recommendations around the appraisal of the impacts of long-term exposure to air pollution and chronic bronchitis[12]. COMEAP did not recommend that an association between long-term exposure to ambient air pollution and chronic bronchitis is included in core health impact assessments because the evidence considered did not sufficiently establish causality. COMEAP recommend that only sensitivity calculations be undertaken. COMEAP recommended use of long-term average concentrations of particulate matter measured as PM_{10} in the sensitivity calculations. We have not included this impact pathway in our central assessment, but it is included in the 'high' sensitivity. Likewise, given concerns around the robustness of the CRFs, impacts on asthma in adults (NO_2), diabetes (NO_2 and $PM_{2.5}$), and lung cancer (NO_2) are also only included in the high sensitivity.

3.3 APPROACH TO MONETISING HEALTH IMPACTS

The health impacts associated with the Proposed Scheme can be valued (i.e. presented in monetary terms) to show the economic benefit associated with reductions in air pollution. The valuation of health improvements captures a number of economic effects, including the direct impact on the utility of the affected individual (commonly captured by the 'willingness-to-pay' of the individual to avoid the detrimental health outcome), reduction in medical costs and increase in productivity. Monetising the health impacts in this way is a common approach which allows the economic benefits of improved

[10] https://www.gov.uk/government/publications/fine-particulate-air-pollution-pm25-setting-targets
[11] https://www.gov.uk/government/publications/fine-particulate-air-pollution-pm25-setting-targets
[12] https://www.gov.uk/government/publications/comeap-long-term-exposure-to-air-pollution-and-chronic-bronchitis

health outcomes to be compared to the costs of delivering the road user charging scenario in cost-benefit analysis.

The Defra IPA Guidance[13] recommends a range of unit values to value different health endpoints. These values have been used in this study to value the impacts on health and are presented in the table below. These values draw upon a range of supporting studies, in particular a Defra-led study by Chilton et al (2004)[14] which aimed to identify the willingness to pay to reduce the health impacts associated with air pollution, using a survey-style contingent valuation approach.

To value chronic mortality, the approach uses the concept of the 'Value of a life year' (VOLY). This is combined with the number of life-years saved under the with Proposed Scheme scenario to estimate a monetary benefit.

The value of a hospital admission saved includes the resource cost (e.g. NHS cost), opportunity cost (lost productivity) and dis-utility associated with an admission. These are combined with the impact on hospital admissions to estimate the associated benefit.

The majority of the values applied are consistent with those used in the latest set of Defra damage costs, with the exception of a couple of pathways, for which the unit valuation has been revised following a further review of evidence.

The valuations listed in the table below have been used. The central, low and high valuations were combined with the central, low and high values respectively from the health impact assessment to provide central, low and high values respectively for the valuation. Valuations were provided by central, inner and outer London, within Greater London as a whole and by London borough.

Table 2: IGCB(A) recommended health values (2017 prices)

Health effect	Form of measurement valuation apply to	Central value	Sensitivity
Chronic mortality	Number of years of life lost due to air pollution. Life expectancy losses assumed to be in normal health.	£42,780	£32,035- £53,324
Respiratory hospital admissions	Case of a hospital admission, of average duration 8 days	£8,296	£2,803-£313,789
Cardio-vascular hospital admissions	Case of a hospital admission, of average duration 8 days	£8,471	£2,979-£13,963
CHD and Lung cancer	Disability-Adjusted Life Year (DALY)	£62,750	£31,375-£83,667
Asthma children	Value per incidence	£5,920[15]	N/A
Stroke	Value per incidence	£83,900[16]	N/A

3.4 OTHER DATA INPUTS

Data for the base rate of hospital admissions (for both respiratory and cardiovascular disease (CVD) separately) are sourced from the Health and Social Care Information Centre's Hospital Episode

[13] http://www.hscic.gov.uk/hes

[14] Chilton et al (2004), 'Valuation of the health benefits associated with reductions in air pollution', available at

[15] Average of Van de Vel (as cited in: https://ec.europa.eu/environment/air/pdf/CAO2-ANNEX-final-21Dec20.pdf) and US EPA (https://www.epa.gov/sites/default/files/2015-04/documents/benmap-ce_user_manual_march_2015.pdf)

[16] Centre of range from Xu et al: https://journals.sagepub.com/doi/10.1177/2396987317746516

Statistics (HES)[17] database. The analysis assumes the same rates of admissions per 100,000 of the population as the average rate from 2008/09 to 2012/13.

The base rate of life years lost (LYL) associated with chronic mortality is taken from existing life-table calculations in the Defra damage cost workbook. These life-table calculations were originally undertaken for different CRFs, different geographical scope and base years: they are based on UK population data in 2012 (and not the London population in 2023). As such, the original results of the life-tables calculations were scaled in proportion to the London populations used for the assessment years. In addition, the life table calculation results were based on PM CRFs and were scaled and used for the NO_2 chronic mortality effects sensitivity analysis.

Population data was provided by TfL.

4. HEALTH IMPACTS

Health 'burden' measures the impact of living with illness and injury and dying prematurely. The data presented below demonstrates the health 'burden' associated with the absolute levels of pollutant concentrations under the without and with Proposed Scheme scenarios, and the marginal impact of the Proposed Scheme relative to the base case (i.e. the health benefit associated with implementing the Proposed Scheme, calculated as the difference between the without and with Proposed Scheme burden).

For the majority of pathways (all but chronic mortality), the results show the burden or relative change in burden in the study year (2023) associated with the pollutant change in that year. The chronic mortality values reflect the total burden or change in burden in LYL over a 100-year assessment period, associated with the change in pollution in the initial assessment year (2023). Tables are included for a central case and for the low and high sensitivity cases, which has been calculated using the low and high CRFs for mortality.

[17] http://www.hscic.gov.uk/hes

Table 3: Results of air quality health impacts analysis for the without and with Proposed Scheme scenarios in 2023 for the central case.

		NO_2				$PM_{2.5}$						
		Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidences of asthma - small children	Incidences of asthma - older children	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidences of lung cancer	Incidences of asthma - older children
		# Hospital admissions	LYL	# new cases	# new cases	LYL	# Hospital admissions	# Hospital admissions	# new cases	# new cases	# new cases	# new cases
Without scheme	Central London	443	3,576	3,022	583	12,877	309	173	202	249	118	3,143
	Inner London	524	4,229	3,574	689	16,215	389	218	254	313	148	3,958
	Outer London	1,146	9,255	7,821	1,508	38,050	913	513	596	735	348	9,288
	Greater London	2,112	17,060	14,416	2,780	67,142	1,610	904	1,052	1,297	614	16,390
With Proposed Scheme	Central London	439	3,543	2,994	577	12,868	309	173	202	249	118	3,141
	Inner London	518	4,184	3,536	682	16,205	389	218	254	313	148	3,956
	Outer London	1,129	9,118	7,705	1,486	38,010	912	512	596	734	348	9,279
	Greater London	2,086	16,846	14,236	2,745	67,083	1,609	904	1,051	1,296	614	16,376
Change in burden with Proposed Scheme	Central London	-4	-32	-27	-5	-8	-0.20	-0.11	-0.13	-0.16	-0.08	-2.07
	Inner London	-6	-45	-38	-7	-10	-0.25	-0.14	-0.16	-0.20	-0.09	-2.52
	Outer London	-17	-137	-115	-22	-40	-0.96	-0.54	-0.63	-0.78	-0.37	-9.80
	Greater London	-26	-214	-181	-35	-59	-1.41	-0.79	-0.92	-1.14	-0.54	-14.40

Table 4: Results of air quality health impacts analysis for the without and with Proposed Scheme scenarios in 2023 for the low sensitivity case.

		NO_2				$PM_{2.5}$						
		Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidences of asthma - small children	Incidences of asthma - older children	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidences of lung cancer	Incidences of asthma - older children
		# Hospital admissions	LYL	# new cases	# new cases	LYL	# Hospital admissions	# Hospital admissions	# new cases	# new cases	# new cases	# new cases
Without scheme	Central London	256	786	N/A	N/A	9,761	203	50	N/A	N/A	N/A	N/A
	Inner London	303	929	N/A	N/A	12,292	255	63	N/A	N/A	N/A	N/A
	Outer London	663	2,034	N/A	N/A	28,844	599	148	N/A	N/A	N/A	N/A
	Greater London	1,223	3,749	N/A	N/A	50,897	1,057	261	N/A	N/A	N/A	N/A
With Proposed Scheme	Central London	254	779	N/A	N/A	9,755	203	50	N/A	N/A	N/A	N/A
	Inner London	300	919	N/A	N/A	12,284	255	63	N/A	N/A	N/A	N/A
	Outer London	654	2,004	N/A	N/A	28,814	598	148	N/A	N/A	N/A	N/A
	Greater London	1,208	3,702	N/A	N/A	50,853	1,056	261	N/A	N/A	N/A	N/A
Change in burden with Proposed Scheme	Central London	-2	-7	N/A	N/A	-6	-0.13	-0.03	N/A	N/A	N/A	N/A
	Inner London	-3	-10	N/A	N/A	-8	-0.16	-0.04	N/A	N/A	N/A	N/A
	Outer London	-10	-30	N/A	N/A	-30	-0.63	-0.16	N/A	N/A	N/A	N/A
	Greater London	-15	-47	N/A	N/A	-45	-0.93	-0.23	N/A	N/A	N/A	N/A

Table 5: Results of air quality health impacts analysis for the without and with Proposed Scheme scenario in 2023 for the high sensitivity case.

		NO_2				$PM_{2.5}$						
		Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidences of asthma - small children	Incidences of asthma - older children	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidences of lung cancer	Incidences of asthma - older children
		# Hospital admissions	LYL	# new cases	# new cases	LYL	# Hospital admissions	# Hospital admissions	# new cases	# new cases	# new cases	# new cases
Without scheme	Central London	637	7,830	4,441	1,147	14,342	830	295	461	565	183	5,361
	Inner London	753	9,262	5,254	1,357	18,060	1,045	371	581	712	231	6,750
	Outer London	1,649	20,268	11,496	2,968	42,380	2,452	871	1,363	1,671	541	15,840
	Greater London	3,039	37,360	21,191	5,472	74,782	4,327	1,537	2,405	2,949	955	27,951
With Proposed Scheme	Central London	631	7,760	4,401	1,137	14,333	829	295	461	565	183	5,357
	Inner London	745	9,163	5,198	1,342	18,049	1,044	371	580	712	231	6,746
	Outer London	1,624	19,969	11,326	2,925	42,335	2,450	870	1,361	1,669	541	15,823
	Greater London	3,001	36,892	20,925	5,403	74,716	4,324	1,536	2,403	2,946	954	27,927
Change in burden with Proposed Scheme	Central London	-6	-71	-40	-10	-9	-0.55	-0.19	-0.30	-0.37	-0.12	-3.53
	Inner London	-8	-99	-56	-14	-12	-0.67	-0.24	-0.37	-0.45	-0.15	-4.30
	Outer London	-24	-299	-170	-44	-45	-2.59	-0.92	-1.44	-1.76	-0.57	-16.72
	Greater London	-38	-469	-266	-69	-66	-3.80	-1.35	-2.11	-2.59	-0.84	-24.55

The results of the air quality health impacts analysis suggest the Proposed Scheme delivers positive health benefits relative to the base case. For example, through the reductions in concentrations achieved in 2023, the Proposed Scheme is estimated to achieve a London-wide reduction of 214 (range 47 to 469) life-years lost associated with exposure to NO_2. It is important to note that not all the mortality benefits will fall in that year: this health impact is associated with reductions in chronic exposure and these impacts are modelled to accrue over the 100-year period following the concentration change through the life-tables approach.

5. MONETISED HEALTH IMPACTS

The monetised benefits of each health outcome split by central, inner and outer London, within Greater London as a whole and by London borough for the central, low and high valuation cases are presented in the tables below. In these tables a benefit is presented as a positive value.

It is important to note that the population weighting represents location of residence. This in practice is a simplification of exposure, which would also take place depending on an individual's movements outside of their place of residence over the course of a day, week or year. This simplification could affect both the impacts calculated, and where benefits are attributed to.

The impacts are presented in 2020 prices (the Defra unit values have been uprated to 2020 prices using the HM Treasury (HMT) gross domestic product (GDP) deflators[18]). All impacts have been discounted to 2023 using the social discount rate of 3.5 per cent as recommended by the HMT Green Book[19]. In addition, health values are uplifted by 2per cent per year over the appraisal period in keeping with the Defra guidance: this recognises that willingness-to-pay to reduce detrimental health outcomes tends to increase with income and hence could be expected to rise over time with real income growth.

[18] https://www.gov.uk/government/statistics/gdp-deflators-at-market-prices-and-money-gdp-march-2013
[19] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_co

Table 6: Central case 2023 Proposed Scheme health benefit (i.e. valuation of relative impact, £2020 prices)

Area	NO_2							PM_{10}		$PM_{2.5}$									
	Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidence of asthma (adults)	Incidence of diabetes	Incidence of lung cancer	Incidences of asthma - small children	Incidences of asthma - older children	Chronic bronchitis	Productivity	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidence of diabetes	Incidences of lung cancer	Incidences of asthma - older children	Productivity	TOTAL
Central London	41,238	1,416,418	N/A	N/A	N/A	14,915	4,415	N/A	N/A	373,055	2,104	1,206	36,226	17,133	N/A	4,775	1,742	24,442	1,937,670
Inner London	57,694	1,981,606	N/A	N/A	N/A	20,867	6,177	N/A	N/A	454,182	2,561	1,469	44,104	20,858	N/A	5,814	2,121	29,758	2,627,210
Outer London	174,882	6,006,693	N/A	N/A	N/A	63,252	18,723	N/A	N/A	1,765,047	9,953	5,708	171,396	81,060	N/A	22,593	8,243	115,645	8,443,195
Greater London	273,814	9,404,717	N/A	N/A	N/A	99,034	29,315	N/A	N/A	2,592,285	14,618	8,383	251,725	119,051	N/A	33,181	12,106	169,845	13,008,075
Barking and Dagenham	7,054	242,273	N/A	N/A	N/A	2,551	755	N/A	N/A	69,943	394	226	6,792	3,212	N/A	895	327	4,583	339,005
Barnet	14,877	510,995	N/A	N/A	N/A	5,381	1,593	N/A	N/A	141,775	799	458	13,767	6,511	N/A	1,815	662	9,289	707,922
Bexley	7,972	273,805	N/A	N/A	N/A	2,883	853	N/A	N/A	87,870	496	284	8,533	4,035	N/A	1,125	410	5,757	394,023
Brent	11,195	384,510	N/A	N/A	N/A	4,049	1,199	N/A	N/A	98,406	555	318	9,556	4,519	N/A	1,260	460	6,447	522,473
Bromley	9,995	343,300	N/A	N/A	N/A	3,615	1,070	N/A	N/A	103,629	584	335	10,063	4,759	N/A	1,326	484	6,790	485,951
Camden	6,737	231,394	N/A	N/A	N/A	2,437	721	N/A	N/A	63,934	361	207	6,208	2,936	N/A	818	299	4,189	320,240
City of London	196	6,719	N/A	N/A	N/A	71	21	N/A	N/A	2,546	14	8	247	117	N/A	33	12	167	10,150
Croydon	13,238	454,687	N/A	N/A	N/A	4,788	1,417	N/A	N/A	144,644	816	468	14,046	6,643	N/A	1,851	675	9,477	652,750
Ealing	11,748	403,517	N/A	N/A	N/A	4,249	1,258	N/A	N/A	111,282	628	360	10,806	5,111	N/A	1,424	520	7,291	558,193
Enfield	11,373	390,631	N/A	N/A	N/A	4,113	1,218	N/A	N/A	115,918	654	375	11,256	5,324	N/A	1,484	541	7,595	550,482
Greenwich	8,692	298,541	N/A	N/A	N/A	3,144	931	N/A	N/A	64,842	366	210	6,297	2,978	N/A	830	303	4,248	391,381
Hackney	6,818	234,180	N/A	N/A	N/A	2,466	730	N/A	N/A	57,916	327	187	5,624	2,660	N/A	741	270	3,795	315,715

Area	NO_2							PM_{10}		$PM_{2.5}$									
	Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidence of asthma (adults)	Incidence of diabetes	Incidence of lung cancer	Incidences of asthma - small children	Incidences of asthma - older children	Chronic bronchitis	Productivity	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidence of diabetes	Incidences of lung cancer	Incidences of asthma - older children	Productivity	TOTAL
Hammersmith and Fulham	5,128	176,126	N/A	N/A	N/A	1,855	549	N/A	N/A	44,902	253	145	4,360	2,062	N/A	575	210	2,942	239,107
Haringey	6,636	227,931	N/A	N/A	N/A	2,400	710	N/A	N/A	40,580	229	131	3,941	1,864	N/A	519	190	2,659	287,790
Harrow	8,595	295,222	N/A	N/A	N/A	3,109	920	N/A	N/A	99,900	563	323	9,701	4,588	N/A	1,279	467	6,545	431,212
Havering	7,594	260,825	N/A	N/A	N/A	2,747	813	N/A	N/A	86,088	485	278	8,360	3,954	N/A	1,102	402	5,640	378,287
Hillingdon	9,694	332,957	N/A	N/A	N/A	3,506	1,038	N/A	N/A	112,385	634	363	10,913	5,161	N/A	1,439	525	7,363	485,979
Hounslow	9,579	329,027	N/A	N/A	N/A	3,465	1,026	N/A	N/A	106,406	600	344	10,333	4,887	N/A	1,362	497	6,972	474,497
Islington	5,736	196,998	N/A	N/A	N/A	2,074	614	N/A	N/A	53,204	300	172	5,166	2,443	N/A	681	248	3,486	271,123
Kensington and Chelsea	4,189	143,866	N/A	N/A	N/A	1,515	448	N/A	N/A	41,352	233	134	4,015	1,899	N/A	529	193	2,709	201,083
Kingston upon Thames	6,361	218,497	N/A	N/A	N/A	2,301	681	N/A	N/A	75,837	428	245	7,364	3,483	N/A	971	354	4,969	321,490
Lambeth	9,742	334,606	N/A	N/A	N/A	3,523	1,043	N/A	N/A	75,773	427	245	7,358	3,480	N/A	970	354	4,965	442,486
Lewisham	8,766	301,072	N/A	N/A	N/A	3,170	938	N/A	N/A	67,670	382	219	6,571	3,108	N/A	866	316	4,434	397,512
Merton	7,785	267,382	N/A	N/A	N/A	2,816	833	N/A	N/A	91,044	513	294	8,841	4,181	N/A	1,165	425	5,965	391,246
Newham	8,663	297,561	N/A	N/A	N/A	3,133	927	N/A	N/A	41,513	234	134	4,031	1,907	N/A	531	194	2,720	361,549
Redbridge	10,585	363,570	N/A	N/A	N/A	3,828	1,133	N/A	N/A	89,162	503	288	8,658	4,095	N/A	1,141	416	5,842	489,222
Richmond upon Thames	6,449	221,504	N/A	N/A	N/A	2,332	690	N/A	N/A	66,068	373	214	6,416	3,034	N/A	846	309	4,329	312,564
Southwark	7,850	269,610	N/A	N/A	N/A	2,839	840	N/A	N/A	62,251	351	201	6,045	2,859	N/A	797	291	4,079	358,012
Sutton	6,789	233,182	N/A	N/A	N/A	2,455	727	N/A	N/A	83,527	471	270	8,111	3,836	N/A	1,069	390	5,473	346,301
Tower Hamlets	8,435	289,705	N/A	N/A	N/A	3,051	903	N/A	N/A	75,139	424	243	7,296	3,451	N/A	962	351	4,923	394,882

Area	NO_2							PM_{10}		$PM_{2.5}$									
	Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidence of asthma (adults)	Incidence of diabetes	Incidence of lung cancer	Incidences of asthma - small children	Incidences of asthma - older children	Chronic bronchitis	Productivity	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidence of diabetes	Incidences of lung cancer	Incidences of asthma - older children	Productivity	TOTAL
Waltham Forest	7,362	252,879	N/A	N/A	N/A	2,663	788	0	0	40,583	229	131	3,941	1,864	N/A	519	190	2,659	313,808
Wandsworth	11,192	384,421	N/A	N/A	N/A	4,048	1,198	0	0	102,198	576	331	9,924	4,693	N/A	1,308	477	6,696	527,064
Westminster	6,790	233,226	N/A	N/A	N/A	2,456	727	0	0	73,996	417	239	7,185	3,398	N/A	947	346	4,848	334,576

Table 7: Low sensitivity case 2023 Proposed Scheme health benefit (i.e. valuation of relative impact, £2020 prices)

