AIR QUALITY ASSESSMENT
CITROEN SITE, BRENTFORD

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A CONCEPT LIFE SCIENCES COMPANY

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EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by L&Q to undertake an Air Quality Assessment in support of a planning application for a proposed development located at the Citroen Site, Brentford.

The proposals comprise the redevelopment of the site to provide a mixed use scheme of 441 residential units (Class C3) including 50% affordable housing with ancillary facilities, flexible uses (within Classes A1, A2, A3 and B1) and a nursery (Class D1). Comprising buildings of 12, 13, 16, 17 and 18 storeys in height, with associated cycle parking, car parking, playspace, landscaping and public realm improvements.

The proposed development is located within an area identified by the London Borough of Hounslow as experiencing elevated pollutant concentrations and as such, there is the potential for the development to cause adverse impacts at nearby sensitive locations as well as have the potential to introduce future site users into an area of high pollutant concentrations. An Air Quality Assessment was therefore required to determine baseline conditions at the site, assess site suitability for the proposed end-use and assess the potential impacts as a result of the proposed development.

During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. It is considered that the use of good practice control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and to assess the potential for future users to be exposed to poor air quality. This indicated that annual mean nitrogen dioxide concentrations were below the relevant air quality standards at sensitive uses across the development site on all floor levels. However, predicted nitrogen dioxide concentrations were classified as APEC Category B at all sensitive uses on the ground and first floor level and some residential units located on the second and third floor levels. As such specific mitigation techniques will be required to protect future users from elevated concentrations.

Potential impacts during the operational phase of the development may also occur due to the combination of both road vehicle exhaust emissions and energy emissions associated with the operation of the boiler units. A detailed assessment was therefore undertaken in order to quantify pollutant levels with and without the proposals in place. The assessment concluded that overall impacts on pollutant levels at existing sensitive receptor locations were predicted to be **not significant.**

The London Plan states that new developments must be considered Air Quality Neutral. Pollutant emissions associated with energy consumption within the development and traffic generated by the development were compared to relevant benchmarks. This indicated that transport and energy emissions from the proposals were below the benchmark and as such, the development is considered Air Quality Neutral.

Based on the assessment results the site is considered suitable for the proposed end use subject to the inclusion of relevant mitigation measures, and complies with the London Plan, the London Borough of Hounslow Local Plan and relevant legislation.

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1 INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by L&Q to undertake an Air Quality Assessment in support of a planning application for a proposed development located at the Citroen Site, Brentford.

The proposals comprise the redevelopment of the site to provide a mixed use scheme of 441 residential units (Class C3) including 50% affordable housing with ancillary facilities, flexible uses (within Classes A1, A2, A3 and B1) and a nursery (Class D1). Comprising buildings of 12, 13, 16, 17 and 18 storeys in height, with associated cycle parking, car parking, playspace, landscaping and public realm improvements.

1.2 Site Location and Context

The Citroen Garage Site is located on Capital Interchange Way, Brentford, at approximate National Grid Reference (NGR):519090, 178310. Reference should be made to Figure 1 within Appendix I for a location plan.

The proposed development is located within the London Borough of Hounslow (LBH) Air Quality Management Area (AQMA) which has been declared for exceedances of the annual mean Air Quality Objective (AQO) for nitrogen dioxide (NO_2). As such, there is the potential for future residents to be exposed to an area of poor air quality. Additionally, there is the potential for the development to cause adverse impacts to existing pollution levels at nearby sensitive receptors within the AQMA. This is detailed in the following report.

1.3 Limitations

This report has been produced in accordance with REC's standard terms of engagement. REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC; a charge may be levied against such approval.

2 LEGISLATION AND POLICY

2.1 European Legislation

European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$). The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for NO_2, oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

2.2 UK Legislation

The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007[1]. The AQS sets out AQOs that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 1 presents the AQOs for pollutants considered within this assessment.

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/m^3)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean - 99.79th percentile (%ile)
PM_{10}	40	Annual Mean
CO	10,000	Maximum daily running 8-hour mean

Table 2 summarises the advice provided in Greater London Authority (GLA) guidance LLAQM.TG (16)[2] on where the AQOs for pollutants considered within this report apply.

Some short-term air quality criteria are framed in terms of the number of occasions in a calendar year on which the concentration should not be exceeded. As such, the percentiles shown in Table 2 were selected to represent the relationship between the permitted number of exceedances of short-period concentrations and the number of periods within a calendar year.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term

[2] London Local Air Quality Management Technical Guidance 2016 LLAQM.TG(16), GLA, 2016.

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
1-hour mean	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

2.3 Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of administration under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQOs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period are likely to be exceeded, the LA is required to declare an AQMA. For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 Dust

The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments, such as construction sites, is that provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

> *"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance."*

Enforcement of the Act, in regard to nuisance, is currently under the administration of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

2.5 National Planning Policy

2.5.1 National Planning Policy Framework

The National Planning Policy Framework[3] (NPPF) was published on 27th March 2012 and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment:

> *"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*
>
> *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."*

In March 2018 a draft revised NPPF was issued for consultation. The document contains the following paragraph which is relevant to this assessment:

> *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*

The implications of the NPPF and draft NPPF have been considered throughout this assessment.

2.5.2 National Planning Practice Guidance

The National Planning Practice Guidance[4] (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The relevant air quality sections are highlighted below:

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[3] National Planning Policy Framework, Department for Communities and Local Government, 2012.
[4] http://planningguidance.planningportal.gov.uk/

Paragraph 001 states that: *"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values" and "It is important that the potential impact of new development on air quality is taken into account, where the national assessment indicates that relevant limits have been exceeded or are near the limit". The role of Local Authorities under LAQM are stated and that Air Quality Action Plans should "identify measures that will be introduced in pursuit of the objectives"*

Paragraph 005 states that *"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation*

Paragraph 007 states that *"Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality". In terms of mitigation, it states that "Mitigation options where necessary will be location specific, will depend on the proposed development and should be proportionate to the likely impact".*

Paragraph 009 shows a flow chart highlighting how the assessment of air quality impacts should fit into the development management process. It makes it clear that air quality impact risks, AQLVs and AQOs should be considered in the decision-making process.

These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

2.6 Local Planning Policy

2.6.1 London Planning Policy

The Minor Alterations to The London Plan[5] was published in March 2016 and sets out a fully integrated economic, environmental, transport and social framework for the development of the capital until 2031. London boroughs' local plans need to be in general conformity with the London Plan, and its policies guide decisions on planning applications by councils and the Mayor.

The London Plan policies relating to air quality are outlined below:

"Policy 3.2 Improving health and addressing health inequalities

Strategic

- The Mayor will take account of the potential impact of development proposals on health and health inequalities within London. The Mayor will work in partnership with the NHS in London, boroughs and the voluntary and community sector as appropriate to reduce health inequalities and improve the health of all Londoners, supporting the spatial

[5] The London Plan, Minor Alterations to the London Plan, Greater London Authority, March 2016.

implications of the Mayor's Health Inequalities Strategy.

- The Mayor will promote London as a healthy place for all – from homes to neighbourhoods and across the city as a whole – by:

- Coordinating planning and action on the environment, climate change and public health to maximise benefits and engage a wider range of partners in action

[…]

- The impacts of major development proposals on the health and wellbeing of communities should be considered, for example through the use of Health Impact Assessments (HIA).

Planning decisions

- New developments should be designed, constructed and managed in ways that improve health and promote healthy lifestyles to help to reduce health inequalities.

Policy 5.3 - Sustainable design and construction

Strategic

- The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

Planning decisions

- Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

- Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

[…]

- Minimising pollution (including noise, air and urban run-off)

[…]"

Policy 7.14 - Improving air quality

Strategic

- The Mayor recognises the importance of tackling air pollution and improving air quality to London's development and the health and well-being of its people. He will work with strategic partners to ensure that the spatial, climate change, transport and design policies of this plan support implementation of his Air Quality and Transport strategies to achieve reductions in pollutant emissions and minimise public exposure to pollution.

Planning decisions

Development proposals should:

- 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).

- 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 Council's 'The control of dust and emissions from construction and demolition'.

- 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).

- 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."

These policies have been considered throughout the completion of this Air Quality Assessment.

The Draft New London Plan sets out the proposed development strategy for London from 2019 to 2041. It was consulted from 29th November 2017 until 2nd March 2018. A review of the Draft New London Plan indicated the following policy in relation to air quality:

"Draft Policy SI1 Improving air quality

London’s air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced:

- Development proposals should not:

a) lead to further deterioration of existing poor air quality

b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits

c) reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality

d) create unacceptable risk of high levels of exposure to poor air quality.

- Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality. Particular care should be taken with developments that are in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people.

- The development of large-scale redevelopment areas, such as Opportunity Areas and those subject to an Environmental Impact Assessment should propose methods of achieving an Air Quality Positive approach through the new development. All other developments should be at least Air Quality Neutral.

- Development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance

- Air Quality Assessments (AQAs) should be submitted with all major developments, unless they can demonstrate that transport and building emissions will be less than the previous or existing use.

- Development proposals should ensure that where emissions need to be reduced, this is done on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated.

This policy has been considered throughout the undertaking of this Air Quality Assessment. However, it should be noted that the plan carries limited weight in the determination of this application.

2.6.2 London Borough of Hounslow Local Plan

The Local Plan[6] was adopted by LBH in September 2015 and provides a framework for development within the borough until 2030. It includes a number of planning policies and strategic site allocations and supersedes the Employment Development Plan Document, the Brentford Area Action Plan and the Unitary Development Plan. As such, it provides the current basis for the determination of planning applications within LBH.

[6] The Hounslow Local Plan, London Borough of Hounslow, 2015

A review of the Local Plan indicated the following policy in relation to air quality:

"Policy EQ 4 – Air Quality

We will seek to reduce the potential air quality impacts of development and promote improved air quality conditions across the borough, in line with the Air Quality Action Plan.

We will achieve this by

(a) Assessing the potential air quality impacts of development proposals;

(b) Encouraging air quality-sensitive development to be located in the most appropriate places, and requiring mitigation measures to minimise adverse impacts on end users through planning conditions; and

(c) Ensuring that development does not exacerbate existing air quality, by promoting development that reduces and limits exposure to emissions through on-site mitigation and is 'air quality neutral', and through promoting sustainable design and seeking developer contributions where appropriate, consistent with the London Plan, the Mayor's Air Quality Strategy and the National Air Quality Strategy.

We will expect development proposals to

(d) Carry out air quality assessments where major development 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; and

(e) Incorporate mitigation measures where air quality assessments show that developments could cause or exacerbate air pollution, or where end users could be exposed to air pollution."

Reference has been made to these policies during the undertaking of this Air Quality Assessment.

2.6.3 London Borough of Hounslow Air Quality Action Plan

The London Borough of Hounslow Air Quality Action Plan (AQAP)[7] has involved a review of strategies, polices and plans which tackle or are in some way related to air quality in order to develop a clear, robust and meaningful set of actions that will provide a proportionate and cost-effective response to air quality issues within the borough.

The primary objectives of the AQAP are to provide an overview of measures that are being implemented as a result of national legislation and through local plans. The Plan also includes a

[7] The London Borough of Hounslow Air Quality Action Plan, London Borough of Hounslow, 2005

number of new initiatives that LBH and other bodies could undertake to help improve the air quality within the borough.

The AQAP considers a large number of measures and as such, they have been grouped into a series of 'packages'. For each measure, and within each package, an appraisal has been made to help determine the environmental, social and economic effect of each measure. This plan will allow councils to carry out their statutory duties under Part IV of the Environment Act 1995, as its implementation will help mandatory EU limit values to be met.

In June 2017 a draft revised AQAP[8] was issued for consultation. The document reviews the current air quality situation within the borough, indicating where exceedance of Limit Values is predicted to be most pronounced both in the present and in the future up until 2020, with some information for 2030.The report also demonstrates estimates of health impacts in terms of mortality burden.

The draft AQAP[8] reviews the progress of the original AQAP[7] and considers the measures of existing plans and policies to determine more suitable methods of implementation of the measures and the allocation of the specific actions to different parts of the council or the most relevant external organisations. This is to ensure that the relevant body has the power to implement the measures.

Considerations to both the original AQAP[8] and draft AQAP[7] has been made throughout the assessment.

[8] Revision of Hounslow's Air Quality Action Plan, London Borough of Hounslow, 2017

3 METHODOLOGY

The proposed development has the potential to cause air quality impacts during the construction and operational phases. These issues have been assessed in accordance with the following methodology. This methodology has been approved by Surinderpal Suri, Team Leader (interim) - Environmental Strategy, on 15/08/2017.

3.1 Construction Phase Assessment

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the (GLA) document 'The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance'[9].

Activities on the proposed construction site have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM_{10}.

The assessment steps are detailed below.

3.1.1 Step 1

Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the site boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary site or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should also proceed to Step 2.

Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

3.1.2 Step 2

Step 2 assesses the risk of potential dust impacts. A site is allocated to a risk category based on two

[9] The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance, GLA, 2016.

factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and
- The sensitivity of the area to dust impacts, which can defined as low, medium or high sensitivity (Step 2B).

The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 3

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Demolition	• Total building volume greater than 50,000m^3 • Potentially dusty construction material (e.g. concrete) • On-site crushing and screening • Demolition activities greater than 20m above ground level
	Earthworks	• Total site area greater than 10,000m^2 • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved
	Construction	• Total building volume greater than 100,000m^3 • On site concrete batching • Sandblasting
	Trackout	• More than 50 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Demolition	• Total building volume 20,000m^3 to 50,000m^3 • Potentially dusty construction material • Demolition activities 10m to 20m above ground level
	Earthworks	• Total site area 2,500m^2 to 10,000m^2 • Moderately dusty soil type (e.g. silt) • 5 to 10 heavy earth moving vehicles active at any one time • Formation of bunds 4m to 8m in height • Total material moved 20,000 tonnes to 100,000 tonnes

Magnitude	Activity	Criteria
	Construction	• Total building volume 25,000m^3 to 100,000m^3 • Potentially dusty construction material (e.g. concrete) • On site concrete batching
	Trackout	• 10 to 50 HDV trips per day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50m to 100m
Small	Demolition	• Total building volume under 20,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber) • Demolition activities less than 10m above ground level • Demolition during wetter months
	Earthworks	• Total site area less than 2,500m^2 • Soil type with large grain size (e.g. sand) • Less than 5 heavy earth moving vehicles active at any one time • Formation of bunds less than 4m in height • Total material moved less than 20,000 tonnes • Earthworks during wetter months
	Construction	• Total building volume less than 25,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	• Less than 10 HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

Step 2B defines the sensitivity of the area around the development site for earthworks, construction and trackout activities. The factors influencing the sensitivity of the area are shown in Table 4

Table 4 Examples of Factors Defining Sensitivity of an Area

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	• Users expect of high levels of amenity • High aesthetic or value property • People expected to be present continuously for extended periods of time • Locations where members of the public are exposed over a time period relevant to the AQO for PM_{10} e.g. residential properties, hospitals, schools and residential care homes	• Internationally or nationally designated site e.g. Special Area of Conservation

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
Medium	• Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	• Nationally designated site e.g. Sites of Special Scientific Interest
Low	• Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads	• Locally designated site e.g. Local Nature Reserve

The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts during the construction phase:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

These factors were considered in the undertaking of this assessment.

The sensitivity of the area to dust soiling effects on people and property is shown in Table 5.

Table 5 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

Table 6 outlines the sensitivity of the area to human health impacts.

Table 6 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m^3	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m^3	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m^3	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m^3	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	-	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
Low	-	1 - 10	Low	Low	Low	Low	Low

Table 7 outlines the sensitivity of the area to ecological impacts.

Table 7 Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

Table 8 outlines the risk category from demolition activities.

Table 8 Dust Risk Category from Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

Table 9 outlines the risk category from earthworks and construction activities.

Table 9 Dust Risk Category from Earthworks and Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table 10 outlines the risk category from trackout.

Table 10 Dust Risk Category from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

3.1.3 Step 3

Step 3 requires the identification of site specific mitigation measures within the GLA guidance to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with **negligible** risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

3.1.4 Step 4

Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.

The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The GLA[9] guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix IV.

3.2 Operational Phase Assessment

3.2.1 Future Exposure

The proposed development includes sensitive land use and is located within an AQMA, within close proximity to the local highway network. As such, the proposals have the potential to introduce new receptors into an area of existing poor air quality. Detailed dispersion modelling was therefore undertaken to quantify NO_2, PM_{10} and CO concentrations across the site and determine suitability for the proposed use. Reference should be made to Appendix II for details of the assessment inputs.

The results of the dispersion modelling assessment were compared against the Air Pollution Exposure Criteria (APEC) contained within the London Councils Air Quality and Planning Guidance[10] from the London Air Pollution Planning and the Local Environment (APPLE) working group. These are outlined in Table 11.

[10] London Councils Air Quality and Planning Guidance, London Councils, 2007.

Table 11 Air Pollution Exposure Criteria

Category	Applicable Range	Recommendation
APEC - A	Below 5% of the annual mean AQO	No air quality grounds for refusal; however mitigation of any emissions should be considered
APEC - B	Between 5% below or above the annual mean AQO	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g. maximise distance from pollutant source, proven ventilation systems, parking considerations, winter gardens, internal layout considered and internal pollutant emissions minimised
APEC - C	Above 5% of the annual mean AQO	Refusal on air quality grounds should be anticipated, unless the LA has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures

It should be noted that a significant area of London would fall under APEC - C due to high NO_2 concentrations throughout the city. As such, a presumption against planning consent in these locations may result in large areas of land becoming undevelopable and prevent urban regeneration. The inclusion of suitable mitigation measures to protect future users is therefore considered a suitable way to progress sustainable schemes in these locations and has been considered within this assessment.

3.2.2 Road Vehicle and On-site Energy Exhaust Emissions

The combination of associated vehicle trips and the energy emissions associated with the proposed CHP and boiler units will generate additional emissions. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

The assessment considered the following scenarios:

- 2016 Verification;
- Opening year do-minimum (DM) (predicted traffic flows in 2023 should the proposals not proceed including committed developments); and
- Opening year do-something (DS) (predicted traffic flows in 2023 should the proposed development be completed including committed developments, with the addition of traffic flows generated by the development and emissions associated with on-site energy generating activities).

Reference should be made to the Appendices for assessment input data.

Receptors potentially sensitive to changes in NO_2 concentrations were identified within the assessment extents. LLAQM.TG(16)[2] provides the following examples of where annual and 1-hour

AQOs should apply:

- Residential properties;
- Schools;
- Hospitals;
- Care homes; and
- Places of work

The sensitivity impact significance of each receptor was defined in accordance with the criteria shown in Table 12. These are based upon the guidance provided within the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance 'Land-Use Planning and Development Control: Planning for Air Quality'[11].

Table 12 Operational Traffic Exhaust Emissions - Significance of Impact

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial
110% or more of AQO	Moderate	Substantial	Substantial	Substantial

The criteria shown in Table 12 is adapted from the EPUK and IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality'[11] with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance.

It is not normal practice to use impact descriptors for short-term (hourly) impacts. However, the EPUK and IAQM guidance[11] suggests the following descriptors based on Environment Agency guidance.

Table 13 Short Term Process Contribution - Severity of Impact

% Change in Hourly Concentration Relative to AQO			
<10	10-20	20-50	>50
Negligible	Slight	Moderate	Substantial

[11] Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and Institute of Air Quality Management, 2017.

Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 12 and Table 13, the EPUK and IAQM[11] document states that this framework is to be used as a starting point to make a judgement on significance of effect but other influences might need to be accounted for. Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- The extent to which an objective is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3.

These factors were considered and an overall significance determined for the impact of operational phase road vehicle exhaust emissions and energy emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

3.3 Air Quality Neutral

An assessment is usually undertaken to compare benchmark emissions with the application site use emissions in accordance with the methodology outlined within the GLA Air Quality Neutral Planning Support GLA 80371[12]. The methodology is outlined below:

3.3.1 Air Quality Neutral Assessment

The following potential scenarios have been considered within the assessment:

- Benchmark; and
- Development.

The benchmark scenario is representative of annual NO_x benchmark emissions, which are target emissions as defined by the GLA Guidance[12]. The development scenario is representative of the annual NO_x emissions from the operation of the proposed development only.

The following emission source was considered during the assessment:

- Road vehicles travelling to and from the application site
- On-site energy generation

[12] Air Quality Neutral Planning Support: GLA 80371, Air Quality Consultants Ltd in association with ENVIRON UK Ltd, 2014.

3.3.2 Road Vehicle Exhaust Emissions

The proposed development has the potential to cause variations in exhaust emissions associated with vehicles travelling to and from the site. These were assessed by calculating annual emissions based on the anticipated traffic generated by the site and standard emission factors provided in the Air Quality Neutral Planning Support GLA 80371[12], as shown in Table 14.

Table 14 Air Quality Neutral Road Transport Emission Factors

Pollutant	g/vehicle-km in Outer London
NO_x	0.3530
PM_{10}	0.0606

3.3.3 Energy Emissions

The proposed redevelopment has the potential to change NO_x emissions as a result of variations in CHP and boiler technologies used in the provision of heating and hot water. This was assessed by calculating annual emissions based on the anticipated energy usage of the site and standard release rates provided by the Air Quality Neutral Planning Support GLA 80371[12].

4 BASELINE

Existing air quality conditions in the vicinity of the proposed development were identified in order to provide a baseline for assessment. These are detailed in the following sections.

4.1 Local Air Quality Management

As required by the Environment Act (1995), LBH has undertaken Review and Assessment of air quality within their area of administration. This process has indicated that annual mean concentrations of NO_2 are above the AQOs within the borough. As such, an AQMA has been declared, described as:

"Hounslow AQMA – An area encompassing the entire borough of Hounslow"

The proposed development site is located within the Hounslow AQMA. As such, there is the potential for future residents to be exposed to elevated pollutant concentrations, as well as the potential to cause adverse impacts to air quality within this area. This has been considered within this report.

LBH has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have been designated.

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by LBH using continuous and periodic methods throughout their area of administration. A review of the most recent Air Quality Report[13] indicates that there are two continuous monitors located within the assessment extents.

Recent monitoring results from these locations are shown in Table 15. Exceedances are shown in **bold.**

Table 15 Automatic NO_2 Monitoring Results

Site Name		NGR		Type	Annual Mean NO_2 Concentration ($\mu g/m^3$)	
		X	Y		2015	2016
HS5	Brentford	Roadside	517425	178074	**53.3**	**56.9**
HS8	Gunnersbury	Roadside	519184	179369	**53.0**	**59.1**

As indicated in Table 15 there were exceedances of the annual mean AQO for NO_2 at both sites in recent years. This is to be expected due to their roadside locations within an AQMA.

Both of these sites also monitor PM_{10} and recent results are shown in Table 16.

[13] Air Quality Annual Status Report, London Borough of Hounslow, 2016

Table 16 Automatic PM_{10} Monitoring Results

Site Name		NGR		Type	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	
		X	Y		2015	2016
HS5	Brentford	Roadside	517425	178074	31.1	30.7
HS8	Gunnersbury	Roadside	519184	179369	25.6	27.0

As indicated in Table 16 there were no exceedances of the annual mean AQO for PM_{10} at both sites in recent years.

LBH also utilise passive diffusion tubes to monitor NO_2 concentrations throughout the borough. A review of the most recent monitoring data available indicated that there are eleven diffusion tubes located in the assessment extents. Recent results are shown in Table 17. Exceedances of the AQO are shown in **bold**.

