



AIR QUALITY ASSESSMENT 29 – 35 STATION ROAD READING

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EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by Station Road Development Company Ltd to undertake an Air Quality Assessment in support of a planning application for a proposed mixed-use development at Station Road.

The proposals comprise the redevelopment of the site to provide a mixed-use retail, commercial and hotel, across 22 stories.

The proposed development site is located in close proximity to an area identified by Reading Borough Council as experiencing elevated pollutant concentrations. Subsequently, there is the potential that the development will introduce future site users to poor air quality. Additionally, due to the scale of the proposals, the development has the potential to cause air quality impacts at sensitive locations. These may include fugitive dust emissions from construction works and emissions associated with traffic and energy generated by the site during the operational phase. As such, an Air Quality Assessment was required in order to determine baseline conditions, assess site suitability for proposed end use and provide consideration of potential impacts associated with the development.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of 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 development may also occur due to a combination of road traffic exhaust emissions associated with vehicles travelling to and from the site and the combustion of gas associated with the proposed on-site energy generating facilities. A detailed assessment was therefore undertaken in order to quantify pollutant levels with and without the proposals. The assessment concluded that overall impacts on pollutant levels as a result of operational phase emissions were predicted to be not significant. The use of robust assumptions, where necessary, was considered to provide sufficient results confidence for an assessment of this nature.

Dispersion modelling was also undertaken in order to quantify pollutant concentrations across the site and to assess the potential for future users to be exposed to poor air quality. The results indicated that pollutant levels at sensitive locations across the site are below the relevant air quality standards and as such, the inclusion of mitigation measures is not required.

Based on the results of this assessment, air quality should not be considered a constraint to planning consent for the proposed development.





TABLE OF CONTENTS

1. INTRODUCTION	5
1.1 Background	5
1.2 Site Location and Context	5
1.3 Limitations	5
2. LEGISLATION AND POLICY	6
2.1 European Legislation	6
2.2 UK Legislation	6
2.3 Local Air Quality Management	8
2.4 Dust	8
2.5 National Planning Policy	8
2.5.1 National Planning Policy Framework	8
2.5.2 National Planning Practice Guidance	9
2.6 Local Planning Policy	10
3. METHODOLOGY	13
3.1 Construction Phase Assessment	13
3.1.1 Step 1	13
3.1.2 Step 2	13
3.1.3 Step 3	19
3.1.4 Step 4	19
3.2 Operational Phase Assessment	19
3.2.1 Road Vehicle and On-site Energy Exhaust Emissions	19
4. BASELINE	22
4.1 Local Air Quality Management	22
4.2 Air Quality Monitoring	22
4.3 Background Pollutant Concentrations	23
4.4 Sensitive Receptors	24
4.4.1 Construction Phase Sensitive Receptors	24
4.5 Operational Phase Sensitive Receptors	26
5. ASSESSMENT	28
5.1 Construction Phase Assessment	28
5.1.1 Step 1	28
5.1.2 Step 2	28
5.1.3 Step 3	30
5.1.4 Step 4	32
5.2 Operational Phase Assessment	32
5.2.1 Nitrogen Dioxide	32
5.2.2 Nitrogen Dioxide - 1-Hour Mean	36
5.2.3 Particulate Matter (PM ₁₀)	40
5.2.4 Particulate Matter (PM _{2.5})	43
5.2.5 Carbon Monoxide	43
5.2.6 Impact Significance	47





6. CONCLUSION	49
7. ABBREVIATIONS	50

Appendices

Appendix I	Figures
Appendix II	Assessment Inputs
Appendix II	Assessor's Curriculum Vitae





1. INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Station Road Development Company Ltd to undertake an Air Quality Assessment in support of a residential led mixed-use development at 29 - 35 Station Road, Reading

1.2 Site Location and Context

The site is located at land at Station Road at approximate National Grid Reference (NGR): 471480, 173680. Reference should be made to Figure 1 for a location plan.

The proposals comprise the redevelopment of the site to provide a mixed-use retail, commercial and hotel, across 22 stories.

The proposed development site is located within the Reading Borough Council (RBC) Air Quality Management Area (AQMA) which has been declared for exceedances of the annual mean Air Quality Objective (AQO) for nitrogen dioxide (NO₂). As such, there is the potential for the proposals to cause air quality impacts at sensitive receptor locations within the AQMA as well as exposing future site users to elevated pollutant concentrations as a result of emissions associated with the construction and operational phases of the development. This is detailed in the following report.

1.3 Limitations

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





2. LEGISLATION AND POLICY

2.1 European Legislation

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

- ▶ Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for nitrogen dioxide (NO₂), oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- ▶ Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and
- ▶ Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

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

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

2.2 UK Legislation

The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out AQOs that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

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

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





Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM ₁₀	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year
PM _{2.5}	25	Annual mean

Table 2 summarises the advice provided in DEFRA guidance LAQM TG (16)² on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour 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-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 2016 LAQM (TG16), DEFRA, 2016.





2.3 Local Air Quality Management

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

2.4 Dust

The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2018) are those provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

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

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

2.5 National Planning Policy

2.5.1 National Planning Policy Framework

The National Planning Policy Framework³ (NPPF) was published on 24th July 2018 (updated on 19th February 2019) and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

[...]

Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve

³ National Planning Policy Framework, Department for Communities and Local Government, 2018.





local environmental conditions such as air and water quality.

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

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

2.5.2 National Planning Practice Guidance

The National Planning Practice Guidance⁴ (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

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

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

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

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

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

⁴ <http://planningguidance.planningportal.gov.uk/>.





2.6 Local Planning Policy

RBC's Local Development Framework (LDF) consists of a portfolio of documents. The Core Strategy, which was adopted with alterations in January 2015, is the principal overarching part. The Core Strategy sets out the strategic policy framework for the city until 2020.

A review of the Core Strategy indicated the following policies in relation to air quality that are relevant to this assessment:

"Policy CS34: Pollution and Water Resources

Development will only be permitted where it would not be damaging to the environment through air, land, noise or light pollution; where it would preserve or ideally enhance ground and surface water quality; and where existing water resources, sewerage and wastewater treatment infrastructure are adequate to support the proposed development.

Proposals for development that are sensitive to the effects of air, noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution."

And

"Policy CS11: Employment Land for Alternative Uses

Factors which may be taken into account in assessing these criteria include:

[...]

(iv) effects on neighbouring uses of noise, pollution and air quality, intensity of activity"

The draft Local Plan was submitted in March 2018 and aims to guide development within Reading up to 2036. A review of this local plan indicated the following policy in relation to air quality

"Policy CC9: Securing infrastructure

Proposals for development will not be permitted unless infrastructure, services, resources, amenities or other assets lost or impacted upon as a result of the development or made necessary by the development will be provided through direct provision or financial contributions at the appropriate time. Employment development should provide mitigation measures in line with its impacts on the demand for housing (including affordable housing), labour and skills and on the transport network.

[...]

Other measures, as follows, should also be considered where a specific need is





identified and justified:

[...]

Measures to tackle poor air quality or for on-going air quality monitoring”

“Policy EN15 Air Quality

Development should have regard to the need to improve air quality and reduce the effects of poor air quality.

- i. Development that would detrimentally affect air quality will not be permitted unless the effect is to be mitigated. The following criteria should be taken into account:*

[...]

Development should have regard to the need to improve air quality and reduce the effects of poor air quality.

- ii. Development that would detrimentally affect air quality will not be permitted unless the effect is to be mitigated. The following criteria should be taken into account: ii. Where a development would introduce sensitive uses (such as residential, schools and nurseries, hospitals, care facilities) into, or intensify such uses within, an Air Quality Management Area, detrimental effects on that use will be mitigated. Mitigation measures should be detailed in any planning application. If there are significant detrimental effects that cannot be mitigated, the application should be refused. iii. Where required, planning obligations will be used to secure contributions to measures to tackle poor air quality or for air quality monitoring”*

“Policy CR6 Living in Central Reading

Proposals for residential development within the central area will be assessed against the following criteria

[...]

ii) Proposals for new residential development within the central area will be required to demonstrate how the issue of potential noise disturbance from neighbouring land uses and other sources, and air quality implications of residential development, have been considered and if necessary, mitigated. New residential development should not be located next to existing town centre uses where those uses would give rise to unacceptable levels of noise and disturbance to the occupiers of the new scheme, unless this can be mitigated.”

“Policy CR14: Other Sites For Development in Central Reading

The following sites will be developed according with the principles set out in this policy:





[...]

Address air quality impacts on residential use;”

Reference has been made to these policies during the undertaking of this Air Quality Assessment by assessing pollutant concentrations across the proposed development.





3. METHODOLOGY

The proposed development has the potential to cause air quality impacts during the construction and operational phases. These issues have been assessed in accordance with the following methodology.

3.1 Construction Phase Assessment

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction'⁵.

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

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

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

- ▶ Annoyance due to dust soiling;
- ▶ Harm to ecological receptors; and
- ▶ The risk of health effects due to a significant increase in exposure to PM₁₀.

The assessment steps are detailed below.

3.1.1 Step 1

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

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

3.1.2 Step 2

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

- ▶ The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and

⁵ Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2016.





- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).

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

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

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Demolition	• Total building volume greater than 50,000m³ • Potentially dusty construction material (e.g. concrete) • On-site crushing and screening • Demolition activities greater than 20m above ground level
	Earthworks	• Total site area greater than 10,000m² • 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 100,000m³ • 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 20,000m³ to 50,000m³ • Potentially dusty construction material • Demolition activities 10m to 20m above ground level
	Earthworks	• Total site area 2,500m² to 10,000m² • 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 25,000m³ to 100,000m³ • Potentially dusty construction material (e.g. concrete) • On site concrete batching





Magnitude	Activity	Criteria
	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 20,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber) - Demolition activities less than 10m above ground level - Demolition during wetter months
	Earthworks	- Total site area less than 2,500m² - 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 25,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	- Less than 10 HDV trips per day - Surface material with low potential for dust release - Unpaved road length less than 50m

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

Table 4 Examples of Factors Defining Sensitivity of an Area

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	- Users expect of high levels of amenity - High aesthetic or value property - People expected to be present continuously for extended periods of time - Locations where members of the public are exposed over a time period relevant to the AQO for PM₁₀ e.g. residential properties, hospitals, schools and residential care homes	Internationally or nationally designated site e.g. Special Area of Conservation





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

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

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

These factors were considered in the undertaking of this assessment.

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

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

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





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

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

Table 6 Sensitivity of the Area to Human Health Impacts

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

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





Table 7 Sensitivity of the Area to Ecological Impacts

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

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

Table 8 outlines the risk category from demolition activities.

Table 8 Dust Risk Category from Demolition

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

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

Table 9 Dust Risk Category from Earthworks and Construction

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

Table 10 outlines the risk category from trackout.





Table 10 Dust Risk Category from Trackout

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

3.1.3 Step 3

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

3.1.4 Step 4

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

The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The IAQM² guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix III.

3.2 Operational Phase Assessment

The proposed development includes sensitive land use and is located with an AQMA. As such, the proposals have the potential to introduce new receptors into an area of existing poor air quality. Detailed dispersion modelling was therefore undertaken to quantify NO₂, PM₁₀, PM_{2.5} and CO concentrations across the site and determine suitability for the proposed use.

3.2.1 Road Vehicle and On-site Energy Exhaust Emissions

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

The assessment considered the following scenarios:

- ▶ 2017 Base Year Verification;
- ▶ Opening year do-minimum (DM) (predicted traffic flows in 2020 should the proposals not proceed); and





- ▶ Opening year do-something (DS) (predicted traffic flows in 2020 should the proposals be completed, with the addition of emissions associated with on-site energy generating activities).

The DM (i.e. without development) scenario is representative of anticipated traffic data for 2020. The DS (i.e. with development) scenario is representative of anticipated traffic data for 2020 with the addition of predicted variations in traffic flow patterns as a result of the proposals.

It should be noted that air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2017 were utilised within the dispersion model. The use of 2020 traffic data and 2017 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

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

Receptors potentially sensitive to changes in NO₂, PM₁₀, PM_{2.5} and CO concentrations were identified within 200m of the affected highway network in accordance with the guidance provided within the IAQM guidance² on the likely limits of pollutant dispersion from road sources. LAQM (TG16)² provides the following examples of where annual mean AQOs should apply:

- ▶ Residential properties;
- ▶ Schools;
- ▶ Hospitals; and
- ▶ Care homes.

The sensitivity impact of each receptor will be defined in accordance with the criteria shown in Table 11. These are based upon the guidance provided within the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance 'Land-Use Planning and Development Control: Planning for Air Quality'⁶

Table 11 Operational Traffic Exhaust Emissions - Assessment of Impacts

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

The criteria shown in Table 11 is adapted from the EPUK and IAQM guidance 'Land-Use Planning and

⁶ Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and Institute of Air Quality Management, 2015.





Development Control: Planning for Air Quality with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance.

It is not normal practice to use impact descriptors for short-term (hourly) impacts. However, the EPUK and IAQM guidance² suggests the following descriptors based on Environment Agency guidance.

Table 12 Short Term Process Contribution - Assessment of Impact

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

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

- ▶ Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- ▶ Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- ▶ The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- ▶ Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- ▶ The extent to which an objective is exceeded e.g. an annual mean NO₂ concentration of 41µg/m³ should attract less significance than an annual mean of 51µg/m³.

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





4. BASELINE

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.