Area	NO_2							PM_{10}		$PM_{2.5}$									
	Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidence of asthma (adults)	Incidence of diabetes	Incidence of lung cancer	Incidences of asthma - small children	Incidences of asthma - older children	Chronic bronchitis	Productivity	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidence of diabetes	Incidences of lung cancer	Incidences of asthma - older children	Productivity	TOTAL
Central London	8,067	233,052	N/A	N/A	N/A	N/A	N/A	N/A	N/A	211,765	-466	123	N/A	N/A	N/A	N/A	N/A	8,256	460,796
Inner London	11,286	326,046	N/A	N/A	N/A	N/A	N/A	N/A	N/A	257,816	-568	149	N/A	N/A	N/A	N/A	N/A	10,052	604,781
Outer London	34,211	988,317	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,001,928	-2,207	580	N/A	N/A	N/A	N/A	N/A	39,064	2,061,892
Greater London	53,564	1,547,414	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,471,508	-3,241	852	N/A	N/A	N/A	N/A	N/A	57,372	3,127,468
Barking and Dagenham	1,380	39,863	N/A	N/A	N/A	N/A	N/A	N/A	N/A	39,703	-87	23	N/A	N/A	N/A	N/A	N/A	1,548	82,429
Barnet	2,910	84,077	N/A	N/A	N/A	N/A	N/A	N/A	N/A	80,478	-177	47	N/A	N/A	N/A	N/A	N/A	3,138	170,473
Bexley	1,559	45,051	N/A	N/A	N/A	N/A	N/A	N/A	N/A	49,879	-110	29	N/A	N/A	N/A	N/A	N/A	1,945	98,353
Brent	2,190	63,266	N/A	N/A	N/A	N/A	N/A	N/A	N/A	55,860	-123	32	N/A	N/A	N/A	N/A	N/A	2,178	123,403
Bromley	1,955	56,485	N/A	N/A	N/A	N/A	N/A	N/A	N/A	58,825	-130	34	N/A	N/A	N/A	N/A	N/A	2,293	119,463
Camden	1,318	38,073	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36,292	-80	21	N/A	N/A	N/A	N/A	N/A	1,415	77,038
City of London	38	1,105	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,445	-3	1	N/A	N/A	N/A	N/A	N/A	56	2,643
Croydon	2,590	74,812	N/A	N/A	N/A	N/A	N/A	N/A	N/A	82,107	-181	48	N/A	N/A	N/A	N/A	N/A	3,201	162,577
Ealing	2,298	66,393	N/A	N/A	N/A	N/A	N/A	N/A	N/A	63,169	-139	37	N/A	N/A	N/A	N/A	N/A	2,463	134,220
Enfield	2,225	64,273	N/A	N/A	N/A	N/A	N/A	N/A	N/A	65,801	-145	38	N/A	N/A	N/A	N/A	N/A	2,565	134,757
Greenwich	1,700	49,121	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36,808	-81	21	N/A	N/A	N/A	N/A	N/A	1,435	89,004
Hackney	1,334	38,531	N/A	N/A	N/A	N/A	N/A	N/A	N/A	32,876	-72	19	N/A	N/A	N/A	N/A	N/A	1,282	73,969
Hammersmith and Fulham	1,003	28,979	N/A	N/A	N/A	N/A	N/A	N/A	N/A	25,489	-56	15	N/A	N/A	N/A	N/A	N/A	994	56,423
Haringey	1,298	37,503	N/A	N/A	N/A	N/A	N/A	N/A	N/A	23,035	-51	13	N/A	N/A	N/A	N/A	N/A	898	62,697

Area	NO_2							PM_{10}		$PM_{2.5}$									
	Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidence of asthma (adults)	Incidence of diabetes	Incidence of lung cancer	Incidences of asthma - small children	Incidences of asthma - older children	Chronic bronchitis	Productivity	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidence of diabetes	Incidences of lung cancer	Incidences of asthma - older children	Productivity	TOTAL
Harrow	1,681	48,575	N/A	N/A	N/A	N/A	N/A	N/A	N/A	56,708	-125	33	N/A	N/A	N/A	N/A	N/A	2,211	109,083
Havering	1,486	42,915	N/A	N/A	N/A	N/A	N/A	N/A	N/A	48,868	-108	28	N/A	N/A	N/A	N/A	N/A	1,905	95,094
Hillingdon	1,896	54,783	N/A	N/A	N/A	N/A	N/A	N/A	N/A	63,795	-141	37	N/A	N/A	N/A	N/A	N/A	2,487	122,859
Hounslow	1,874	54,137	N/A	N/A	N/A	N/A	N/A	N/A	N/A	60,401	-133	35	N/A	N/A	N/A	N/A	N/A	2,355	118,669
Islington	1,122	32,413	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30,201	-67	17	N/A	N/A	N/A	N/A	N/A	1,177	64,865
Kensington and Chelsea	819	23,671	N/A	N/A	N/A	N/A	N/A	N/A	N/A	23,473	-52	14	N/A	N/A	N/A	N/A	N/A	915	48,841
Kingston upon Thames	1,244	35,951	N/A	N/A	N/A	N/A	N/A	N/A	N/A	43,049	-95	25	N/A	N/A	N/A	N/A	N/A	1,678	81,852
Lambeth	1,906	55,055	N/A	N/A	N/A	N/A	N/A	N/A	N/A	43,013	-95	25	N/A	N/A	N/A	N/A	N/A	1,677	101,580
Lewisham	1,715	49,537	N/A	N/A	N/A	N/A	N/A	N/A	N/A	38,413	-85	22	N/A	N/A	N/A	N/A	N/A	1,498	91,100
Merton	1,523	43,994	N/A	N/A	N/A	N/A	N/A	N/A	N/A	51,681	-114	30	N/A	N/A	N/A	N/A	N/A	2,015	99,129
Newham	1,695	48,959	N/A	N/A	N/A	N/A	N/A	N/A	N/A	23,565	-52	14	N/A	N/A	N/A	N/A	N/A	919	75,100
Redbridge	2,071	59,820	N/A	N/A	N/A	N/A	N/A	N/A	N/A	50,613	-111	29	N/A	N/A	N/A	N/A	N/A	1,973	114,395
Richmond upon Thames	1,262	36,445	N/A	N/A	N/A	N/A	N/A	N/A	N/A	37,504	-83	22	N/A	N/A	N/A	N/A	N/A	1,462	76,612
Southwark	1,536	44,360	N/A	N/A	N/A	N/A	N/A	N/A	N/A	35,337	-78	20	N/A	N/A	N/A	N/A	N/A	1,378	82,553
Sutton	1,328	38,367	N/A	N/A	N/A	N/A	N/A	N/A	N/A	47,414	-104	27	N/A	N/A	N/A	N/A	N/A	1,849	88,881
Tower Hamlets	1,650	47,667	N/A	N/A	N/A	N/A	N/A	N/A	N/A	42,653	-94	25	N/A	N/A	N/A	N/A	N/A	1,663	93,563
Waltham Forest	1,440	41,608	N/A	N/A	N/A	N/A	N/A	N/A	N/A	23,037	-51	13	N/A	N/A	N/A	N/A	N/A	898	66,945
Wandsworth	2,189	63,251	N/A	N/A	N/A	N/A	N/A	N/A	N/A	58,013	-128	34	N/A	N/A	N/A	N/A	N/A	2,262	125,621
Westminster	1,328	38,374	N/A	N/A	N/A	N/A	N/A	N/A	N/A	42,004	-93	24	N/A	N/A	N/A	N/A	N/A	1,638	83,276

Table 8: High sensitivity case 2023 Proposed Scheme health benefit (i.e. valuation of relative impact, £2020 prices)

Area	NO_2							PM_{10}		$PM_{2.5}$									
	Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidence of asthma (adults)	Incidence of diabetes	Incidence of lung cancer	Incidences of asthma - small children	Incidences of asthma - older children	Chronic bronchitis	Productivity	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidence of diabetes	Incidences of lung cancer	Incidences of asthma - older children	Productivity	TOTAL
Central London	98,605	3,866,309	1,326,684	240,713	46,712	21,924	8,691	467,825	3,831	517,910	9,397	3,381	110,402	38,938	14,582	9,904	2,971	54,172	6,842,951
Inner London	137,952	5,409,068	1,856,066	336,764	65,352	30,673	12,159	569,562	4,664	630,538	11,440	4,116	134,411	47,405	17,753	12,058	3,617	65,953	9,349,550
Outer London	418,162	16,396,099	5,626,153	1,020,806	198,096	92,976	36,856	2,213,436	18,125	2,450,402	44,460	15,996	522,349	184,227	68,991	46,859	14,057	256,307	29,624,356
Greater London	654,720	25,671,475	8,808,903	1,598,282	310,161	145,572	57,705	3,250,823	26,620	3,598,850	65,297	23,492	767,163	270,570	101,325	68,821	20,645	376,432	45,816,857
Barking and Dagenham	16,866	661,318	226,924	41,173	7,990	3,750	1,487	87,711	718	97,102	1,762	634	20,699	7,300	2,734	1,857	557	10,157	1,190,738
Barnet	35,573	1,394,830	478,622	86,841	16,852	7,910	3,135	177,791	1,456	196,825	3,571	1,285	41,957	14,798	5,542	3,764	1,129	20,587	2,492,467
Bexley	19,061	747,387	256,458	46,532	9,030	4,238	1,680	110,192	902	121,989	2,213	796	26,004	9,171	3,435	2,333	700	12,760	1,374,883
Brent	26,768	1,049,572	360,150	65,345	12,681	5,952	2,359	123,405	1,011	136,616	2,479	892	29,122	10,271	3,846	2,613	784	14,290	1,848,156
Bromley	23,899	937,083	321,551	58,342	11,322	5,314	2,106	129,955	1,064	143,868	2,610	939	30,668	10,816	4,051	2,751	825	15,048	1,702,213
Camden	16,109	631,621	216,734	39,324	7,631	3,582	1,420	80,175	657	88,759	1,610	579	18,921	6,673	2,499	1,697	509	9,284	1,127,784
City of London	468	18,340	6,293	1,142	222	104	41	3,192	26	3,534	64	23	753	266	100	68	20	370	35,025
Croydon	31,653	1,241,130	425,881	77,272	14,995	7,038	2,790	181,389	1,485	200,808	3,643	1,311	42,806	15,097	5,654	3,840	1,152	21,004	2,278,949
Ealing	28,091	1,101,454	377,953	68,576	13,308	6,246	2,476	139,552	1,143	154,492	2,803	1,008	32,933	11,615	4,350	2,954	886	16,159	1,965,999
Enfield	27,194	1,066,282	365,884	66,386	12,883	6,046	2,397	145,365	1,190	160,928	2,920	1,050	34,305	12,099	4,531	3,077	923	16,833	1,930,294
Greenwich	20,783	814,910	279,628	50,736	9,846	4,621	1,832	81,315	666	90,020	1,633	588	19,189	6,768	2,535	1,721	516	9,416	1,396,722
Hackney	16,303	639,227	219,344	39,798	7,723	3,625	1,437	72,629	595	80,405	1,459	525	17,140	6,045	2,264	1,538	461	8,410	1,118,927
Hammersmith and Fulham	12,261	480,761	164,968	29,932	5,809	2,726	1,081	56,309	461	62,338	1,131	407	13,288	4,687	1,755	1,192	358	6,520	845,983

Area	NO_2							PM_{10}		$PM_{2.5}$									
	Respiratory hospital admission (HA)	Chronic mortality (LYL)	Incidence of asthma (adults)	Incidence of diabetes	Incidence of lung cancer	Incidences of asthma - small children	Incidences of asthma - older children	Chronic bronchitis	Productivity	Chronic mortality (LYL)	Respiratory hospital admission (HA)	Cardiovascular hospital admission (HA)	Incidences of CHD	Incidences of stroke	Incidence of diabetes	Incidences of lung cancer	Incidences of asthma - older children	Productivity	TOTAL
Haringey	15,868	622,169	213,491	38,736	7,517	3,528	1,399	50,889	417	56,337	1,022	368	12,009	4,236	1,586	1,077	323	5,893	1,036,865
Harrow	20,552	805,850	276,519	50,171	9,736	4,570	1,811	125,278	1,026	138,691	2,516	905	29,564	10,427	3,905	2,652	796	14,507	1,499,478
Havering	18,158	711,957	244,301	44,326	8,602	4,037	1,600	107,957	884	119,515	2,168	780	25,477	8,985	3,365	2,285	686	12,501	1,317,585
Hillingdon	23,179	908,853	311,864	56,584	10,981	5,154	2,043	140,935	1,154	156,023	2,831	1,018	33,259	11,730	4,393	2,984	895	16,320	1,690,200
Hounslow	22,906	898,126	308,183	55,916	10,851	5,093	2,019	133,437	1,093	147,723	2,680	964	31,490	11,106	4,159	2,825	847	15,451	1,654,869
Islington	13,714	537,734	184,518	33,479	6,497	3,049	1,209	66,719	546	73,862	1,340	482	15,745	5,553	2,080	1,412	424	7,726	956,090
Kensington and Chelsea	10,015	392,702	134,752	24,449	4,745	2,227	883	51,857	425	57,409	1,042	375	12,238	4,316	1,616	1,098	329	6,005	706,480
Kingston upon Thames	15,211	596,417	204,654	37,132	7,206	3,382	1,341	95,102	779	105,284	1,910	687	22,443	7,915	2,964	2,013	604	11,012	1,116,058
Lambeth	23,294	913,353	313,408	56,865	11,035	5,179	2,053	95,023	778	105,196	1,909	687	22,424	7,909	2,962	2,012	603	11,003	1,575,692
Lewisham	20,959	821,818	281,998	51,166	9,929	4,660	1,847	84,861	695	93,946	1,705	613	20,026	7,063	2,645	1,797	539	9,827	1,416,094
Merton	18,614	729,857	250,443	45,440	8,818	4,139	1,641	114,173	935	126,396	2,293	825	26,944	9,503	3,559	2,417	725	13,221	1,359,942
Newham	20,715	812,233	278,709	50,569	9,813	4,606	1,826	52,059	426	57,633	1,046	376	12,286	4,333	1,623	1,102	331	6,028	1,315,713
Redbridge	25,310	992,414	340,537	61,787	11,990	5,628	2,231	111,813	916	123,783	2,246	808	26,387	9,306	3,485	2,367	710	12,947	1,734,664
Richmond upon Thames	15,420	604,626	207,471	37,643	7,305	3,429	1,359	82,852	678	91,722	1,664	599	19,552	6,896	2,582	1,754	526	9,594	1,095,675
Southwark	18,769	735,937	252,529	45,819	8,892	4,173	1,654	78,065	639	86,423	1,568	564	18,423	6,497	2,433	1,653	496	9,040	1,273,573
Sutton	16,233	636,502	218,409	39,628	7,690	3,609	1,431	104,747	858	115,960	2,104	757	24,719	8,718	3,265	2,218	665	12,129	1,199,643
Tower Hamlets	20,168	790,789	271,351	49,234	9,554	4,484	1,778	94,227	772	104,315	1,893	681	22,237	7,843	2,937	1,995	598	10,911	1,395,767
Waltham Forest	17,604	690,269	236,859	42,975	8,340	3,914	1,552	50,892	417	56,341	1,022	368	12,010	4,236	1,586	1,077	323	5,893	1,135,679
Wandsworth	26,762	1,049,331	360,067	65,330	12,678	5,950	2,359	128,161	1,049	141,881	2,574	926	30,245	10,667	3,995	2,713	814	14,840	1,860,343
Westminster	16,236	636,622	218,450	39,636	7,692	3,610	1,431	92,794	760	102,728	1,864	671	21,898	7,723	2,892	1,964	589	10,745	1,168,307

Under the Core set of health pathways for the with Proposed Scheme scenario, the improved health outcomes associated with reduced air pollution in 2023 for the greater London area are estimated to have a total monetised benefit of £13.0m (range £3.1m to £45.8m). The range in these results represents the sensitivity around the CRF for mortality and for the valuations of mortality and hospital admissions.

Across boroughs and other London region groupings (i.e. central, inner and outer), the size of monetised impact scales with the level of underlying health impacts. These impacts in turn scale according to the level of population and specific changes in air pollutant concentrations in the boroughs given other inputs into valuation (CRF, base rates of health impacts, monetary unit values) are not varied by area.

6. HEALTH IMPACTS NOT QUANTIFIED

The air quality health impacts analysis has captured a range of key health impacts directly associated with changes in concentrations of air pollutants. The effects captured are the impact of chronic exposure to air pollution on mortality, and the impact of acute exposure on respiratory hospital admissions and cardio-vascular hospital admissions, amongst other morbidity outcomes.

Alongside these effects, exposure to air pollutants has been associated with a wider range of health impacts that have not been included in this assessment. These include additional health impacts from PM and NO_2 improvements that have not been quantified and the potential health benefits from reductions in other pollutants. These are discussed below. For the health impact pathways included here, this assessment has followed the published Defra IPA guidance to guide its assessment and recent recommendation from COMEAP for the impact of long-term exposure to NO_2. The WHO's 2013 HRAPIE study[20] also included a number of other health impact pathways (with varying confidence in the strength of the relationship) in their published guidance. These are not included within the Defra guidance and have therefore not been included in our assessment. These pathways are as follows:

- PM_{10} and infant mortality
- NO_2 and chronic bronchitis in children
- NO_2 and acute mortality.

Furthermore, previous published studies of the impacts of air quality on health in the EU (based on the EU CAFE approach[21]) and the US (based on the US EPA's approach[22]) have also included an assessment of health pathways outside those included in the recent HRAPIE work, including the impacts of particulate matter on respiratory medication use, lower respiratory symptoms and school days lost.

The Proposed Scheme may also lead to small reductions in the emissions of other pollutants (e.g. SO_2 and the pollutants that can contribute to low level O_3 formation (e.g. volatile organic compounds)). These pollutants are included in the Defra guidance (and HRAPIE report); in particular, the impacts of acute exposure to SO_2 and O_3 on mortality and respiratory hospital admissions. However, the impacts on health of these other pollutants could not be quantified in this assessment because the impacts of the Proposed Scheme on pollutants other than PM and NO_2 have not been modelled. The impact on ozone concentrations could, in fact, be quite complex, leading to either decrease or increase in ozone concentrations and this has not been investigated in this study. That said, any impacts are anticipated to be very small, both due to the likely changes in emissions associated with the policy options, and also the strength of the health impacts associated with these pollutants (which are typically smaller than those associated with PM and NO_2).

The acute mortality impacts of particulate matter have also been excluded as advised by COMEAP guidance to avoid overlaps with the chronic impacts of exposure already captured.

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[20] http://www.euro.who.int/__data/assets/pdf_file/0006/238956/Health-risks-of-air-pollution-in-Europe-HRAPIE-project,-Recommendations-for-concentrationresponse-functions-for-costbenefit-analysis-of-particulate-matter,-ozone-and-nitrogen-dioxide.pdf

[21] Holland, M et al. (2011): 'The Reduction in Air Quality Impacts and Associated Economic Benefits of Mitigation Policy. Summary of Results from the EC RTD ClimateCost Project.'; In Watkiss, P (Editor) (2011): 'The ClimateCost Project. Final Report'; Volume 1: Europe; http://www.climatecost.cc/images/Policy_Brief_master_REV_WEB_medium_.pdf

[22] US EPA (2011): 'The benefits and costs of the Clean Air Act from 1990 to 2020'; report by the US Environmental Protection Agency Office of Air and Radiation; http://www.epa.gov/air/sect812/feb11/fullreport_rev_a.pd

Furthermore, it has not been possible to assess mortality benefits associated with reductions in secondary nitrate concentrations arising from the reductions in NO_x emissions within this study because the impact on nitrate concentrations has not been included in the air pollutant concentration modelling.

Finally, we have limited the assessment to the impacts of the Proposed Scheme within Greater London. There is likely to be some additional positive impacts of the Proposed Scheme on concentrations of pollutants outside of London, but this has not been fully quantified and therefore the health impacts could not be calculated in this study.

7. CONCLUSION

The key outputs of the study are presented in the following table.

Table 9 – Summary table of results – impact of proposed scheme relative to base case in 2023 (£m 2020 prices)

	Central			**Low**			**High**		
	Impact of change in NO_2	Impact of change in $PM_{2.5}$	**Total impact**	*Impact of change in NO_2*	*Impact of change in $PM_{2.5}$*	***Total impact***	*Impact of change in NO_2*	*Impact of change in $PM_{2.5}$*	***Total impact***
Central London	£1.48	£0.46	**£1.94**	*£0.24*	*£0.22*	***£0.46***	*£5.61*	*£1.23*	***£6.84***
Inner London	£2.07	£0.56	**£2.63**	*£0.34*	*£0.27*	***£0.60***	*£7.85*	*£1.50*	***£9.35***
Outer London	£6.26	£2.18	**£8.44**	*£1.02*	*£1.04*	***£2.06***	*£23.79*	*£5.84*	***£29.62***
Greater London	£9.81	£3.20	**£13.01**	*£1.60*	*£1.53*	***£3.13***	*£37.25*	*£8.57*	***£45.82***

From this analysis, it is clear that the Proposed Scheme would bring about important reductions in the health impacts associated with air pollution in Greater London and would therefore be an important part of London's overall strategy for improving air quality and limiting the associated health impacts.

The above conclusion is evident from the analysis of the potential change in mean exposure to NO_2 and PM, and from the quantification of actual health benefits. The improvements in health outcomes are estimated to have a total London-wide economic benefit valued around £13.0m associated with the single year change in concentrations in 2023 for the central valuation, with the greatest benefit being provided through reductions in mortality (all impacts are in 2020 prices and discounted to 2023). Should the scheme continue to deliver air quality improvements over subsequent years, the cumulative, total health impacts of the Proposed scheme would be greater than the results for a single year as presented in this analysis.