Table 17 Diffusion Tube Monitoring Results

Site ID		Type	NGR (m)		Annual Mean NO_2 Concentration ($\mu g/m^3$)	
			X	Y	2015	2016
HS32	24 Adelaide Terrace	Roadside	517592	178210	**58.8**	**59.4**
HS33	30 Surrey Crescent	Roadside	519452	178314	**59.4**	**57.6**
HS34	Chiswick Community School	Intermediate	521028	177321	32.8	34.0
HS35	Hogarth Primary School	Intermediate	521174	178069	34.6	37.2
HS69	Kew Bridge	Roadside	519005	178040	**60.1**	**55.4**
HS71	Gunnersbury Avenue	Roadside	519184	179369	**57.3**	**54.1**
BREN A,B,C	Brentford, Glenhurst Road	Roadside	517425	178071	**62.1**	**64.7**
CHIS A,B,C	Chiswick High Road	Roadside	521085	178499	**58.1**	**55.5**
20[a]	Mortlake Rd, Kew (nr. Kent Rd)	Kerbside	519205	177221	**48.0**	**47.0**
54[a]	Mortlake Road, adjacent to West Hall Road, Kew	Kerbside	519585	176492	**51.0**	**49.0**
66[a]	South Circular, Kew Green	Kerbside	519060	177428	-[b]	**49.0**

[a]Diffusion tubes are operated under the administration of the London Borough of Richmond upon Thames
[b]Diffusion tube was not operational in 2015

As indicated in Table 17, the annual mean AQO for NO_2 was exceeded at nine locations in recent years. This is to be expected due to their roadside and kerbside locations within an AQMA. Reference

should be made to Figure 2 within Appendix I for a graphical representation of all monitoring locations including both automatic and diffusion tube locations.

4.3 Background Pollutant Concentrations

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in grid square NGR: 519500, 178500. Data for this location was downloaded from the DEFRA website[14] for the purpose of this assessment and is summarised in Table 18.

Table 18 Predicted Background Pollutant Concentrations

Pollutant	Predicted 2016 Background Concentration (µg/m$^{3)}$
NO_2	31.83
NO_x	50.67
PM_{10}	18.87
CO	506.00

As shown in Table 18, background concentrations do not exceed the relevant AQOs. Comparison with the monitoring results indicates the impact that vehicle exhaust emissions from the highway network have on pollutant concentrations at roadside locations.

It should be noted that the background concentrations for CO were predicted for 2001. These were the most recent predictions available from DEFRA and are therefore considered to provide a reasonable representation of background concentrations in the vicinity of the site.

4.4 Sensitive Receptors

A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for dust and road vehicle exhaust emission impacts in the following Sections.

4.4.1 Construction Phase Sensitive Receptors

Receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 350m from the development boundary. These are summarised in Table 19.

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

Table 19 Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Less than 20	10 - 100	0
20 - 50	10 - 100	0
50 - 100	More than 100	-
100 - 350	More than 100	-

Reference should be made to Figure 3 within Appendix I for a graphical representation of earthworks and construction dust buffer zones.

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access. These are summarised in Table 20. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. However, it was assumed traffic would access the site from Capital Interchange Way, utilising either the A205 (South Circular Road) or the A4 (Great West Road).

Table 20 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Less than 20	10 - 100	0
20 - 50	More than 100	0

Reference should be made to Figure 4 within Appendix I for a graphical representation of trackout dust buffer zones.

There are no ecological receptors within 50m of the site or trackout boundary. As such, ecological impacts have not been assessed further within this report.

A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 21.

Table 21 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The site is located in a mixed Industrial and residential location. As such, history of dust generation is minimal

Guidance	Comment
The likelihood of concurrent dust generating activity on nearby sites	A review of the LBH planning portal indicated that there are 6 major planning applications within 500m of the proposed development. As such, there is the potential for concurrent dust generation due to overlapping construction phases
Pre-existing screening between the source and the receptors	The proposed site has no vegetation along the boundary.
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The wind direction is predominantly from the south-west and west of the development, as shown in Figure 5 within Appendix I. As such, properties to the north-east and east of the site would be most affected by dust emissions
Conclusions drawn from local topography	The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	The development opening year of 2023 suggests the duration of the construction phase is likely to extend over one years. As such potential impact to receptors is low
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline

Based on the criteria shown in Table 4, the sensitivity of the receiving environment to potential dust impacts was considered to be **high**. This was because users would expect to enjoy a reasonable level of amenity, aesthetics or value of their property could be diminished by soiling and people would be expected to be present for extended periods of time e.g. residential properties.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.1.2, is shown in Table 22.

Table 22 Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Low	Low	Low	Low

4.4.2 Operational Phase Sensitive Receptors

Receptors sensitive to potential operational phase energy emission impacts were identified from a desk-top study and are summarised in Table 23. Respective heights were model to reflect a worse case exposure from road vehicle emissions (1.5m) and worst case exposure from energy emissions, which is equivalent to the highest habitable floor level of each receptor building considered.

Table 23 Operational Phase Sensitive Receptor Locations

Receptor		NGR (m)		Height (m)
		X	Y	
R1	Block K, Capital Court Site	519051.0	178257.9	1.5
R1a	Block K, Capital Court Site	519051.0	178257.9	36
R2	Block J, Capital Court Site	519032.3	178265.6	1.5
R2a	Block J, Capital Court Site	519032.3	178265.6	51
R3	Block J, Capital Court Site	519024.4	178281.5	1.5
R3a	Block J, Capital Court Site	519024.4	178281.5	51
R4	Block I, Capital Court Site	519027.0	178311.6	1.5
R4a	Block I, Capital Court Site	519027.0	178311.6	48
R5	Block H, Central Eastern Site	518999.0	178385.7	1.5
R5a	Block H, Central Eastern Site	518999.0	178385.7	55.5
R6	Block G, Central Eastern Site	518972.4	178359.5	1.5
R6a	Block G, Central Eastern Site	518972.4	178359.5	58
R7	Wheatstone House	519214.3	178324.3	26.5
R8	Wheatstone House	519213.9	178335.2	26.5
R9	Wheatstone House	519224.0	178344.0	26.5
R10	Kew House School	519092.7	178204.8	1.5
R10a	Kew House School	519092.7	178204.8	15.4
R11	Kew House School	519071.5	178163.8	1.5
R12	55 Kew Bridge Road	518952.0	178065.0	1.5
R13	Stile Hall Mansions, Wellesley Road	519135.0	178176.0	4.5
R14	551 Chiswick High Road	519209.0	178236.0	1.5
R15	Wheatstone House	519269.0	178319.0	1.5
R16	6 Stonehill Road	519366.0	178283.0	1.5

Receptor		NGR (m)		Height (m)
R17	30 Surrey Crescent	519452.0	178314.0	1.5
R18	463 Chiswick High Road	519461.0	178384.0	1.5
R19	447 Chiswick High Road	519536.0	178395.0	1.5
R20	International School of London	519318.9	178798.1	1.5
R21	406 High Street	518662.5	177939.9	1.5

The sensitive receptors identified in Table 23 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the application site that may experience air quality impacts as a result of the proposed development that have not been individually identified above. Reference should be made to Figure 6 within Appendix I for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

5 ASSESSMENT

There is the potential for air quality impacts as a result of the construction and operation of the proposed development. These are assessed in the following Sections.

5.1 Construction Phase Assessment

5.1.1 Step 1

The undertaking of activities such as demolition, excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.

The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

5.1.2 Step 2

Demolition

Demolition will involve the removal of the existing building structures. It is anticipated that the volume of buildings to be demolished is likely to be between 20,000m^3 and 50,000m^3. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **medium.**

Table 22 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 8, the development is considered to be a **medium** risk site for dust soiling as a result of demolition activities.

Table 22 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for human health as a result of demolition activities.

Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. Information on soil type was not available for the purpose of this assessment. As such, the soil type was considered to be potentially dusty in order to provide a worst-case scenario.

The proposed development site is estimated to cover a total area between 2,500m^2 and 10,000m^2. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **medium.**

Table 22 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **medium** risk site for dust soiling as a result of earthworks activities.

Table 22 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health as a result of earthwork activities.

Construction

Due to the size of the development site the total building volume is likely to be above 100,000m^3. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **large**.

Table 22 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **high** risk site for dust soiling as a result of construction activities.

Table 22 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health as a result of construction activities.

Trackout

Information on the number of HDV trips to be generated during the construction phase of the development provided by Peter Brett Associates LLP indicated that the peak period of construction will be in November 2019 with 65 HGV movements to site across a day (130 two-trips). In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **large**.

Table 22 indicates the sensitivity of the area to dust soiling effects to people and property is **high**. In accordance with the criteria outlined in Table 10, the development is considered to be a **high** risk site for dust soiling as a result of trackout activities.

Table 22 indicates the sensitivity of the area to human health is **low**. In accordance within the criteria outlined in Table 10, the development is considered to be a **low** risk site for human health as a result of trackout activities.

Summary of the Risk of Dust Effects

A summary of the risk from each dust generating activity is provided in Table 24.

Table 24 Summary of Potential Unmitigated Dust Risks

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	High	High
Human Health	Low	Low	Low	Low

As indicated in Table 24, the potential risk of dust soiling is **high** from construction and trackout activities and **medium** from demolition and earthworks activities. The potential risk of human health impacts is **low** for demolition, earthworks construction and trackout activities.

It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

5.1.3 Step 3

The GLA guidance provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the development site as summarised in Table 25.

Table 25 Fugitive Dust Mitigation Measures

Issue	Control Measure
Communications	• Develop and implement a stakeholder communication plan that includes community engagement before work commences on site • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary • Display the head or regional office contact information • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA
Site Management	• Record all dusty and air quality complaints and make the complaints log available to the LA when asked • Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation • Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised
Monitoring	• Undertake daily on-site and off-site inspection where receptors are nearby to monitor dust • Carry out regular site inspections to monitor compliance with the DMP • Increase frequency of site inspections when activities with a high potential to produce dust are being carried out

Issue	Control Measure
Preparing and Maintaining the Site	• Plan site layout so that machinery and dust causing activities are located away from receptors • Fully enclose site or specific operations where there is a high potential for dust production and the site as actives for an extensive period • Avoid site runoff of water or mud • Keep site fencing, barriers and scaffolding clean using wet methods • Remove materials that have a potential to produce dust from site as soon as possible • Cover, seed or fence stockpiles to prevent wind whipping Use water as dust suppressant where applicable
Operating Vehicle/ Machinery and Sustainable Travel	• Ensure all on-road vehicles comply with the requirements of the London low emission zone and the London NRMM standards, Where applicable • All vehicles to switch off engines - no idling vehicles • Avoid the use of diesel or petrol-powered generators where practicable • Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph in unsurfaced haul roads • Produce a construction logistics plan to manage the sustainable delivery of goods and materials • Implement a travel plan that supports and encourages sustainable travel.
Operations	• Cutting equipment to use water as dust suppressant or suitable local extract ventilation • Ensure adequate water supply on the site for effective dust/particulate matter suppression/mitigation • Use enclosed chutes and covered skips • Minimise drop heights • Ensure equipment is readily available on site to clean any spillages
Waste Management	• No bonfires
Demolition	• Soft strip inside buildings before demolition • Ensure effective water suppression is used during demolition operations. • Avoid explosive blasting - use appropriate manual alternatives • Bag or remove any debris
Earthworks and Construction	• Avoid scabbling (roughening of concrete surfaces) • Ensure bulk cement and other fine powders are stored in bunded area and are not allowed to dry out unless this is required for a particular process • Ensure bulk cement and other fine powder materials are delivered and stored to prevent escape
Trackout	• Use water-assisted dust sweeper on the access and local roads • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving sites are covered to prevent escape of materials • Inspect on-site routes for integrity, instigate necessary repairs and record in

Issue	Control Measure
	site log book • Install hard surfaced haul routes which are regularly damped down • Implement a wheel washing system at a suitable location near site exit • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits • Access gates to be located at least 10m from receptors, where possible

5.1.4 Step 4

Assuming the relevant mitigation measures outlined in Table 25 are implemented, the residual effect from all dust generating activities is predicted to be **not significant**, in accordance with the GLA guidance[9].

5.2 Operational Phase Assessment - Future Exposure

The proposed development has the potential to expose future users to elevated pollution levels. This was assessed through dispersion modelling, with the results presented in the following Sections.

5.2.1 Nitrogen Dioxide - Annual Mean

Annual mean NO_2 concentrations predicted across the entire development site for the DM and DS scenarios at the following building heights of 2.25m, 6.10m, 9.20m, 12.40m, 15.50m and 56.50m to represent exposure across the ground, first, second, third, fourth and seventeenth floor of the proposed development, respectively. Reference should be made to Figures 7 to 13 within Appendix I. It should be noted that the ground level of the proposed development represents worst-case locations from road vehicle exhaust emissions and the seventeenth floor represents worst-case locations from the energy emissions.

Predicted annual mean NO_2 concentrations across the proposed sensitive uses (residential units and nursery) from ground floor to fourth floor level for the DS scenario are summarised in Table 26.

Table 26 Predicted Annual Mean NO_2 Concentrations

Floor	Predicted 2023 Annual Mean NO_2 Concentration Range ($\mu g/m^3$)	APEC Category
Ground Floor (2.25m)	38.13 - 38.81	B
First Floor (6.10m)	37.84 - 39.04	A - B
Second Floor (9.20m)	37.04 - 38.93	A - B
Third Floor (12.40m)	36.49 - 38.17	A - B
Fourth Floor (15.50m)	36.09 - 37.38	A

Table 26 indicates that predicted NO_2 concentrations did not exceeded the annual mean AQO across all levels at proposed sensitive locations. However, there were exceedances of the annual mean AQO

for NO_2 across the development site boundary on the ground and first floor levels, as shown in Figures 8 and 9 within Appendix I.

As indicated in Table 26, all sensitive locations on the ground floor levels are classified as APEC - B in accordance with the London Councils Air Quality and Planning Guidance[10]. Additionally, concentrations at the sensitive uses on the first, second and third floor levels were predicted to range between APEC - A and APEC - B. It is important to note that levels between fourth and seventeenth floor were predicted to be APEC - A.

Based on the dispersion modelling results the implementation of mitigation measures is required to protect future residents from poor air quality at ground, first, second and third floor level. Further details on required mitigation techniques are detailed in Section 6. It should be noted that the annual mean AQO does not apply at commercial areas and therefore mitigation measures are not required at these building uses on the ground and first floor level.

5.2.2 Nitrogen Dioxide - 1-Hour Mean

Predicted 99.79th percentile of hourly mean NO_2 concentrations were modelled across the development site at ground floor level (2.25m) for the DM and DS scenarios and the seventeenth floor level (56.50m) for the DS scenario, as shown in Figures 14 to 16 within Appendix I. The predicted concentrations for the DS scenarios across the development site are summarised in Table 27 for the development opening year.

Table 27 Predicted 1-Hour Mean NO_2 Concentrations

Floor Height	Predicted 2023 Hourly 99.79th %ile NO_2 Concentration Range (µg/m^3)
Ground Floor (2.25m)	68.34 - 70.61
Seventeenth Floor (56.50m)	64.50 - 92.34

As indicated in Table 27, there are no predicted exceedances of the hourly AQO across the development site.

5.2.3 Particulate Matter - PM_{10} Annual Mean

Annual Mean PM_{10} concentrations were modelled across the development site at ground floor level (2.25m) for the DM and DS scenarios, as shown in Figures 17 to 18 within Appendix I. The predicted concentrations for the DS scenarios across the development site are summarised in Table 28 for the development opening year.

Table 28 Predicted Annual Mean PM_{10} Concentrations

Floor	Predicted 2023 Annual Mean PM_{10} Concentration Range (µg/m^3)	APEC Category
Ground Floor (2.25m)	28.78 - 29.13	A

As indicated in Table 28 there were no predicted exceedances of the annual mean AQO for PM_{10} across the proposed development. It should be noted that Figures showing predicted annual mean

PM_{10} concentrations at heights above the ground floor were not included as concentrations reduce at increased heights and therefore the relevant AQO will not be exceeded at other levels.

5.2.4 Carbon Monoxide - 8-Hour Rolling Mean

Predicted 8-hour rolling mean CO concentrations as a result of the CHP and boiler units were modelled across the seventeenth-floor level (56.50m) of the proposed development during the DS scenario as shown in Figure 19 within Appendix I. The predicted concentrations for the DS scenario across the development site are summarised in Table 29 or the development opening year.

Table 29 Predicted 8-Hour Rolling Mean CO Concentration

Floor Height	Predicted 2023 8-Hour Rolling Mean Concentration Range (µg/m^3)
Seventeenth Floor (56.50m)	1012.66 - 1040.22

As indicated in Table 29 there were no predicted exceedances of the 8-hour rolling mean AQO for CO across the proposed development.

5.3 Operational Phase Assessment - Sensitive Receptors

The development has the potential to impact on existing air quality as a result of operational phase emissions, as well as exposing future users to elevated pollutant levels. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

The assessment considered the following scenarios:

- 2016 Verification;
- 2023 DM; and
- 2023 DS.

The DM (i.e. without development) scenario is representative of anticipated traffic data for 2023. The DS (i.e. with development) scenarios are representative of anticipated traffic data for 2023 in addition to vehicle trips associated with the proposals and emissions from the proposed CHP and boiler units.

For the purpose of this assessment traffic data was supplied for 2023, the development opening year. Emission factors for the assessment were calculated using the Calculator Using Realistic Emissions for Diesels (CURED, version V3A), development by Air Quality Consultants Ltd. This calculator gives realistic, worst case emission factors for diesels for future years which utilise recent real-world emissions test data. It should be noted that PM_{10} emission factors were calculated using the Emission Factor Toolkit (version 8.0.1) for the 2016 Verification scenario and the 2023 Opening Year scenario.

The use of 2023 traffic data and emission factors calculated using the CURED approach is considered to provide a robust scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

Reference should be made to the Appendices for full assessment input details.

5.3.1 Nitrogen Dioxide - Annual Mean

Predicted Impacts at Sensitive Receptors

Annual mean NO_2 concentrations were predicted for the DM and DS scenarios and are summarised in Table 30. Exceedances of the relevant AQO are highlighted in **bold.**

Table 30 Predicted Annual Mean NO_2 Concentrations

Sensitive Receptor		Modelled Height (m)	Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
			DM	DS	Change
R1	Block K, Capital Court Site	1.5	37.68	37.73	0.05
R1a	Block K, Capital Court Site	36	33.71	33.75	0.04
R2	Block J, Capital Court Site	1.5	37.25	37.30	0.05
R2a	Block J, Capital Court Site	51	32.82	33.05	0.23
R3	Block J, Capital Court Site	1.5	37.24	37.29	0.05
R3a	Block J, Capital Court Site	51	32.81	32.95	0.14
R4	Block I, Capital Court Site	1.5	37.47	37.51	0.04
R4a	Block I, Capital Court Site	48	32.94	32.99	0.05
R5	Block H, Central Eastern Site	1.5	37.82	37.83	0.01
R5a	Block H, Central Eastern Site	55.5	31.72	31.80	0.08
R6	Block G, Central Eastern Site	1.5	37.22	37.23	0.01
R6a	Block G, Central Eastern Site	58	31.66	31.71	0.05
R7	Wheatstone House	26.5	34.94	34.97	0.03
R8	Wheatstone House	26.5	34.95	34.98	0.03
R9	Wheatstone House	26.5	34.95	34.99	0.04
R10	Kew House School	1.5	39.81	39.82	0.01
R10a	Kew House School	15.4	36.21	36.22	0.01
R11	Kew House School	1.5	**43.03**	**43.06**	0.03
R12	55 Kew Bridge Road	1.5	**41.51**	**41.53**	0.02
R13	Stile Hall Mansions, Wellesley Road	4.5	**46.15**	**46.18**	0.03
R14	551 Chiswick High Road	1.5	**47.39**	**47.42**	0.03

Sensitive Receptor		Modelled Height (m)	Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
			DM	DS	Change
R15	Wheatstone House	1.5	**45.96**	**45.99**	0.03
R16	6 Stonehill Road	1.5	**48.02**	**48.06**	0.04
R17	30 Surrey Crescent	1.5	**46.51**	**46.54**	0.03
R18	463 Chiswick High Road	1.5	**49.52**	**49.55**	0.03
R19	447 Chiswick High Road	1.5	**41.68**	**41.69**	0.01
R20	International School of London	1.5	**40.60**	**40.61**	0.01
R21	406 High Street	1.5	33.60	33.62	0.02

As indicated in Table 30, predicted annual mean NO_2 concentrations exceeded the AQO at ten sensitive receptor locations in both the DM and DS scenarios. More critically, no new exceedances of the annual mean AQO for NO_2 are predicted to occur as a result of the proposed development.

Predicted impacts on annual mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 31.

Table 31 Predicted Annual Mean NO_2 Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Block K, Capital Court Site	0.12	95-102% of AQO	Negligible
R1a	Block K, Capital Court Site	0.10	76-94% of AQO	Negligible
R2	Block J, Capital Court Site	0.12	76-94% of AQO	Negligible
R2a	Block J, Capital Court Site	0.57	76-94% of AQO	Negligible
R3	Block J, Capital Court Site	0.12	76-94% of AQO	Negligible
R3a	Block J, Capital Court Site	0.35	76-94% of AQO	Negligible
R4	Block I, Capital Court Site	0.10	76-94% of AQO	Negligible
R4a	Block I, Capital Court Site	0.13	76-94% of AQO	Negligible
R5	Block H, Central Eastern Site	0.02	95-102% of AQO	Negligible
R5a	Block H, Central Eastern Site	0.20	76-94% of AQO	Negligible
R6	Block G, Central Eastern Site	0.02	76-94% of AQO	Negligible
R6a	Block G, Central Eastern Site	0.13	76-94% of AQO	Negligible

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R7	Wheatstone House	0.08	76-94% of AQO	Negligible
R8	Wheatstone House	0.07	76-94% of AQO	Negligible
R9	Wheatstone House	0.10	76-94% of AQO	Negligible
R10	Kew House School	0.02	95-102% of AQO	Negligible
R10a	Kew House School	0.02	76-94% of AQO	Negligible
R11	Kew House School	0.08	103-109% of AQO	Negligible
R12	55 Kew Bridge Road	0.05	103-109% of AQO	Negligible
R13	Stile Hall Mansions, Wellesley Road	0.08	110+ of AQO	Negligible
R14	551 Chiswick High Road	0.08	110+ of AQO	Negligible
R15	Wheatstone House	0.08	110+ of AQO	Negligible
R16	6 Stonehill Road	0.10	110+ of AQO	Negligible
R17	30 Surrey Crescent	0.08	110+ of AQO	Negligible
R18	463 Chiswick High Road	0.07	110+ of AQO	Negligible
R19	447 Chiswick High Road	0.02	103-109% of AQO	Negligible
R20	International School of London	0.02	95-102% of AQO	Negligible
R21	406 High Street	0.05	76-94% of AQO	Negligible

As indicated in Table 31, the impacts on annual mean NO_2 concentrations as a result of road vehicle exhaust and energy emissions associated with the proposed development were predicted to be **negligible** at all sensitive receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are **not significant.**

5.3.2 Nitrogen Dioxide - 1-Hour Mean

In order to predict the 1-hour mean background NO_2 concentration, the advice provided within the EA guidance[15] was followed, which advises that an estimate of the maximum combined pollutant concentration can be obtained by adding the maximum predicted short-term concentration due to emissions from the source to twice the annual mean baseline concentration. The 1-hour mean background NO_2 concentration was therefore assumed to be twice the annual mean background NO_2 concentration.

[15] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit.

1-hour mean NO_2 concentrations were predicted for the DM and DS scenarios site and are summarised in Table 32.

Table 32 Predicted 1-Hour Mean NO_2 Concentrations

Sensitive Receptor		Modelled Height (m)	Predicted 1-Hour Mean NO_2 Concentration ($\mu g/m^3$)		
			DM	DS	Change
R1	Block K, Capital Court Site	1.5	68.45	68.90	0.45
R1a	Block K, Capital Court Site	36	65.32	65.76	0.44
R2	Block J, Capital Court Site	1.5	68.01	68.47	0.46
R2a	Block J, Capital Court Site	51	64.76	70.89	6.13
R3	Block J, Capital Court Site	1.5	67.99	68.44	0.45
R3a	Block J, Capital Court Site	51	64.77	66.68	1.91
R4	Block I, Capital Court Site	1.5	68.00	68.44	0.44
R4a	Block I, Capital Court Site	48	64.95	65.89	0.94
R5	Block H, Central Eastern Site	1.5	67.35	67.50	0.15
R5a	Block H, Central Eastern Site	55.5	62.98	65.26	2.28
R6	Block G, Central Eastern Site	1.5	67.27	67.39	0.12
R6a	Block G, Central Eastern Site	58	62.88	64.39	1.51
R7	Wheatstone House	26.5	66.04	66.33	0.29
R8	Wheatstone House	26.5	66.17	66.51	0.34
R9	Wheatstone House	26.5	66.19	66.49	0.30
R10	Kew House School	1.5	71.17	71.35	0.18
R10a	Kew House School	15.4	67.35	67.56	0.21
R11	Kew House School	1.5	73.37	73.59	0.22
R12	55 Kew Bridge Road	1.5	73.01	73.20	0.19
R13	Stile Hall Mansions, Wellesley Road	4.5	75.16	75.39	0.23
R14	551 Chiswick High Road	1.5	74.84	75.10	0.26
R15	Wheatstone House	1.5	76.21	76.41	0.20
R16	6 Stonehill Road	1.5	78.56	78.70	0.14
R17	30 Surrey Crescent	1.5	78.41	78.54	0.13

Sensitive Receptor		Modelled Height (m)	Predicted 1-Hour Mean NO_2 Concentration ($\mu g/m^3$)		
			DM	DS	Change
R18	463 Chiswick High Road	1.5	80.15	80.28	0.13
R19	447 Chiswick High Road	1.5	73.61	73.73	0.12
R20	International School of London	1.5	72.60	72.69	0.09
R21	406 High Street	1.5	56.18	56.37	0.19

As indicated in Table 32, predicted 1-hour mean NO_2 concentrations did not exceeded the 1-hour mean AQO for NO_2 at any sensitive receptor locations in both the DM and DS scenarios.

