Cycle Superhighway 9

Air Quality and Noise Modelling

Transport for London

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Glossary

AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
ADMS	Air Dispersion Modelling System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
ASR	Annual Status Report
BID	Business Improvement District
CAFE	Clean Air for Europe
CERC	Cambridge Environmental Research Consultants
C	Carbon
CO_2	Carbon Dioxide
CRTN	Calculation of Road Traffic Noise
dB	Decibel
Defra	Department for the Environment. Food and Rural Affairs
DfT	Department for Transport
DCLG	Department for Communities and Local Government
DMRB	Design Manual For Roads and Bridges
EC	European Community
EFT	Emissions Factor Toolkit
END	Environmental Noise Directive
EPUK	Environmental Protection UK
EU	European Union
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
LIP	Local Implementation Plan
LIP2	Second Local Implementation Plan
LLAQM	London Local Air Quality Management
LOAEL	Lowest Observable Adverse Effect Level
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NOAL	No Observed Adverse Effect Level
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPSE	Noise Policy Statement for England
PM	Particulate Matter (PM_{10} and $PM_{2\,5}$)
PPG	Planning Practice Guidance
RMSE	Root Mean Square Error
RTTM	Real Time Traffic Management
SO_2	Sulphur Dioxide
SOAEL	Significant Observed Adverse Effect Level
TfL	Transport for London
UAEL	Unacceptable Averse Effect Level
UK	United Kingdom

Table of Contents

Figures (in Appendix A)

Tables

1. Executive Summary

This report provides an assessment of road traffic related noise and air pollution impacts at selected locations due to a Transport for London (TfL) proposed Cycle Superhighway Scheme known as Cycle Superhighway 9 (CS9). This scheme would provide a continuous, mostly segregated cycle route between Kensington Olympia and Brentford town centre via Hammersmith and Chiswick. CS9 would form part of TfL's planned wider Cycle Superhighway network.

The assessments are based on predicted traffic flows and speeds provided by TfL for a base situation (i.e. without the CS9 scheme) and a situation with the scheme. Based on the predicted changes to traffic, road layout and planned buildings with the proposed scheme in place, changes in pollutant concentrations and traffic noise levels are provided for selected residential properties, schools and hospitals within a defined study area. These buildings are located close to roads as these are where the greatest changes in noise and air pollution are predicted to occur.

Modelled annual mean nitrogen dioxide concentrations are predicted to be above the UK's air quality strategy objective value at many of the selected locations close to main roads and the hourly mean objective is predicted to be met at most selected receptors with and without the scheme. Particulate concentrations (PM_{10} and $PM_{2.5}$) are below the relevant objective values with and without the scheme at all selected receptors. The overall impact of the proposed scheme on nitrogen dioxide concentrations is considered to be negligible and therefore not significant at 72 of the 92 selected locations. There are predicted to be reductions in concentrations which benefit selected locations along the cycle superhighway route itself due to a combination of traffic reductions and segregated cycle lanes meaning traffic lanes are further from the adjacent buildings. It is predicted that there would be a worsening in nitrogen dioxide concentrations at a number of selected locations along the A4 and M4 corridor, particularly close to the Chiswick and Hogarth roundabouts due to predicted increases in traffic flows and lower speeds due to the scheme.

The results of the air quality assessment suggest that the overall impact of the scheme is considered to have both beneficial and adverse effects in terms of air quality impacts but the majority of impacts are negligible. Overall, as there are both improvements and deteriorations in NO_2, and negligible changes in particulates, these effects are collectively considered to be balanced and overall not significant.

Overall the scheme has a negligible effect on road traffic noise exposure in most locations. There are some slight beneficial effects at selected receptors locations along the proposed route as a result of lower traffic volumes and the cycle superhighway moving some of the traffic further from some adjacent building façades. A substantial beneficial effect is expected at Stile Hall Gardens where the scheme will prevent vehicular access to the South Circular, considerably reducing traffic volumes, and therefore road traffic noise, on this road. There is predicted to be one slight adverse impact, on Dolman Road (just north of Chiswick High Street), as a result of an increase in local traffic.

The overall impact of the scheme on road traffic noise is not considered significant.

2. Introduction

AECOM Limited (AECOM) has been appointed by Transport for London (TfL) to assess the potential impact of changes due to the proposed Cycle Superhighway 9 (CS9) scheme on traffic noise levels and air pollutant concentrations.

The scope of this assessment is as follows:

- Identify a selection of the closest potentially sensitive receptors to the proposed scheme;
- Predict road traffic noise levels at a selection of identified receptors with and without the scheme;
- Predict concentrations of the main road traffic pollutants nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) at a selection of identified receptors with and without the proposed scheme; and
- Predict annual emissions of nitrogen oxides (NO_x), particulate matter and carbon dioxide (CO_2) with and without the proposed scheme.

2.1 Site Description

The proposed CS9 scheme would provide a continuous, largely-segregated cycle route between Kensington Olympia and Brentford town centre, via Hammersmith and Chiswick. The scheme aims to make cycling and walking along this route easier and safer thereby encouraging more people to use public transport, or to walk and cycle.

The route of CS9 starts at the edge of the Royal Borough of Kensington and Chelsea in the east and runs through the London Boroughs of Hammersmith and Fulham and Hounslow. At the eastern end, the route would connect with Russell Road and a proposed Quietway cycle route off King Street in the vicinity of St Peter's Garden. The route provides upgraded walking and cycling connections between Hammersmith and Twickenham along the A316. At the western end, the route would provide safe access for cyclists back into the carriageway before the junction with Dock Road.

2.2 Proposed Scheme

The proposed scheme provides the following key changes between Kensington Olympia and Brentford town centre:

- Two-way segregated cycle track on Hammersmith Road, King Street and Chiswick High Road;
- Five new signal-controlled pedestrian crossings and over 20 upgraded pedestrian crossings;
- Reduced through traffic and rat-running in residential roads by restricting access to the South Circular from Wellesley Road and Stile Hall Gardens;
- Stepped cycle tracks (at a lower height than the footway) in each direction on Brentford High Street; eastbound stepped track on Kew Bridge Road, westbound cycle path through Waterman's Park;
- Changes to bus stop locations and layouts, including new bus stop bypasses for cyclists; and
- Changes to parking and loading bays and hours of operation.

3. Planning Policy and Legislation

3.1 Air Quality Legislation

These sections provide a background to the current environmental and planning policies and legislation for air quality, covering European Guidance which forms the basis for the UK's air quality strategy as well as national, London and local policies.

3.1.1 European Legislation

In Europe, the Clean Air for Europe (CAFE) programme replaces the EU Framework Directive 96/62/EC (Council of European Communities, 1996) and associated Daughter Directives 1999/30/EC (Council of European Communities, 1999), 2000/69/EC (Council of European Communities, 2000), 2002/3/EC (Council of European Communities, 2002), and the Council Decision 97/101/EC (Council of European Communities, 1997) with a single legal act; the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Council of European Communities, 2008).

Directive 2008/50/EC (Council of European Communities, 2008) is transcribed into UK legislation by the Air Quality Standards Regulations 2010 (H.M. Government, 2010). Limit values are set which are binding on the UK to avoid, prevent or reduce harmful effects on human health and the environment.

3.1.2 National Policy

3.1.2.1 National Air Quality Strategy

The UK National Air Quality Strategy (AQS) (Defra, 2000) was initially published in 2000, under the requirements of the Environment Act 1995 (H.M. Government, 1995). The most recent revision of the Strategy (Defra, 2007) sets objective values to help Local Authorities manage local air quality improvements in accordance with the EU Air Quality Framework Directive. Some of these objective values have been laid out within the Air Quality (England) Regulations 2000 (H.M. Government, 2000) and later amendments (H.M. Government, 2002).

The air quality objective values have been set down in regulation for the purposes of local air quality management (LAQM). Under the LAQM regime, local authorities have a duty to carry out regular assessments of air quality against the objective values and if it is unlikely that the objective values will be met in the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values. The boundary of an AQMA is set by the local authority to define the geographical area that is to be subject to the management measures to be set out in a subsequent action plan. It is not unusual for the boundary of an AQMA to include within it, relevant locations where air quality is not at risk of exceeding an air quality objective.

The UK's national air quality objective values for the pollutants of relevance to this assessment are displayed in Table 1.

Table 1: Air Quality Objective Values

Pollutant	Averaging Period	Value	Maximum Permitted Exceedances	Target Date
Nitrogen Dioxide (NO_2)	Annual Mean	40 µg/m^3	None	31/12/05
	Hourly Mean	200 µg/m^3	18 times per year	31/12/05
Particulate Matter (PM_{10})	Annual Mean	40 µg/m^3	None	31/12/04
	24-hour	50 µg/m^3	35 times per year	31/12/04
Fine Particulate Matter ($PM_{2.5}$)	Annual Mean	25 µg/m^3	None	2020

3.1.2.2 National Planning Policy Framework

Paragraph 109 of the National Planning Policy Framework (NPPF) (Department for Communities and Local Government, 2012) states that:

"The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"

Paragraph 124 of the NPPF states that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

3.1.2.3 Planning Practice Guidance (PPG)

In March 2014, the Department for Communities and Local Government (Department for Communities and Local Government, 2014) released its Planning Practice Guidance (PPG) web-based resource to support the NPPF. This provides a summary of the air quality in the NPFF and notes that the assessments should include the following information:

- the existing air quality in the study area (existing baseline);
- the future air quality without the development in place (future baseline); and
- the future air quality with the development in place (with mitigation).

The guidance advises that a planning application should proceed to a decision with appropriate planning conditions or a planning obligation, if the proposed scheme (including mitigation) would not lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or fail to comply with the requirements of the Habitats Regulations.

3.1.3 London Planning Policy

The following regional planning policies apply to air quality in London.

3.1.3.1 The London Plan – Spatial Development Strategy for Greater London

The current London Plan was published by the Mayor of London in March 2016 (Greater London Authority, 2016a). Policy 7.14 Improving Air Quality states that:

"Development proposals should:

a) minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3).

b) *promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition'.*

c) *be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs)).*

d) *ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches.*

e) *where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boiler are identified".*

3.1.3.2 'Clearing the Air' - The Mayor's Air Quality Strategy

The Mayor's 2010 Air Quality Strategy for London (Greater London Authority, 2010) identified that the main pollutants of concern in London are NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) and set out a range of policies and proposals to address these pollutants and improve air quality in Greater London. The strategy includes policies to reduce emissions from road transport, including TfL's own fleet, introducing the Low Emission Zone and specific measures to tackle priority hotspot locations. There are also measures to reduce emissions from homes, businesses and industries as well as dust from construction and demolition.

3.1.3.3 Mayor's Draft London Environment Strategy

The Mayor of London recently consulted on an Environment Strategy to improve air and noise pollution and carbon emissions (Greater London Authority, 2017a). The final strategy will be published during 2018.

Chapter 4 of the draft strategy focuses on air quality and includes measures to tackle NO_2 and particulates by reducing exposure at hotspot locations (e.g. schools) in the short term and working to establish newer tighter targets towards a zero emission London in 2050 from transport and non-transport sources. The strategy also refers to work by boroughs to improve public realm to encourage walking and cycling and a commitment for modal shift to more sustainable transport.

3.1.3.4 Mayor's Transport Strategy and Transport Action Plan

In 2017, TfL produced the 'Healthy Streets for London' (Transport for London, 2017). The Action Plan recognises that poor air quality is an issue particularly inner London and that road transport is a key source. A range of measures are outlined to improve air quality including bringing forward and expanding the Low Emission Zone, tightening of Low Emission Zone standards for HGVs, buses and coaches, use of hybrid buses and retiring the oldest and most polluting taxis.

The Mayor of London has consulted on a new Transport Strategy for London (Greater London Authority, 2017b). This draft strategy is based on a Healthy Streets Approach that prioritises human health by changing the mix of transport in London to encourage walking, cycling and public transport. The Mayor aims for 80 percent of Londoner's trips to be made by public transport, cycling or walking by 2041.

3.1.4 Local Policy

The proposed scheme is located within the London Borough of Hammersmith and Fulham (LBHF), London Borough of Hounslow (LBH) and the Royal Borough of Kensington and Chelsea (RBKC). In addition, neighbouring boroughs; London Borough of Ealing (LBE) and the London Borough of Richmond upon Thames (LBRT) may be affected by the scheme. The latest information on local planning polices and air quality management in all five boroughs are summarised below.

3.1.4.1 Transport Plans

In London, local authority's Local Implementation Plans (LIPs) set out how they plan to implement the Mayor's Transport Strategy. The five boroughs are all involved in the implementation of their second LIPs (LIP2), for the period to 2031 (LBHF, 2011, LBH, 2011, RBKC, 2014, LBE, 2014 and LBRT, 2011). The LIPs contain objectives to improve air quality and climate change to be achieved through measures such as enhancing freight movements, smoothing traffic flow, parking controls, better public transport connectivity, Better Streets and Cycle Superhighway schemes. Within this LIP timescale, the boroughs provide regular delivery plans setting out three year strategies to implement the measures.

3.1.4.2 Local Plans

LBHF currently has a draft Local Plan (LBHF, 2015) which is due to be implemented in early 2018. The local plan provides documents to set out their local policy framework for the area.

The borough wide Policy CC9 sets out to reduce adverse air quality impacts of new developments by:

"Requiring all major developments to provide an air quality assessment that considers the potential impacts of pollution from the development on the site and on neighbouring areas and also considers the potential for exposure to pollution levels above the Government's air quality objectives"

And

"Requiring mitigation measures that reduce exposure to acceptable levels where developments are proposed that could result in the occupants being particularly affected by poor air quality".

Under the Local Development Framework, Hounslow adopted their latest Local Plan in 2015 (LBH, 2015) which provides a number of policies to set out their local policy framework for the borough from 2015-2030.

Policy EQ4 Air Quality sets out how the Council aims to improve air quality in line with the Air Quality Action Plan and expects development proposals to:

"Carry out air quality assessments where major developments or change of use to air quality sensitive uses are proposed, considering the potential impacts of air pollution from the development on the site and neighbouring areas, and the potential for end users to be exposed to air pollution, consistent with requirements established in the Air Quality SPD, the London Plan and in government and European policy are met"

RBKC adopted their latest Local Plan in 2015 (RBKC, 2015a). The Consolidated Local Plan provides objectives and policies to ensure targets are met.

Policy CE5 Air Quality sets out actions that will help improve air quality with in the area:

"The Council will carefully control the impact of development on air quality, including the consideration of pollution from vehicles, construction, the heating and cooling of buildings. The Council will require developments to be carried out in a way that minimises the impact on air quality and mitigates exceedances of air pollutants".

LBE adopted a Core Strategy in 2012 (LBE, 2012), it contains policies with guidelines on how development will be controlled within Ealing.

Policy 1.1 Spatial Vision for Ealing 2026 describes how the growth of Ealing will impact the surrounding areas:

"To reduce the environmental impact of activities within the borough, protecting and improving air quality and ambient noise levels, achieving and maintaining a clean and healthy environment for all communities to enjoy."

LBRT adopted their Core Strategy in 2009 (LBRT, 2009). The strategy contains policies to ensure that targets are met.

1 – A sustainable future states its responsibility towards global sustainability.

"The Borough will play its part in minimising climate change, maintaining finite resources and reducing adverse environmental impacts of any development… The need for travel will be minimised and non-car based travel will increase, contributing to reducing congestion and improving air quality.

3.1.4.3 Local Air Quality Management

Under the requirements of Part IV of the Environment Act (1995), all local authorities must carry out a phased review and assessment of local air quality within their boroughs.

In 2000, the whole of Hammersmith and Fulham was declared as an AQMA for exceedances of the short and long term objectives of NO_2 and PM_{10}. LBHF measured annual and hourly mean concentrations of NO_2 and PM_{10} at an automatic road monitoring site in Shephard's Bush. Annual mean and hourly mean NO_2 are far in excess of the objective values; however continually improving. PM_{10} has been within objective values for the last few years (LBHF, 2017).

LBH declared the whole borough as an AQMA in 2001 due to exceedances in NO_2 and identifies road transport as the major source of air pollution. The borough has five automatic roadside monitoring sites which measure NO_2 and PM_{10}. All five sites exceeded annual NO_2 objectives in 2016; however concentrations have continually been falling year on year. There was one exceedance of the hourly NO_2 objective and no exceedances of the annual mean concentrations of PM_{10} in 2016 (LBH, 2017).

In 2000, RBKC declared the whole borough an AQMA; due to exceedances of the NO_2 and PM_{10} objective values. The borough has seven automatic monitoring sites; five of which are roadside sites. Six of the seven sites have continually exceeded the annual mean NO_2 objective since 2010; however are improving year on year. The hourly objective is also exceeded at roadsides in Earls Court and Knightsbridge. Objectives for PM_{10} and $PM_{2.5}$ have been met at monitoring sites for more than five years (RBKC, 2015b).

The entire area of LBE was declared an AQMA in 2000 due to exceedances of NO_2 and PM_{10}. The borough has four automatic monitoring sites, two are roadside sites, one is urban background and the last is an industrial site. All sites bar the background have continually exceeded the NO_2 annual objective. Both roadside sites had 17 hourly NO_2 exceedances in 2014 (LBE, 2015).

The entire area of LBRT was declared an AQMA in 2000 for exceedances of NO_2 and PM_{10} objectives. Richmond has three automatic monitoring sites, one being roadside and two are suburban sites. Concentrations at all locations are within the annual objective. However there is a mobile continuous monitor which is placed at various roadside locations that continually exceeds the annual objective for NO_2 (LBRT, 2017).

All five local authorities run extensive NO_2 diffusion tube networks and annual mean concentrations are well in excess of the objective value at the majority of roadside sites.

3.2 Noise Legislation

These sections provide a background to the current environmental and planning policies and legislation for noise covering European Guidance as well as national, London and local policies.

3.2.1 European Legislation

Directive 2002/49/EC (known as the Environmental Noise Directive – END (Council of the European Communities, 2002b)) is transcribed into UK legislation by the Environmental Noise (England) Regulations (H.M. Government, 2006 as amended 2008, 2009) and involves the strategic noise mapping of major roads, railways, airports and agglomerations across the UK. Results from this mapping highlight certain Noise Important Areas several of which overlap the boundary of the proposed scheme (see Figure 1).

3.2.2 National Policy

3.2.2.1 National Planning Policy Framework

With regard to noise, the NPPF states that planning policies and decisions should aim to:

- *"avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established [subject to the provisions of the Environmental Protection Act 1990 and other relevant law]; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

3.2.2.2 Planning Practice Guidance (PPG)

In March 2014, the Department for Communities and Local Government (Department for Communities and Local Government, 2014) released its PPG web-based resource to support the NPPF.

With regard to noise the guidance advises that local planning authorities' should consider:

- whether or not a significant adverse effect is occurring or likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved.

This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level).

Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts.

3.2.2.3 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) (Defra, 2010) sets out the long term vision of the government's noise policy, which is to *"promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development"*.

This long term vision is supported by three aims:

- *"avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvements of health and quality of life."*

The long term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society.

The 'Explanatory Note' within the NPSE provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

The three aims can therefore be interpreted as/ follows:

- the first aim is to avoid noise levels above the SOAEL.