The Proposed Scheme would continue to deliver air quality and health benefits for a number of years beyond 2023, however these have not been modelled or quantified as part of this study. The magnitude of these benefits would, however, reduce over gradually time due to natural improvements in the vehicle fleet, meaning that the levels of vehicle compliance with emissions standards would increase.

The improvements in health outcomes with the Proposed scheme are greatest in outer London where the biggest reductions in population weighted mean concentrations of NO_2 and PM are seen (and the largest population reside). The impacts are lowest in central London, which may in part be driven by the air quality improvements which have already been delivered by existing policies (i.e. congestion charge and existing ULEZ), which are already included in the baseline.

Appendix B. Assessment methodologies

Economic and Business Impact Assessment (EBIA)

Introduction

It is proposed to assess the expanded ULEZ proposals against two key economic objectives namely:

- To support the growth and creation of businesses in outer London, including small to medium sized enterprises (SMEs)
- To promoting the vitality and viability of London's varied town centres

Our approach to doing this is to understand the impact of the existing ULEZ on businesses and town centres within the existing ULEZ and hence the impact of behavioural changes that the Proposed Scheme may have in outer London.

In assessing the magnitude of impacts, a scale of 0-3 has been applied as set out in Table B1-1.

Table B 1-1: Criteria for Determining Magnitude of Economic impacts

Magnitude	Criterion
0	likely scale of impact cannot be determined – impact is zero or very small and effectively unmeasurable within the context of the economy as a whole or unquantifiable due to insufficient data
+/- 1	minor (positive or negative) – small impact less than 0.05 per cent of the size of London's economy or 1 per cent of an individual sector
+/- 2	moderate (positive or negative) – impact of 0.05-1 per cent of the size of London's economy or between 1-5 per cent of an individual sector
+/- 3	major (positive or negative) – impact of greater than 1 per cent of the size of London's economy or more than 5per cent for an individual sector

Employment

Methodology

To determine the potential impact on businesses from extending the ULEZ we assess the impact that the existing ULEZ has had on economic activity based on data analysis and discussions with key stakeholders. Secondly, we considered what the implications for outer London would be if similar behavioural changes and consequential impacts were replicated by the proposed extension.

To assess the impact of the existing ULEZ on businesses we:

- Review data on vehicle movements into the existing ULEZ by vehicle type to see how volumes and composition of traffic has changed from pre to post ULEZ implementation in October 2021
- Review economic data on unemployment to benchmark performance of areas within and without the existing ULEZ since October 2021
- Review Google Mobility data by Borough to benchmark performance of areas within and without the existing ULEZ since October 2021
- Review data on ULEZ payments by vehicle type and trends over time
- Hold a workshop with a variety of trade associations that represent businesses in Greater London. The aim of the workshop will be to explore both the costs and benefits of the existing ULEZ on businesses

This initial work provides a base as to assess the expected behavioural change arising from extending the ULEZ London wide and potential changes in mobility. Our approach to doing this is to understand existing vehicle movements in this part of outer London by vehicle type (LGV, taxi/PHV, private car) and journey purpose. We therefore review:

- TfL model output data on vehicle movements within outer London that do not enter the existing ULEZ, by journey purpose, and vehicle type
- TfL model output data on vehicle movements entering Greater London that do not enter the existing ULEZ area by journey purpose, and vehicle type

Both of these data sets at a London Borough level to better understand the vehicle intensity/dependence of local economies:

- Census (2011) travel to work data (although now dated) to destinations in outer London from both outer London and outside Greater London by destination and mode of travel
- Employment in outer London by economic sector, size of employer and Borough

For those vehicles that are not compliant there are a number of potential responses that owners can take to the Proposed Scheme, namely:

- Mode shift for individuals
- pay the charge
- replace vehicle with a compliant one (new or second-hand)
- retrofit vehicle to achieve compliance
- reallocate vehicles to ensure those that enter the London-wide ULEZ are compliant.
- withdraw from serving or travelling into the London-wide ULEZ area (including, for example commuters choosing to work from home or changing jobs)
- withdraw from business altogether

Based on behaviours seen as a result of the existing ULEZ and TfL's own assumptions, it is possible to estimate the proportion of non-compliant vehicles that fall into each category and the cost of either complying or paying the ULEZ charge.

We then seek to establish which sectors of the economy and which areas of Greater London see the greatest impacts, if any. Input-output tables were used to identify which sectors of the economy are road transport dependent, but the assessment is necessarily qualitative and informed by stakeholder engagement.

For commuters that have non-compliant vehicles, the potential responses include:

- pay the charge
- if the job allows, work from home
- change jobs / location of office employment
- change transport mode
- replace vehicle with a compliant one (new or second-hand)
- retrofit vehicle to achieve compliance (this is no longer assumed to be an option)
- reallocate vehicles to ensure those that enter the expanded ULEZ are compliant

Based on TfL's assumptions as to which of these responses are expected we assess the number of workers that are likely to be impacted by the Proposed Scheme and the impact, if any, that this may have on SMEs in outer London.

Geographical scope

The geographical scope is that part of Greater London that falls within the London-wide ULEZ with data analysis being undertaken at a borough level where applicable.

Town Centres

Methodology

Retail expenditure is typically split into convenience and comparison spend. The former covers items bought on a regular basis such as food and toiletries which tend to be purchased close to where people live. The latter covers more ad hoc purchases such as clothing, furniture and electrical items and where people tend to travel to specialist stores or major centres that offer a wide range of choice.

We will review data on the level of comparison retail spend and the size of the night time economy in outer London town centres to determine the level of spend associated with those who travel by car especially from outside Greater London.

Individuals who reside in Greater London and have non-compliant vehicles may:

- Continue to use same retail centre but switch mode
- Switch destination to one more easily accessible by other modes of transport

- Switch to on-line and home delivery
- Pay the charge

For individuals who reside outside Greater London who drive a non-compliant vehicle, who presently travel into Greater London for retail and leisure purposes may:

- Continue to use same retail centre but switch mode
- Switch destination to one more easily accessible by other modes of transport within Greater London
- Switch destination to outside Greater London
- Switch to on-line and home delivery
- Pay the charge

For those who use the night time economy the options are the same with switch to on-line covering streaming services and food delivery apps.

Geographical scope
Town centres that are located within Greater London that fall within the Proposed Scheme with data analysis being undertaken at a borough level where applicable.

Environment

Air Quality

Methodology

The assessment of the potential impacts of the Proposed Scheme on air quality considers both changes in emissions and concentrations of key road traffic derived air pollutants, specifically:

- Oxides of nitrogen (NOx)
- Nitrogen dioxide (NO_2)
- Particulate matter less than 10µm in diameter (PM_{10})
- Particulate matter less than 2.5µm in diameter ($PM_{2.5}$)

Changes in emissions of air pollutants

The impact of the Proposed Scheme on emissions of NO_x, PM_{10} and $PM_{2.5}$ has been assessed by comparing estimated road traffic emissions provided by TfL 'with the Proposed Scheme' with those 'without the Proposed Scheme' in 2023. The following criteria have been used to describe the magnitude of relative changes in estimated emissions within this assessment:

- < 1 per cent = Negligible
- 1 – 5 per cent = Minor
- 5 – 10 per cent = Moderate
- >10 per cent = Major

Changes in exposure to air pollution

The impact of the Proposed Scheme on exposure to air pollution has been assessed using modelled 2023 annual mean NO_2 and $PM_{2.5}$ concentrations provided by TfL, both 'with the Proposed Scheme' and 'without the Proposed Scheme'. These modelled concentrations, along with population data and the locations of sensitive receptors provided by TfL, have been used to derive the following metrics at a central, inner, outer and Greater London level, as well as within each London borough:

- Changes in population weighted annual average NO_2 and $PM_{2.5}$ concentrations
- Changes in populations exposed to pollutant concentrations in excess of the annual mean NO_2 air quality objective (40 µg/m^3), lowest WHO Interim Target for annual mean NO_2 (20 µg/m^3) and lowest WHO Interim Target for annual mean $PM_{2.5}$ (10 µg/m^3)
- Changes in the numbers of schools, hospitals and care homes exposed to pollutant concentrations in excess of the annual mean NO_2 air quality objective lowest WHO Interim Target for annual mean NO_2 (20 µg/m^3) and lowest WHO Interim Target for annual mean $PM_{2.5}$ (10 µg/m^3)

The following criteria were then used to describe the magnitude of relative changes in exposure to pollution within this assessment:

- < 1 per cent = Negligible
- 1 – 5 per cent = Minor
- 5 – 10 per cent = Moderate
- >10 per cent = Major

Compliance with legal limits

The impact of the Proposed Scheme on compliance with legal limits has been assessed using the proportion of major road links adjacent to which exceedances of the annual mean NO_2 Limit Value are modelled to occur in 2023, both with and without the Proposed Scheme. The following criteria were then used to describe the magnitude of relative changes in compliance with the annual mean NO_2 Limit Value within this assessment:

- <5 per cent = Minor
- 5 – 10 per cent = Moderate
- >10 per cent = Major

Distributional impacts

An assessment of how changes in air quality as a result of the Proposed Scheme would be distributed across society has been made by comparing changes in population weighted pollutant concentrations at Lower Super Output Area (LSOA) level to deciles of the Index of Multiple Deprivation (IMD) 2019 at the same spatial scale.

The outputs of this assessment have been considered within the Health and Equality Impact Assessment (see Section 6).

Geographical scope

The geographical scope of the assessment has been limited to the area covered by the London Atmospheric Emissions Inventory (LAEI), which includes Greater London (the 32 London boroughs and the City of London), as well as areas outside Greater London up to the M25 motorway (the approximate extent of which is illustrated in Figure 10.1).

Changes in road traffic emissions and exposure to pollution has been assessed at the Greater London level, as well as across central, inner' and outer London and within each London borough, respectively, and within 'non-Greater London' areas covered by the LAEI.

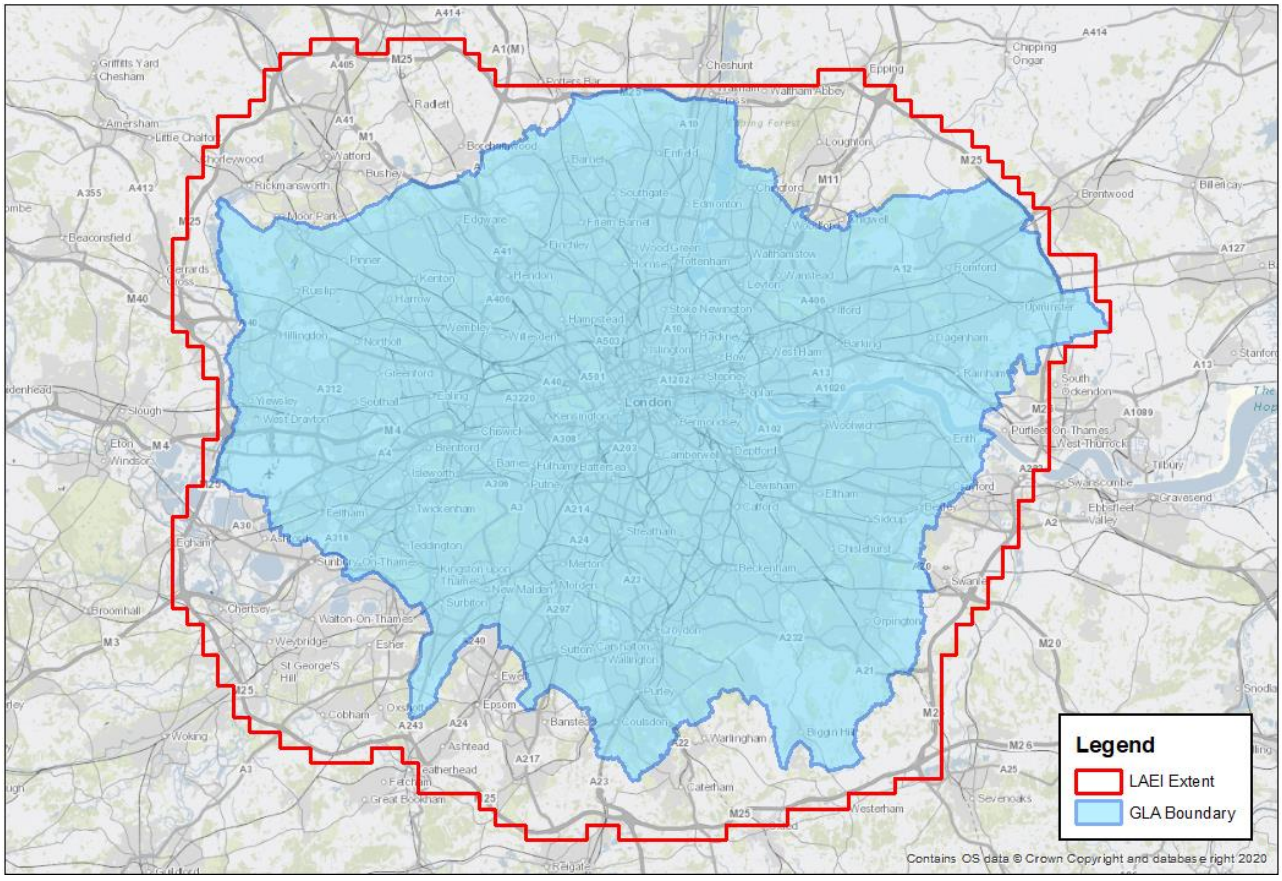

Figure B 2-1. Approximate Extent of Air Quality Study Area

Data required to inform Impact Assessment

The following data were provided from TfL to inform the assessment:

- Estimated road traffic emissions of NO_x, PM_{10} and $PM_{2.5}$ within central, inner and outer London and within each London borough, respectively, and within 'non-Greater London' areas covered by the LAEI, for the assessment year (2023), both with and without the Proposed Scheme (in tonnes / yr)
- Modelled annual mean concentrations of NO_x, NO_2, PM_{10} and $PM_{2.5}$ across Greater London and within 'non-Greater London' areas covered by the LAEI, for the assessment year (2023), both with and without the Proposed Changes in the following format:
  - at 20m grid resolution
  - as average concentrations at Output Area and Lower Super Output Area Level
  - as population weighted concentrations across central, inner, outer and Greater London and within each London borough, respectively and within 'non-Greater London' areas covered by the LAEI
- Population data across Greater London and within 'non-Greater London' areas covered by the LAEI at Output Area level for the assessment year (2023).
- Locations of hospitals, schools, and care homes in Greater London and within 'non-Greater London' areas covered by the LAEI
- Boundary data for Output Areas, Lower Super Output Areas, London boroughs, central, inner, outer and Greater London

Assumptions/Limitations

Given the geographical scope of the assessment is limited to the area covered by the LAEI, no assessment of potential changes in emissions or concentrations of air pollutants as a result of the Proposed Scheme has been undertaken outside of this area. While changes in emissions and concentrations of air pollutants are likely to occur outside of the study area considered, it is assumed that any such changes would primarily be either

negligible or positive in nature (e.g. as a result of reductions in traffic flows or improvements to the vehicle fleet).

The assessment is based on traffic modelling, emissions estimates and dispersion modelling, all of which are subject to uncertainty, to a greater or lesser extent, particularly when forecasting into the future. It is therefore assumed that all model outputs are suitably robust for the purposes of this assessment.

Climate

Methodology

The impact of the Proposed Scheme on emissions of CO_2 has been assessed by comparing estimated 2023 road traffic CO_2 emissions provided by TfL 'with the Proposed Scheme' with those 'without the Proposed Scheme'. The following criteria have been used to describe the magnitude of relative changes in estimated CO_2 emissions within this assessment:

- < 1 per cent = Negligible
- 1 – 5 per cent = Minor
- 5 – 10 per cent = Moderate
- >10 per cent = Major

Geographical scope

The geographical scope of the assessment has been limited to the area covered by the London Atmospheric Emissions Inventory (LAEI), which includes Greater London (the 32 London boroughs and the City of London), as well as areas outside Greater London up to the M25 motorway (the approximate extent of which is illustrated in Figure B-1).

Changes in road traffic CO_2 emissions have been assessed at the Greater London level, as well as across central', inner and outer London and within each London borough, respectively, and within 'non-Greater London' areas covered by the LAEI.

Data required to inform Impact Assessment

The following data were provided by TfL to inform the assessment:

- Estimated road traffic emissions of CO_2 within central, inner and outer London and within each London borough, respectively, and within 'non-Greater London' areas covered by the LAEI, for the assessment year (2023), both with and without the Proposed Scheme (in tonnes / year)

Assumptions/Limitations

Given the geographical scope of the assessment is limited to the area covered by the LAEI, no assessment of potential changes in road traffic CO_2 emissions as a result of the Proposed Scheme was undertaken outside of this area. While changes in road traffic CO_2 emissions are likely to occur outside of the study area considered, it is assumed that any such changes would primarily be either negligible or positive in nature (e.g., as a result of reductions in traffic flows or improvements to the vehicle fleet).

The assessment is based on traffic modelling and emissions estimates, both of which are subject to uncertainty, to a greater or lesser extent, particularly when forecasting into the future. It is therefore assumed that all model outputs are suitably robust for the purposes of this assessment.

Biodiversity

Methodology

The potential impacts of the Proposed Scheme on ecological sites sensitive to air pollution has been assessed by determining the change in the proportion of designated ecological sites (including Special Areas of

Conservation, Special Protection Areas, Sites of Special Scientific Interest, Ramsar, National Nature Reserves) estimated to exceed the air quality objective for NO_x for the protection of vegetation (30 µg/m^3).

Geographical scope

The geographical scope of the assessment was limited to the area covered by the LAEI, which includes Greater London (the 32 London boroughs and the City of London), as well as areas outside Greater London up to the M25 motorway the approximate extent of which is illustrated in Figure B-1).

Data required to inform Impact Assessment

Modelled annual mean concentrations of NO_x across Greater London and within 'non-Greater London' areas covered by the LAEI, were provided by TfL for the assessment year (2023), both with and without the Proposed Scheme, at 20m grid resolution

Assumptions/Limitations

Given the geographical scope of the assessment is limited to the area covered by the LAEI, no assessment of potential changes in NO_x concentrations as a result of the Proposed Scheme was undertaken outside of this area. While changes in NO_x concentrations are likely to occur outside of the study area considered, it is assumed that any such changes would primarily be either negligible or positive in nature (e.g. because of reductions in traffic flows or improvements to the vehicle fleet).

The assessment is based on traffic modelling, emissions estimates and dispersion modelling, all of which are subject to uncertainty, to a greater or lesser extent, particularly when forecasting into the future. It is therefore assumed that all model outputs are suitably robust for the purposes of this assessment.

Historic Environment

Methodology

Atmospheric particles can deposit on exposed surfaces of buildings leading to darkening, known as 'soiling', which can be a visual nuisance. The impact would be dependent on the scale of change in emissions of Particulate Matter ($PM_{2.5}$ and PM_{10}). The Further Changes to ULEZ IIA (2017) concluded that the reductions in PM would be so small, there would be a neutral impact to historic buildings and landscapes from PM soiling.

Levels of NO_x emissions in London pose a threat to cultural heritage assets as a result of pollutants that are principally responsible for causing acid rain. Almost all materials are affected by the deposition of acid, but the degree of damage tends to vary. Assessing NO_x emissions from vehicular traffic and quantifying their impact on historic buildings is challenging as it is difficult to isolate the effects of NO_x from vehicular traffic alone, as acid rain can be caused by other sources at greater distances. In addition, the interactions between building materials and pollutants are very complex and multi-variable. The deposition of pollutants onto surfaces depends on atmospheric conditions of the pollutants, the climate and microclimate around the surface. Once the pollutants are on the surface, the interactions will vary depending on the amount of exposure, reactivity of the materials and amount of moisture present.

As noted in the Further Changes to ULEZ IIA (2017) Reductions in NO_x emissions from traffic in London will be a minor contributor to the overall total NO_x emissions that have an influence on the risk of acid rain within Greater London.

This is necessarily a qualitative assessment but based on a modelled level of change in pollutants. Given the high levels of vehicle compliance in outer London it is not expected that the change in levels of pollutants would be of a scale to have a discernible impact on the erosion or soiling of historic buildings. This assumption will be reviewed upon receipt of the modelled emissions outputs.

Geographical scope

The geographical scope of the assessment has been limited to the area covered by the LAEI which includes Greater London (the 32 London boroughs and the City of London), as well as areas outside Greater London up to the M25 motorway.

Materials and Waste

Methodology

Using fleet composition data and other baseline data on existing scrappage rates, the assessment has identified the difference in scrappage rates 'from the previous ULEZ expansion assessment findings (without scheme)' and compares this against estimated scrappage rates 'with scheme' for cars and light vehicles and the capacity of End of Life Vehicles (ELV's) Authorised Treatment Facilities (ATF's) within the Greater London area to manage this.

Geographical scope

The scope includes Greater London (the 32 London boroughs and the City of London), as well as the locations of waste management facilities outside Greater London at which scrapped vehicles are processed.

Heavy vehicles (>3.5 tonnes) are not within the scope of this assessment as they are already subject to London-wide LEZ.