4.1 Local Air Quality Management

As required by the Environment Act (1995) RBC has undertaken Review and Assessment of air quality within their area of administration. This process has indicated that annual mean concentrations of NO₂ are above the annual AQO within the area. As such, one AQMA has been declared which is described as:

"Reading AQMA - An area covering Reading Town Centre, areas along the major radial road routes into Reading (including J11 of the M4) and along the railway lines where they pass through built-up areas."

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

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

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by RBC using continuous methods throughout the borough. A review of RBC's most recent monitoring data available indicated that there is one automatic analyser in the vicinity of the site, RD1 Caversham Road, approximately 800m north-west of the development. Recent monitoring results are shown in Table 13.

Table 13 NO₂ Monitoring Results

Site Name		Type	NGR (m)		Annual Mean NO ₂ Concentration (µg/m ³)		
			X	Y	2015	2016	2017
RD1	Caversham Road	Roadside	471153	174429	38	39	36

As indicated in **Table 13** the annual mean concentration for NO₂ did not exceed the AQO at the RD1 Caversham Road Analyser within recent years.

RBC also utilise passive diffusion tubes to monitor NO₂ concentrations throughout the area of administration. A review of the most recent monitoring data available indicated seven monitoring locations in close proximity to the site, which were considered to provide the most representative conditions. Recent NO₂ monitoring results from these locations are shown in Table 12. Exceedances of the AQO are shown in **bold**.





Table 14 Diffusion Tube Monitoring Results

Site Name		Type	NGR (m)		Annual Mean NO ₂ Concentration (µg/m ³)		
			X	Y	2015	2016	2017
41	Picture House	Roadside	471113	173487	30	32	30
42	Sackville Street	Roadside	471177	173641	40	37	37
43	Vachel Street	Roadside	471174	173705	33	35	34
44	Garrad Street	Roadside	471422	173694	42	42	n/a
45	Friar Street nearr Nandos	Roadside	471437	173589	47	52	50
48	33 Caverhsam Road	Roadside	471123	173734	48	43	45
49	`59a Caversham Road	Roadside	471169	173869	42	41	43

As indicated in Table 14, the annual mean AQO for NO₂ was exceeded at five diffusion tube locations during recent years. This is due to their roadside locations within an AQMA. Reference should be made to Figure 2 for a graphical representation of the monitoring location.

4.3 Background Pollutant Concentrations

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in grid square NGR: 471500, 173500. Data for this location was downloaded from the DEFRA website⁷ for the purpose of this assessment and is summarised in Table 15 for 2017 and the development opening year of 2020.

Table 15 Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m ³)	
	2017	2020
NO _x	28.47	25.32
NO ₂	45.32	39.03
PM ₁₀	15.64	14.94
PM _{2.5}	9.89	9.39
CO	450	

As shown in Table 15, there were no exceedances of the background AQO. The background concentration of CO was predicted for 2001. These are the most recent predictions available from

⁷ <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>.





DEFRA and are therefore considered to provide a reasonable representation of background concentrations in the vicinity of the site. Comparison with the monitoring results indicates the impact that vehicle exhaust emissions from the highway network have on pollutant concentrations at roadside locations.

Reference should be made to Table AII.3 for revised DEFRA background concentration following the removal of A-road contribution as in accordance with the methodology outlined in DEFRA guidance LAQM (TG16)².

4.4 Sensitive Receptors

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

4.4.1 Construction Phase Sensitive Receptors

Receptors sensitive to potential dust impacts during 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 16.

Table 16 Demolition, Earthworks and Construction Dust Sensitive Receptors

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

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

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access route. These are summarised in Table 17. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. However, it was assumed construction traffic would access the site from Station Road to ensure the maximum potential trackout distance was considered.

Table 17 Trackout Dust Sensitive Receptors

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





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

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

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

A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 18.

Table 18 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The proposal is located in a predominantly commercial area. As such, there is likely to have been a history of dust generating activities due to development in the locality, as well as dust generated from commuting activities.
The likelihood of concurrent dust generating activity on nearby sites	A review of the RBC Planning Portal indicated that the area is currently being regenerated. As such there is the potential for concurrent dust generation.
Pre-existing screening between the source and the receptors	There is currently no vegetation present along any boundary of the site. As such, there is no pre-existing natural protective screening to receptors
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The wind direction is predominantly from the south and south-west of the development, as shown in Figure 5 within Appendix I. As such, properties to the north and north-east would be most affected by dust emissions
Conclusions drawn from local topography	The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	Currently it is unclear as to the duration of the construction phase. However, it is likely to extend over one year
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline

Based on the criteria shown in **Table 18**, the sensitivity of the receiving environment to potential dust impacts was considered to be **high**. This was because users would expect to enjoy a reasonable level of amenity, aesthetics or value of their property could be diminished by soiling and people would be





expected to be present for extended periods of time e.g. residential properties.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.1, is shown in Table 19.

Table 19 Sensitivity of the Surrounding Area

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

4.5 Operational Phase Sensitive Receptors

A desk-top study was undertaken in order to identify any sensitive receptor locations in the vicinity of the site that require specific consideration during the assessment. These were modelled at a height of 1.5m in order to represent ground and first floor level and are summarised in Table 20.

Table 20 Existing Sensitive Human Receptors

Receptor		Height	NGR (m)	
			X	Y
R1	HM Prison	1.5	472112	173573
R2	HM Prison	1.5	472085	173613
R3	Forbury Gardens Day Nursery	1.5	472011	173603
R4	Apex Plaza	1.5	471726	173734
R5	Ignite Data - Commercial	1.5	471632	173706
R6	Robert Half - Residential	4.5	471604	173709
R7	Malmaison Reading - Commercial	1.5	471515	173702
R8	Ericsson - Commercial	1.5	471489	173719
R9	Garrard Street - Commercial	1.5	471279	173716
R10	Garrard Street - Commercial	1.5	471258	173731
R11	Premier House - Offices	1.5	471196	173774
R12	40rty Caversham Road	1.5	471154	173720
R13	Church	1.5	471147	173615
R14	Iceland - Commercial	1.5	471094	173591





Receptor		Height	NGR (m)	
			X	Y
R15	Friar Street	4.5	471272	173578
R16	The Picture House - Residential	4.5	471114	173497
R17	18 Friar Street	4.5	471525	173599
R18	21 Weldale Street	1.5	471107	173681
R19	59 Caversham Road - Residential	1.5	471177	173867
R20	The Malthouse - Residential	4.5	471272	173798
R21	Thames Tower	55	471476	173712
R22	Novotel Hotel	55	471468	173667
R23	Brunel House	24	471490	173676
R24	Merchants Place	25	471442	173656
R25	Great Western House	30	471516	173687
R26	Garrard House	17.5	471470	173689
R27	Aquis House	45	471561	173686
R28	Northgate House	15	471679	173668
R29	Apex Plaza	45	471632	173735
R30	No.3 Forbury Place	45	471795	173742

The sensitive receptors identified in

Table 20 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the proposed development that have not been individually identified above. Reference should be made to Figure 6 within Appendix I for a graphical representation of operational phase emission sensitive human receptor locations.





5. ASSESSMENT

There is the potential for air quality impacts as a result of the construction and operation of the proposed development in addition to the exposure of future site users to elevated pollution levels. These are assessed in the following Sections.

5.1 Construction Phase Assessment

5.1.1 Step 1

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

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

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

5.1.2 Step 2

Demolition

Demolition will involve the removal of existing buildings on the site. It is estimated that the volume of buildings to be demolished is under 20,000m³. As such, the magnitude of potential dust emissions from demolition activities is **small**, in accordance with the criteria outlined in Table 3.

Table 19 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 3, the development is considered to be a **medium** risk site for dust soiling as a result of demolition activities.

Table 19 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **negligible** risk site for human health as a result of demolition activities.

Earthworks

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

The proposed development site is estimated to cover a total area of less than 2,500m². In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **small**.





Table 19 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 **low** risk site for dust soiling as a result of earthworks activities.

Table 19 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for human health as a result of earthwork activities.

Construction

Due to the size of the development site the total building volume is likely to be between 25,000 m³ to 100,000m³. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **medium**.

Table 19 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.

Table 19 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health as a result of construction activities.

Trackout

Information on the number of HDV trips to be generated during the construction phase of the development was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project.

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

Table 19 indicates the sensitivity of the area to dust soiling effects to people and property is **high**. In accordance with the criteria outlined in Table 10, the development is considered to be a **low** risk site for dust soiling as a result of trackout activities.

Table 19 indicates the sensitivity of the area to human health is **medium**. In accordance within the criteria outlined in Table 10, the development is considered to be a **negligible** risk site for human health as a result of trackout activities.

Summary of the Risk of Dust Effects

A summary of the risk from each dust generating activity is provided in Table 21.





Table 21 Summary of Potential Unmitigated Dust Risks

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

As indicated in **Table 21**, the potential risk of dust soiling is **medium** from demolition and construction activities and **low** from earthwork and trackout activities. The potential risk of human health impacts is **low** from construction activities and **negligible** from demolition, earthworks and trackout activities.

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

5.1.3 Step 3

The IAQM² guidance provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the development site as summarised in Table 22. The mitigation measures outlined in Table 22 can be reviewed prior to the commencement of construction works incorporated into the existing the strategies as applicable.

Table 22 Fugitive Dust Mitigation Measures

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





Issue	Control Measure
Preparing and Maintaining the Site	• Plan site layout so that machinery and dust causing activities are located away from receptors • Fully enclose site or specific operations where there is a high potential for dust production and the site as 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 • Cover, seed or fence stockpiles to prevent wind whipping Use water as dust suppressant where applicable
Operating Vehicle/ Machinery and Sustainable Travel	• All vehicles to switch off engines - no idling vehicles • Avoid the use of diesel or petrol powered generators where practicable • Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph in unsurfaced haul roads • Produce a Construction Logistics Plan to manage sustainable deliveries • Implement a Travel Plan that supports and encourages sustainable travel
Operations	• Cutting equipment to use water as dust suppressant or suitable local extract ventilation • Ensure adequate water supply on the site for effective dust/particulate matter suppression/mitigation • Use enclosed chutes and covered skips • Minimise drop heights • Ensure equipment is readily available on site to clean any spillages
Waste Management	• No bonfires and burning of waste material
Demolition	• Soft Strip inside of buildings before demolition. • Ensure effective water suppression is used during demolition operations • Avoid explosive blasting • Remove any biological debris before demolitions
Earthworks and Construction	• Avoid scabbling • Ensure sand and other aggregates are stored and not able to dry out, unless it is required for a specific process • Ensure bulk cement and other fine powder materials are delivered and stored to prevent escape • For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust





Issue	Control Measure
Trackout	• Use water-assisted dust sweeper on the access and local roads • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving sites are covered to prevent escape of materials • Implement a wheel washing system at a suitable location near site exit

5.1.4 Step 4

Assuming the relevant mitigation measures outlined in Table 22 are implemented, the residual effect from all dust generating activities is predicted to be **not significant**, in accordance with the IAQM guidance ².

5.2 Operational Phase Assessment

Additional vehicle movements associated with the operation of the proposed development will generate exhaust emissions, such as NO₂, PM₁₀ and PM_{2.5}, 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.

The assessment considered the following scenarios:

- ▶ 2017 Verification;
- ▶ 2020 DM; and
- ▶ 2020 DS.

The DM (i.e. without development) scenario is representative of anticipated traffic data for 2020. The DS (i.e. with development) scenarios are representative of anticipated traffic data for 2020 inclusive of the cumulative development outputs with the addition of predicted variations in traffic flow patterns as a result of the application proposal and the proposed boiler units and CHP Unit.

For the purpose of this assessment traffic data was supplied for 2020, the development opening year. Air quality is predicted to improve in the future, in order to provide a realistic assessment, emission factors for 2020 were utilised in conjunction with the provided 2020 traffic data. The use of future year traffic data and emission factors is considered to provide a realistic representation of on-site conditions. As such a sufficient level of confidence can be placed within the predicted pollution concentrations.

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

5.2.1 Nitrogen Dioxide

Predicted Concentrations at the Development Site

Annual mean NO₂ concentrations were predicted across the development for the DS scenarios, as shown in Figures 7 and 8 at heights of 1.5m and 74.5m to represent the ground and top floor level. It should be noted that ground floor level of the proposed development represents worst-case location





from road vehicle emissions and the top floor level represents worst-case locations from the CHP and boiler emissions.

Predicted annual mean NO₂ concentrations across the proposed units for the DS scenario are summarised in Table 23.

Table 23 Modelling Results - Annual Mean NO₂

Elevation (m)	Predicted 2020 Annual Mean NO ₂ Concentration Range (µg/m ³)
Ground Floor (1.5m)	33.25 – 39.12
Top Floor (74.5m)	28.55 – 28.68

The predicted concentrations shown in Table 23 predicted NO₂ concentrations did not exceed the annual mean AQO across the ground floor level and top floor level.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for the purpose-end use without the implementation of mitigation techniques to protect future site users from elevated NO₂ concentrations

Predicted Concentrations at Sensitive Receptors

Annual mean NO₂ concentrations were predicted for the 2020 DM and DS scenarios and are summarised in Table 24. Exceedances of the AQO at relevant sensitive locations are shown below in **bold**.