- the second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However this does not mean that such adverse effects cannot occur.
- the third aim seeks, where possible, to positively improve the health and quality of life through the pro-active management of noise whilst also taking account of the guiding principles of sustainable development. It is considered that the protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

The NPSE recognises that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that is applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and at different times of the day.

3.2.2.4 Noise Important Areas

As part of the Environmental Noise Directive (END), strategic noise mapping of major roads, railways, airports and agglomerations has been completed across the UK, including London. In Defra's subsequent Draft Noise Action Plan 2013, it was decided that Noise Important Areas, with respect to noise from major roads, would be defined as the location of the 1% of the population affected by the highest noise levels from major roads according to the strategic mapping. The document states that *"…it is anticipated that the relevant highway authority will examine each Important Area having regard to any ongoing noise mitigation initiatives, schemes and plans*". The results of round 2 of the noise mapping process were released by Defra in late 2015.

3.2.3 London Policy

3.2.3.1 The London Plan – Spatial Development Strategy for Greater London

The current London Plan was published by the Mayor of London in March 2016 (Greater London Authority, 2016a). Policy 7.15 Reducing Noise and Enhancing Soundscapes states that development proposals should seek to reduce noise by:

- *"Minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*
- *Separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference to sole reliance on sound insulation; and*
- *Promoting new technologies and improved practices to reduce noise at source".*

3.2.3.2 'Sounder City' - The Mayor's London Ambient Noise Strategy

The London Ambient Noise Strategy aims to minimise the adverse impacts of noise on people living, working in and visiting London by using the best available practices and technologies within a sustainable development framework (Greater London Authority, 2004). The Strategy aims to work towards more compact city development, while minimising noise. This requires careful consideration of the adverse impact of noise on, from, within or in proximity to a development. With regard to road traffic noise action to maintain road surfaces, use quieter road surfacing, smooth vehicle flows, encourage quieter vehicles and encourage walking and cycling is proposed.

3.2.3.3 Mayor's Draft London Environment Strategy

Chapter 9 of the Mayor of London's draft Environment Strategy (Greater London Authority, 2017a) deals with ambient noise from road traffic and non-road traffic sources as well as promoting good acoustic design and quieter spaces.

3.2.3.4 Mayor's Transport Strategy and Transport Action Plan

TfL's Healthy Streets for London (Transport for London, 2017), it recognises that noise is an issue particularly in inner London. It is highlighted that road traffic contributes to the noise levels and has a negative impact on health.

The Mayor of London has consulted on a new Transport Strategy for London (Greater London Authority, 2017b). The final Mayor's Transport Strategy will be published in 2018 after consultation responses have been reviewed and potential changes to the strategy considered. The draft strategy is based on a Healthy Streets Approach that prioritises human health by changing the mix of transport in

London to encourage walking, cycling and public transport. Key proposals impacting traffic noise include reducing traffic volumes and speeds, low-noise road surfacing where appropriate, monitoring noise levels close to major road corridors, facilitating quiet deliveries and working with DfT to reduce noise from the loudest vehicles.

3.2.4 Local Policy

The proposed scheme is located within the London Borough of Hammersmith and Fulham (LBHF), London Borough of Hounslow (LBH) and the Royal Borough of Kensington and Chelsea (RBKC). The latest information on local planning polices and noise management in boroughs are summarised below.

3.2.4.1 Local Plans

LBHF currently has a draft Local Plan (LBHF, 2015) which is due to be implemented in early 2018. The local plan provides documents to set out their local policy framework for the area.

Borough-wide Policy HO12 – Noise (including vibration) impacts of development will be controlled by implementing the following measures:

"Noise generating development will not be permitted, if it would be liable to materially increase the noise experienced by the occupants/ users of existing or proposed noise sensitive uses in the vicinity."

Under the Local Development Framework, Hounslow adopted their latest Local Plan in 2015 (LBH, 2015) which provides a number of policies to set out their local policy framework for the borough from 2015-2030.

Policy EQ5 – Noise – Hounslow will seek to reduce the impact of noise from transport and noise-generating sources, and require the location and design of new developments to have considered the impact of noise. Development proposals are expected to:

"Carry out noise assessments where major schemes or a change of use to a more noise-sensitive use are proposed, detailing on site noise levels both internally and in any external amenity space, and the potential impact of the development on surrounding uses."

The Royal Borough of Kensington and Chelsea adopted their latest Local Plan in 2015 (RBKC, 2015a). The Consolidated Local Plan provides objectives and policies to ensure targets are met.

Policy CE6 – Noise and Vibration – The council will control the impact of noise and vibration generating sources which affect amenity both during the construction and operational phases of development, to ensure this, the council will:

"Resist development which fail to meet adopted local noise and vibration standards."

"Resist all applications for noise and vibration generating development and plant that would have an unacceptable noise and vibration impact on surrounding amenity."

"Require that development protects, respects and enhances the special significance of the boroughs tranquil areas."

LBE adopted a core Strategy in 2012 (LBE, 2012), which contains policies with guidelines on how development will be controlled within Ealing.

Policy 1.1 Spatial Vision for Ealing 2026 describes how the growth of Ealing will impact the surrounding areas:

"To reduce the environmental impact of activities within the borough, protecting and improving air quality and ambient noise levels, achieving and maintaining a clean and healthy environment for all communities to enjoy."

LBRT adopted their Core strategy in 2009 (LBRT, 2009). The strategy contains policies to ensure that targets are met.

4. Methodology

4.1 Summary

The following sections provide details of the approach taken to conduct the air quality and noise assessment for the study. The methodology employed by AECOM to convert the modelled traffic data provided by TfL into the format required for noise and air quality modelling is outlined, and technical details of the setup of both the noise and air quality models used are discussed in turn. The section also outlines the methodology used to determine if there are significant changes to air quality and traffic noise levels with the proposed scheme in place at selected receptors.

4.2 Traffic Data

Both the noise and air quality predictions are based on forecast traffic flows and speeds within the study area from the TfL strategic ONE model (VISUM).

AM (08:00-09:00) and PM (17:00-18:00) peak hour data in the form of traffic flows, composition (lights (e.g. cars, taxis and LGVs), heavy goods vehicles and buses) and speed have been provided by TfL from the ONE model for the CS9 study area and covers the following scenarios:

- 2016 Network with 2016 traffic data – Base – existing situation
- 2021 Network with 2021 traffic data – Future Base (Without Scheme) – contains all planned and committed schemes for the area (including 20 mph speed limits and Kensington High Street), with the exception of CS9.
- 2021 Network with 2021 traffic data - Future Proposed (With Scheme) – contains all planned and committed schemes and CS9.

The peak hour data has been converted to 18 hour AAWT and 24 hour AADT, as required for the noise and air quality assessments, by the AECOM Traffic Team. The conversion method is based on a standardised approach which has been agreed with TfL. It uses observed annual continuous traffic count data (2016, with the exception of Earl's Court Road which uses 2015 data) for links within the study area and Central Cordon Data (2016), sourced from TfL's Traffic Data Centre to generate factors to convert the peak hour traffic model outputs into estimates of 18 hour AAWT and 24 Hour AADT flows and speeds.

Four different sets of factors have been calculated and applied to the AM and PM peak data as listed below:

- Factors to convert model outputs for Lights (cars, taxi, LGV) to 18 AAWT and 24 hour AADT;
- Factors to convert model outputs for HGVs to 18 AAWT and 24 hour AADT;
- Factors to convert model outputs for Buses to 18 AAWT and 24 hour AADT; and
- Factors to convert average model speeds to 18 hour weekday and 24 hour daily average speeds.

Based on the availability of traffic data, specific factors have been derived for the following links:

- Chiswick High Road;
- Stamford Brook Road;
- A4 Great West Road;
- A4 Cromwell Road;
- A3220;
- A316 Great Chertsey Road;
- A4 Hogarth Lane; and

- Fulham Palace Road.

For those links where specific traffic data was unavailable to derive a conversion factor, an average factor was derived for strategic and local links from the available traffic data in the study area and subsequently applied based on link type.

4.3 Receptors

The concentration of road traffic emitted pollutants at the roadside or at sensitive receptors is influenced by a number of factors. These include background pollution levels and the amount of traffic emissions, which is dictated by traffic flow rates, composition and speed. Local road traffic noise levels are also determined by traffic conditions and can be impacted by surrounding buildings, which may act as reflectors or barriers, and, for high speed roads, the type of road surface.

The air quality objective values for pollutants associated with road traffic were set by the Expert Panel of Air Quality Standards (and subsequently adopted as UK Air Quality Objectives) at a level below the lowest concentration at which the more sensitive members of society have been observed to be adversely affected by exposure to each pollutant. Therefore, all receptors that represent exposure of the public are of equal sensitivity as any member of the public could be present at those locations.

Commercial properties are not considered sensitive to changes in ambient pollutant concentrations or traffic noise levels and are legislated separately as part of health and safety regulations. These are therefore not included in the assessment and the focus is on proposed and existing residential buildings and sensitive receptors such as schools and hospitals as these are most sensitive to the annual mean objective values and to noise.

The air quality and traffic noise predictions have been completed for a selection of receptors close to the roadside on sensitive buildings within the proposed scheme extent and within the wider study area likely to be affected by the scheme, across all five boroughs. The receptors have been selected from the current AddressBase ordnance survey data in conjunction with a review of aerial photography and publically available mapping. Each of the receptors chosen represents the maximum level of exposure that could be experienced at other receptors in their vicinity.

Committed developments in the study area have been included as follows:

- The mixed use Brentford Waterside development on the south side of Brentford High Street. These proposed buildings include receptors R41 and R43.
- Developments around Lionel Road South. These proposed buildings include a new stadium for Brentford FC and several mixed use developments including receptor R69.
- A residential development at Sovereign Court in Hammersmith, located opposite receptor R78.

The selected receptors are shown in Table 2 (G = ground floor, 1 = 1st floor etc). All receptors are sensitive to both noise and/or air quality impacts except for receptor R92, an ecological site which is relevant for air quality impacts only. The receptor locations are also presented in Figure 1 in Appendix A.

Table 2: Summary of Receptors

ID	Receptor	Use (by floor)	Local Authority
R1	Barker House, 75, British Grove	Residential G-2	Hounslow
R2	9, Heathfield Gardens	Residential G-1	Hounslow
R3	44, Dukes Avenue	Residential G-2	Hounslow
R4	Flat 1, 22a, Walpole Gardens	Residential G-2	Hounslow
R5	23, Chiswick Lane	Residential G-2	Hounslow
R6	120, Sutton Court Road	Residential G-1	Hounslow
R7	109, Grove Park Road	Residential G-1	Hounslow

ID	Receptor	Use (by floor)	Local Authority
R8	1, Burford House, Ealing Road	Residential G-3	Hounslow
R9	391, Chiswick High Road	Commercial - G Residential 1-2	Hounslow
R10	167a, Acton Lane	Residential G-1	Ealing
R11	30, The Avenue, Chiswick	Residential G-2	Ealing
R12	160, Hammersmith Grove	Residential G-2	Hammersmith and Fulham
R13	82, Hammersmith Grove	Residential G-2	Hammersmith and Fulham
R14	238, Blythe Road	Commercial - G Residential 1-2	Hammersmith and Fulham
R15	Basement Flat, 76, Holland Road	Residential G-3	Kensington and Chelsea
R16	51, Brook Green	Residential G-1	Hammersmith and Fulham
R17	200, Riverside Gardens	Residential G-3	Hammersmith and Fulham
R18	24, Fulham Palace Road	Commercial - G Residential 1-2	Hammersmith and Fulham
R19	19, Weltje Road	Residential G-2	Hammersmith and Fulham
R20	3, Linacre Court, Great Church Lane	Residential G-17	Hammersmith and Fulham
R21	Apartment 136, 8, Kew Bridge Road	Commercial - G Residential 1-4	Hounslow
R22	Flat 31, Hamilton House, Hogarth Lane	Residential G-4	Hounslow
R23	Beecham House, Brentford	Residential G-2	Hounslow
R24	Flat 5, Knowling Court, High Street, Brentford	Residential G-4	Hounslow
R25	Flat 25, 2, Kew Bridge Road	Residential G-3	Hounslow
R26	17, Stamford Brook Road	Residential G-1	Hammersmith and Fulham
R27	361-369, Kensington High Street	Commercial - G Residential 1-5	Kensington and Chelsea
R28	108, Kew Green	Residential G-2	Richmond
R29	Addley Court, 435, Chiswick High Road	Residential G-3	Hounslow
R30	17, Holland Gardens, Brentford	Residential G-6	Hounslow
R31	4, Warwick Gardens	Residential G-3	Kensington and Chelsea
R32	136, Holland Road	Residential G-3	Kensington and Chelsea
R33	98, Airedale Avenue	Residential G-1	Hounslow
R34	27c, Wellesley Road	Residential G-2	Hounslow
R35	Flat 1, 124, Edith Road	Residential G-2	Hammersmith and Fulham
R36	Flat 12b, Glyn Mansions, Hammersmith Road	Residential G-4	Hammersmith and Fulham
R37	60a, Wellesley Road	Residential G-3	Hounslow
R38	1a, Acton Lane	Commercial - G Residential 1-2	Hounslow
R39	Flat a, 276, King Street	Commercial - G Residential 1-2	Hammersmith and Fulham
R40	69, Stile Hall Gardens	Residential G-2	Hounslow
R41	Proposed - 228-227 A315, Brentford	Commercial - G Residential 1-4	Hounslow
R42	28, Acton Lane, Chiswick	Residential G-2	Ealing

ID	Receptor	Use (by floor)	Local Authority
R43	Proposed - 111, High Street, Brentford	Commercial - G Residential 1-2	Hounslow
R44	186, Devonshire Road	Residential G-1	Hounslow
R45	First Floor Flat, 233, King Street	Commercial - G Residential 1-3	Hammersmith and Fulham
R46	544, Chiswick High Road	Commercial - G Residential 1-5	Hounslow
R47	22, Heathfield Terrace	Residential G-2	Hounslow
R48	7, Falcon Close	Residential G-1	Hounslow
R49	11 Heathfield Terrace	Residential G-2	Hounslow
R50	133, Goldhawk Road	Residential G-2	Hammersmith and Fulham
R51	1 Goldhawk Road	Commercial - G Residential - 1	Hammersmith and Fulham
R52	3, Woodstock Grove	Residential G-2	Hammersmith and Fulham
R53	49, Green Dragon Lane	Residential G-1	Hounslow
R54	525, Chiswick High Road	Residential G-1	Hounslow
R55	3-4, Bedford Park Corner	Commercial - G Residential - 1	Hounslow
R56	2a, Stile Hall Parade, Chiswick High Road	Commercial - G Residential - 1-2	Hounslow
R57	First Floor Flat, 7, Hammersmith Road	Commercial - G Residential - 1-3	Hammersmith and Fulham
R58	30, Surrey Crescent	Residential G-1	Hounslow
R59	12, South Parade	Residential G-2	Ealing
R60	42, Ellesmere Road	Residential G-1	Hounslow
R61	463, Chiswick High Road	Residential G-1	Hounslow
R62	79, Windmill Road	Residential G-1	Hounslow
R63	69, Ealing Road	Residential G-1	Hounslow
R64	1, Chiswick Square	Residential G-2	Hounslow
R65	126, King Street	Commercial - G Residential 1-2	Hammersmith and Fulham
R66	41, Turnham Green Terrace	Commercial - G Residential 1-2	Hounslow
R67	58, Turnham Green Terrace	Commercial - G Residential - 1	Hounslow
R68	102-104, Hammersmith Road	Commercial - G Residential 1-8	Hammersmith and Fulham
R69	Proposed - Brentford FC development, Lionel Road South	Commercial - G Residential 1-15	Hounslow
R70	Proposed - 245, Hammersmith Road	Commercial - G Residential 1-13	Hammersmith and Fulham
R71	Flat 1, 29, London Road	Residential G-4	Hounslow
R72	61, Whitestile Road	Residential G-1	Hounslow
R73	2b, Princes Avenue	Residential G-1	Hounslow
R74	88, Devonshire Road	Residential G-1	Hounslow
R75	Flat 1, 172, Southfield Road	Residential G-1	Ealing
R76	29, Airedale Avenue	Residential G-2	Hounslow

ID	Receptor	Use (by floor)	Local Authority
R77	Flat 5, 114, Coningham Road	Residential G-2	Hammersmith and Fulham
R78	Room 3, 42, Glenthorne Road	Residential G-2	Hammersmith and Fulham
R79	108, Blythe Road	Commercial - G Residential 1-3	Hammersmith and Fulham
R80	11-12, Addison Road	Residential G-2	Kensington and Chelsea
R81	School, 205, Warwick Road	School	Kensington and Chelsea
R82	School House, Dalling Road	School	Hammersmith and Fulham
R83	The Little School, 42-43, Boston Park Road	School	Hounslow
R84	Belmont Primary School, Belmont Road	School	Hounslow
R85	Speakeasy Language School, 24,Chiswick High Road	School	Hounslow
R86	Mace Montessori School, 30-40, Dalling Road	School	Hammersmith and Fulham
R87	West London Free School, Palingswick House, 241, King Street	School	Hammersmith and Fulham
R88	The Arts Educational London School, 14, Bath Road	School	Hounslow
R89	Charing Cross Hospital, Fulham Palace Road	Hospital	Hammersmith and Fulham
R90	Clayponds Hospital, Sterling Place, Ealing	Hospital	Ealing
R91	Ravenscourt Park Hospital, Ravenscourt Park	Hospital	Hammersmith and Fulham
R92	Gunnersbury Triangle Nature Reserve	Ecological	Hounslow

4.4 Air Quality Prediction Methodology

There is currently no statutory guidance on the method by which an air quality impact assessment should be undertaken. Several non-statutory bodies have published their own guidance relating to air quality and development control (Environmental Protection UK, EPUK and Institute of Air Quality Management, IAQM, 2017) or to the assessment of the significance of air quality effects (IAQM, 2009).

This section will explain the methods used to assess the significance of the impact of road traffic exhaust emissions associated with the proposed scheme.

Potentially affected air quality sensitive receptors have been identified as detailed above and the magnitude of the change in air quality statistics at each receptor has been considered. The methods used to determine the significance of effect associated with air quality impacts are described latter.

4.4.1 Road Traffic Emissions

The incomplete combustion of fuel in vehicle engines results in the presence of hydrocarbons (HC) such as benzene and 1,3-butadiene, and sulphur dioxide (SO_2), carbon monoxide (CO), PM_{10} and $PM_{2.5}$ in exhaust emissions. In addition, at the high temperatures and pressures found within vehicle engines, some of the nitrogen in the air and the fuel is oxidised to form NO_X, mainly in the form of nitric oxide (NO), which is then converted to NO_2 in the atmosphere. NO_2 is associated with adverse effects on human health. Better emission control technology and fuel specifications are expected to reduce emissions per vehicle in the long term.

Although SO_2, CO, benzene and 1,3-butadiene are also present in motor vehicle exhaust emissions, detailed consideration of the associated impacts on local air quality is not considered relevant in the

context of this proposal as none of these pollutants are at risk of exceeding the relevant objective values within the study area.

Exhaust emissions from road vehicles affect the concentrations of the principal pollutants of concern, NO_2, PM_{10} and $PM_{2.5}$, at sensitive receptors in the vicinity of the scheme. Therefore, these pollutants are the focus of the assessment of the significance of road traffic impacts.