People

Introduction

Due to the close inter-relationship between health and equality, these two elements of the IIA have been combined into a single 'Health and Equality Impact Assessment'. The population deemed to be affected by the Proposed Scheme comprises the communities within Greater London and adjacent areas who may be affected either directly (as drivers or passengers of vehicles) or indirectly (as users of mobile services) which travel into, within or through the area encompassed by the Proposed Scheme. The aim of the HIA is to assess potential impacts on health, improve health outcomes and reduce health inequalities, while EQIA seeks to support the Public Sector Equality Duty (PSED) to promote equality of opportunity and foster good relations between those with protected characteristic and those without.

Baseline

A literature review has been undertaken as part of the baseline data collection for the IIA, collecting evidence from a range of sources to clearly identify the pathways between potential changes in health determinants and resulting effects on health and wellbeing outcomes. Evidence has also been gathered from existing research undertaken in relation to the particular needs and travel behaviour of PCGs and other vulnerable groups. Together baseline data on travel behaviour combined with a literature review of user needs and predicted impacts on the number and type of journeys provides a robust basis against which professional judgement has been used to determine whether the proposed changes are likely to result in health and equalities impacts.

Air Quality

The Proposed Scheme is a key mechanism as part of the Mayor's ambitious programme to reduce air pollution and associated health impacts in London. The Proposed Scheme is expected to reduce emissions from road traffic within the city, having an overall positive impact on air quality. The assessment has considered the potential positive and negative health effects related to asthma, lung disease, and other respiratory and cardiovascular effects associated with forecast changes in traffic emissions. Equality impacts in relation to different population groups that are more susceptible to the effects of poor air quality has been considered.

The assessment has drawn upon the output of the 'Environment' assessment in relation to changes in pollutant concentrations by age group, by London borough, and at key sensitive receptors (schools, hospitals, and care homes) to determine the potential for disproportionate impacts on certain PCGs (older people,

younger people, disabled people, people with underlying health conditions, Black, Asian and minority ethnic people, people living in deprived areas). Overall health effects on the general population is also discussed.

A comparison of changes in population weighted pollutant concentrations at Lower Super Output Area (LSOA) level with deciles of the Index of Multiple Deprivation (IMD) 2019 at the same spatial scale has been undertaken as part of the air quality assessment. The distribution of the changes has been considered in the HIA/EQIA to identify where there may be disproportionate health impacts on socio-economically deprived communities.

Quantification and monetisation of health impacts arising from modelled concentrations of NO_2 and $PM_{2.5}$ has been undertaken by Ricardo using Air Quality Health Impact Calculator (AQ-HIC) and the results of the assessment are presented in a separate appendix to the IIA. The outcome of the assessment in relation to air quality impacts on human health are summarised in the IIA.

Climate

The Mayor has acknowledged that poor and disadvantaged Londoners are likely to be most exposed to the climate crisis, the effects of which risk worsening existing structural inequalities within the city (Sadiq Khan, 2021). The Proposed Scheme aims to reduce carbon dioxide emissions within London, and in doing so contribute towards the UK's climate change target for achieving net zero by 2050, with emissions reduced by 78per cent by 2035. There is therefore potential for the Proposed Scheme to have a disproportionate benefit to communities that are likely to be at more risk of flooding and affected by extreme heat and humidity due to the changing climate.

The assessment has considered the potential for reductions in CO_2 to have beneficial impacts for disadvantaged communities that may be more vulnerable to the effects of climate change. The assessment has drawn upon the output of the 'Environment' assessment in relation to changes in $CO_2$and the likely impact on climate change. A qualitative conclusion has been reached as to whether this is likely to have an effect on the health and wellbeing of Londoners, with consideration of PCGs and socio-economically deprived communities.

Active travel

Active travel is the main source of physical activity for Londoners, both for trips undertaken wholly by active travel and for those including public transport. Physical activity helps to prevent and manage over 20 chronic conditions and diseases, including some cancers, heart disease, type 2 diabetes, and depression. It is recommended that all adults get at least 150 minutes of physical activity per week. Before the pandemic, more than a third of Londoners reported not doing sufficient physical activity (Major of London, n.d).

The Proposed Scheme has potential to encourage the uptake of active travel as people may seek to adopt alternative modes of transport to private vehicle. This topic assesses the effects of the Proposed Scheme on active travel, and the potential indirect impacts on health and wellbeing from an increase in physical activity.

Baseline data has been gathered in relation to active travel habits within Greater London and the surrounding local authorities, where available. Data relating to existing active travel journeys and physical activity within the Greater London Area undertaken by different population groups has also been gathered. This is compared with modelled data on trip by mode with the Proposed Scheme in place to determine whether an increased uptake of active travel is likely to arise.

Effects of any potential changes to physical activity due to increased uptake of active travel and improved amenity has been analysed qualitatively based on evidence and studies that have been done to date. Any relevant quantitative data available from follow-up surveys or studies on the effects of the original ULEZ scheme has been incorporated.

Potential equality effects have been considered through the lens of the travel patterns and behaviour of different protected groups, including those for whom active travel may not be a viable option. Therefore, the potential for there to be a widening disparity between groups due to the reduced availability of safe and affordable transport choices for some in relation to others have also been considered.

Public transport

The Proposed Scheme may encourage some people to utilise public transport instead of private vehicle. People who would previously have travelled by private vehicle into outer London may now consider using public transport to avoid paying the charge or upgrading their vehicle. Travelling by public transport has

health and wellbeing benefits from increased physical activity in comparison to travelling by private vehicle. These impacts are expected to be negligible overall, however, and are scoped out of further assessment.

The ease with which people are able to access public transport has been identified using Public Transport Accessibility Levels (PTAL) data by LSOA, provided by TfL, which considers accessibility factors such as location of stations, reliability and frequency of services. Information on station accessibility has also been considered (e.g. step free access). This and PTAL data have been overlaid with demographic data to identify potential disproportionate impacts on PCGs in outer London that may not be able to easily switch to public transport due to poor accessibility and/or financial reasons.

There are also potential negative impacts that could arise from increased use of public transport for journeys to outer London. There are fewer public transport options available in the surrounding areas than within Greater London and the system is less accessible, particularly for disabled people. Stations in the surrounding local authorities may also become busier as more people change mode, resulting in reduced journey amenity. Public transport services outside Greater London tend to be less frequent, and as a result people's journey times may become longer and less convenient. This could impact on people's mental wellbeing as a result of reduced journey amenity, potentially increasing levels of stress and anxiety. To analyse the adverse impacts that could arise as a result of a mode shift to public transport, information has been gleaned from rail statistics available online in relation to footfall and crowding, experiences of disabled passengers using rail, and from local authorities during stakeholder workshops.

Safety and Crime

There is the potential for a beneficial impact on safety and perceptions of safety from increased use of public transport and footfall at stations. However, this impact is considered to be negligible due to the anticipated limited overall mode shift towards public transport and is scoped out of further assessment.

There are, however, potential negative impacts for people who may be required to switch from private vehicle to public transport to travel to outer London. The potential for people to feel unsafe using public transport due to fear of being attacked or victimised shall be discussed qualitatively (based on survey evidence where available). Specifically, the experiences of people travelling from outside London into outer London on public transport at night time has been considered, as these services tend to be less busy and not so frequent as services in Greater London, which may result in heightened perceptions of risk of crime or threats to personal security. The potential for disproportionate effects on PCGs and other vulnerable groups associated with personal safety and crime has been considered, with particular note of the experiences of women and LGBT+ people.

Accessibility

The Proposed Scheme has the potential to impact on the ability of different population groups to access facilities in outer London. The financial impacts of a boundary charge could impact how people access work, education, health, and leisure opportunities for those lower income groups who currently drive in outer London but may be unable to afford a compliant vehicle. For certain trips, such as those made orbitally around outer London, it may not be possible to easily switch modes without a significant increase in journey times and financial cost. Additionally, for some PCGs for whom the availability (frequency and reach of services) and accessibility (for impairment reasons predominantly) of travel choice is limited, the Proposed Scheme could result in those choices becoming further limited. There may be resulting indirect effects on socio-economic outcomes and health and wellbeing on different groups arising from these impacts.

The assessment has utilised data on the compliance rate of the Blue Badge holder vehicles / disabled vehicle tax class registrations / mobility fleet / community transport operating within outer London to identify the scale of the impact of the Proposed Scheme on people who rely on these means.

The assessment has considered the potential for specific PCGs to be disproportionately impacted due to the limited means by which they are able to upgrade to a compliant vehicle. The scale of the potential impact on these groups (including Black, Asian and minority ethnic people and people living in deprived areas) has been assessed by using GIS mapping to overlay demographic data of Lower Super Output Areas (LSOAs) with compliant vehicle ownership by ward in outer London.

The assessment has considered the potential impacts of the Proposed Scheme on access to major health centres in outer London, as well as in relation to the cost of provision of domiciliary care services. Information on mobile care services in outer London, and the experience from the existing ULEZ to identify whether individual employees in the formal care sector or their employers shoulder the existing ULEZ charge/or costs

of compliance, has been sought from representatives of the health and social care sector, including through the relevant stakeholder workshops.

Charitable organisations operating within outer London that provide support to vulnerable groups may also be financially impacted on. For example, those organisations that use vans to deliver donations to foodbanks or minibuses to transport people to safe accommodation or for recreational day trips. Information on compliance has been sought from representatives of the sector, including through the relevant stakeholder workshops.

Catchment areas for schools and colleges will extend across the Proposed Scheme boundary. These effects have been assessed using the school catchment area boundaries and OS Address base data to determine the location of education facilities, considered against journey purpose for vehicles with an origin outside Greater London to a destination within Greater London on weekdays and weekends.

Changes in access to work and training opportunities within outer London that could arise from the financial impact of the Proposed Scheme and the indirect impact they have on health and equality have been considered. This aspect of the accessibility theme relies on the outputs of the EBIA and relevant surveys or findings of studies associated with the existing ULEZ scheme in terms of behaviour modifications and economic effects. Potential impacts have been discussed in relation to specific employment and economic sectors (to the extent they are identified in the EBIA) and any specific impacts on particular PCGs and other vulnerable groups which may arise.

The impact of the Proposed Scheme specifically on NHS staff working at hospitals and care homes within outer London in relation to retention of staff and attracting staff to fill vacancies have been considered, as this was a key issue raised by hospitals for the existing ULEZ scheme.

Interdependencies

The People assessment also draws on output from the other IIA topic assessments, as follows:

- EBIA - Impacts in relation to people working in various types of employment such as PHV drivers, building trades, and at small retailers and street markets
- Environmental Assessment (air quality)

A.1 Changes in population weighted annual average NO_2 and $PM_{2.5}$ concentrations.
A.2 Changes in populations (including within different age groups, e.g. children) exposed to pollutant concentrations in excess of the annual mean NO_2 air quality objective (40 µg/m3) and the WHO's fourth interim annual mean $PM_{2.5}$ target (10 µg/m3) (WHO, 2021).
A.3 Changes in the numbers of schools, hospitals and care homes exposed to pollutant concentrations in excess of the annual mean NO_2 air quality objective and WHO Air Quality Guidelines (2021) fourth interim annual mean $PM_{2.5}$ target.

As outlined above, the outcome of the quantitative assessment undertaken by Ricardo in relation to air quality impacts on human health have been summarised in the IIA.

Appendix C. Stakeholder Workshops

Session: Business and Economics

Thursday 17th March 2022

Participants:

Organisation
British Vehicle Rental and Leasing Association
Road Haulage Association
London First
London Chamber of Commerce and Industry
British Motorcycle Federation
CoMo UK
Federation of SMALL Businesses
National Motorcycles Council
British Vehicle Rental and Leasing Association

Summary of feedback

What impacts have been experienced since the extension of ULEZ in October 2021?

- It was highlighted by some organisations that the extension of ULEZ to inner London in 2021 has resulted in a reduction of trips to inner London. However, other organisations highlighted that the high compliance. with ULEZ means that traffic levels are not reducing as much as anticipated, and congestion issues remain
- After the extension of ULEZ to inner London in 2021, some hauliers are no longer serving inner London and it was noted that this therefore has cost implications for businesses inside the ULEZ as deliveries / logistic services become more expensive
- The cost of compliance is increasing and whilst scrappage schemes are welcomed; they do not cover the cost of a compliant vehicle
- There is a difficulty in finding ULEZ-compliant vehicles, with current issues in the vehicle manufacturing industry impacting people and Small Medium Enterprises. In addition, there are concerns about delivery timescales for ULEZ-compliant vehicles due to global supply chain constraints
- It was recognised that good public transport is essential and concerns that high compliance is not providing the forecast revenues for TfL to deliver these improvements
- Different experiences have been observed amongst small businesses because of the ULEZ extension. Some organisations partially attribute recent growth to the extended ULEZ, other have suffered. For example, vehicle repair shops / garages inside the North / South circulars were negatively impacted as a result of reduction in customers due to ULEZ charge. However, it was noted that this may be mitigated if ULEZ expands to cover all of Greater London
- Issues around signage not being clear, and causing issues, was highlighted. In addition, concerns were raised over the range of road user charging schemes, leading to confusion (ULEZ, DVS, LEZ etc)
- Electric vehicle infrastructure challenges were highlighted. Businesses who wish to transition to fully electric vehicle fleets encounter difficulties finding publicly accessible chargers and many are often not working. Also concern over cost of installing chargers at home / business locations and the 'true cost' of electric vehicles in the context of living

- Concerns over ULEZ wider messaging that driving a polluting vehicle is ok if you are able to pay for it.
- It was noted that the scrappage scheme and messaging is focused on replacing vehicles with cleaner vehicles, as opposed to promoting mobility in London more widely
- Opportunity for fleet owners to upgrade fleets and small businesses to participate in pool schemes to ensure compliance and reduce direct costs of vehicle ownership
- There are concerns around the impacts on sole traders and small independent contractors such as due to the lack of funds to upgrade to cleaner vehicles, and that small businesses do not feel listened to. It is suggested that further engagement is undertaken with smaller operators (rather than larger operators who have the means and funding to upgrade fleets).
- Motorcycles should be seen as a solution to congestion and pollution and support for the rolling exemption to historic motorcycles

What (new or different to existing ULEZ) positive / negative impacts are likely?

- It was noted that there is a lack of data concerning the ULEZ extension (2021), and that this would have been impacted by COVID
- Concerns over public transport accessibility in outer London, particularly orbital routes.
- Industry / logistics hubs / depots are located in outer London were less affected by ULEZ extension (2021)
- Concern that vehicle fleets will not be able to be upgraded in time, with the proposed extension approximately a year away. Reasons given include a lack of supply vehicles, shortage of charging infrastructure and cost of investing in ULEZ compliant vehicles
- It was noted that the decreasing value of non-compliant vehicles damages businesses.
- It was highlighted that HGVs often have a lifespan of 12+ years whereas LGVs have a lifespan of 15+ years and that any scrappage scheme should be focussed on the oldest, dirtiest vehicles
- It was suggested that diesel standard is amended to Euro 5 for vans
- It was suggested that there is a need to target all UK businesses impacts as opposed to solely those based in London
- It was noted that many businesses are home-based. There are concerns surrounding the fact that the government grant for domestic electric vehicle chargers is closing at the end of March 2022

Which current discounts & exemptions may need to be extended and/or what additional mitigation measures should be considered?

- Mobility credit to maximise modal shift. It was noted that many residents in outer London have cars, or multiple vehicles, that are used infrequently. Could be replaced by car club vehicle or similar
- With outer London town centres, research on car dominance affecting vitality. Evidence that active travel improvements increase local spending which should be considered as an impact
- It was noted that liaison with local authorities outside Greater London would be beneficial. The benefits of ULEZ should be promoted widely
- There is a need to demonstrate benefits of charging; there are concerns related to safety issues of structures and decreasing reliability on the road network. Cost to business worth the benefit of reduced congestion
- Alignment and linkage with journey time reliability for London businesses is required. A scrappage scheme should include mobility credits as an incentive to use public transport, e-cargo, bikes etc.
- It was suggested that extension of the scrappage scheme outside of Greater London, to neighbouring authorities who will be affected, should be considered
- Discounts and exemptions should extend to community transport and charities as they play an important role in their communities and should be protected

Session: Health

Monday 21st March 2022

Participants:

Organisation
UK Health Security Agency (UKHSA)
Association of Directors of Public Health London (ADPHL)

London Living Streets
South East London Clinical Commissioning Group / Sustainability SRO
Net Zero Network for NHS England & Improvement (London)
Home Care Association
North East London Health and Care Partnership

Summary of feedback

What impacts have been experienced since the extension of ULEZ in October 2021?

- There is a need to encourage public transport and sustainable transport (walking and cycling) alongside the ULEZ
- Reference was made to the Mayor's net zero carbon scenario to reduce vehicle kilometres driven in London by 27 per cent and questions were raised as to whether previous schemes have resulted in reductions in mileage or just cleaner vehicles
- Health improvements have been seen in London as a result of better air quality from interventions such as the ULEZ. Whilst tangible changes have been delivered, it was also noted that far more can be done
- It was noted that the ULEZ extension in 2021 required a collaborative approach between NHS trusts to mobilise reimbursement and ensure that patients were not adversely affected. It was highlighted that there did not appear to be a major impact on patients, observed in GP practices. This may be different when extended to outer London where people are more reliant on private cars to access primary care

What (new or different to existing ULEZ) positive / negative impacts are likely?

- It is important to consider health inequalities in the city and not to make these worse
- Domiciliary care providers were negatively impacted by the ULEZ. It was noted that the domiciliary care sector requires a (low paid) mobile workforce who undertake site visits by car to patients. This sector is already labour constrained. Outer London has a larger older population, and the carers operating in these areas are more likely to be impacted which may in turn affect the service users
- Questions were raised as to whether TfL services have capacity for uplift in passengers
- Concerns were raised in outer London that NHS staff are being pushed out of living and working in London by changes to the ULEZ
- It was noted that the messaging around the transition to electric vehicles misses negative impacts around the continued use of private vehicles (e.g. continued emissions of particulates from tyre and brake wear)
- Concerns were raised around electric vehicle access due to high costs and barriers such as charging. In addition, it was also noted that there is no standardised mileage/ULEZ reimbursement allowance in the care sector, as this varies by care provider
- There has been a positive shift in dialogue around air quality and health following the ULEZ extension. Integrated Care Systems (ICS) are making air quality an important item on their agendas.
- Health professionals are increasingly knowledgeable about the impacts of poor air quality on public health. It was noted that there is a need to continue dialogue, with the ULEZ extension proposal being a part of making positive change happen
- There often too much attention is paid to mortality as a result of air pollution, but a consideration of morbidity must be made and the impact on human health through life and impact on quality of life
- There is a perception that late-night public transport is unsafe and that some may not feel comfortable using it
- Primary care services (GPs) tend to be local, but specialist services require people to travel across the boundary and people accessing these services may be disproportionately impacted
- All NHS trusts are aware of the ULEZ reimbursement scheme through publicity and awareness campaigns

Which current discounts & exemptions may need to be extended and/or what additional mitigation measures should be considered?

- There are road safety issues in outer London and improvements to infrastructure such as new cycle lanes to promote active travel is required, as in some locations this is a barrier to uptake
- There is an opportunity for the ULEZ to be a part of wider policy changes, setting out clear aspirations for the type of city that Londoners want to live in. This needs to be considered alongside more radical lifestyle changes
- The time between now and the implementation of the scheme in 2023 could be used to address gaps in sustainable public transport policy/infrastructure to allow mode shift to occur more easily (e.g. expansion of Low Traffic Neighbourhoods)
- It was noted that regular cross-boundary trips are required for care visits. Discounts and exemptions for care workers to mitigate financial impacts, and knock-on effects for service users, was requested. Exemptions for carers should be simple and accessible
- Mitigation needs to cover child and disability care alongside care for older people, with informal care also being affected
- Opportunities for tailored travel options for people unable to use public transport or use active travel options should be considered
- There is a need to change messaging around reaching standards on air quality pollutant concentration levels to make it clear there is no 'safe' level
- The question was raised as to whether the scrappage scheme could be used to promote the purchase of e-bikes rather than defaulting to another vehicle

Session: Environment IIA

Tuesday 22nd March 2022

Participants:

Organisation
London Borough of Tower Hamlets
Transport East
Clean Air in London
Clean Air Fund
Clean Cities Campaign

Summary of feedback

What impacts have been experienced since the extension of ULEZ in October 2021?

- It was highlighted that over 35 Non-Governmental Organisations have written to the European Commission to request that they comply with WHO guidelines by 2030 to deliver meaningful actions: https://www.env-health.org/wp-content/uploads/2022/03/220322-Civil-society-letter-re-EU-clean-air-standards.pdf
- There is a concern over the 2030 Net Zero target and the slowness in reaching this goal and calls for acceleration of a Zero Emissions City
- The ULEZ does not go far enough in phasing out diesel vehicles and there is a need to reduce the number of diesel cars. It was noted that the emissions standards were set in 2014 and that this should be reviewed as newer vehicles, particularly diesel, still create negative impacts and emit pollutants

- It was requested that most up to date pollution hotspot maps / date are utilised in TfL reporting materials as this would use current standards on safe pollutant levels as opposed to previous standards
- It should be considered how far beyond the Greater London boundary the impacts will be measured.
- The scrappage scheme should not just be an invitation to buy a new car
- It was noted that the ULEZ has minimal impact on vehicle kilometres, noting Mayor of London's desire to see a 27 per cent reduction
- There is a need to draw attention to the improvements in place. The messaging on environment and health is clear, but ULEZ can improve places and promote economic activity (e.g. supporting high streets)

What (new or different to existing ULEZ) positive / negative impacts are likely?

