Air Quality Assessment

High Street, Staines

Client: Future High Street Living (Staines) Ltd

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Executive Summary

Redmore Environmental Ltd was commissioned by Future High Street Living (Staines) Ltd to undertake an Air Quality Assessment in support of a residential-led development at the former Debenhams Store, off High Street, Staines-upon-Thames.

The development may lead to the exposure of future occupants to elevated pollution levels, as well as adverse air quality effects at sensitive locations. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions, consider site suitability for the proposed end-use and assess potential impacts as a result of the scheme.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of demolition, earthworks, construction and trackout activities. 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.

Potential impacts during the operational phase of the proposals may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. Dispersion modelling was therefore undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the local highway network both with and without the development in place. Results were subsequently verified using local monitoring data.

The dispersion modelling assessment indicated that predicted air quality impacts as a result of traffic generated by the development were not significant at any sensitive location in the vicinity of the site.

The results of the dispersion modelling assessment indicated elevated pollution levels at residential locations across the first and second floor of the development. As such, suitable mitigation in the form of mechanical ventilation has been specified for the relevant units.

Based on the assessment results, air quality factors are not considered a constraint to planning consent for the development, subject to the inclusion of the specified mitigation.

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1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by Future High Street Living (Staines) Ltd to undertake an Air Quality Assessment in support of a residential-led development at the former Debenhams Store, off High Street, Staines-upon-Thames.

1.1.2 The development may lead to the exposure of future occupants to poor air quality, as well as adverse impacts at sensitive locations. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions at the site, consider location suitability for the proposed end-use and assess potential impacts associated with the scheme.

1.2 Site Location and Context

1.2.1 The former Debenhams Store is located off High Street, Staines-upon-Thames, at approximate National Grid Reference (NGR): 503530, 171520. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 The proposals comprise demolition of the former Debenhams Store and redevelopment of site to provide 226 dwellings (Use Class C3) and commercial units (Use Class E) together with car and cycle parking, hard and soft landscaping, amenity space and other associated infrastructure works. Reference should be made to Figure 2 for a site layout plan of ground and first floor level.

1.2.3 Spelthorne Borough Council (SBC) have declared an Air Quality Management Area (AQMA) due to exceedences of the annual mean Air Quality Objective (AQO) for nitrogen dioxide (NO_2). The development is located within the AQMA. As such, the proposals may introduce future occupants to poor air quality and affect existing pollution levels in this sensitive area. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions, consider potential effects as a result of the proposals and define any requirement for mitigation. This is detailed in the following report.

1.2.3 It should be noted that Vitec, the Energy Consultants for the project, have confirmed that heating and hot water for the site will be provided through electric heat pumps and the proposals do not include a Combined Heat and Power (CHP) Unit. As such, emissions associated with energy provision have not been considered further within the context of the report.

2.0 LEGISLATION AND POLICY

2.1 Legislation

2.1.1 The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and include Air Quality Limit Values (AQLVs) for the following pollutants:

- NO_2;
- Sulphur dioxide;
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
- Particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$);
- Benzene; and,
- Carbon monoxide.

2.1.2 Air quality target values were also provided for an additional 6 pollutants.

2.1.3 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 exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

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

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/m^3)	Averaging Period
NO_2	40	Annual mean

1 The AQS for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

Pollutant	Air Quality Objective	
	Concentration (µg/m³)	Averaging Period
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
PM_{10}	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum

2.1.5 Table 2 summarises the advice provided in DEFRA guidance[2] on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objective Should Apply At	Objective 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 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
1-hour mean	All locations where the annual mean and 24 and 8-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 Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

2.2 Local Air Quality Management

2.2.1 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 jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure, as summarised in Table 2, 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.

2.3 Dust

2.3.1 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."

2.3.2 Enforcement of the Act, in regard to nuisance, is currently under the jurisdiction 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). 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 practicable means.

2.4 National Planning Policy

2.4.1 The revised National Planning Policy Framework[3] (NPPF) was published in July 2021 and sets out the Government's planning policies for England and how these are expected to be applied.

2.4.2 The purpose of the planning system is to contribute to the achievement of sustainable development. In order to ensure this, the NPPF recognises three overarching objectives, including the following of relevance to air quality:

> "c) An environmental objective - to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

2.4.3 Chapter 15 of the NPPF details objectives in relation to conserving and enhancing the natural environment. It states that:

> "174. Planning policies and decisions should contribute to and enhance the natural and local environment by:
>
> …
>
> e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality …"

2.4.4 The NPPF specifically recognises air quality as part of delivering sustainable development and states that:

[3] NPPF, Ministry of Housing, Communities and Local Government, 2021.

> "186. 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."

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

2.5 National Planning Practice Guidance

2.5.1 The National Planning Practice Guidance[4] (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 and updated on 1st November 2019 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. What air quality considerations does planning need to address?
2. What is the role of plan-making with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality considerations be relevant to the development management process?
6. What specific issues may need to be considered when assessing air quality impacts?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?

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

[4] https://www.gov.uk/guidance/air-quality--3.

2.6 Local Planning Policy

2.6.1 The Spelthorne Core Strategy and Policies, Development Plan Document[5] was adopted by SBC in February 2009. It sets out the strategic planning framework for the borough's future development needs up to 2026.

2.6.2 Review of the Spelthorne Core Strategy and Policies, Development Plan Document[6] indicated the following policies of relevance to the assessment:

> "Policy SP6: Maintaining and Improving the Environment
>
> The Council will seek to maintain and improve the quality of the environment of the Borough. It will:
>
> …
>
> b) contribute to improving air quality in the Borough,
>
> …"

> "Policy EN3: Air Quality
>
> The Council will seek to improve the air quality of the Borough and minimise harm from poor air quality by:
>
> a) supporting measures to encourage non-car based means of travel,
> b) supporting appropriate measures to reduce traffic congestion where it is a contributor to existing areas of poor air quality,
> c) requiring an air quality assessment where development:
>
> i. is in an Air Quality Management Area, and
> ii. generates significant levels of pollution, or
> iii. increases traffic volumes or congestion, or

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5 Core Strategy and Policies, Development Plan Documents, SBC, 2009.

6 Core Strategy and Policies, Development Plan Documents, SBC, 2009.

iv. is for non-residential uses of 1000m^2 or greater, or
v. is for 10 or more dwellings, or
vi. involves development sensitive to poor air quality.

d) refusing development where the adverse effects on air quality are of a significant scale, either individually or in combination with other proposals, and which are not outweighed by other important considerations or effects and cannot be appropriately and effectively mitigated,
e) refusing development where the adverse effects of existing air quality on future occupiers are of a significant scale which cannot be appropriately or effectively mitigated and which are not outweighed by other material considerations."

2.6.3 These policies have been considered throughout the report by assessing potential air quality impacts as a result of the proposed development.

3.0 METHODOLOGY

3.1 Introduction

3.1.1 The proposed development has the potential to expose future users to poor air quality and cause adverse impacts during the construction and operational phases. These issues were assessed in accordance with the following methodology, which was agreed with Claire Lucas, Principal Pollution Control Officer at SBC, on 6th July 2021.

3.2 Construction Phase Assessment

3.2.1 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 IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction V1.1'[7].

3.2.2 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.

3.2.3 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}.

3.2.4 The assessment steps are detailed below.

7 Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Step 1

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

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

Step 2

3.2.7 Step 2 assesses the risk of potential dust impacts. A site is allocated a risk category based on two 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 be defined as low, medium or high sensitivity (Step 2B).

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

3.2.9 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

Magnitude	Activity	Criteria
	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
	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

Magnitude	Activity	Criteria
	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

3.2.10 Step 2B defines the sensitivity of the area around the development to potential dust impacts. The influencing factors are shown in Table 4.

Table 4 Construction Dust - Examples of Factors Defining Sensitivity of an Area

Receptor 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
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

Receptor Sensitivity	Examples	
	Human Receptors	Ecological Receptors
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, farmland, short term car parks and roads	• Locally designated site e.g. Local Nature Reserve

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

- 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 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.

3.2.12 These factors were considered in the undertaking of this assessment.

3.2.13 The criteria for determining the sensitivity of the area to dust soiling effects on people and property is summarised in Table 5.

Table 5 Construction Dust - 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

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

3.2.14 Table 6 outlines the criteria for determining the sensitivity of the area to human health impacts.

Table 6 Construction Dust - Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Background 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/m³	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m³	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m³	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/m³	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	Greater than 32µg/m³	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low

Receptor Sensitivity	Background 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
	28 - 32µg/m³	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m³	More than 10	Low	Low	Low	Low	Low
		1 -10	Low	Low	Low	Low	Low
	Less than 24µg/m³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	1 or more	Low	Low	Low	Low	Low

3.2.15 Table 7 outlines the criteria for determining the sensitivity of the area to ecological impacts.

Table 7 Construction Dust - 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

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

3.2.17 Table 8 outlines the risk category from demolition activities.

Table 8 Construction Dust - Dust Risk Category from Demolition

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

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

Table 9 Construction Dust - Dust Risk Category from Earthworks and Construction Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

3.2.19 Table 10 outlines the risk category from trackout activities.

Table 10 Construction Dust - Dust Risk Category from Trackout Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

Step 3

3.2.20 Step 3 requires the identification of site specific mitigation measures within the IAQM guidance[8] 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.

Step 4

3.2.21 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**.

3.2.22 The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. The IAQM guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

3.3 Operational Phase Assessment

3.3.1 The development has the potential to affect existing air quality as a result of road traffic exhaust emissions associated with vehicles travelling to and from the site, as well as expose future residents to poor air quality. Potential impacts have therefore been defined by predicting pollutant concentrations at sensitive locations using dispersion modelling for the following scenarios:

- 2019 - Verification;
- Opening year Do-Minimum (DM) (predicted traffic flows in 2024, should the proposals not proceed); and,
- Opening year Do-Something (DS) (predicted traffic flows in 2024 should the proposals be completed).

[8] Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

3.3.2 Reference should be made to Appendix 1 for assessment input data and details of the verification process.

Potential Development Impacts

3.3.3 Traffic exhaust emissions associated with the development may cause air quality impacts during operation. Locations sensitive to potential changes in off-site pollutant concentrations were identified within 200m of the highway network in accordance with the guidance provided within the Design Manual for Roads and Bridges (DMRB)[9] on the likely limits of pollutant dispersion from road sources. The criteria provided within DEFRA guidance[10] on where the AQOs apply, as summarised in Table 2, was utilised to determine appropriate receptor positions.

3.3.4 The significance of predicted air quality impacts was determined in accordance with the guidance provided within the IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality'[11]. Using this methodology impacts were defined based on the interaction between the predicted pollutant concentration from the DS scenario and the magnitude of change between the DM and DS scenarios, as outlined in Table 11.

Table 11 Significance of Operational Phase Road Vehicle Exhaust Emissions Impact

Concentration at Receptor in Assessment Year	Predicted Concentration Change as Proportion of 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

9 DMRB, LA 105 Air quality, Highways England, 2019.

10 Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

11 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

3.3.5 The matrix shown in Table 11 is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which makes it clearer which cell the impact falls within. It should be noted that changes of 0%, i.e. less than 0.5%, are described as **negligible**.

3.3.6 Following the prediction of impacts at discrete receptor locations, the IAQM document[12] provides guidance on determining the overall air quality impact significance of the operation of a development. The following factors are identified for consideration by the assessor:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and,
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

3.3.7 The IAQM guidance states that an assessment must reach a conclusion on the likely significance of the predicted impact. It should be noted that this is a binary judgement of either **significant** or **not significant**. The determination of significance relies on professional judgement and reasoning has been provided as far as practicable. The IAQM guidance[13] suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

Potential Future Exposure

3.3.8 The proposals have the potential to expose future occupants to any existing air quality issues at the site. Pollutant concentrations were therefore quantified across the site using dispersion modelling. The results were subsequently compared with the relevant AQOs to determine the potential for exposure of future occupants to elevated pollutant concentrations and identify appropriate mitigation, if necessary.

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12 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

13 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

4.0 BASELINE

4.1 Introduction

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

4.2 Local Air Quality Management

4.2.1 As required by the Environment Act (1995), SBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean NO_2 concentrations are above the AQO within the borough. As such, one AQMA has been declared. This is described as follows:

> "An area encompassing the whole borough including the majority of Staines, Shepperton, Ashford and Sunbury-on-Thames extending from west of the M25 in the northwest to the River Thames in the southeast."

4.2.2 The development is located within the AQMA. As such, there is the potential for the exposure of future occupants to poor air quality and vehicles travelling to and from the site to increase pollution levels in this sensitive area. These issues have been considered throughout the assessment.

4.2.3 SBC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs. As such, no further AQMAs have been designated.

4.3 Air Quality Monitoring

4.3.1 Monitoring of pollutant concentrations is undertaken by SBC throughout their area of jurisdiction. Recent results recorded in the vicinity of the development are shown in Table 12. Exceedences of the relevant AQO are shown in **bold**.

Table 12 Monitoring Results

Monitoring Site		Classification	Monitored NO_2 Concentration ($\mu g/m^3$)		
			2017	2018	2019
SP1	Staines High Street	Urban Centre	28.3	25.8	27.5
SP3	Wraysbury Road	Kerbside	30.7	29.0	30.4
SP12	Stanwell New Road, Stanwell North	Urban Background	30.7	27.6	29.4
SP20	Greenlands Rd, Staines	Urban Background	31.6	27.1	30.9
SP27	Church Street, Staines	Roadside	31.4	27.7	34.2
SP28	London Road, Staines	Roadside	34.5	35.7	**42.4**
SP29	London Road, Staines	Kerbside	**44.0**	33.8	**50.8**
SP46	South Street, Staines	Other	31.1	30.9	32.9
SP51	Fairfield Avenue, Staines	Roadside	36.7	36.4	**41.0**

4.3.2 As shown in Table 12, annual mean NO_2 concentrations were above the annual mean AQO at the SP27, SP29 and SP51 monitors in recent years. As these sites are positioned at roadside locations within an AQMA, elevated concentrations are to be expected. Reference should be made to Figure 3 for a map of the survey positions.

4.3.3 SBC does not undertake PM_{10} monitoring within the vicinity of the site.

4.4 Background Pollutant Concentrations

4.4.1 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: 503500, 171500. Data for this location was downloaded from the DEFRA website[14] for the purpose of the assessment and is summarised in Table 13.

14 http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018.

Table 13 Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentration (µg/m³)		
	2019	2021	2024
NO_2	21.72	20.89	18.27
PM_{10}	16.29	15.96	15.23

4.4.2 As shown in Table 13, predicted background NO_2 and PM_{10} concentrations are below the relevant AQOs at the development site.

4.5 Sensitive Receptors

4.5.1 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.

Construction Phase Sensitive Receptors

4.5.2 Receptors sensitive to potential dust impacts during demolition, 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 14.

Table 14 Demolition, Earthworks and Construction Dust Sensitive Receptors

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

4.5.3 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 15.

Table 15 Trackout Dust Sensitive Receptors

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

4.5.4 There are no ecological receptors within 50m of the development boundary or the access route within 500m of the site entrance. As such, impacts on ecological designations during construction have not been assessed further within this report.

4.5.5 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 16.