Table 24 Predicted Annual Mean NO₂ Concentrations

Sensitive Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	HM Prison	28.84	28.94	0.10
R2	HM Prison	29.16	29.26	0.10
R3	Forbury Gardens Day Nursery	26.83	26.89	0.06
R4	Apex Plaza	38.68	39.02	0.34
R5	Ignite Data - Commercial	36.68	36.90	0.22
R6	Robert Half - Residential	35.21	35.38	0.17
R7	Malmaison Reading - Commercial	35.91	36.12	0.21
R8	Ericsson - Commercial	35.29	35.60	0.31
R9	Garrard Street - Commercial	38.68	39.09	0.41
R10	Garrard Street - Commercial	38.20	38.68	0.48





Sensitive Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R11	Premier House - Offices	37.85	38.33	0.48
R12	40rty Caversham Road	48.28	48.40	0.12
R13	Church	42.36	42.49	0.13
R14	Iceland - Commercial	47.22	47.41	0.19
R15	Friar Street	36.75	36.89	0.14
R16	The Picture House - Residential	36.26	36.40	0.14
R17	18 Friar Street	36.61	36.75	0.14
R18	21 Weldale Street	46.72	46.85	0.13
R19	59 Caversham Road - Residential	41.90	42.03	0.13
R20	The Malthouse - Residential	36.05	36.33	0.28
R21	Thames Tower	24.79	24.89	0.10
R22	Novotel Hotel	24.79	24.87	0.08
R23	Brunel House	25.66	25.84	0.18
R24	Merchants Place	29.44	29.50	0.06
R25	Great Western House	29.15	29.25	0.10
R26	Garrard House	30.15	30.35	0.20
R27	Aquis House	28.74	28.77	0.03
R28	Northgate House	30.31	30.35	0.04
R29	Apex Plaza	28.75	28.78	0.03
R30	No.3 Forbury Place	28.73	28.75	0.02

As indicated in Table 24, predicted annual mean NO₂ concentrations did exceeded the annual mean AQO at five sensitive receptor location in both the DM and DS scenario. This has been taken into consideration in the assessment of significance as discussed in **Table 24**.

Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 25.





Table 25 Predicted NO₂ Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	HM Prison	0.25	75% or Less of the AQO	Negligible
R2	HM Prison	0.25	75% or Less of the AQO	Negligible
R3	Forbury Gardens Day Nursery	0.15	75% or Less of the AQO	Negligible
R4	Apex Plaza	0.85	95-102% of the AQO	Slight
R5	Ignite Data - Commercial	0.55	76-94% of the AQO	Negligible
R6	Robert Half - Residential	0.43	76-94% of the AQO	Negligible
R7	Malmaison Reading - Commercial	0.53	76-94% of the AQO	Negligible
R8	Ericsson - Commercial	0.78	76-94% of the AQO	Negligible
R9	Garrard Street - Commercial	1.03	95-102% of the AQO	Slight
R10	Garrard Street - Commercial	1.20	95-102% of the AQO	Slight
R11	Premier House - Offices	1.20	95-102% of the AQO	Slight
R12	40rty Caversham Road	0.30	110+% of the AQO	Negligible
R13	Church	0.33	103-109% of the AQO	Negligible
R14	Iceland - Commercial	0.47	110+% of the AQO	Negligible
R15	Friar Street	0.35	76-94% of the AQO	Negligible
R16	The Picture House - Residential	0.35	76-94% of the AQO	Negligible
R17	18 Friar Street	0.35	76-94% of the AQO	Negligible
R18	21 Weldale Street	0.33	110+% of the AQO	Negligible
R19	59 Caversham Road - Residential	0.33	103-109% of the AQO	Negligible
R20	The Malthouse - Residential	0.70	76-94% of the AQO	Negligible
R21	Thames Tower	0.25	75% or Less of the AQO	Negligible
R22	Novotel Hotel	0.20	75% or Less of the AQO	Negligible
R23	Brunel House	0.45	75% or Less of the AQO	Negligible
R24	Merchants Place	0.15	75% or Less of the AQO	Negligible
R25	Great Western House	0.25	75% or Less of the AQO	Negligible
R26	Garrard House	0.50	75% or Less of the AQO	Negligible
R27	Aquis House	0.08	75% or Less of the AQO	Negligible





Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R28	Northgate House	0.10	75% or Less of the AQO	Negligible
R29	Apex Plaza	0.08	75% or Less of the AQO	Negligible
R30	No.3 Forbury Place	0.05	75% or Less of the AQO	Negligible

As indicated in Table 25, the significance of impacts on annual mean NO₂ concentrations as a result of the development was predicted to be **negligible** at 26 receptor locations and slight at 4 receptor locations. It should be noted that no new exceedance of the AQO has been predicted as a result of the proposed development.

Furthermore, the EPUK and IAQM² guidance states that "where a single development can be judged in isolation, it is likely that a 'moderate' or 'substantial' impact will give rise to a significant effect, and a 'negligible' or 'slight' impact will not have a significant effect." Section 5.2, discusses the overall significance of the predicted impacts.

Predicted annual mean concentrations at all receptor locations above Ground Floor (1.5m) can be considered as an over-estimation of actual concentrations. This is because background concentrations at the modelled elevations will be significantly lower than the ground level concentrations predicted by DEFRA and as such, in reality, predicted impacts are likely to be reduced.

5.2.2 Nitrogen Dioxide - 1-Hour Mean

Predicted 99.79th percentile of hourly mean NO₂ concentrations were modelled across the development site at 1.5m and 74.5m for the DS scenario, as shown in Figures 9 and 10. The predicted concentrations for the DS scenarios at the proposed units are summarised in Table 26 for the development opening year. Exceedances of the AQO at relevant sensitive locations are shown below in **bold**.

Table 26 Predicted 1-Hour Mean NO₂ Concentrations

Floor Height	Predicted 2020 Hourly 99.79 th %ile NO ₂ Concentration Range (µg/m ³)
Ground Floor (1.5m)	63.96 – 74.06
Top Floor (74.5m)	57.31- 58.47

As indicated in Table 26, there are no predicted exceedances of the 1-hourly AQO at any location across the development site.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for the purpose-end use without the implementation of mitigation techniques to protect future site users from elevated 1-hour mean NO₂ concentrations





Predicted Impacts at Sensitive Receptors

In order to predict the 1-hour mean background NO₂ concentration, the advice provided within the EA guidance⁸ was followed, which advises that an estimate of the maximum combined pollutant concentrations can be obtained by adding the maximum predicted short-term concentration due to emissions from the source to twice the annual mean baseline concentration. The 1-hour mean background NO₂ concentration was therefore assumed to be twice the annual mean background NO₂ concentration.

1-hour mean NO₂ concentrations were predicted at sensitive receptors for the DM and DS scenarios, as summarised in Table 27.

Table 27 Predicted 1-Hour Mean NO₂ Concentrations

Sensitive Receptor		Predicted 1-Hour Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	HM Prison	55.12	55.39	0.28
R2	HM Prison	55.87	56.13	0.26
R3	Forbury Gardens Day Nursery	53.25	53.47	0.22
R4	Apex Plaza	67.75	68.03	0.28
R5	Ignite Data - Commercial	66.98	67.72	0.74
R6	Robert Half - Residential	66.82	67.74	0.92
R7	Malmaison Reading - Commercial	64.81	65.12	0.30
R8	Ericsson - Commercial	68.29	68.71	0.42
R9	Garrard Street - Commercial	68.08	68.48	0.40
R10	Garrard Street - Commercial	67.10	67.84	0.74
R11	Premier House - Offices	66.49	67.02	0.53
R12	40rty Caversham Road	77.44	77.66	0.21
R13	Church	72.17	72.44	0.27
R14	Iceland - Commercial	88.00	88.36	0.36
R15	Friar Street	67.59	67.94	0.34
R16	The Picture House - Residential	70.32	70.62	0.30
R17	18 Friar Street	66.66	66.84	0.19

⁸ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>.





Sensitive Receptor		Predicted 1-Hour Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R18	21 Weldale Street	85.66	85.99	0.33
R19	59 Caversham Road - Residential	74.88	75.23	0.36
R20	The Malthouse - Residential	66.26	66.87	0.61
R21	Thames Tower	49.75	50.77	1.02
R22	Novotel Hotel	49.76	50.78	1.02
R23	Brunel House	50.88	52.10	1.22
R24	Merchants Place	58.53	59.36	0.83
R25	Great Western House	58.22	59.44	1.22
R26	Garrard House	59.26	60.43	1.16
R27	Aquis House	57.60	58.55	0.95
R28	Northgate House	60.24	60.59	0.36
R29	Apex Plaza	57.68	58.13	0.45
R30	No.3 Forbury Place	57.80	58.13	0.34

As indicated in Table 27, predicted 1-hour mean NO₂ concentrations did not exceed the AQO of 200µg/m³ at any sensitive receptor location in either the DM or DS scenario.

Predicted impacts on 1-hour mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 28.

Table 28 Predicted 1-Hour Mean NO₂ Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Significance of Impact
R1	HM Prison	0.14	75% or Less of the AQO	Negligible
R2	HM Prison	0.13	75% or Less of the AQO	Negligible
R3	Forbury Gardens Day Nursery	0.11	75% or Less of the AQO	Negligible
R4	Apex Plaza	0.14	75% or Less of the AQO	Negligible
R5	Ignite Data - Commercial	0.37	75% or Less of the AQO	Negligible





Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Significance of Impact
R6	Robert Half - Residential	0.46	75% or Less of the AQO	Negligible
R7	Malmaison Reading - Commercial	0.15	75% or Less of the AQO	Negligible
R8	Ericsson - Commercial	0.21	75% or Less of the AQO	Negligible
R9	Garrard Street - Commercial	0.20	75% or Less of the AQO	Negligible
R10	Garrard Street - Commercial	0.37	75% or Less of the AQO	Negligible
R11	Premier House - Offices	0.27	75% or Less of the AQO	Negligible
R12	40rty Caversham Road	0.11	75% or Less of the AQO	Negligible
R13	Church	0.14	75% or Less of the AQO	Negligible
R14	Iceland - Commercial	0.18	75% or Less of the AQO	Negligible
R15	Friar Street	0.17	75% or Less of the AQO	Negligible
R16	The Picture House - Residential	0.15	75% or Less of the AQO	Negligible
R17	18 Friar Street	0.09	75% or Less of the AQO	Negligible
R18	21 Weldale Street	0.17	75% or Less of the AQO	Negligible
R19	59 Caversham Road - Residential	0.18	75% or Less of the AQO	Negligible
R20	The Malthouse - Residential	0.30	75% or Less of the AQO	Negligible
R21	Thames Tower	0.51	75% or Less of the AQO	Negligible
R22	Novotel Hotel	0.51	75% or Less of the AQO	Negligible
R23	Brunel House	0.61	75% or Less of the AQO	Negligible
R24	Merchants Place	0.42	75% or Less of the AQO	Negligible
R25	Great Western House	0.61	75% or Less of the AQO	Negligible
R26	Garrard House	0.58	75% or Less of the AQO	Negligible
R27	Aquis House	0.48	75% or Less of the AQO	Negligible
R28	Northgate House	0.18	75% or Less of the AQO	Negligible
R29	Apex Plaza	0.23	75% or Less of the AQO	Negligible
R30	No.3 Forbury Place	0.17	75% or Less of the AQO	Negligible





As indicated in Table 28, the significance of impacts on 1-hour mean NO₂ concentrations as a result of the operational phase energy emissions was predicted to be **negligible** at all 30 receptor locations considered based on the EPUK and IAQM guidance presented in Table 12.

5.2.3 Particulate Matter (PM₁₀)

Predicted Concentrations at the Development Site

Annual mean PM₁₀ concentrations were predicted across the development for the DS scenario at a height of 1.5m to represent exposure across the ground floor level, as shown in Figure 11 within Appendix I. Predicted annual mean PM₁₀ concentrations across the development site during the DS scenario are summarised in **Table 29**.

Table 29 Modelling Results - Annual Mean PM₁₀

Elevation (m)	Predicted 2020 Annual Mean PM ₁₀ Concentration Range (µg/m ³)
Ground (1.5m)	16.22 – 16.96

The predicted concentrations shown in Table 29 indicate that there were no exceedances of the AQO throughout the proposed development area. As such, it is considered that annual mean PM₁₀ levels at the development site should not be viewed as a constraint to development.

Similar to NO₂ concentrations, background PM₁₀ levels are likely to be lower at elevated heights due to increased distance from emission sources, such as roads. Therefore, predicted concentrations at heights above ground floor level across the residential aspects of the developments are considered acceptable in regards to future exposure and have not been assessed further.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for purpose-end use without the implementation of mitigation techniques to protect future site users from elevated PM₁₀ concentrations.

Predicted Concentrations at Sensitive Receptors

Annual mean PM₁₀ concentrations were predicted for 2020 DM and DS scenarios and are summarised in Table 30.