- It was noted that there has been little push back on previous congestion charging and ULEZ schemes, and that people understand why changes are needed.
- If the M25 is to be used as an alternative there may be the potential for worsening of congestion at junctions if vehicles divert
- Concerns over impact on boundary roads raised. The LEZ is already in place for HGVs, but smaller roads will need to be considered in any boundary and differences they will experience.
- It was noted that the urban areas next to the Greater London boundary close to the Thames (east London) are more contiguous than in some other parts of outer London where the Green Belt acts as natural buffer between communities within and outside what would be an expanded ULEZ.

Which current discounts & exemptions may need to be extended and/or what additional mitigation measures should be considered?

- The ULEZ consultation should be publicised widely, including outside the Greater London boundary. This will enable a wide range of views to be heard
- It was recommended that further TfL engagement be undertaken with strategic transport bodies surrounding Greater London
- Charities and community groups should be considered for exemptions and sunset periods
- The exemption for black cabs was questioned, and whether this exemption is feasible to continue with going forward. It was noted that there has already been a significant sunset period to phase out very polluting vehicles. A considerable proportion of central London pollutants are from black cabs
- It was suggested that exemptions be kept to a minimum and ensure that sunset periods are sensible and practical to give time to the public to modify and adapt
- The number of registered vans has increased considerably since 2000 and a growth has been observed in online retail. It was noted that there has been an unsustainable growth in commercial vehicles and alternatives should be supported, such as cargo bikes in urban areas
- For a future scrappage scheme a mobility credit may be preferred to a cash payment and promote use of public transport over private car replacement
- It was suggested that people could be paid to walk and cycle to offer real incentives for model shift. It was noted that the technology is already in place to support this, as demonstrated by the NHS Covid app, and could revolutionise how people think about moving around in London

Session: Equalities

Wednesday 23rd March 2022

Participants:

Organisation
Logistics UK
Whizz Kidz
Disability Rights UK
Stonewall

Inclusion London
London Forum of Civic and Amenity Societies

Summary of feedback

What impacts have been experienced since the extension of ULEZ in October 2021?

- It was noted that the ULEZ scheme has been successful in that many people have stopped driving into inner London. Extending the scheme to outer London will have a different effect as residents have fewer public transport options
- Public transport is not fully accessible, and this is a particular issue in outer London. It was also highlighted that there is poor access from east to west of the city by public transport, with private car being the only viable option for some trips. Dial-a-ride and taxi card were noted as potential solutions, though these are only available for leisure/social trips rather than journeys to work
- It was suggested that distance-based road user charging should be prioritised as a fair method of charging
- Disabled people are most affected by poor air quality and measures to improve air quality will help them
- There are a range of specialist services in outer London (e.g. Stanmore Hospital) which are accessed by people from outside Greater London. In addition, it was highlighted that patient transport often has excessive wait times, and therefore people opt to drive to appointments. The use of private car to access hospital appointments gives independence to many younger disabled people
- Concerns over the lack of step-free access on the TfL London Underground network were highlighted. Only 1 in 3 stations are step-free and there is concern surrounding ongoing funding uncertainty regarding future upgrades
- COVID has disproportionality impacted disabled people, who made up 60 per cent of deaths from the virus, despite making up 17 per cent of the population. It was highlighted that over half of the deprived population are disabled. It was noted that the effect of climate change and the cost-of-living crisis is also having a severe impact on people with disabilities
- Concerns were raised that the previous ULEZ scrappage scheme grant of £2,000 did not cover the cost of buying a compliant vehicle. It was also highlighted that many people did not know about the scrappage scheme and have missed out previously
- It was noted that the reimbursement scheme for certain NHS patients was not widely known and that it needs to be clearer where NHS patient reimbursements apply
- Concerns were raised over ULEZ financial implications, specifically for disabled people and in light of the cost-of-living crisis
- Additional concerns were raised surrounding limited scrappage scheme funding and how this would fund expensive wheelchair accessible vehicles (WAVs). Many expensive specialist/adapted will be difficult to upgrade to be compliant
- It was highlighted that many disabled people do not have vehicles registered in DVLA disabled tax class. Only those in receipt of the highest band of Personal Independence Payment (PIP) qualify for disabled vehicle tax class and are eligible for a ULEZ exemption, so the bar is very high.
- It was noted that logistics operators are already compliant with the existing ULEZ to inner London and other charges (LEZ and Congestion Charge) and the expansion is therefore less likely to have as many direct impacts as before
- Concerns regarding outer London logistics warehouse businesses and staff access to sites was raised. These are often located in areas with poor public transport and shift-based work patterns limited or no public transport access.
- There are wider issues surrounding vehicle supply. There are lead times of over a year at present and there is not enough supply to match demand for new vehicles, which is therefore increasing costs to businesses. There are resultant knock-on impacts on second-hand vehicle prices, which have increased considerably

What (new or different to existing ULEZ) positive / negative impacts are likely?

- Concerns were raised over the impact of the Silvertown Tunnel scheme and it contradicts ULEZ proposals
- Concerns were raised regarding the social care impact and impact on carers.
- It was considered that there will be a disproportionate impact on access to services and participation in society for disabled people

- IIA should consider intersectionality: for example, disabled people are more likely to be of ethnic minorities and low income groups
- Concerns were raised around potential for LGBT+ people feeling as though they are forced onto public transport in outer London. LGBT+ members may have feelings of discomfort or feel unsafe, particularly at night

Which current discounts & exemptions may need to be extended and/or what additional mitigation measures should be considered?

- Simplification of the system to improve its accessibility is key. It was highlighted that the scheme is considered to be onerous and bureaucratic
- It was highlighted that awareness of the scheme often comes too late, after it has already been introduced. Hard to reach groups may not have access to internet or be able to use digital communication modes which would affect access to platforms such as the online payment / auto pay and registration services
- Request for Blue Badge exemption from ULEZ charges. Congestion Charge has exemption for two vehicles per day for Blue Badge holders, who can nominate vehicles used by carers.
- There is a need to support businesses that want to make change to greener vehicles. The suggestion was raised of longer sunset periods to allow for supply delays for pro-active businesses who have ordered and are awaiting cleaner vehicles
- It was suggested that a grace period should be implemented for people who have non-compliant adapted vehicles until the lease expires
- A sunset period for community and charity minibuses was suggested. These often engage in cross-boundary activities in outer London
- Receipt of scrappage grant has impacted the ability of some people to claim benefits as it has often resulted in their annual income being above the savings threshold, even if the money was for specifically scrapping an older vehicle. It was recommended that the scrappage grant be made un-declarable to avoid this

Session: Taxi and Private Hire

Thursday 24th March 2022

Participants:

Organisation
GMB Union
United Cabbies Group (UCG)
Free New
London Taxi Drivers Association (LTDA)
Uber
Uber
Unite the Union
Private Hire Board

Summary of feedback

What impacts have been experienced since the extension of ULEZ in October 2021?

- The impact of the existing scheme has been minimal as taxis are exempt from the ULEZ charge. It was requested that taxis continue to be exempt as they form part of London's public transport network and are often relied upon by older and less mobile people
- Concerns regarding the impact to older people raised specifically, and how they may be isolated by charges, especially as they are more likely to have an older non-compliant vehicle
- There is support for the need to clean up London's air. ULEZ has encouraged people to buy greener vehicles and this has been noticed
- ULEZ expansion aligns with Uber corporate plan to be fully electric by 2025. The business has not experienced significant issues since the ULEZ expansion in 2021 as the vast majority of vehicles are compliant
- London Chamber of Commerce has raised comments that access restrictions more generally are a threat to the vitality of town centres and London's city centre
- It was highlighted that there has been damage to 'London plc' after the pandemic as fewer people access the city centre
- Affordability of vehicle upgrades is an issue and there is a concern surrounding the high cost of electric vehicles
- There are issues with existing Electric Vehicle (EV) charging infrastructure. It was also highlighted that the cost of electricity is more than the petrol/diesel equivalent in some places
- It was highlighted that many private hire vehicles from outside London serve Heathrow Airport. And that there may be Heathrow airport boundary impacts. It was also noted that the new £5 drop-off charge at Heathrow Airport has had an impact
- Examples of existing boundary issues were raised, with an example of an adverse impact on a business on the North Circular road
- Parcel deliveries impacted by the ULEZ
- There is a particular impact on self-employed contractors who have been financially hit by charges as they pay the charge, not the business they are contracted to

What (new or different to existing ULEZ) positive / negative impacts are likely?

- ULEZ is considered a tax, with the greatest impact on the poorest people
- Those outside of London may not be aware of plans and may only find out once the scheme is launched and they are charged
- There are examples whereby private hire vehicles have registered in local authorities outside of London and, in some cases, a considerable distance to avoid onerous / bureaucratic restrictions.
- There is an understanding that TfL is required to consult on revenue raising measures
- It was highlighted that private hire vehicles can build in additional charges into their fares and that taxis cannot. This reduces their profit if they have to pay several charges (e.g. Heathrow charge and ULEZ if they are from outside London)
- Taxi meters will need upgrading to account for costs of ULEZ for those registered outside of London.
- It was highlighted that many drivers have left the industry following the pandemic to work logistics, or as delivery drivers, for a more consistent income
- There are concerns over the affordability of electric taxis, which can be up to £80k. There are also concerns regarding the range of vehicles which require regular charging and therefore are less economic as more time is spent on charging the battery and less on jobs
- The question was raised as to whether the ULEZ expansion is required, considering the pace of electric vehicle roll out in London
- The greatest impact is considered to be on older people outside of London. It was also highlighted that there will be a difficulty for carers who live outside the boundary
- It was noted that private hire vehicles are an important mode to access hospital appointments.
- There are concerns over low noise electric vehicle models and how these may impact blind or visually impaired individuals

Which current discounts & exemptions may need to be extended and/or what additional mitigation measures should be considered?

- Unite have called for all taxis to be exempt, including those registered outside of Greater London.

- The exemption for showmans' vehicles was queried. They are considered to be businesses run for profit and therefore should not be exempt
- There are calls for reductions in VAT on EVs. It was also noted that there are delays in receiving vehicles, and supply chain issues
- Uber has a Clean Air Plan. Money is raised from fares as a separate ring-fenced fund to help drivers to purchase / lease electric vehicles. This will be reliant upon more second-hand electric vehicles entering the market to ensure rapid and widespread transition

Session: London boroughs

Friday 25th March 2022

Participants

Break Out Group A
Transport Policy Manager (LB & KC)
Transport Strategy Manager (Richmond and Wandsworth)
Transport (Hackney)
Strategic Transport Project Manager (Waltham Forest)
Sutton and Kingston
Planner (Hillingdon)
Head of Strategic Transport (Croydon)
Assistant director for Sustainable Communities (Merton)
Transport Planning Team Leader (Havering)
Senior Parking Manager (Waltham Forest)
Team leader Strategy and Commissioning (Kingston and Sutton)
Engagement Manager (Lambeth)
Transport Planning Officer – London Borough of Barking and Dagenham / Be First
Break Out Group B
Team Leader Transport Policy, Southwark Council
Highways Programme Manager, Southwark Council
Head of Transportation, Hillingdon Council
Transport Planning Manager, Brent Council
Head of Highways, Traffic and Asset Management, Harrow Council
Team Leader Spatial Planning and Transport, Islington Council
LEDNet Principal Policy and Project Manager, London Councils

Hillingdon Council
Head of Highways and Transportation, Redbridge Council

Summary of feedback – Group A

What impacts have been experienced since the extension of ULEZ in October 2021?

- Support for exemptions for blue badge holders who rely on others to drive
- Some experience of older residents in existing ULEZ boundary have given up driving due to not being able to upgrade cards due to the cost of buying a new car. For those unable to use public transport, this is having a negative impact on their quality of life and increases social isolation
- The main concern with regards to the ULEZ is in relation to blue badge holders. Have not heard of too much negative impact on trades people from the ULEZ
- It was highlighted that there was greater parking on the boundary than was anticipated
- Concerns raised that scrappage scheme funds ran out quickly prior to implementation of the ULEZ extension
- There was not as much traffic reduction as expected and it was suggested that stronger measures are needed

What (new or different to existing ULEZ) positive / negative impacts are likely?

- It was noted that air quality improvements have been better than expected so far.
- The proposal does not go far enough but it is a step in the right direction. Stronger measures are needed
- Further extension will help with the active travel agenda, especially in Low Traffic Neighbourhoods (LTNs)
- The question was raised as to how the policy will align with the London Plan
- It was highlighted that a significant number of people who come into Sutton and Kingston from outside do so for shopping / leisure trips. There is a concern that these journeys will reduce
- Concerns regarding public transport in outer London were raised. It was noted that a lot of traffic is radial and that that radial public transport is poor, particularly in outer London
- Questions were raised on how to resolve issues for trades people travelling in from outside of London
- Noted that public transport outside London was responsibility of highway authorities (e.g. County Councils) – what expectations do we have of them?
- There is an issue with cross boundary NHS Trusts whereby patients cannot choose which medical facility they attend and so may have no choice but to travel into outer London
- Some wheelchair accessible vehicles can be very expensive (over £100,000) due to extensive adaptations and some cannot be made compliant. Scrappage payments do not account for this. Grace period is not sufficient in this respect. A 'specialist vehicle' approach to adapted vehicles was suggested, due to the high cost and low availability of WAVs.
- Poor public transport links may mean that people have no choice but to use the car
- Extending the ULEZ further will make travelling for disabled people unaffordable, resulting in perfectly good vehicles being scrapped with no means of replacing them
- Very few companies are able to supply electric and hybrid vehicles and that there is insufficient space within smaller WAVs to accommodate wheelchair access equipment with battery and hybrid technology
- Income levels tend to be lower in outer London and that it is difficult to upgrade vehicles for the very poor, especially given the increase in cost of living
- Concerns were raised regarding micro-businesses with one van who struggle to upgrade their vehicle.
- The delivery of community services may be an issue for outer London boroughs
- Concerns around continual affordability of the freedom pass scheme were raised. It was noted that Croydon have ring-fenced parking income and used the revenue to fund the freedom pass scheme. The revenue from this emissions-based parking is likely to be affected.

Which current discounts & exemptions may need to be extended and/or what additional mitigation measures should be considered?

- Information is needed on how to make adapt privately owned vehicles to be ULEZ compliant
- The question was raised as to whether there will be any consideration and support for charities, with some charities finding it difficult to change vehicles and being forced to use alternative expensive support. It was noted that the grace period for charity minibuses runs out in October 2023, and feedback indicates that charities are finding it difficult to fund these upgrades
- It was noted that there are a lot of requests in Hackney for Electric Vehicle (EV) charge points from trades people living in the estates, as they want to convert now
- The question was raised as to whether income from the ULEZ expansion would contribute towards the freedom pass scheme
- There is a need to engage with local authorities outside of the Greater London Authority (Greater London) boundary, especially those with community hubs or major employment centres (E.g. NHS hospitals)

Summary of feedback - Group B

What impacts have been experienced since the extension of ULEZ in October 2021?

- There has not been an observed notable difference in pollution in Southwark following the ULEZ extension in October 2021. Conversely changes to traffic levels have not been observed in some boroughs
- The current ULEZ is not considered to be effective enough, and concerns were raised regarding the speed of a future roll out. The question was raised as to why it is going to take until the end of the decade to become a distance-based scheme
- With the rise in electric vehicles, concerns were raised regarding the likely increase in vehicle kilometres and increased congestion. It was noted that EVs are driven on average 30 per cent more than Internal Combustion Engine (ICE) vehicles
- It was noted that Hillingdon has observed minimal impact of the extension as the North/South Circulars are a considerable distance from the borough boundary

What (new or different to existing ULEZ) positive / negative impacts are likely?

- The impacts are likely to be similar to the 2021 extension to the ULEZ. It was noted that there are high levels of compliance, and it is therefore unlikely to have a major impact after the extension, other than on a relatively small number of high polluting vehicles
- There is a need to address congestion, which is a major issue
- Brent supportive as initially requested a London-wide ULEZ as the borough is currently divided by the North Circular
- It was noted that Uxbridge, the main town centre in Hillingdon, is on the Greater London boundary meaning that any boundary impacts will be felt
- There is limited public transport outside of Greater London and what there is, is expensive
- There may be an impact on the low-paid who make daily cross-boundary journeys from outside of London into the new expanded ULEZ
- There was concern that it is unlikely there will be any scrappage schemes or mitigation outside of the Greater London boundary, which is where impacts will be most felt by poorer residents with older vehicles
- It was noted that Heathrow Airport had proposals for its own ULEZ scheme, and that was replaced by a drop off charge (£5). Approximately 7 per cent of Hillingdon residents work at Heathrow
- There are concerns as to whether businesses, particularly industrial, will relocate so as not to be impacted by the ULEZ scheme
- Redbridge borough is currently divided by the existing ULEZ boundary. There are parts of the borough with poor public transport, and this has been exacerbated by cuts to local bus route (549)
- The cost of the ULEZ is ultimately passed into the customer. For example, if a builder / contractor is appointed, they will pass on any charges. A pay per mile would be fairer as heavier users would be charged more than light users
- Privately owned wheelchair accessible vehicles (WAVs) need to be considered. These are expensive to replace and are required by those with mobility needs. It was noted that only private hire WAVs are exempt at present
- Concerns were raised with regards to equalities, blue badge holders more widely – who pay ULEZ charges

- Concerns expressed that access to hospital appointments and medical services more generally, particularly specialist services where users require private transport will be hindered

Which current discounts & exemptions may need to be extended and/or what additional mitigation measures should be considered?

- Clarity is needed around exemptions and the NHS reimbursement process
- Awareness of Blue Badge abuse was raised, and concerns were raised that this could be exploited as a loophole
- Questions were raised regarding the NHS exemptions policy and whether this is only for those living in Greater London or can those outside of London also apply for exemption?
- The question was raised as to why historic vehicles are exempt given their emissions and environmental impact
- It is assumed that any scrappage scheme would only be for London borough residents. It was noted that many employees in London boroughs may live outside of London and drive to work
- It was highlighted that there is a need for clear Q & A to provide detailed information on the scheme
- Improvements to public transport in outer London are needed for it to be considered as a viable alternative to the car. It was suggested that revenues be reinvested into public transport

Appendix D. Air quality and carbon results by London Borough and Local Authority

Table 9-1. Estimated changes in 2023 road traffic NO_x emissions within London Boroughs and relevant non-Greater London local authorities

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic NO_x emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
London Boroughs						
Barking and Dagenham	-7,010 (-10.3%)	15 (0.3%)	-2,925 (-7.3%)	-20 (-0.2%)	-20 (-0.1%)	-9,955 (-7.2%)
Barnet	-19,910 (-9.3%)	25 (0.2%)	-8,250 (-6.4%)	25 (<0.1%)	-10 (>-0.1%)	-28,120 (-6.9%)
Bexley	-12,030 (-10.6%)	25 (0.4%)	-4,410 (-7.0%)	-5 (>-0.1%)	-10 (>-0.1%)	-16,425 (-7.7%)
Brent	-7,945 (-8.1%)	15 (0.2%)	-3,305 (-6.2%)	-140 (-0.8%)	-90 (-0.5%)	-11,470 (-5.9%)
Bromley	-16,715 (-10.7%)	60 (0.8%)	-4,920 (-7.1%)	15 (0.1%)	-30 (-0.1%)	-21,595 (-8.1%)
Camden	-1,660 (-4.4%)	20 (<0.1%)	-630 (-2.2%)	15 (<0.1%)	10 (<0.1%)	-2,250 (-1.7%)
City	-285 (-4.9%)	-10 (>-0.1%)	-180 (-1.8%)	-25 (-0.3%)	-25 (-0.2%)	-530 (-0.9%)
City of Westminster	-2,370 (-4.7%)	-315 (-0.3%)	-975 (-2.2%)	-80 (-0.4%)	-125 (-0.3%)	-3,865 (-1.5%)
Croydon	-14,305 (-10.7%)	65 (0.9%)	-4,515 (-7.3%)	-35 (-0.2%)	-20 (>-0.1%)	-18,805 (-7.8%)
Ealing	-11,410 (-8.5%)	30 (0.3%)	-4,570 (-5.9%)	275 (1.1%)	155 (0.6%)	-15,520 (-5.7%)
Enfield	-16,510 (-7.2%)	55 (0.3%)	-6,255 (-5.1%)	-120 (-0.3%)	-55 (-0.2%)	-22,890 (-5.3%)
Greenwich	-7,335 (-6.7%)	-20 (-0.2%)	-3,565 (-5.2%)	-65 (-0.3%)	-10 (>-0.1%)	-10,995 (-4.7%)
Hackney	-1,505 (-4.2%)	-15 (-0.2%)	-685 (-2.4%)	<5 (<0.1%)	10 (<0.1%)	-2,195 (-2.2%)
Hammersmith and Fulham	-1,755 (-3.8%)	-35 (-0.3%)	-690 (-2.6%)	<5 (<0.1%)	50 (0.4%)	-2,430 (-2.2%)
Haringey	-1,635 (-3.1%)	-15 (-0.2%)	-760 (-2.5%)	15 (0.1%)	35 (0.2%)	-2,360 (-2.1%)
Harrow	-9,870 (-11.3%)	55 (1.2%)	-2,395 (-7.0%)	25 (0.3%)	-20 (-0.2%)	-12,210 (-8.4%)
Havering	-17,860 (-7.3%)	65 (0.5%)	-6,235 (-4.7%)	-90 (-0.2%)	-45 (-0.2%)	-24,170 (-5.3%)
Hillingdon	-22,600 (-9.3%)	45 (0.2%)	-7,245 (-6.4%)	-115 (-0.4%)	-100 (-0.4%)	-30,015 (-6.9%)
Hounslow	-15,400 (-9.4%)	15 (<0.1%)	-5,455 (-6.7%)	145 (0.6%)	50 (0.2%)	-20,645 (-6.4%)
Islington	-1,030 (-4.4%)	-5 (>-0.1%)	-515 (-2.3%)	5 (<0.1%)	-10 (>-0.1%)	-1,555 (-1.8%)