This assessment follows current guidance for the determination of pollutant concentrations, and uses emissions factors for road traffic calculated with the latest information as provided in the latest version of Defra's Emission Factor Toolkit (EFT) (Version 8.0.1).

The same version of the EFT is also used to consider changes in annual road transport emissions of carbon in the form of carbon dioxide (CO_2), NOx and particulates (PM_{10} and $PM_{2.5}$) that may be brought about by the proposed scheme across the study area in the 2021 opening year.

4.4.2 Other Emission Sources

The assessment has only explicitly modelled emissions from road traffic sources in the area. Emissions from other sources such as rail and industry directly within the study area, other roads and other sources from further afield are taken into account as part of the background contribution.

4.4.3 Prediction of Air Quality Impacts

This assessment has used the dispersion model software 'ADMS-Roads' (4.1.1.0) to quantify pollution levels at selected receptors due to road traffic emissions. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies (CERC, 2013).

The model outputs have been presented at individual receptor locations rather than across a regular grid to provide a contour plot. This chosen approach provides a better representation of the impact of the scheme as it avoids the need to interpolate results between gridded points.

4.4.4 Air Quality Dispersion Model Input Data and Model Conditions

Details of general model conditions set up in ADMS-Roads are provided in Table 3. Some of these conditions are summarised in detail below.

Table 3: General ADMS-Roads Model Conditions

Variables	ADMS-Roads Model Input: Road Traffic Model
Surface roughness at source	1.5m
Minimum Monin-Obukhov length for stable conditions	100m
Terrain types	Flat
Receptor location	x, y coordinates determined by GIS, z = various.
Emissions	NO_x, PM_{10}, $PM_{2\,5}$
Emission factors	EFT Version 8.0.1 emission factor dataset.
Meteorological data	1 year (2016) hourly sequential data from Heathrow Airport meteorological station.
Emission profiles	Weekday, Saturday and Sunday emission profiles were included for air quality modelling.
Receptors	Facades of selected receptors only.
Model output	Long-term (annual) mean NO_x concentrations. Long-term (annual) mean PM_{10} concentrations.

Variables	ADMS-Roads Model Input: Road Traffic Model
	Long-term (annual) mean $PM_{2.5}$ concentrations.

4.4.5 Air Quality Meteorological Data

One year (2016) of hourly sequential observation data from Heathrow Airport meteorological station has been used in this assessment to correspond with the baseline year. The station is located approximately 20 km west of the proposed scheme and experiences meteorological conditions that are representative of those experienced in London and within the air quality study area.

4.4.6 Air Quality Background Data

Background data for NO_2, PM_{10} and $PM_{2.5}$ concentrations for 2016 and 2021 have been sourced from Defra's 2015-based background maps (Defra, 2017a) for receptors within the nearest 1km by 1km grid squares. The background data used in this assessment are set out in Table 4. Motorways, Trunk roads and Primary A roads are included in the model so these have been taken out of the background to avoid double counting.

The data shows that the annual concentrations for NO_2 are below the objective value within the study area in the boroughs of Ealing, Hammersmith and Fulham, Hounslow, Kensington and Chelsea and Richmond.

Table 4: Modelled Annual Mean Background Concentrations, 2016

Receptor ID	1km Grid Square X	1km Grid Square Y	NO_2 µg/m^3	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3
R41, R43, R71	517500	177500	25.3	16.6	10.7
R62, R72, R83	517500	178500	25.9	18.2	11.5
R24, R30, R63	518500	177500	23.0	15.9	10.3
R8, R21, R23, R53, R90	518500	178500	25.7	17.9	11.3
R7, R28, R48	519500	177500	23.8	16.6	10.7
R9, R25, R29, R34, R37, R40, R54, R56, R58, R61, R69	519500	178500	25.4	18.6	11.7
R73	519500	179500	26.7	17.6	11.2
R6, R60	520500	177500	23.9	17.3	11.0
R2, R3, R4, R38, R42, R46, R47, R49, R59, R84	520500	178500	26.9	17.6	11.3
R10, R75	520500	179500	27.0	17.6	11.2
R22, R44, R64	521500	177500	24.6	17.3	11.0
R1, R5, R33, R55, R66, R67, R74, R76, R85, R88	521500	178500	27.3	18.6	11.7
R11, R26	521500	179500	26.6	17.4	11.1
R17, R19, R39, R45, R65, R86, R87, R91	522500	178500	26.5	19.0	11.9
R50, R77, R82	522500	179500	27.9	18.4	11.6
R16, R18, R20, R68, R70, R78, R89	523500	178500	31.8	20.4	12.8
R12, R13, R14, R51, R52, R79	523500	179500	29.5	20.0	12.4
R35, R36, R57	524500	178500	30.5	20.3	12.6
R15, R27, R31, R32,	524500	179500	30.6	19.5	12.2

Receptor ID	1km Grid Square X	1km Grid Square Y	NO_2 µg/m^3	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3
R80, R81					

Table 5: Modelled Annual Mean Background Concentrations, 2021 All Scenarios

Receptor ID	1km Grid Square X	1km Grid Square Y	NO_2 µg/m^3	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3
R41, R43, R71	517500	177500	20.8	15.9	10.1
R62, R72, R83	517500	178500	21.1	17.6	10.9
R24, R30, R63	518500	177500	18.7	15.3	9.7
R8, R21, R23, R53, R90	518500	178500	21.0	17.3	10.7
R7, R28, R48	519500	177500	19.3	16.0	10.1
R9, R25, R29, R34, R37, R40, R54, R56, R58, R61, R69	519500	178500	20.5	18.0	11.1
R73	519500	179500	21.8	16.9	10.5
R6, R60	520500	177500	19.2	16.7	10.4
R2, R3, R4, R38, R42, R46, R47, R49, R59, R84	520500	178500	21.7	17.0	10.6
R10, R75	520500	179500	21.9	16.9	10.5
R22, R44, R64	521500	177500	19.6	16.7	10.4
R1, R5, R33, R55, R66, R67, R74, R76, R85, R88	521500	178500	21.9	17.9	11.0
R11, R26	521500	179500	21.3	16.8	10.4
R17, R19, R39, R45, R65, R86, R87, R91	522500	178500	21.1	18.3	11.2
R50, R77, R82	522500	179500	22.0	17.7	10.8
R16, R18, R20, R68, R70, R78, R89	523500	178500	25.5	19.4	11.9
R12, R13, R14, R51, R52, R79	523500	179500	23.3	19.2	11.6
R35, R36, R57	524500	178500	23.9	19.5	11.8
R15, R27, R31, R32, R80, R81	524500	179500	23.9	18.8	11.4

4.4.7 Air Quality Model Verification

Model verification is the process by which the performance of the model is assessed to identify any discrepancies between modelled and measured concentrations at air quality monitoring sites within the study area.

Recent annual mean NO_2 concentrations at automatic and diffusion tube monitoring sites close to the scheme are given in Table 6. Levels are above the objective value at all roadside sites but below at the intermediate (background) site at Howarth Primary School (HS35) in Hounslow.

PM_{10} is also measured at the Hounslow automatic monitoring site in Chiswick High Road (HS4) and annual mean concentrations have been below the objective value for the last five years. The 2016 PM_{10} annual mean was 22.4 µg/m^3.

Table 6: Recent Trends in Annual Mean NO_2 Concentrations within the Wider Study Area ($\mu g/m^3$)

Site ID and Name	Site Type	2012	2013	2014	2015	2016
CMS-HS5 (Brentford)	Roadside	**46.1**	**50.3**	**52.6**	**53.3**	**56.9**
HS32 (Adelaide Terrace)	Roadside	**55.4**	**55.9**	**63.5**	**58.8**	**59.4**
HS33 (30 Surrey Crescent)	Roadside	**54.4**	**55.6**	**61.4**	**59.4**	**57.6**
HS35 (Hogarth Primary School)	Intermediate	32.0	33.9	37.3	34.6	37.2
HS43 (Glenhurst Road)	Roadside	39.3	**43.3**	**43.9**	**41.2**	**43.1**
HS68 (Commerce Road	Roadside	**66.5**	**64.7**	**74.9**	**74.2**	**67.8**
HS69 (Key Bridge)	Roadside	**50.7**	**58.9**	**59.2**	**60.1**	**55.4**
HS70 (Chiswick Lane)	Roadside	**51.1**	**54.3**	**63.0**	**61.9**	**64.9**
CHIS (Chiswick High Road)	Roadside	**60.9**	**59.3**	**68.0**	**58.1**	**55.5**
CMS-HS4 (Chiswick High Road)	Roadside	**55.5**	**56.4**	**51.7**	**44.8**	**49.8**
HF32 (Hammersmith Broadway)	Roadside	**77.0**	**89.6**	**78.8**	**77.5**	**79.9**
HF53 (Addison Gardens)	Background	36.0	**41.6**	32.5	32.6	38.2
HF62 (Cardross Street)	Background	-	34.7	31.8	30.7	34.4
HF63 (Talgarth Road)	Roadside	**56.0**	**65.2**	**56.1**	**49.8**	**59.8**

Concentrations in bold are above the objective value

The model verification process has been undertaken following the methodology described in technical guidance LLAQM.TG(16) (Greater London Authority, 2016b). This verification process is supported by a NO_X - NO_2 conversion tool (version 6.1) (Defra, 2017b) that is used to convert modelled NO_x from the road to NO_2 by taking into account the background concentrations. Initially modelled predictions were made for annual mean NO_2 concentrations at these monitoring sites and a comparison of monitored and modelled NO_2 concentration was made. This found that the results for half of the sites were within 25% of the monitored concentration. Therefore according to LLAQM.TG (16), the results needed to be adjusted to further improve the modelled results.

Based on a further comparison of modelled road NO_x with measured road NO_x at the monitoring sites, a number of sites were discounted as they were considered to either be not well placed for verification, for example close to a junction or car park (i.e.HS68 or HS4) or further away from modelled roads in a more background location (i.e.HF53, HF62).Following this step, two adjustment factors were applied to different parts of the model. For the majority of the roads, an adjustment factor of 1.57 was applied to adjust the modelled road NO_x results based on data from seven of the monitoring sites. This resulted in all sites having modelled NO_2 concentrations within 25% of the NO_2 monitored concentrations. The accuracy of the model was considered via the calculation of the Root Mean Square Error (RMSE) which was calculated to be 6.9 $\mu g/m^3$.

However due to the strategic nature of the traffic model, it was found to not fully represent complex junctions and emissions from queuing traffic. Therefore, to take this limitation into account, a separate higher adjustment factor of 4.57 was calculated based on a comparison with data from the HS70 Chiswick Lane monitoring site and specifically applied to receptors R22, R44 and R64 at this junction with the A4 and A316.

4.4.8 Air Quality Predicting Short Term PM_{10} Objective

The guidance document LAQM.TG(03) (Defra, 2003) sets out the method by which the number of days in which the PM_{10} 24-hour objective is exceeded can be obtained based on a relationship with the predicted PM_{10} annual mean concentration. The most recent guidance LAQM.TG(16) (Defra, 2016b) and LLAQM,TG(16) (Greater London Authority, 2016b) suggests no change to this method. As such, the formula used within this assessment is:

$$\text{No. of } Exceedances = 0.0014 * C^3 + \frac{206}{C} - 18.5$$

where C is the annual mean concentration of PM_{10}.

4.4.9 Air Quality Predicting Short Term NO_2 Objective

Research projects completed on behalf of Defra and the Devolved Administrations (Laxen and Marner, 2003, and AEAT, 2008) have concluded that the hourly mean NO_2 objective is unlikely to be exceeded if annual mean concentrations are predicted to be less the 60 µg/m^3.

In 2003, Laxen and Marner concluded:

"…local authorities could reliably base decisions on likely exceedences of the 1-hour objective for nitrogen dioxide alongside busy streets using an annual mean of 60 µg/m^3 and above."

The findings presented by Laxen and Marner (2003) are further supported by AEAT (2008) who revisited the investigation to complete an updated analysis including new monitoring results and additional monitoring sites. The recommendations of this report are:

"Local authorities should continue to use the threshold of 60 µg/m^3 NO_2 as the trigger for considering a likely exceedance of the hourly mean nitrogen dioxide objective."

This means that where predicted concentrations are below 60 µg/m^3, it can be concluded that the hourly mean NO_2 objective (200 µg/m^3 NO_2 not more than 18 times per year) will be achieved. In addition to this, the assessment has evaluated the likelihood of exceeding the hourly mean NO_2 objective by predicting the 99.79th percentile of NO_2 concentrations as this is equivalent to the hourly objective value.

4.5 Traffic Noise Prediction Methodology

Noise from a flow of road traffic is generated by both vehicles' engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or occupants of a building, is influenced by a number of factors including traffic flow, speed, composition (percentage heavy duty vehicles), gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.

Noise from a stream of traffic is not constant; therefore, to assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government in 'The Calculation of Road Traffic Noise' (CRTN) (DoE & the Welsh Office, 1988) to assess traffic noise is $L_{A10,18h}$. This value is determined by taking the highest 10% of noise readings in each of the eighteen 1-hour periods between 06:00 and 24:00, and then calculating the arithmetic mean. A reasonably good correlation has been shown to exist between this index and residents' perception of traffic noise over a wide range of exposures. When CRTN was first validated it was found to have a mean error of 0.3 dB(A) with a standard deviation of 2.4 dB(A) (Delaney et al, 1976).

CRTN provides the standard methodology for predicting the $L_{A10,18h}$ road traffic noise level in the UK. Noise levels are predicted at a point 1 m measured horizontally externally from the façade of the building and therefore are 'façade' rather than 'free-field' levels. Façade levels include the reflection of noise from the building façade. CRTN applies a standard 'façade correction' of +2.5 dB to convert free-field levels (unaffected by façade reflections) to 'façade' levels (including façade reflections).

Details of the road layout with and without the proposed scheme have been provided by TfL, along with corresponding 2021 traffic data. Based on the provided information noise models of the 'with' and 'without' scheme situations have been developed using the SoundPLAN (v8.0) noise mapping software. SoundPLAN implements the standard UK CRTN road traffic noise prediction methodology. Further details of the traffic noise modelling approach are provided in Appendix B.

4.6 Method for Assessment of Significance

4.6.1 Air Quality Assessment of Significance

4.6.1.1 Air Quality Effects Descriptors

With regard to road traffic emissions, the change in pollutant concentrations with respect to future baseline concentrations has been described at receptors that are representative of exposure to impacts on local air quality within the study area. The absolute magnitude of pollutant concentrations in the "with" and "without" scheme scenario is also described and this is used to consider the risk of the air quality limit values being exceeded in each scenario.

For consideration of a change in annual mean concentration of a given magnitude, the EPUK and IAQM have published recommendations for describing the effects of such impacts at individual receptors as set out in Table 7 and Table 8 (EPUK & IAQM, 2017).

Table 7: Effects Descriptors at Individual Receptors – Annual Mean NO_2 and PM_{10}

Long Term Average Concentration at Receptor in Assessment Year (µg/m^3)	Change in Concentration Relative to Air Quality Assessment Level (AQAL) – NO_2 and PM_{10} (µg/m^3)				
	<0.2	0.2 - <0.6	0.6 - <2.2	2.2 -<=4.0	>4.0
	(Imperceptible)	(Very Small)	(Small)	(Medium)	(Large)
<30.2	Negligible	Negligible	Negligible	Slight	Moderate
30.2 - <37.8	Negligible	Negligible	Slight	Moderate	Moderate
37.8 - <41.0	Negligible	Slight	Moderate	Moderate	Substantial
41.0 - <43.8	Negligible	Moderate	Moderate	Substantial	Substantial
≥43.8	Negligible	Moderate	Substantial	Substantial	Substantial

Table 8: Effects Descriptors at Individual Receptors – Annual Mean $PM_{2.5}$

Long Term Average Concentration at Receptor in Assessment Year (µg/m^3)	Change in Concentration Relative to Air Quality Assessment Level (AQAL) – $PM_{2.5}$ (µg/m^3)				
	<0.1	0.1 - <0.4	0.4 - <1.4	1.4 -<=2.5	>2.5
	(Imperceptible)	(Very Small)	(Small)	(Medium)	(Large)
<18.9	Negligible	Negligible	Negligible	Slight	Moderate
18.9 - <23.6	Negligible	Negligible	Slight	Moderate	Moderate
23.6 - <25.6	Negligible	Slight	Moderate	Moderate	Substantial
25.6 - <27.4	Negligible	Moderate	Moderate	Substantial	Substantial
≥27.4	Negligible	Moderate	Substantial	Substantial	Substantial

A change in predicted annual mean concentrations of NO_2 or PM_{10} of less than 0.2 µg/m^3 is considered to be so small as to be imperceptible. For short-term objectives, the guidance states that where the concentrations range from 11% - 20% of the relevant objective, the magnitude of impacts is

small. Concentrations that are 21% - 50% and greater than 50% of the objectives have moderate or large impact respectively. A change (impact) that is imperceptible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

All relevant receptors that have been selected to represent locations where people are likely to be present are based on impacts on human health. The air quality objective values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such the sensitivity of receptors was considered in the definition of the air quality objective values, and therefore, no additional subdivision of human health receptors on the basis of building or location type is necessary.

4.6.1.2 Significance of Effects

The significance of the reported effects is then considered for the proposed scheme in overall terms. The potential for the scheme to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principal focus is any change to the likelihood of future achievement of the air quality objective values set out in Table 1 for the following pollutants:

- Annual mean nitrogen dioxide (NO_2) concentration of 40 µg/m^3;
- Annual mean particulate matter (PM_{10}) concentration of 40 µg/m^3;
- Annual mean fine particulate matter ($PM_{2.5}$) concentrations of 25 µg/m^3;
- 24-hour mean PM_{10} concentration of 50 µg/m^3 not to be exceeded on more than 35 days per year; and
- 1-hour mean NO_2 concentration of 200 µg/m^3 not to be exceeded on more than 18 times per year.

The achievement of local authority goals for local air quality management are directly linked to the achievement of the air quality objective values described above, and as such, this assessment focuses on the likelihood of achievement of the air quality objective values as a result of the proposed scheme

In terms of the significance of any adverse impacts, an effect is reported as being either ‘not significant’ or as being ‘significant’. If the overall effect of the scheme on local air quality or on amenity is found to be ‘moderate’ or ‘substantial’ this is deemed to be ‘significant’. Effects found to be ‘slight’ are considered to be ‘not significant’, although they may be a matter of local concern. ‘Negligible’ effects are considered to be ‘not significant’.

4.6.2 Traffic Noise Assessment of Significance

The assessment of the significance of the effect of the proposed scheme on traffic noise levels is based on the guidance in the Design Manual for Roads and Bridges (DMRB) (Highways Agency, 2011) on the magnitude of traffic noise changes, combined with consideration of the sensitivity of the receptor. Table 9 is adapted from the DMRB classification of the magnitude of impact in the short term i.e. the year of opening.

Table 9: Road Traffic Noise Magnitude of Impact Criteria

Change in Traffic Noise Level $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1-0.9	Imperceptible
1.0-2.9	Small
3.0-4.9	Medium
5.0+	Large

The significance of the effect is determined based on the matrix in Table 10. The effect is beneficial if the traffic noise level is reduced and adverse if the traffic noise level is increased.