Predicted impacts on 1-hour mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 33.

Table 33 Predicted 1-Hour Mean NO_2 Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Impact
R1	Block K, Capital Court Site	0.23	Negligible
R1a	Block K, Capital Court Site	0.22	Negligible
R2	Block J, Capital Court Site	0.23	Negligible
R2a	Block J, Capital Court Site	3.07	Negligible
R3	Block J, Capital Court Site	0.23	Negligible
R3a	Block J, Capital Court Site	0.96	Negligible
R4	Block I, Capital Court Site	0.22	Negligible
R4a	Block I, Capital Court Site	0.47	Negligible
R5	Block H, Central Eastern Site	0.08	Negligible
R5a	Block H, Central Eastern Site	1.14	Negligible
R6	Block G, Central Eastern Site	0.06	Negligible
R6a	Block G, Central Eastern Site	0.75	Negligible
R7	Wheatstone House	0.14	Negligible
R8	Wheatstone House	0.17	Negligible
R9	Wheatstone House	0.15	Negligible
R10	Kew House School	0.09	Negligible

Sensitive Receptor		% Change in Concentration Relative to AQO	Impact
R10a	Kew House School	0.11	Negligible
R11	Kew House School	0.11	Negligible
R12	55 Kew Bridge Road	0.09	Negligible
R13	Stile Hall Mansions, Wellesley Road	0.12	Negligible
R14	551 Chiswick High Road	0.13	Negligible
R15	Wheatstone House	0.10	Negligible
R16	6 Stonehill Road	0.07	Negligible
R17	30 Surrey Crescent	0.07	Negligible
R18	463 Chiswick High Road	0.06	Negligible
R19	447 Chiswick High Road	0.06	Negligible
R20	International School of London	0.05	Negligible
R21	406 High Street	0.09	Negligible
R1	Block K, Capital Court Site	0.23	Negligible
R1a	Block K, Capital Court Site	0.22	Negligible

As indicated in Table 33, the impacts on 1-hour mean NO_2 concentrations as a result of road vehicle exhaust and energy emissions associated with the proposed development were predicted to be **negligible** at all sensitive receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are **not significant.**

5.3.3 Particulate Matter - Annual Mean

Annual mean PM_{10} concentrations were predicted for the DM and DS scenarios and are summarised in Table 34.

Table 34 Predicted Annual Mean PM_{10} Concentrations

Sensitive Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^{3)}$		
		DM	DS	Change
R1	Block K, Capital Court Site	19.913	19.916	0.003
R1a	Block K, Capital Court Site	19.193	19.193	0.000
R2	Block J, Capital Court Site	19.828	19.831	0.003

Sensitive Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^{3)}$		
		DM	DS	Change
R2a	Block J, Capital Court Site	19.041	19.041	0.000
R3	Block J, Capital Court Site	19.826	19.829	0.003
R3a	Block J, Capital Court Site	19.040	19.040	0.000
R4	Block I, Capital Court Site	19.868	19.872	0.004
R4a	Block I, Capital Court Site	19.061	19.061	0.000
R5	Block H, Central Eastern Site	19.317	19.319	0.002
R5a	Block H, Central Eastern Site	18.233	18.233	0.000
R6	Block G, Central Eastern Site	19.205	19.207	0.002
R6a	Block G, Central Eastern Site	18.223	18.223	0.000
R7	Wheatstone House	19.395	19.396	0.001
R8	Wheatstone House	19.398	19.398	0.000
R9	Wheatstone House	19.398	19.398	0.000
R10	Kew House School	20.272	20.274	0.002
R10a	Kew House School	19.626	19.627	0.001
R11	Kew House School	20.931	20.933	0.002
R12	55 Kew Bridge Road	19.855	19.856	0.001
R13	Stile Hall Mansions, Wellesley Road	21.444	21.447	0.003
R14	551 Chiswick High Road	21.819	21.823	0.004
R15	Wheatstone House	21.374	21.378	0.004
R16	6 Stonehill Road	21.614	21.617	0.003
R17	30 Surrey Crescent	21.311	21.314	0.003
R18	463 Chiswick High Road	21.816	21.818	0.002
R19	447 Chiswick High Road	20.616	20.617	0.001
R20	International School of London	20.672	20.673	0.001
R21	406 High Street	17.851	17.852	0.001

As indicated in Table 34, annual mean PM_{10} concentrations were below the relevant AQO at all sensitive receptor locations for both scenarios considered.

Predicted impacts on annual mean PM_{10} concentrations at the sensitive receptor locations are summarised in Table 35.

Table 35 Predicted PM_{10} Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Block K, Capital Court Site	0.008	75% or Less of AQO	Negligible
R1a	Block K, Capital Court Site	0.000	75% or Less of AQO	Negligible
R2	Block J, Capital Court Site	0.008	75% or Less of AQO	Negligible
R2a	Block J, Capital Court Site	0.000	75% or Less of AQO	Negligible
R3	Block J, Capital Court Site	0.008	75% or Less of AQO	Negligible
R3a	Block J, Capital Court Site	0.000	75% or Less of AQO	Negligible
R4	Block I, Capital Court Site	0.010	75% or Less of AQO	Negligible
R4a	Block I, Capital Court Site	0.000	75% or Less of AQO	Negligible
R5	Block H, Central Eastern Site	0.005	75% or Less of AQO	Negligible
R5a	Block H, Central Eastern Site	0.000	75% or Less of AQO	Negligible
R6	Block G, Central Eastern Site	0.005	75% or Less of AQO	Negligible
R6a	Block G, Central Eastern Site	0.000	75% or Less of AQO	Negligible
R7	Wheatstone House	0.003	75% or Less of AQO	Negligible
R8	Wheatstone House	0.000	75% or Less of AQO	Negligible
R9	Wheatstone House	0.000	75% or Less of AQO	Negligible
R10	Kew House School	0.005	75% or Less of AQO	Negligible
R10a	Kew House School	0.002	75% or Less of AQO	Negligible
R11	Kew House School	0.005	75% or Less of AQO	Negligible
R12	55 Kew Bridge Road	0.003	75% or Less of AQO	Negligible
R13	Stile Hall Mansions, Wellesley Road	0.008	75% or Less of AQO	Negligible
R14	551 Chiswick High Road	0.010	75% or Less of AQO	Negligible
R15	Wheatstone House	0.010	75% or Less of AQO	Negligible
R16	6 Stonehill Road	0.008	75% or Less of AQO	Negligible
R17	30 Surrey Crescent	0.008	75% or Less of AQO	Negligible
R18	463 Chiswick High Road	0.005	75% or Less of AQO	Negligible

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R19	447 Chiswick High Road	0.003	75% or Less of AQO	Negligible
R20	International School of London	0.002	75% or Less of AQO	Negligible
R21	406 High Street	0.003	75% or Less of AQO	Negligible

As indicated in Table 35, impacts on annual mean PM_{10} concentrations as a result of road vehicle exhaust emissions and energy emissions associated with the development were predicted to be **negligible** at all sensitive receptor locations considered. It is therefore considered that the overall impacts as a result of the proposed development are **not significant.**

5.3.4 Impact Significance

The overall significance of emission impacts associated with operational phase road vehicle exhaust emissions and energy emissions was determined as **not significant**. This was based on the predicted impacts at discrete receptor locations and the considerations outlined in Section 3. Further justification is provided in Table 36.

Table 36 Overall Road Traffic Exhaust and Energy Emission Impact Significance

Guidance	Comment
Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance	Impacts on annual mean and 1-hour mean NO_2 and annual mean PM_{10} concentrations were predicted to be **negligible** at all sensitive receptors The sensitive locations represent worst-case locations and therefore it is unlikely that any other receptors would be significantly affected by the proposed development.
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	Although there were no exceedances of the annual mean AQO for NO_2 at sensitive uses across all floors of the proposed development site, sensitive uses on the ground to third floor levels were classified as APEC - B in accordance with the London Councils Air Quality and Planning Guidance[8]. As a result, operational phase mitigation is to be implemented to reduce the significant exposure across the development site at multiple floor levels. Reference should be made to Section 6 for further information regarding suggested mitigation techniques. Subject to the implementation of the suitable mitigation measures, exposure to elevated NO_2 concentration at sensitive locations across the site can be considered as **not significant** and therefore **negligible**

Guidance	Comment
The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors	The maximum changes in annual mean and 1-hour mean NO_2 and annual mean PM_{10} concentrations relative to their respective AQOs were predicted to be 0.57%, 3.07% and 0.008% respectively. As such, resultant impacts were predicted to **be negligible** at all sensitive receptor locations
Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease	There were exceedances of the annual mean AQO for NO_2 at sensitive and non-sensitive locations within the modelling extents. The area of exceedance was not predicted to substantially increase or decrease as a result of the development. Conversely, there were no exceedances of the 1-hour mean AQO for NO_2 and the annual mean AQO for PM_{10} at any location within the modelling extents
The extent to which an objective is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3	There were exceedances of the annual mean AQO for NO_2 at 10 sensitive locations, of which 6 locations exceeded an annual mean concentration of 45µg/m^3. Critically, exceedances of 45µg/m^3 were predicted during both the DM and DS scenarios and therefore, they cannot be directly accounted to the operation of the proposed development. Furthermore, the magnitude of change at the most significantly affected receptor locations was considered **not significant**

5.4 Air Quality Neutral Assessment

The proposals comprise the redevelopment of the site to provide a mixed use scheme of 441 residential units (Class C3) including 50% affordable housing with ancillary facilities, flexible uses (within Classes A1, A2, A3 and B1) and a nursery (Class D1). Comprising buildings of 12, 13, 16, 17 and 18 storeys in height, with associated cycle parking, car parking, playspace, landscaping and public realm improvements.

The development will impact on the total emissions of the site. These are assessed in the following Sections.

5.4.1 Road Transport

Benchmarks

The Transport Emissions Benchmark (TEB) has been calculated using the GLA Air Quality Neutral Planning Support Guidance document based on the land-use class of the proposed development. The number of dwellings for the residential land use was provided by JLL. Additionally the floor area for the office space and retail was also provided by JLL. The TEBs are those provided in the GLA Air Quality Neutral Planning Support document and are detailed in Table 37 below.

It should be noted that the floor area for the proposed A2 and A3 land use category associated with the development have been combined with the A1 (Retail) land use category. This is because there are no TEBs available for the A2 and A3 land use categories and as such, the TEB for the A1 land use category has been utilised, as stated within the GLA Air Quality Neutral Planning Support document.

Table 37 Transport Emission Benchmarks

Land Use	Quantity (m^2 or number of dwellings)	NO_x		PM_{10}	
		TEB ((NO_x (g/m^2/year) /(g/dwelling/ year))	NO_x per Land Use (kg/year)	TEB ((PM_{10} (g/m^2/year) /(g/dwelling/ year))	PM_{10} per Land Use (kg/year)
C3 -Residential	441	1553.0	684.9	267.0	117.7
A1- Retail	340	249.0	84.7	42.9	14.6
B1 - Office	110	68.5	7.5	11.8	1.3
Total	-	**1870.5**	**777.1**	**321.7**	**133.6**

As indicated in Table 37, the total annual NO_x emission TEB is 777.1kg/year and the total annual PM_{10} emission TEB is 133.6kg/year.

Development Emissions

Estimated development road transport emissions were calculated using traffic data provided by Peter Brett Associates. The number of daily trips was used to calculate annual NOx and PM10 based on emission factors provided in the GLA Air Quality Neutral Planning Support document, as shown in Table 38. A summary of the traffic data used in the assessment is provided in Table 38.

Table 38 Development Emissions - Traffic Data

Land use	24-hour AADT Flow	Road Type	Average Distance (km/m_2/annum) or (km/dwelling/annum)
C3 -Residential	79	London - Outer	11.4
A1- Retail	44	London - Outer	5.4
B1 - Office	4	London - Outer	10.8

The inputs outlined in Table 37 and Table 38 were utilised to calculate development road vehicle exhaust emissions. This is summarised in Table 39.

Table 39 Development Emissions - Road Vehicle Exhaust Emissions

Land Use	NO_x Emission (kg/year)	PM_{10} Emission (kg/year)
C3 -Residential	116.0	19.9

Land Use	NO_x Emission (kg/year)	PM_{10} Emission (kg/year)
A1- Retail	30.6	5.3
B1 - Office	5.6	1.0
Total	**152.2**	**26.1**

The TEB and development road traffic exhaust emissions were calculated using the inputs and methodology outlined in Section 3.3.2. These are summarised in Table 40.

Table 40 Development Road Vehicle Exhaust Emissions

Scenario	NO_x Emission (kg/year)	PM_{10} Emission (kg/year)
TEB	777.1	133.6
Development Emissions	152.2	26.1
Difference	**-624.9**	**-107.5**

As indicated in Table 40, annual NO_x and PM_{10} road vehicle exhaust emissions are below the TEB by 732.4kg/year.

5.4.2 Energy Emissions

Similarly to the TEB, the Building Emissions Benchmark (BEB) has been calculated using the GLA Air Quality Neutral Planning Support[12] guidance document based on the land-use class of the proposed development.

The floor area was provided by JLL. The BEBs are those provided in the GLA Air Quality Neutral Planning Support document. This is detailed in Table 41.

Table 41 Energy Emission Benchmarks

Land Use	Quantity (m^2)	NO_x	
		BEB (NO_x ((g/m^2/year))	NO_x per Land Use (kg/year)
C3 - Residential	28,873.0	26.2	756.5
A1 - Retail	85.0	22.6	1.9
A3 - Café / Restaurant	255.0	75.2	19.2
B1 - Office	110.0	30.8	3.4
D1 (b) - Nursery	250.0	75.0	18.8
D2 (e) - Gym	147.0	284.0	41.7
Total	**29,720.0**	**513.8**	**841.5**

As indicated in Table 41, the total annual NO_x emission BEB is 841.5kg/year.

Development Emissions

Development energy emissions were calculated using emission rates for the proposed gas boilers and CHP. All energy sources were assumed to be operational for the entire year, producing a worst case scenario. As such, a robust assessment was carried out.

The relevant input data is outlined in Table 42.

Table 42 Development Energy Emissions

Source	NO_x emissions (kg/yr)
CHP	492.0
Boiler (combined for 3 units)	159.9
Total	**651.8**

The BEB and development energy emissions were calculated using the inputs and methodology outlined in Sections a 3.3.3. These are summarised in Table 43.

Table 43 Energy Emissions

Scenario	NO_x Emission (kg/year)
BEB	841.5
Development Emissions	651.8
Difference	**-189.6**

As indicated in Table 43, annual development NO_x emissions from the energy provision are Below the BEB by 189.6kg/year.

5.4.3 Air Quality Neutral Assessment Summary

Overall comparison of the TEB and BEB with the development emissions are summarised in Table 44.

Table 44 Benchmark vs. Development Emissions

Scenario	Source	Annual NO_x Emissions (kg/yr)	Annual Total NO_x Emissions (kg/yr)	Annual PM_{10} Emissions (kg/yr)	Annual Total PM_{10} Emissions (kg/yr)
Benchmark	Road Vehicles	777.1	1618.5	133.6	133.6
	Energy	841.5		-	

Scenario	Source	Annual NO_x Emissions (kg/yr)	Annual Total NO_x Emissions (kg/yr)	Annual PM_{10} Emissions (kg/yr)	Annual Total PM_{10} Emissions (kg/yr)
Development Emissions	Road Vehicles	152.2	804.1	26.1	26.1
	Energy	651.8		-	
Difference	**Road Vehicles**	**-624.9**	**-814.5**	**-107.5**	**-107.5**
	Energy	**-189.6**		**-**	

As indicated in Table 44, annual NO_x and PM_{10} emissions and annual NO_x emissions from energy emissions are predicted to be below the TEB and BEB. As such, the development is considered to be Air Quality Neutral.

6 MITIGATION

There are a number of air quality mitigation options available to reduce potential exposure of future site users to elevated pollutant concentrations.

Detailed dispersion modelling undertaken at heights equivalent to the proposed building floor levels indicated that the sensitive uses including all residential units and the nursery on the ground level were classified as APEC - B for predicted annual mean NO_2 concentrations, as shown in Figure 8 within Appendix I. Additionally, Figures 9 to 11 within Appendix I representing predicted concentrations of NO_2 across the first, second and third floor levels indicate that there are sensitive uses (including residential units and the nursery) classified as APEC - B. In accordance with the London Councils Air Quality and Planning Guidance[9] states that mitigation measures must be considered for areas classified as APEC - B.

It is therefore proposed that the inclusion of appropriate mitigation measures should be implemented to all residential units on the ground floor and first floor levels, as well as specific residential units situated on the second and third floor levels of the proposed development. It should be noted that appropriate mitigation measures should also be include to the ground and first floor nursery.

Whilst it is noted that the development will provide mechanical ventilation within each individual residential unit, there is in some cases a requirement for NO_x filtration units to be installed as a number of units are unable to supply clean air. With this in mind, the inclusion of NO_x filtration should be included in the building design for all residential units and the nursery on the ground floor and first floor levels (see Figures 8 and 9 within Appendix I) and the residential units located within an area classified as APEC - B on the second and third floor levels (see Figures 10 and 11 within Appendix I).

For the second floor, this comprises all residential units in Cores 4 and 5, as well as the two bedroom plot in the north-eastern corner of Core 3 (plot 3.2.2). For the third floor, this comprises the three bedroom plot to on the northern façade of Core 4 and the two bedroom plot on the eastern façade of Core 4 (plots 4.3.5 and 4.3.1). The inclusion of mechanical ventilation with NO_x filtration at these sensitive uses should ensure the supply of clean air for future site users.

Additionally, a high specification of air tightness on the windows and doors should be incorporated at all residential units on the ground and first floor levels, and the specific residential units identified in the above paragraph on the second and third floor level. This ensures that the windows will remain openable at the affected areas and provides freedom of choice over whether natural ventilation is preferable during certain periods. The high specification of air tightness will also ensure that when the windows are shut, the nursery and the aforementioned residential units will be well ventilated by the mechanical ventilation systems. The key to reducing exposure using this method is to ensure occupants are informed over the potential risks associated with prolonged exposure to elevated pollution levels. As such, it may also be possible to provide future users with a welcome pack containing air quality information which will allow them to follow appropriate advice on protection against high concentrations during certain periods.

7 CONCLUSION

REC was commissioned by L&Q to undertake an Air Quality Assessment in support of a planning application for a proposed development located at the Citroen Site, Brentford.

The proposals comprise the redevelopment of the site to provide a mixed use scheme of 441 residential units (Class C3) including 50% affordable housing with ancillary facilities, flexible uses (within Classes A1, A2, A3 and B1) and a nursery (Class D1). Comprising buildings of 12, 13, 16, 17 and 18 storeys in height, with associated cycle parking, car parking, playspace, landscaping and public realm improvements.

The site is located within an area identified by the LBH as experiencing elevated pollutant concentrations and as such, there is the potential for the proposed development to cause adverse impacts to existing pollution levels at nearby sensitive locations as well as have the potential to introduce future site users into an area of high pollutant concentrations. As such, an Air Quality Assessment was required in order to determine baseline conditions at the site, assess site suitability for the proposed end-use and assess the potential impacts as a result of the proposed development.

During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the GLA methodology. It is considered that the use of good practice control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

Dispersion modelling was undertaken in order to predict air quality impacts during the operational phase, as a result of the road vehicle exhaust emissions, results were subsequently verified using monitoring results obtained from LBH. Although there were no exceedances of the annual mean AQO for NO_2 at any sensitive uses (nursery and residential units) across the proposed development at all floor levels, there were predicted NO_2 concentrations that are classified as APEC - B at all sensitive uses on the ground and first floor level and some residential units located on the second and third floor levels. As such specific mitigation techniques will be required to protect future users from elevated concentrations. The 1-hour mean AQO for NO_2, annual mean AQO for PM_{10} and 8-hour rolling mean for CO were also not exceeded at any location across the site.

Predicted impacts on annual mean and 1-hour mean NO_2 concentrations as a result of operational phase exhaust emissions and emissions from the on-site CHP and boiler units were predicted to be **negligible** at all sensitive receptor locations. Predicted impacts on PM_{10} concentrations were predicted to be **negligible** at all sensitive receptor locations considered. The overall significance of potential impacts was determined to be **not significant**, in accordance with the EPUK and IAQM guidance.

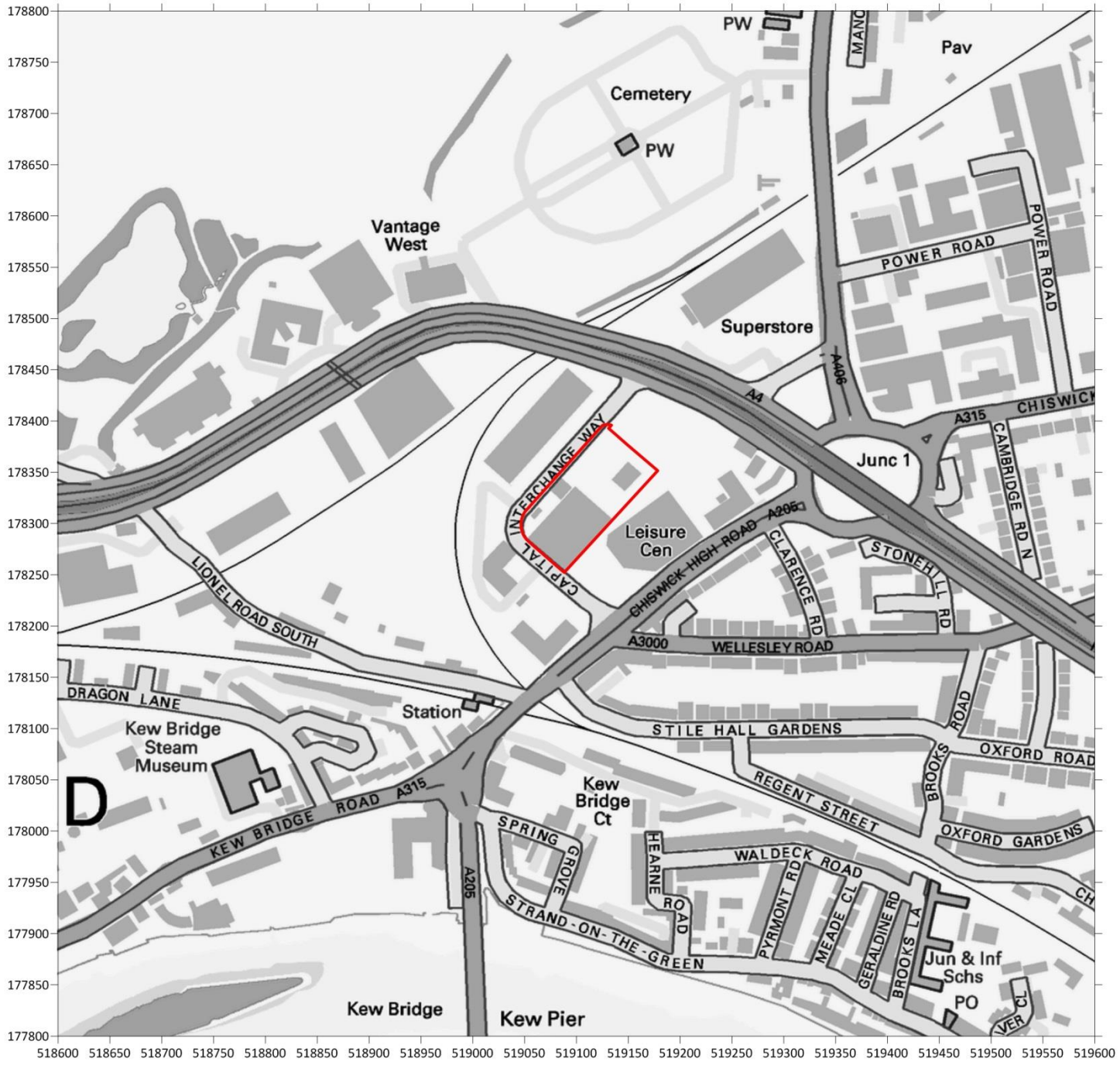
The results of the Air Quality Natural assessment concluded that the combined annual emissions are predicted to be below the combined benchmark level for both NO_x and PM_{10}. As such the proposed development is considered Air Quality Neutral.