Table 30 Predicted Annual Mean PM₁₀ Concentrations

Sensitive Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	HM Prison	15.79	15.80	0.01
R2	HM Prison	15.85	15.86	0.01
R3	Forbury Gardens Day Nursery	15.47	15.48	0.01





Sensitive Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m³)		
		DM	DS	Change
R4	Apex Plaza	16.92	16.96	0.04
R5	Ignite Data - Commercial	16.67	16.68	0.01
R6	Robert Half - Residential	16.47	16.48	0.01
R7	Malmaison Reading - Commercial	16.56	16.58	0.02
R8	Ericsson - Commercial	16.48	16.51	0.03
R9	Garrard Street - Commercial	16.98	17.03	0.05
R10	Garrard Street - Commercial	16.85	16.90	0.05
R11	Premier House - Offices	17.00	17.05	0.05
R12	40rty Caversham Road	18.72	18.75	0.03
R13	Church	17.94	17.97	0.03
R14	Iceland - Commercial	18.51	18.54	0.03
R15	Friar Street	16.71	16.73	0.02
R16	The Picture House - Residential	16.95	16.97	0.02
R17	18 Friar Street	16.63	16.64	0.01
R18	21 Weldale Street	18.24	18.26	0.02
R19	59 Caversham Road - Residential	17.94	17.95	0.01
R20	The Malthouse - Residential	16.59	16.61	0.02
R21	Thames Tower	15.14	15.14	0.00
R22	Novotel Hotel	15.14	15.14	0.00
R23	Brunel House	15.25	15.26	0.01
R24	Merchants Place	15.76	15.77	0.01
R25	Great Western House	15.73	15.73	0.00
R26	Garrard House	15.85	15.85	0.00
R27	Aquis House	15.67	15.67	0.00
R28	Northgate House	15.88	15.88	0.00
R29	Apex Plaza	15.68	15.68	0.00
R30	No.3 Forbury Place	15.67	15.67	0.00





As indicated in Table 30, annual mean PM₁₀ concentrations were below the relevant AQO at all sensitive receptor locations for both scenarios considered.

Predicted impacts on annual mean PM₁₀ concentrations are summarised in Table 31.

Table 31 Predicted PM₁₀ Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	HM Prison	0.03	75% or Less of the AQO	Negligible
R2	HM Prison	0.02	75% or Less of the AQO	Negligible
R3	Forbury Gardens Day Nursery	0.02	75% or Less of the AQO	Negligible
R4	Apex Plaza	0.10	75% or Less of the AQO	Negligible
R5	Ignite Data - Commercial	0.02	75% or Less of the AQO	Negligible
R6	Robert Half - Residential	0.03	75% or Less of the AQO	Negligible
R7	Malmaison Reading - Commercial	0.05	75% or Less of the AQO	Negligible
R8	Ericsson - Commercial	0.08	75% or Less of the AQO	Negligible
R9	Garrard Street - Commercial	0.13	75% or Less of the AQO	Negligible
R10	Garrard Street - Commercial	0.12	75% or Less of the AQO	Negligible
R11	Premier House - Offices	0.13	75% or Less of the AQO	Negligible
R12	40rty Caversham Road	0.08	75% or Less of the AQO	Negligible
R13	Church	0.07	75% or Less of the AQO	Negligible
R14	Iceland - Commercial	0.07	75% or Less of the AQO	Negligible
R15	Friar Street	0.05	75% or Less of the AQO	Negligible
R16	The Picture House - Residential	0.05	75% or Less of the AQO	Negligible
R17	18 Friar Street	0.03	75% or Less of the AQO	Negligible
R18	21 Weldale Street	0.05	75% or Less of the AQO	Negligible
R19	59 Caversham Road - Residential	0.02	75% or Less of the AQO	Negligible
R20	The Malthouse - Residential	0.05	75% or Less of the AQO	Negligible
R21	Thames Tower	0.00	75% or Less of the AQO	Negligible
R22	Novotel Hotel	0.00	75% or Less of the AQO	Negligible
R23	Brunel House	0.02	75% or Less of the AQO	Negligible
R24	Merchants Place	0.02	75% or Less of the AQO	Negligible





Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R25	Great Western House	0.00	75% or Less of the AQO	Negligible
R26	Garrard House	0.00	75% or Less of the AQO	Negligible
R27	Aquis House	0.00	75% or Less of the AQO	Negligible
R28	Northgate House	0.00	75% or Less of the AQO	Negligible
R29	Apex Plaza	0.00	75% or Less of the AQO	Negligible
R30	No.3 Forbury Place	0.00	75% or Less of the AQO	Negligible

As indicated in Table 31, impacts on annual mean PM₁₀ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be **negligible** at all receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are **not significant**.

5.2.4 Particulate Matter (PM_{2.5})

PM_{2.5} has not been modelled within the assessment as the predicted concentrations relating to annual mean PM₁₀ remain below the annual mean AQO for PM_{2.5} (25 µg/m³).

Since PM₁₀ accounts for all particulate matter with an aerodynamic diameter of less than 10µm, PM_{2.5} is effectively included within these predictions; and at worst could be considered that PM_{2.5} concentrations would be equal to the predicted PM₁₀ concentrations.

Therefore, it is considered all predicted PM_{2.5} concentrations are below the annual mean AQO. The overall significance of operational phase road traffic emission impacts on annual mean PM_{2.5} concentration was determined **not significant**.

5.2.5 Carbon Monoxide

In order to predict the 8-hour rolling background CO concentration, the advice provided within the EA guidance² was followed, which advises that an estimate of the maximum combined pollutant concentration can be obtained by adding the maximum predicted short-term concentration due to emissions from the source to twice the annual mean baseline concentration. The 8-hour rolling mean background CO concentration was therefore assumed to be twice the annual mean background CO concentration.

Predicted 8-hour rolling mean CO concentrations as a result of the CHP and boiler units were modelled at the top floor level of the proposed development at a height of 74.5m as shown in Figure 12. The predicted concentrations are summarised in Table 32.





Table 32 Predicted 8-Hour Rolling Mean CO Concentration at the Development Site

Floor Height	Predicted 2020 8-Hour Rolling Mean Concentration Range ($\mu\text{g}/\text{m}^3$)
Top Floor (74.5m)	900.00 – 901.29

As indicated in Table 32 there were no predicted exceedances of the 8-hour rolling mean AQO for CO across the proposed development. As such, based on the dispersion modelling results, the implementation of mitigation measures is not required to protect future residents from poor air quality at the proposed development.

Predicted Concentrations at Sensitive Receptors

8-Hour rolling mean CO concentrations were predicted for 2020 DM and DS scenarios and are summarised in Table 33.

Table 33 Predicted 8-Hour Rolling Mean CO Concentrations

Sensitive Receptor		Predicted 8-Hour Rolling Mean CO Concentration ($\mu\text{g}/\text{m}^3$)		
		DM	DS	Change
R1	HM Prison	950.00	950.08	0.08
R2	HM Prison	950.00	950.08	0.08
R3	Forbury Gardens Day Nursery	950.00	950.09	0.09
R4	Apex Plaza	950.00	950.00	0.00
R5	Ignite Data - Commercial	950.00	950.58	0.58
R6	Robert Half - Residential	950.00	950.58	0.58
R7	Malmaison Reading - Commercial	950.00	950.00	0.00
R8	Ericsson - Commercial	950.00	950.00	0.00
R9	Garrard Street - Commercial	950.00	950.00	0.00
R10	Garrard Street - Commercial	950.00	950.10	0.10
R11	Premier House - Offices	950.00	950.09	0.09
R12	40rty Caversham Road	950.00	950.07	0.07
R13	Church	950.00	950.08	0.08
R14	Iceland - Commercial	950.00	950.09	0.09
R15	Friar Street	950.00	950.12	0.12





Sensitive Receptor		Predicted 8-Hour Rolling Mean CO Concentration ($\mu\text{g}/\text{m}^3$)		
		DM	DS	Change
R16	The Picture House - Residential	950.00	950.10	0.10
R17	18 Friar Street	950.00	950.00	0.00
R18	21 Weldale Street	950.00	950.08	0.08
R19	59 Caversham Road - Residential	950.00	950.15	0.15
R20	The Malthouse - Residential	950.00	950.13	0.13
R21	Thames Tower	950.00	950.79	0.79
R22	Novotel Hotel	950.00	950.79	0.79
R23	Brunel House	950.00	950.79	0.79
R24	Merchants Place	950.00	950.58	0.58
R25	Great Western House	950.00	950.70	0.70
R26	Garrard House	950.00	950.79	0.79
R27	Aquis House	950.00	950.58	0.58
R28	Northgate House	950.00	950.20	0.20
R29	Apex Plaza	950.00	950.48	0.48
R30	No.3 Forbury Place	950.00	950.15	0.15

As indicated in Table 33, predicted 8-hour rolling mean CO concentrations did not exceed the AQO at any sensitive receptor location considered in either the DM or DS scenario.

Predicted impacts on 8-hour rolling mean CO concentrations at the sensitive receptor locations are summarised in Table 34.

Table 34 Predicted 8-Hour Rolling Mean CO Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Impact
R1	HM Prison	0.00	Negligible
R2	HM Prison	0.00	Negligible
R3	Forbury Gardens Day Nursery	0.00	Negligible





Sensitive Receptor		% Change in Concentration Relative to AQO	Impact
R4	Apex Plaza	0.00	Negligible
R5	Ignite Data - Commercial	0.00	Negligible
R6	Robert Half - Residential	0.01	Negligible
R7	Malmaison Reading - Commercial	0.01	Negligible
R8	Ericsson - Commercial	0.00	Negligible
R9	Garrard Street - Commercial	0.00	Negligible
R10	Garrard Street - Commercial	0.00	Negligible
R11	Premier House - Offices	0.00	Negligible
R12	40rty Caversham Road	0.00	Negligible
R13	Church	0.00	Negligible
R14	Iceland - Commercial	0.00	Negligible
R15	Friar Street	0.00	Negligible
R16	The Picture House - Residential	0.00	Negligible
R17	18 Friar Street	0.00	Negligible
R18	21 Weldale Street	0.00	Negligible
R19	59 Caversham Road - Residential	0.00	Negligible
R20	The Malthouse - Residential	0.00	Negligible
R21	Thames Tower	0.00	Negligible
R22	Novotel Hotel	0.01	Negligible
R23	Brunel House	0.01	Negligible
R24	Merchants Place	0.01	Negligible
R25	Great Western House	0.01	Negligible
R26	Garrard House	0.01	Negligible
R27	Aquis House	0.01	Negligible
R28	Northgate House	0.01	Negligible





Sensitive Receptor		% Change in Concentration Relative to AQO	Impact
R29	Apex Plaza	0.00	Negligible
R30	No.3 Forbury Place	0.00	Negligible

As indicated in Table 34, the impacts on 8-hour rolling mean CO concentrations as a result of the operational phase energy emissions was predicted to be **negligible** at all sensitive receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are **not significant**.

5.2.6 Impact Significance

The overall significance of operational phase road traffic emission impacts was determined as **not significant**. This was based on the predicted impacts at discrete receptor locations and the considerations outlined in Section 5.2. Further justification is provided in **Table 35**.

Table 35 Overall Road Emissions Impact Significance

Guidance	Comment
Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance	Impacts on annual mean NO₂ concentrations were predicted to be negligible 26 sensitive receptors and slight at 4 sensitive receptors considered. These represent worst-case locations and therefore it is unlikely that any other receptors would be significantly affected by the proposed development In accordance with the EPUK and IAQM² guidance. "Where a single development can be judged in isolation, it is likely that a 'moderate' or 'substantial' impact will give rise to a significant effect, and a 'negligible' or 'slight' impact will not have a significant effect." Impacts on 1-hour mean NO₂, annual mean PM₁₀ and PM_{2.5}, and 8 hour rolling mean CO concentrations were predicted to be negligible at all sensitive receptors considered. These represent worst-case locations and therefore it is unlikely that any other receptors would be significantly affected by the proposed development
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	There were no new predicted exceedances of the annual or hourly mean AQOs for any assessed pollutant concentrations at sensitive locations across the proposed development. As such no new exposure to poor air quality is introduced as a result of the operation of the site





Guidance	Comment
The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors	The change in annual mean NO₂ concentrations relative to the AQO were predicted to range between 0.050% and 1.20%. As such impacts are predicted to range between negligible and slight in accordance with the criteria presented in Table 11. It should be noted that only four slights are present The change in 1-hour mean NO₂ concentrations relative to the AQO were predicted to range between 0.09% and 0.61%. As such impacts on 1-hour NO₂ concentrations were predicted to be negligible in accordance with the criteria presented in Table 12 The change in Annual mean PM₁₀ concentrations relative to the AQO were predicted to range between 0.00% and 0.13%. As such impacts on Annual PM₁₀ concentrations were predicted to be negligible in accordance with the criteria presented in Table 11
Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease	There were no exceedances of the annual mean AQO for across the local road networks and within the proposed development extents. There were no exceedances of the relevant AQOs for NO₂ and PM₁₀ at any existing sensitive locations throughout the modelling extents. Additionally, associated impacts at these locations were deemed not significant
The extent to which an objective is exceeded e.g. an annual mean NO ₂ concentration of 41µg/m ³ should attract less significance than an annual mean of 51µg/m ³	There were predicted exceedances of the annual mean AQO for NO₂ above 41µg/m³ in both the DM and DS scenarios at 5 sensitive receptor, while remaining 25 receptors are predicted to experience NO₂ concentrations below 40µg/m³ Impacts were predicted to be negligible at 26 sensitive receptor locations and slight at 4 sensitive receptor locations. It should be noted that all slight receptors remained below the AQO. In accordance with the EPUK and IAQM² guidance, the overall magnitude of concentration is considered to be not significant in the context of this assessment

The use of 2020 traffic data and 2017 emission factors utilised with the assessment is considered to provide a worst-case scenario, which may lead to overestimations of actual pollutant concentrations during the operation of the proposals. As such, the overall significance of operational phase road traffic emission impacts on annual mean NO₂ concentration was determined **not significant** with a sufficient level of confidence.