Table 10: Road Traffic Noise Significance of Effect Matrix

Sensitivity of Receptor	Magnitude of Impact			
	Large	Medium	Small	Imperceptible
High	Substantial	Moderate	Slight	Negligible
Medium	Moderate	Slight	Negligible	Negligible
Low	Slight	Negligible	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible

Residential properties or buildings containing some residential use including houses and nursing homes are considered to be of high sensitivity to changes in road traffic noise. Receptors such as schools and hostels with permanent residences are also ranked as 'high' sensitivity. Commercial receptors are considered to be of low sensitivity to traffic noise changes.

Generally, effects classed as negligible or slight are considered to be insignificant, whereas effects classed as moderate or substantial adverse are considered to be significant. However, final determination of whether effects are likely to be significant in specific situations is made following the classification of effects and using professional judgement. This is based on information such as the overall magnitude of the noise level.

5. Predicted Impacts

5.1 Summary

The following sections present the results of the air quality and noise assessments at selected receptors, providing the predicted levels with and without the scheme in place and the differences. For both air quality and noise, a consideration of whether these changes are considered to be significant is provided.

5.2 Air Quality Concentrations

Table 11 provides the modelled annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations for the base situation in 2016 and Table 12 provides the modelled annual mean concentrations with and without the proposed scheme in 2021, and the difference between them for each of the selected receptor locations. This table includes concentrations at receptors on proposed developments as well as existing sensitive receptors. Table 13 shows the number of days predicted to exceed the 24-hourly mean PM_{10} objective and change due to the proposed scheme.

An overview of the predicted changes in NO_2 concentrations at each selected receptor in 2021 is illustrated in Figure 2a, with magnified views containing the receptor labels from Table 2 shown in Figures 2b, 2c and 2d. These figures are contained in Appendix A. As changes in PM_{10} and $PM_{2.5}$ are smaller than for NO_2 and are all negligible, these have not been displayed in a figure.

Each receptor has been modelled at the lowest floor of the building where there is residential use. For ground floor, this height is 1.5m, and every floor above this is an additional 3 metres (e.g. first floor height is 4.5 m and 2nd floor height is 7.5m). The ground floor height provides the worst case locations and any receptors higher up the buildings would be anticipated to have lower overall concentrations and experience smaller impacts.

Table 11: Annual Mean Air Quality Results, 2016 Base

Receptor	Floor	NO_2 (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
R1	G	34.3	19.6	12.4
R2	G	35.1	18.9	12.1
R3	G	31.4	18.4	11.7
R4	G	35.7	19.2	12.2
R5	G	36.1	20.0	12.6
R6	G	31.5	18.4	11.7
R7	G	29.1	17.6	11.3
R8	G	36.0	19.7	12.5
R9	1	33.8	20.0	12.5
R10	G	31.1	18.3	11.6
R11	G	29.6	17.9	11.4
R12	G	32.8	20.5	12.7
R13	G	33.5	20.6	12.8
R14	1	**41.3**	21.7	13.5
R15	G	**40.5**	21.4	13.3
R16	G	36.6	21.2	13.2
R17	G	**56.6**	25.5	15.9
R18	1	**62.8**	26.5	16.6
R19	G	**55.3**	25.2	15.7
R20	G	**48.2**	23.2	14.5
R21	1	**45.9**	21.1	13.3

Receptor	Floor	NO_2 (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
R22*	G	**78.1**	30.2	18.9
R23	G	**40.3**	20.7	13.1
R24	G	38.5	18.2	11.7
R25	G	53.6	23.1	14.5
R26	G	34.3	18.7	11.9
R27	1	**48.2**	21.9	13.7
R28	G	38.7	19.0	12.2
R29	G	37.1	20.5	12.9
R30	G	34.6	17.9	11.5
R31	G	**41.3**	21.0	13.1
R32	G	**46.6**	22.2	13.9
R33	G	**49.4**	23.0	14.4
R34	G	32.9	20.0	12.6
R35	G	**43.8**	22.3	13.9
R36	G	**47.3**	22.8	14.2
R37	G	39.9	21.3	13.4
R38	1	33.7	18.7	11.9
R39	!	33.8	20.2	12.7
R40	G	33.5	20.0	12.6
R41	1	**41.5**	18.7	12.0
R42	G	31.9	18.5	11.8
R43	1	36.5	18.3	11.7
R44*	G	**53.3**	23.0	14.6
R45	1	36.5	20.6	12.9
R46	1	34.9	18.9	12.0
R47	G	33.6	18.8	11.9
R48	G	**46.6**	21.4	13.6
R49	G	34.3	18.7	11.9
R50	G	34.9	19.6	12.3
R51	1	**52.2**	23.0	14.3
R52	G	**48.8**	22.7	14.1
R53	G	37.5	19.8	12.5
R54	G	**49.3**	22.8	14.3
R55	1	36.4	19.9	12.5
R56	1	**43.2**	21.8	13.7
R57	1	**44.5**	22.3	13.9
R58	G	**58.1**	25.2	15.7
R59	G	31.5	18.3	11.7
R60	G	**44.2**	21.7	13.7
R61	G	**62.4**	23.7	14.9
R62	G	**63.1**	26.6	16.6
R63	G	31.3	17.0	11.0
R64*	G	**69.7**	26.7	16.9
R65	1	35.9	20.5	12.9
R66	1	34.9	19.5	12.3
R67	1	36.3	19.7	12.4

Receptor	Floor	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)
R68	1	**40.5**	21.8	13.6
R69	1	**42.9**	21.7	13.6
R70	1	**45.8**	22.5	14.1
R71	G	39.1	18.8	12.0
R72	G	30.0	18.9	12.0
R73	G	39.1	20.3	12.8
R74	G	31.4	19.3	12.1
R75	G	29.8	18.0	11.4
R76	G	31.4	19.2	12.1
R77	G	30.1	18.7	11.8
R78	G	37.7	21.4	13.4
R79	1	33.1	20.5	12.7
R80	G	34.0	20.1	12.6
R81	G	**52.1**	22.5	14.1
R82	G	30.7	18.8	11.8
R83	G	39.1	20.8	13.1
R84	G	31.8	18.3	11.6
R85	G	38.2	20.3	12.7
R86	G	34.4	20.2	12.7
R87	G	37.1	20.7	13.0
R88	G	39.7	20.3	12.8
R89	G	**47.0**	22.7	14.2
R90	G	28.1	18.3	11.6
R91	G	29.6	19.5	12.2
R92	G	31.8	19.6	12.3

Concentrations in bold are predicted to be above the relevant objective value and concentrations underlined may exceed the hourly objective value.

*A different adjustment factor was applied to modelled concentrations at these receptors

Table 12: Annual Mean Air Quality Results With and Without Proposed Scheme, 2021

Receptor	Floor	NO_2 (µg/m^3)			PM_{10} (µg/m^3)			$PM_{2.5}$ (µg/m^3)		
		Without Scheme	With Scheme	Change	Without Scheme	With Scheme	Change	Without Scheme	With Scheme	Change
R1	G	26.3	26.0	-0.3	18.9	18.8	-0.1	11.6	11.5	-0.1
R2	G	27.8	28.4	+0.6	18.1	18.2	+0.1	11.3	11.3	<0.1
R3	G	25.1	24.7	-0.3	17.7	17.6	-0.1	11.0	11.0	<0.1
R4	G	28.8	27.6	-1.2	18.5	18.2	-0.3	11.4	11.3	-0.1
R5	G	28.5	28.2	-0.3	19.2	19.2	<0.1	11.8	11.8	<0.1
R6	G	24.4	24.7	+0.3	17.7	17.7	<0.1	11.0	11.0	<0.1
R7	G	23.4	23.2	-0.2	16.9	16.9	<0.1	10.6	10.6	<0.1
R8	G	27.8	27.9	+0.1	18.9	18.9	<0.1	11.6	11.6	<0.1
R9	1	26.1	26.0	-0.1	19.1	19.1	<0.1	11.7	11.7	<0.1
R10	G	24.9	24.8	-0.1	17.6	17.6	<0.1	10.9	10.9	<0.1
R11	G	23.3	23.3	<0.1	17.3	17.3	<0.1	10.7	10.7	<0.1
R12	G	25.8	25.8	<0.1	19.8	19.8	<0.1	11.9	11.9	<0.1
R13	G	25.7	25.7	-0.1	19.7	19.7	<0.1	11.9	11.9	<0.1
R14	1	29.7	30.4	+0.7	20.7	20.8	+0.1	12.5	12.5	<0.1
R15	G	31.6	32.0	+0.4	20.8	20.9	+0.1	12.6	12.6	<0.1
R16	G	28.7	28.5	-0.3	20.1	20.1	-0.1	12.3	12.2	-0.1
R17	G	**41.1**	**41.5**	+0.5	23.9	24.0	+0.1	14.4	14.4	<0.1
R18	1	**45.7**	**45.7**	<0.1	24.7	24.7	<0.1	14.9	14.9	<0.1
R19	G	**40.8**	**41.2**	+0.4	23.7	23.8	+0.1	14.3	14.3	<0.1
R20	G	34.9	34.9	<0.1	21.7	21.6	<0.1	13.1	13.1	<0.1
R21	1	36.2	36.2	<0.1	20.0	20.0	-0.1	12.3	12.3	<0.1
R22*	G	**61.1**	**63.5**	+2.3	28.3	28.8	+0.5	17.1	17.4	0.3
R23	G	31.7	31.7	<0.1	19.9	19.9	<0.1	12.2	12.2	<0.1
R24	G	28.6	27.9	-0.7	17.4	17.2	-0.2	10.9	10.8	-0.1
R25	G	**43.5**	**41.5**	-2.0	22.0	21.7	-0.3	13.4	13.2	-0.2

Receptor	Floor	NO_2 (µg/m^3)			PM_{10} (µg/m^3)			$PM_{2.5}$ (µg/m^3)		
		Without Scheme	With Scheme	Change	Without Scheme	With Scheme	Change	Without Scheme	With Scheme	Change
R26	G	26.4	26.3	-0.1	17.9	17.9	<0.1	11.0	11.0	<0.1
R27	1	34.0	33.3	-0.7	20.9	20.7	-0.2	12.7	12.5	-0.2
R28	G	30.2	29.9	-0.2	18.2	18.2	<0.1	11.3	11.3	<0.1
R29	G	28.5	29.0	+0.5	19.6	19.7	+0.1	12.0	12.1	+0.1
R30	G	26.7	25.6	-1.1	17.1	17.0	-0.1	10.7	10.7	<0.1
R31	G	29.7	29.4	-0.3	20.1	20.0	-0.1	12.2	12.1	-0.1
R32	G	36.0	36.7	+0.8	21.4	21.5	+0.1	13.0	13.0	<0.1
R33	G	38.1	38.5	+0.5	21.8	21.9	+0.1	13.3	13.3	<0.1
R34	G	26.6	25.9	-0.7	/19.3	19.1	-0.2	11.8	11.7	-0.1
R35	G	31.9	31.8	-0.1	21.2	21.2	<0.1	12.8	12.8	<0.1
R36	G	33.4	33.3	-0.1	21.7	21.5	-0.3	13.0	12.9	-0.1
R37	G	31.8	29.6	-2.1	20.5	20.1	-0.4	12.5	12.3	-0.2
R38	1	26.7	26.4	-0.3	18.0	17.9	-0.1	11.2	11.1	-0.1
R39	!	25.1	25.3	+0.1	19.3	19.4	<0.1	11.8	11.8	<0.1
R40	G	26.9	25.5	-1.4	19.3	19.0	-0.3	11.8	11.7	-0.1
R41	1	31.6	31.6	<0.1	17.7	17.8	<0.1	11.1	11.1	<0.1
R42	G	25.5	25.3	-0.2	17.8	17.8	<0.1	11.1	11.0	-0.1
R43	1	28.6	28.4	-0.1	17.5	17.5	<0.1	11.0	10.9	-0.1
R44*	G	**41.9**	**42.9**	+1.0	21.9	22.1	+0.1	13.5	13.5	<0.1
R45	1	26.7	26.7	<0.1	19.6	19.6	-0.1	12.0	11.9	-0.1
R46	1	26.7	26.6	-0.1	18.0	18.0	<0.1	11.2	11.2	<0.1
R47	G	26.4	26.5	+0.1	17.9	17.9	<0.1	11.1	11.1	<0.1
R48	G	38.5	**40.5**	+2.0	20.5	20.5	<0.1	12.6	12.7	+0.1
R49	G	26.7	26.6	-0.1	17.9	17.9	<0.1	11.1	11.1	<0.1
R50	G	26.3	26.1	-0.1	18.7	18.7	<0.1	11.4	11.4	<0.1

Receptor	Floor	NO_2 (µg/m^3)			PM_{10} (µg/m^3)			$PM_{2.5}$ (µg/m^3)		
		Without Scheme	With Scheme	Change	Without Scheme	With Scheme	Change	Without Scheme	With Scheme	Change
R51	1	36.0	36.6	+0.6	21.7	21.8	+0.1	13.1	13.1	<0.1
R52	G	35.3	35.8	+0.5	21.6	21.7	+0.1	13.0	13.1	+0.1
R53	G	28.7	28.8	<0.1	18.8	18.8	<0.1	11.6	11.6	<0.1
R54	G	38.7	38.7	<0.1	21.8	21.9	+0.1	13.3	13.3	<0.1
R55	1	27.5	27.4	-0.1	19.1	19.1	-0.1	11.7	11.7	<0.1
R56	1	34.6	33.2	-1.4	21.0	20.8	-0.2	12.8	12.7	-0.1
R57	1	32.0	33.0	+1.1	21.4	21.2	-0.2	12.9	12.7	-0.2
R58	G	**45.9**	**46.5**	+0.6	24.0	24.1	+0.1	14.5	14.6	+0.1
R59	G	24.7	24.6	<0.1	17.7	17.6	<0.1	11.0	11.0	<0.1
R60	G	34.4	35.0	+0.6	20.7	20.8	+0.1	12.7	12.8	+0.1
R61	G	**48.0**	**48.7**	+0.8	22.5	22.6	+0.1	13.7	13.7	<0.1
R62	G	**49.6**	**49.1**	-0.5	25.4	25.3	-0.1	15.3	15.3	<0.1
R63	G	23.6	23.7	+0.1	16.3	16.3	<0.1	10.3	10.3	<0.1
R64*	G	**54.7**	**56.3**	+1.6	25.2	25.5	+0.3	15.3	15.5	+0.2
R65	1	26.1	26.2	+0.1	19.6	19.5	<0.1	11.9	11.9	<0.1
R66	1	26.5	26.4	-0.1	18.7	18.7	<0.1	11.5	11.5	<0.1
R67	1	27.3	27.1	-0.2	18.9	18.8	-0.1	11.6	11.6	<0.1
R68	1	30.3	30.0	-0.3	20.6	20.5	-0.2	12.5	12.5	<0.1
R69	1	34.3	33.2	-1.0	20.9	20.7	-0.2	12.7	12.6	-0.1
R70	1	33.9	33.6	-0.2	21.2	21.1	<0.1	12.9	12.8	-0.1
R71	G	29.7	29.6	-0.1	17.9	17.9	<0.1	11.2	11.2	<0.1
R72	G	23.6	23.6	-0.1	18.2	18.2	<0.1	11.2	11.2	<0.1
R73	G	31.2	31.3	+0.1	19.3	19.4	<0.1	11.9	11.9	<0.1
R74	G	25.2	25.2	<0.1	18.6	18.6	<0.1	11.4	11.4	<0.1
R75	G	23.6	23.5	<0.1	17.3	17.3	<0.1	10.7	10.7	<0.1

Receptor	Floor	NO_2 (µg/m^3)			PM_{10} (µg/m^3)			$PM_{2.5}$ (µg/m^3)		
		Without Scheme	With Scheme	Change	Without Scheme	With Scheme	Change	Without Scheme	With Scheme	Change
R76	G	24.6	24.6	<0.1	18.5	18.5	<0.1	11.4	11.4	0.0
R77	G	23.8	23.8	+0.1	18.0	18.0	<0.1	11.0	11.1	+0.1
R78	G	28.7	28.8	+0.1	20.2	20.2	<0.1	12.3	12.3	<0.1
R79	1	25.6	25.6	+0.1	19.7	19.7	<0.1	11.9	11.9	<0.1
R80	G	26.6	26.6	<0.1	19.4	19.4	<0.1	11.8	11.8	<0.1
R81	G	37.3	36.9	-0.4	21.8	21.7	-0.1	13.2	13.1	-0.1
R82	G	23.9	23.9	<0.1	18.1	18.1	<0.1	11.1	11.1	<0.1
R83	G	30.8	30.5	-0.3	19.9	19.9	<0.1	12.2	12.2	<0.1
R84	G	24.9	25.2	+0.3	17.6	17.7	+0.1	10.9	11.0	+0.1
R85	G	28.1	28.3	+0.2	19.4	19.4	<0.1	11.9	11.9	<0.1
R86	G	25.4	25.5	+0.1	19.3	19.3	<0.1	11.8	11.8	<0.1
R87	G	27.3	27.3	<0.1	19.8	19.7	<0.1	12.0	12.0	<0.1
R88	G	29.6	29.5	-0.1	19.5	19.4	-0.1	12.0	11.9	-0.1
R89	G	35.6	35.5	<0.1	21.5	21.5	<0.1	13.1	13.1	<0.1
R90	G	22.8	22.8	<0.1	17.7	17.7	<0.1	10.9	10.9	<0.1
R91	G	23.0	23.0	<0.1	18.8	18.8	<0.1	11.5	11.5	<0.1
R92	G	24.7	24.6	-0.1	18.8	18.8	<0.1	11.6	11.5	-0.1

Concentrations in bold are predicted to be above the relevant objective value and concentrations underlined may exceed the hourly objective value.

*A different adjustment factor was applied to modelled concentrations at these receptors.

Table 13: Number of days per year above 24 Hourly PM_{10} Objective, With and Without Proposed Scheme, 2021

Receptor	Floor	Without Scheme	With Scheme	Change
R1	G	2	2	<1
R2	G	2	2	<1
R3	G	1	1	<1
R4	G	2	2	<1
R5	G	3	3	<1
R6	G	1	1	<1
R7	G	1	1	<1
R8	G	2	2	<1
R9	1	3	3	<1
R10	G	1	1	<1
R11	G	1	1	<1
R12	G	3	3	<1
R13	G	3	3	<1
R14	1	4	5	+1
R15	G	4	5	+1
R16	G	4	4	<1
R17	G	10	10	<1
R18	1	11	11	<1
R19	G	9	10	+1
R20	G	6	6	<1
R21	1	4	3	-1
R22*	G	21	23	+2
R23	G	3	3	<1
R24	G	1	1	<1
R25	G	6	6	<1
R26	G	2	2	<1
R27	1	5	4	-1
R28	G	2	2	<1
R29	G	3	3	<1
R30	G	1	1	<1
R31	G	4	3	-1
R32	G	5	6	<1
R33	G	6	6	<1
R34	G	3	3	<1
R35	G	5	5	<1
R36	G	6	5	-1
R37	G	4	4	<1
R38	1	2	2	<1
R39	!	3	3	<1
R40	G	3	2	-1
R41	1	1	1	<1
R42	G	1	1	<1
R43	1	1	1	<1

Receptor	Floor	Without Scheme	With Scheme	Change
R44*	G	6	6	<1
R45	1	3	3	<1
R46	1	2	2	<1
R47	G	2	2	<1
R48	G	4	4	<1
R49	G	2	2	<1
R50	G	2	2	<1
R51	1	6	6	<1
R52	G	6	6	<1
R53	G	2	2	<1
R54	G	6	6	<1
R55	1	3	3	<1
R56	1	5	4	-1
R57	1	5	5	<1
R58	G	10	10	<1
R59	G	1	1	<1
R60	G	4.0	5.0	+1
R61	G	7	7	<1
R62	G	13	13	<1
R63	G	1	1	<1
R64*	G	13	13	<1
R65	1	3	3	<1
R66	1	2	2	<1
R67	1	2	2	<1
R68	1	4	4	<1
R69	1	5	4	-1
R70	1	5	5	<1
R71	G	2	2	<1
R72	G	2	2	<1
R73	G	3	3	<1
R74	G	2	2	<1
R75	G	1	1	<1
R76	G	2	2	<1
R77	G	2	2	<1
R78	G	4	4	<1
R79	1	3	3	<1
R80	G	3	3	<1
R81	G	6	6	<1
R82	G	2	2	<1
R83	G	3	3	<1
R84	G	1	1	<1
R85	G	3	3	<1
R86	G	3	3	<1
R87	G	3	3	<1
R88	G	3	3	<1

Receptor	Floor	Without Scheme	With Scheme	Change
R89	G	6	6	<1
R90	G	1	1	<1
R91	G	2	2	<1
R92	G	2	2	<1

*A different adjustment factor was applied to modelled concentrations at these receptors.