Based on the assessment results the site is considered suitable for the proposed end use subject to the inclusion of relevant mitigation measures, and complies with the London Plan, the LBH Local Plan and relevant legislation.

8 ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DM	Do Minimum
DMRB	Design Manual for Roads and Bridges
DS	Do Something
EPUK	Environmental Protection UK
EU	European Union
GLA	Greater London Authority
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LBH	London Borough of Hounslow
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
REC	Resource and Environmental Consultants
TEMPRO	Trip End Model Presentation Program
z_0	Roughness Length

APPENDIX I FIGURES



Legend

Site Boundary

Title

Figure 1

Site Location

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

Client

L&Q

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Resource and Environmental Consultants Ltd
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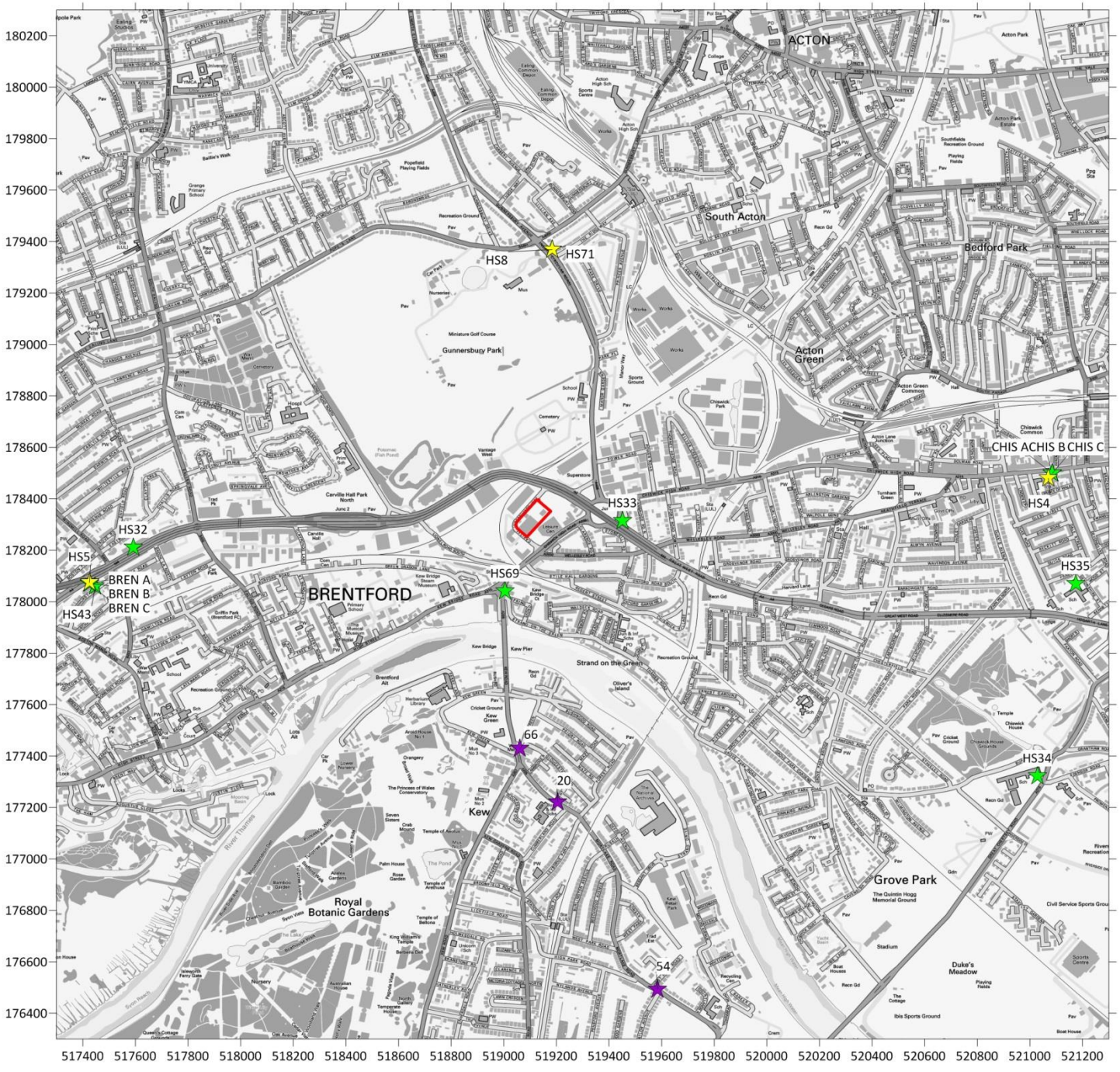

Legend

- Site Boundary
- Diffusion Tube Monitoring Locations
- Automatic Analyser Monitoring Location
- London Borough of Richmond upon Thames Diffusion Tube Monitoring Location

Title

Figure 2

Diffusion Tube and Automatic Analyser Monitoring Locations

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

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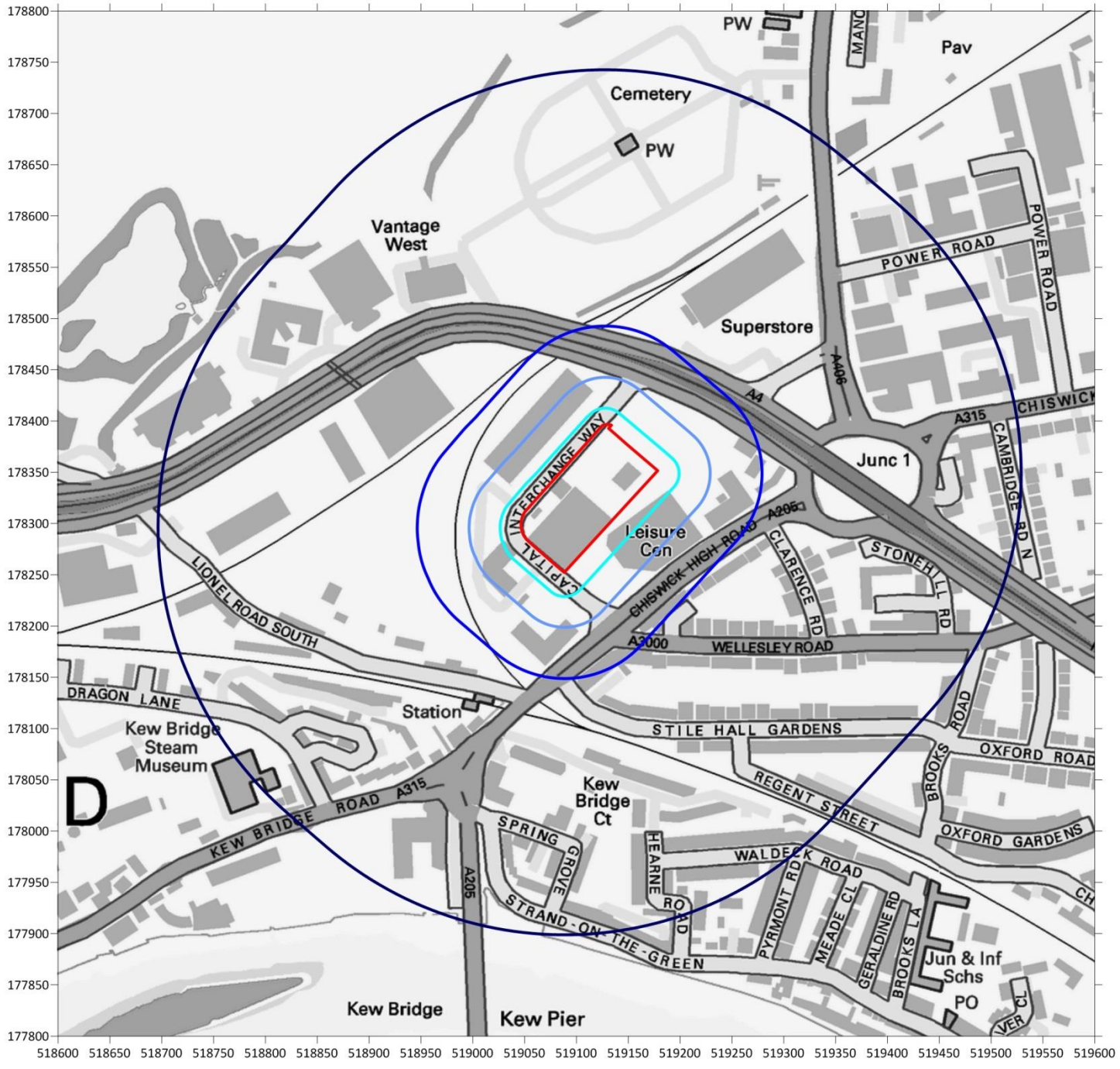

Legend

- Site Boundary
- 20m from Site Boundary
- 50m from Site Boundary
- 100m from Site Boundary
- 350m from Site Boundary

Title

Figure 3

Demolition, Earthworks and Construction Dust Buffer Zones

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

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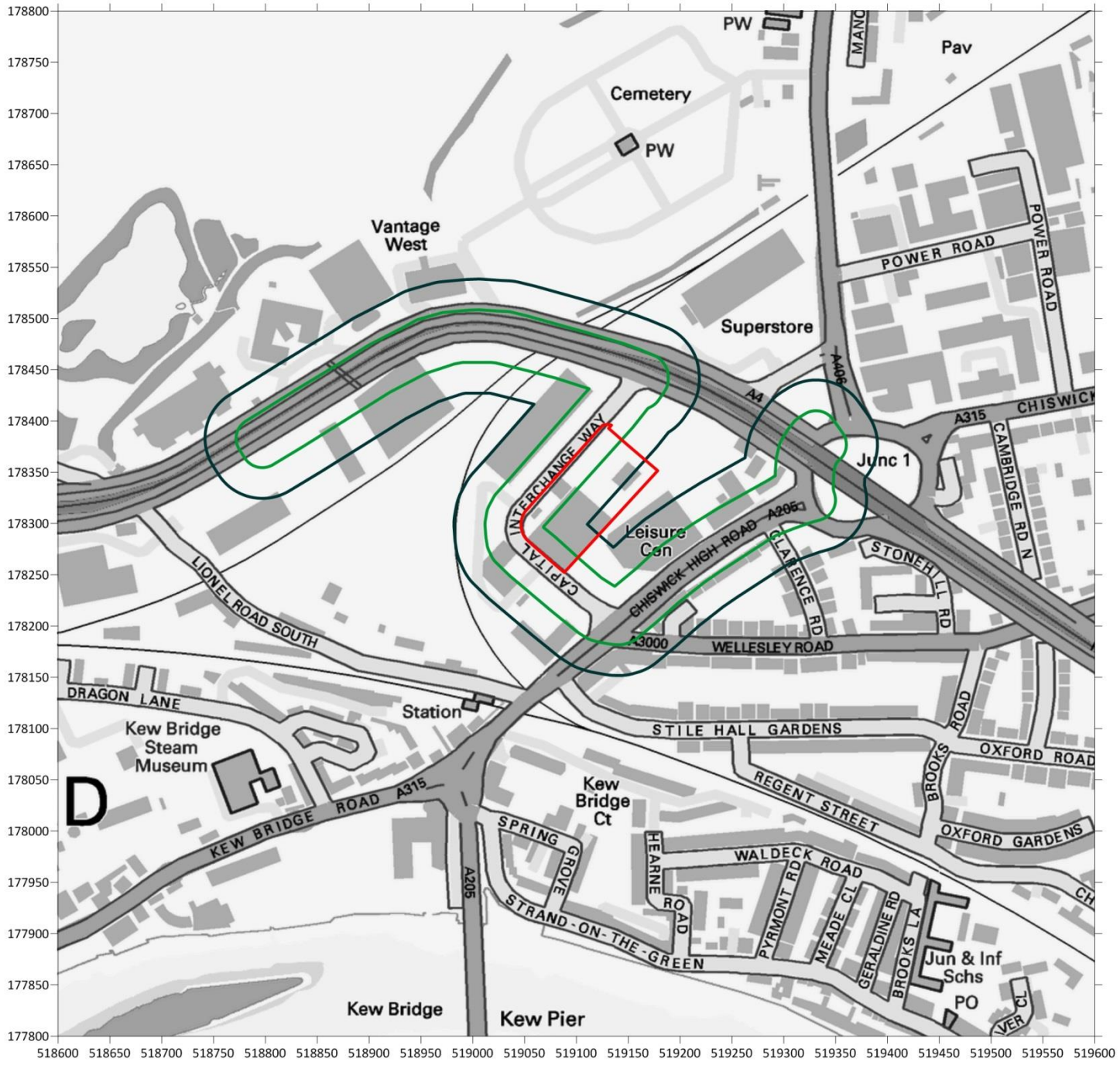

Legend

- Site Boundary
- 20m from Site Access Route
- 50m from Site Access Route

Title

Figure 4

Trackout Dust Buffer Zones

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

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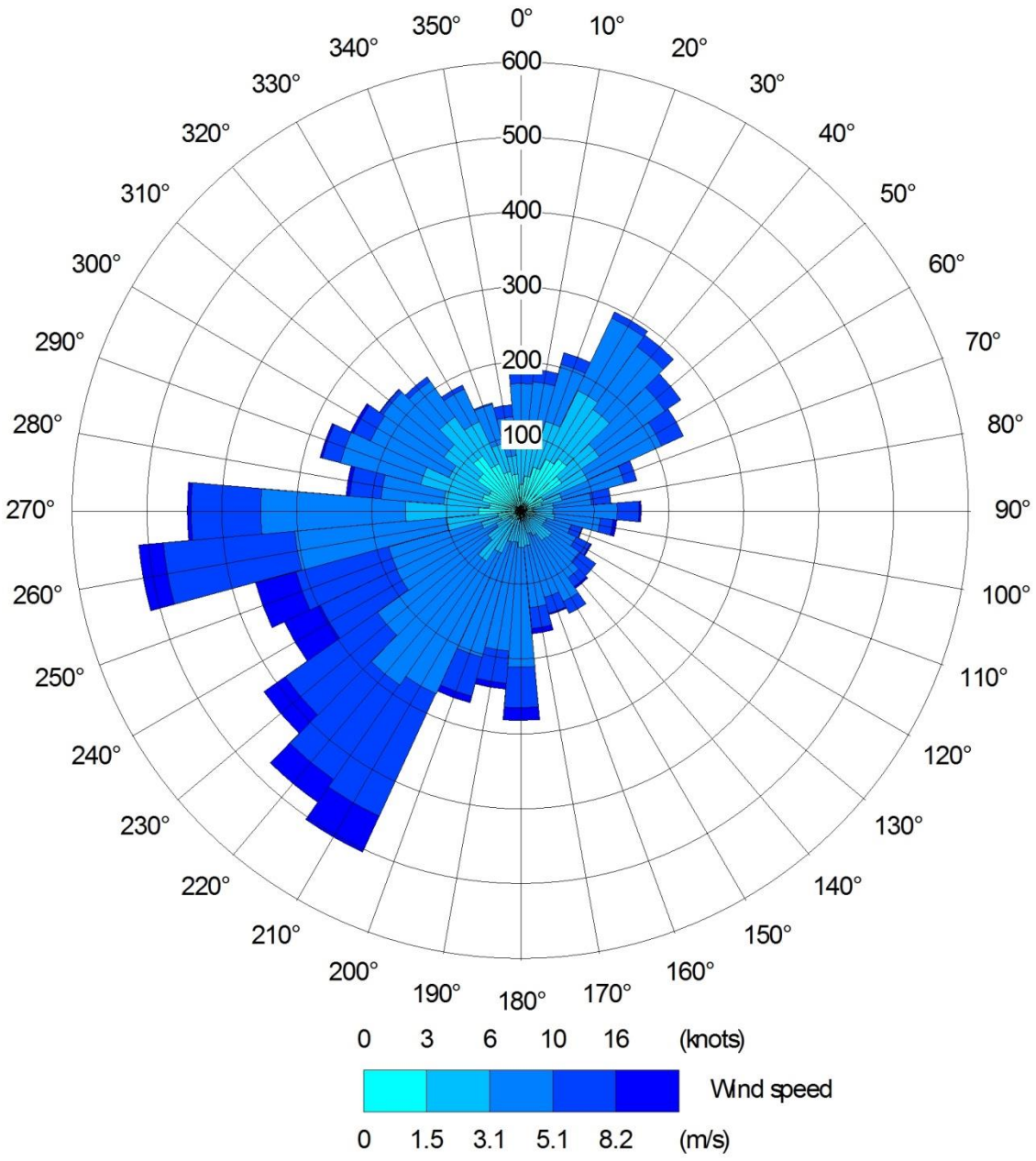

Legend

Title

Figure 5

2016 Wind Rose
Heathrow Meteorological Station

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

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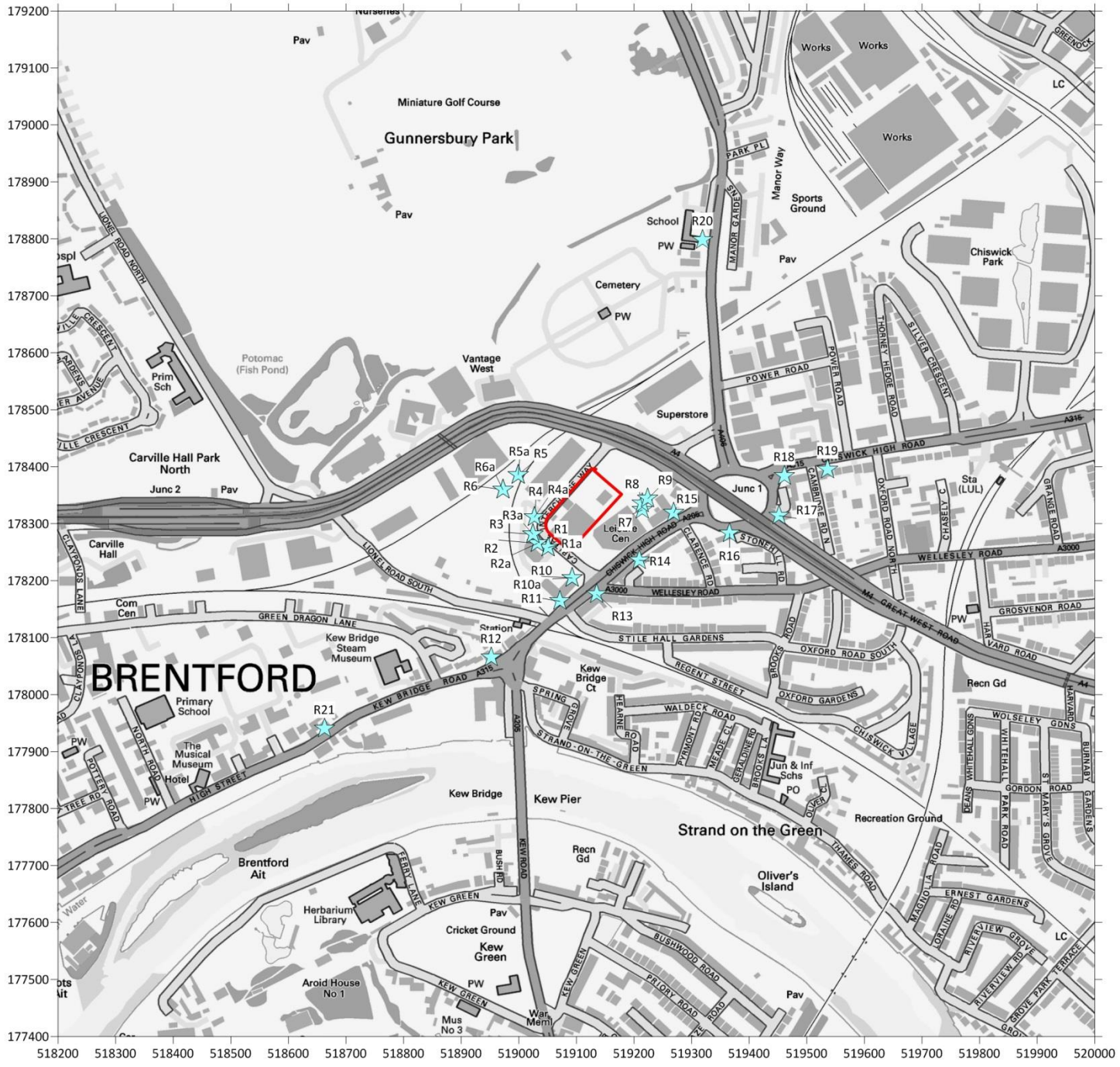

Legend

Site Boundary

Sensitive Receptor Locations

Title

Figure 6

Sensitive Receptor Locations

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

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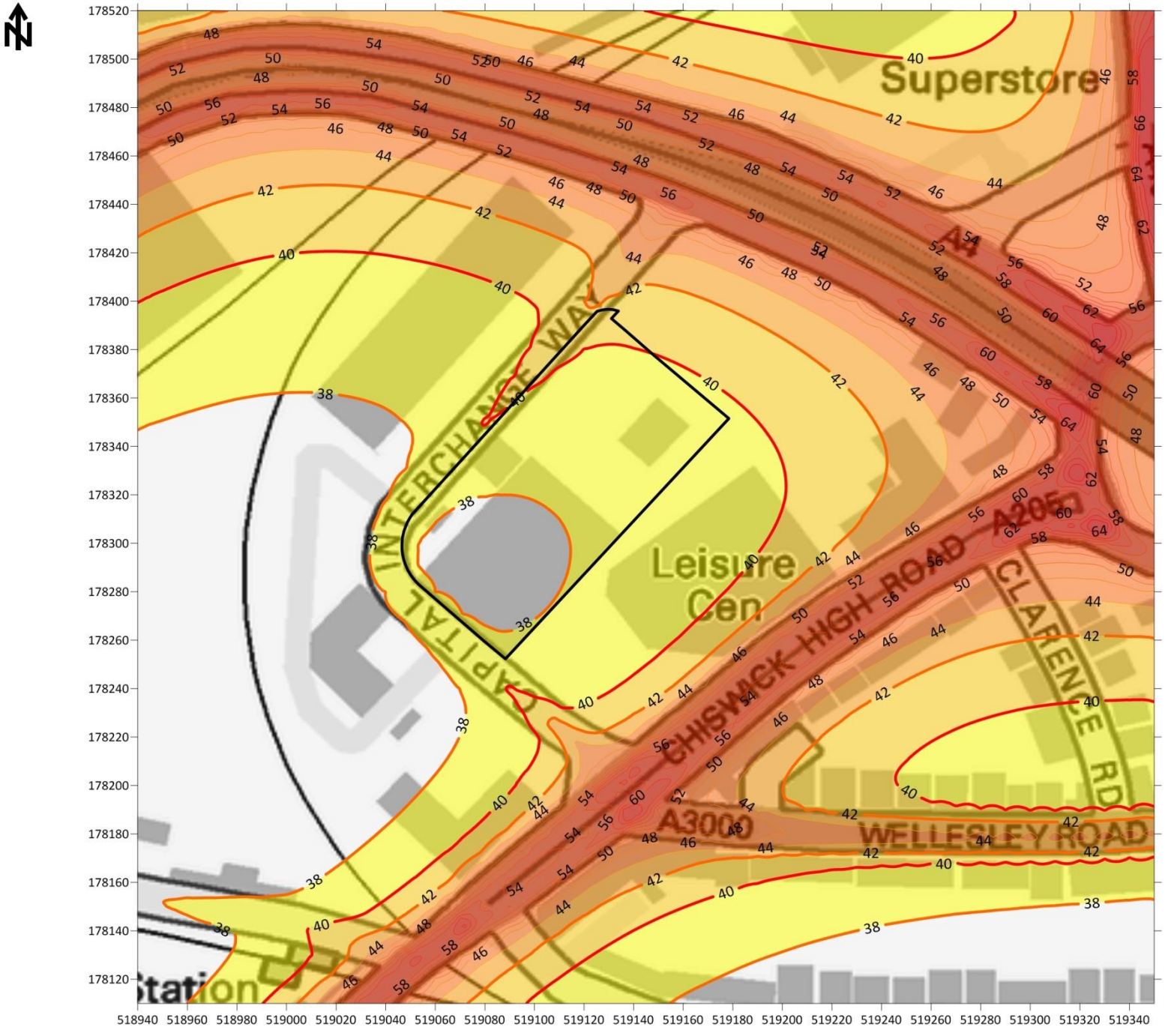