6. CONCLUSION

REC Ltd was commissioned by Station Road Development Company Ltd to undertake an Air Quality Assessment in support of a planning application for a proposed mixed-use development at 29-35 Station Road, Reading.

The proposals comprise the redevelopment of the site to provide a mixed-use retail, commercial and hotel, across 22 stories.

The proposed development site is located within the Reading Borough Council (RBC) Air Quality Management Area (AQMA). Subsequently, there is the potential that the development will introduce future site users to poor air quality. Additionally, due to the scale of the proposals, the development has the potential to cause air quality impacts at sensitive locations. These may include fugitive dust emissions from construction works and road vehicle exhaust emissions associated with traffic generated by the site during the operational phase. As such, an Air Quality Assessment was required in order to determine baseline conditions at the site, assess site suitability for the proposed end-use and assess the potential impacts as a result of the proposed development.

During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **not significant**.

Dispersion modelling was undertaken in order to quantify pollutant concentrations across the site at heights between 1.5m and 74.5m to assess potential exposure of future users. Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and to predict air quality impacts as a result of emissions associated with traffic generated by the development and energy generated on the site by the proposed boilers and CHP units. Results were subsequently verified using monitoring results obtained from RBC.

The dispersion modelling results indicated that annual mean pollutant concentration of NO₂ were **negligible** at 26 receptor locations and **slight** at 4 receptor locations which have been discussed in the Section 5.2. However, 1-Hour mean NO₂ concentrations as a result of operational phase road and energy emissions were predicted to be **negligible** at all 30 sensitive receptor locations. The annual mean concentration of PM₁₀ across the proposed site were below the relevant AQOs. The location is therefore considered suitable for the proposed end use without the inclusion of mitigation methods to protect future users from poor air quality.

Predicted impacts on 8-hour rolling mean CO, NO₂ and PM₁₀ concentrations as a result of operational phase exhaust and energy emissions were predicted to be **negligible** at all sensitive receptor locations within the vicinity of the site. The overall significance of potential impacts was determined to be **not significant**, in accordance with the EPUK and IAQM guidance.

Based on the assessment results, air quality is not considered a constraint to planning consent for the proposed development.





7. ABBREVIATIONS

AADT	Annual Average Daily Traffic
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
DEFRA	Department for Environment, Food and Rural Affairs
DM	Do Minimum
DMRB	Design Manual for Roads and Bridges
DS	Do Something
EPUK	Environmental Protection UK
EU	European Union
HBC	Havant Borough Council
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
NGR	National Grid Reference
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
PM _{2.5}	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10µm
RBC	Reading Borough Council
REC	Resource and Environmental Consultants





APPENDIX I FIGURES





Legend



Title

Figure 1
Site Location

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

AQ105820

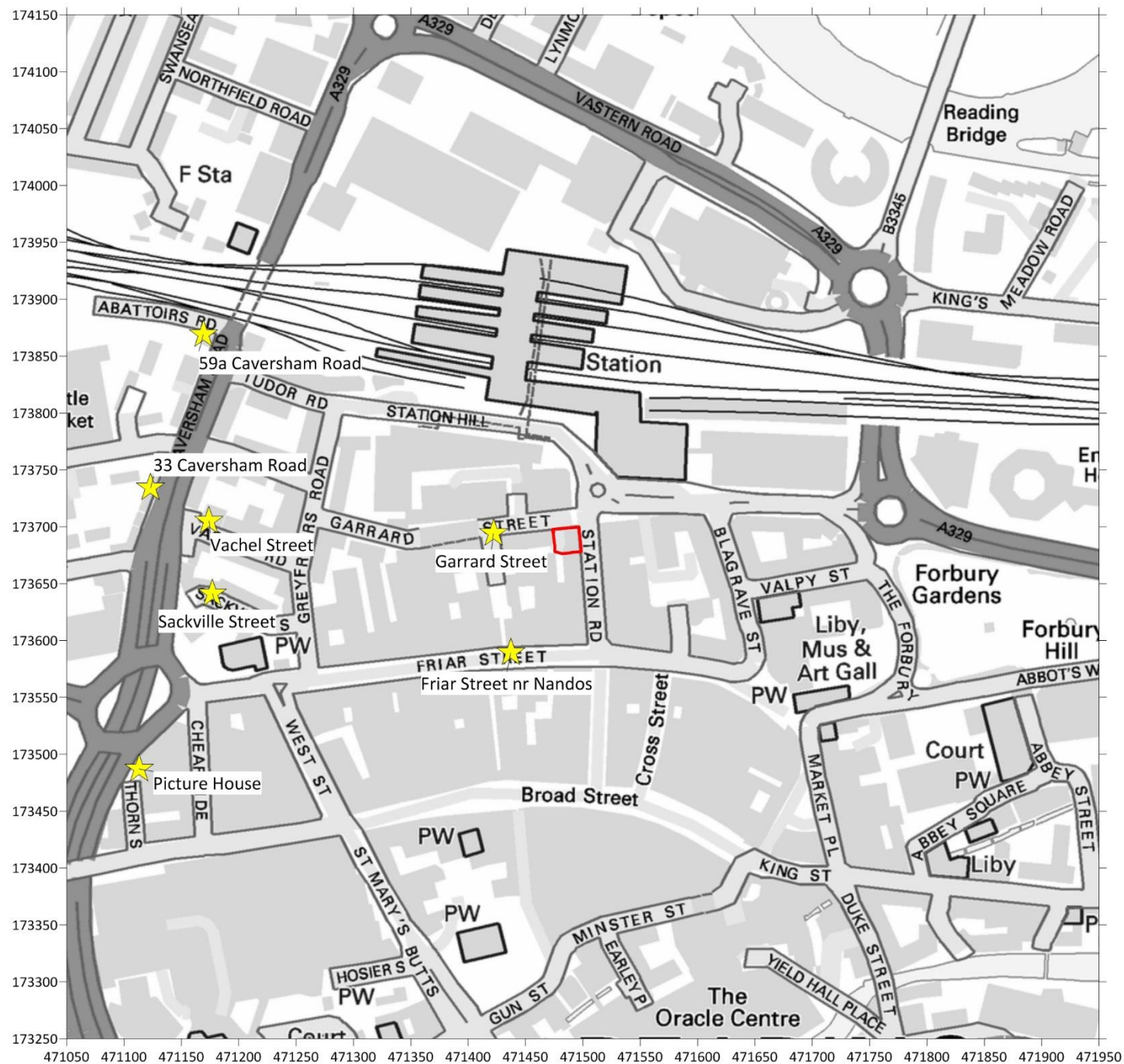
Client

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Legend

-  Site Boundary
-  Diffusion Tube Monitoring Locations

Title

Figure 2
Diffusion Tube Monitoring Locations

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

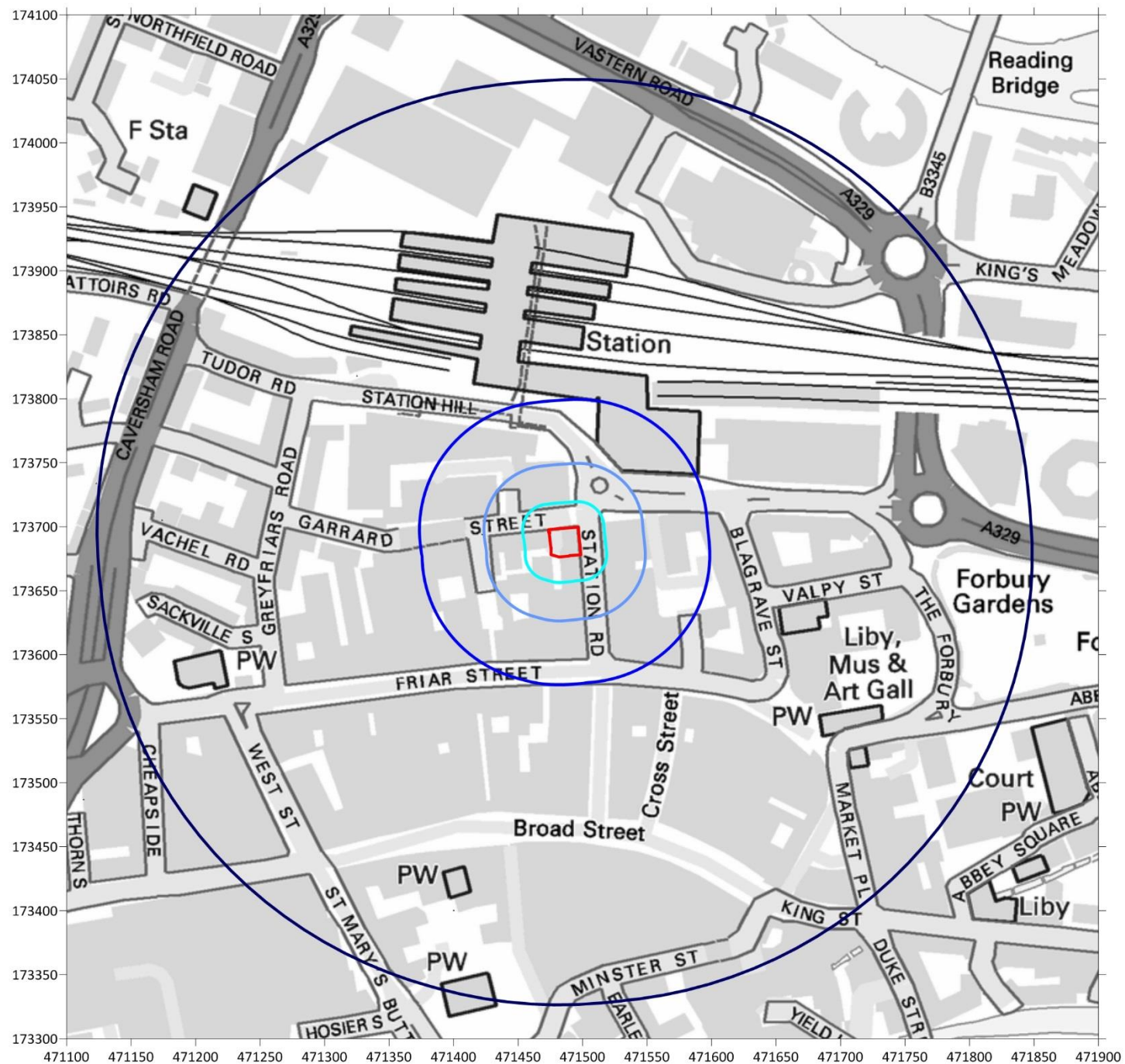
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Legend

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

Title

Figure 3
Demolition, Earthworks and Construction
Dust Buffer Zones

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

AQ105820

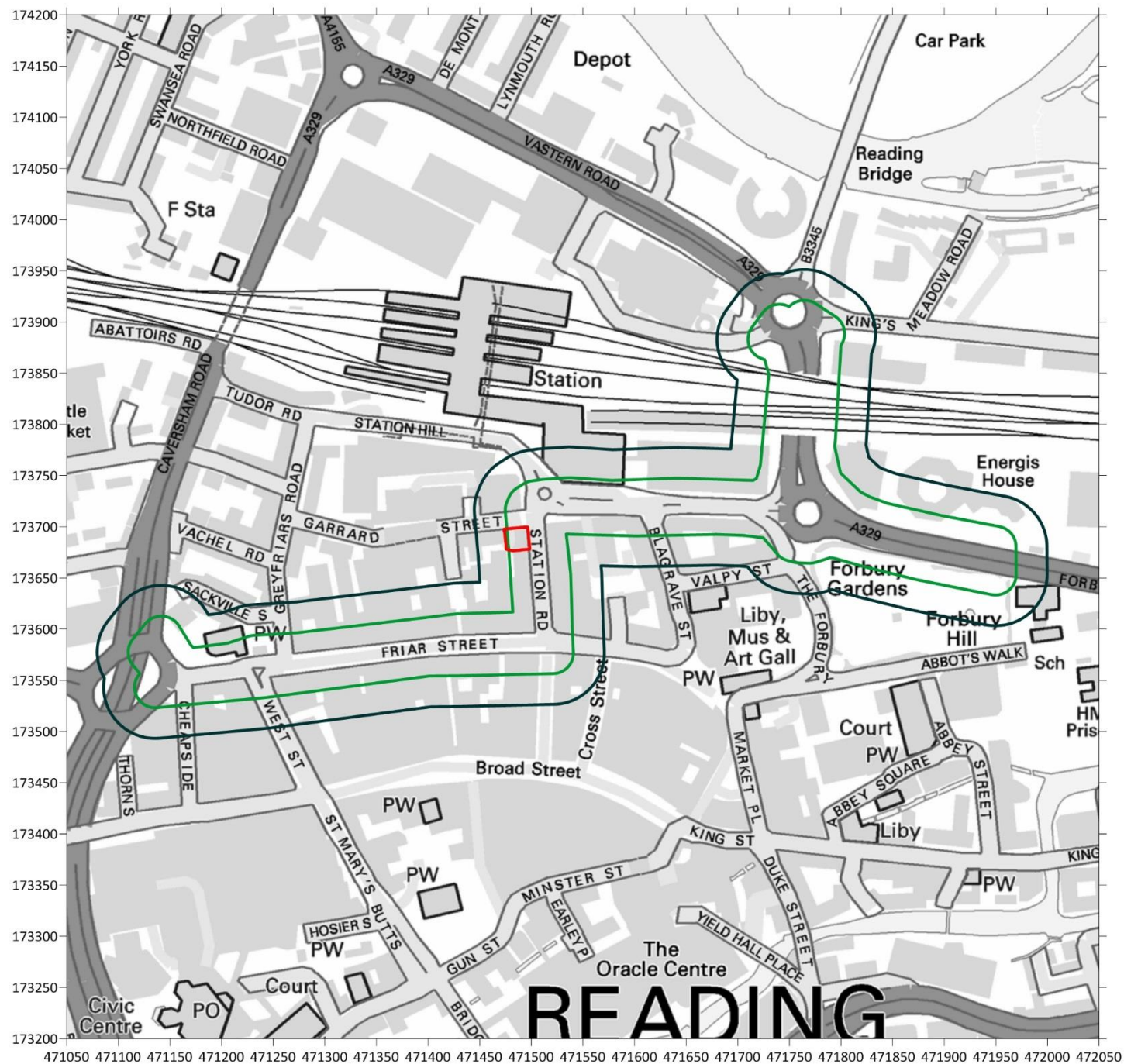
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Legend