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic NO_x emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
Kensington and Chelsea	-1,660 (-4.5%)	5 (<0.1%)	-620 (-2.3%)	>-5 (>-0.1%)	-5 (>-0.1%)	-2,275 (-2.0%)
Kingston	-9,050 (-10.5%)	40 (0.7%)	-2,780 (-6.9%)	-20 (-0.3%)	-20 (-0.2%)	-11,825 (-8.0%)
Lambeth	-3,315 (-6.0%)	-5 (>-0.1%)	-1,600 (-4.4%)	30 (0.2%)	20 (<0.1%)	-4,870 (-3.3%)
Lewisham	-3,840 (-6.6%)	5 (<0.1%)	-1,635 (-5.1%)	-60 (-0.4%)	-25 (-0.1%)	-5,555 (-4.3%)
Merton	-8,070 (-11.1%)	35 (0.7%)	-2,495 (-7.4%)	-60 (-0.5%)	-85 (-0.6%)	-10,675 (-7.7%)
Newham	-3,230 (-4.3%)	-30 (-0.2%)	-1,995 (-3.8%)	50 (0.3%)	25 (0.1%)	-5,185 (-2.9%)
Redbridge	-12,510 (-8.9%)	<5 (<0.1%)	-5,055 (-6.7%)	-45 (-0.3%)	-15 (>-0.1%)	-17,620 (-6.7%)
Richmond	-7,780 (-9.7%)	30 (0.6%)	-2,320 (-6.8%)	15 (0.2%)	-10 (>-0.1%)	-10,070 (-7.1%)
Southwark	-1,930 (-4.2%)	40 (0.3%)	-960 (-2.6%)	10 (<0.1%)	-30 (-0.1%)	-2,870 (-2.1%)
Sutton	-7,185 (-11.4%)	20 (0.7%)	-1,770 (-7.5%)	-5 (-0.1%)	-30 (-0.3%)	-8,970 (-8.5%)
Tower Hamlets	-2,500 (-4.3%)	-85 (-0.4%)	-1,355 (-2.6%)	-110 (-0.4%)	-65 (-0.4%)	-4,115 (-2.4%)
Waltham Forest	-4,855 (-6.0%)	>-5 (>-0.1%)	-2,240 (-4.6%)	10 (<0.1%)	20 (0.1%)	-7,070 (-4.3%)
Wandsworth	-6,025 (-8.1%)	-10 (-0.1%)	-2,555 (-6.2%)	-30 (-0.2%)	5 (<0.1%)	-8,615 (-5.5%)
Non-Greater London Local Authorities [a]						
Brentwood	-660 (-3.6%)	<5 (0.3%)	-320 (-3.0%)	>-5 (>-0.1%)	<5 (0.3%)	-980 (-2.9%)
Broxbourne	-130 (-10.2%)	<5 (2.6%)	-60 (-7.0%)	-5 (-1.2%)	>-5 (-0.8%)	-190 (-7.7%)
Chiltern	-550 (-2.8%)	>-5 (-0.1%)	-190 (-2.2%)	5 (0.1%)	<5 (0.1%)	-735 (-2.3%)
Dacorum	-130 (-3.6%)	>-5 (-0.3%)	-40 (-2.3%)	<5 (<0.1%)	<5 (<0.1%)	-170 (-2.5%)
Dartford	-12,150 (-12.8%)	20 (0.5%)	-2,935 (-4.1%)	325 (1.4%)	15 (0.4%)	-14,720 (-7.4%)
Elmbridge	-20,465 (-14.5%)	15 (0.3%)	-3,475 (-4.3%)	-10 (-0.1%)	>-5 (>-0.1%)	-23,930 (-9.9%)
Epping Forest	-17,665 (-8.2%)	25 (0.2%)	-4,745 (-3.4%)	-20 (>-0.1%)	20 (0.4%)	-22,380 (-5.5%)
Epsom and Ewell	-5,945 (-18.2%)	5 (0.3%)	-785 (-5.7%)	5 (0.2%)	15 (0.7%)	-6,710 (-12.8%)
Guildford	-1,325 (-4.6%)	>-5 (>-0.1%)	-395 (-2.9%)	5 (0.1%)	5 (0.7%)	-1,710 (-3.4%)
Hertsmere	-19,370 (-10.4%)	<5 (<0.1%)	-4,050 (-3.5%)	-60 (-0.2%)	10 (0.2%)	-23,470 (-6.7%)

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic NO_x emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
Mole Valley	-5,200 (-4.5%)	-10 (-0.2%)	-1,605 (-2.7%)	5 (<0.1%)	5 (<0.1%)	-6,805 (-3.4%)
Reigate and Banstead	-11,655 (-7.2%)	-5 (>-0.1%)	-2,695 (-3.3%)	-15 (>-0.1%)	5 (0.1%)	-14,365 (-5.2%)
Runnymede	-9,725 (-6.3%)	5 (<0.1%)	-2,015 (-3.0%)	30 (0.1%)	20 (0.3%)	-11,690 (-4.5%)
Sevenoaks	-8,760 (-4.6%)	10 (0.1%)	-2,630 (-2.5%)	-5 (>-0.1%)	<5 (<0.1%)	-11,385 (-3.3%)
Slough	-330 (-4.7%)	<5 (0.2%)	-80 (-3.1%)	20 (1.3%)	<5 (0.6%)	-390 (-3.3%)
South Bucks	-9,890 (-5.4%)	5 (<0.1%)	-2,380 (-2.9%)	-15 (>-0.1%)	>-5 (>-0.1%)	-12,280 (-4.0%)
Spelthorne	-15,030 (-13.1%)	-10 (-0.2%)	-2,210 (-4.2%)	-125 (-0.8%)	-20 (-0.4%)	-17,400 (-9.0%)
St. Albans	-3,785 (-4.5%)	-5 (>-0.1%)	-1,210 (-2.5%)	-40 (-0.2%)	-5 (-0.4%)	-5,040 (-3.2%)
Tandridge	-7,425 (-5.5%)	-5 (>-0.1%)	-1,980 (-2.9%)	20 (<0.1%)	15 (0.5%)	-9,375 (-4.0%)
Three Rivers	-12,445 (-6.5%)	>-5 (>-0.1%)	-2,440 (-2.8%)	-55 (-0.2%)	-20 (-0.3%)	-14,960 (-4.6%)
Thurrock	-6,545 (-9.7%)	30 (1.0%)	-1,885 (-3.7%)	-45 (-0.2%)	>-5 (>-0.1%)	-8,450 (-5.7%)
Watford	-7,610 (-17.6%)	5 (0.3%)	-935 (-5.6%)	<5 (<0.1%)	5 (0.2%)	-8,535 (-12.6%)
Welwyn Hatfield	-70 (-19.7%)	<5 (0.3%)	-10 (-6.0%)	>-5 (-1.8%)	>-5 (-1.6%)	-80 (-15.1%)
Windsor and Maidenhead	-395 (-8.1%)	-5 (-1.2%)	-60 (-3.2%)	-45 (-5.7%)	-15 (-5.0%)	-520 (-6.4%)
Woking	-1,290 (-4.0%)	<5 (<0.1%)	-350 (-2.3%)	10 (0.2%)	<5 (0.1%)	-1,630 (-2.9%)

SOURCE: Estimated road traffic NO_x emissions by vehicle type for major roads provided by TfL.

Note: Values presented in kilogrammes per annum in table above are rounded to the nearest 5 kilogrammes.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

Table 9-2. Estimated changes in 2023 road traffic PM_{10} emissions within London Boroughs and relevant non-Greater London local authorities

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic PM_{10} emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
London Boroughs						
Barking and Dagenham	-230 (-2.0%)	5 (0.5%)	-55 (-1.5%)	>-5 (>-0.1%)	<5 (<0.1%)	-285 (-1.3%)

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic PM_{10} emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
Barnet	-535 (-1.4%)	5 (0.4%)	-175 (-1.6%)	-10 (-0.1%)	>-5 (>-0.1%)	-720 (-1.2%)
Bexley	-470 (-2.3%)	5 (0.7%)	-75 (-1.3%)	10 (0.2%)	<5 (<0.1%)	-530 (-1.6%)
Brent	-150 (-0.9%)	5 (0.3%)	-60 (-1.2%)	-5 (-0.2%)	>-5 (>-0.1%)	-220 (-0.7%)
Bromley	-635 (-2.4%)	15 (1.6%)	-80 (-1.3%)	10 (0.3%)	<5 (<0.1%)	-690 (-1.7%)
Camden	-35 (-0.6%)	<5 (<0.1%)	-5 (-0.3%)	<5 (<0.1%)	>-5 (>-0.1%)	-40 (-0.3%)
City	-15 (-1.6%)	>-5 (>-0.1%)	-5 (-0.3%)	>-5 (-0.2%)	<5 (<0.1%)	-20 (-0.4%)
City of Westminster	-90 (-1.0%)	-20 (-0.3%)	-10 (-0.3%)	>-5 (>-0.1%)	-5 (-0.1%)	-125 (-0.5%)
Croydon	-535 (-2.4%)	15 (1.6%)	-70 (-1.2%)	10 (0.2%)	<5 (<0.1%)	-580 (-1.6%)
Ealing	-215 (-0.9%)	5 (0.5%)	-80 (-1.1%)	-5 (-0.1%)	>-5 (>-0.1%)	-300 (-0.7%)
Enfield	-495 (-1.7%)	10 (0.7%)	-120 (-1.4%)	-10 (>-0.1%)	<5 (<0.1%)	-615 (-1.1%)
Greenwich	-25 (-0.1%)	-5 (-0.3%)	-75 (-1.1%)	-25 (-0.5%)	-5 (>-0.1%)	-135 (-0.4%)
Hackney	-15 (-0.2%)	>-5 (-0.3%)	-10 (-0.4%)	>-5 (>-0.1%)	<5 (<0.1%)	-25 (-0.2%)
Hammersmith and Fulham	-5 (>-0.1%)	-10 (-0.6%)	-15 (-0.7%)	-5 (-0.3%)	>-5 (-0.1%)	-40 (-0.2%)
Haringey	70 (0.8%)	>-5 (-0.3%)	-15 (-0.5%)	-5 (-0.3%)	>-5 (>-0.1%)	45 (0.3%)
Harrow	-420 (-3.0%)	10 (2.0%)	-45 (-1.5%)	10 (0.6%)	<5 (<0.1%)	-445 (-2.1%)
Havering	-665 (-2.1%)	5 (0.6%)	-125 (-1.4%)	-5 (>-0.1%)	<5 (<0.1%)	-785 (-1.4%)
Hillingdon	-865 (-2.2%)	10 (0.3%)	-135 (-1.4%)	10 (<0.1%)	<5 (<0.1%)	-985 (-1.5%)
Hounslow	-475 (-1.6%)	5 (<0.1%)	-110 (-1.4%)	-5 (>-0.1%)	-5 (-0.1%)	-590 (-1.2%)
Islington	-20 (-0.5%)	>-5 (-0.2%)	-5 (-0.4%)	<5 (<0.1%)	>-5 (>-0.1%)	-30 (-0.3%)
Kensington and Chelsea	-40 (-0.6%)	-5 (-0.2%)	-5 (-0.3%)	<5 (<0.1%)	<5 (<0.1%)	-50 (-0.3%)
Kingston	-355 (-2.2%)	10 (1.1%)	-40 (-1.0%)	>-5 (>-0.1%)	<5 (<0.1%)	-385 (-1.6%)
Lambeth	-5 (>-0.1%)	>-5 (-0.1%)	-30 (-0.9%)	>-5 (>-0.1%)	>-5 (>-0.1%)	-40 (-0.2%)
Lewisham	-25 (-0.3%)	<5 (0.1%)	-35 (-1.2%)	-5 (-0.3%)	>-5 (>-0.1%)	-70 (-0.4%)
Merton	-330	5	-45	10	<5	-355

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic PM_{10} emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
	(-2.8%)	(1.4%)	(-1.4%)	(0.4%)	(<0.1%)	(-1.8%)
Newham	95 (0.6%)	-5 (-0.5%)	-35 (-0.7%)	-15 (-0.3%)	>-5 (>-0.1%)	40 (0.1%)
Redbridge	-260 (-1.0%)	<5 (<0.1%)	-100 (-1.4%)	-15 (-0.2%)	>-5 (>-0.1%)	-370 (-0.9%)
Richmond	-255 (-1.9%)	5 (1.0%)	-35 (-1.1%)	5 (0.2%)	>-5 (>-0.1%)	-280 (-1.3%)
Southwark	10 (0.1%)	<5 (0.2%)	-15 (-0.4%)	>-5 (>-0.1%)	>-5 (>-0.1%)	-5 (>-0.1%)
Sutton	-330 (-3.2%)	5 (1.4%)	-30 (-1.4%)	5 (0.2%)	>-5 (>-0.1%)	-355 (-2.3%)
Tower Hamlets	-40 (-0.3%)	-10 (-0.5%)	-30 (-0.6%)	-5 (>-0.1%)	>-5 (>-0.1%)	-80 (-0.3%)
Waltham Forest	-5 (>-0.1%)	>-5 (-0.1%)	-40 (-0.8%)	-10 (-0.4%)	>-5 (>-0.1%)	-55 (-0.2%)
Wandsworth	-105 (-0.8%)	-5 (-0.2%)	-50 (-1.4%)	-10 (-0.4%)	-5 (-0.2%)	-170 (-0.8%)
Non-Greater London Local Authorities [a]						
Brentwood	-10 (-0.8%)	<5 (0.3%)	-5 (-1.3%)	>-5 (>-0.1%)	<5 (<0.1%)	-20 (-0.6%)
Broxbourne	-5 (-1.9%)	<5 (3.0%)	>-5 (-0.9%)	>-5 (-0.2%)	>-5 (-0.2%)	-5 (-1.2%)
Chiltern	-10 (-0.6%)	>-5 (-0.2%)	-5 (-0.9%)	<5 (0.1%)	<5 (0.1%)	-10 (-0.4%)
Dacorum	>-5 (-0.7%)	>-5 (-0.3%)	>-5 (-0.5%)	<5 (<0.1%)	<5 (<0.1%)	-5 (-0.4%)
Dartford	-235 (-1.6%)	5 (0.6%)	-70 (-1.4%)	-10 (>-0.1%)	<5 (<0.1%)	-310 (-1.0%)
Elmbridge	-385 (-1.7%)	5 (0.5%)	-70 (-1.3%)	5 (0.1%)	>-5 (>-0.1%)	-450 (-1.3%)
Epping Forest	-320 (-1.3%)	<5 (0.2%)	-105 (-1.3%)	-5 (>-0.1%)	<5 (0.2%)	-425 (-0.9%)
Epsom and Ewell	-130 (-2.3%)	<5 (0.6%)	-15 (-1.2%)	<5 (0.3%)	<5 (<0.1%)	-140 (-1.7%)
Guildford	-15 (-0.7%)	<5 (<0.1%)	-5 (-0.9%)	<5 (0.2%)	<5 (0.2%)	-20 (-0.4%)
Hertsmere	-405 (-1.7%)	>-5 (>-0.1%)	-90 (-1.3%)	-10 (-0.1%)	>-5 (>-0.1%)	-510 (-1.2%)
Mole Valley	-65 (-0.7%)	>-5 (>-0.1%)	-30 (-1.1%)	5 (<0.1%)	<5 (<0.1%)	-90 (-0.5%)
Reigate and Banstead	-215 (-1.3%)	<5 (0.1%)	-50 (-1.2%)	>-5 (>-0.1%)	>-5 (>-0.1%)	-265 (-0.9%)
Runnymede	-130 (-0.8%)	<5 (<0.1%)	-35 (-1.0%)	10 (0.2%)	<5 (0.1%)	-155 (-0.6%)
Sevenoaks	-165 (-1.1%)	<5 (0.1%)	-55 (-1.2%)	5 (<0.1%)	<5 (<0.1%)	-215 (-0.7%)
Slough	-5	<5	>-5	>-5	<5	-10

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic PM_{10} emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
	(-1.0%)	(<0.1%)	(-0.7%)	(>-0.1%)	(<0.1%)	(-0.7%)
South Bucks	-200 (-1.2%)	>-5 (>-0.1%)	-50 (-1.1%)	<5 (<0.1%)	>-5 (>-0.1%)	-250 (-0.8%)
Spelthorne	-315 (-1.9%)	>-5 (-0.1%)	-40 (-1.1%)	-5 (-0.1%)	>-5 (-0.2%)	-360 (-1.4%)
St. Albans	-65 (-0.9%)	>-5 (-0.2%)	-30 (-1.2%)	-10 (-0.2%)	>-5 (-0.2%)	-105 (-0.7%)
Tandridge	-130 (-1.0%)	<5 (<0.1%)	-40 (-1.1%)	5 (0.1%)	<5 (0.1%)	-160 (-0.7%)
Three Rivers	-230 (-1.2%)	>-5 (>-0.1%)	-45 (-0.9%)	5 (<0.1%)	>-5 (>-0.1%)	-275 (-0.8%)
Thurrock	-120 (-1.4%)	<5 (0.5%)	-40 (-1.1%)	>-5 (>-0.1%)	>-5 (>-0.1%)	-160 (-0.7%)
Watford	-115 (-1.5%)	<5 (0.4%)	-20 (-1.4%)	<5 (<0.1%)	<5 (<0.1%)	-135 (-1.3%)
Welwyn Hatfield	-5 (-4.3%)	<5 (1.1%)	>-5 (-1.5%)	>-5 (-0.5%)	>-5 (-0.5%)	-5 (-3.6%)
Windsor and Maidenhead	-5 (-1.2%)	>-5 (-0.2%)	>-5 (-1.2%)	>-5 (-0.1%)	>-5 (-0.7%)	-10 (-1.0%)
Woking	-15 (-0.6%)	<5 (<0.1%)	-5 (-0.7%)	<5 (0.2%)	<5 (0.1%)	-20 (-0.4%)

SOURCE: Estimated road traffic PM_{10} emissions by vehicle type for major roads provided by TfL.