The selected receptors cover a relatively wide geographical area between Shepard's Bush and Brentford and there is therefore a range in concentrations with much higher values closer to main roads and lower concentrations which are just above the background levels in the more residential areas, further from roads.

In 2016, the annual mean annual mean NO_2 objective value of 40 µg/m^3 is exceeded at a large number of receptors close to main roads with the highest concentrations at receptors near the A4 (e.g. R17, R18), M4 and roundabout with Hogarth Lane including receptors R22, R44 and R64. There are also high concentrations close to other busy roads such as Goldhawk Road (e.g. R51), Chiswick High Road (e.g. R61, R58) and Warwick Road (R81). A number of these receptors have annual mean NO_2 concentrations above 60µ g/m^3 which suggests that the hourly objective may be exceeded. There are no predicted exceedances of the objective values for PM_{10} and $PM_{2.5}$ at the selected receptors.

By the scheme opening year of 2021, concentrations are lower due to improvements in background pollution and lower emissions from newer vehicle fleet. There are still exceedances of the annual mean NO_2 objective value closer to the main roads both with and without the proposed scheme in the locations above. The highest NO_2 concentration is just over 60 µg/m^3 at R22 (A4 Hogarth Lane) which suggests the hourly objective may be exceeded.

With the proposed scheme in place, there are imperceptible or very small changes predicted at the majority of the 92 selected receptors, particularly those closer to minor roads and away from the cycle superhighway route. There are small improvements in concentrations of 2 µg/m^3 or lower along the length of the cycle superhighway scheme itself including at R25 (Kew Bridge Road), R27 (Kensington High Street) R37 (Wellesley Road), R56 (Chiswick High Road) and R69 (Lionel Road). These improvements are due to overall traffic flow reductions and the introduction of segregated cycle lanes along the CS9 route that means the vehicular traffic is further away from the building façades. At R37 (Wellesley Road), R40 (Stile Hall Gardens) and R56 (Chiswick High Road) there are reductions of over 1 µg/m^3 as the scheme prevents vehicle access to the South Circular from Wellesley Road and Stile Hall Gardens, thereby substantially reducing overall traffic flow on these roads.

Conversely, there are small increases of 2 µg/m^3 or less in annual mean NO_2 concentrations at receptors along the A4/M4 corridor or on minor roads close to the main corridor, including R44 (Devonshire Road), R48 (Falcon Close), R60 (Ellesmere Road) and R64 (Chiswick Square). These increases are due to predicted increases in traffic flows and associated lower speeds with the proposed scheme. The greatest increases of just over 2 µg/m^3 are also at receptors close to the A4 at R22 (Hogarth Lane) and R48 (Falcon Close). Traffic flows on the Hogarth Lane section of the A4 to the west of Hogarth Roundabout are predicted to increase by 5% as a result of the proposed scheme resulting in more than 5,000 vehicles using this section of road per day.

There are some small increases of 1 µg/m^3 or lower at receptors to the north east of the scheme in the boroughs of Hammersmith and Kensington and Chelsea, such as R14 (Blythe Road), R32 (Holland Road), R33 (Airdale Avenue), R51 (Goldhawk Road) and R57 (Hammersmith Road). The reason for the increases at these receptors is due to predicted increases in traffic by 9% as a result of the proposed scheme along A219 Shepherds Bush Road and a 3% increase in vehicles using A3220 Holland Road with the proposed scheme. The change in road layout, removal of a bus lane and decrease in predicted average speeds from 23 km/h to 6 km/h at R57 (Hammersmith Road) offsets the predicted reduction in traffic at this location.

Concentrations of PM_{10} and $PM_{2.5}$ are both below their respective annual mean objective values of 40 µg/m^3 and 25 µg/m^3 with and without the proposed scheme and there are no exceedances of the 24-hour mean objective for PM_{10} in 2021. As there is a high contribution from background sources,

the contribution from road traffic emissions is relatively small. Therefore any changes due to the scheme are considered to be imperceptible or very small at all receptors.

The total absolute annual mean concentrations and changes displayed in Table 12 combine to give an effect descriptor for each receptor, following the criteria set out in Table 7 and Table 8. Table 14 shows the predicted effect descriptor for each receptor.

Table 14: Air Quality Significance Effects Descriptors. Impacts With Scheme

Receptor	Floor	Effect Descriptors		
		NO_2	PM_{10}	$PM_{2.5}$
R1	G	Negligible	Negligible	Negligible
R2	G	Negligible	Negligible	Negligible
R3	G	Negligible	Negligible	Negligible
R4	G	Negligible	Negligible	Negligible
R5	G	Negligible	Negligible	Negligible
R6	G	Negligible	Negligible	Negligible
R7	G	Negligible	Negligible	Negligible
R8	G	Negligible	Negligible	Negligible
R9	1	Negligible	Negligible	Negligible
R10	G	Negligible	Negligible	Negligible
R11	G	Negligible	Negligible	Negligible
R12	G	Negligible	Negligible	Negligible
R13	G	Negligible	Negligible	Negligible
R14	1	Slight Adverse	Negligible	Negligible
R15	G	Negligible	Negligible	Negligible
R16	G	Negligible	Negligible	Negligible
R17	G	Moderate Adverse	Negligible	Negligible
R18	1	Negligible	Negligible	Negligible
R19	G	Moderate Adverse	Negligible	Negligible
R20	G	Negligible	Negligible	Negligible
R21	1	Negligible	Negligible	Negligible
R22	G	Substantial Adverse	Negligible	Negligible
R23	G	Negligible	Negligible	Negligible
R24	G	Negligible	Negligible	Negligible
R25	G	Moderate Beneficial	Negligible	Negligible
R26	G	Negligible	Negligible	Negligible
R27	1	Slight Beneficial	Negligible	Negligible
R28	G	Negligible	Negligible	Negligible
R29	G	Negligible	Negligible	Negligible
R30	G	Negligible	Negligible	Negligible
R31	G	Negligible	Negligible	Negligible
R32	G	Slight Adverse	Negligible	Negligible
R33	G	Slight Adverse	Negligible	Negligible
R34	G	Negligible	Negligible	Negligible
R35	G	Negligible	Negligible	Negligible
R36	G	Negligible	Negligible	Negligible
R37	G	Slight Beneficial	Negligible	Negligible
R38	1	Negligible	Negligible	Negligible

Receptor	Floor	Effect Descriptors		
		NO_2	PM_{10}	$PM_{2.5}$
R39	1	Negligible	Negligible	Negligible
R40	G	Negligible	Negligible	Negligible
R41	1	Negligible	Negligible	Negligible
R42	G	Negligible	Negligible	Negligible
R43	1	Negligible	Negligible	Negligible
R44	G	Moderate Adverse	Negligible	Negligible
R45	1	Negligible	Negligible	Negligible
R46	1	Negligible	Negligible	Negligible
R47	G	Negligible	Negligible	Negligible
R48	G	Moderate Adverse	Negligible	Negligible
R49	G	Negligible	Negligible	Negligible
R50	G	Negligible	Negligible	Negligible
R51	1	Slight Adverse	Negligible	Negligible
R52	G	Negligible	Negligible	Negligible
R53	G	Negligible	Negligible	Negligible
R54	G	Negligible	Negligible	Negligible
R55	1	Negligible	Negligible	Negligible
R56	1	Slight Beneficial	Negligible	Negligible
R57	1	Slight Adverse	Negligible	Negligible
R58	G	Moderate Adverse	Negligible	Negligible
R59	G	Negligible	Negligible	Negligible
R60	G	Slight Adverse	Negligible	Negligible
R61	G	Substantial Adverse	Negligible	Negligible
R62	G	Moderate Beneficial	Negligible	Negligible
R63	G	Negligible	Negligible	Negligible
R64	G	Substantial Adverse	Negligible	Negligible
R65	1	Negligible	Negligible	Negligible
R66	1	Negligible	Negligible	Negligible
R67	1	Negligible	Negligible	Negligible
R68	1	Negligible	Negligible	Negligible
R69	1	Slight Beneficial	Negligible	Negligible
R70	1	Negligible	Negligible	Negligible
R71	G	Negligible	Negligible	Negligible
R72	G	Negligible	Negligible	Negligible
R73	G	Negligible	Negligible	Negligible
R74	G	Negligible	Negligible	Negligible
R75	G	Negligible	Negligible	Negligible
R76	G	Negligible	Negligible	Negligible
R77	G	Negligible	Negligible	Negligible
R78	G	Negligible	Negligible	Negligible
R79	1	Negligible	Negligible	Negligible
R80	G	Negligible	Negligible	Negligible
R81	G	Negligible	Negligible	Negligible
R82	G	Negligible	Negligible	Negligible

Receptor	Floor	Effect Descriptors		
		NO_2	PM_{10}	$PM_{2.5}$
R83	G	Negligible	Negligible	Negligible
R84	G	Negligible	Negligible	Negligible
R85	G	Negligible	Negligible	Negligible
R86	G	Negligible	Negligible	Negligible
R87	G	Negligible	Negligible	Negligible
R88	G	Negligible	Negligible	Negligible
R89	G	Negligible	Negligible	Negligible
R90	G	Negligible	Negligible	Negligible
R91	G	Negligible	Negligible	Negligible
R92	G	Negligible	Negligible	Negligible

Table 15: Summary Significance of Effect Descriptor at Receptors – Air Quality

Receptor	Annual mean conc. at receptor ($\mu g/m^3$)	Change in concentration of NO_2 ($\mu g/m^3$)				
		<0.2 (Imperceptible)	0.2 - <0.6 (Very small)	0.6 - <2.2 (Small)	2.2 -<=4.0 (Medium)	>4.0 (Large)
R61, R64	≥43.8			Substantial		
R22	≥43.8				Substantial	
R17, R19, R58	41.0 - <43.8		Moderate			
R44, R48	37.8 - <41.0			Moderate		
R19	37.8 - <41.0		Slight			
R14, R32, R33, R51, R57, R60	30.2 - <37.8			Slight		
R62	≥43.8		Moderate			
R25	41.0 - <43.8			Moderate		
R27, R37, R56, R69	30.2 - <37.8			Slight		
R42, R54, R20, R21, R23, R73, R89	30.2 - <37.8	Negligible				
R15, R68, R70, R28, R52, R81, R84	30.2 - <37.8		Negligible			

Receptor	Annual mean conc. at receptor ($\mu g/m^3$)	Change in concentration of NO_2 ($\mu g/m^3$)				
		<0.2 (Imperceptible)	0.2 - <0.6 (Very small)	0.6 - <2.2 (Small)	2.2 -<=4.0 (Medium)	>4.0 (Large)
R8, R9, R10, R11, R12, R13, R18, R29, R26, R35, R36, R38, R39, R43, R45, R46, R47, R49, R50, R53, R55, R59, R63, R65, R66, R71, R72, R74, R75, R76, R77, R78, R79, R80, R82, R86 R87, R88, R90, R91, R92	<30.2	Negligible				
R1, R3, R5, R6, R7, R16, R29, R31, R42, R67, R84, R85	<30.2		Negligible			
R2, R4, R24, R30, R34, R40,	<30.2			Negligible		

Overall the proposed scheme is predicted to result in small changes to annual mean NO_2 concentrations at most of the 92 selected receptors both within the CS9 route extent and within the wider affected study area. This change in concentration due to the scheme is small enough at 72 of the receptors to be considered to be a negligible impact, which is a not significant effect.

There are small reductions in annual mean NO_2 concentration due to the proposed scheme at six selected receptors along the scheme route itself. The impact of this is a slight beneficial impact at four of the selected receptors (R27, R37, R56 and R69), all of which have concentrations below the objective value. There are moderate beneficial impacts at two receptors (R25 and R62) which have concentrations above the objective value. Following EPUK/IAQM Guidance, these moderate impacts constitute a potentially significant effect due to the scheme.

There are slight adverse impacts at six receptors (R14, R32, R33, R51, R57 and R60) due to the changes in traffic flow and/or speed as explained above. These receptors are either located along the A4 (R33, R60) or on other roads to the north of the scheme in Hammersmith. In this area, traffic is predicted to increase primarily along Shepherds Bush Road and Holland Road affecting concentrations at receptors such as R14, R32 and R51. There are also moderate to substantial adverse impacts predicted at eight receptors (R17, R19, R22, R44, R48, R58, R61 and R64). All of these receptors are located along the A4/M4 corridor and close to the M4 roundabout with Chiswick High Road, as this is where traffic flows are predicted to increase with the scheme. Concentrations at seven of these receptors are predicted to be above the annual mean objective with or without the scheme, and concentrations at R48 are predicted to increase with the scheme in place, from below the objective to 40.5 $\mu g/m^3$, which is just above the objective. Due to these high concentrations, following EPUK/IAQM guidance (see Table 7), even small changes in concentrations are described as moderate and constitute a potentially significant effect at individual receptors.

For PM_{10} and $PM_{2.5}$, the overall effect at all receptors due to the scheme is considered to be negligible. This is because concentrations are predicted to be below the relevant objective values and there is either no change in concentrations or a very small/small increase or decrease.

5.3 Emissions

Table 16 details the predicted annual emissions with and without the proposed scheme in 2021 for CO_2, NO_x and particulates (PM_{10} and $PM_{2.5}$) for over the entire study area.

Table 16: Regional Emissions

	Total Emissions, 2021 (tonnes/year)		
Pollutant	Without Scheme	With Scheme	Change
CO_2	120,669	121,737	+1,068
NO_x	243.4	245.5	+2.1
PM_{10}	24.8	24.8	<1
$PM_{2\,5}$	14.2	14.2	<1

Annual emissions of CO_2 and NO_x are predicted to increase slightly by 1% with the proposed scheme in place, compared to the situation without the scheme. Overall particulate emissions are unchanged.

5.4 Traffic Noise

Table 17 details the predicted road traffic noise levels with and without the proposed scheme in 2021, including the difference in noise between the two scenarios for the selected receptor locations. The majority of receptors consist of a number of floors. The results presented are for the floor which undergoes the predicted worst case change due to the proposed scheme (the total number of floors is provided in brackets). If all floors are predicted to experience an improvement in traffic noise, the floor which experiences the least improvement is reported. Details of the location of each receptor are included on Figure 1 in Appendix A.

An overview of the predicted changes in traffic noise levels at each selected receptor in 2021 is illustrated in Figure 3a, with magnified views containing the receptor labels from Table 2 are shown in Figures 3b, 3c and 3d. These figures are contained in Appendix A.

Table 17: Traffic Noise Results

Receptor	Location	Façade Direction	Floor (No. Floors)	Traffic Noise Level $L_{A10,18h}$ dB (façade)		Worst Case Change dB	Sensitivity of Receptor	Significance of Effect
				Without Scheme	With Scheme			
R1	Barker house, 75, British Grove,	N	2 (3)	63.8	61.7	-2.1	High	Slight Beneficial
R2	9, Heathfield Gardens	W	1 (2)	65.9	66.6	+0.7	High	Negligible
R3	44, Dukes Avenue	W	1 (3)	64.6	62.8	-1.8	High	Slight Beneficial
R4	Flat 1, 22a, Walpole Gardens	SE	G (3)	71.5	70.6	-0.9	High	Negligible
R5	23, Chiswick Lane	W	G (3)	69.5	69.3	-0.2	High	Negligible
R6	120, Sutton Court Road	W	1 (2)	70.1	70.3	+0.2	High	Negligible
R7	109, Grove Park Road	SW	G (2)	68.3	67.9	-0.4	High	Negligible
R8	1, Burford House, Ealing Road	SW	1 (4)	70.4	70.6	+0.2	High	Negligible
R9	391 Chiswick High Road	N	1 (3)	73.1	73.0	-0.1	High	Negligible
R10	167a, Acton Lane	W	G (2)	69.6	69.5	-0.1	High	Negligible
R11	30, The Avenue, Chiswick	W	1 (3)	68.5	68.2	-0.3	High	Negligible
R12	160, Hammersmith Grove	W	G (3)	65.6	65.7	+0.1	High	Negligible
R13	82, Hammersmith Grove	W	1 (3)	63.5	62.3	-1.2	High	Slight Beneficial
R14	238, Blythe Road	W	1 (3)	75.4	75.7	+0.3	High	Negligible
R15	Basement Flat, 76, Holland Road	SW	1 (4)	75.4	75.4	0.0	High	No Effect
R16	51, Brook Green	SW	G (2)	65.9	64.9	-1.0	High	Slight Beneficial
R17	200, Riverside Gardens	S	G (4)	79.3	79.2	-0.1	High	Negligible
R18	24, Fulham Palace Road	NE	2 (3)	79.1	79.0	-0.1	High	Negligible
R19	19, Weltje Road	N	1 (3)	78.3	78.2	-0.1	High	Negligible
R20	3, Linacre Court, Great Church Lane	S	5 (18)	72.5	72.5	0.0	High	No Effect
R21	Apartment 136, 8, Kew Bridge Road	NE	1 (5)	77.0	77.6	+0.6	High	Negligible
R22	Flat 31, Hamilton House, Hogarth Lane	SW	1 (5)	75.6	75.6	0.0	High	No Effect
R23	Beecham House, Brentford	NE	2 (3)	72.8	73.0	+0.2	High	Negligible
R24	Flat 5, Knowling Court, High Street, Brentford	NW	G (5)	75.0	74.3	-0.7	High	Negligible