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

Title

Figure 4
Trackout Dust Buffer Zones

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

AQ105820

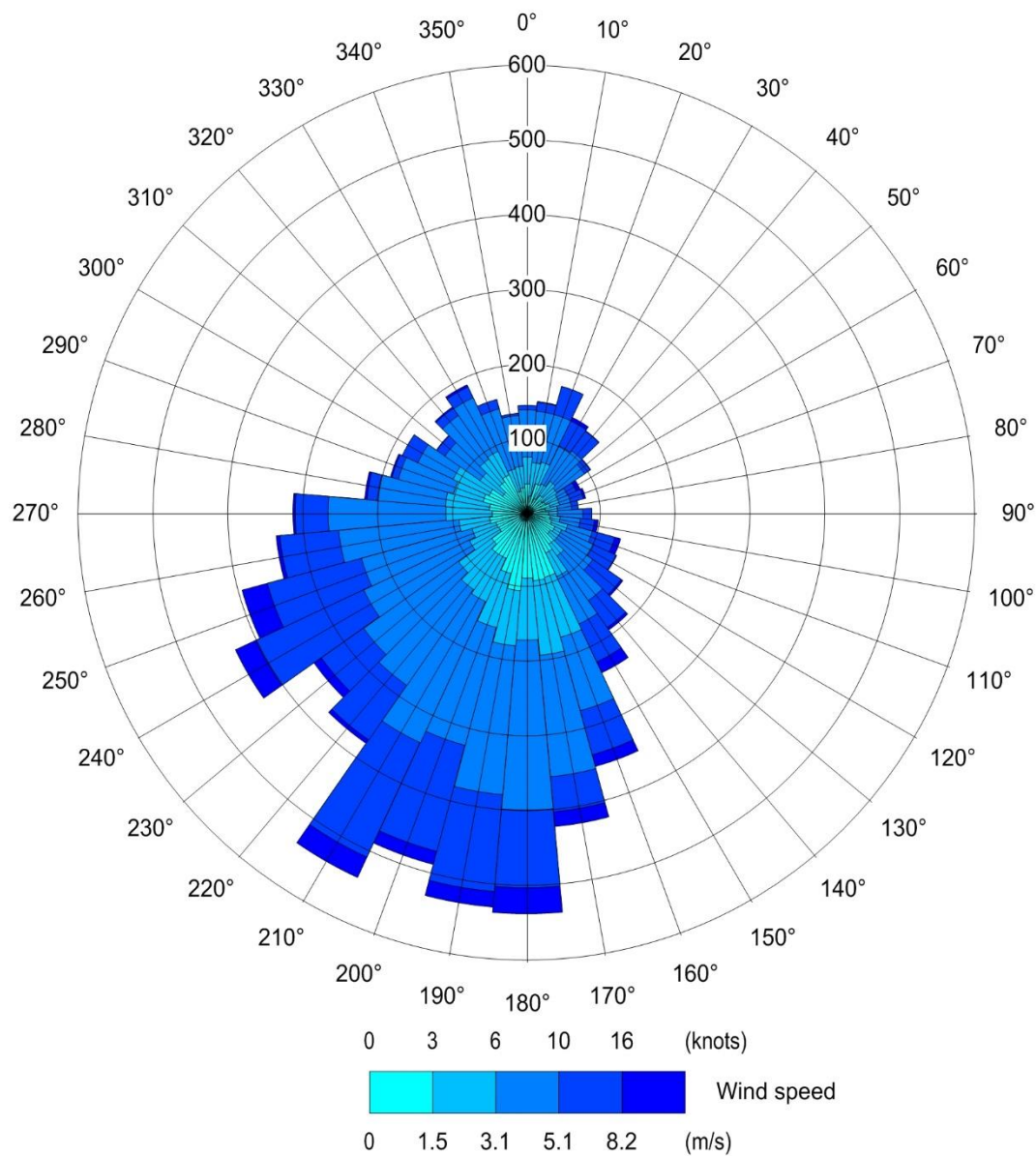
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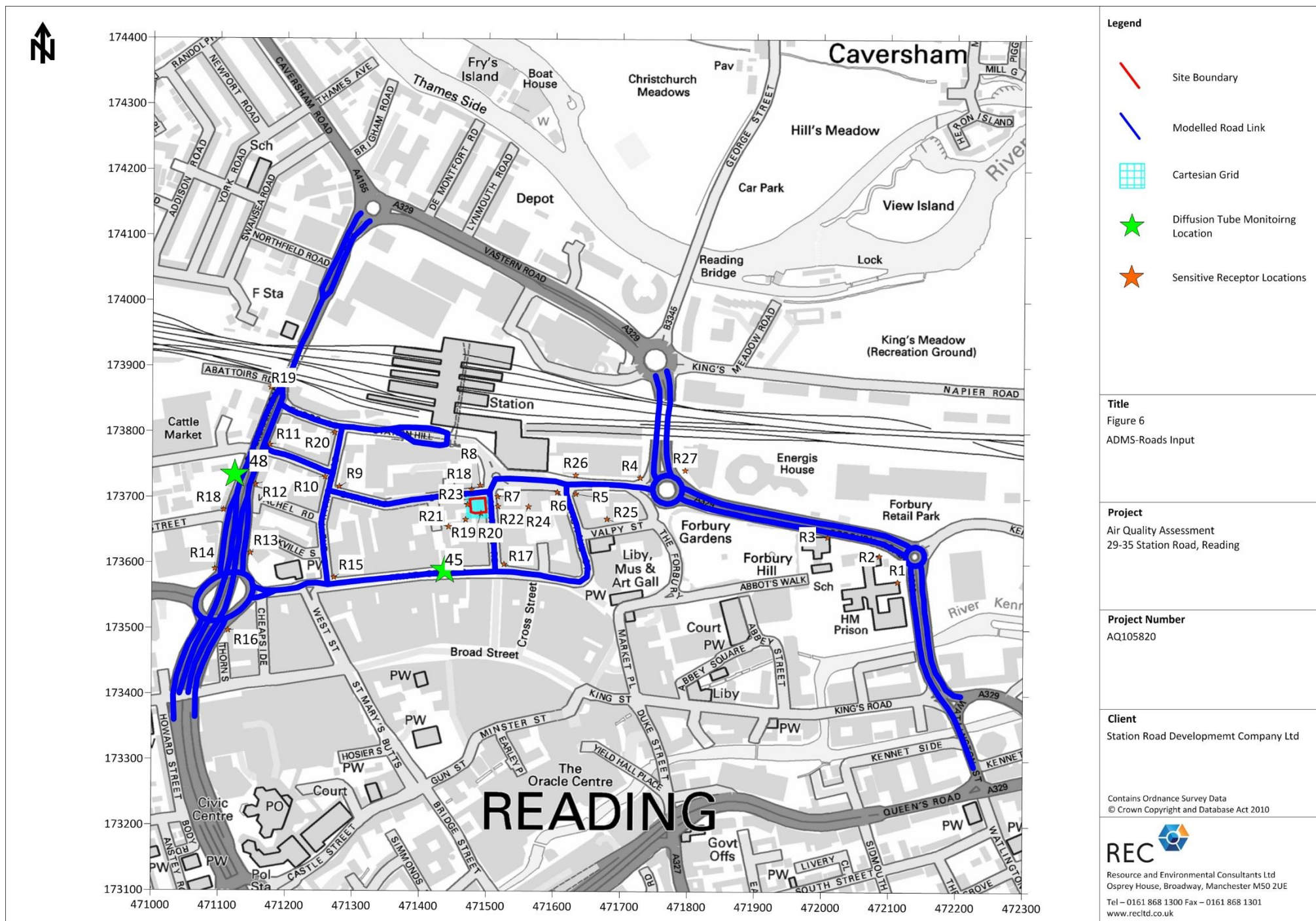
Title
Figure 5
Wind Rose 2017
Benson Meteorological Station

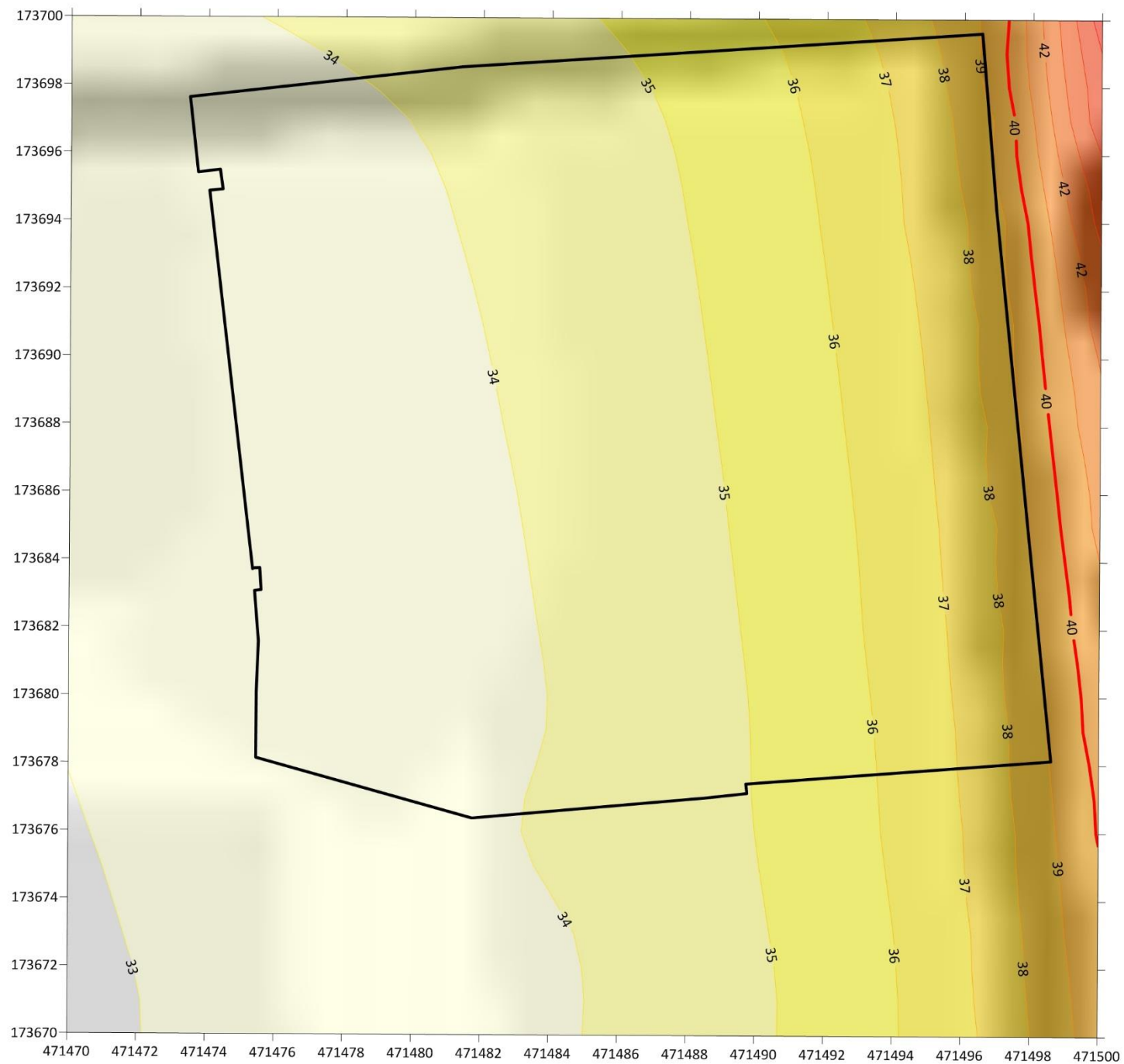
Project
Air Quality Assessment
29-35 Station Road, Reading

Project Number
AQ105820

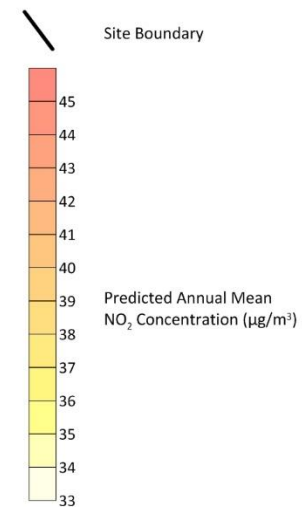
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Legend