Legend

Site Boundary

66 64 62 60 58 56 54 52 50 48 46 44 42 40 38

Predicted Annual Mean NO_2 Concentration (µg/m³)

Title

Figure 7

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2023 DM

Ground Floor (z=2.25m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

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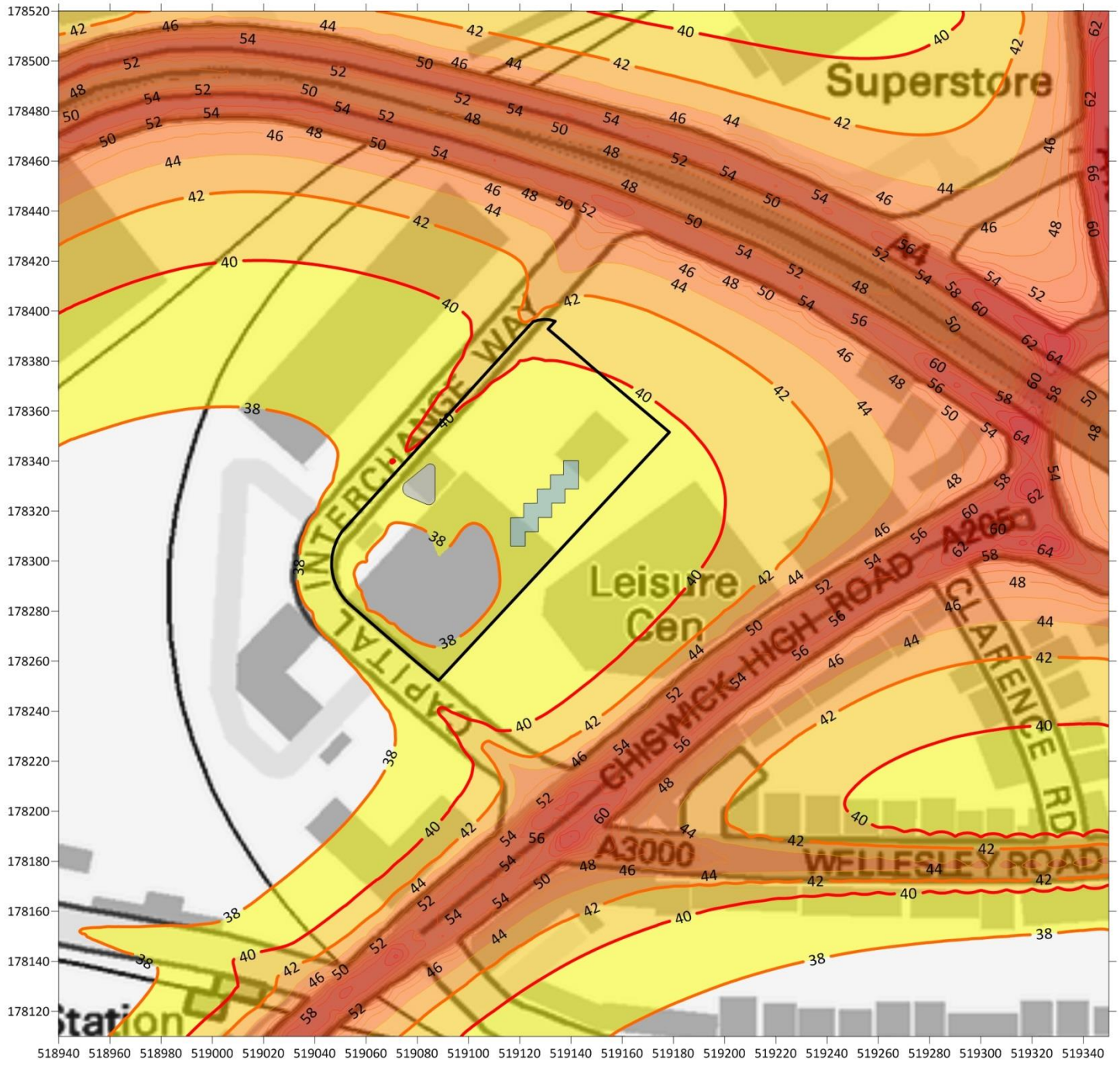

Legend

Site Boundary

Proposed Residential Units

Proposed Nursery

Predicted Annual Mean NO_2 Concentration (µg/m³)

66 64 62 60 58 56 54 52 50 48 46 44 42 40 38

Title

Figure 8

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2023 DS

Ground Floor (z=2.25m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

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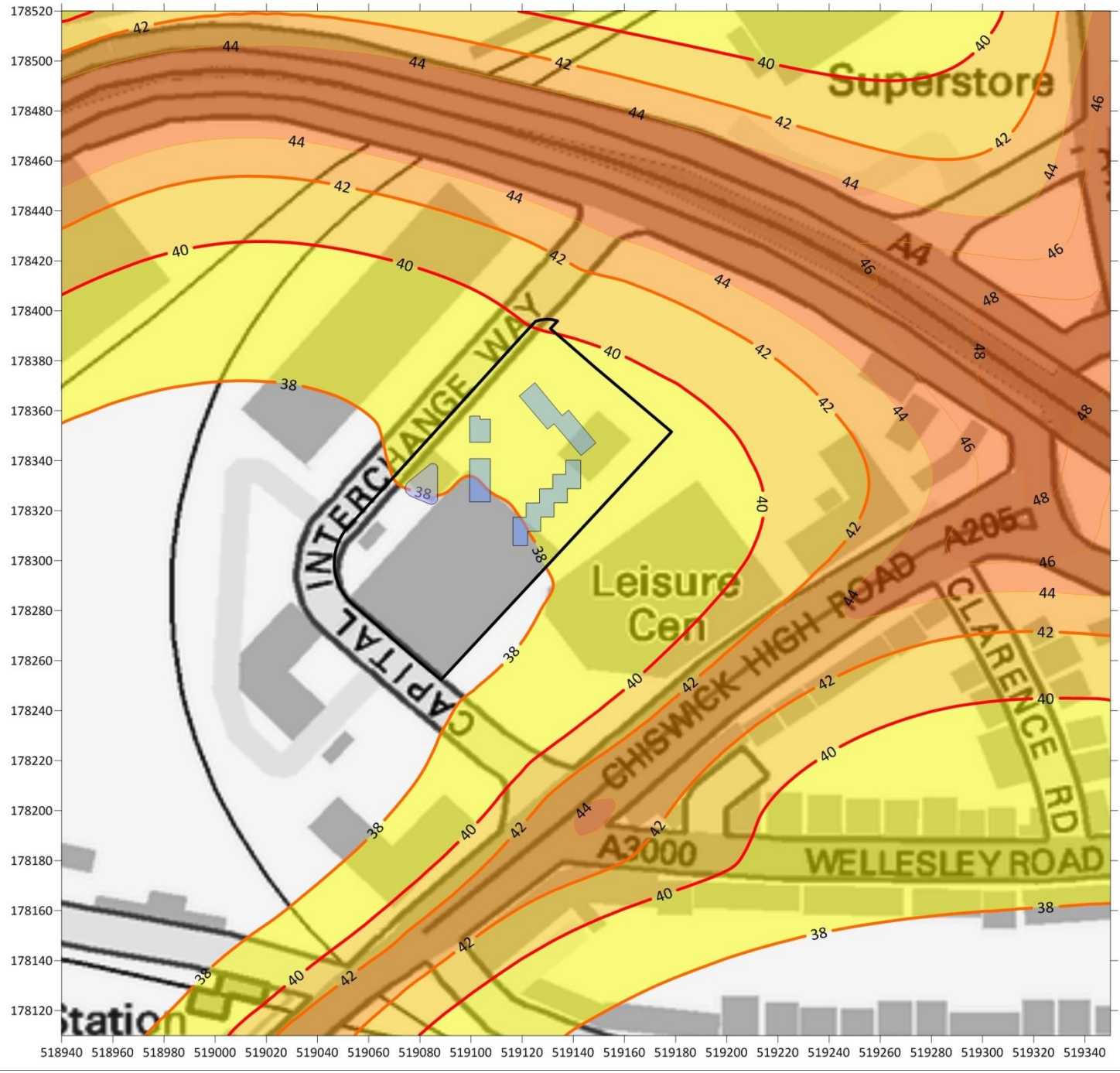

Legend

- Site Boundary
- Proposed Residential Units
- Proposed Nursery
- Predicted Annual Mean NO_2 Concentration (µg/m³): 38, 40, 42, 44, 46, 48

Title

Figure 9

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2023 DS

First Floor (z=6.10m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

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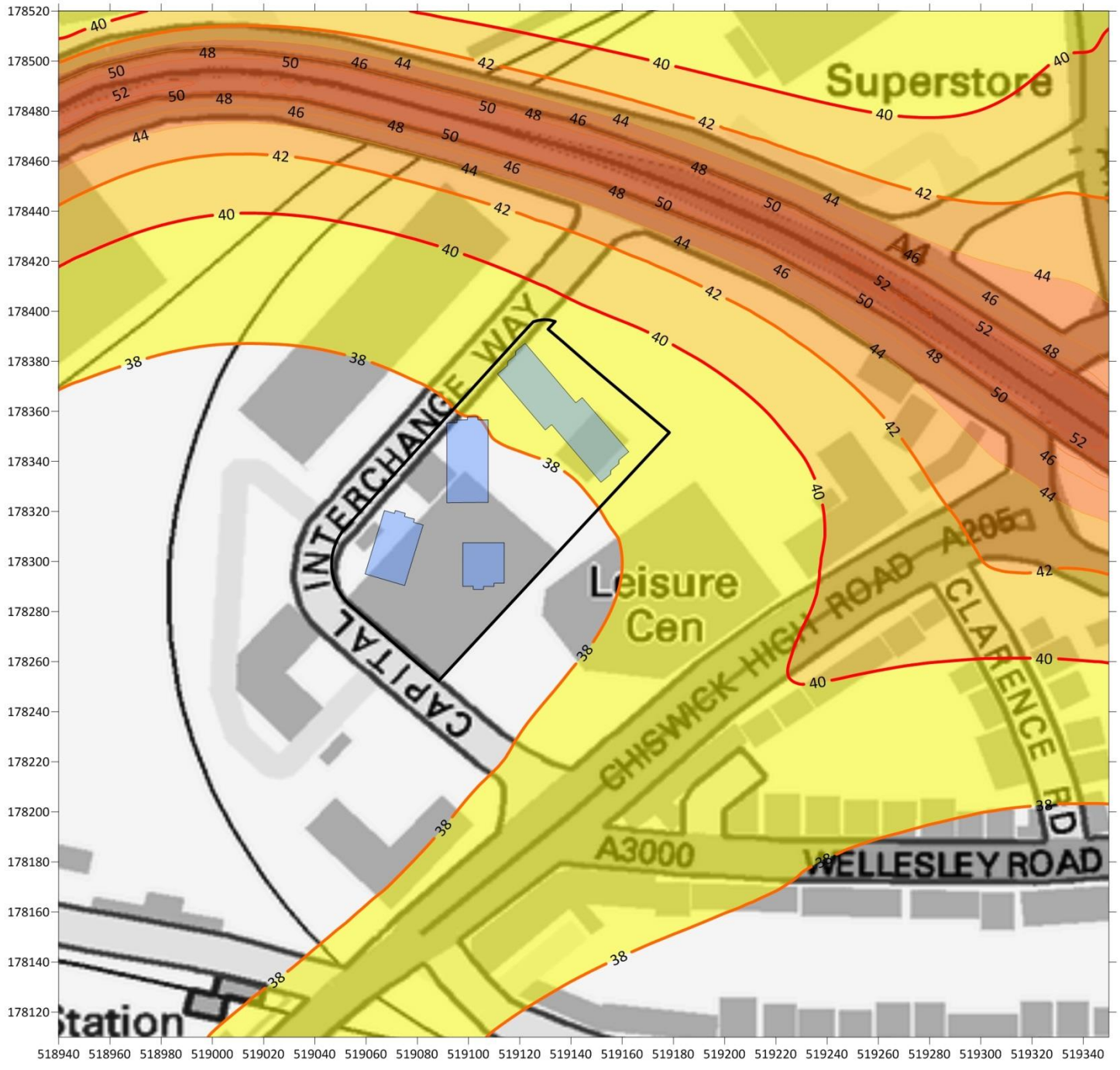

Legend

Site Boundary

Proposed Residential Units

Predicted Annual Mean NO_2 Concentration (µg/m³)

52
50
48
46
44
42
40
38

Title

Figure 10

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2023 DS

Second Floor (z=9.20m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

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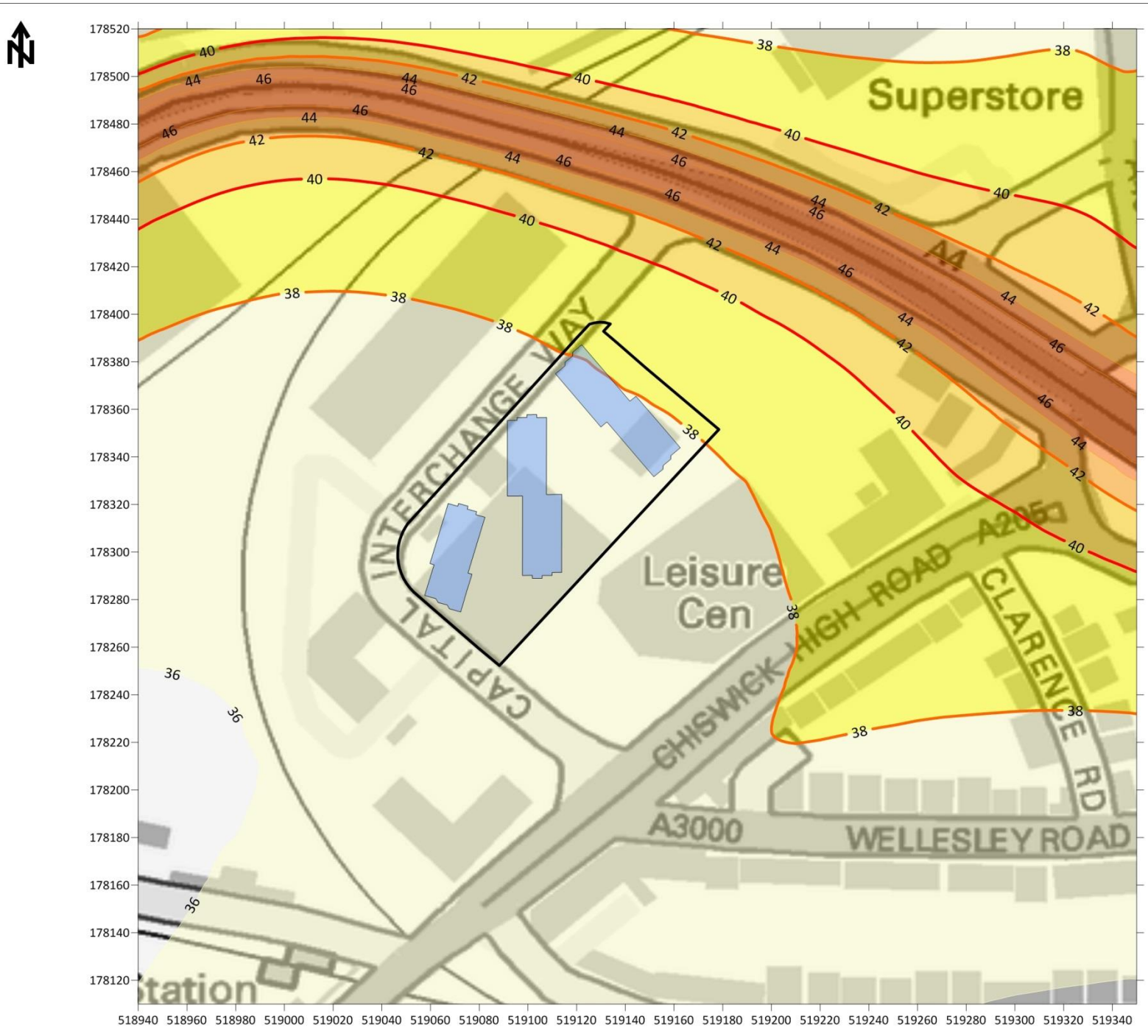

Legend

Site Boundary

Proposed Residential Units

Predicted Annual Mean NO_2 Concentration (µg/m³)

46
44
42
40
38
36

Title

Figure 11

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2023 DS

Third Floor (z=12.40m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

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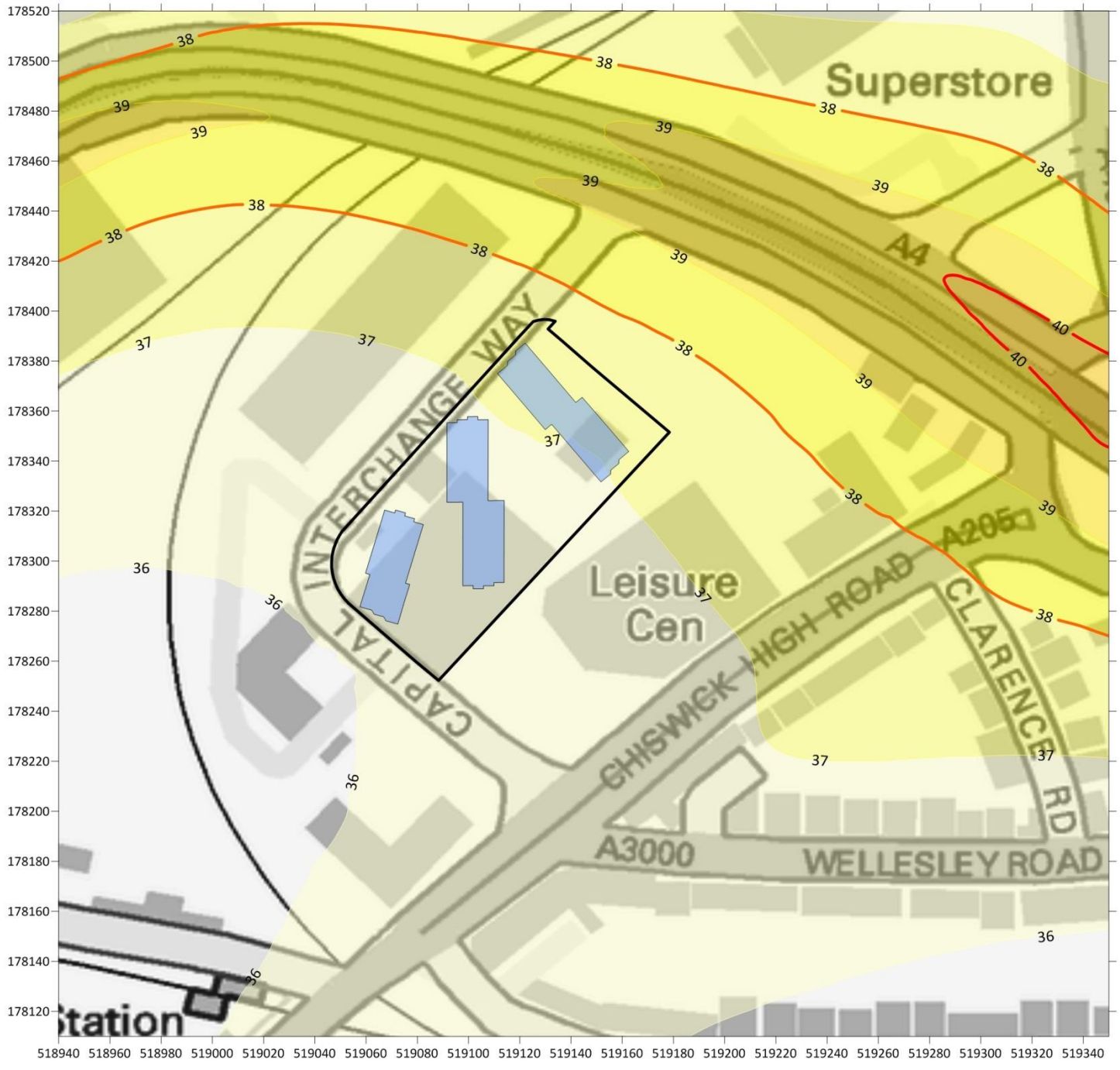

Legend

Site Boundary

Proposed Residential Units

Predicted Annual Mean NO_2 Concentration (µg/m³)

40
39
38
37
36

Title

Figure 12

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2023 DS

Fourth Floor (z=15.50m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

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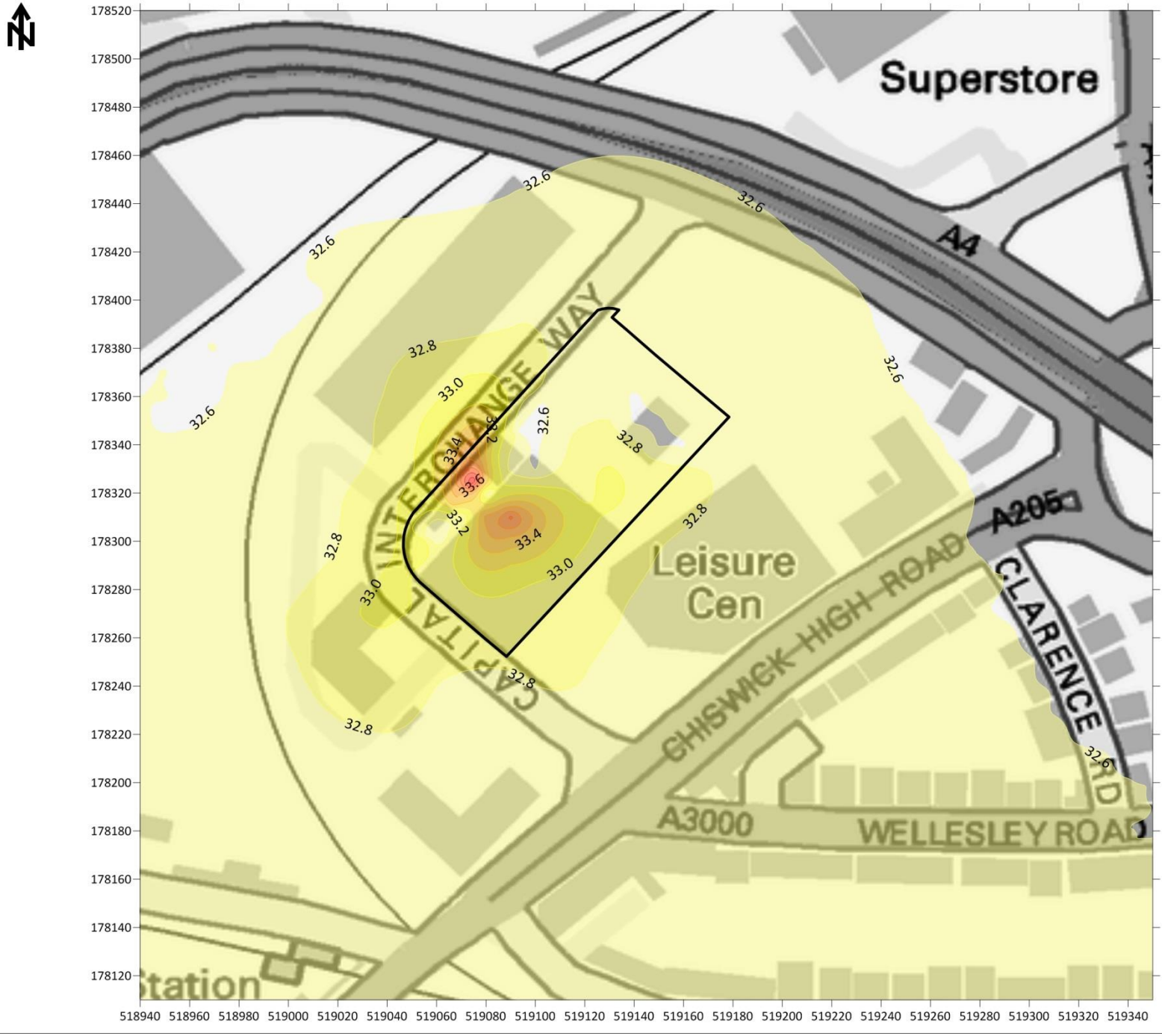