Table 16 Additional Area Sensitivity Factors to Potential Dust Impacts

Guidance	Comment
Whether there is any history of dust generating activities in the area	The desk top study indicated that construction of a number of developments in the vicinity of the site has been undertaken during recent years. This may have led to dust generation in the local area
The likelihood of concurrent dust generating activity on nearby sites	There are a number of proposed developments in the vicinity of the site. It is therefore possible that there will be concurrent dust generation in the area should the construction phases overlap
Pre-existing screening between the source and the receptors	There is no significant screening around the site boundary
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	As shown in Figure 4, the predominant wind bearing at the site is from the south-west. As such, receptors to the north-east of the site are most likely to be affected by dust releases
Conclusions drawn from local topography	There are no significant topographical constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	The construction phase of the development is anticipated to last 24-months
Any known specific receptor sensitivities which go beyond the classifications given in the document	No specific receptor sensitivities identified during the baseline assessment

4.5.6 Based on the criteria shown in Table 4, the sensitivity of the receiving environment to potential dust impacts was determined as **high**. This was because the receptors included residential properties.

4.5.7 The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.2, is shown in Table 17.

Table 17 Sensitivity of the Surrounding Area to Potential Dust Impacts

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

Operational Phase Sensitive Receptors

4.5.8 Locations sensitive to potential operational phase road vehicle exhaust emission impacts were identified from a desk-top study and are summarised in Table 18. The height was defined as the lowest position of relevant exposure to allow for less sensitive land uses, such as retail units, at ground level.

Table 18 Sensitive Operational Phase Road Vehicle Exhaust Emissions Receptor Locations

Receptor		NGR (m)		Receptor Height (m)
		X	Y	
R1	Residential - Greenlands Road	504325.9	171883.9	1.5
R2	Residential - Greenlands Road	504353.5	171852.1	1.5
R3	Residential - London Road	504434.8	171908.8	1.5
R4	Residential - London Road	504409.1	171952.9	1.5
R5	Residential - London Road	504245.9	171901.3	1.5
R6	Residential - London Road	504150.7	171866.9	1.5
R7	Residential - London Road	504127.1	171856.6	1.5
R8	Residential - London Road	504088.8	171838.6	1.5

Receptor		NGR (m)		Receptor Height (m)
		X	Y	
R9	Residential - Chertsey Lane	503449.8	171056.3	1.5
R10	Residential - Chertsey Lane	503173.5	171335.6	1.5
R11	Residential - London Road	504861.1	172094.1	1.5
R12	Residential - London Road	505047.3	172184.7	1.5
R13	Residential - The Causeway	502781.5	171534.2	1.5
R14	Residential - Chertsey Lane	503396.9	171133.1	1.5
R15	Residential - Thames Street	503719.0	171143.5	1.5
R16	Residential - London Road	503281.0	171564.8	1.5
R17	Residential - London Road	503504.3	171478.9	1.5
R18	Residential - London Road	503769.2	171749.0	4.0

4.5.1 Reference should be made to Figure 5 for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

5.0 ASSESSMENT

5.1 Introduction

5.1.1 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.

5.2 Construction Phase Assessment

Step 1

5.2.1 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.

5.2.2 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.

5.2.3 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.

Step 2

Demolition

5.2.4 Demolition will involve clearance of the existing building on site at the start of the construction phase.

5.2.5 It is estimated that the total building volume to be demolished is between 20,000m^3 and 50,000m^3. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from demolition is therefore **medium**.

5.2.6 Table 17 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.

5.2.7 Table 17 indicates the sensitivity of the area to human health impacts is **medium**. In accordance with the criteria outlined in Table 8, the development is considered to be a **medium** risk site for human health impacts as a result of demolition activities.

Earthworks

5.2.8 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. The area of the proposed development site is 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**.

5.2.9 Table 17 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.

5.2.10 Table 17 indicates the sensitivity of the area to human health impacts is **medium**. In accordance with the criteria outlined in Table 9, the development is considered to be a **medium** risk site for human health impacts as a result of earthworks.

Construction

5.2.11 It is anticipated that the total building volume is likely to be between 25,000m^3 and 100,000m^3. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **medium**.

5.2.12 Table 17 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 construction activities.

5.2.13 Table 17 indicates the sensitivity of the area to human health impacts is **medium**. In accordance with the criteria outlined in Table 9, the development is considered to be a **medium** risk site for human health impacts as a result of construction activities.

Trackout

5.2.14 Based on the site area, it is anticipated that the unpaved road length will be less than 50m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **small**.

5.2.15 Table 17 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 10, the development is considered to be a **low** risk site for dust soiling as a result of trackout.

5.2.16 Table 17 indicates the sensitivity of the area to human health impacts is **medium**. In accordance within the criteria outlined in Table 10, the development is considered to be a **negligible** risk site for human health impacts as a result of trackout.

Summary of the Risk of Dust Effects

5.2.17 A summary of the risk from each dust generating activity is provided in Table 19.

Table 19 Summary of Potential Unmitigated Dust Risks

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

5.2.18 As indicated in Table 19, the potential risk of dust soiling is **medium** from demolition, earthworks and construction and **low** from trackout. The potential risk of human health effects is **medium** from demolition, earthworks and construction and **negligible** from trackout.

5.2.19 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.

Redmore environmental

Step 3

5.2.20 The IAQM guidance[15] provides potential mitigation measures to reduce impacts as a result of fugitive dust emissions during the construction phase. These have been adapted for the development site as summarised in Table 20. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan or similar if required by the LA.

Table 20 Fugitive Dust Emission Mitigation Measures

Issue	Control Measure
Communications	• Develop and implement a stakeholder communications 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. This may be the environment manager/engineer or the site manager • 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 dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken • Make the complaints log available to the LA upon request • Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book
Monitoring	• Undertake daily on-site and off-site inspection to monitor dust, record inspection results, and make the log available to the LA upon request • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the LA upon request • Increase the frequency of site inspections when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions

15 Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Issue	Control Measure
Site preparation	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible • Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site • Fully enclose specific operations where there is a high potential for dust production and they are active 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, unless being re-used • Cover, seed or fence stockpiles to prevent wind whipping
Operating vehicle/machinery and sustainable travel	• Ensure all vehicles switch off engines when stationary - no idling vehicles • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable • Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials
Operations	• Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques • Ensure an adequate water supply on the site for effective dust suppression, using non-potable water where possible and appropriate • Use enclosed chutes and conveyors and covered skips • Minimise drop heights and use fine water sprays wherever appropriate • Ensure equipment is available to clean any dry spillages, and clean up spillages as soon as reasonably practicable using wet cleaning methods
Waste management	• No bonfires and burning of waste materials
Demolition	• Soft strip inside buildings before demolition • Ensure effective water suppression is used during demolition operations • Avoid explosive blasting, using appropriate manual or mechanical alternatives • Bag and remove any biological debris or damp down such material before demolition
Earthworks	• Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable • Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable
Construction	• Avoid scabbling (roughening of concrete surfaces) if possible • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out

Issue	Control Measure
Trackout	• Use water-assisted dust sweeper on access and local roads, if required • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving site are covered to prevent escape of materials • Implement a wheel washing system

Step 4

5.2.21 Assuming the relevant mitigation measures outlined in Table 20 are implemented, the residual impacts from all dust generating activities is predicted to be **not significant**, in accordance with the IAQM guidance[16].

5.3 Operational Phase Assessment

5.3.1 Vehicle movements associated with the operation of the proposal will generate exhaust emissions on the local and regional road networks. 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, as well as consider potential exposure of future residents to AQO exceedences.

5.3.2 The assessment considered the following scenarios:

- 2019 - Verification;
- 2024 - DM; and,
- 2024 - DS.

5.3.3 The DM (i.e. without development) scenario included anticipated baseline traffic data, inclusive of anticipated growth and committed developments, for the relevant assessment year. The DS (i.e. with development) scenario included anticipated baseline traffic data, inclusive of anticipated growth and committed developments, for the relevant assessment year, in addition to predicted changes in vehicle flows associated with the operation of the proposals.

16 Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

5.3.4 Reference should be made to Appendix 1 for full assessment input details.

5.3.5 During pre-application discussions it was requested that the potential impacts on baseline pollution levels associated with emissions from existing CHP units in the vicinity of the site were considered in the assessment. As such, a review of the planning portal was undertaken in order to identify any other existing or proposed developments which included CHP units. This exercise did not identify any sources for inclusion in the analysis.

5.3.6 Reference should be made the following Figures for graphical representations of the annual mean predicted pollutant concentrations and proposed sensitive receptor locations:

- Figure 6 - Ground floor annual mean NO_2 concentrations DM;
- Figure 7 - Ground floor annual mean NO_2 concentrations DS;
- Figure 8 - Ground floor annual mean PM_{10} concentrations DM;
- Figure 9 - Ground floor annual mean PM_{10} concentrations DS;
- Figure 10 - First floor annual mean NO_2 concentrations DS;
- Figure 11 - Second floor annual mean NO_2 concentrations DS; and,
- Figure 12 - Proposed sensitive receptor locations.

Potential Development Impacts

Predicted Concentrations

5.3.7 Annual mean NO_2 concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 21. Exceedences of the relevant AQO are shown in **bold**.

Table 21 Predicted Annual Mean NO_2 Concentrations

Receptor		Predicted Annual Mean NO_2 Concentration (μg/m^3)		
		DM	DS	Change
R1	Residential - Greenlands Road	38.05	38.08	0.03
R2	Residential - Greenlands Road	34.29	34.31	0.02
R3	Residential - London Road	39.77	39.80	0.03

Receptor		Predicted Annual Mean NO_2 Concentration (µg/m³)		
		DM	DS	Change
R4	Residential - London Road	**45.59**	**45.62**	0.03
R5	Residential - London Road	35.67	35.73	0.06
R6	Residential - London Road	29.94	29.96	0.02
R7	Residential - London Road	29.77	29.79	0.02
R8	Residential - London Road	29.49	29.50	0.01
R9	Residential - Chertsey Lane	30.58	30.59	0.01
R10	Residential - Chertsey Lane	31.67	31.68	0.01
R11	Residential - London Road	32.10	32.11	0.01
R12	Residential - London Road	32.02	32.03	0.01
R13	Residential - The Causeway	30.85	30.85	0.00
R14	Residential - Chertsey Lane	31.02	31.03	0.01
R15	Residential - Thames Street	32.57	32.58	0.01
R16	Residential - London Road	33.46	33.49	0.03
R17	Residential - London Road	29.22	29.20	-0.02
R18	Residential - London Road	30.28	30.30	0.02

5.3.8 As indicated in Table 21, predicted annual mean NO_2 concentrations were above the relevant AQO at one receptor and below at 16 locations in both the DM and DS scenarios. It should be noted that there were no new exceedences in the DS scenario when compared to the DM.

5.3.9 The results indicate a decrease in NO_2 concentrations at one location and an increase at 17 receptors. The reduction is likely to be a consequence of a change in the way air pollutants are transported and recirculated along and within Thames Street. This is attributable to the alteration in local urban topography as a result of the positioning of the proposed building.

5.3.10 Reference should be made to Figures 6 and 7 for graphical representations of annual mean NO_2 concentrations across the assessment area for the DM and DS scenarios, respectively.

5.3.11 Annual mean PM_{10} concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 22.

Table 22 Predicted Annual Mean PM_{10} Concentrations

Receptor		Predicted Annual Mean PM_{10} Concentration (µg/m^3)		
		DM	DS	Change
R1	Residential - Greenlands Road	18.01	18.02	0.01
R2	Residential - Greenlands Road	17.42	17.42	0.00
R3	Residential - London Road	18.44	18.44	0.00
R4	Residential - London Road	19.37	19.38	0.01
R5	Residential - London Road	17.72	17.73	0.01
R6	Residential - London Road	16.76	16.76	0.00
R7	Residential - London Road	16.73	16.73	0.00
R8	Residential - London Road	16.68	16.68	0.00
R9	Residential - Chertsey Lane	16.93	16.93	0.00
R10	Residential - Chertsey Lane	17.13	17.13	0.00
R11	Residential - London Road	17.32	17.32	0.00
R12	Residential - London Road	17.31	17.31	0.00
R13	Residential - The Causeway	16.98	16.98	0.00
R14	Residential - Chertsey Lane	17.02	17.02	0.00
R15	Residential - Thames Street	17.35	17.35	0.00
R16	Residential - London Road	17.36	17.37	0.00
R17	Residential - London Road	16.63	16.63	0.00
R18	Residential - London Road	16.79	16.79	0.00

5.3.12 As indicated in Table 22, predicted annual mean PM_{10} concentrations were below the relevant AQO at all sensitive receptors in both the DM and DS scenarios.

5.3.13 Reference should be made to Figures 8 and 9 for graphical representations of annual mean PM_{10} concentrations across the assessment area for the DM and DS scenarios, respectively.

Predicted Impacts

5.3.14 Predicted impacts on annual mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 23.

Table 23 Predicted Impacts - NO_2

Receptor		Predicted Annual Mean NO_2 Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - Greenlands Road	95 - 102% of AQO	0	Negligible
R2	Residential - Greenlands Road	76 - 94% of AQO	0	Negligible
R3	Residential - London Road	95 - 102% of AQO	0	Negligible
R4	Residential - London Road	110% or more of AQO	0	Negligible
R5	Residential - London Road	76 - 94% of AQO	0	Negligible
R6	Residential - London Road	Below 75% of AQO	0	Negligible
R7	Residential - London Road	Below 75% of AQO	0	Negligible
R8	Residential - London Road	Below 75% of AQO	0	Negligible
R9	Residential - Chertsey Lane	76 - 94% of AQO	0	Negligible
R10	Residential - Chertsey Lane	76 - 94% of AQO	0	Negligible
R11	Residential - London Road	76 - 94% of AQO	0	Negligible
R12	Residential - London Road	76 - 94% of AQO	0	Negligible
R13	Residential - The Causeway	76 - 94% of AQO	0	Negligible
R14	Residential - Chertsey Lane	76 - 94% of AQO	0	Negligible
R15	Residential - Thames Street	76 - 94% of AQO	0	Negligible
R16	Residential - London Road	76 - 94% of AQO	0	Negligible
R17	Residential - London Road	Below 75% of AQO	0	Negligible

Receptor		Predicted Annual Mean NO_2 Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R18	Residential - London Road	76 - 94% of AQO	0	Negligible

5.3.15 As indicated in Table 23, impacts on annual mean NO_2 concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

5.3.16 Predicted impacts on annual mean PM_{10} concentrations at the sensitive locations are summarised in Table 24.

Table 24 Predicted Impacts - PM_{10}

Receptor		Predicted Annual Mean PM_{10} Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - Greenlands Road	Below 75% of AQO	0	Negligible
R2	Residential - Greenlands Road	Below 75% of AQO	0	Negligible
R3	Residential - London Road	Below 75% of AQO	0	Negligible
R4	Residential - London Road	Below 75% of AQO	0	Negligible
R5	Residential - London Road	Below 75% of AQO	0	Negligible
R6	Residential - London Road	Below 75% of AQO	0	Negligible
R7	Residential - London Road	Below 75% of AQO	0	Negligible
R8	Residential - London Road	Below 75% of AQO	0	Negligible
R9	Residential - Chertsey Lane	Below 75% of AQO	0	Negligible
R10	Residential - Chertsey Lane	Below 75% of AQO	0	Negligible
R11	Residential - London Road	Below 75% of AQO	0	Negligible
R12	Residential - London Road	Below 75% of AQO	0	Negligible
R13	Residential - The Causeway	Below 75% of AQO	0	Negligible
R14	Residential - Chertsey Lane	Below 75% of AQO	0	Negligible
R15	Residential - Thames Street	Below 75% of AQO	0	Negligible

Receptor		Predicted Annual Mean PM_{10} Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R16	Residential - London Road	Below 75% of AQO	0	Negligible
R17	Residential - London Road	Below 75% of AQO	0	Negligible
R18	Residential - London Road	Below 75% of AQO	0	Negligible

5.3.17 As indicated in Table 24, impacts on annual mean PM_{10} concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

Potential Future Exposure

5.3.1 The proposed development has the potential to cause exposure of future occupants to elevated pollution levels. Dispersion modelling was therefore undertaken with the inputs described in Appendix 1 to quantify air quality conditions at the site. Modelling was undertaken at a number of discrete receptors to represent future receptors within the development. A summary of the positions and corresponding heights is shown in Table 27 and Figure 12.