Receptor	Location	Façade Direction	Floor (No. Floors)	Traffic Noise Level $L_{A10,18h}$ dB (façade)		Worst Case Change dB	Sensitivity of Receptor	Significance of Effect
				Without Scheme	With Scheme			
R25	Flat 25, 2, Kew Bridge Road	SW	G (4)	78.4	76.3	-2.1	High	Slight Beneficial
R26	17, Stamford Brook Road	N	G (2)	70.7	70.7	0.0	High	No Effect
R27	361-369, Kensington High Street	NW	1 (6)	76.7	75.7	-1.0	High	Slight Beneficial
R28	108, Kew Green	S	1 (3)	71.3	71.2	-0.1	High	Negligible
R29	Addley Court 435 Chiswick High Road	N	1 (4)	70.6	71.2	+0.6	High	Negligible
R30	17, Holland Gardens, Brentford	SE	G (7)	73.5	73.3	-0.2	High	Negligible
R31	4 Warwick Gardens	NW	1 (4)	71.9	71.4	-0.5	High	Negligible
R32	136, Holland Road	SW	1 (4)	76.5	76.7	+0.2	High	Negligible
R33	98, Airedale Avenue	S	1 (2)	76.7	76.7	0.0	High	No Effect
R34	27c, Wellesley Road	S	1 (3)	68.2	67.1	-1.1	High	Slight Beneficial
R35	Flat 1, 124, Edith Road	N	G (3)	70.9	71.1	+0.2	High	Negligible
R36	Flat 12b, Glyn Mansions, Hammersmith Road	N	1 (5)	74.6	74.4	-0.2	High	Negligible
R37	60a, Wellesley Road	E	G (3)	69.0	68.3	-0.7	High	Negligible
R38	1a, Acton Lane	SE	1 (3)	67.9	67.5	-0.4	High	Negligible
R39	Flat a, 276, King Street	S	1 (3)	71.3	72.1	+0.8	High	Negligible
R40	69, Stile Hall Gardens	S	2 (3)	65.1	55.7	-9.4	High	Substantial Beneficial
R41	228-227 A315, Brentford	N	1 (5)	75.9	75.8	-0.1	High	Negligible
R42	28, Acton Lane, Chiswick	SE	G (3)	69.7	69.7	0.0	High	No Effect
R43	First floor Flat a1, 111, High Street, Brentford	N	1 (3)	74.0	73.9	-0.1	High	Negligible
R44	186, Devonshire Road	SW	G (2)	63.7	63.3	-0.4	High	Negligible
R45	First Floor flat, 233, King Street	N	1 (4)	72.4	71.2	-1.2	High	Slight Beneficial
R46	544, Chiswick High Road	S	1 (6)	72.5	72.4	-0.1	High	Negligible
R47	22, Heathfield Terrace	N	1 (3)	66.4	66.5	+0.1	High	Negligible
R48	7, Falcon Close	N	1 (2)	76.8	77.0	+0.2	High	Negligible
R49	11 Heathfield Terrace	N	1 (3)	66.9	66.9	0.0	High	No Effect

Receptor	Location	Façade Direction	Floor (No. Floors)	Traffic Noise Level $L_{A10,18h}$ dB (façade)		Worst Case Change dB	Sensitivity of Receptor	Significance of Effect
				Without Scheme	With Scheme			
R50	133, Goldhawk Road	N	1 (3)	72.6	72.5	-0.1	High	Negligible
R51	1 Goldhawk Road	NE	1 (2)	78.0	78.4	+0.4	High	Negligible
R52	3, Woodstock Grove	NE	2 (3)	74.4	74.7	+0.3	High	Negligible
R53	49, Green Dragon Lane	S	G (2)	69.1	69.6	+0.5	High	Negligible
R54	525, Chiswick High Road	NE	1 (2)	72.8	72.8	0.0	High	No Effect
R55	3-4, Bedford Park Corner	NW	1 (2)	71.3	71.2	-0.1	High	Negligible
R56	2a, Stile Hall Parade, Chiswick High Road	NW	1 (3)	76.3	75.1	-1.2	High	Slight Beneficial
R57	First floor Flat, 7, Hammersmith Road	N	1 (4)	75.8	74.8	-1.0	High	Slight Beneficial
R58	30, Surrey Crescent	N	1 (2)	74.1	74.3	+0.2	High	Negligible
R59	12, South Parade	S	G (3)	68.3	68.3	0.0	High	No Effect
R60	42, Ellesmere Road	S	1 (2)	77.9	77.9	0.0	High	No Effect
R61	463, Chiswick High Road	W	G (2)	76.5	76.6	+0.1	High	Negligible
R62	79, Windmill Road	SW	1 (2)	75.0	75.1	+0.1	High	Negligible
R63	69, Ealing Road	E	G (2)	70.6	70.6	0.0	High	No Effect
R64	1, Chiswick Square	NW	1 (3)	73.3	73.3	0.0	High	No Effect
R65	126 King Street	S	1 (3)	73.0	71.8	-1.2	High	Slight Beneficial
R66	41, Turnham Green Terrace	W	1 (3)	72.8	72.4	-0.4	High	Negligible
R67	58, Turnham Green Terrace	S	1 (2)	75.6	75.1	-0.5	High	Negligible
R68	102-104, Hammersmith Road	S	1 (9)	75.4	72.7	-2.7	High	Slight Beneficial
R69	Brentford FC development, Lionel Road S	SE	1 (16)	72.9	72.4	-0.5	High	Negligible
R70	245, Hammersmith Road	N	1 (14)	71.9	71.3	-0.6	High	Negligible
R71	Flat 1, 29, London Road	NW	G (5)	74.4	74.3	-0.1	High	Negligible
R72	61, Whitestile Road	NW	1 (2)	55.6	55.2	-0.4	High	Negligible
R73	2b, Princes Avenue	NW	1 (2)	74.7	74.7	0.0	High	No Effect
R74	88, Devonshire Road	W	G (2)	64.7	64.2	-0.5	High	Negligible

Receptor	Location	Façade Direction	Floor (No. Floors)	Traffic Noise Level $L_{A10,18h}$ dB (façade)		Worst Case Change dB	Sensitivity of Receptor	Significance of Effect
				Without Scheme	With Scheme			
R75	Flat 1, 172, Southfield Road	S	G (2)	69.9	69.5	-0.4	High	Negligible
R76	29, Airedale Avenue	W	2 (3)	54.7	54.7	0.0	High	No Effect
R77	Flat 5, 114, Coningham Road	W	1 (3)	65.6	65.6	0.0	High	No Effect
R78	Room 3, 42, Glenthorne Road	S	1 (3)	69.0	69.2	+0.2	High	Negligible
R79	108, Blythe Road	S	G (4)	67.5	67.6	+0.1	High	Negligible
R80	11-12, Addison Road	SW	1 (3)	65.6	64.9	-0.7	High	Negligible
R81	School, 205, Warwick Road	N	G (4)	76.1	75.7	-0.4	High	Negligible
R82	School house, Dalling Road	E	1 (2)	60.0	60.3	+0.3	High	Negligible
R83	The little school, 42-43, Boston Park Road	SE	1 (2)	66.6	66.7	+0.1	High	Negligible
R84	Belmont Primary School, Belmont Road	SW	1 (4)	62.1	64.0	+1.9	High	Slight Adverse
R85	Speakeasy Language School, 24,Chiswick High Road	S	G (3)	73.6	74.1	+0.5	High	Negligible
R86	Mace Montessori School, 30-40, Dalling Road	W	G (3)	63.4	63.2	-0.2	High	Negligible
R87	West London Free School, Palingswick House, 241, King Street	N	1 (4)	65.0	64.9	-0.1	High	Negligible
R88	The Arts Educational London School, 14, Bath Road	N	G (4)	73.7	73.6	-0.1	High	Negligible
R89	Charing Cross Hospital, Fulham Palace Road	SW	1 (3)	73.2	73.1	-0.1	High	Negligible
R90	Clayponds Hospital, Sterling Place, Ealing	E	1 (2)	53.8	53.8	0.0	High	No Effect
R91	Ravenscourt Park Hospital, Ravenscourt Park	E	1 (5)	59.9	59.9	0.0	High	No Effect

Table 18 combines the sensitivity of the receptor with the magnitude of impact due to changes in road traffic noise (see Table 9 and Table 10) to provide a summary of the significance of effect due to the predicted changes in traffic noise. Red represents an increase and green a decrease in noise. Note that some receptors are predicted to experience no change in traffic noise and therefore do not have a descriptor in terms of significance but have been included in the table for completeness.

Table 18: Summary Significance of Effect Descriptor at Receptors – Traffic Noise

Receptor	Sensitivity of Receptor	Magnitude of Impact			
		Large	Medium	Small	Imperceptible
R84	High	-	-	Slight Adverse	-
R2, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R17, R18, R19, R21, R23, R24, R28, R29, R30, R31, R32, R35, R36, R37, R38, R39, R41, R43, R44, R46, R47, R48, R50, R51, R52, R53, R55, R58, R61, R62, R66, R67, R69, R70, R71, R72, R74, R75, R78, R79, R80, R81, R82, R83, R85, R86, R87, R88, R89	High	-	-	-	Negligible
R15, R20, R22, R26, R33, R42, R49, R54, R59, R60, R63, R64, R73, R76, R77, R90, R91	High	No change			
R1, R3, R13, R16, R25, R27, R34, R45, R56, R57, R65, R68	High	-	-	Slight Beneficial	-
R40	High	Substantial Beneficial	-	-	-

The selected receptors cover a relatively wide geographical area between Shepard's Bush and Brentford and as such overall road traffic noise levels vary considerably, from around 54-55 dB(A) at locations to the north-western edge of the modelled area such as Clayponds Hospital and Whitestile Road in South Ealing to around 77-79 dB(A) at busy locations for traffic such as Kew Bridge and the Hammersmith Flyover.

Overall the scheme has a negligible effect on road traffic noise exposure in most locations. There are slight beneficial effects at 12 of the 91 selected receptors locations, primarily along the cycle superhighway route itself between Earl's Court at the eastern end and Kew Bridge towards the western end. These benefits are generally realised as a result of the cycle superhighway moving

some of the traffic further from the building façade at these locations rather than any predicted significant change in traffic speed or volume.

The one substantial beneficial effect is reported for Stile Hall Gardens where the scheme will prevent vehicular access to the South Circular, considerably reducing traffic volumes, and therefore road traffic noise, on this road. There will also be greatly reduced traffic volumes on Wellesley Road, to the north of Site Hall Gardens, but an associated reduction in road traffic noise is not observed at R37 (60a Wellesley Road) since the modelled façade is the one facing Brooks Road.

There is only one selected receptor expected to experience a non-negligible adverse effect as a result of the scheme and this effect is not classed as significant. The slight adverse effect is predicted to occur at Belmont Primary School (R84) as a result of an increase in traffic volume on Dolman Road with the scheme in place. Nevertheless, overall levels are expected to remain below 65 dB(A) outside the school which is relatively quiet for the local area.

6. Conclusions

6.1 Summary

A summary of the overall findings of the air and noise assessments are presented below with recommendations on mitigation measures if required. The results of both assessments show a similar trend in changes to air quality and noise due to the scheme within the study area, although the magnitude of change at individual receptors may vary.

6.2 Air Quality

By the opening year of 2021, modelled annual mean NO_2 concentrations are predicted to be above the objective value with and without the scheme at many receptors close to busy roads, with the highest concentrations of just over 60 µg/m^3 predicted at receptor R22 at Hogarth Lane. The hourly mean NO_2 objective value may therefore be breached at this site. However, annual mean NO_2 concentrations at the majority of receptors that are located further from these main roads are predicted to be below the objective with or without the scheme. The relevant particulate (PM_{10} and $PM_{2\,5}$) objective values are also predicted to be met at all receptors.

The overall impact of the proposed scheme on annual mean NO_2 concentrations is considered to be negligible and therefore not significant at 72 of the 92 selected receptors. There are slight beneficial impacts at four receptors and moderate beneficial impacts at two receptors along the cycle superhighway route due to a combination of traffic reductions and segregated cycle lanes moving traffic further from the buildings. There are predicted to be slight adverse impacts at six receptors on roads away from the cycle superhighway route due to predicted increases in traffic due to diversions away from the route. This includes receptor locations along the A4 and M4 corridor, particularly close to the junctions with Chiswick High Road and A316 and at selected receptor locations on other roads close to Shepherds Bush Road and Holland Road in Hammersmith which are predicted to experience an increase in traffic and/or reduction in speed. There are moderate or substantial adverse impacts at eight further receptors along the A4/M4 corridor which constitutes a potentially significant effect. Concentrations at these receptors are above the annual mean objective, therefore even small increases can be potentially significant. At R48 (Falcon Close), concentrations are predicted to increase to a level above the objective with the scheme.

Any increases or decreases in annual mean and 24-hour mean PM_{10} and $PM_{2.5}$ concentrations due to the scheme are predicted to be negligible at all selected receptor locations.

The results of the air quality assessment suggest that the overall impact of the scheme is considered to have both beneficial and adverse effects in terms of air quality impacts but the majority of impacts are negligible. Overall, as there are both improvements and deteriorations in NO_2, and negligible changes in particulates, these effects are collectively considered to be balanced and overall not significant.

6.3 Traffic Noise

Overall the scheme has a negligible effect on road traffic noise exposure in most locations. There are some slight beneficial effects at selected receptor locations along the proposed route as a result of the cycle superhighway moving some of the traffic further from some building façades.

A substantial beneficial effect is expected at Stile Hall Gardens where the scheme will prevent vehicular access to the South Circular, drastically reducing traffic volumes, and therefore road traffic noise, on this road.

There is predicted to be one slight adverse impact, on Dolman Road (just north of Chiswick High Street), as a result of an increase in local traffic. Nevertheless, the overall impact of the scheme on road traffic noise is not considered significant.

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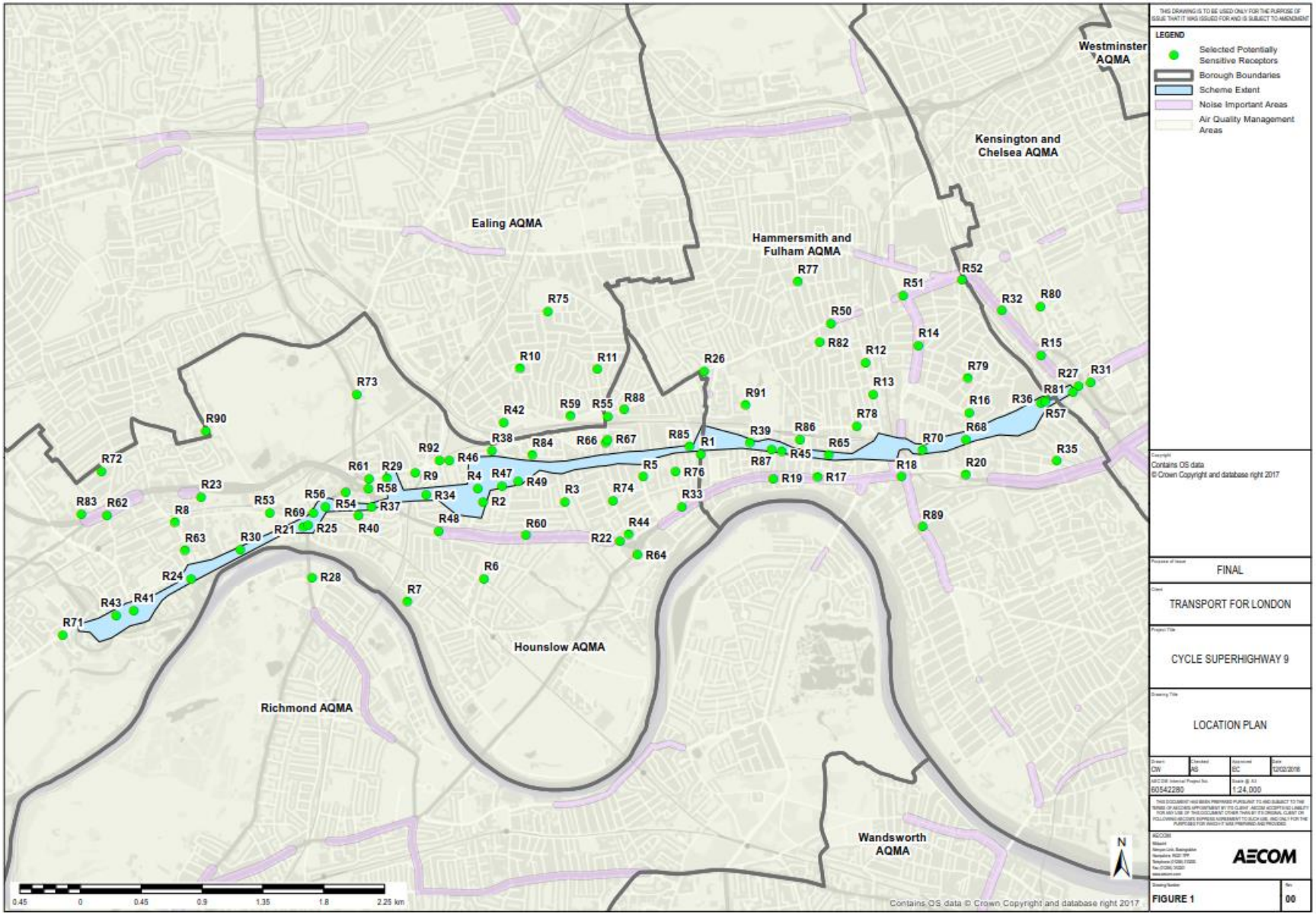
Appendix A Figures