Legend

Site Boundary

Predicted Annual Mean NO_2 Concentration (µg/m³)

34.4
34.2
34.0
33.8
33.6
33.4
33.2
33.0
32.8
32.6

Title

Figure 13

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2023 DS

Seventeenth Floor (z=56.50m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

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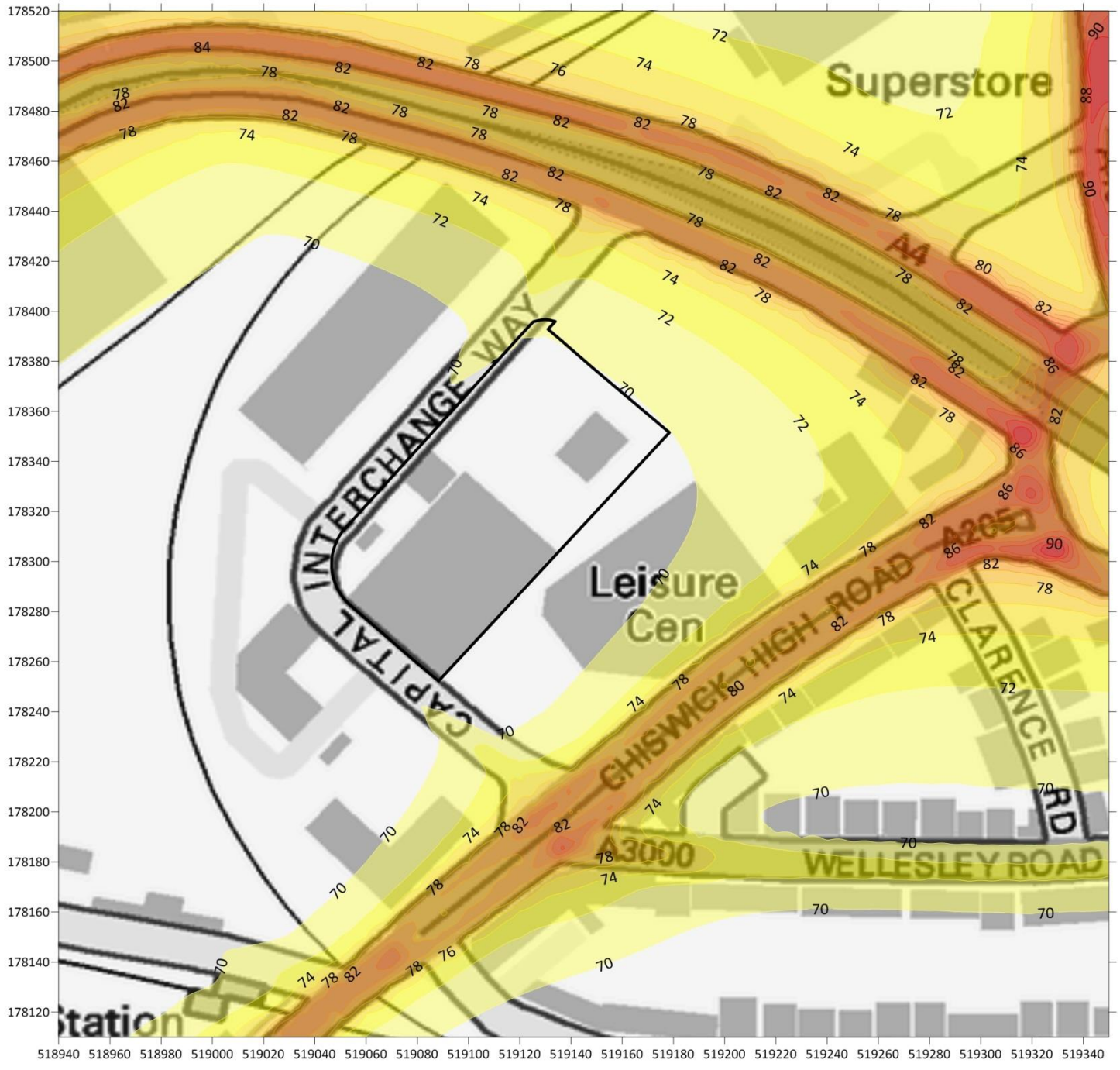

Legend

Site Boundary

92
90
88
86
84
82
80
78
76
74
72
70

Predicted 1-Hour Mean NO_2 Concentration (µg/m³)

Title

Figure 14

Predicted 1-Hour Mean NO_2 Concentrations (µg/m³) 2023 DM

Ground Floor (z=2.25m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

Client

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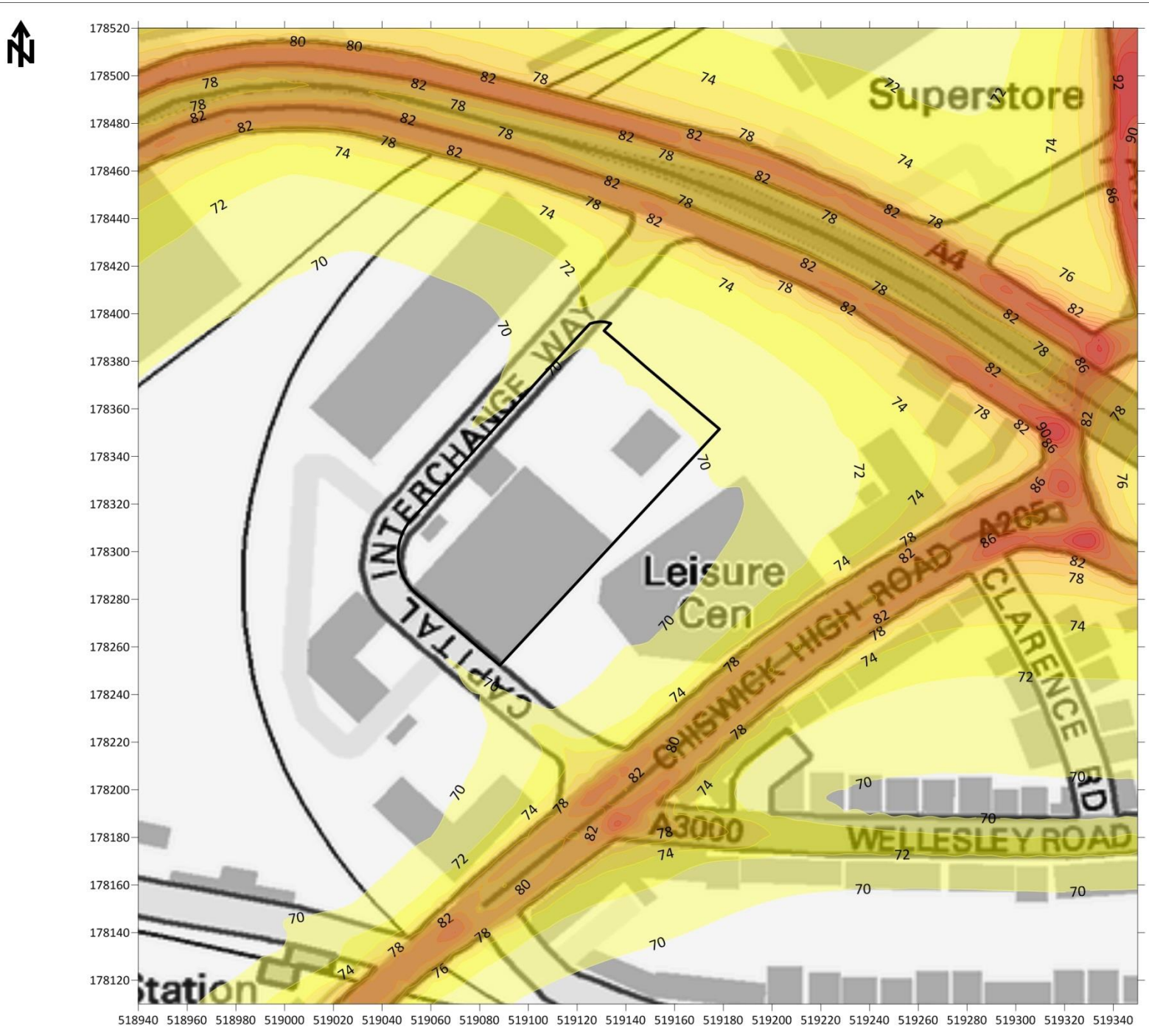

Legend

Site Boundary

92
90
88
86
84
82
80
78
76
74
72
70

Predicted 1-Hour Mean NO_2 Concentration (µg/m³)

Title

Figure 15

Predicted 1-Hour Mean NO_2 Concentrations (µg/m³) 2023 DS

Ground Floor (z=2.25m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

Client

L&Q

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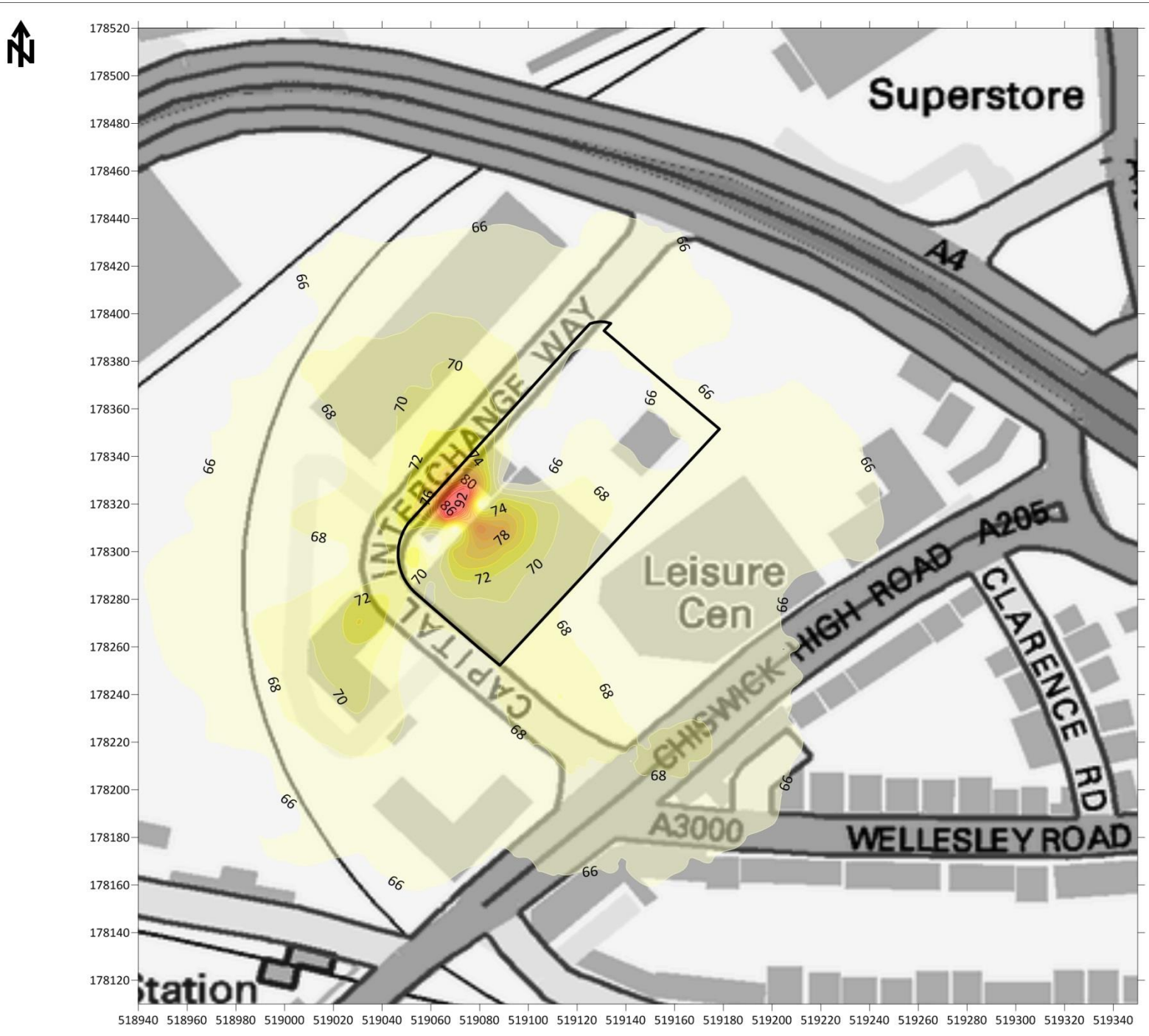

Legend

Site Boundary

Predicted 1-Hour Mean NO_2 Concentration (µg/m³)

92
90
88
86
84
82
80
78
76
74
72
70
68
66

Title

Figure 16

Predicted 1-Hour Mean NO_2 Concentrations (µg/m³) 2023 DS

Seventeenth Floor (z=56.50m)

Project

Air Quality Assessment
Citroen Site, Brentford

Project Number

AQ103860

Client

L&Q

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
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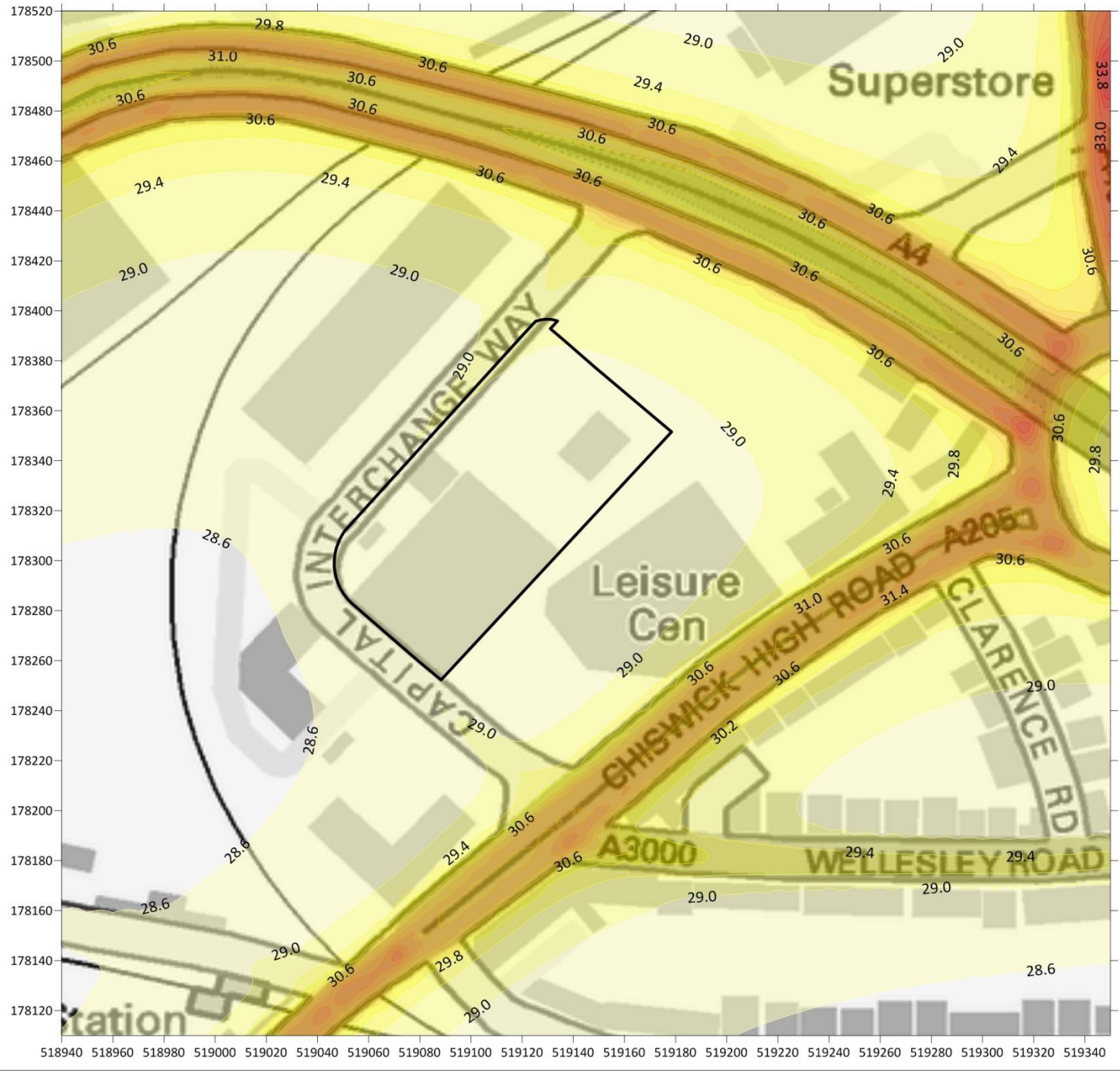

Legend

Site Boundary

Predicted Annual Mean PM_{10} Concentration (µg/m³)

- 33.8
- 33.4
- 33.0
- 32.6
- 32.2
- 31.8
- 31.4
- 31.0
- 30.6
- 30.2
- 29.8
- 29.4
- 29.0
- 28.6

Title

Figure 17

Predicted Annual Mean PM_{10} Concentrations (µg/m³) 2023 DM

Ground Floor (z=2.25m)

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Legend

Site Boundary

Predicted Annual Mean PM_{10} Concentration (µg/m³)

33.8
33.4
33.0
32.6
32.2
31.8
31.4
31.0
30.6
30.2
29.8
29.4
29.0
28.6

Title

Figure 18

Predicted Annual Mean PM_{10} Concentrations (µg/m³) 2023 DS

Ground Floor (z=2.25m)

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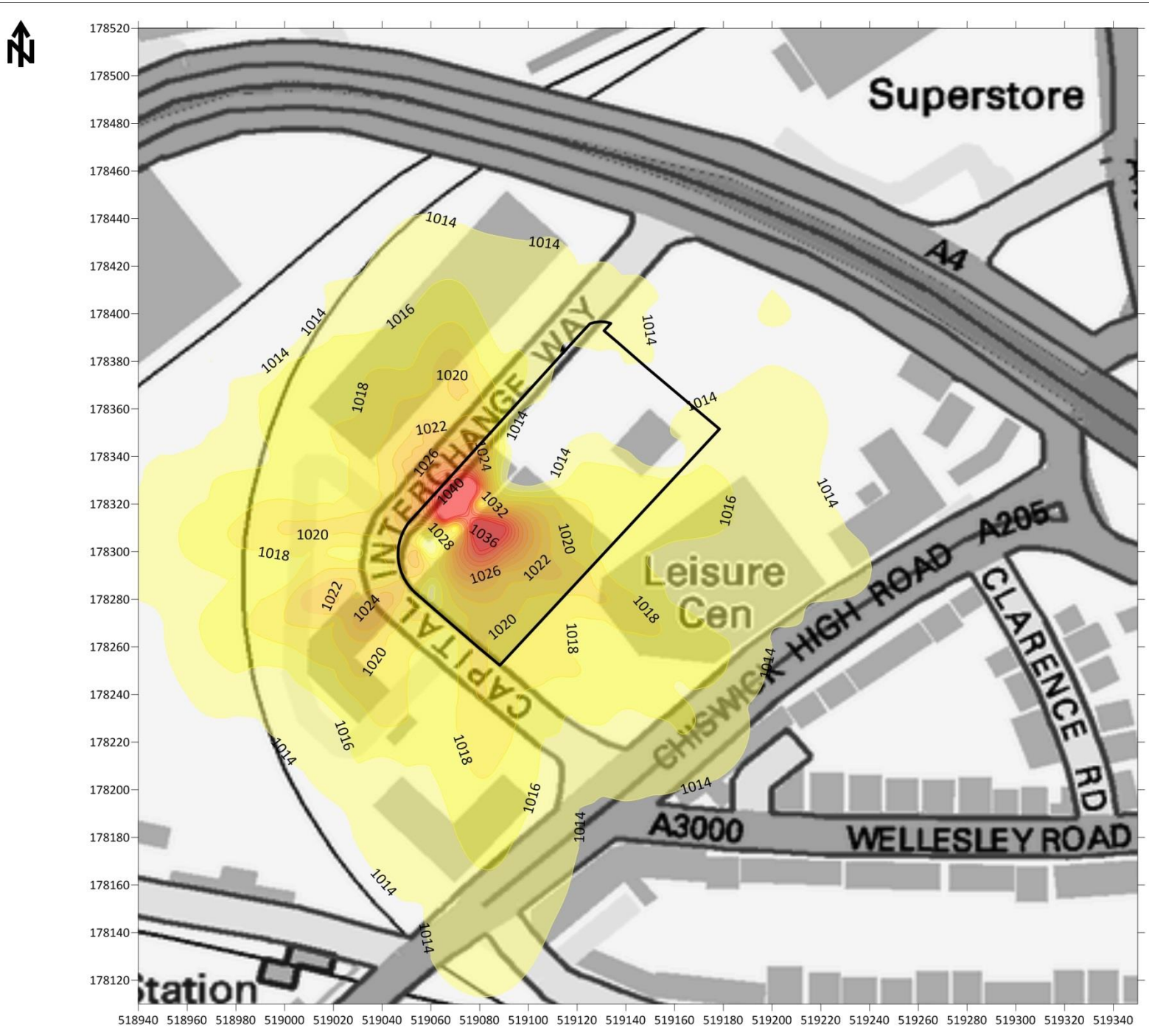

Legend

Site Boundary

1040
1038
1036
1034
1032
1030
1028
1026
1024
1022
1020
1018
1016
1014

Predicted 8-Hour Rolling Mean CO Concentration (µg/m³)

Title

Figure 19

Predicted 8-Hour Rolling Mean CO Concentrations (µg/m³) 2023 DS

Seventeenth Floor (z=56.50m)