Title

Figure 7
Predicted Annual Mean NO₂
Concentrations (µg/m³) 2020 DS
Z=1.5m

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

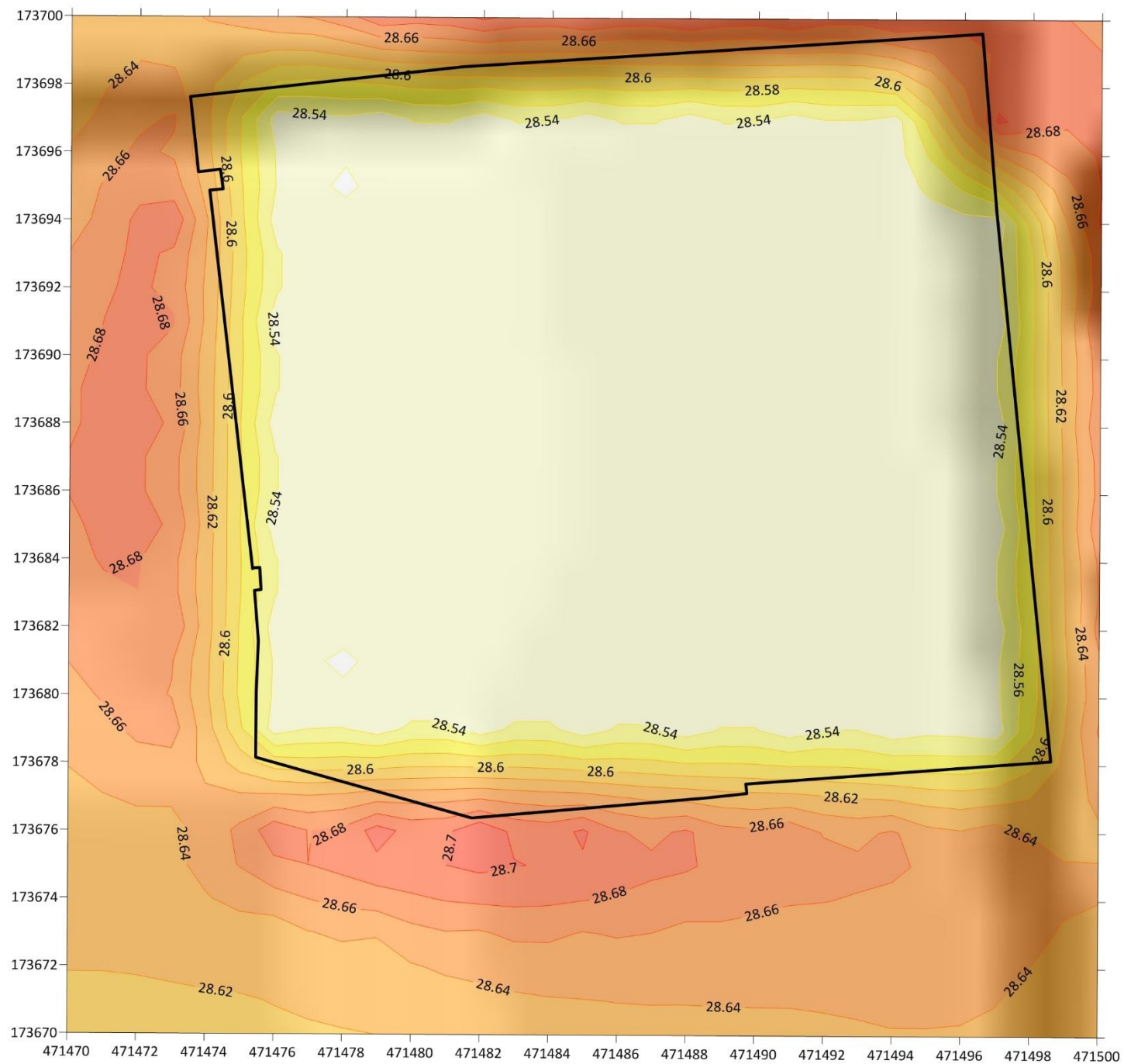
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Legend



Site Boundary



Predicted Annual Mean
NO₂ Concentration (µg/m³)

Title

Figure 8

Predicted Annual Mean NO₂
Concentrations (µg/m³) 2020 DS
Z=74.5m

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

AQ105820

Client

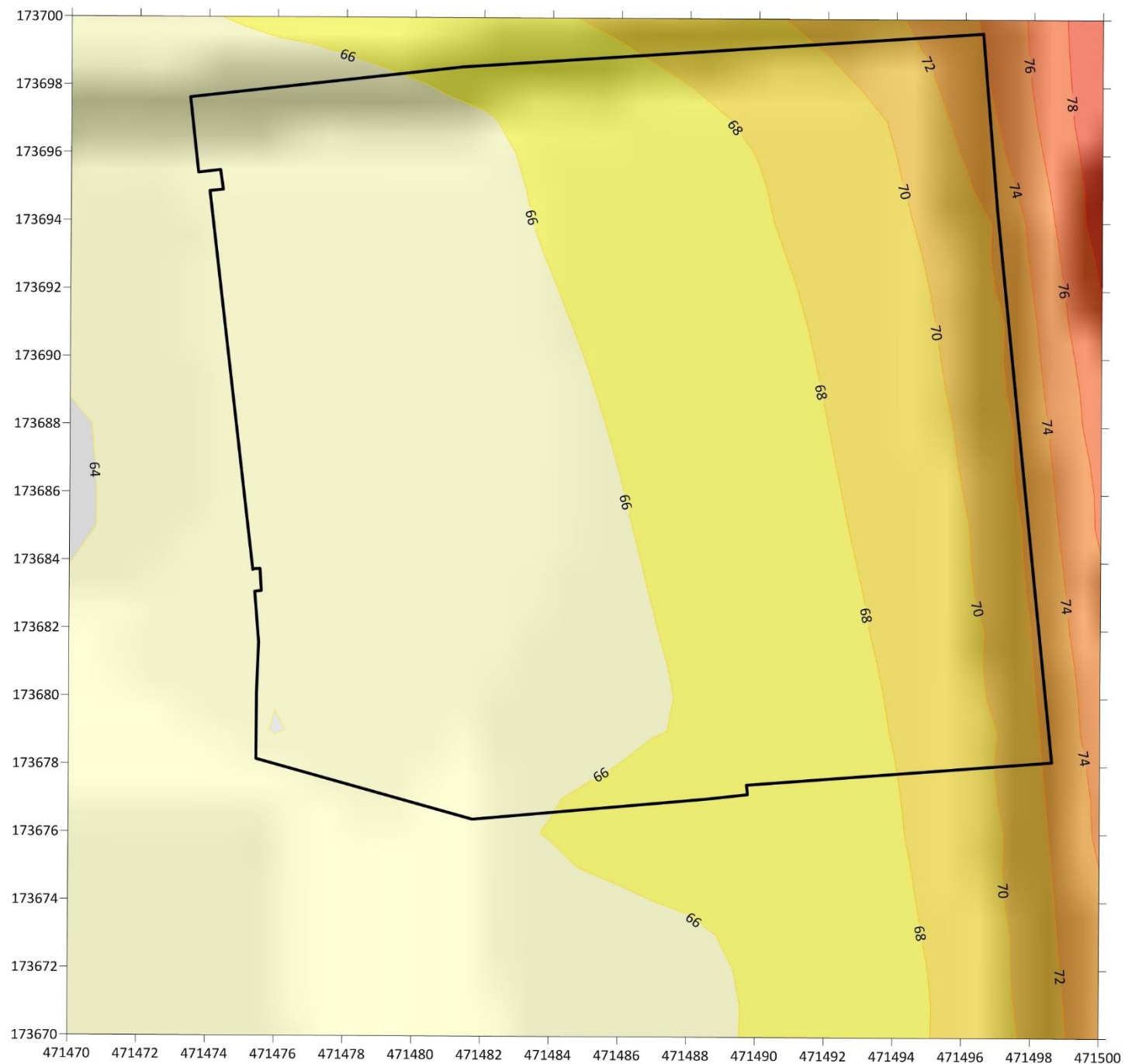
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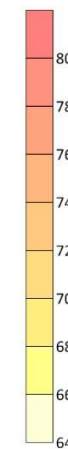
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Legend



Site Boundary



Predicted 1-Hour Mean
NO₂ Concentration (µg/m³)

Title

Figure 9

Predicted 1-Hour Mean NO₂
Concentrations (µg/m³) 2020 DS
Z=1.5m

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

AQ105820

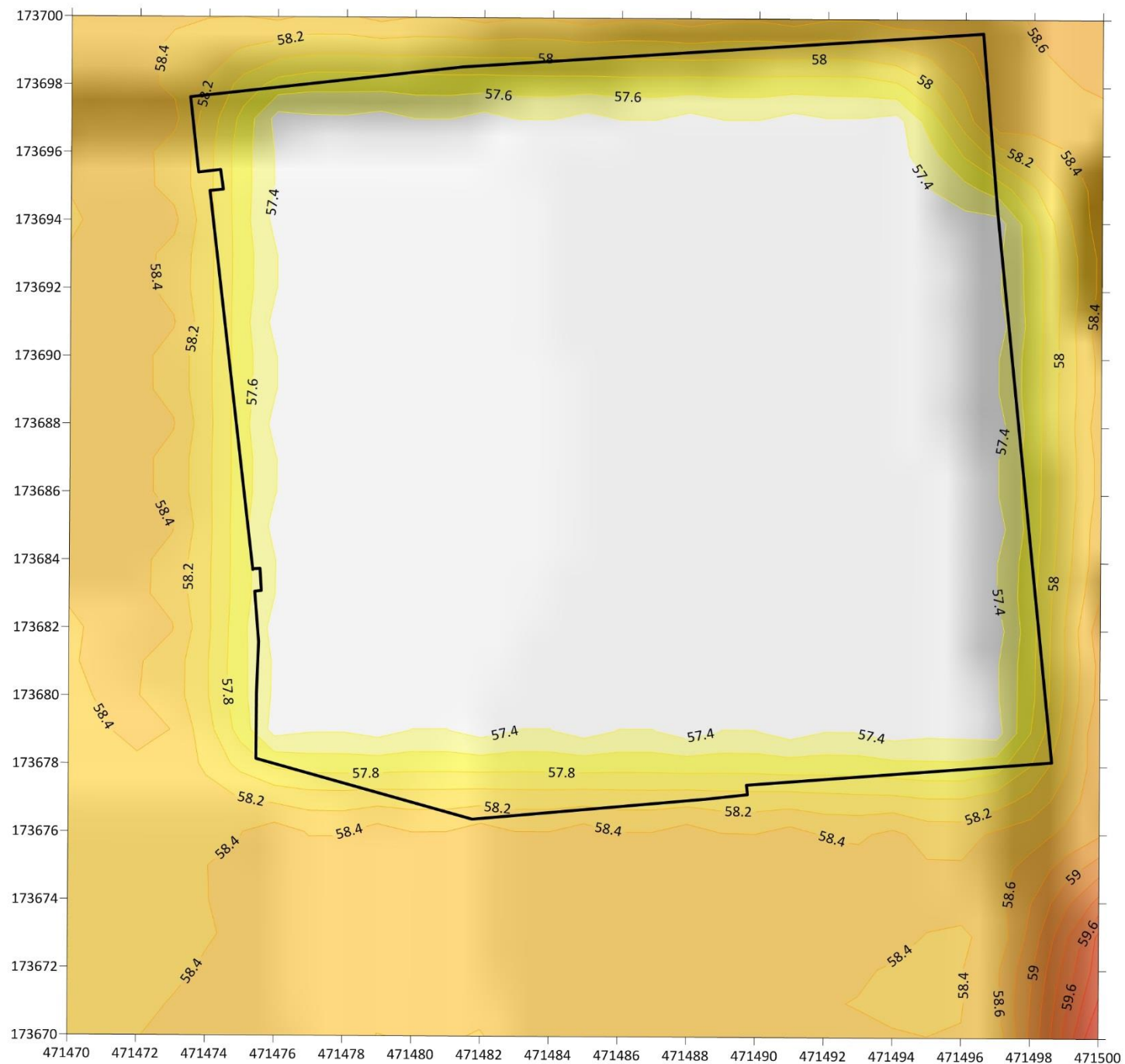
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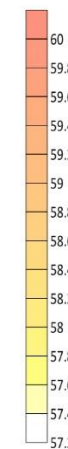
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Legend



Site Boundary



Predicted 1-Hour Mean
NO₂ Concentration (µg/m³)