Table 25 Discrete Receptor Locations - Proposed Development

Receptor		NGR (m)		Floor Level	Height (m)
		X	Y		
P1	Commercial Space Ground Floor	503495.0	171542.8	Ground	1.5
P2	Proposed Apartment - First Floor	503495.0	171542.8	First	5.2
P3	Proposed Apartment - Second Floor	503495.0	171542.8	Second	8.2
P4	Proposed Apartment - Third Floor	503495.0	171542.8	Third	11.2
P5	Proposed Apartment - Fourth Floor	503495.0	171542.8	Fourth	14.2
P6	Proposed Apartment - Fifth Floor	503495.0	171542.8	Fifth	17.2
P7	Commercial Space Ground Floor	503497.8	171537.8	Ground	1.5
P8	Proposed Apartment - First Floor	503497.8	171537.8	First	5.2
P9	Proposed Apartment - Second Floor	503497.8	171537.8	Second	8.2

Receptor		NGR (m)		Floor Level	Height (m)
		X	Y		
P10	Proposed Apartment - Third Floor	503497.8	171537.8	Third	11.2
P11	Proposed Apartment - Fourth Floor	503497.8	171537.8	Fourth	14.2
P12	Proposed Apartment - Fifth Floor	503497.8	171537.8	Fifth	17.2
P13	Commercial Space Ground Floor	503499.3	171534.9	Ground	1.5
P14	Proposed Apartment - First Floor	503499.3	171534.9	First	5.2
P15	Proposed Apartment - Second Floor	503499.3	171534.9	Second	8.2
P16	Proposed Apartment - Third Floor	503499.3	171534.9	Third	11.2
P17	Proposed Apartment - Fourth Floor	503499.3	171534.9	Fourth	14.2
P18	Proposed Apartment - Fifth Floor	503499.3	171534.9	Fifth	17.2
P19	Proposed Apartment - First Floor	503530.9	171506.2	First	5.2
P20	Proposed Apartment - Second Floor	503530.9	171506.2	Second	8.2
P21	Proposed Apartment - Third Floor	503530.9	171506.2	Third	11.2
P22	Proposed Apartment - Fourth Floor	503530.9	171506.2	Fourth	14.2
P23	Proposed Apartment - Fifth Floor	503530.9	171506.2	Fifth	17.2
P24	Proposed Apartment - First Floor	503535.7	171499.5	First	5.2
P25	Proposed Apartment - Second Floor	503535.7	171499.5	Second	8.2
P26	Proposed Apartment - Third Floor	503535.7	171499.5	Third	11.2
P27	Proposed Apartment - Fourth Floor	503535.7	171499.5	Fourth	14.2
P28	Proposed Apartment - Fifth Floor	503535.7	171499.5	Fifth	17.2
P29	Proposed Apartment - First Floor	503540.2	171491.3	First	5.2
P30	Proposed Apartment - Second Floor	503540.2	171491.3	Second	8.2
P31	Proposed Apartment - Third Floor	503540.2	171491.3	Third	11.2
P32	Proposed Apartment - Fourth Floor	503540.2	171491.3	Fourth	14.2
P33	Proposed Apartment - Fifth Floor	503540.2	171491.3	Fifth	17.2

5.3.18 A summary of the predicted results at each discrete receptor is shown in Table 26. Concentrations within 10% of the AQO are shown in **bold**.

Table 26 Predicted Pollutant Concentrations at Discrete Receptors

Receptor		Predicted Annual Mean Concentration (µg/m³)	
		NO_2	PM_{10}
P1	Commercial Space Ground Floor	**38.95**	18.75
P2	Proposed Apartment - First Floor	**37.66**	18.46
P3	Proposed Apartment - Second Floor	**36.70**	18.24
P4	Proposed Apartment - Third Floor	35.85	18.06
P5	Proposed Apartment - Fourth Floor	34.93	17.86
P6	Proposed Apartment - Fifth Floor	33.55	17.56
P7	Commercial Space Ground Floor	**39.15**	18.80
P8	Proposed Apartment - First Floor	**37.81**	18.50
P9	Proposed Apartment - Second Floor	**36.81**	18.27
P10	Proposed Apartment - Third Floor	35.81	18.05
P11	Proposed Apartment - Fourth Floor	34.84	17.84
P12	Proposed Apartment - Fifth Floor	33.48	17.54
P13	Commercial Space Ground Floor	**39.24**	18.82
P14	Proposed Apartment - First Floor	**37.91**	18.52
P15	Proposed Apartment - Second Floor	**36.97**	18.31
P16	Proposed Apartment - Third Floor	35.81	18.05
P17	Proposed Apartment - Fourth Floor	34.79	17.83
P18	Proposed Apartment - Fifth Floor	33.45	17.53
P19	Proposed Apartment - First Floor	33.72	17.59
P20	Proposed Apartment - Second Floor	33.26	17.49
P21	Proposed Apartment - Third Floor	32.77	17.39
P22	Proposed Apartment - Fourth Floor	32.25	17.27
P23	Proposed Apartment - Fifth Floor	31.50	17.12
P24	Proposed Apartment - First Floor	33.69	17.58
P25	Proposed Apartment - Second Floor	33.16	17.47

Receptor		Predicted Annual Mean Concentration (µg/m³)	
		NO_2	PM_{10}
P26	Proposed Apartment - Third Floor	32.68	17.37
P27	Proposed Apartment - Fourth Floor	32.18	17.26
P28	Proposed Apartment - Fifth Floor	31.46	17.11
P29	Proposed Apartment - First Floor	33.81	17.61
P30	Proposed Apartment - Second Floor	33.17	17.47
P31	Proposed Apartment - Third Floor	32.66	17.36
P32	Proposed Apartment - Fourth Floor	32.17	17.26
P33	Proposed Apartment - Fifth Floor	31.46	17.11

5.3.19 As shown in Table 26 and Figure 7, predicted annual mean NO_2 concentrations were within 10% of the AQO at three proposed receptor locations (P1, P7 and P13) at ground floor level. However, as the units will be utilised for commercial and amenity space and concentrations were below 60µg/m³, the 1-hour mean AQO is unlikely to be exceeded and mitigation techniques are not considered necessary.

5.3.20 As shown in Table 26 and Figures 10 and 11, predicted annual mean NO_2 concentrations were predicted to be within 10% of the AQO at first floor receptors P2, P8 and P14, and at second floor receptors P3, P9 and P15. During consultation with Claire Lucas, Principal Pollution Control Officer at the SBC[17], it was recommended that mitigation in the form of mechanical ventilation is provided for first and second floor units to ensure future occupants are not exposed to elevated NO_2 concentrations. Specific measures are described in Section 6.0.

5.3.21 As shown in Table 26 and Figure 9, predicted PM_{10} concentrations were below 10% of the AQO at all locations across the site.

17 Email Correspondence, Claire Lucas, Principal Pollution Control Officer, SBC, 14th July 2021.

Overall Impact Significance

5.3.22 The overall significance of operational phase road traffic emission impacts was determined as **negligible**. This was based on the predicted impacts at the discrete receptor locations and the factors identified previously. Further justification is provided in Table 27.

Table 27 Overall Road Vehicle Exhaust Emissions Impact Significance

Guidance	Comment
The existing and future air quality in the absence of the development	Predicted NO_2 concentrations were above the relevant AQO at one sensitive receptor in the DM scenario. Predicted PM_{10} concentrations were below the relevant AQOs at all sensitive receptors in the DM scenario It is considered unlikely that future air quality conditions will change significantly in the absence of the development given the relatively established nature of the area
The extent of current and future population exposure to the impacts	The development is not predicted to affect the population exposed to exceedences of the AQOs
The influence and validity of any assumptions adopted when undertaking the prediction of impacts	The assessment assumed that vehicle exhaust emission rates and background pollutant levels will not reduce in future years. This provides worst-case results when compared with DEFRA and Highways England methodologies Due to the adopted assumptions it is considered the presented results are sufficiently robust for an assessment of this nature

5.3.23 The IAQM guidance[18] states that only if the impact is **moderate** or **substantial**, the effect is considered significant. As impacts were predicted to be **negligible**, overall effects are considered **not significant**, in accordance with the stated methodology.

18 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

6.0 MITIGATION

6.1.1 Consultation with Claire Lucas, Principal Pollution Control Officer at the SBC[19], recommended that mitigation to ensure a supply of clean air for future residents is required at all residential locations across the site where the predicted annual mean NO_2 concentration exceeds 36µg/m^3. As shown previously, this included locations along the façade fronting Thames Street at first and second floors. As such, mitigation will be provided within the affected units. Reference should be made to Figure 13 for a plan of the relevant apartments.

6.1.2 The mitigation will comprise a decentralised Mechanical Ventilation with Heat Recovery (MVHR) system for each apartment including inline $PM_{2.5}$ carbon filters such as the Nuaire Q-Aire filter. These are tested by the Building Research Establishment (BRE) and can reduce concentrations of NO_2 by up to 99.5% and particulate matter by 75%. The exact system specification can be secured through planning condition if required.

6.1.3 The proposals also include provision of 30 Electric Vehicle (EV) charging points and 226 cycle spaces in order to promote uptake of EVs and use of non-motorised transport options.

6.1.4 Mechanical ventilation and EV charging are mitigation measures suggested within the IAQM 'Land-Use Planning & Development Control: Planning for Air Quality'[20] guidance. As such, they are considered a suitable solution for a development of this size and nature.

19 Email Correspondence, Claire Lucas, Principal Pollution Control Officer, SBC, 14th July 2021.

20 Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

7.0 CONCLUSION

7.1.1 Redmore Environmental Ltd was commissioned by Future High Street Living (Staines) Ltd to undertake an Air Quality Assessment in support of a residential-led development at the former Debenhams Store, off High Street, Staines-upon-Thames.

7.1.2 The development has the potential to cause impacts at sensitive locations during construction and operation. These may include fugitive dust emissions associated with construction works and road traffic exhaust emissions from vehicles travelling to and from the site during the operational phase. There is also the potential for the exposure of future users to elevated pollution levels. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and consider potential effects as a result of the proposals.

7.1.3 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 IAQM methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by demolition, earthworks, construction and trackout activities was predicted to be **not significant**.

7.1.4 Potential impacts during the operational phase of the development may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. Additionally, future residents may be exposed to any existing air quality issues. An assessment was therefore undertaken using detailed dispersion modelling to quantify NO_2 and PM_{10} concentrations both with and without the proposals.

7.1.5 Impacts on NO_2 and PM_{10} concentrations as a result of the operational phase road vehicle exhaust emissions were predicted to be **negligible** at all receptor locations.

7.1.6 The results of the dispersion modelling assessment indicated that predicted annual mean NO_2 concentrations were above 36$\mu g/m^3$ at the High Street building façade at first and second floor level. As such, suitable mitigation in the form of a MVHR system with inline filtration has been specified for the relevant units. This will ensure a supply of clean air for future occupants and is suggested within the IAQM guidance document[21] as a suitable solution for a development of this size and nature.

7.1.7 Based on the assessment results, the overall significance of potential operational phase air quality impacts was determined as **negligible**. Following consideration of the relevant issues, impacts as a result of the operation of the development were considered **not significant,** in accordance with the IAQM guidance.

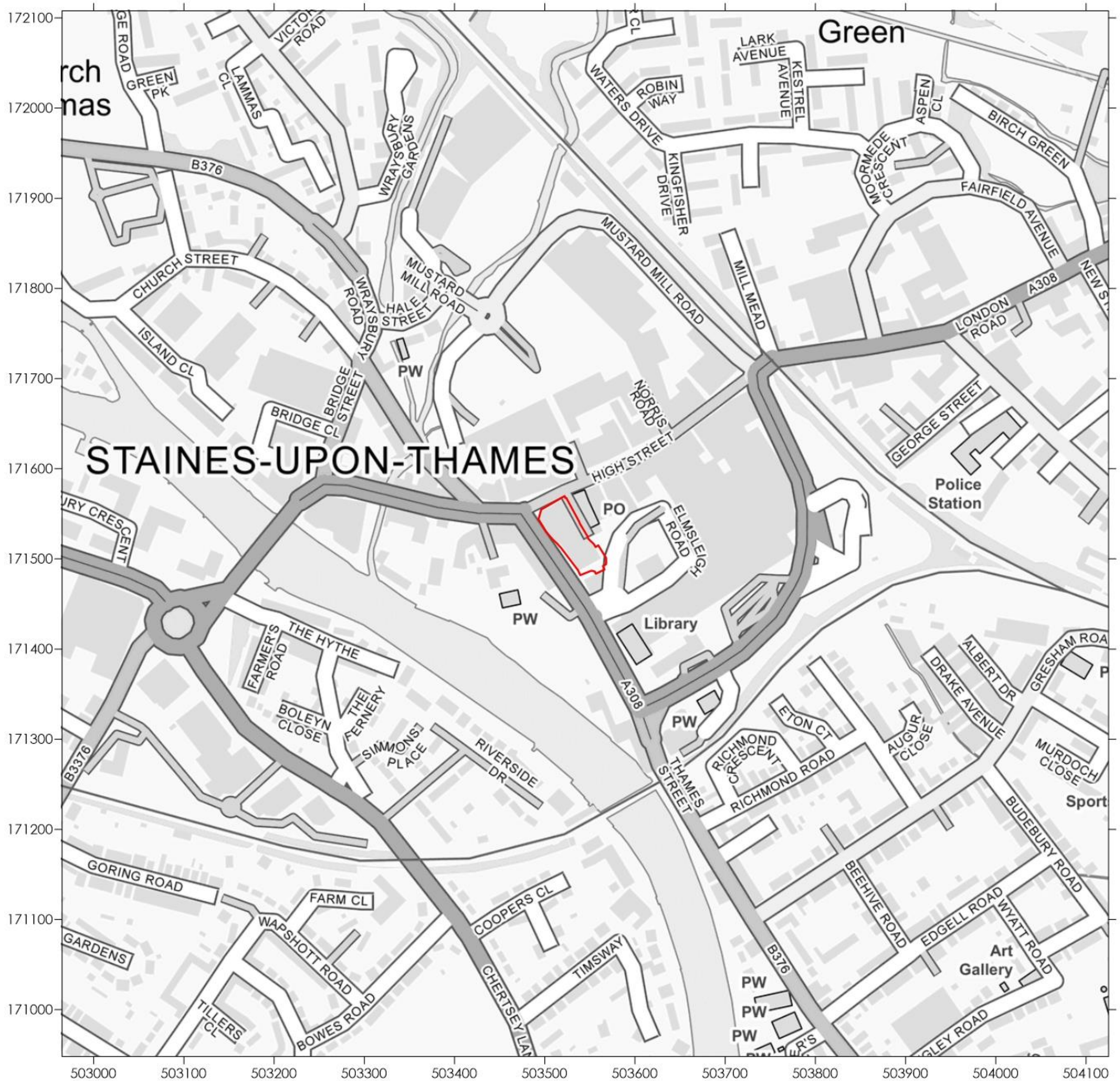
7.1.8 Based on the assessment results, air quality factors are not considered a constraint to planning consent for the development, subject to the inclusion of the specified mitigation.