Westminster AQMA
Kensington and Chelsea AQMA
Ealing AQMA
Hammersmith and Fulham AQMA
Hounslow AQMA
Richmond AQMA
Wandsworth AQMA
R1 R2 R3 R4 R5 R6 R7 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R34 R35 R36 R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65 R66 R67 R68 R69 R70 R71 R72 R73 R74 R75 R76 R77 R78 R79 R80 R81 R82 R83 R84 R85 R86 R87 R88 R89 R90 R91 R92
LEGEND
Selected Potentially Sensitive Receptors
Borough Boundaries
Scheme Extent
Noise Important Areas
Air Quality Management Areas
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FINAL
TRANSPORT FOR LONDON
CYCLE SUPERHIGHWAY 9
LOCATION PLAN
60542280
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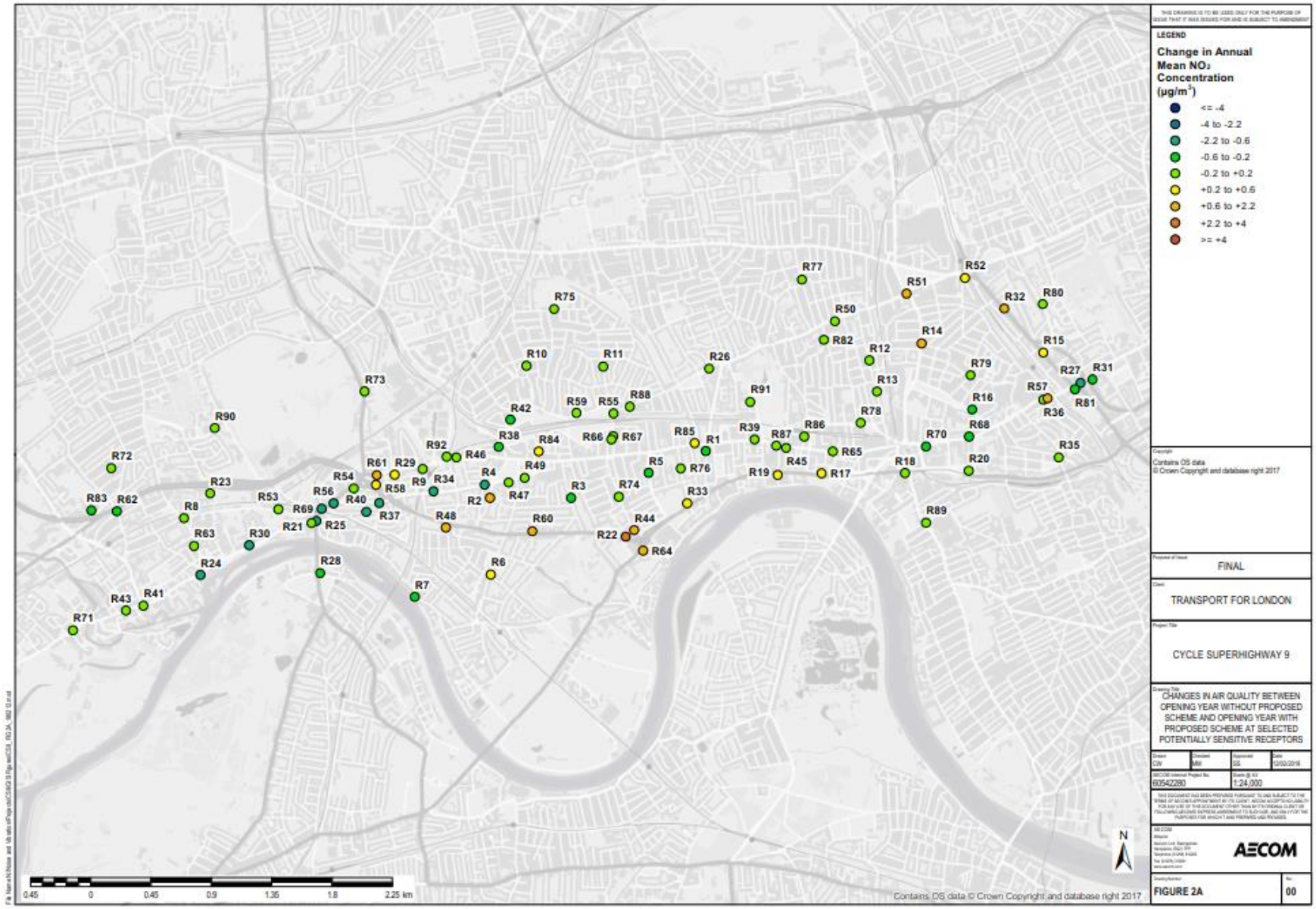
AECOM
FIGURE 1
00
N
0.45 0 0.45 0.9 1.35 1.8 2.25 km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Change in Annual Mean NO2 Concentration (µg/m3)
<= -4
-4 to -2.2
-2.2 to -0.6
-0.6 to -0.2
-0.2 to +0.2
+0.2 to +0.6
+0.6 to +2.2
+2.2 to +4
>= +4
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TRANSPORT FOR LONDON
CYCLE SUPERHIGHWAY 9
CHANGES IN AIR QUALITY BETWEEN OPENING YEAR WITHOUT PROPOSED SCHEME AND OPENING YEAR WITH PROPOSED SCHEME AT SELECTED POTENTIALLY SENSITIVE RECEPTORS
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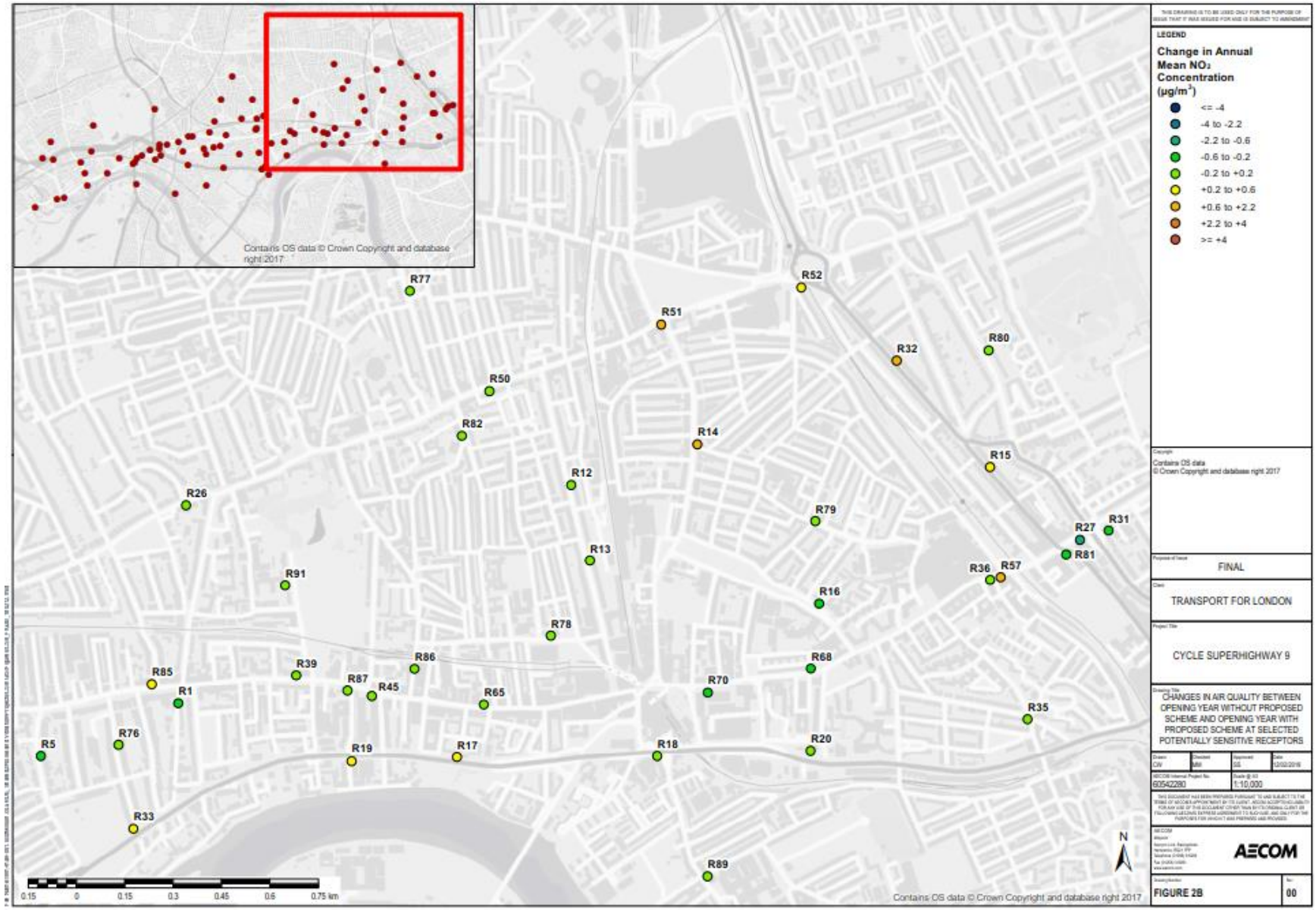
1:24,000
AECOM
FIGURE 2A
00
0.45 0 0.45 0.9 1.35 1.8 2.25 km
N


LEGEND
Change in Annual Mean NO2 Concentration (µg/m3)
<= -4
-4 to -2.2
-2.2 to -0.6
-0.6 to -0.2
-0.2 to +0.2
+0.2 to +0.6
+0.6 to +2.2
+2.2 to +4
>= +4
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TRANSPORT FOR LONDON
CYCLE SUPERHIGHWAY 9
CHANGES IN AIR QUALITY BETWEEN OPENING YEAR WITHOUT PROPOSED SCHEME AND OPENING YEAR WITH PROPOSED SCHEME AT SELECTED POTENTIALLY SENSITIVE RECEPTORS
60542280
1:10,000
AECOM
FIGURE 2B
00
0.15 0 0.15 0.3 0.45 0.6 0.75 km
N
R77
R51
R52
R32
R80
R50
R82
R14
R15
R12
R26
R79
R27
R31
R81
R13
R91
R36
R57
R16
R78
R68
R86
R39
R85
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R65
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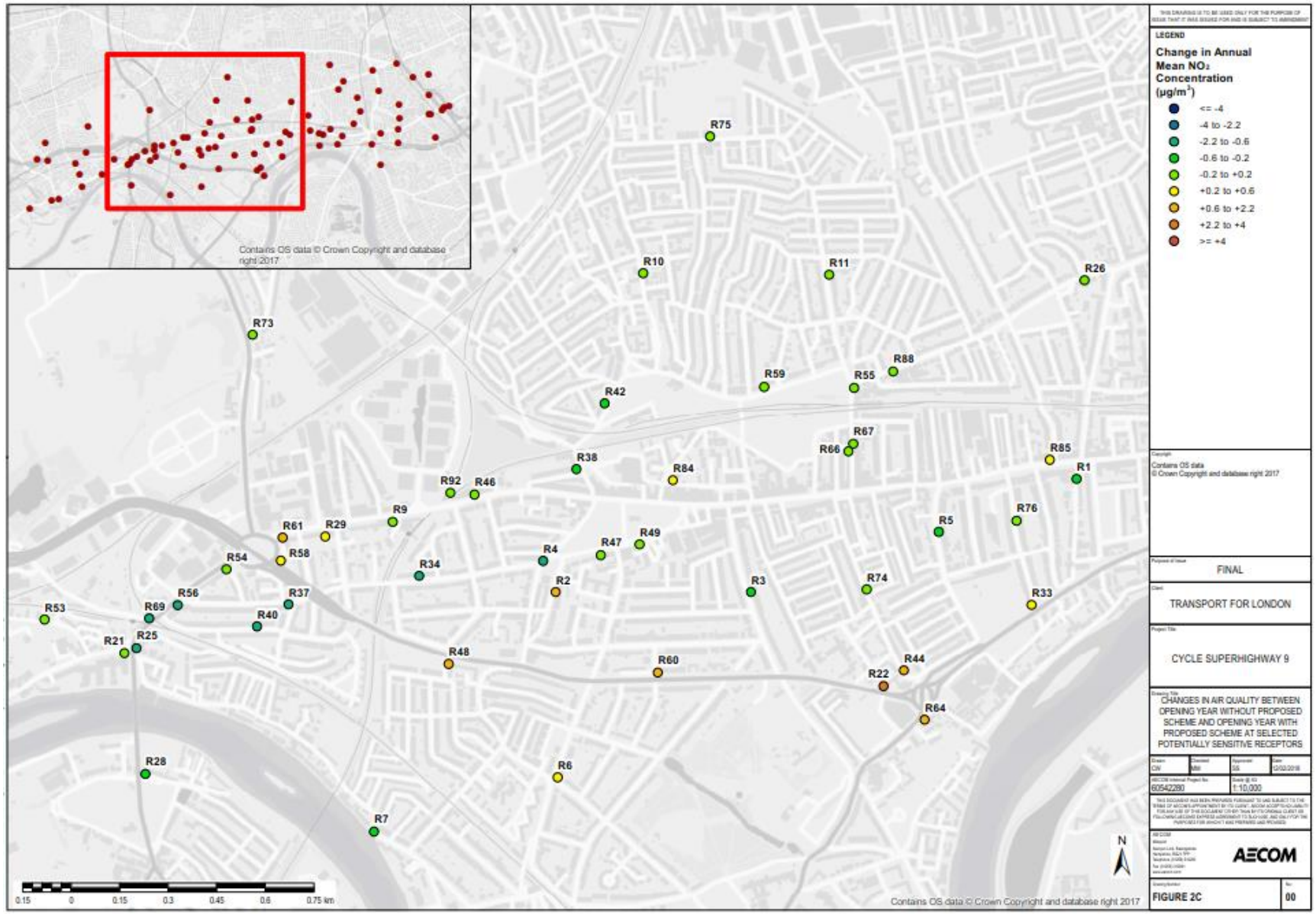
R35
R5
R76
R19
R17
R18
R20
R33
R89


LEGEND
Change in Annual Mean NO2 Concentration (µg/m3)
<= -4
-4 to -2.2
-2.2 to -0.6
-0.6 to -0.2
-0.2 to +0.2
+0.2 to +0.6
+0.6 to +2.2
+2.2 to +4
>= +4
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TRANSPORT FOR LONDON
CYCLE SUPERHIGHWAY 9
CHANGES IN AIR QUALITY BETWEEN OPENING YEAR WITHOUT PROPOSED SCHEME AND OPENING YEAR WITH PROPOSED SCHEME AT SELECTED POTENTIALLY SENSITIVE RECEPTORS
60542280
1:10,000
AECOM
FIGURE 2C
00
0.15 0 0.15 0.3 0.45 0.6 0.75 km
N
R75
R10
R11
R26
R73
R88
R59
R55
R42
R67
R66
R85
R1
R38
R84
R92
R46
R9
R76
R5
R61
R29
R49
R47
R4
R58
R54
R34
R2
R3
R74
R33
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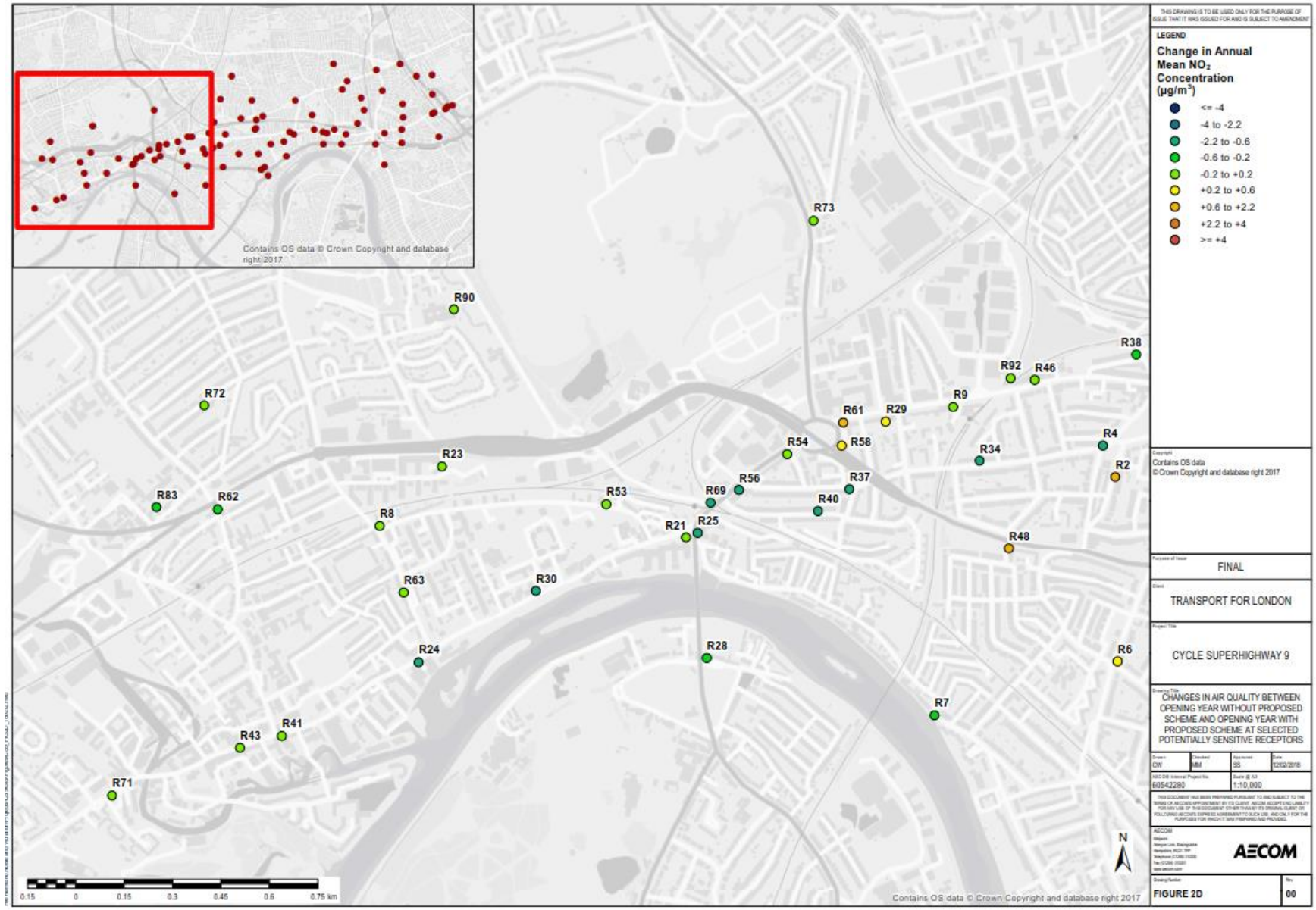
LEGEND
Change in Annual Mean NO_2 Concentration ($\mu g/m^3$)
<= -4
-4 to -2.2
-2.2 to -0.6
-0.6 to -0.2
-0.2 to +0.2
+0.2 to +0.6
+0.6 to +2.2
+2.2 to +4
>= +4
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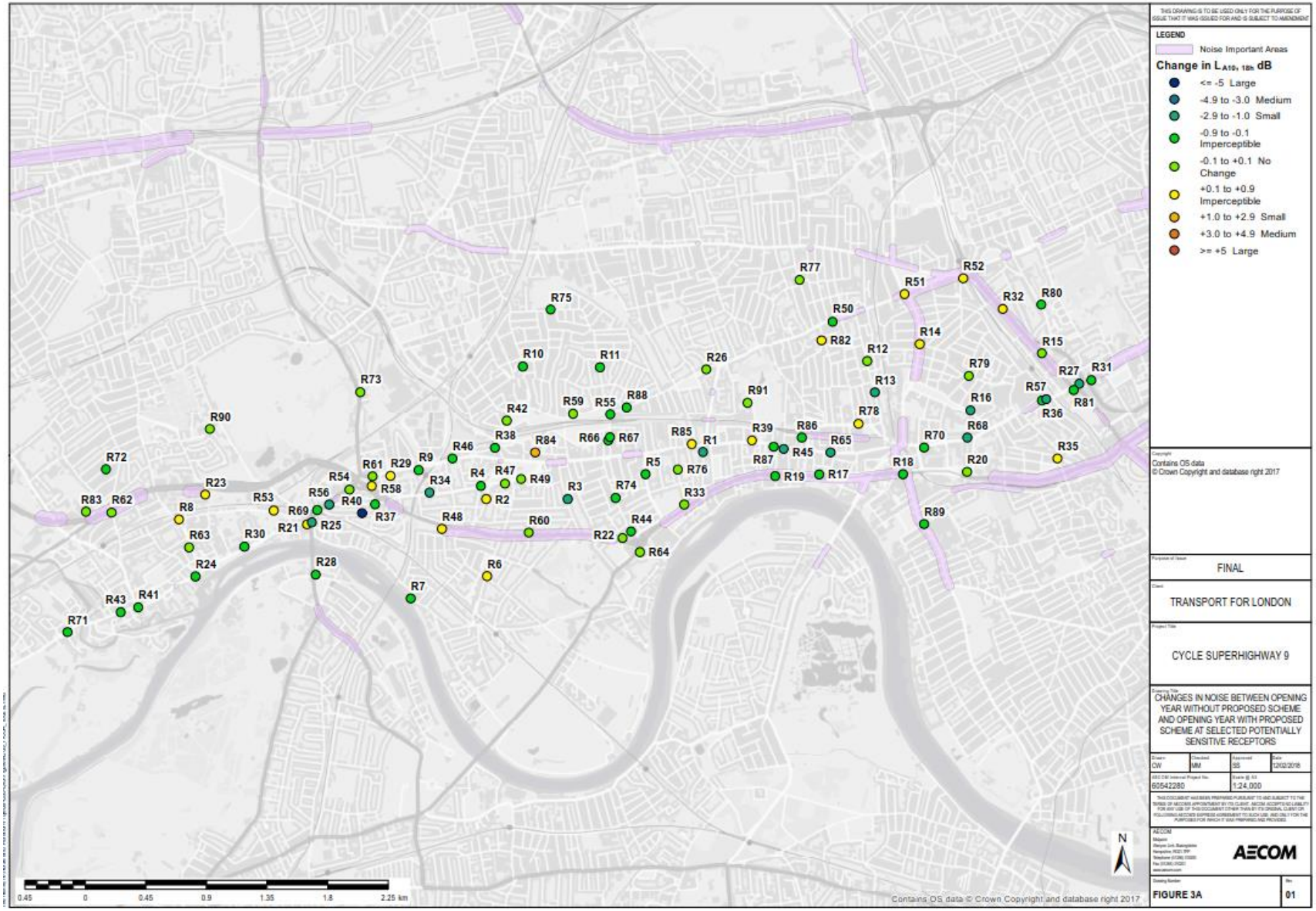
FINAL
TRANSPORT FOR LONDON
CYCLE SUPERHIGHWAY 9
CHANGES IN AIR QUALITY BETWEEN OPENING YEAR WITHOUT PROPOSED SCHEME AND OPENING YEAR WITH PROPOSED SCHEME AT SELECTED POTENTIALLY SENSITIVE RECEPTORS
60542280
1:10,000
AECOM
FIGURE 2D
00
N
0.15 0 0.15 0.3 0.45 0.6 0.75 km
R73
R90
R38
R92
R46
R72
R9
R61
R29
R4
R54
R58
R34
R2
R23
R56
R37
R83
R62
R53
R69
R40
R8
R21
R25
R48
R63
R30
R24
R28
R6
R7
R43
R41
R71