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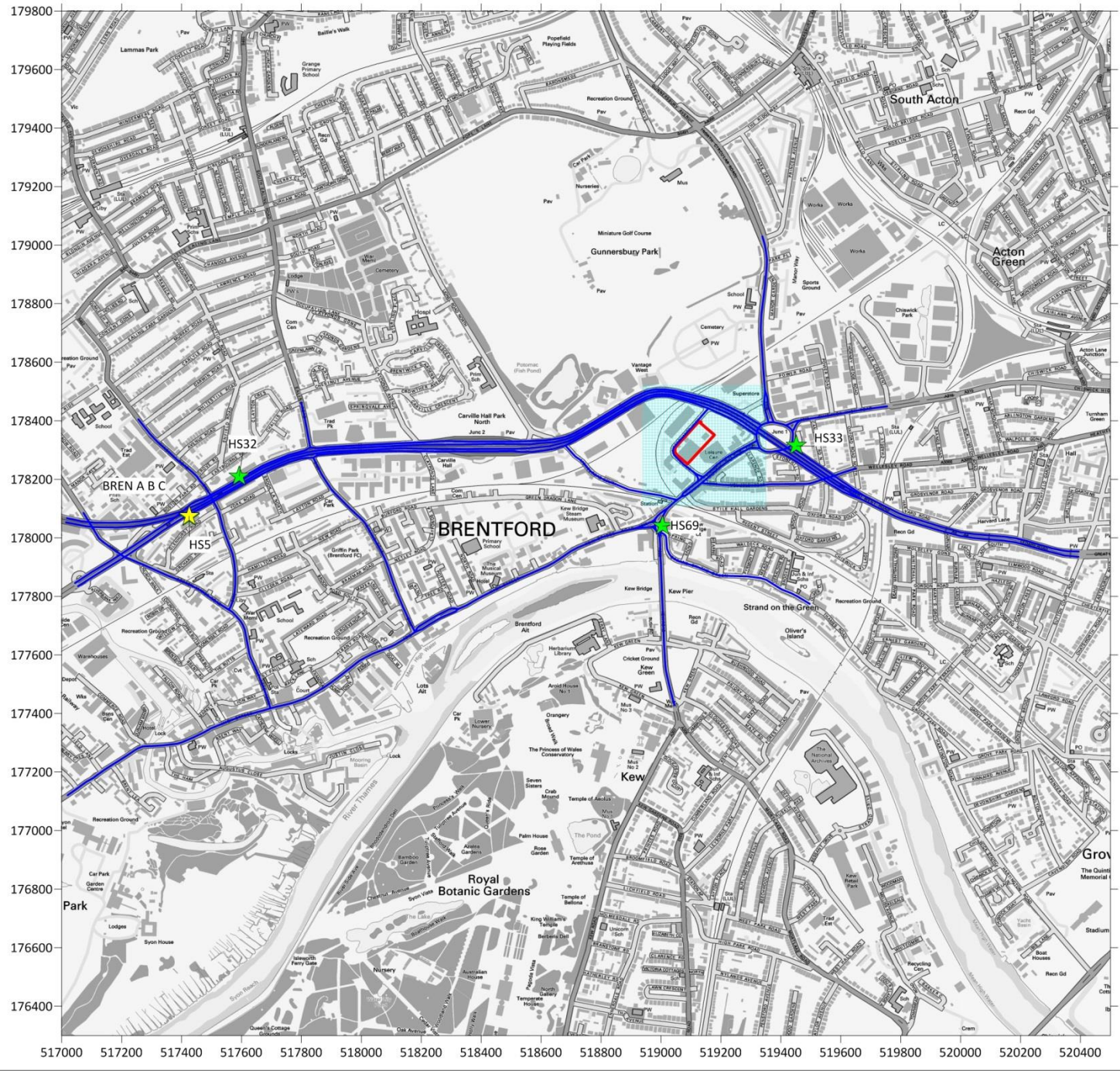

Legend

- Site Boundary
- Modelled Road Link
- Cartesian Grid
- Diffusion Tube Monitoirng Location
- Automatic Monitoring Location

Title

Figure 20

ADMS-Roads Input

Project

Air Quality Assessment
Citroen Site, Brentford

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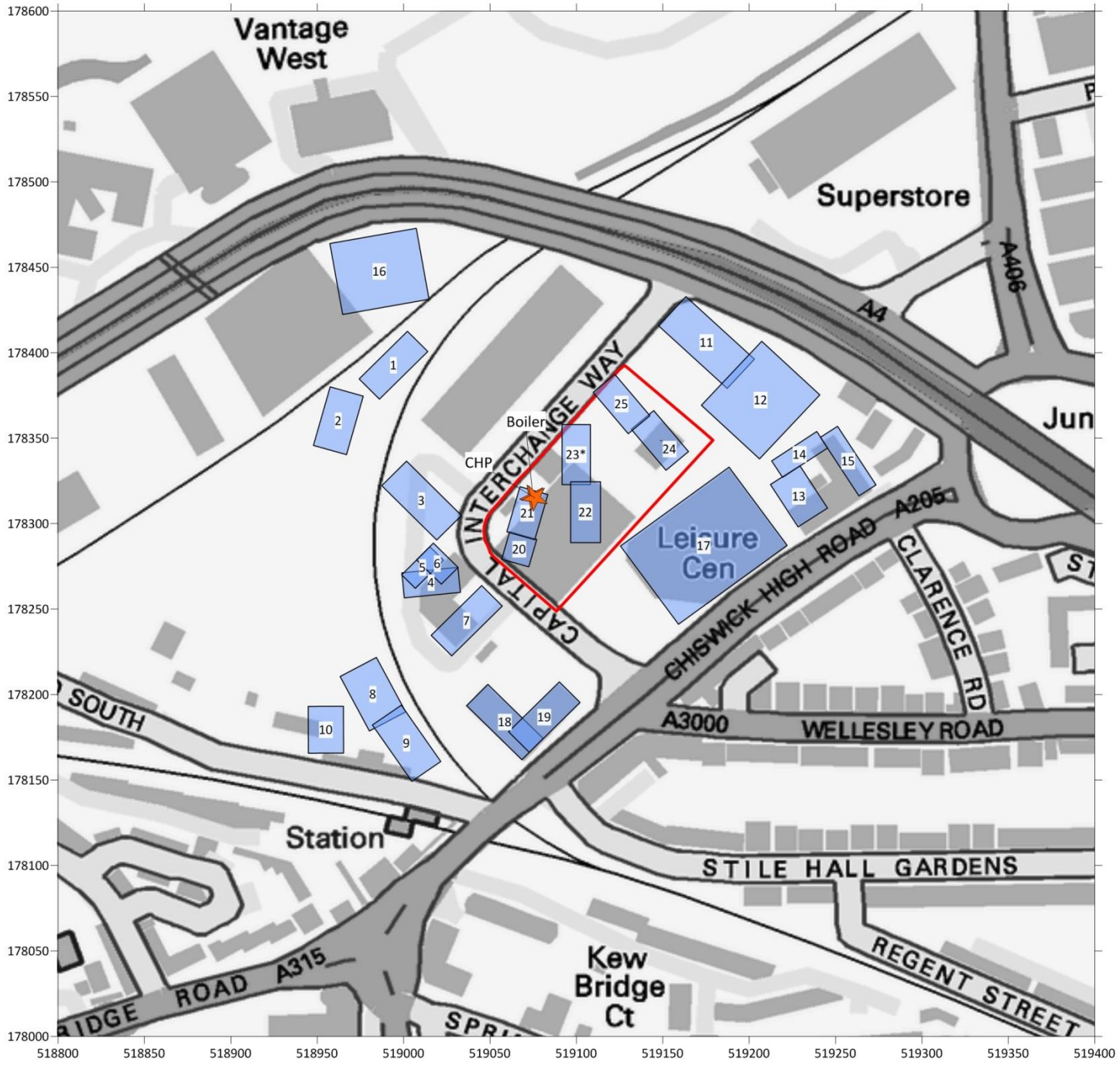

Legend

- Site Boundary
- Modelled Building Layout
- Modelled Point Source

Title
Figure 21
ADMS-5 Inputs

Project
Air Quality Assessment
Citroen Site, Brentford

Project Number
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APPENDIX II ASSESSMENT INPUT DATA

ADMS ROADS – ASSESSMENT INPUTS

The proposed development has the potential to expose future site users to elevated pollutant levels, as well as cause impacts to sensitive locations. In order to assess NO_2 and PM_{10} concentrations across the site, detailed dispersion modelling was undertaken in accordance with the following methodology.

Input Data

The dispersion model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and
- Monin-Obukhov length.

Assessment inputs are described in the following subsections.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 4.0.1.0). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and London.

Assessment Area

Ambient concentrations were predicted over the area NGR: 518940, 178110 to 519350, 178520 at the following heights:

- 2.25m - Ground Floor;
- 6.10m - First Floor;
- 9.20m - Second Floor;
- 12.40m - Third Floor;
- 15.50m - Fourth Floor; and
- 56.50m -Seventeenth Floor.

Results were subsequently used to produce contour plots within the Surfer software package.

Reference should be made to Figure 20 within Appendix I for a graphical representation of the assessment grid extents.

Traffic Flow Data

Traffic data for use in the assessment, including committed development flows and flows associated with the proposals, was provided by Peter Brett Associates LLP, the appointed Transport Consultant for the project.

The provided data did not include a number of roads within the surrounding road network. As such, 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition, was obtained from the London Atmospheric Emissions Inventory (LAEI). The updated version of the LAEI (2013) was released by the Greater London Authority (GLA) in 2016 and provides information on emissions from all sources of air pollutants in the Greater London area.

Growth factors provided by the Trip End Model Presentation Program (TEMPRO) software package were utilised to allow for conversion from the obtained 2013 traffic flow year to 2016, which was used for model verification, and to 2023, which was used to represent the development opening year.

Road widths were estimated from aerial photography and UK highway design standards. Reference should be made to Figure 20 within Appendix I for a graphical representation of the road link locations. A summary of the traffic data used in the verification scenarios is provided in Table AII.1

Table AII.1 2016 Traffic Data

Road Link		Elevation of Road (m)	Road Width (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
L1	Capital Interchange Way	0.0	6.9	1,462	11.91	40.0
L1a	Capital Interchange Way	0.0	6.9	1,462	11.91	40.0
L1b	Capital Interchange Way - A4 Jct	0.0	9.9	1,462	11.91	15.0
L1c	Capital Interchange Way - A205 Slip off	0.0	4.9	731	11.91	15.0
L1d	Capital Interchange Way - A205 Slip on	0.0	4.4	731	11.91	15.0
L2	A205 (S Circular Rd)	0.0	11.4	26,311	6.78	30.0
L2a	A205 (S Circular Rd) - A205/A315 Jct Slip off	0.0	7.8	13,156	6.78	25.0
L2b	A205 (S Circular Rd) - A205/A315 Jct Slip on	0.0	10.4	13,156	6.78	15.0
L3	A205 (S Circular Rd) - Eastbound	0.0	7.3	13,156	6.78	30.0
L3a	A205 (S Circular Rd) - Eastbound - Slow Down	0.0	7.6	13,156	6.78	15.0
L3b	A205 (S Circular Rd) - Eastbound	0.0	6.8	13,156	6.78	30.0
L3c	A205 (S Circular Rd) - Eastbound - Chiswick Roundabout Jct	0.0	9.5	13,156	6.78	15.0

Road Link		Elevation of Road (m)	Road Width (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
L4	A205 (S Circular Rd) - Westbound	0.00	7.1	13,156	6.78	30.0
L4a	A205 (S Circular Rd) - Westbound - A300 Jct	0.00	7.3	13,156	6.78	15.0
L4b	A205 (S Circular Rd) - Westbound	0.00	7.3	13,156	6.78	30.0
L4c	A205 (S Circular Rd) - Westbound - Chiswick Roundabout Jct	0.00	6.1	13,156	6.78	15.0
L5	A315 (Kew Bridge Rd)	0.00	11.1	21,344	7.08	40.0
L5a	A315 (Kew Bridge Rd) - A205/A315 Jct Slip off	0.00	5.2	10,672	7.08	25.0
L5b	A315 (Kew Bridge Rd) - A205/A315 Jct Slip on	0.00	9.1	10,672	7.08	15.0
L6	A315 (High St)	0.00	8.1	21,344	7.08	40.0
L6a	A315 (High St) - Westbound	0.00	6.3	10,672	7.08	40.0
L6b	A315 (High St) - Eastbound	0.00	6.6	10,672	7.08	40.0
L6c	A315 (High St) - W of B455	0.00	8.0	21,032	5.70	40.0
L6d	A315 (High St) - W of A3002	0.00	7.8	19,300	9.14	40.0
L7	A315 (London Rd)	0.00	9.9	18,764	6.54	40.0
L8	A205 (S Circular Rd)	0.00	10.5	36,788	6.25	40.0
L8a	A205 (S Circular Rd) - A205/A315 Jct Slip off	0.00	9.0	18,451	6.65	25.0
L8b	A205 (S Circular Rd) - A205/A315 Jct Slip on	0.00	5.3	18,459	6.69	15.0
L9	A205/315 Jct	0.00	6.5	6,578	6.78	15.0
L9a	A205/315 Jct	0.00	6.4	6,578	6.78	15.0
L10	A205/315 Jct	0.00	4.2	9,230	6.69	15.0
L10a	A205/315 Jct	0.00	6.5	9,230	6.69	15.0
L11	A205/315 Jct	0.00	4.9	5,336	7.08	15.0
L11a	A205/315 Jct	0.00	6.5	5,336	7.08	15.0
L12	A3000 (Wellesley Rd) - A205 Jct	0.00	6.7	8,029	1.63	15.0
L12a	A3000 (Wellesley Rd)	0.00	8.6	8,029	1.63	30.0
L13	A315 (Chiswick High Rd)	0.00	10.9	15,779	9.91	30.0

Road Link		Elevation of Road (m)	Road Width (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
L13a	A315 (Chiswick High Rd) - Chiswick Roundabout Slip off	0.00	6.1	7,890	9.92	25.0
L13b	A315 (Chiswick High Rd) - Chiswick Roundabout Slip on	0.00	9.4	7,890	9.92	15.0
L14	A4 (Cedars Rd/Great West Rd) - Westbound	9.50	8.8	47,057	3.76	50.0
L14a	A4 (Great West Rd) - Westbound - S of Jct 1 - Slip off	4.75	7.6	5,283	3.76	30.0
L14b	A4 (Great West Rd) - Westbound - S of Jct 1 - Slip off	0.00	7.7	5,283	3.76	15.0
L15	A4 (Cedars Rd/Great West Rd) - Eastbound	9.50	8.9	47,057	3.76	50.0
L15a	A4 (Great West Rd) - Eastbound - S of Jct 1 - Slip on	4.75	4.9	5,283	3.76	30.0
L15b	A4 (Great West Rd) - Eastbound - S of Jct 1 - Slip on	0.00	7.8	5,283	3.76	15.0
L16	M4 - Westbound	9.50	7.4	41,774	4.35	50.0
L16a	M4 - Westbound - Jct 2	9.50	15.7	41,774	4.35	50.0
L16b	M4 - Westbound - W of Jct 2	9.50	7.1	43,858	4.31	65.0
L17	M4 - Eastbound	9.50	7.3	41,774	4.35	50.0
L17a	M4 - Eastbound - Jct 2	9.50	16.7	41,774	4.35	50.0
L17b	M4 - Eastbound - W of Jct	9.50	7.1	43,858	4.31	65.0
L18	A4 (Great West Rd) - Westbound - N of Jct 1	0.00	9.4	20,979	4.66	40.0
L18a	A4 (Great West Rd) - Westbound - N of Jct 1 - Chiswick Roundabout Jct	0.00	7.3	20,979	4.66	25.0
L18b	A4 (Great West Rd) - Westbound - W of Jct 2	0.00	9.4	19,147	7.33	50.0
L18c	A4 (Great West Rd) - Westbound - B452 Jct	0.00	9.4	19,147	7.33	15.0
L18d	A4 (Great West Rd) - Westbound - W of B452	0.00	9.4	19,147	7.33	40.0
L18e	A4 (Great West Rd) - Westbound - A3002 Jct	0.00	9.3	19,147	7.33	15.0
L18f	A4 (Great West Rd) - Westbound - W of A3002	0.00	9.2	25,245	3.06	50.0
L19	A4 (Great West Rd) - Easttbound - N of Jct 1	0.00	8.8	20,979	4.66	40.0
L19a	A4 (Great West Rd) - Eastbound - N of Jct 1 - Chiswick Roundabout Jct	0.00	11.0	20,979	4.66	15.0
L19b	A4 (Great West Rd) - Eastbound - W of Jct 2	0.00	9.1	19,147	7.33	50.0

Road Link		Elevation of Road (m)	Road Width (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
L19c	A4 (Great West Rd) - Easttbound - B452 Jct	0.00	11.5	19,147	7.33	15.0
L19d	A4 (Great West Rd) - Eastbound - W of B452	0.00	9.9	19,147	7.33	40.0
L19e	A4 (Great West Rd) - Eastbound - A3002 Jct	0.00	9.5	19,147	7.33	15.0
L19f	A4 (Great West Rd) - Eastbound - W of A3002	0.00	9.5	25,245	3.06	50.0
L20	A406 (N Circular Rd)	0.00	11.5	44,152	5.54	40.0
L20a	A406 (N Circular Rd) - Slip off Chiswick Roundabout	0.00	5.9	22,553	7.54	25.0
L20b	A406 (N Circular Rd) - Slip on Chiswick Roundabout	0.00	8.3	22,140	5.81	15.0
L21	B455 (Ealing Road) - S of M4	0.00	8.0	10,625	7.02	30.0
L21a	B455 (Ealing Road) - N of M4	0.00	7.7	14,307	6.11	30.0
L22	A3002 (Half Acre)	0.00	7.4	9,135	11.61	30.0
L22a	A3002 (Boston Manor Rd) - S of A4	0.00	6.6	8,866	8.92	30.0
L22b	A3002 (Boston Manor Rd) - S of A4 - A4 Jct	0.00	14.8	8,866	8.92	15.0
L22c	A3002 (Boston Manor Rd) - N of A4 - A4 Jct	0.00	13.9	18,191	5.53	15.0
L22d	A3002 (Boston Manor Rd) - N of A4	0.00	11.0	18,191	5.53	30.0
L23	B452 (Windmill Rd) - S of A4	0.00	6.7	2,682	12.98	30.0
L23a	B452 (Windmill Rd) - S of A4 - A4 Jct	0.00	7.0	2,682	12.98	15.0
L23b	B452 (Windmill Rd) - N of A4 - A4 Jct	0.00	7.1	8,875	6.81	15.0
L23c	B452 (Windmill Rd) - N of A4	0.00	6.8	8,875	6.81	30.0
R1	Chiswick Roundabout	0.00	10.4	8,367	15.05	20.0
R1a	Chiswick Roundabout	0.00	10.4	14,902	7.79	20.0
R1b	Chiswick Roundabout	0.00	10.4	14,902	7.79	20.0
R1c	Chiswick Roundabout	0.00	10.4	14,903	7.80	20.0
R1d	Chiswick Roundabout	0.00	10.4	7,826	9.19	20.0
L24	Strand-On-The-Green	0.00	10.8	9,415	5.46	25.0
L25	Lionel Rd S	0.00	6.0	1,347	3.67	25.0

The elevation of the road, road width and mean vehicle speed shown in Table All.1 remained the

same for 2023. A summary of the 2023 traffic data is shown in Table AII.2.

Table AII.2 2023 Traffic Data

Road Link		DM		DS	
		24-hour AADT Flow	HDV Prop. (%)	24-hour AADT Flow	HDV Prop. (%)
L1	Capital Interchange Way	2,226	7.91	2,312	7.91
L1a	Capital Interchange Way	2,701	6.52	2,738	6.52
L1b	Capital Interchange Way - A4 Jct	2,226	7.91	2,312	7.91
L1c	Capital Interchange Way - A205 Slip off	1,351	6.52	1,369	6.52
L1d	Capital Interchange Way - A205 Slip on	1,351	6.52	1,369	6.52
L2	A205 (S Circular Rd)	30,049	6.51	30,086	6.51
L2a	A205 (S Circular Rd) - A205/A315 Jct Slip off	15,025	6.51	15,043	6.51
L2b	A205 (S Circular Rd) - A205/A315 Jct Slip on	15,025	6.51	15,043	6.51
L3	A205 (S Circular Rd) - Eastbound	15,025	6.51	15,043	6.51
L3a	A205 (S Circular Rd) - Eastbound - Slow Down	15,025	6.51	15,043	6.51
L3b	A205 (S Circular Rd) - Eastbound	15,025	6.51	15,043	6.51
L3c	A205 (S Circular Rd) - Eastbound - Chiswick Roundabout Jct	15,025	6.51	15,043	6.51
L4	A205 (S Circular Rd) - Westbound	15,025	6.51	15,043	6.51
L4a	A205 (S Circular Rd) - Westbound - A300 Jct	15,025	6.51	15,043	6.51
L4b	A205 (S Circular Rd) - Westbound	15,025	6.51	15,043	6.51
L4c	A205 (S Circular Rd) - Westbound - Chiswick Roundabout Jct	15,025	6.51	15,043	6.51
L5	A315 (Kew Bridge Rd)	22,758	7.08	22,767	7.08
L5a	A315 (Kew Bridge Rd) - A205/A315 Jct Slip off	11,379	7.08	11,384	7.08
L5b	A315 (Kew Bridge Rd) - A205/A315 Jct Slip on	11,379	7.08	11,384	7.08
L6	A315 (High St)	22,758	7.08	22,767	7.08
L6a	A315 (High St) - Westbound	11,379	7.08	11,384	7.08
L6b	A315 (High St) - Eastbound	11,379	7.08	11,384	7.08
L6c	A315 (High St) - W of B455	22,426	5.70	22,435	5.70
L6d	A315 (High St) - W of A3002	20,579	9.14	20,588	9.14

Road Link		DM		DS	
		24-hour AADT Flow	HDV Prop. (%)	24-hour AADT Flow	HDV Prop. (%)
L7	A315 (London Rd)	20,007	6.54	20,016	6.54
L8	A205 (S Circular Rd)	39,225	6.25	39,229	6.25
L8a	A205 (S Circular Rd) - A205/A315 Jct Slip off	19,673	6.65	19,675	6.65
L8b	A205 (S Circular Rd) - A205/A315 Jct Slip on	19,682	6.69	19,684	6.69
L9	A205/315 Jct	7,207	6.78	7,216	6.78
L9a	A205/315 Jct	7,207	6.78	7,216	6.78
L10	A205/315 Jct	9,841	6.69	9,842	6.69
L10a	A205/315 Jct	9,841	6.69	9,842	6.69
L11	A205/315 Jct	5,690	7.08	5,692	7.08
L11a	A205/315 Jct	5,690	7.08	5,692	7.08
L12	A3000 (Wellesley Rd) - A205 Jct	8,561	1.63	8,561	1.63
L12a	A3000 (Wellesley Rd)	8,561	1.63	8,561	1.63
L13	A315 (Chiswick High Rd)	16,824	9.91	16,835	9.91
L13a	A315 (Chiswick High Rd) - Chiswick Roundabout Slip off	8,412	9.92	8,418	9.92
L13b	A315 (Chiswick High Rd) - Chiswick Roundabout Slip on	8,412	9.92	8,418	9.92
L14	A4 (Cedars Rd/Great West Rd) - Westbound	50,472	3.73	50,481	3.73
L14a	A4 (Great West Rd) - Westbound - S of Jct 1 - Slip off	5,931	3.57	5,940	3.57
L14b	A4 (Great West Rd) - Westbound - S of Jct 1 - Slip off	5,931	3.57	5,940	3.57
L15	A4 (Cedars Rd/Great West Rd) - Eastbound	50,472	3.73	50,481	3.73
L15a	A4 (Great West Rd) - Eastbound - S of Jct 1 - Slip on	5,931	3.57	5,940	3.57
L15b	A4 (Great West Rd) - Eastbound - S of Jct 1 - Slip on	5,931	3.57	5,940	3.57
L16	M4 - Westbound	44,541	4.35	44,604	4.35
L16a	M4 - Westbound - Jct 2	44,541	4.35	44,604	4.35
L16b	M4 - Westbound - W of Jct 2	46,763	4.31	46,826	4.31

Road Link		DM		DS	
		24-hour AADT Flow	HDV Prop. (%)	24-hour AADT Flow	HDV Prop. (%)
L17	M4 - Eastbound	44,541	4.35	44,541	4.35
L17a	M4 - Eastbound - Jct 2	44,541	4.35	44,541	4.35
L17b	M4 - Eastbound - W of Jct	46,763	4.31	46,763	4.31
L18	A4 (Great West Rd) - Westbound - N of Jct 1	23,283	4.60	23,369	4.60
L18a	A4 (Great West Rd) - Westbound - N of Jct 1 - Chiswick Roundabout Jct	23,283	4.60	23,369	4.60
L18b	A4 (Great West Rd) - Westbound - W of Jct 2	20,713	7.23	20,799	7.23
L18c	A4 (Great West Rd) - Westbound - B452 Jct	20,713	7.23	20,799	7.23
L18d	A4 (Great West Rd) - Westbound - W of B452	20,713	7.23	20,799	7.23
L18e	A4 (Great West Rd) - Westbound - A3002 Jct	20,713	7.23	20,799	7.23
L18f	A4 (Great West Rd) - Westbound - W of A3002	27,215	3.03	27,301	3.03
L19	A4 (Great West Rd) - Easttbound - N of Jct 1	23,283	4.60	23,283	4.60
L19a	A4 (Great West Rd) - Eastbound - N of Jct 1 - Chiswick Roundabout Jct	23,283	4.60	23,283	4.60
L19b	A4 (Great West Rd) - Eastbound - W of Jct 2	20,713	7.23	20,713	7.23
L19c	A4 (Great West Rd) - Easttbound - B452 Jct	20,713	7.23	20,713	7.23
L19d	A4 (Great West Rd) - Eastbound - W of B452	20,713	7.23	20,713	7.23
L19e	A4 (Great West Rd) - Eastbound - A3002 Jct	20,713	7.23	20,713	7.23
L19f	A4 (Great West Rd) - Eastbound - W of A3002	27,215	3.03	27,215	3.03
L20	A406 (N Circular Rd)	47,077	5.54	47,093	5.54
L20a	A406 (N Circular Rd) - Slip off Chiswick Roundabout	24,048	7.54	24,056	7.54
L20b	A406 (N Circular Rd) - Slip on Chiswick Roundabout	23,607	5.81	23,615	5.81
L21	B455 (Ealing Road) - S of M4	11,329	7.02	11,329	7.02
L21a	B455 (Ealing Road) - N of M4	15,254	6.11	15,254	6.11
L22	A3002 (Half Acre)	9,740	11.61	9,740	11.61
L22a	A3002 (Boston Manor Rd) - S of A4	9,453	8.92	9,453	8.92
L22b	A3002 (Boston Manor Rd) - S of A4 - A4 Jct	9,453	8.92	9,453	8.92

Road Link		DM		DS	
		24-hour AADT Flow	HDV Prop. (%)	24-hour AADT Flow	HDV Prop. (%)
L22c	A3002 (Boston Manor Rd) - N of A4 - A4 Jct	19,396	5.53	19,396	5.53
L22d	A3002 (Boston Manor Rd) - N of A4	19,396	5.53	19,396	5.53
L23	B452 (Windmill Rd) - S of A4	2,859	12.98	2,859	12.98
L23a	B452 (Windmill Rd) - S of A4 - A4 Jct	2,859	12.98	2,859	12.98
L23b	B452 (Windmill Rd) - N of A4 - A4 Jct	9,463	6.81	9,463	6.81
L23c	B452 (Windmill Rd) - N of A4	9,463	6.81	9,463	6.81
R1	Chiswick Roundabout	8,921	15.05	8,930	15.05
R1a	Chiswick Roundabout	15,889	7.79	15,908	7.79
R1b	Chiswick Roundabout	15,889	7.79	15,908	7.79
R1c	Chiswick Roundabout	15,891	7.80	15,909	7.80
R1d	Chiswick Roundabout	8,345	9.19	8,363	9.19
L24	Strand-On-The-Green	10,039	5.46	10,040	5.46
L25	Lionel Rd S	1,436	3.67	1,436	3.67

Emission Factors

For the 2016 Verification, emission factors for each road link were calculated using the relevant traffic flows and Emissions Factor Toolkit (version 8.0.1) released in 2017, which incorporates updated COPERTv5 vehicle emissions factors for NO_x and vehicle fleet information.