[21] Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

8.0 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 Objective
AQS	Air Quality Strategy
BRE	Building Research Establishment
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DMP	Dust Management Plan
EFT	Emissions Factor Toolkit
EV	Electric Vehicle
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
MVHR	Mechanical Ventilation with Heat Recovery
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5µm
SBC	Spelthorne Borough Council
z_0	Roughness length

Figures



Legend

Site Boundary

Title

Figure 1 - Site Location

Project

Air Quality Assessment
High Street, Staines

Project Reference

4698

Client

Future High Street Living (Staines) Ltd

Redmore environmental

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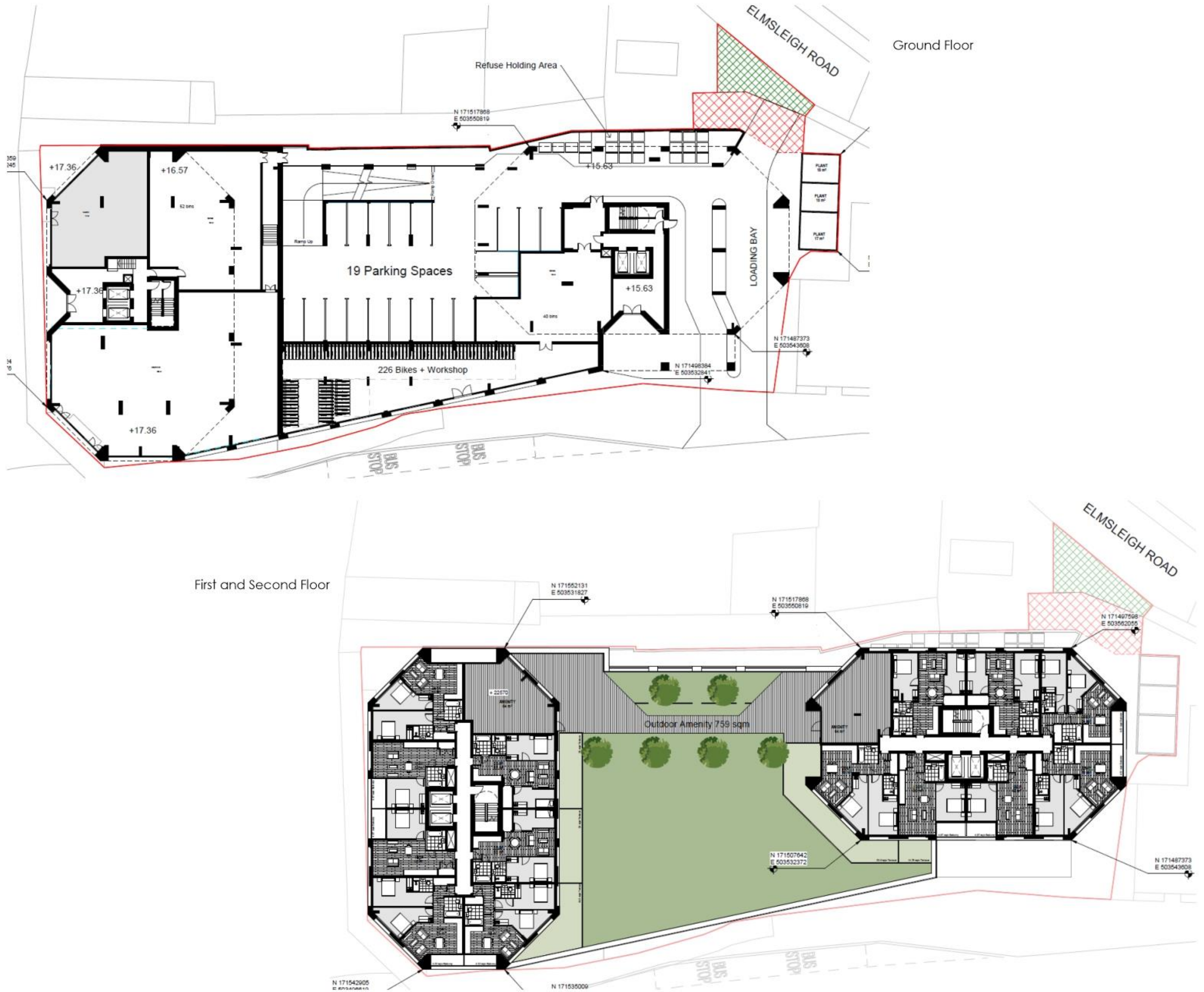

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Title
Figure 2 - Proposed Ground, First and Second Floor Layout

Project
Air Quality Assessment
High Street, Staines

Project Reference
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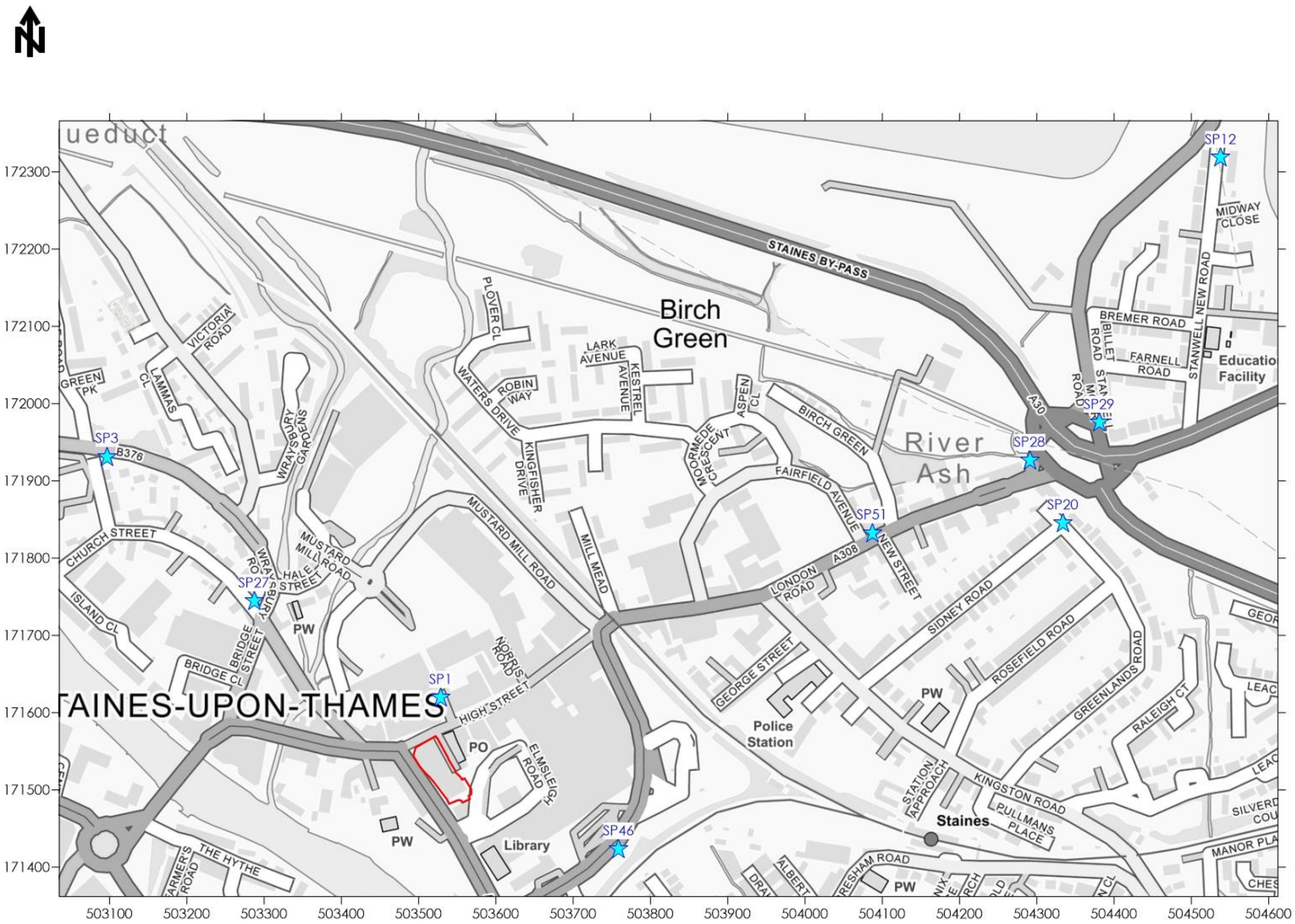

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Site Boundary

Monitor

Title

Figure 3 - Monitoring Locations

Project

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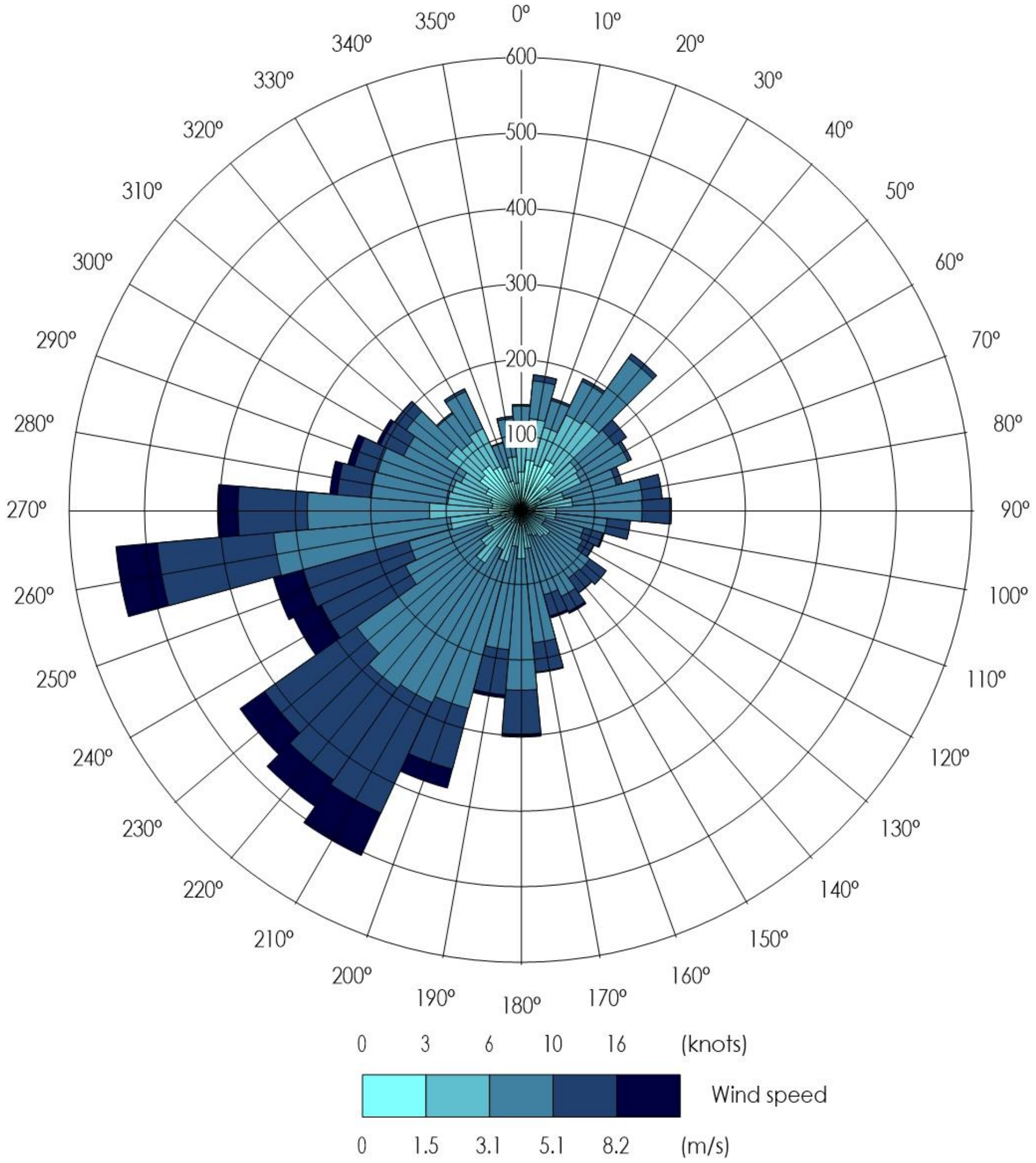

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Title

Figure 3 - Wind Rose of 2019 Heathrow Airport Meteorological Data

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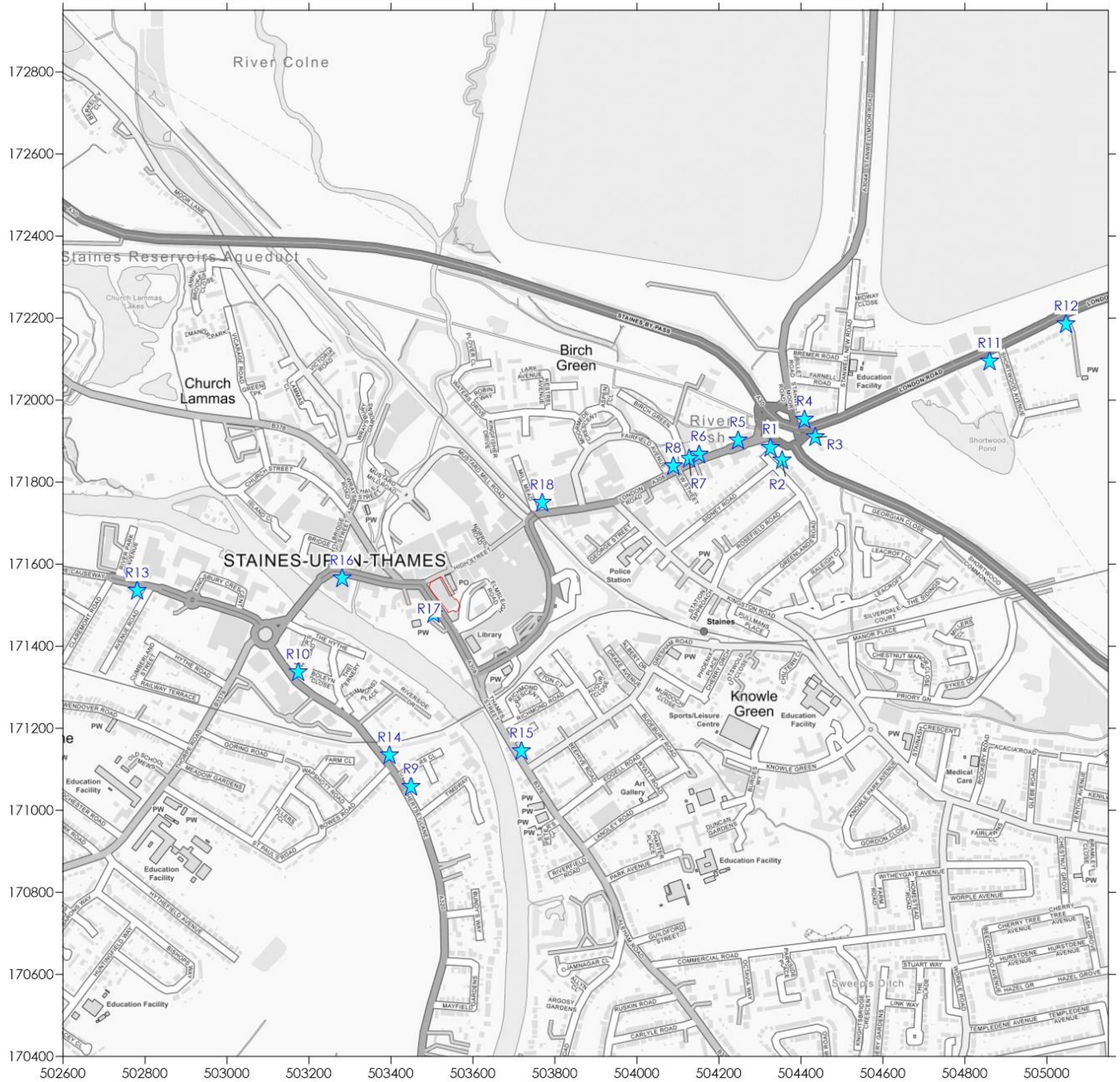