LEGEND
Noise Important Areas
Change in $L_{A10, 18h}$ dB
<= -5 Large
-4.9 to -3.0 Medium
-2.9 to -1.0 Small
-0.9 to -0.1 Imperceptible
-0.1 to +0.1 No Change
+0.1 to +0.9 Imperceptible
+1.0 to +2.9 Small
+3.0 to +4.9 Medium
>= +5 Large
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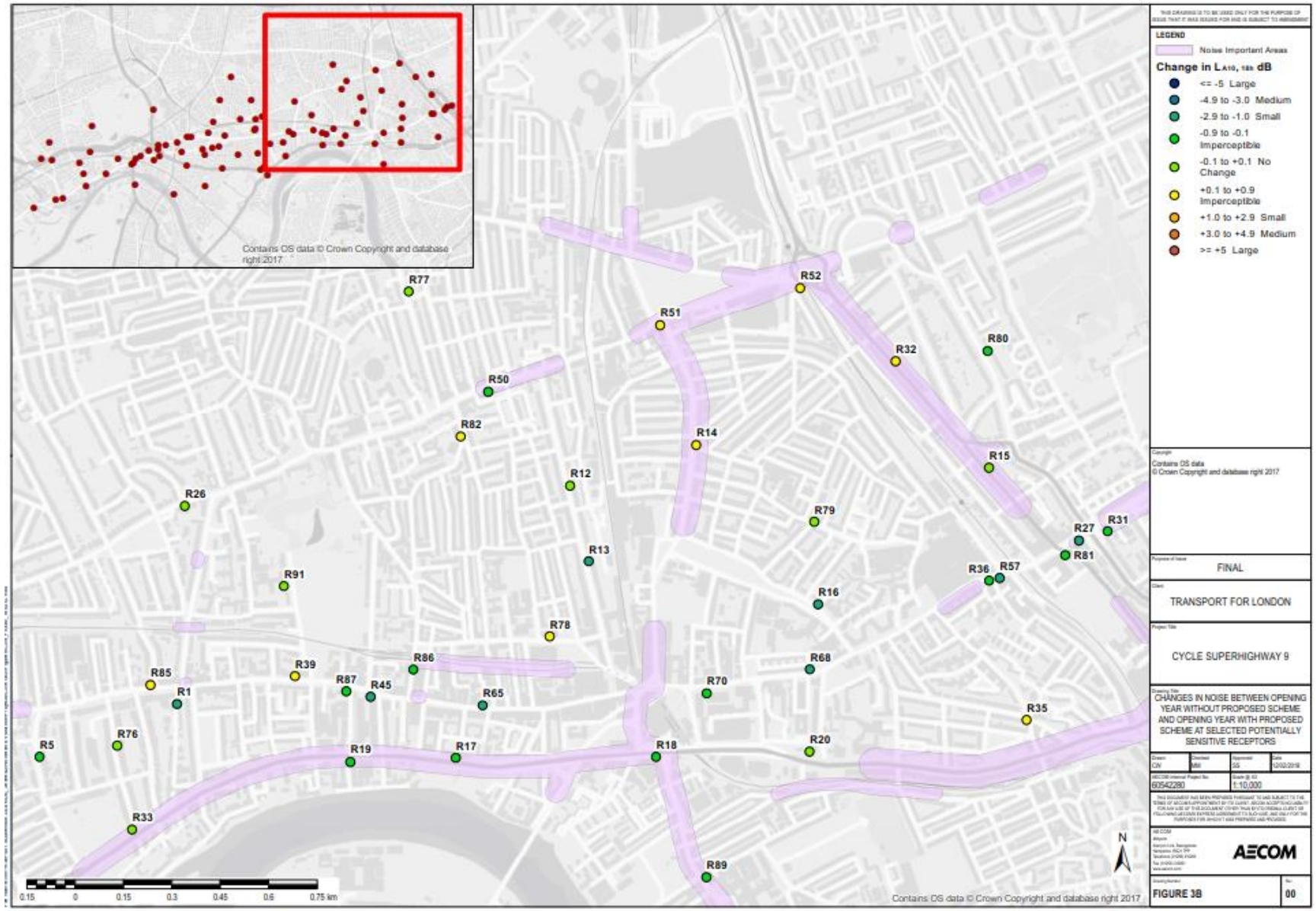
FINAL
TRANSPORT FOR LONDON
CYCLE SUPERHIGHWAY 9
CHANGES IN NOISE BETWEEN OPENING YEAR WITHOUT PROPOSED SCHEME AND OPENING YEAR WITH PROPOSED SCHEME AT SELECTED POTENTIALLY SENSITIVE RECEPTORS
60542280
1:24,000
AECOM
FIGURE 3A
01


LEGEND
Noise Important Areas
Change in LA10, 18h dB
<= -5 Large
-4.9 to -3.0 Medium
-2.9 to -1.0 Small
-0.9 to -0.1 Imperceptible
-0.1 to +0.1 No Change
+0.1 to +0.9 Imperceptible
+1.0 to +2.9 Small
+3.0 to +4.9 Medium
>= +5 Large
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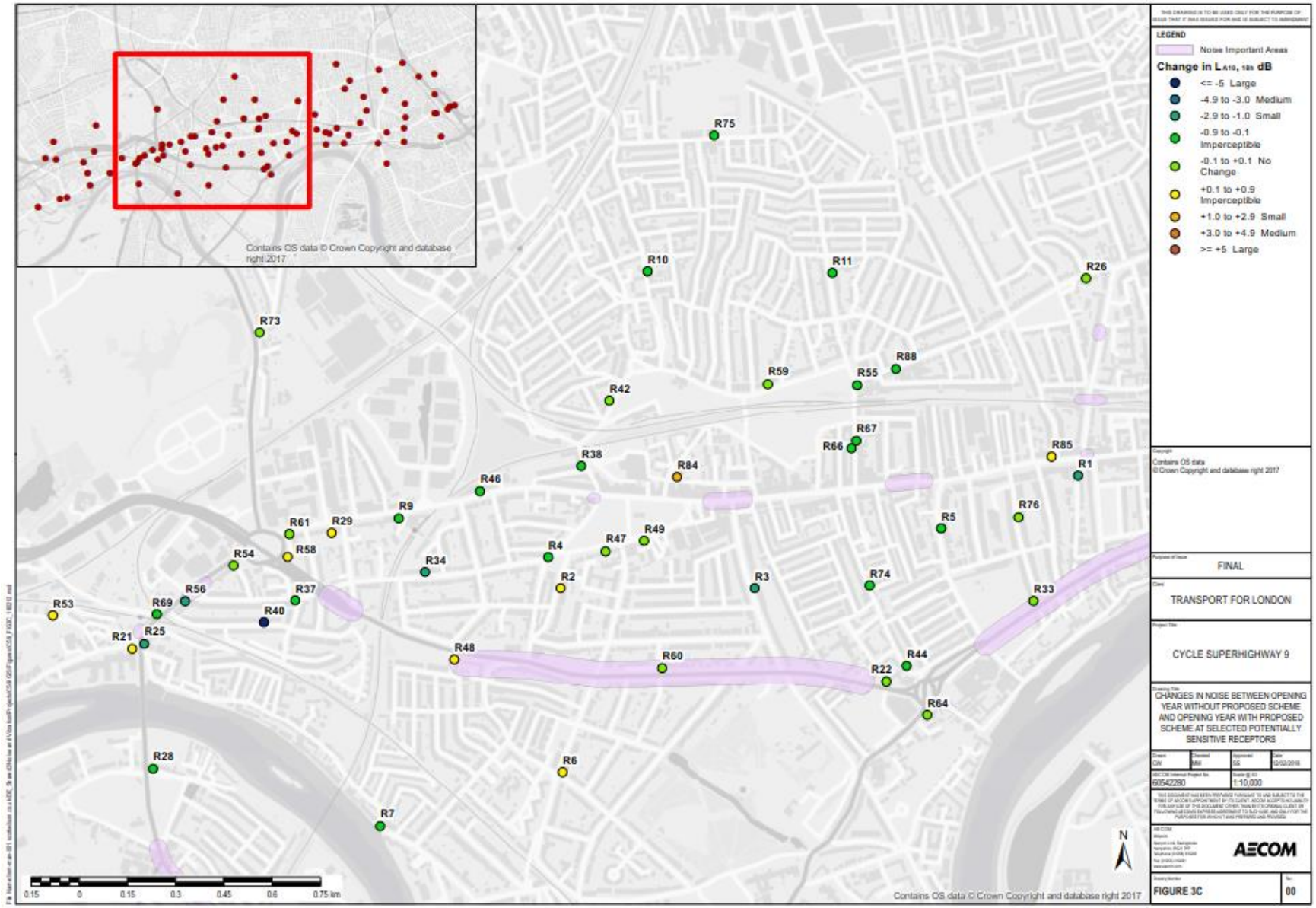
FINAL
TRANSPORT FOR LONDON
CYCLE SUPERHIGHWAY 9
CHANGES IN NOISE BETWEEN OPENING YEAR WITHOUT PROPOSED SCHEME AND OPENING YEAR WITH PROPOSED SCHEME AT SELECTED POTENTIALLY SENSITIVE RECEPTORS
60542280
1:10,000
AECOM
FIGURE 3B
00
N
0.15 0 0.15 0.3 0.45 0.6 0.75 km
R77
R52
R51
R32
R80
R50
R82
R14
R15
R12
R26
R79
R27
R31
R81
R13
R91
R36
R57
R16
R78
R39
R86
R68
R85
R87
R45
R70
R1
R65
R35
R76
R5
R19
R17
R18
R20
R33
R89


LEGEND
Noise Important Areas
Change in L A10, 18h dB
<= -5 Large
-4.9 to -3.0 Medium
-2.9 to -1.0 Small
-0.9 to -0.1 Imperceptible
-0.1 to +0.1 No Change
+0.1 to +0.9 Imperceptible
+1.0 to +2.9 Small
+3.0 to +4.9 Medium
>= +5 Large
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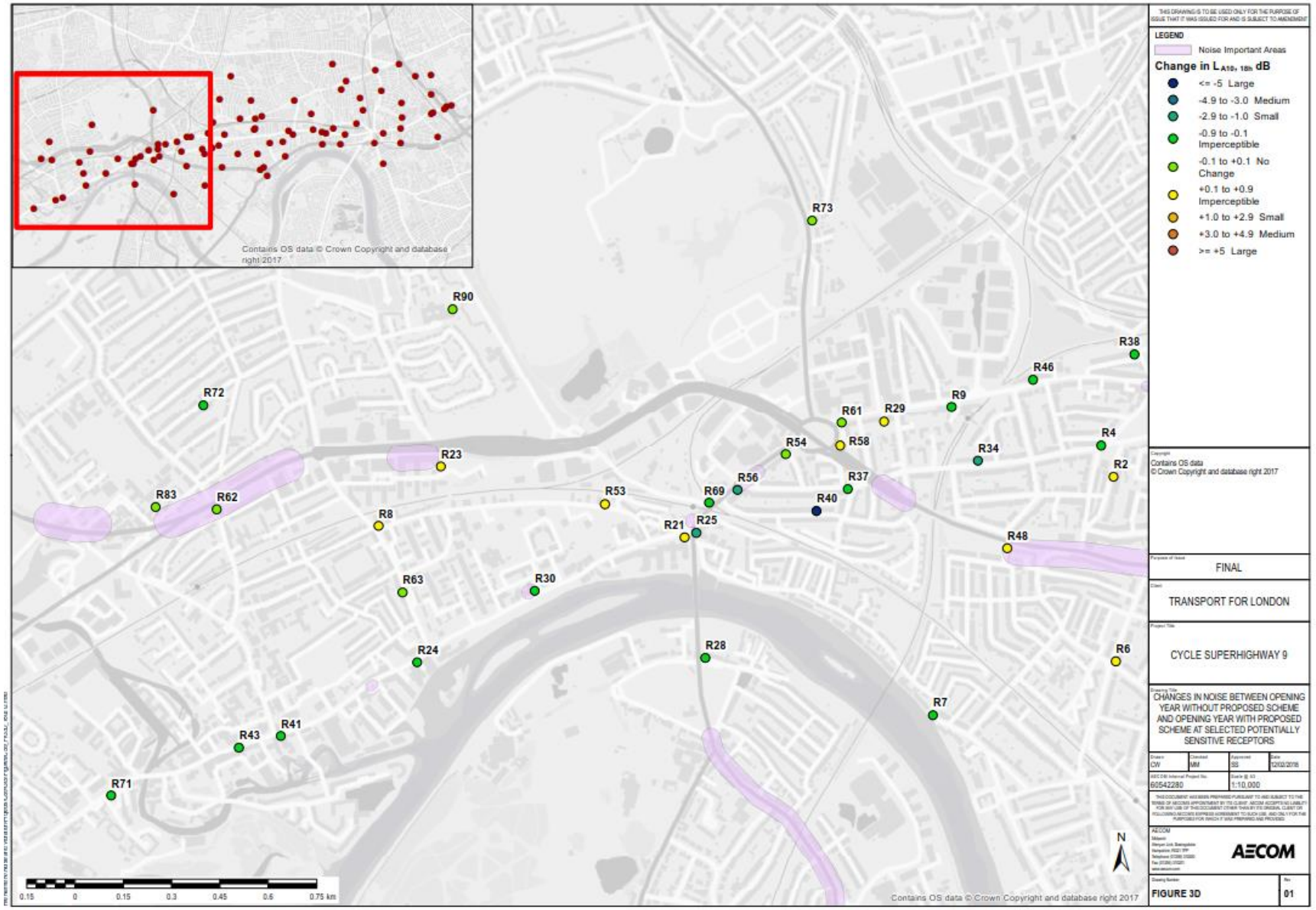
FINAL
TRANSPORT FOR LONDON
CYCLE SUPERHIGHWAY 9
CHANGES IN NOISE BETWEEN OPENING YEAR WITHOUT PROPOSED SCHEME AND OPENING YEAR WITH PROPOSED SCHEME AT SELECTED POTENTIALLY SENSITIVE RECEPTORS
60542280
1:10,000
AECOM
FIGURE 3C
00
0.15 0 0.15 0.3 0.45 0.6 0.75 km
N


LEGEND
Noise Important Areas
Change in $L_{A10, 18h}$ dB
<= -5 Large
-4.9 to -3.0 Medium
-2.9 to -1.0 Small
-0.9 to -0.1 Imperceptible
-0.1 to +0.1 No Change
+0.1 to +0.9 Imperceptible
+1.0 to +2.9 Small
+3.0 to +4.9 Medium
>= +5 Large
Contains OS data © Crown Copyright and database right 2017
FINAL
TRANSPORT FOR LONDON
CYCLE SUPERHIGHWAY 9
CHANGES IN NOISE BETWEEN OPENING YEAR WITHOUT PROPOSED SCHEME AND OPENING YEAR WITH PROPOSED SCHEME AT SELECTED POTENTIALLY SENSITIVE RECEPTORS
60542280
1:10,000
AECOM
FIGURE 3D
01
0.15 0 0.15 0.3 0.45 0.6 0.75 km
N
R73
R90
R38
R46
R72
R9
R61
R29
R4
R54
R58
R34
R2
R23
R56
R37
R83
R62
R53
R69
R40
R8
R21
R25
R48
R63
R30
R24
R28
R6
R7
R43
R41
R71

Appendix B Data and Assumptions

Data Provided:

- Ground heights from publically available LIDAR Digital Terrain Map data, downloaded at http://environment.data.gov.uk/ds/survey/index.jsp#/survey.
- Building heights from OS TOPO layer provided by TfL on 20th December 2017.
- OS mapping files from MasterMap® including ITN road centreline and TOPO layer from TfL on 20th December 2017.
- AddressBase® layer with building points and addresses provided by TfL on 21st December 2017.
- Road scheme layout provided by TfL in CAD format on 19th December 2017.
- AM (8am - 9am) and PM (5pm - 6pm) peak traffic data from ONE model provided by TfL for base (2016), future-base and proposed case (2021) on 19th December 2017.
- Ad hoc flow and speed data for selected locations provided by TfL on 21st December 2017.
- Automatic traffic count data (flow and speed) provided by TfL on 3rd January 2018.

Air Modelling Assumptions

- Traffic data converted to 24-hour AADT format based on existing traffic count data in the study area provided by TfL.
- NO_x, PM_{10} and $PM_{2.5}$ and CO_2 vehicle emission factors assumed for 2016 and 2021 as per information in Defra's latest Emission Factor Toolkit v8.0.1.
- Background NO_x, NO_2, PM_{10} and $PM_{2.5}$ concentrations assumed as per information in Defra's background maps for 2016 and 2021.
- Residential accommodation is assumed for ground floor (1.5m height) except where alternative information is known (for example where ground floor is commercial).

Noise Modelling Assumptions:

- Traffic data converted to 18-hour AAWT format based on existing traffic count data in the study area provided by TfL.
- Presumed that any average speeds less than 20 km/h are 20 km. in CRTN
- Predominantly hard ground assumed across the study area (ground absorption 0.0 or 0.2) except for park areas where soft ground assumed (ground absorption 1.0).
- Road surface correction: road surface correction of -1 dB(A) applied to all roads in accordance with guidance in DMRB and CRTN for Hot Rolled Asphalt).
- Existing building heights and number of floors based on a combination of Building heights from OS TOPO layer provided by TfL on 20th December 2017 and aerial photography.
- Buildings being constructed have been digitised based on information provided by TfL on committed developments on 21st December 2017 and determined by AECOM.

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