Emission factors for the 2023 Future Year scenario were calculated using the Calculator Using Realistic Emissions for Diesels (CURED, version V3A), developed by Air Quality Consultants Ltd. This calculator gives realistic, worst case emission factors for diesels for future years which utilise recent real-world emissions test data. This calculator was used exclusively for the future year 2023 Future Year Scenario for NO_x.

It should be noted that PM_{10} emission factors were calculated using the Emission Factor Toolkit (version 8.0.1) for the 2016 Verification scenario and the 2023 Opening Year scenario.

Meteorological Data

Meteorological data used in this assessment was taken from Heathrow Airport Meteorological Station over the period 1st January 2016 to 31st December 2016 (inclusive). Heathrow Airport Meteorological station is located at approximate NGR: 507060, 176500, which is approximately 12.1km west of the proposed development.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 5 within Appendix I for a wind rose of utilised meteorological data.

Roughness Length

A roughness length (z_0) of 1.5m was used in this dispersion modelling study. This value of z_0 is considered appropriate for the morphology of the assessment area and is suggested within ADMS-Roads as being suitable for 'large urban areas'.

A z_0 of 0.5m was utilised to represent the morphology of the meteorological station location and is suggested as being suitable for 'parkland, open-suburbia'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used in this dispersion modelling study. This value is considered appropriate for the nature of the assessment area and meteorological station location and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

Background Concentrations

An annual mean NO_2 concentration of 31.83µg/m^3, PM_{10} concentration of 18.87µg/m^3 and a CO concentration of 506.00µg/m^3 as predicted by DEFRA, was used in the dispersion modelling assessment to represent annual mean pollutant levels in the vicinity of the site.

Since both the monitoring locations used in the verification process and the receptor locations used in the operational phase assessment were located in several grid squares, predicted concentrations from their respective grid squares were used to represent their respective background concentrations for the modelling process.

Table AII.3 displays the predicted background concentrations by DEFRA used in the verification process for the diffusion tube monitoring location.

Table AII.3 Predicted Background Pollutant Concentrations for Verification

Monitor Grid Square	Monitors	Pollutant	Predicted Background Concentration (µg/m^3)
			2016
517500, 178500	HS32, Bren A B C, HS5	NO_x	48.91
		NO_2	30.99
		PM_{10}	18.44
519500, 178500	HS33, HS69	NO_x	50.67
		NO_2	31.83

Monitor Grid Square	Monitors	Pollutant	Predicted Background Concentration (µg/m^3)
			2016
		PM_{10}	18.87

Table AII.4 displays the predicted background concentrations by DEFRA used in the operational phase assessment for the sensitive receptor locations.

Table AII.4 Predicted Background Pollutant Concentrations for Receptors

Receptor Grid Square	Receptors	Pollutant	Predicted Background Concentration (µg/m^3)
			2016
518500, 177500	R21	NO_x	35.88
		NO_2	23.93
		PM_{10}	15.95
518500, 178500	R5, R5a, R6, R6a, R12	NO_x	49.07
		NO_2	30.96
		PM_{10}	18.10
519500, 178500	R1, R1a, R2, R2a, R3, R3a, R4, R4a, R7, R8, R9, R10, R10a, R11, R13, R14, R15, R16, R17, R18, R19, R20	NO_x	50.67
		NO_2	31.83
		PM_{10}	18.87

Background concentrations for 2016 were utilised in preference to the development opening year. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposals.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO_2 concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LLAQM.TG (16).

Verification

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

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;

- Variations in meteorological conditions;
- Overall model limitations; and
- Uncertainties associated with monitoring data, including locations.

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

For the purpose of this assessment model verification was undertaken for 2016, using traffic data, meteorological data and monitoring results from this year.

LBH undertakes monitoring of NO_2 concentrations at 5 suitable roadside monitoring locations within the assessment extents, which includes one automatic monitoring location These locations are considered to be best representative of the site as they are either located within the vicinity of the site or in close proximity to the A4/M4, similarly to the proposed development. Figure 20 within Appendix I displays the monitoring locations used in the verification process.

The road contribution to total NO_x concentration was calculated from the monitored NO_2 result for use in the verification process. This was undertaken following the methodology contained within GLA guidance LLAQM.TG (16).

The dispersion model was run with the traffic input data previously detailed for 2016 to predict the NO_x concentration at the monitoring locations. The results are shown in Table AII.5.

Table AII.5 Monitoring Results

Monitoring Location		Monitored Road NO_x Concentration ($\mu g/m^3$)	Modelled Road NO_x Concentration ($\mu g/m^3$)
HS32	24 Adelaide Terrace	74.40	20.23
HS33	30 Surrey Crescent	66.59	26.55
HS69	Kew Bridge	59.95	43.42
BREN A B C	Brentford, Glenhurst Road	91.56	32.31
HS5	Brentford	66.66	32.95

The monitored and modelled NO_x road contribution concentrations were calculated and the equation of the trendline based on the linear progression through zero was calculated. This indicated that a verification factor of **2.1506** was required to be applied to all NO_x modelling results, showing the model has a tendency to underestimate pollutant concentrations throughout the assessment extents.

Graph 1 – Primary Verification Adjustment Factor

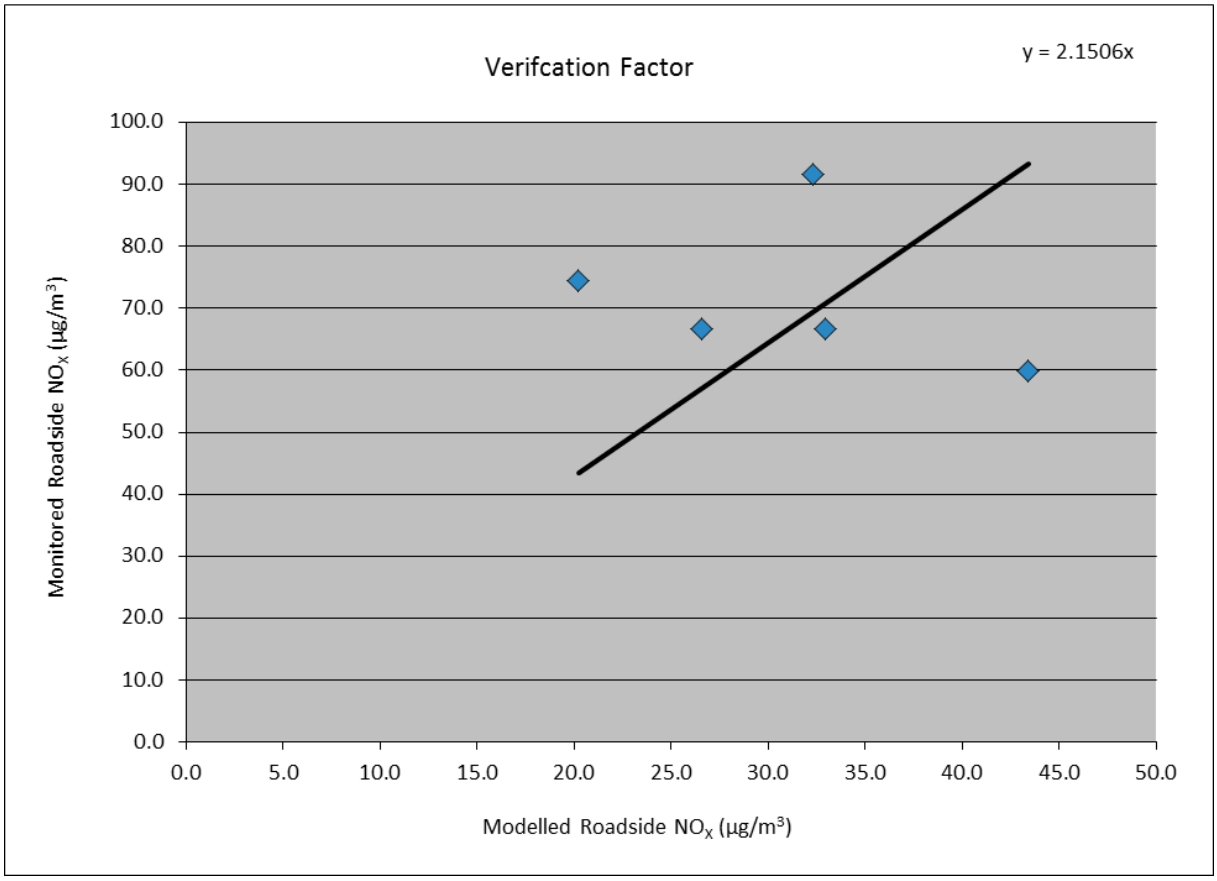

Table AII.6 presents the monitored annual mean NO_2 concentrations and the adjusted modelled total NO_2 concentration based on the above verification factor. Exceedances are shown in **bold.**

Table AII.6 2016 NO_2 Monitoring Results

Site ID	Monitoring Location	Monitored NO_2 Concentration ($\mu g/m^3$)	Adjusted Modelled Total NO_2 Concentration ($\mu g/m^3$)	Difference (%)
HS32	24 Adelaide Terrace	**59.40**	**48.91**	17.67
HS33	30 Surrey Crescent	**57.60**	**54.43**	5.50
HS69	Kew Bridge	**55.40**	**65.94**	-19.03
BREN A B C	Brentford, Glenhurst Road	**64.70**	**57.83**	10.63
HS5	Brentford	**56.90**	**58.27**	-2.40

LBH undertakes monitoring of annual mean PM_{10} concentrations at one monitoring location within the assessment extents, it was therefore possible to provide a separate PM_{10} verification factor. Table AII.7 indicates the monitored and calculated annual mean PM_{10} concentrations.

Table AII.7 PM_{10} Monitoring Results

Site ID	Monitoring Location	Monitored PM_{10} Concentration ($\mu g/m^3$)	Modelled PM_{10} concentration ($\mu g/m^3$)
HS5	Brentford	30.70	20.71

The monitored and modelled roadside concentrations were compared to calculate the associated ratio. This indicated a verification factor of **1.4820** was required to be applied to all PM_{10} modelling results.

APPENDIX III ADMS 5 INPUT DATA

ADMS 5 – ASSESSMENT INPUTS

Atmospheric emissions from the proposed CHP and boiler units have the potential to result in air quality impacts in the vicinity of the development. Dispersion modelling using ADMS-5 was therefore undertaken to predict increase in NO_2 and CO concentrations at sensitive locations in order to consider potential changes and impacts as a result of the proposals.

Assessment inputs are described in the following Subsections.

Dispersion Model

Dispersion modelling was undertaken using ADMS-5 (v5.2), which is developed by CERC. ADMS-5 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

The model utilises hourly meteorological data to define conditions for plume rise, transport and diffusion. It estimates the concentration for each source and receptor combination for each hour of input meteorology, and calculates user-selected long-term and short-term averages.

Assessment Area

Ambient concentrations were predicted using the same assessment grids previously described for the ADMS-Roads modelling.

Process Conditions

Process conditions were provided through correspondence with Silcock Dawson, the Engineering Consultants for the project. Reference should be made to Table AIII.1 for dispersion modelling inputs. It should be noted that the process conditions shown are per flue rather than per unit.

Table AIII. 1 Process Conditions

Condition	Unit	CHP	Boilers
Stack location	NGR	519076.0, 178315.1	519074.9, 178315.4
Stack diameter	m	0.3	0.8
Stack height	m	58.0	58.0
Flue gas volumetric flow rate	m^3/s	0.53	3.77
Flue gas efflux velocity	m/s	7.5	7.5
Temperature	˚C	120.0	90.0

Reference should be made to Figure 21 within Appendix I for a graphical representation of the stack locations.

Emissions

Pollutant emissions were provided through correspondence with Silcock Dawson. This is shown in Table AIII.2. It should be noted that the mass emission rates are again shown per flue rather than per unit.

Table AIII.2 Mass Emission Rates

Unit	Parameter	Mass Emission Rate (g/s)
CHP	NO_x	0.00507
	CO	0.01521
Boilers	NO_x	0.0156
	CO	0.0028

Time Varied Emissions

As advised by Silcock Dawson, the proposed CHP boiler units are expected to operate 17 hours a day (annual operational hours of 6,205 hours). A time varied file was therefore applied to represent these hours of operation for the CHP and boiler units. This is considered to be a realistic representation of likely operations, and therefore is considered to provide a robust assessment.

Meteorological Data

Meteorological data used in this assessment was taken from Heathrow Airport Meteorological Station over the period 1st January 2016 to 31st December 2016 (inclusive).

Roughness Length

A z_0 of 1.5m was used in this dispersion modelling study. A z_0 value of 0.5m was used to represent the assessment area and the meteorological station location.

Monin-Obukhov Length

A minimum Monin-Obukhov length of 30m was used to represent the assessment area and meteorological station location.

Building Effects

Analysis of the site layout indicated that a number of structures should be included within the model in order to take account of effects on pollutant dispersion. It should be noted that committed developments within in the vicinity of the site have been included within the model where relevant. Building input geometries are shown in Table AIII.3.

Table AIII.3 Building Geometries

Building		NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
1	Block H, Central Eastern Site	518994.1	178392.7	57.5	16.7	39.5	135.1
2	Block G, Central Eastern Site	518962.2	178360.2	60.5	35.6	19.9	195.8
3	Block I, Capital Court Site	519010.4	178313.5	50.0	45.0	20.3	135.0
4	Block J, Capital Court Site	519015.9	178265.5	53.0	14.7	32.6	174.3
5	Block J, Capital Court Site	519011.0	178274.3	53.0	23.2	11.2	225.0
6	Block J, Capital Court Site	519019.5	178276.6	53.0	13.8	20.2	224.8
7	Block K, Capital Court Site	519036.5	178243.2	38.0	41.3	16.9	225.1
8	Block F, Central Southern Site	518982.2	178200.2	60.0	36.1	23.8	152.0
9	Block F, Central Southern Site	519001.7	178171.5	33.0	20.4	40.1	235.3
10	Block E, Central Southern Site	518955.0	178179.4	54.0	27.4	20.4	179.8
11	Inchape Volkswagen West London	519175.3	178406.0	28.0	23.3	54.0	222.7
12	Inchape Volkswagen West London	519206.6	178372.3	28.0	51.2	46.0	223.0
13	Wheatstone House	519228.8	178316.0	29.5	20.3	29.5	237.2
14	Wheatstone House	519229.2	178340.5	29.5	11.5	31.3	146.6
15	Wheatstone House	519257.3	178336.6	26.5	40.9	11.8	147.0
16	Big Yellow Self Storage Chiswick	518986.0	178447.6	37.0	42.2	50.8	169.9
17	Brentford Fountain Leisure Centre	519173.7	178287.1	14.9	56.8	78.0	143.7
18	Kew House School	519058.6	178183.9	17.4	17.5	45.0	224.7
19	Kew House School	519081.4	178186.8	17.4	41.4	17.0	225.2
20	Core 1, Proposed Building	519066.9	178285.0	47.3	16.7	16.3	196.0
21	Core 1, Proposed Building	519071.6	178306.1	53.6	27.5	16.8	196.0
22	Core 2, Proposed Building	519105.3	178306.7	41.0	35.6	17.3	180.0
23	Core 3, Proposed Building	519099.9	178340.4	56.7	35.2	16.4	180.0
24	Core 5, Proposed Building	519148.3	178348.7	59.9	31.3	17.0	140.0
25	Core 4, Proposed Building	519126.1	178370.0	44.1	31.6	16.4	140.0

Reference should be made to Figure 21 within Appendix I for a graphical representation of the modelled building locations.

APPENDIX IV ASSESSOR'S CURRICULUM VITAE

CONAL KEARNEY

Principal Air Quality Consultant

BEng(Hons), MSc, MIAQM, MIEnvSc

KEY EXPERIENCE:

Conal is a Principal Consultant with specialist experience in the air quality and odour sector. His key capabilities include:

- Advanced atmospheric air dispersion modelling of road vehicle and industrial emissions using ADMS-ROADS and AIRVIRO.
- Preparation of factual and interpretative Air Quality Assessment reports and Air Quality Environmental Statement chapters in the vicinity of proposed schemes and developments in accordance with DEFRA, Environment Agency and Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) methodologies.
- Management and delivery of project work on key, land development and urban regeneration projects.
- Assessment of road vehicle exhaust emissions using the Design Manual for Roads and Bridges (DMRB) calculation spreadsheet.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Dust and Odour impact assessments from minerals and waste sites
- Representing clients at public enquiries and planning hearings.

QUALIFICATIONS:

- Bachelor of Engineering
- Master of Science
- Member of Institute of Air Quality Management
- Member of the Institute of Environmental Science (IES)

SELECT PROJECTS SUMMARY:

Industrial Developments

Buck Park, Denholme - AQA and dust assessment for proposed mineral extraction and site restoration project.

Messingham Quarry, North Lincolnshire - AQA and dust impacts for proposed new sand extraction site.

Arden Quarry, Derbyshire - AQA for proposed mineral extraction and site restoration

Clayton Hall Landfill, Chorley - AQA and odour assessment for proposed landfill extension and mineral extraction.

Granta Park, Oxfordshire. Assessment of VOC fume emissions.

University of Birmingham. Permit application for CHP scheme.

Arbroath Road, Carnoustie. Odour and AQA for biogas CHP scheme.

Highways Developments

Alderley Edge Bypass, Cheshire - AQA for major new road scheme.

South Heywood – EIA for new link road and mixed use joint development

Residential Developments

Orchard Close, Knaresborough. AQA and public enquiry evidence.

Bredbury Curve, Stockport - AQA assessment for proposed residential development in AQMA.

Hollin Lane, Middlewich – AQA for large scale residential development.

Friars School, Southwark, London. School development for mixed use education and residential building in AQMA.

Abbotsford House, Bearsden, Scotland – AQA and dust assessment for residential development

Westcraig, Edinburgh - EIA chapter for residential development

Queensway, Lytham St Annes. Dust and odour assessment for development.

Manor Place, London. Road and energy generation emissions assessment

Craven Park, London. Mitigation statement and planning hearing expert opinion

Public Sector

Technical advisor on Manchester Airport Consultative Committee - advise members on environmental technical matters in relation to the airport's operations.

Cheshire County Council - compile AQ chapters for Local Transport Plan

Cheshire East Council - specialist AQ advice on highways, minerals and waste projects

Local Air Quality Management

Broughton Gyratory, Chester - dispersion model for City Centre detailed assessment report

Congleton town centre - dispersion modelling assessment for detailed and further assessment reports.

Disley - dispersion modelling assessment for detailed and further assessments

Holmes Chapel - dispersion modelling assessment for detailed and further assessment reports for road and rail sources.

Crewe - town centre dispersion modelling for detailed and further assessment reports.

Commercial Developments

Granta Park Daycare Centre, Oxfordshire. AQA for new build daycare centre adjacent to major road.

Curzon Cinema, Colchester. Air quality assessment for town centre new build cinema.

Newfoundland Circus, Bristol - AQA for hotel development in city centre

Salesians School, Chertsey - AQA for school extension near M25.

Cathedral Street and Thistle Street, Glasgow. University energy generation emission assessments.

JOSH JONES

Graduate Air Quality Consultant

MSci (Hons)

KEY EXPERIENCE:

Josh is a Graduate Environmental Consultant with specialist experience in the air quality sector. His key capabilities include:

- Production of Air Quality Assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, retail and commercial sectors.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of pollutant concentrations at various floor levels and assessment of suitability of development sites for proposed end-use.
- Assessment of road vehicle exhaust emissions using the Design Manual for Roads and Bridges (DMRB) calculation spreadsheet.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Production of air quality mitigation strategies for developments throughout the UK.
- Defining baseline air quality conditions and identification of sensitive areas.

QUALIFICATIONS:

- Master of Science

SELECT PROJECTS SUMMARY:

Residential Developments:

Springmount Mill, Stockport - Air Quality Assessment for a proposed residential development comprising 171 residential units in three new build accommodation blocks.

Watling Street, Norwich - Air Quality Assessment including Construction Phase and dispersion modelling of road-vehicle exhaust emissions using ADMS-Roads.

Green Lane, Padgate, Warrington - Air Quality Assessment in support of a proposed residential development located adjacent to the Manchester/Liverpool Diesel railway line.

Greyfriars House, Coventry - Air Quality Assessment in support of a proposed student accommodation located adjacent to a number of taxi ranks.

Clematis Cottage, Sale - Air Quality Assessment in support of the development of 6 residential units located within close proximity to the M60.

Whitchurch Road, Chester - Air Quality Assessment in support of the redevelopment of site to provide 26 bungalows and assisted living accommodation on land adjacent to the A41 and a Park and Ride.

Knowles House, Brent - Air Quality Assessment and Construction Method Statement for a residential development comprising a 97 unit Temporary Accommodation building and a 57 unit Non-Assisted Independent Living building to provide Care Home accommodation.

Mixed - Use Developments:

50 Severn Street, Birmingham - Air Quality Assessment using ADMS-Roads and ADMS 5 for a proposed mixed-use development comprising 31 residential units and two commercial units over ten storeys.

Iceland Road, Fish Island - Air Quality, Qualitative Dust and Qualitative Odour Assessment in support of a residential-led development comprising residential and commercial space.

Commercial Developments:

33-38 Rushworth Street, Southwark - Air Quality Assessment using ADMS-Roads and ADMS 5 in support of the redevelopment of the site to provide commercial office space and associated infrastructure.

Industrial Developments:

Blakeney Way, Kingswood Lakeside, Cannock - Construction Environmental Management Plan in order to address a planning condition for the proposed development of two distribution warehouses.

Ma6nitude 160, Middlewich - Air Quality Assessment in support of the development of the site to provide a 160,400 sq ft industrial unit.