Legend

Site Boundary

Receptors

Title

Figure 5 - Operational Phase Sensitive Receptor Locations

Project

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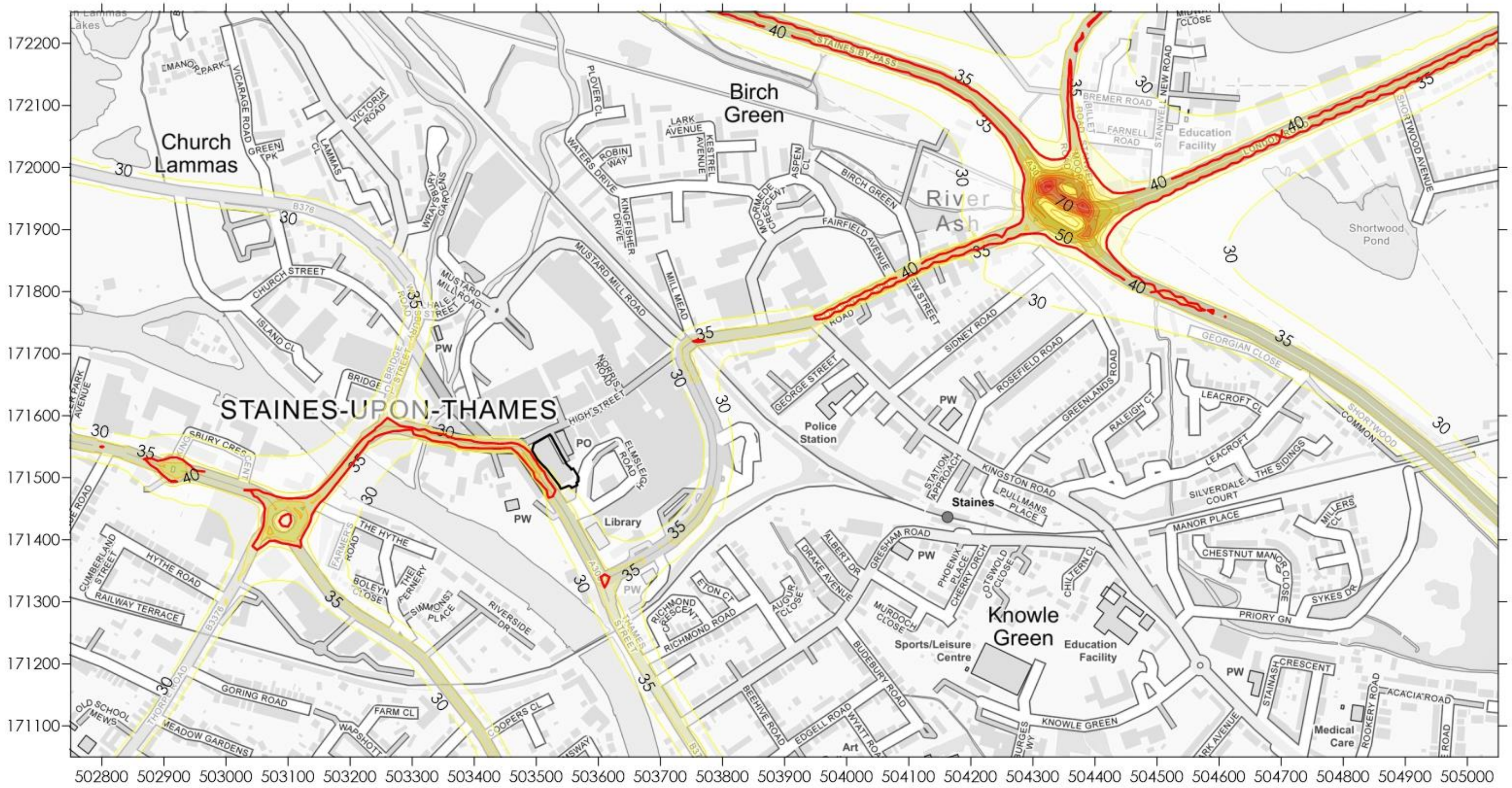

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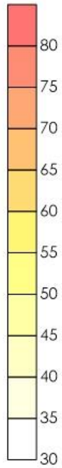

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Figure 6 - Predicted Annual Mean NO_2 Concentrations (μg/m³)
Do-Minimum
Ground Floor

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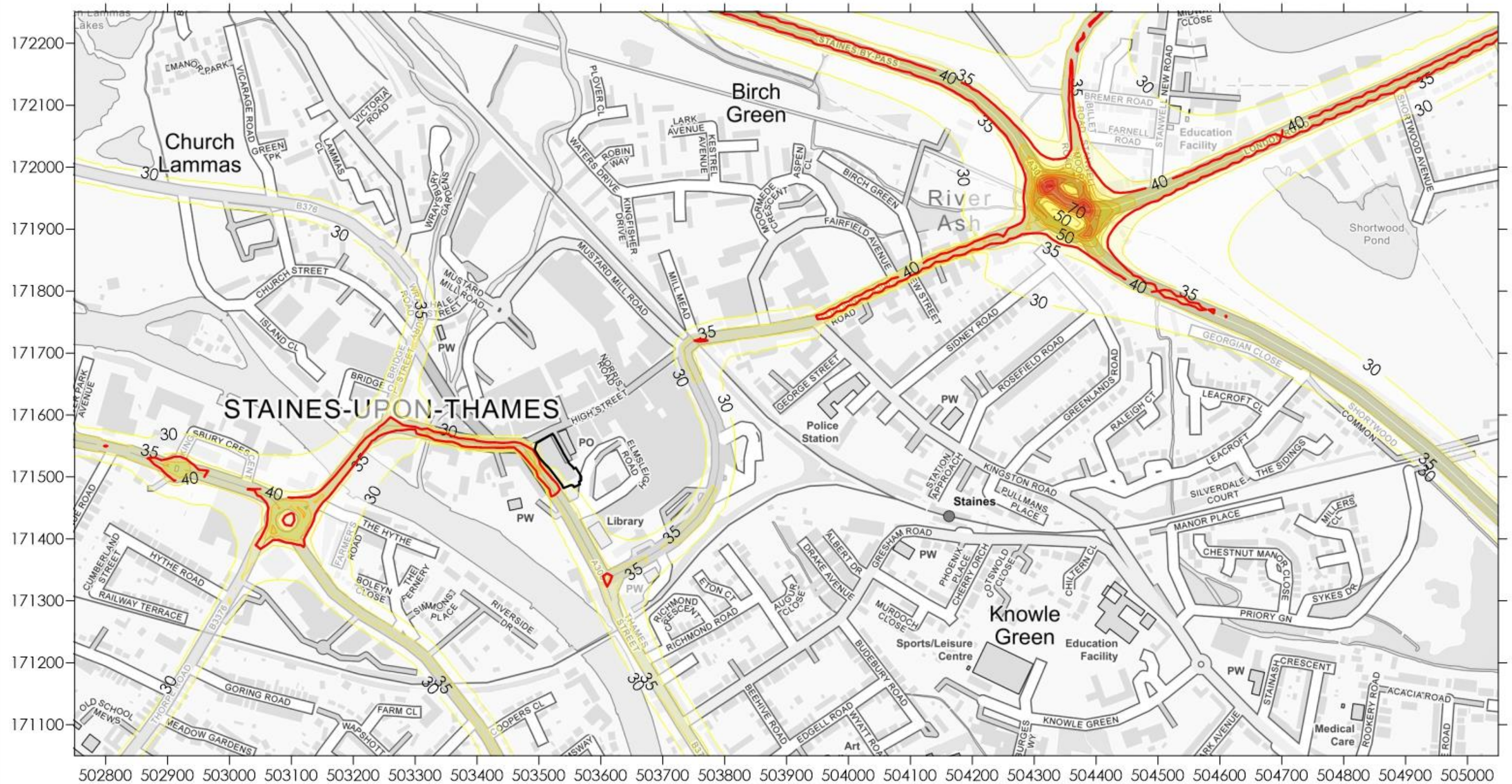

Legend

Site Boundary

Annual Mean NO_2 Concentrations (µg/m³)

80
75
70
65
60
55
50
45
40
35
30

Title

Figure 7 - Predicted Annual Mean NO_2 Concentrations (µg/m³)
Do-Something
Ground Floor

Project

Air Quality Assessment
High Street, Staines

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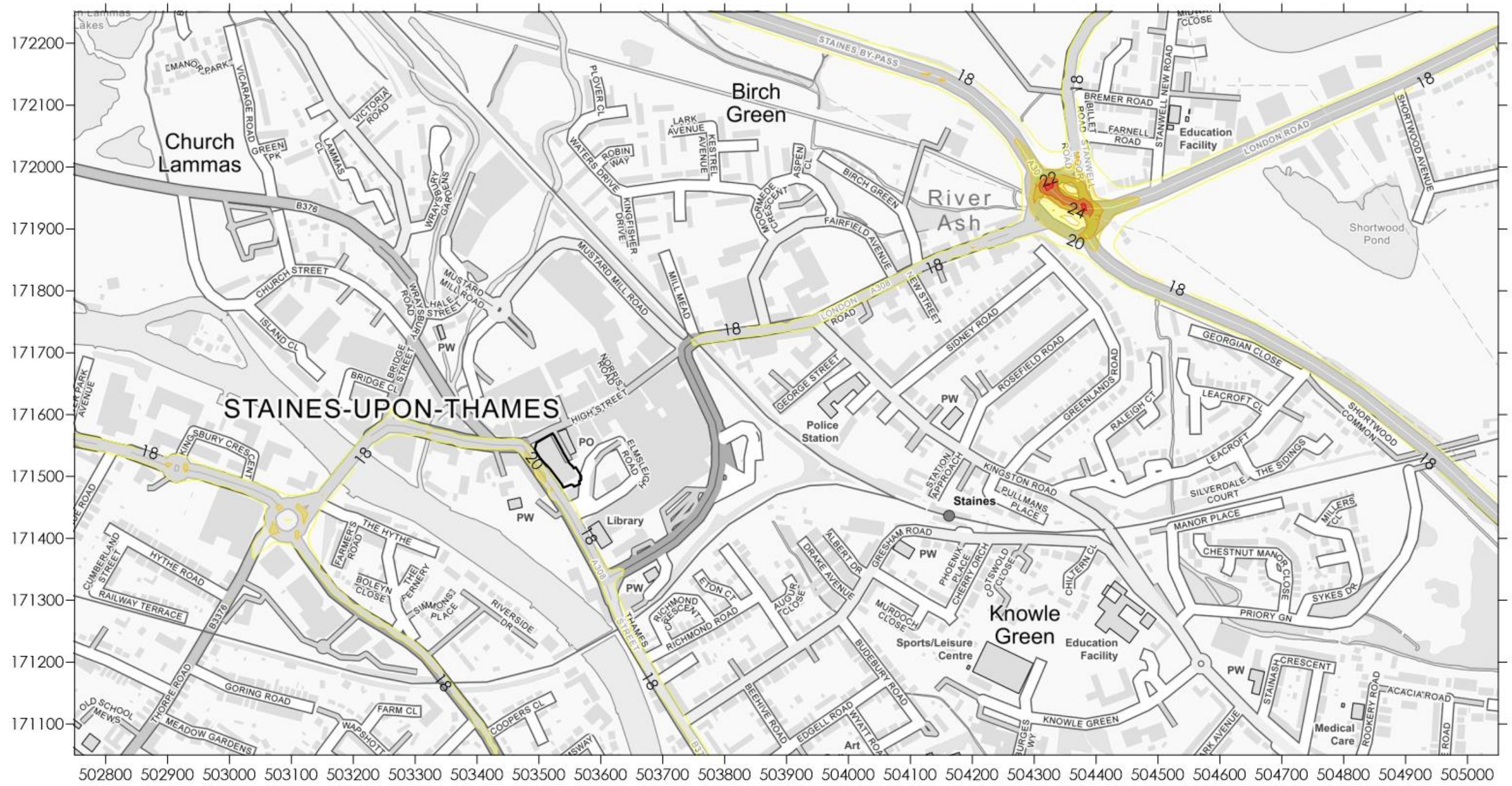

Legend

Site Boundary

Annual Mean PM_{10} Concentrations ($\mu g/m^3$)

26
24
22
20
18

Title

Figure 8 - Predicted Annual Mean PM_{10} Concentrations ($\mu g/m^3$)
Do-Minimum
Ground Floor

Project

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High Street, Staines

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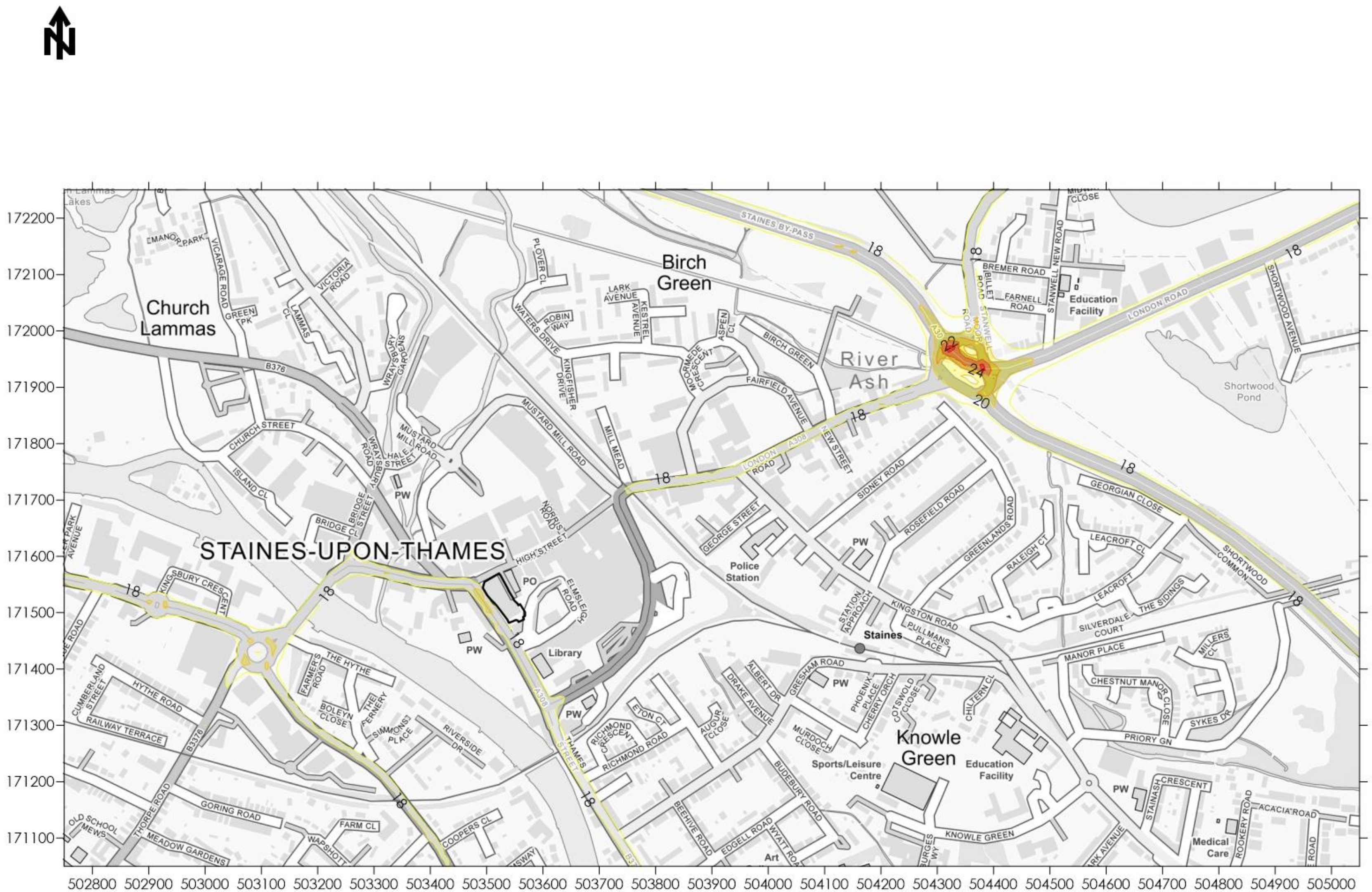