Note: Values presented in kilogrammes per annum in table above are rounded to the nearest 5 kilogrammes.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

Table 9-3. Estimated changes in 2023 road traffic $PM_{2.5}$ emissions within London Boroughs and relevant non-Greater London local authorities

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic $PM_{2.5}$ emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
London Boroughs						
Barking and Dagenham	-175 (-2.7%)	<5 (0.4%)	-50 (-2.5%)	>-5 (>-0.1%)	<5 (<0.1%)	-225 (-1.9%)
Barnet	-440 (-2.1%)	5 (0.4%)	-165 (-2.8%)	-5 (-0.1%)	>-5 (>-0.1%)	-605 (-1.8%)
Bexley	-340 (-3.0%)	5 (0.7%)	-75 (-2.3%)	5 (0.2%)	<5 (<0.1%)	-410 (-2.2%)
Brent	-145 (-1.5%)	<5 (0.3%)	-55 (-1.9%)	-5 (-0.2%)	>-5 (>-0.1%)	-205 (-1.2%)
Bromley	-460 (-3.1%)	5 (1.5%)	-80 (-2.3%)	5 (0.3%)	<5 (<0.1%)	-530 (-2.4%)
Camden	-35	<5	-5	<5	>-5	-40

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic $PM_{2.5}$ emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
	(-1.0%)	(<0.1%)	(-0.5%)	(<0.1%)	(>-0.1%)	(-0.5%)
City	-10 (-1.8%)	>-5 (>-0.1%)	>-5 (-0.5%)	>-5 (-0.2%)	<5 (<0.1%)	-15 (-0.5%)
City of Westminster	-65 (-1.4%)	-10 (-0.3%)	-10 (-0.5%)	>-5 (>-0.1%)	-5 (-0.1%)	-95 (-0.6%)
Croydon	-390 (-3.1%)	5 (1.6%)	-70 (-2.2%)	5 (0.2%)	<5 (<0.1%)	-450 (-2.3%)
Ealing	-205 (-1.6%)	5 (0.5%)	-75 (-1.8%)	-5 (-0.1%)	>-5 (>-0.1%)	-285 (-1.3%)
Enfield	-385 (-2.2%)	5 (0.6%)	-110 (-2.2%)	-5 (>-0.1%)	<5 (<0.1%)	-490 (-1.6%)
Greenwich	-80 (-0.7%)	>-5 (-0.3%)	-65 (-1.8%)	-15 (-0.5%)	>-5 (>-0.1%)	-160 (-0.8%)
Hackney	-20 (-0.6%)	>-5 (-0.2%)	-10 (-0.6%)	>-5 (>-0.1%)	<5 (<0.1%)	-35 (-0.4%)
Hammersmith and Fulham	-20 (-0.4%)	-5 (-0.6%)	-10 (-0.9%)	-5 (-0.3%)	>-5 (>-0.1%)	-40 (-0.5%)
Haringey	20 (0.4%)	>-5 (-0.3%)	-10 (-0.8%)	-5 (-0.3%)	>-5 (>-0.1%)	<5 (<0.1%)
Harrow	-295 (-3.8%)	5 (2.0%)	-45 (-2.7%)	5 (0.6%)	<5 (<0.1%)	-330 (-2.8%)
Havering	-480 (-2.7%)	5 (0.6%)	-120 (-2.4%)	-5 (>-0.1%)	<5 (<0.1%)	-600 (-1.8%)
Hillingdon	-630 (-2.8%)	5 (0.3%)	-130 (-2.4%)	5 (<0.1%)	<5 (<0.1%)	-750 (-2.0%)
Hounslow	-375 (-2.3%)	<5 (<0.1%)	-100 (-2.4%)	>-5 (>-0.1%)	-5 (-0.1%)	-475 (-1.7%)
Islington	-20 (-0.9%)	>-5 (-0.2%)	-5 (-0.6%)	<5 (<0.1%)	>-5 (>-0.1%)	-30 (-0.5%)
Kensington and Chelsea	-35 (-1.0%)	>-5 (-0.2%)	-5 (-0.5%)	<5 (<0.1%)	<5 (<0.1%)	-45 (-0.6%)
Kingston	-260 (-2.9%)	5 (1.1%)	-40 (-2.0%)	>-5 (>-0.1%)	<5 (<0.1%)	-295 (-2.2%)
Lambeth	-30 (-0.6%)	>-5 (-0.1%)	-30 (-1.5%)	>-5 (>-0.1%)	>-5 (>-0.1%)	-60 (-0.6%)
Lewisham	-50 (-0.9%)	<5 (0.1%)	-30 (-1.8%)	-5 (-0.3%)	>-5 (>-0.1%)	-80 (-0.8%)
Merton	-235 (-3.5%)	5 (1.4%)	-40 (-2.5%)	5 (0.4%)	<5 (<0.1%)	-265 (-2.5%)
Newham	15 (0.2%)	-5 (-0.5%)	-30 (-1.1%)	-5 (-0.3%)	>-5 (>-0.1%)	-25 (-0.2%)
Redbridge	-240 (-1.7%)	<5 (<0.1%)	-90 (-2.3%)	-5 (-0.2%)	>-5 (>-0.1%)	-335 (-1.4%)
Richmond	-195 (-2.6%)	5 (1.0%)	-35 (-2.0%)	<5 (0.2%)	>-5 (>-0.1%)	-225 (-1.9%)
Southwark	-15	<5	-15	>-5	>-5	-25

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic $PM_{2.5}$ emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
	(-0.3%)	(0.2%)	(-0.7%)	(>-0.1%)	(>-0.1%)	(-0.3%)
Sutton	-230 (-4.0%)	<5 (1.4%)	-30 (-2.4%)	<5 (0.2%)	>-5 (>-0.1%)	-255 (-3.0%)
Tower Hamlets	-45 (-0.7%)	-5 (-0.5%)	-20 (-0.8%)	>-5 (>-0.1%)	>-5 (>-0.1%)	-75 (-0.6%)
Waltham Forest	-45 (-0.5%)	>-5 (-0.1%)	-35 (-1.4%)	-5 (-0.3%)	>-5 (>-0.1%)	-90 (-0.6%)
Wandsworth	-105 (-1.5%)	>-5 (-0.2%)	-45 (-2.2%)	-5 (-0.4%)	>-5 (-0.1%)	-160 (-1.3%)
Non-Greater London Local Authorities [a]						
Brentwood	-10 (-1.1%)	<5 (0.3%)	-5 (-2.0%)	>-5 (>-0.1%)	<5 (<0.1%)	-15 (-0.8%)
Broxbourne	-5 (-2.5%)	<5 (3.0%)	>-5 (-1.7%)	>-5 (-0.3%)	>-5 (-0.2%)	-5 (-1.8%)
Chiltern	-5 (-0.8%)	>-5 (-0.2%)	-5 (-1.4%)	<5 (0.1%)	<5 (0.1%)	-10 (-0.6%)
Dacorum	>-5 (-1.0%)	>-5 (-0.3%)	>-5 (-0.8%)	<5 (<0.1%)	<5 (<0.1%)	>-5 (-0.6%)
Dartford	-200 (-2.4%)	<5 (0.6%)	-65 (-2.2%)	-5 (>-0.1%)	<5 (<0.1%)	-265 (-1.6%)
Elmbridge	-330 (-2.6%)	<5 (0.5%)	-70 (-2.2%)	<5 (0.1%)	>-5 (>-0.1%)	-395 (-2.1%)
Epping Forest	-275 (-1.9%)	<5 (0.2%)	-95 (-2.0%)	-5 (>-0.1%)	<5 (0.2%)	-370 (-1.3%)
Epsom and Ewell	-105 (-3.3%)	<5 (0.6%)	-15 (-1.9%)	<5 (0.3%)	<5 (0.1%)	-115 (-2.6%)
Guildford	-15 (-1.0%)	<5 (<0.1%)	-5 (-1.4%)	<5 (0.2%)	<5 (0.2%)	-20 (-0.7%)
Hertsmere	-330 (-2.4%)	>-5 (>-0.1%)	-85 (-2.1%)	-5 (-0.1%)	>-5 (>-0.1%)	-425 (-1.7%)
Mole Valley	-65 (-1.1%)	>-5 (>-0.1%)	-25 (-1.6%)	<5 (<0.1%)	<5 (<0.1%)	-90 (-0.8%)
Reigate and Banstead	-180 (-1.8%)	<5 (0.1%)	-45 (-1.8%)	>-5 (>-0.1%)	>-5 (>-0.1%)	-230 (-1.4%)
Runnymede	-125 (-1.4%)	<5 (<0.1%)	-35 (-1.5%)	5 (0.2%)	<5 (0.1%)	-155 (-1.0%)
Sevenoaks	-135 (-1.4%)	<5 (0.1%)	-50 (-1.8%)	<5 (<0.1%)	<5 (<0.1%)	-185 (-1.0%)
Slough	-5 (-1.4%)	<5 (<0.1%)	>-5 (-1.1%)	<5 (<0.1%)	<5 (<0.1%)	-5 (-1.0%)
South Bucks	-165 (-1.6%)	>-5 (>-0.1%)	-45 (-1.6%)	<5 (<0.1%)	>-5 (>-0.1%)	-210 (-1.1%)
Spelthorne	-255 (-2.7%)	>-5 (-0.1%)	-40 (-1.9%)	-5 (-0.1%)	>-5 (-0.2%)	-300 (-2.1%)
St. Albans	-55 (-1.3%)	>-5 (-0.2%)	-25 (-1.8%)	-5 (-0.2%)	>-5 (-0.2%)	-90 (-1.0%)

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic $PM_{2.5}$ emissions in kilogrammes per annum (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
Tandridge	-110 (-1.5%)	<5 (<0.1%)	-35 (-1.7%)	5 (0.1%)	<5 (0.2%)	-140 (-1.1%)
Three Rivers	-195 (-1.7%)	>-5 (>-0.1%)	-40 (-1.4%)	<5 (<0.1%)	>-5 (>-0.1%)	-235 (-1.2%)
Thurrock	-105 (-2.1%)	<5 (0.5%)	-35 (-1.8%)	>-5 (>-0.1%)	>-5 (>-0.1%)	-140 (-1.1%)
Watford	-105 (-2.6%)	<5 (0.4%)	-20 (-2.1%)	<5 (<0.1%)	<5 (<0.1%)	-125 (-2.2%)
Welwyn Hatfield	>-5 (-5.1%)	<5 (1.1%)	>-5 (-2.0%)	>-5 (-0.5%)	>-5 (-0.6%)	>-5 (-4.4%)
Windsor and Maidenhead	-5 (-1.8%)	>-5 (-0.3%)	>-5 (-1.7%)	>-5 (-0.2%)	>-5 (-0.9%)	-5 (-1.4%)
Woking	-15 (-0.9%)	<5 (<0.1%)	-5 (-1.1%)	<5 (0.2%)	<5 (0.1%)	-20 (-0.6%)

SOURCE: Estimated road traffic $PM_{2.5}$ emissions by vehicle type for major roads provided by TfL.

Note: Values presented in kilogrammes per annum in table above are rounded to the nearest 5 kilogrammes.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

Table 9-4. Estimated changes in 2023 road traffic CO_2 emissions within London Boroughs

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic CO_2 emissions in kilogrammes per annum (and % change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
London Boroughs						
Barking and Dagenham	-810 (-1.5%)	10 (0.3%)	-25 (-0.2%)	<5 (<0.1%)	<5 (<0.1%)	-825 (-0.8%)
Barnet	-1,410 (-0.8%)	20 (0.3%)	10 (<0.1%)	-40 (>-0.1%)	-10 (>-0.1%)	-1,425 (-0.5%)
Bexley	-1,695 (-1.9%)	15 (0.5%)	10 (<0.1%)	35 (0.1%)	>-5 (>-0.1%)	-1,630 (-1.0%)
Brent	-325 (-0.4%)	5 (0.1%)	-75 (-0.4%)	-50 (-0.2%)	-20 (-0.1%)	-465 (-0.3%)
Bromley	-2,255 (-1.9%)	35 (1.0%)	40 (0.2%)	55 (0.3%)	-10 (>-0.1%)	-2,130 (-1.1%)
Camden	-20 (>-0.1%)	10 (<0.1%)	20 (0.1%)	15 (<0.1%)	5 (<0.1%)	25 (<0.1%)
City	-85 (-1.2%)	-15 (-0.1%)	-15 (-0.3%)	-10 (-0.3%)	-5 (>-0.1%)	-125 (-0.3%)
City of Westminster	-370 (-0.7%)	-170 (-0.3%)	-20 (>-0.1%)	-20 (-0.1%)	-50 (-0.1%)	-625 (-0.3%)
Croydon	-1,960 (-1.9%)	40 (1.0%)	15 (<0.1%)	30 (0.1%)	5 (<0.1%)	-1,870 (-1.1%)
Ealing	-235	20	80	25	15	-100

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic CO_2 emissions in kilogrammes per annum (and % change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
	(-0.2%)	(0.4%)	(0.3%)	(<0.1%)	(<0.1%)	(>-0.1%)
Enfield	-1,560 (-1.0%)	25 (0.3%)	-60 (-0.1%)	-75 (>-0.1%)	-10 (>-0.1%)	-1,680 (-0.5%)
Greenwich	305 (0.3%)	-10 (-0.2%)	-85 (-0.3%)	-145 (-0.5%)	-10 (>-0.1%)	50 (<0.1%)
Hackney	35 (0.1%)	-10 (-0.2%)	-10 (>-0.1%)	-10 (>-0.1%)	<5 (<0.1%)	10 (<0.1%)
Hammersmith and Fulham	250 (0.6%)	-15 (-0.2%)	-5 (>-0.1%)	-25 (-0.2%)	25 (0.2%)	225 (0.2%)
Haringey	650 (1.3%)	-5 (>-0.1%)	5 (<0.1%)	-20 (-0.2%)	10 (<0.1%)	635 (0.7%)
Harrow	-1,700 (-2.5%)	30 (1.3%)	15 (0.1%)	55 (0.5%)	-5 (>-0.1%)	-1,600 (-1.5%)
Havering	-2,265 (-1.4%)	25 (0.4%)	40 (<0.1%)	-90 (>-0.1%)	-5 (>-0.1%)	-2,295 (-0.6%)
Hillingdon	-3,030 (-1.7%)	20 (0.2%)	-20 (>-0.1%)	20 (<0.1%)	-25 (>-0.1%)	-3,030 (-0.9%)
Hounslow	-1,275 (-1.0%)	20 (0.2%)	-10 (>-0.1%)	-15 (>-0.1%)	-25 (>-0.1%)	-1,300 (-0.5%)
Islington	-25 (>-0.1%)	-5 (>-0.1%)	>-5 (>-0.1%)	5 (<0.1%)	>-5 (>-0.1%)	-30 (>-0.1%)
Kensington and Chelsea	-95 (-0.3%)	-10 (>-0.1%)	>-5 (>-0.1%)	<5 (<0.1%)	>-5 (>-0.1%)	-105 (-0.1%)
Kingston	-1,240 (-1.8%)	20 (0.7%)	30 (0.2%)	-5 (>-0.1%)	-5 (>-0.1%)	-1,200 (-1.1%)
Lambeth	285 (0.6%)	-5 (>-0.1%)	-10 (>-0.1%)	10 (<0.1%)	5 (<0.1%)	285 (0.2%)
Lewisham	190 (0.4%)	5 (0.1%)	-30 (-0.2%)	-45 (-0.3%)	-10 (>-0.1%)	110 (0.1%)
Merton	-1,355 (-2.3%)	20 (0.7%)	-25 (-0.2%)	30 (0.2%)	-5 (>-0.1%)	-1,340 (-1.3%)
Newham	755 (1.1%)	-15 (-0.3%)	-25 (-0.1%)	-35 (-0.1%)	10 (<0.1%)	685 (0.5%)
Redbridge	-575 (-0.5%)	<5 (<0.1%)	-35 (-0.1%)	-80 (-0.2%)	-5 (>-0.1%)	-695 (-0.3%)
Richmond	-805 (-1.3%)	20 (0.7%)	5 (<0.1%)	25 (0.2%)	-5 (>-0.1%)	-760 (-0.7%)
Southwark	255 (0.6%)	25 (0.3%)	>-5 (>-0.1%)	5 (<0.1%)	-5 (>-0.1%)	280 (0.3%)
Sutton	-1,315 (-2.7%)	10 (0.8%)	-10 (-0.1%)	10 (0.1%)	-20 (-0.2%)	-1,320 (-1.7%)
Tower Hamlets	-70 (-0.1%)	-80 (-0.7%)	-75 (-0.3%)	-40 (-0.1%)	-20 (-0.1%)	-285 (-0.2%)
Waltham Forest	395 (0.6%)	<5 (<0.1%)	-15 (>-0.1%)	-55 (-0.3%)	5 (<0.1%)	330 (0.3%)
Wandsworth	-70 (-0.1%)	-10 (-0.2%)	-40 (-0.2%)	-50 (-0.3%)	-15 (>-0.1%)	-185 (-0.2%)

London Borough / Non-Greater London Local Authority	Estimated change in 2023 road traffic CO_2 emissions in kilogrammes per annum (and % change 'with' Proposed Scheme vs. 'without' Proposed Scheme)					
	Cars and Motorcycles	Private Hire Vehicles and Taxis	Light Goods Vehicles	Heavy Goods Vehicles	Buses and Coaches	All Vehicles
Note: Values presented in kilogrammes per annum in table above are rounded to the nearest 5 kilogrammes.						

Table 9-5. Estimated 2023 population weighted NO_2 and $PM_{2.5}$ concentrations within London Boroughs and relevant non-Greater London local authorities

London Borough / Non-Greater London Local Authority	Population weighted 2023 annual mean concentration in µg/m³				Change in µg/m³ (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)	
	Without Proposed Scheme		With Proposed Scheme			
	NO_2	$PM_{2.5}$	NO_2	$PM_{2.5}$	NO_2	$PM_{2.5}$
London Boroughs						
Barking and Dagenham	20.1	9.8	19.8	9.7	-0.3 (-1.5%)	<-0.1 (-0.1%)
Barnet	21.3	9.8	21.0	9.8	-0.3 (-1.6%)	<-0.1 (-0.1%)
Bexley	19.2	9.5	18.9	9.5	-0.3 (-1.5%)	<-0.1 (-0.1%)
Brent	22.7	10.1	22.4	10.1	-0.3 (-1.4%)	<-0.1 (-0.1%)
Bromley	18.2	9.3	18.0	9.3	-0.3 (-1.5%)	<-0.1 (-0.1%)
Camden	27.1	11.0	26.8	11.0	-0.2 (-0.8%)	<-0.1 (-0.1%)
City	32.4	12.4	32.2	12.4	-0.2 (-0.6%)	<-0.1 (-0.1%)
City of Westminster	28.6	11.4	28.3	11.4	-0.2 (-0.8%)	<-0.1 (-0.1%)
Croydon	19.5	9.6	19.2	9.6	-0.3 (-1.6%)	<-0.1 (-0.1%)
Ealing	22.2	10.0	21.9	10.0	-0.3 (-1.5%)	<-0.1 (-0.1%)
Enfield	20.6	9.7	20.3	9.7	-0.3 (-1.5%)	<-0.1 (-0.1%)
Greenwich	21.5	10.0	21.2	10.0	-0.3 (-1.3%)	<-0.1 (-0.1%)
Hackney	24.8	10.6	24.6	10.6	-0.2 (-0.9%)	<-0.1 (-0.1%)
Hammersmith and Fulham	24.6	10.6	24.4	10.6	-0.2 (-1.0%)	<-0.1 (-0.1%)
Haringey	22.2	10.1	22.0	10.1	-0.2 (-1.0%)	<-0.1 (0.0%)
Harrow	19.5	9.5	19.2	9.5	-0.3 (-1.6%)	<-0.1 (-0.1%)
Havering	17.5	9.2	17.2	9.2	-0.3 (-1.5%)	<-0.1 (-0.1%)

London Borough / Non-Greater London Local Authority	Population weighted 2023 annual mean concentration in µg/m³				Change in µg/m³ (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)	
	Without Proposed Scheme		With Proposed Scheme			
	NO_2	$PM_{2.5}$	NO_2	$PM_{2.5}$	NO_2	$PM_{2.5}$
Hillingdon	20.5	9.4	20.2	9.4	-0.3 (-1.4%)	<-0.1 (-0.1%)
Hounslow	22.5	9.8	22.2	9.8	-0.3 (-1.4%)	<-0.1 (-0.1%)
Islington	26.3	10.9	26.0	10.9	-0.2 (-0.8%)	<-0.1 (-0.1%)
Kensington and Chelsea	26.7	11.0	26.5	11.0	-0.3 (-0.9%)	<-0.1 (-0.1%)
Kingston	19.9	9.6	19.6	9.6	-0.3 (-1.7%)	<-0.1 (-0.1%)
Lambeth	24.0	10.4	23.7	10.4	-0.3 (-1.1%)	<-0.1 (-0.1%)
Lewisham	21.5	10.0	21.3	10.0	-0.3 (-1.2%)	<-0.1 (-0.1%)
Merton	20.9	9.9	20.5	9.9	-0.4 (-1.7%)	<-0.1 (-0.1%)
Newham	22.8	10.3	22.6	10.3	-0.2 (-1.0%)	<-0.1 (0.0%)
Redbridge	20.6	9.8	20.3	9.8	-0.3 (-1.6%)	<-0.1 (-0.1%)
Richmond	20.8	9.7	20.5	9.7	-0.3 (-1.4%)	<-0.1 (-0.1%)
Southwark	25.3	10.6	25.1	10.6	-0.2 (-0.9%)	<-0.1 (-0.1%)
Sutton	19.0	9.5	18.7	9.5	-0.3 (-1.6%)	<-0.1 (-0.1%)
Tower Hamlets	26.7	10.9	26.4	10.9	-0.2 (-0.8%)	<-0.1 (-0.1%)
Waltham Forest	21.6	10.0	21.4	10.0	-0.2 (-1.1%)	<-0.1 (0.0%)
Wandsworth	22.9	10.2	22.6	10.2	-0.3 (-1.4%)	<-0.1 (-0.1%)
Non-Greater London Local Authorities [a]						
Dartford	18.2	9.2	18.0	9.2	-0.2 (-1.2%)	<-0.1 (-0.1%)
Elmbridge	17.1	8.9	16.9	8.9	-0.2 (-1.1%)	<-0.1 (-0.1%)
Epping Forest	17.5	9.1	17.3	9.0	-0.2 (-1.2%)	<-0.1 (-0.1%)
Epsom and Ewell	17.5	9.2	17.3	9.2	-0.2 (-1.2%)	<-0.1 (-0.1%)
Hertsmere	17.6	8.9	17.4	8.9	-0.2 (-1.1%)	<-0.1 (-0.1%)
Mole Valley	17.1	8.8	17.0	8.8	-0.2 (-1.1%)	<-0.1 (-0.1%)
Reigate and Banstead	16.4	8.8	16.3	8.8	-0.2 (-1.1%)	<-0.1 (-0.1%)

London Borough / Non-Greater London Local Authority	Population weighted 2023 annual mean concentration in µg/m³				Change in µg/m³ (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)	
	Without Proposed Scheme		With Proposed Scheme			
	NO_2	$PM_{2.5}$	NO_2	$PM_{2.5}$	NO_2	$PM_{2.5}$
Runnymede	17.4	8.8	17.2	8.8	-0.2 (-1.0%)	<-0.1 (0.0%)
Sevenoaks	16.7	8.8	16.5	8.8	-0.2 (-1.1%)	<-0.1 (-0.1%)
South Bucks	17.5	8.8	17.3	8.8	-0.2 (-1.1%)	<-0.1 (-0.1%)
Spelthorne	18.5	9.1	18.3	9.1	-0.2 (-1.1%)	<-0.1 (-0.1%)
St Albans	17.5	8.7	17.3	8.7	-0.2 (-1.1%)	<-0.1 (-0.1%)
Tandridge	15.9	8.7	15.7	8.7	-0.2 (-1.0%)	<-0.1 (-0.1%)
Three Rivers	16.4	8.7	16.3	8.7	-0.2 (-1.0%)	<-0.1 (-0.1%)
Thurrock	17.7	9.0	17.6	9.0	-0.2 (-1.0%)	<-0.1 (-0.1%)
Watford	17.2	8.9	17.0	8.9	-0.2 (-1.1%)	<-0.1 (-0.1%)
Woking	16.8	8.7	16.6	8.7	-0.2 (-1.0%)	<-0.1 (0.0%)

SOURCE: Population weighted 2023 annual mean concentrations for central, inner, outer and Greater London were provided by TfL, whilst values for non-Greater London were calculated by Jacobs using output area average pollutant concentrations and population data provided by TfL.