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Site Boundary

Annual Mean PM_{10} Concentrations ($\mu g/m^3$)

26
24
22
20
18

Title

Figure 9 - Predicted Annual Mean PM_{10} Concentrations ($\mu g/m^3$)
Do-Something
Ground Floor

Project

Air Quality Assessment
High Street, Staines

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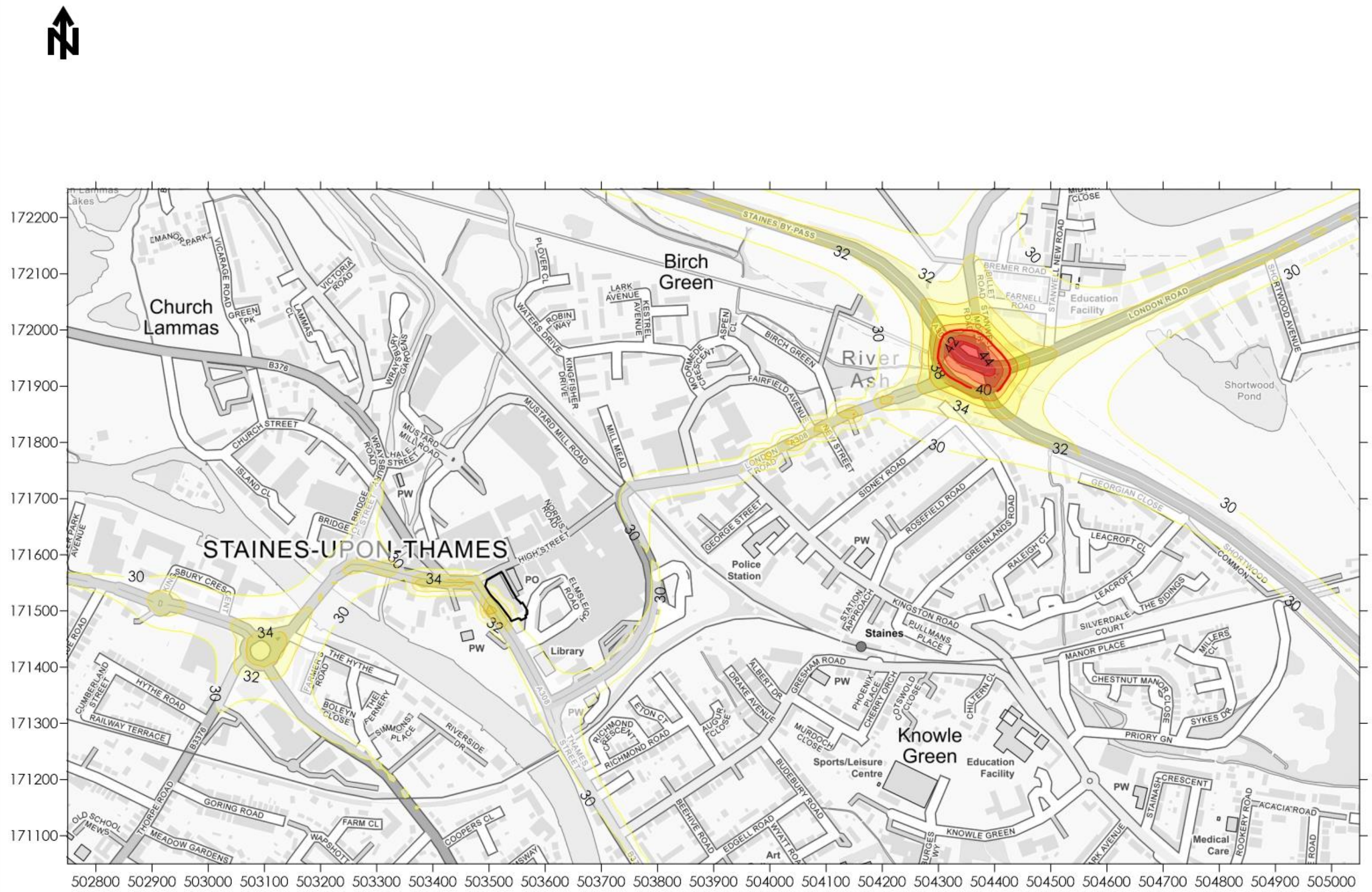

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Site Boundary

Annual Mean NO_2 Concentrations ($\mu g/m^3$)

44
42
40
38
36
34
32
30

Title

Figure 10 - Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$) Do-Something First Floor

Project

Air Quality Assessment
High Street, Staines

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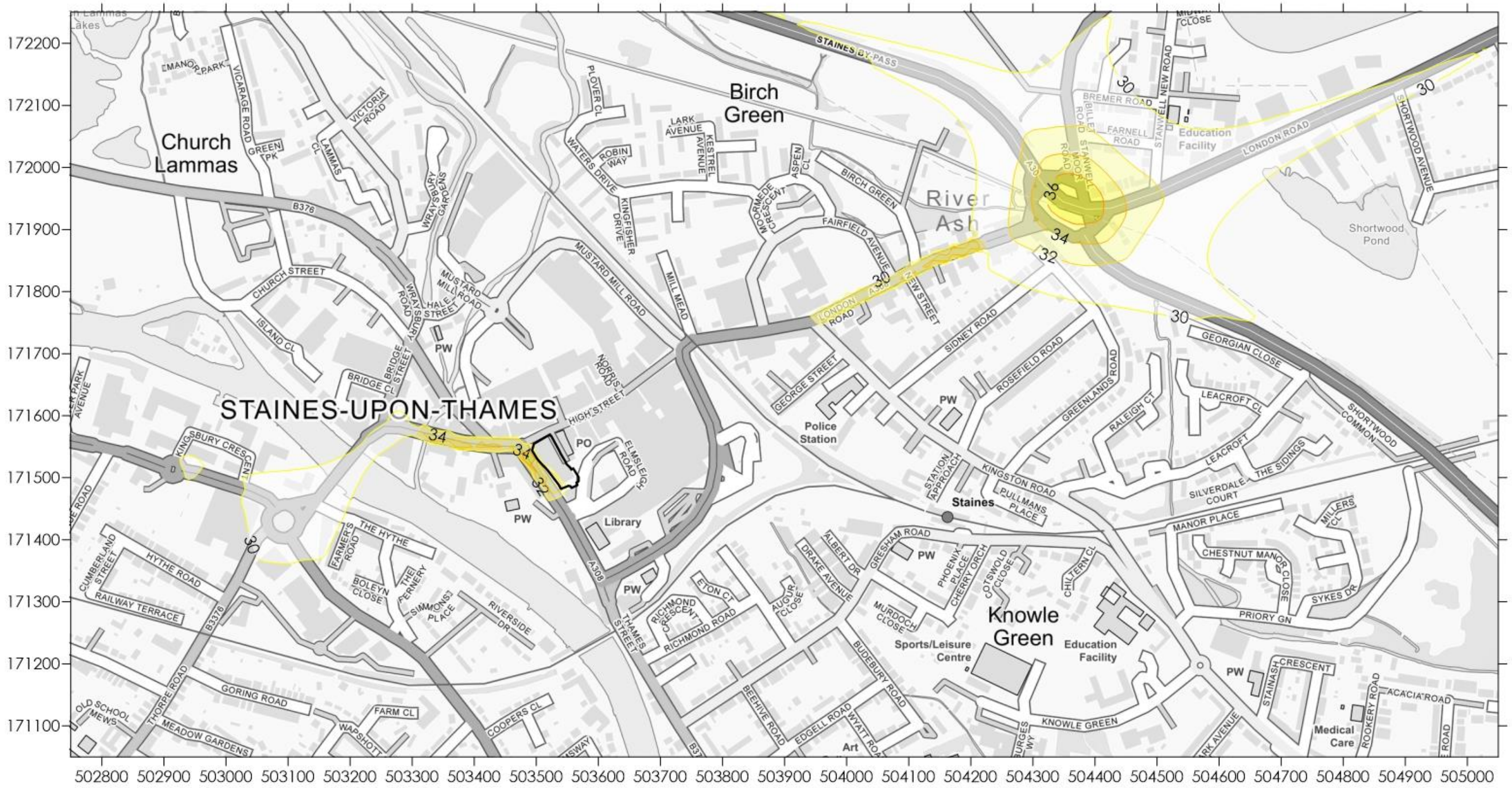

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Site Boundary

Annual Mean NO_2 Concentrations (μg/m³)

44
42
40
38
36
34
32
30

Title

Figure 11 - Predicted Annual Mean NO_2 Concentrations (μg/m³) Do-Something Second Floor

Project

Air Quality Assessment
High Street, Staines

Project Reference

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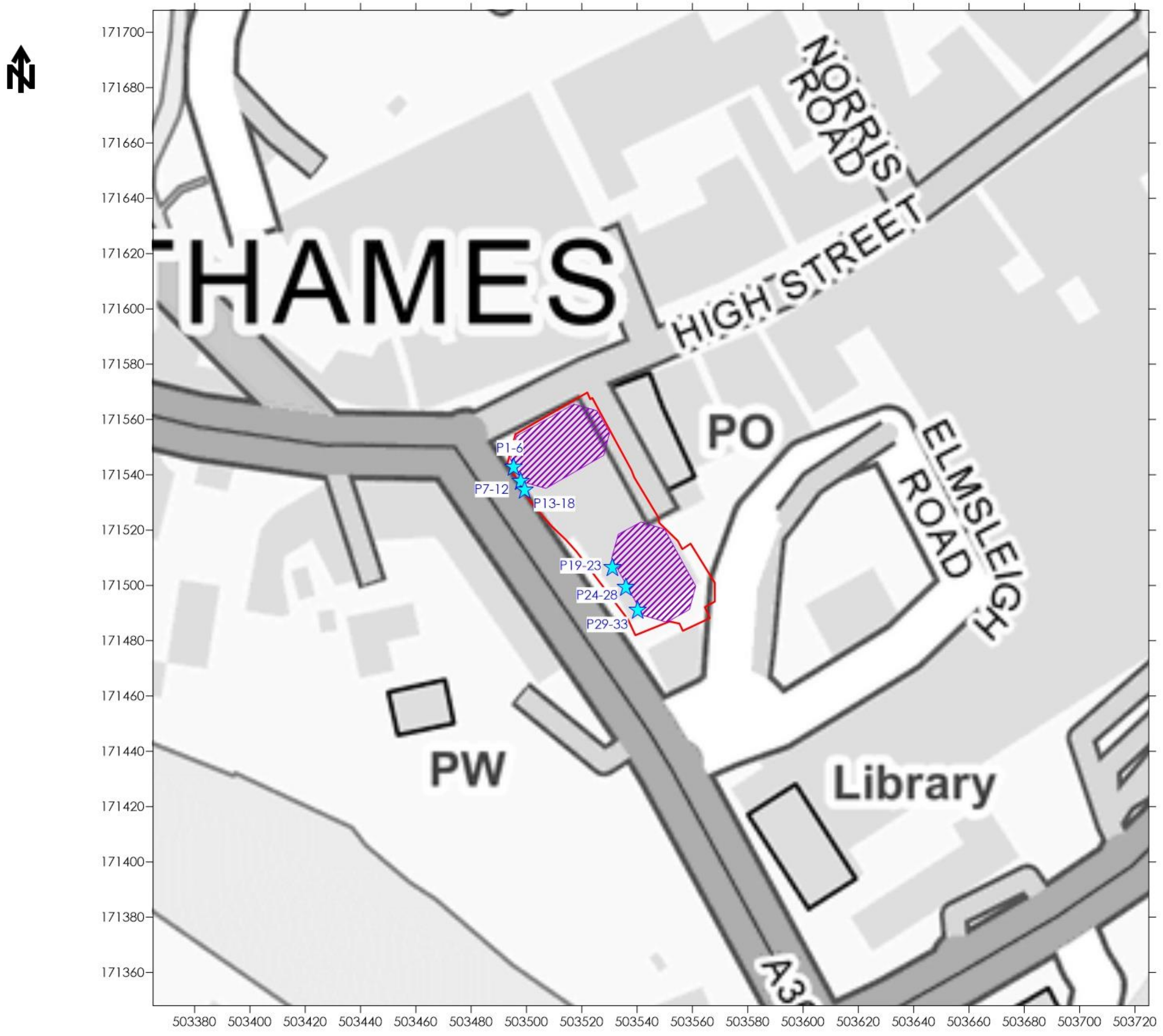