Note: Concentrations presented above are rounded to one decimal place, however, the percentages presented have been calculated using non-rounded values.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

Table 9-6. Estimated populations exposed to annual mean NO_2 and $PM_{2.5}$ concentrations in excess of relevant thresholds in 2023 within London Boroughs and relevant non-Greater London local authorities

London Borough / Non-Greater London Local Authority	Population exceeding air quality threshold in 2023 (% of total population)						Change in population (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)		
	Without Proposed Scheme			With Proposed Scheme					
	NO_2		$PM_{2.5}$	NO_2		$PM_{2.5}$	NO_2		$PM_{2.5}$
	AQO: 40 µg/m³	Lowest WHO Interim Target: 20 µg/m³	Lowest WHO Interim Target: 10 µg/m³	AQO: 40 µg/m³	Lowest WHO Interim Target: 20 µg/m³	Lowest WHO Interim Target: 10 µg/m³	AQO: 40 µg/m³	Lowest WHO Interim Target: 20 µg/m³	Lowest WHO Interim Target: 10 µg/m³
London Boroughs									
Barking and Dagenham	0 (0.0%)	95,300 (43.8%)	38,300 (17.6%)	0 (0.0%)	77,700 (35.7%)	36,800 (16.9%)	0 (0.0%)	-17,600 (-8.1%)	-1,500 (-0.7%)

London Borough / Non-Greater London Local Authority	Population exceeding air quality threshold in 2023 (% of total population)						Change in population (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)		
	Without Proposed Scheme			With Proposed Scheme					
Barnet	0 (0.0%)	293,200 (71.7%)	112,600 (27.5%)	0 (0.0%)	261,800 (64.1%)	111,800 (27.4%)	0 (0.0%)	-31,400 (-7.7%)	-800 (-0.2%)
Bexley	0 (0.0%)	37,400 (14.8%)	10,600 (4.2%)	0 (0.0%)	26,000 (10.3%)	10,400 (4.1%)	0 (0.0%)	-11,400 (-4.5%)	-200 (-0.1%)
Brent	0 (0.0%)	329,700 (96.9%)	212,400 (62.5%)	0 (0.0%)	317,300 (93.3%)	208,600 (61.3%)	0 (0.0%)	-12,400 (-3.7%)	-3,800 (-1.1%)
Bromley	0 (0.0%)	45,800 (13.5%)	9,500 (2.8%)	0 (0.0%)	27,300 (8.0%)	7,600 (2.2%)	0 (0.0%)	-18,500 (-5.5%)	-1,900 (-0.6%)
Camden	800 (0.3%)	281,700 (100.0%)	279,500 (99.2%)	800 (0.3%)	281,700 (100.0%)	279,500 (99.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
City	0 (0.0%)	8,900 (100.0%)	8,900 (100.0%)	0 (0.0%)	8,900 (100.0%)	8,900 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
City of Westminster	700 (0.3%)	273,200 (100.0%)	273,200 (100.0%)	700 (0.3%)	273,200 (100.0%)	273,200 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Croydon	0 (0.0%)	178,100 (45.6%)	63,500 (16.3%)	0 (0.0%)	142,200 (36.4%)	59,400 (15.2%)	0 (0.0%)	-35,900 (-9.2%)	-4,100 (-1.1%)
Ealing	0 (0.0%)	337,100 (99.3%)	134,800 (39.7%)	0 (0.0%)	329,800 (97.2%)	132,400 (39.0%)	0 (0.0%)	-7,300 (-2.2%)	-2,400 (-0.7%)
Enfield	0 (0.0%)	186,500 (55.3%)	50,600 (15.0%)	0 (0.0%)	169,400 (50.2%)	50,000 (14.8%)	0 (0.0%)	-17,100 (-5.1%)	-600 (-0.2%)
Greenwich	0 (0.0%)	236,400 (78.5%)	111,100 (36.9%)	0 (0.0%)	221,900 (73.7%)	110,200 (36.6%)	0 (0.0%)	-14,500 (-4.8%)	-900 (-0.3%)
Hackney	300 (0.1%)	293,100 (100.0%)	282,000 (96.2%)	300 (0.1%)	293,100 (100.0%)	280,900 (95.8%)	0 (0.0%)	0 (0.0%)	-1,100 (-0.4%)
Hammersmith and Fulham	0 (0.0%)	193,200 (100.0%)	192,300 (99.6%)	0 (0.0%)	193,200 (100.0%)	192,100 (99.4%)	0 (0.0%)	0 (0.0%)	-200 (-0.1%)
Haringey	0 (0.0%)	273,600 (100.0%)	153,000 (55.9%)	0 (0.0%)	273,600 (100.0%)	151,600 (55.4%)	0 (0.0%)	0 (0.0%)	-1,400 (-0.5%)
Harrow	0 (0.0%)	67,900 (27.0%)	7,500 (3.0%)	0 (0.0%)	44,800 (17.8%)	6,500 (2.6%)	0 (0.0%)	-23,100 (-9.2%)	-1,000 (-0.4%)
Havering	0 (0.0%)	9,600 (3.6%)	4,800 (1.8%)	0 (0.0%)	6,600 (2.5%)	4,600 (1.7%)	0 (0.0%)	-3,000 (-1.1%)	-200 (-0.1%)
Hillingdon	0 (0.0%)	166,800 (53.1%)	10,600 (3.4%)	0 (0.0%)	150,900 (48.1%)	10,600 (3.4%)	0 (0.0%)	-15,900 (-5.1%)	0 (0.0%)
Hounslow	0 (0.0%)	243,700 (88.6%)	62,500 (22.7%)	0 (0.0%)	236,000 (85.8%)	59,800 (21.7%)	0 (0.0%)	-7,700 (-2.8%)	-2,700 (-1.0%)
Islington	0 (0.0%)	249,700 (100.0%)	249,700 (100.0%)	0 (0.0%)	249,700 (100.0%)	249,700 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Kensington and Chelsea	500 (0.3%)	156,100 (100.0%)	156,100 (100.0%)	500 (0.3%)	156,100 (100.0%)	156,100 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

London Borough / Non-Greater London Local Authority	Population exceeding air quality threshold in 2023 (% of total population)						Change in population (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)		
	Without Proposed Scheme			With Proposed Scheme					
Kingston	0 (0.0%)	70,900 (39.3%)	16,700 (9.2%)	0 (0.0%)	53,300 (29.6%)	15,000 (8.3%)	0 (0.0%)	-17,600 (-9.7%)	-1,700 (-0.9%)
Lambeth	0 (0.0%)	333,200 (100.0%)	256,800 (77.1%)	0 (0.0%)	332,400 (99.8%)	254,400 (76.4%)	0 (0.0%)	-800 (-0.2%)	-2,400 (-0.7%)
Lewisham	0 (0.0%)	266,300 (84.6%)	121,900 (38.7%)	0 (0.0%)	252,300 (80.2%)	118,400 (37.6%)	0 (0.0%)	-14,000 (-4.4%)	-3,500 (-1.1%)
Merton	0 (0.0%)	172,200 (83.2%)	51,200 (24.7%)	0 (0.0%)	142,400 (68.8%)	47,700 (23.0%)	0 (0.0%)	-29,800 (-14.4%)	-3,500 (-1.7%)
Newham	0 (0.0%)	365,900 (100.0%)	316,700 (86.6%)	0 (0.0%)	365,900 (100.0%)	315,700 (86.3%)	0 (0.0%)	0 (0.0%)	-1,000 (-0.3%)
Redbridge	0 (0.0%)	180,600 (58.7%)	70,700 (23.0%)	0 (0.0%)	149,300 (48.5%)	69,200 (22.5%)	0 (0.0%)	-31,300 (-10.2%)	-1,500 (-0.5%)
Richmond	0 (0.0%)	129,900 (64.5%)	31,500 (15.6%)	0 (0.0%)	119,200 (59.2%)	29,800 (14.8%)	0 (0.0%)	-10,700 (-5.3%)	-1,700 (-0.8%)
Southwark	200 (0.1%)	331,500 (100.0%)	300,200 (90.6%)	200 (0.1%)	331,500 (100.0%)	299,800 (90.5%)	0 (0.0%)	0 (0.0%)	-400 (-0.1%)
Sutton	0 (0.0%)	26,200 (12.5%)	5,000 (2.4%)	0 (0.0%)	12,900 (6.2%)	4,400 (2.1%)	0 (0.0%)	-13,300 (-6.4%)	-600 (-0.3%)
Tower Hamlets	0 (0.0%)	348,800 (100.0%)	348,800 (100.0%)	0 (0.0%)	348,800 (100.0%)	348,800 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Waltham Forest	0 (0.0%)	255,000 (89.7%)	134,600 (47.4%)	0 (0.0%)	245,600 (86.4%)	132,800 (46.7%)	0 (0.0%)	-9,400 (-3.3%)	-1,800 (-0.6%)
Wandsworth	0 (0.0%)	337,500 (100.0%)	237,400 (70.3%)	0 (0.0%)	337,500 (100.0%)	233,900 (69.3%)	0 (0.0%)	0 (0.0%)	-3,500 (-1.0%)
Non-Greater London Local Authorities [a]									
Dartford	0 (0.0%)	3,310 (5.1%)	2,052 (3.2%)	0 (0.0%)	2,930 (4.5%)	2,052 (3.2%)	0 (0.0%)	-380 (-0.6%)	0 (0.0%)
Elmbridge	0 (0.0%)	262 (0.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	-262 (-0.2%)	0 (0.0%)
Epping Forest	0 (0.0%)	871 (1.2%)	0 (0.0%)	0 (0.0%)	871 (1.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Epsom and Ewell	0 (0.0%)	1,135 (1.4%)	0 (0.0%)	0 (0.0%)	748 (0.9%)	0 (0.0%)	0 (0.0%)	-387 (-0.5%)	0 (0.0%)
Hertsmere	0 (0.0%)	1,224 (1.5%)	0 (0.0%)	0 (0.0%)	696 (0.9%)	0 (0.0%)	0 (0.0%)	-528 (-0.7%)	0 (0.0%)
Mole Valley	0 (0.0%)	359 (2.4%)	0 (0.0%)	0 (0.0%)	359 (2.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Reigate and Banstead	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Runnymede	0 (0.0%)	2,639 (6.5%)	0 (0.0%)	0 (0.0%)	2,639 (6.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

London Borough / Non-Greater London Local Authority	Population exceeding air quality threshold in 2023 (% of total population)						Change in population (% change 'with' Proposed Scheme vs. 'without' Proposed Scheme)		
	Without Proposed Scheme			With Proposed Scheme					
Sevenoaks	0 (0.0%)	329 (1.3%)	0 (0.0%)	0 (0.0%)	329 (1.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
South Bucks	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Spelthorne	0 (0.0%)	11,276 (11.3%)	351 (0.4%)	0 (0.0%)	8,909 (8.9%)	351 (0.4%)	0 (0.0%)	-2,367 (-2.4%)	0 (0.0%)
St Albans	0 (0.0%)	337 (7.8%)	0 (0.0%)	0 (0.0%)	337 (7.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Tandridge	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Three Rivers	0 (0.0%)	528 (0.7%)	0 (0.0%)	0 (0.0%)	528 (0.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Thurrock	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Watford	0 (0.0%)	1,160 (1.2%)	0 (0.0%)	0 (0.0%)	1,160 (1.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Woking	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

SOURCE: Populations exceeding air quality thresholds for central, inner, outer and Greater London were provided by TfL, whilst values for non-Greater London were calculated by Jacobs using output area average pollutant concentrations and population data provided by TfL.

Note: Populations presented above are rounded to the nearest hundred, however, the percentages presented have been calculated using non-rounded values.

[a] Based on spatial extents of relevant local authority areas covered by the LAEI, which is in some cases limited.

Appendix E. Impacts on Protected Characteristic Groups

Protected Characteristic Group / Vulnerable Group	Description of Impact	Impact Rating
Older People	Differential and disproportionately greater health benefits as a result of air quality improvements for **older people** living in outer London.	Minor Positive
	Differential impact of increased cost for some **older people,** who travel by non-compliant private vehicles to access regular medical appointments at specialist facilities in outer London (and outer London residents accessing healthcare outside London), which may result in adverse health outcomes for these groups.	Moderate Negative
	Differential negative impact on **older people** who receive domiciliary care, mobile healthcare services, and/or informal care in outer London, potentially resulting in poorer health outcomes.	Moderate Negative
	Differential impact on health (stress and anxiety and isolation) for **disabled people** who rely on a non-compliant vehicle and do not qualify for the disabled vehicle tax class exemption, which could result in poor socio-economic and wellbeing outcomes.	Moderate Negative
Young People	Differential and disproportionately greater health benefits as a result of air quality improvements for **children** living in outer London.	Minor Positive
	Potential differential negative impact on **young people attending SEN schools** in outer London who travel by non-compliant private minibus/car and their carers or families on **low incomes.**	Minor Negative
	Differential impact on **young people** who travel by non-compliant private vehicle but cannot afford to upgrade to a compliant vehicle. Young people may be reluctant to use public transport due to perceptions of the risk to personal safety, and therefore may travel less.	Minor Negative
Disabled People	Differential financial impact on **disabled people** who make journeys using non-compliant vehicles and do not qualify for Motability scheme and disabled vehicle tax exemption.	Moderate Negative
	Disproportionate financial impact for **disabled people** who travel by non-compliant private vehicle in outer London to access employment (particularly in night time economy) or opportunities, who do not have a disabled vehicle tax class, due to their lesser capacity to switch to a compliant vehicle and/or to change mode.	Moderate Negative
	Differential impact on **disabled people attending SEN schools** in outer London travelling by non-compliant private minibus / car and their carers or families on **low incomes.**	Minor Negative
	Differential impact on **disabled people** who travel by non-compliant private vehicle but cannot afford to upgrade to a compliant vehicle. **Disabled people** may be reluctant to use public transport due to perceptions of the risk to personal safety, and therefore may travel less.	Minor Negative

Protected Characteristic Group / Vulnerable Group	Description of Impact	Impact Rating
	Differential impact of increased cost for some **disabled people and people with underlying health conditions** who travel by non-compliant private vehicles to access regular medical appointments at specialist facilities in outer London (and outer London residents accessing healthcare outside London), which may result in adverse health outcomes for these groups.	Moderate Negative
	Differential impact on **disabled people** who rely on services provided by charities and community organisations undertaking activities using non-compliant vans and minibuses within outer London.	Minor Negative
	Differential impact on **disabled people** who receive domiciliary care, mobile healthcare services, and/or informal care in outer London, potentially resulting in poorer health outcomes.	Moderate Negative
	Differential impact on health (stress and anxiety and isolation) for **disabled people** who rely on a non-compliant vehicle and do not qualify for the disabled vehicle tax class exemption, which could result in poor socio-economic and wellbeing outcomes.	Moderate Negative
Men	Increased cost of operating LGVs on **tradespeople, likely to be disproportionately experienced by men,** who rely on a non-compliant vehicle to undertake work in outer London.	Moderate Negative
	Disproportionate impact on **PHV drivers, particularly men,** working in outer London in a non-compliant vehicle.	Minor Negative
Women	Disproportionate impact on **women** taking children to school in outer London by non-compliant vehicle.	Minor Negative
	Differential impact on **women** who rely on services provided by charities and community organisations undertaking activities using non-compliant vans and minibuses within outer London.	Minor Negative
	Potential differential negative impact on **women** who travel by non-compliant private vehicle but cannot afford to upgrade to a compliant vehicle. **Women** may be reluctant to use public transport due to perceptions of the risk to personal safety, and therefore may travel less.	Minor Negative
	Disproportionate negative impact for **women who work for the NHS in lower paid positions** who travel by non-compliant private vehicle to access employment in outer London.	Minor Negative
	Where employers do not reimburse care workers for upgrading their vehicle or paying the charge, this is likely to disproportionately impact **Black, Asian and minority ethnic people and women** serving the outer London area as a result of the additional cost associated with the Proposed Scheme. This has the potential to result in stress and anxiety.	Moderate Negative
Black, Asian and minority ethnic people	Disproportionate negative impact on **Black, Asian and minority ethnic PHV drivers** working in outer London in a non-compliant vehicle.	Minor Negative

Protected Characteristic Group / Vulnerable Group	Description of Impact	Impact Rating
	Differential impact on **Black, Asian and minority ethnic people** who travel by non-compliant private vehicle but cannot afford to upgrade to a compliant vehicle. **Black, Asian and minority ethnic people** may be reluctant to use public transport due to perceptions of the risk to personal safety, and therefore may travel less.	Minor Negative
	Differential negative impact for **Black, Asian and minority ethnic people who work for the NHS in lower paid positions** who are travelling by non-compliant private vehicle to access employment in outer London.	Minor Negative
	Where employers do not reimburse care workers for upgrading their vehicle or paying the charge, this is likely to disproportionately impact **Black, Asian and minority ethnic people and women** serving the outer London area as a result of the additional cost associated with the Proposed Scheme. This has the potential to result in stress and anxiety.	Moderate Negative
Gypsy and Traveller communities	Increased cost of operating LGVs on **tradespeople, likely to be disproportionately experienced by members of the Gypsy and Traveller Community**, who rely on a non-compliant vehicle to undertake work in outer London.	Moderate Negative
Pregnant and maternal women	Disproportionate financial impact for **pregnant or maternal** who travel by non-compliant private vehicle in outer London to access employment or opportunities, due to their restricted mobility have less capacity to switch to change mode.	Moderate negative
	Differential impact on pregnant and maternal women who receive domiciliary care, mobile healthcare services, and/or informal care in outer London - resulting in poorer health outcomes.	Moderate Negative
	Differential impact of increased cost for some **pregnant and maternal women** who travel by non-compliant private vehicle to access medical appointments at paediatric/maternity centres in outer London, which may result in adverse health outcomes.	Minor Negative
LGBT+	Differential impact on **LGBT+ and trans people** who travel by non-compliant private vehicle but cannot afford to upgrade to a compliant vehicle. **LGBT+ and trans people** may be reluctant to use public transport due to perceptions of the risk to personal safety, and therefore may travel less. Differential financial impact for some people of **different religious faiths** accessing places of worship in outer London by non-compliant vehicle.	Minor Negative
Gender reassignment (trans)[70]		
People of different religious faiths	Differential financial impact for some **people of different faiths** who access places of worship in Outer London by non-compliant vehicle.	Minor Negative
People on low incomes	Disproportionate financial impact for **people on low incomes** travelling by non-compliant private vehicle in outer London to access employment (particularly in night time economy) or other opportunities, due to their lesser capacity to switch to a compliant vehicle.	Moderate Negative

[70] In 2016 a Women and Equalities Committee report made over 30 recommendations calling for government action to ensure full equality for trans people. One of the report's recommendations was that the use of the terms 'gender reassignment' and 'transsexual' in the Equality Act 2010 are outdated and misleading; the preferred umbrella term is trans (Equality and Human Rights Commission, 2021).

Protected Characteristic Group / Vulnerable Group	Description of Impact	Impact Rating
	Differential negative impact on health (stress and anxiety and isolation) for **people on low incomes** who rely on the use of a non-compliant private vehicle, which could result in poor socio-economic and wellbeing outcomes.	Moderate Negative
	Community severance likely to disproportionately impact **people on low incomes** living in communities adjacent to the London-wide ULEZ boundary who are required to travel into outer London by non-compliant car to access employment, services and facilities.	Minor Negative
	Differential impact of increased cost for some **people on low incomes** who travel by non-compliant private vehicles to access regular medical appointments at specialist facilities in outer London (and outer London residents accessing healthcare outside London), which may result in adverse health outcomes for this group.	
	Potential differential impact on **families on low incomes** due to implications of increased cost of providing dedicated SEN travel to schools in outer London.	
Refugees and Asylum Seekers / Homeless People	Differential impact on **refugees and asylum seekers and homeless people** who rely on services provided by charities and community organisations undertaking activities using non-compliant vans and minibuses within outer London.	Minor Negative