Legend

Site Boundary

Proposed Building

Proposed Receptor

Title

Figure 12 - Proposed Sensitive Receptor Locations

Project

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High Street, Staines

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Legend

Mitigation Required

Title

Figure 13 - Proposed Residential Units Requiring Mitigation

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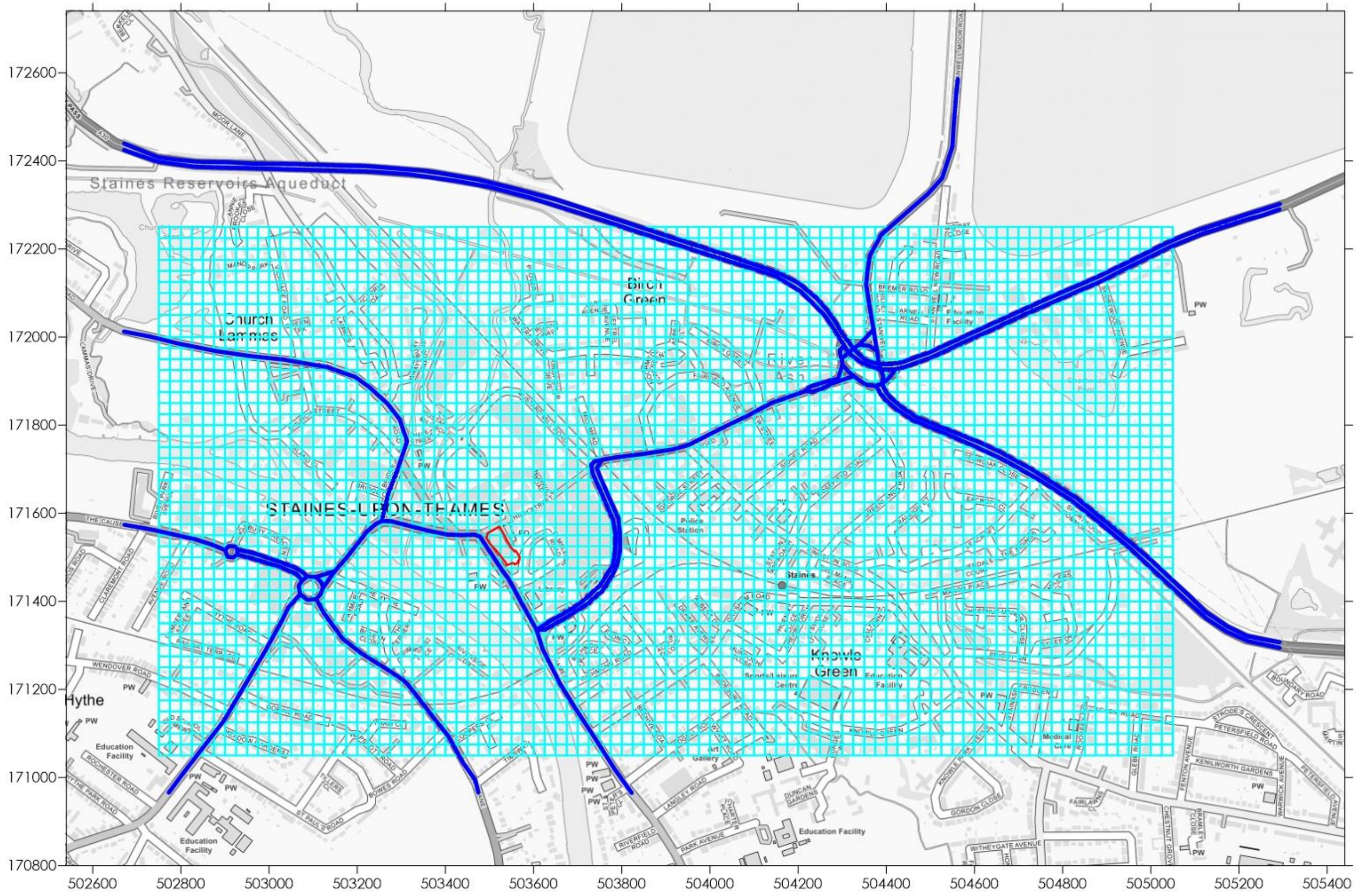

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Site Boundary

Output Grid

Road Link

Title

Figure 14 - ADMS-Roads inputs

Project

Air Quality Assessment
High Street, Staines

Project Reference

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Appendix 1 - Assessment Input Data

Introduction

The proposed development has the potential to expose future residents to elevated pollution levels and cause air quality impacts as a result of emissions associated with vehicles travelling to and from the site. In order to assess NO_2 and PM_{10} concentrations at sensitive locations, detailed dispersion modelling was undertaken in accordance with the following methodology.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0.0.1). 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 DEFRA.

The 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 (z_0); and,
- Monin-Obukhov length.

Additional options can also be selected within the ADMS-Roads interface to take account of site specific characteristics that may affect model output, such as canyons.

The relevant inputs are detailed in the following Sections.

Assessment Area

Ambient concentrations were predicted over the area NGR: 502750, 171050 to 505050, 172250. One Cartesian grid was included within the model to produce data suitable for contour plotting using the Surfer software package.

Reference should be made to Figure 14 for a graphical representation of the assessment grid extents.

Traffic Flow Data

Baseline traffic data for use in the assessment was obtained from the Department for Transport (DfT)[22]. The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network in Great Britain for the years 1999 to 2020. It should be noted that the DfT website is referenced in DEFRA guidance[23] as being a suitable source of data for air quality assessments and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the site.

The baseline traffic data was converted to the appropriate assessment year utilising a factor obtained from TEMPro. This software package has been developed by the DfT to calculate future traffic growth throughout the UK.

Several planning applications have recently been submitted within the vicinity of the proposed site. Traffic generation associated with the following schemes was therefore obtained from the relevant Air Quality and Transport Assessments, as well as consultation with Jamie Cassie, the Transport Consultant for the project, and included within the DM and DS scenarios in order to ensure consideration of cumulative impacts from developments within the local area:

- Charter Square High Street Staines-upon-Thames - 17/01923/FUL;
- 17 -51 London Road, Staines-upon-Thames - 19/00290/FUL;
- Renshaw Industrial Estate 28 Mill Mead Staines-upon-Thames - 17/01365/OUT;
- Poundland, 95 - 99 High Street Staines-upon-Thames - 20/00101/FUL;
- Forum House, 14 Thames Street Staines-upon-Thames - 19/00796/FUL;
- Thameside House, South Street, Staines-upon-Thames - 20/00344/FUL;
- Phase 1c Charter Square High Street Staines-upon-Thames - 20/01112/FUL;
- Renshaw Industrial Estate 28 Mill Mead Staines-upon-Thames - 21/00010/FUL; and,
- The Old Telephone Exchange, Masonic Hall and Adjoining Land Elmsleigh Road Staines-upon-Thames - 20/01199/FUL.

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22 https://roadtraffic.dft.gov.uk/#6/55.254/-6.064/basemap-regions-countpoints.

23 Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

The predicted change in traffic flow on the local road network as a result of the development was also provided by Jamie Cassie, The Transport Consultant for the project. This was added to the baseline flows to produce the DS scenario.

A summary of the traffic data is provided in Table A1.1. Road widths and vehicle speeds were estimated from aerial photography and UK highway design standards.

Table A1.1 Traffic Data

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Road Width (m)	Speed (km/h)
		Verif.	2024 DM	2024 DS			
L1	A308 approach to Bridge Street junction	18,247	20,322	20,406	1.98	14.4	25
L2	A308 east of Bridge Street	18,247	20,322	20,406	1.98	13.6	45
L3	A308 south of High Street	18,247	20,322	20,406	1.98	14.7	45
L4	A308 approach to Thames Street junction	18,247	20,454	20,647	1.98	13.5	45
L5	Thames Street south of A308	18,247	19,679	19,689	1.98	12.8	45
L6	South Street northbound (NB) east of Thames Street	4,938	5,796	5,887	6.20	5.7	45
L7	South Street NB east of Thames Street slow phase (SP)	4,938	5,796	5,887	6.20	6.7	25
L8	South Street NB north of Thames Street	4,938	5,796	5,887	6.20	6.6	45
L9	South Street southbound (SB) north of Thames Street	4,938	5,796	5,887	6.20	6.6	45
L10	South Street SB east of Thames Street SP	4,938	5,796	5,887	6.20	6.3	25
L11	South Street SB east of Thames Street	4,938	5,796	5,887	6.20	8.7	45
L12	South Street SB approach to A308 junction	4,938	5,796	5,887	6.20	8.7	25
L13	South Street NB east of High Street	4,938	5,796	5,887	6.20	6.4	25
L14	South Street SB east of High Street	4,938	5,796	5,887	6.20	6.8	25
L15	South Street approach to London Road	14,743	17,058	17,241	2.90	8.0	25
L16	London Road east of High Street	14,743	17,603	17,786	2.90	10.5	45
L17	London Road NB approach to roundabout	7,372	8,713	8,804	2.90	5.8	25

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Road Width (m)	Speed (km/h)
		Verif.	2024 DM	2024 DS			
L18	London Road SB exit from roundabout	7,372	8,713	8,804	2.90	4.5	25
L19	London Road SB east of roundabout	15,110	16,631	16,678	3.60	7.5	60
L20	A30 SB through roundabout	32,928	35,361	35,361	5.43	9.3	25
L21	A30 NB through roundabout	32,928	35,361	35,361	5.43	11.6	25
L22	London Road NB east of roundabout	15,110	16,631	16,678	3.60	8.2	60
L23	London Road SB approach to roundabout	15,110	16,631	16,678	3.60	10.3	25
L24	London Road NB approach to A30 junction	7,372	8,196	8,228	2.90	7.3	25
L25	A30 NB north of roundabout	16,464	17,960	17,992	5.43	7.6	60
L26	A30 SB north of roundabout	16,464	17,960	17,992	5.43	11.7	60
L27	Stanwell Moor Road north of roundabout	16,855	18,101	18,101	4.90	7.3	50
L28	Stanwell Moor Road SB approach to roundabout	8,428	9,050	9,050	4.90	9.7	25
L29	Stanwell Moor Road NB exit from roundabout	8,428	9,050	9,050	4.90	8.2	25
L30	A308 NB south of roundabout	13,423	14,526	14,539	4.50	7.1	60
L31	A308 NB approach to roundabout	13,423	14,526	14,539	4.50	8.2	25
L32	A308 SB exit from roundabout	13,423	14,526	14,539	4.50	7.9	25
L33	A308 SB south of roundabout	13,423	14,526	14,539	4.50	6.9	60
L34	Bridge Street exit from A308 junction	9,674	10,389	10,389	2.29	10.7	25
L35	Wraysbury Road north of Bridge Street	9,674	10,389	10,389	2.29	10.9	25
L36	B376 north of Wraysbury Road	9,674	10,389	10,389	2.29	10.8	40
L37	A308 NB south of Kingsbury Crescent approach to roundabout	10,265	11,163	11,163	1.09	6.9	25
L38	A308 SB south of Kingsbury Crescent exit from roundabout	10,265	11,163	11,163	1.09	7.8	25
L39	A308 south of Bridge Street junction	22,326	24,703	24,786	1.85	6.9	45
L40	A308 SB approach to roundabout	11,163	12,351	12,393	1.85	9.8	25
L41	A308 NB exit from roundabout	11,163	12,351	12,393	1.85	6.8	25

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Road Width (m)	Speed (km/h)
		Verif.	2024 DM	2024 DS			
L42	Chertsey Lane south of A308	15,344	16,925	16,976	1.26	10.3	45
L43	A308 north of B3376 exit from roundabout	10,265	11,163	11,179	1.09	7.2	25
L44	A308 north of B3376 approach to roundabout	10,265	11,163	11,179	1.09	6.9	25
L45	A308 north of Avenue Road exit from roundabout	20,530	22,327	22,359	1.09	11.3	25
L46	A308 west of Avenue Road	20,530	22,327	22,359	1.09	9.2	45
L47	B3376 exit from roundabout	22,326	23,976	23,976	1.85	8.1	25
L48	B3376 south of A308	10,032	10,773	10,773	1.89	7.9	45
L49	A30 SB approach to roundabout	16,464	17,960	17,992	5.43	11.6	25
L50	A30 NB exit from roundabout	16,464	17,960	17,992	5.43	9.3	25
L51	London Road SB approach to roundabout	16,464	18,086	18,133	5.43	9.3	25
L52	London Road NB exit from roundabout	16,464	18,086	18,133	5.43	11.6	25
L53	London Road east of High Street	14,743	17,603	17,786	2.90	10.5	45
L54	A308 south of High Street	18,247	20,322	20,406	1.98	14.8	45
L55	A308 south of High Street	18,247	20,322	20,406	1.98	14.3	45
R1	A308 roundabout north of B3376	20,131	21,983	22,030	1.85	9.8	20
R2	A308 roundabout south of Kingsbury Crescent	27,882	30,827	30,932	5.43	12.9	20
R3	A30 roundabout Staines-By-Pass	20,530	22,187	22,205	1.09	9.6	20

Reference should be made to Figure 14 for a graphical representation of the road link locations.

Street Canyons

Where buildings or walls surround roads, pollutant dispersion patterns are altered which can lead to high pollutant concentrations. These street canyons can significantly influence are quality along a road and it is therefore important to take consideration of their effects when undertaking dispersion modelling.

The release of ADMS-Roads version 4.0.1.0 in December 2015 incorporated a number of new features, including an advanced street canyon module, which have been retained in version 5.0.0.1. Advanced street canyon modelling allows a number of parameters to be included in the dispersion model in order to predict pollutant dispersion patterns which better reflect air flow within complex urban geometries.

Canyons have five principle effects on dispersion which can influence pollutant concentrations. These are:

- Pollutants are channelled along street canyons;
- Pollutants are dispersed across street canyons by circulating flow at road height;
- Pollutants are trapped in recirculation regions;
- Pollutants leave the canyon through gaps between buildings - as if there was no canyon; and,
- Pollutants leave the canyon from the canyon top.

The combined modelling of these effects will result in concentration patterns unique to each canyon. The parameters used in the assessment are outlined in Table A1.2.

Table A1.2 Verification and DM Canyon Parameters

Link	Parameter (m)					
	Canyon Width to Left	Average Height of Buildings to Left	Building Length Left	Canyon Width Right	Average Height of Buildings to Right	Building Length Right
L2	10.4	12.0	118.3	9.3	12.0	93.0
L3	10.9	16.0	16.3	9.2	18.0	19.1
L53	9.5	10.0	154.7	8.4	14.0	206.2
L54	10.9	16.0	25.4	8.3	18.0	26.1
L55	16.3	16.0	28.1	9.1	18.0	206.2

The proposals will alter the street canyons along the A308 north of Thames Street. As such, the canyon parameters were altered in the future year model to take account of the potential changes in street geometry. The parameters are shown in Table A1.2.

Table A1.2 DS Canyon Parameters

Link	Parameter (m)					
	Canyon Width to Left	Average Height of Buildings to Left	Building Length Left	Canyon Width Right	Average Height of Buildings to Right	Building Length Right
L2	10.4	12.0	118.3	9.3	12.0	93.0
L3	12.7	49.0	16.3	9.2	18.0	19.1
L53	9.5	10.0	154.7	8.4	14.0	206.2
L54	10.9	7.0	25.4	8.3	18.0	26.1
L55	21.6	49.0	28.1	9.1	18.0	30.0

A choice of two modes is provided for use in the advanced canyon module. Standard mode assumes that each road is part of a continuous network of roads with similar canyon properties. Network mode analyses the road network to determine transport of pollutants between adjoining street canyons, allows for varying concentrations along the canyon and accounts for transport of pollutants out of the end of a canyon. Network mode is considered most accurate for detailed local analysis and as such was selected for use in the model.

Emission Factors

Emission factors were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 10.1). This has been produced by DEFRA and incorporates COPERT 5 vehicle emission factors and fleet information.

There is current uncertainty over NO_2 concentrations within the UK, with the implementation of new vehicle emission standards historically not resulting in the previously expected reduction in roadside levels. Therefore, 2019 emission factors were utilised in preference to the development opening year in order to provide robust model outputs. As predictions for 2019 were verified, it is considered the results are a robust indication of worst case concentrations for the future year.

Meteorological Data

Meteorological data used in the assessment was taken from Heathrow Airport meteorological station over the period 1st January 2019 to 31st December 2019 (inclusive). Heathrow Airport is located at NGR: 506947, 176515, which is approximately 6.1km north-east of the development. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

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 4 for a wind rose of utilised meteorological data.

Roughness Length

The z_0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 1m was used to describe the modelling extents. This is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'cities, woodlands'.

A z_0 of 0.3m was used to describe the meteorological site. This value considered appropriate for the morphology of the area due to the large expanse of flat land use, such as runways and surrounding grassland, and is suggested within ADMS-Roads as being suitable for 'agricultural areas (max)'.

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 to describe the modelling extents. This value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

A minimum Monin-Obukhov length of 100m was used to describe the meteorological site. This value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'large conurbations > 1 million'.

Background Concentrations

A review of DEFRA data and local monitoring results was undertaken in order to identify appropriate background values for use in the assessment. This indicated that the annual mean NO_2 concentration at the SP1 - Staines High Street diffusion tube during 2019 was 27.5μg/m^3, higher than the DEFRA background concentration of 21.72μg/m^3 for the grid quare containing the site. As such, the monitoring result was used to provide worst-case predictions.

Monitoring of PM_{10} concentrations is not undertaken at a background location in the vicinity of the site. As such, the value from the DEFRA background for the grid square containing the development site, as shown in Table 13, was used within the assessment.

Background concentrations from 2019 were utilised in preference to the opening year. This provided a robust assessment and avoided issues associated with adjustment of monitoring results for future conditions.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations were converted to NO_2 concentrations using the spreadsheet (version 8.1) provided by DEFRA, which is the method detailed within DEFRA guidance[24].

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 the assessment, model verification was undertaken for 2019 using traffic data, meteorological data and monitoring results from this year.

24 Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

Monitoring of NO_2 concentrations was undertaken at eight locations within the vicinity of roads included within the model during 2019. The results were obtained and the road contribution to total NO_x concentration calculated following the methodology contained within DEFRA guidance[25]. The monitored annual mean NO_2 concentrations and calculated road NO_x concentrations are summarised in Table A1.4.

Table A1.4 Verification - Monitoring Result

Monitoring Location		Monitored NO_2 Concentration (µg/m³)	Calculated Road NO_x Concentration (µg/m³)
SP3	Wraysbury Road	30.4	5.71
SP12	Stanwell New Road, Stanwell North	29.4	3.73
SP20	Greenlands Rd, Staines	30.9	6.71
SP27	Church Street, Staines	34.2	13.43
SP28	London Road, Staines	42.4	31.05
SP29	London Road, Staines	50.8	50.58
SP46	South Street, Staines	32.9	10.76
SP51	Fairfield Avenue, Staines	41.0	27.94

The annual mean road NO_x concentrations predicted from the dispersion model and the 2019 road NO_x concentrations calculated from the monitoring results are summarised in Table A1.5.

Table A1.5 Verification - Modelling Result

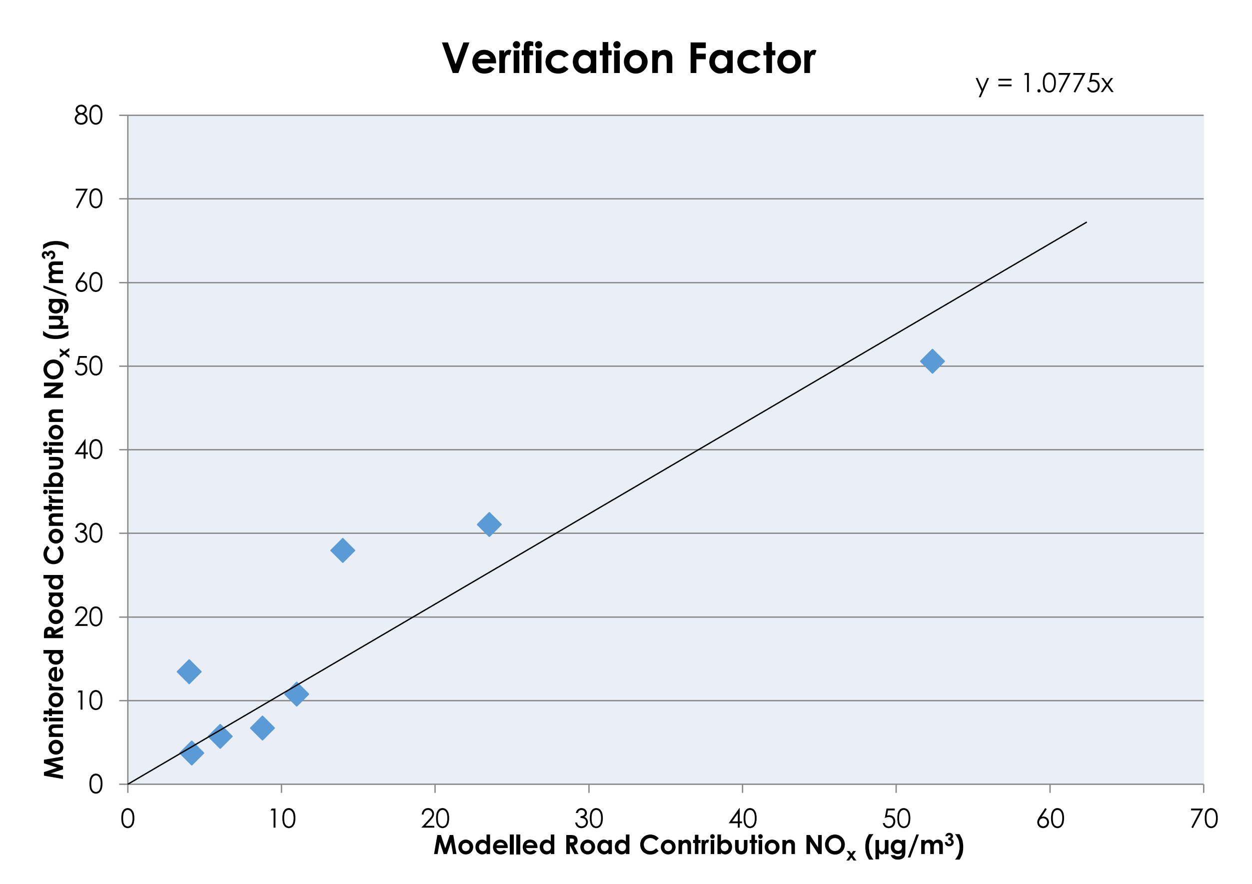
Monitoring Location		Calculated Road NO_x Concentration (µg/m³)	Modelled Road NO_x Concentration (µg/m³)
SP3	Wraysbury Road	5.71	6.03
SP12	Stanwell New Road, Stanwell North	3.73	4.16
SP20	Greenlands Rd, Staines	6.71	8.78
SP27	Church Street, Staines	13.43	4.00
SP28	London Road, Staines	31.05	23.54
SP29	London Road, Staines	50.58	52.37

25 Local Air Quality Management (TG16), DEFRA, 2021.

Monitoring Location		Calculated Road NO_x Concentration (μg/m³)	Modelled Road NO_x Concentration (μg/m³)
SP46	South Street, Staines	10.76	11.00
SP51	Fairfield Avenue, Staines	27.94	14.00

The monitored and modelled road NO_x concentrations were graphed and the equation of the trendline based on linear progression through zero calculated. This indicated that a verification factor of 1.0775 was required to be applied to all road NO_x modelling results, as shown in Graph 1.

Graph 1 NO_x Verification Factor



Further analysis of model performance is recommended in DEFRA guidance[26] in order to provide additional confidence in assessment predictions. As such, a comparison of the modelled and monitored NO_2 concentrations was undertaken. The NO_x verification factor was therefore

[26] Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

applied to the modelled road NO_x concentrations at the monitoring locations and the total NO_2 concentrations calculated using the NO_x to NO_2 spreadsheet. This is summarised in Table A1.6.

Table A1.6 NO_2 Verification - Difference between Monitored and Modelled NO_2 Concentrations

Monitoring Location		Modelled Road NO_x Concentration - Verified (μg/m³)	Modelled NO_2 Concentration (μg/m³)	Monitored NO_2 Concentration (μg/m³)	Difference between Monitored and Modelled NO_2 Concentration (%)
SP3	Wraysbury Road	6.50	30.79	30.4	1.28
SP12	Stanwell New Road, Stanwell North	4.48	29.78	29.4	1.30
SP20	Greenlands Rd, Staines	9.46	32.26	30.9	4.40
SP27	Church Street, Staines	4.31	29.69	34.2	-13.19
SP28	London Road, Staines	25.36	39.82	42.4	-6.08
SP29	London Road, Staines	56.43	53.19	50.8	4.70
SP46	South Street, Staines	11.85	33.43	32.9	1.61
SP51	Fairfield Avenue, Staines	15.09	35.00	41.0	-14.63

DEFRA guidance[27] states that the majority of modelled results should be within +/-25% of the recorded concentrations. As shown in Table A1.6, the difference between the modelled and monitored NO_2 concentrations were within the stated limits at all monitors. As such, the model is considered to be performing to an appropriate standard.

Monitoring of PM_{10} concentrations is not undertaken within the assessment extents. The NO_x verification factor was therefore used to adjust model predictions of this species in accordance with DEFRA guidance[28].

27 Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

28 Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

Appendix 2 - Curricula Vitae

JETHRO REDMORE

Director

BEng (Hons), MSc, MIAQM, MIEnvSc, PIEMA, CEnv

KEY EXPERIENCE:

Jethro is a Chartered Environmentalist and Director of Redmore Environmental with specialist experience in the air quality and odour sectors. His key capabilities include:

- Production and management of Air Quality, Dust and Odour Assessments for a wide-range of clients from the retail, residential, infrastructure, commercial and industrial sectors.
- Production and co-ordination of Environmental Permit applications for a variety of industrial sectors.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads, ADMS-5, AERMOD-PRIME and BREEZE-ROADS. Studies have included impact assessment of ground level pollutant and odour concentrations and assessment of suitability of development sites for proposed end-use.
- Project management and co-ordination of Environmental Impact Assessments and scoping reports for developments throughout the UK.
- Provision of expert witness services at Planning Inquiries.
- Design and project management of pollutant monitoring campaigns.
- Co-ordination and management of large-scale multi-disciplinary projects and submissions.
- Provision of expert advice to local government and international environmental bodies, as well as involvement in production of industry guidance.

SELECT PROJECTS SUMMARY:

Industrial

Shanks Waste Management - Odour Assessments of two waste management facilities to support Environmental Permit Applications.

Tatweer Petroleum - dispersion modelling of Bahrain oil field.

Doha South Sewage Treatment Works - AQA for works extension in Qatar.

IRIS Environmental Appraisal Report Reviews, Isle of Man Government - odour assessment reviews.

Lankem, Greater Manchester - Environmental Permit Application for chemical manufacturing plant.

Newport Docks Bulk Drying, Pelleting and CHP Facility - air quality EIA for gas CHP.

Springshades, Leicester - Environmental Permit Variation Application for textile manufacturing plant.

Valspar, Chester - Odour Assessment and production of Odour Management Plan for a paint manufacturing plant in response to neighbour complaints.

Agrivert - dispersion modelling of odour and CHP emissions from numerous AD plants.

James Cropper Paper Mill, Cumbria - air quality EIA, Environmental Permit Variation and Human Health Risk Assessment for new biomass boiler adjacent to SSSI.

Rigg Approach, Leyton - Air Quality Assessment in support of waste transfer site.

Lynchford Lane Waste Transfer Station - biomass facility energy recovery plant.

Barnes Wallis Heat and Power, Cobham - biomass facility adjacent to AQMA.

Residential

Wood St Mill, Bury - residential development adjacent to scrap metal yard.

Hyams Lane, Holbrook - Odour Assessment to support residential development adjacent to sewage works.

North Wharf Gardens, London - peer review of EIA undertaken for large residential development.

Loxford Road, Alford - Air Quality EIA for residential development, included consideration of impacts from associated package sewage works

Elephant and Castle Leisure Centre - baseline AQA for redevelopment.

Carr Lodge, Doncaster - EIA for large residential development.

Queensland Road, Highbury - residential scheme including CHP.

Bicester Ecotown - dispersion modelling of energy centre.

Castleford Growth Delivery Plan - baseline air quality constraints assessment for town redevelopment.

York St, Bury - residential development adjacent to AQMA.

Temple Point Leeds - residential development adjacent to M1.

Commercial and Retail

Etihad Stadium - Air Quality EIA for the extension to the capacity of the Etihad Stadium, Manchester.

Wakefield College - redevelopment of city centre campus in AQMA.

Manchester Airport Cargo Shed - commercial development.

Manchester Airport Apron Extension - EIA including aircraft emission modelling.

National Youth Theatre, Islington - redevelopment to provide new arts space and accommodation.

EMILY BELL

Air Quality Consultant

BSc (Hons), MSc, GradIEMA

Tel: 0161 706 0075 | Email: emily.bell@red-env.co.uk

KEY EXPERIENCE:

Emily is a Environmental Consultant with specialist experience in the air quality sector. Her key capabilities include:

- Production of Air Quality Assessments in accordance with Department for Environment, Food and Rural Affairs (DEFRA) methodologies for a range of residential, commercial and industrial sectors.
- Detailed dispersion modelling of road vehicle exhaust emissions using ADMS-Roads. Studies have included assessment of road traffic exhaust emissions on sensitive receptors and exposure of new residents to poor air quality.
- Advanced canyon modelling to evaluate the impact of altered urban topography on air quality in built up areas.
- Assessment of construction dust impacts from a range of development sizes.
- Definition of baseline air quality and identification of sensitive areas across the UK.
- Production of air quality mitigation strategies specifically tailored to address issues at individual sites.
- Air quality monitoring at industrial sites to quantify pollutant concentrations
- Odour surveys to assess amenity and suitability of sites for potential future development for residential use.

SELECT PROJECTS SUMMARY:

Bowlers Yard, Manchester

Air Quality Assessment in support of an eleven storey residential development to provide circa 65 units on land known as Bowlers Yard, Manchester. The site was located in an Air Quality Management Area (AQMA) and concerns were raised regarding the exposure of future occupants to poor air quality due to road traffic emissions. Detailed dispersion modelling was undertaken using ADMS-roads to assess $PM_{2.5}$, PM_{10} and NO_2 concentrations across the site. Results indicated that pollution levels were below the air quality objectives across the development.

Freemasons Arms Hotel, Heywood

Air Quality Assessment to support a residential-led development in an AQMA. Detailed dispersion modelling was undertaken with the inclusion of advanced canyon modelling to evaluate the impact of the urban topography within the locality on the dispersion of traffic related pollutants. Predicted concentrations of NO_2 were found to exceed air quality criteria at the building façade fronting Market Place at first floor level. As such, mitigation was specified for the affected units to ensure future residents would not be exposed to poor air quality.

Griffin Road, London

Air Quality Assessment in support of a residential development located in an AQMA. Detailed dispersion modelling was undertaken using ADMS-roads to assess PM_{10} and NO_2 concentrations across the site. Results indicated that pollution levels were classified as APEC - A in accordance with the London Councils Air Quality and Planning Guidance.

High Street, Dudley

Odour Impact Assessment in support of a proposed residential-led development. Due to the location of the site, being above an existing hot food takeaway, odour surveys were required to assess the level of odour across the development. A risk assessment was also undertaken in accordance with the relevant odour guidance. An appropriate ventilation system was identified on the basis of the assessment results.

East Common Lane, Selby

Air Quality Assessment in support of an industrial development on land associated with Access 63 Business Park, East Common Lane Selby. Due to the size of the development it was possible that traffic generated from the scheme may cause negative impacts on sensitive receptors nearby. NO_2 and PM_{10} concentrations were quantified at specific receptor points to ensure there would be no significant increases in pollution levels. Results revealed negligible impacts.

Wharton Road, Winsford

Air Quality Assessment in support of a residential development of circa 138 units on land off Wharton Road, Winsford. Using sensitive receptors, located in areas where increased road traffic may affect NO_2 concentrations, a comparison was made between overall concentrations with and without the development in place. Results indicated pollutant concentrations were below the relevant standards across the site and impacts were not significant.