Title

Figure 10

Predicted 1-Hour Mean NO₂
Concentrations (µg/m³) 2020 DS
Z=74.5m

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

AQ105820

Client

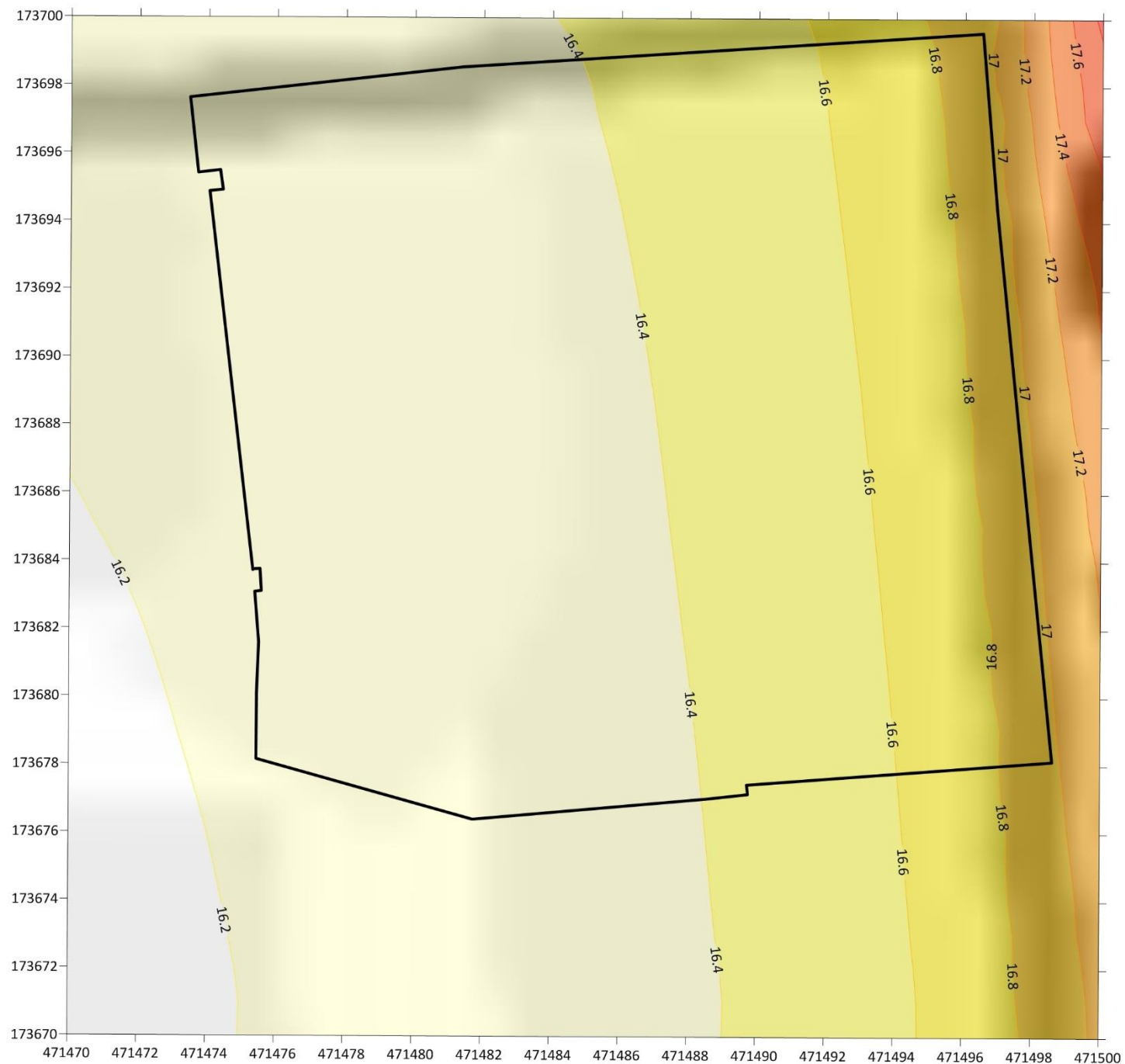
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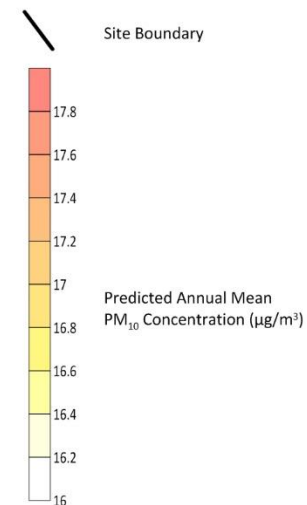


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Legend



Title

Figure 11
Predicted Annual Mean PM₁₀
Concentrations (µg/m³) 2020 DS
Z=1.5m

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

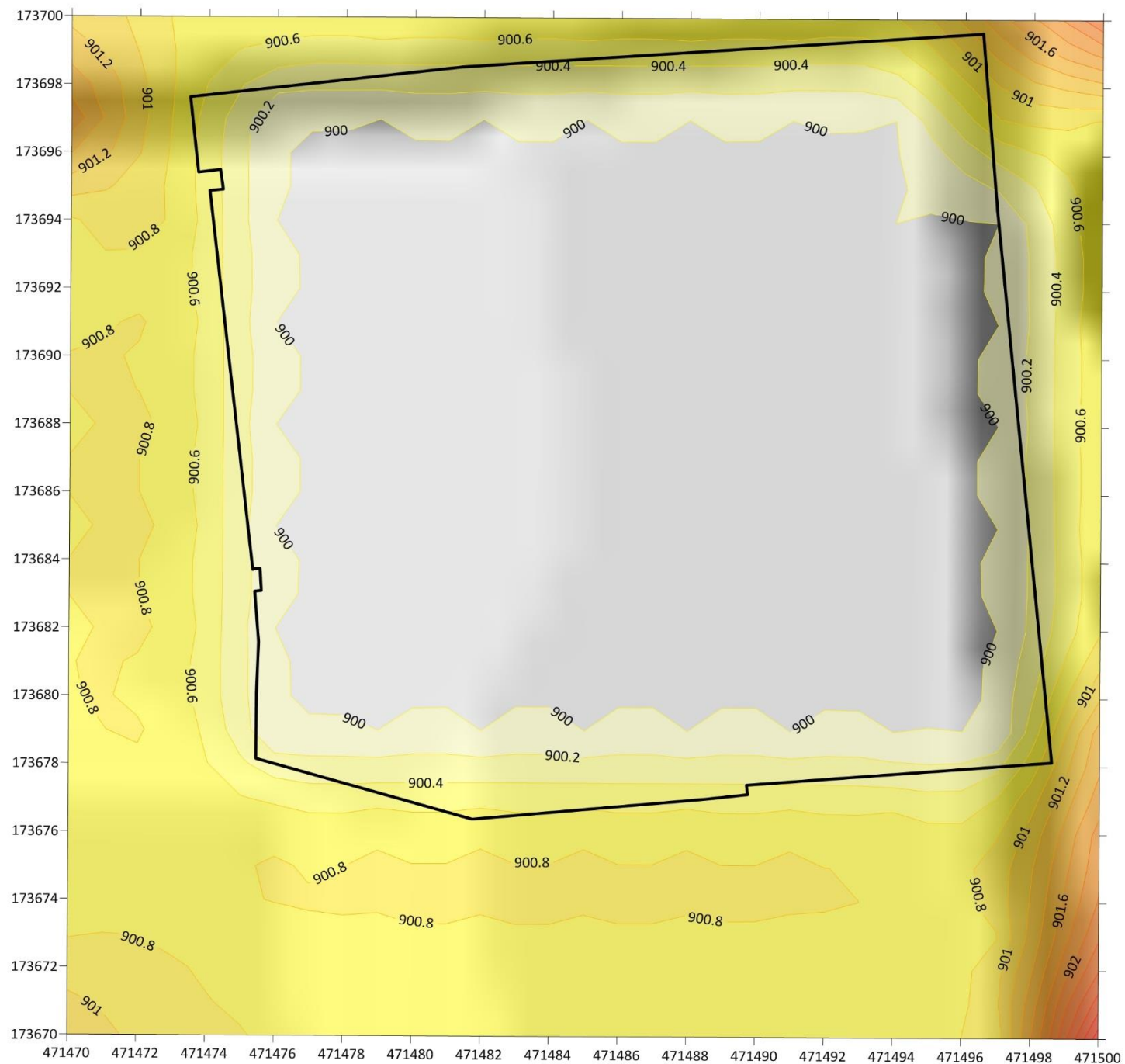
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Legend



Site Boundary



Predicted 8-Hour Rolling Mean
CO Concentration ($\mu\text{g}/\text{m}^3$)

Title

Figure 12

Predicted 8-Hour Rolling Mean
CO Concentrations ($\mu\text{g}/\text{m}^3$)
Z=74.5m

Project

Air Quality Assessment
29-35 Station Road, Reading

Project Number

AQ105820

Client

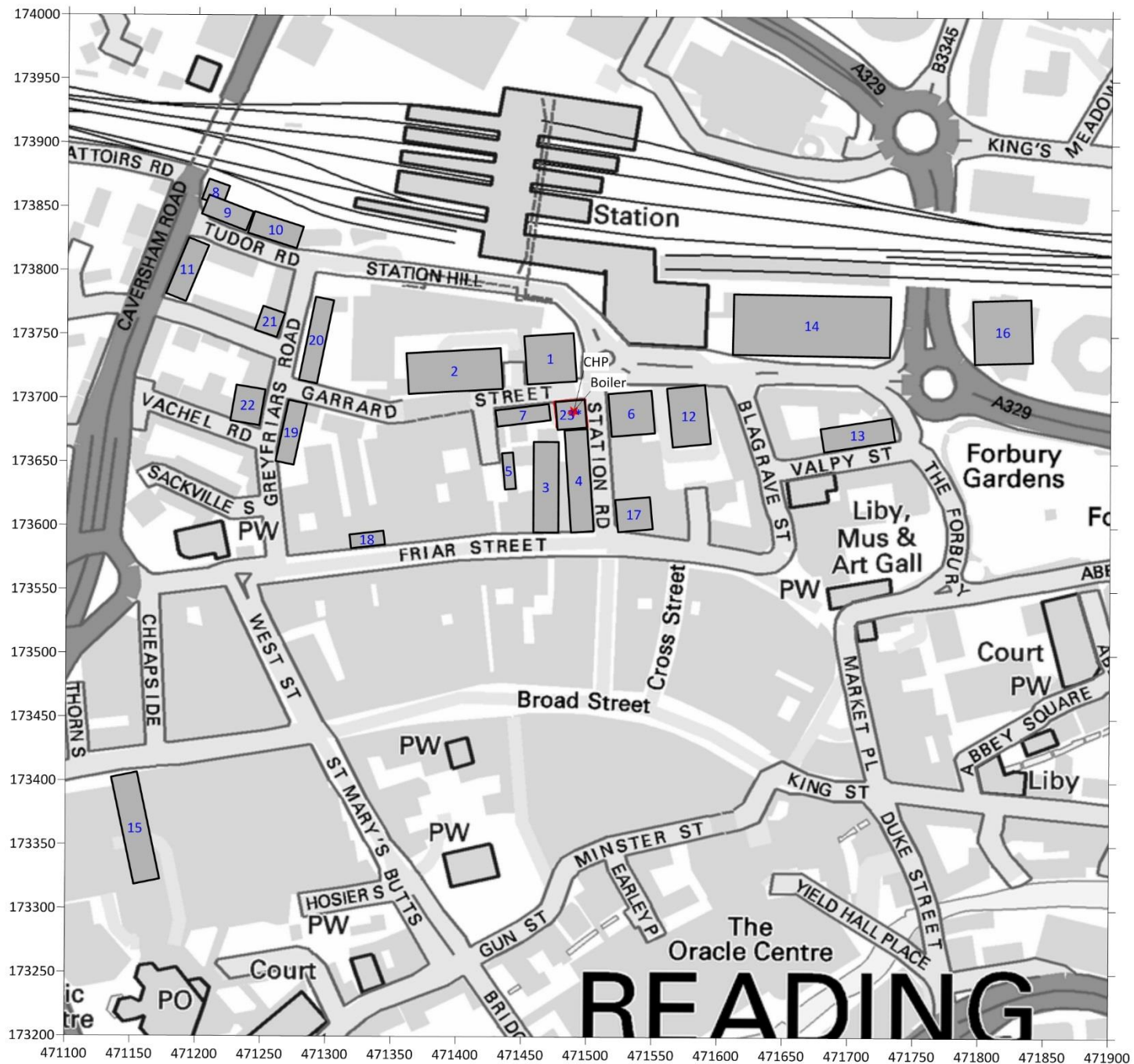
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Legend

-  Site Boundary
-  Stack Location
-  Building Location

Title

Figure 13
ADMS-5 Input

Project

Air Quality Assessment
29-35 Station Road, Reading

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Air Quality Assessment
29-35 Station Road
March 2019
AQ105820r2

APPENDIX II - ASSESSMENT INPUTS





Road Emissions Assessment Inputs

The proposed development has the potential to introduce future site users to poor air quality, as well as the potential to cause impacts during the construction and operational phases of the development. Dispersion modelling using ADMS Roads was therefore undertaken to predict NO₂, PM₁₀ and PM_{2.5} concentrations across the site and at sensitive locations both with and without the development in place, to consider potential impacts and assess site suitability for the proposed end-use.

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;
- ▶ Street Canyon
- ▶ Meteorological data;
- ▶ Roughness length; and
- ▶ Monin-Obukhov length.

Assessment inputs are described in the following subsections.

Dispersion Model

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

Assessment Area

Ambient concentrations were predicted over the proposed development site and surrounding highway network. One Cartesian grid was included in the model over the area at approximately NGR: 471470, 173670 to 471500, 173700 at following heights for the 2020 opening year scenario,

- ▶ Ground Floor (1.5m); and
- ▶ Top Floor (74.5m).

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

Reference should be made to Figure 6 within Appendix I for a graphical representation of the assessment grid extents.

Traffic Flow Data

Traffic data for use in the assessment, including baseline and development flows, was provided by Peter Brett Associates, the appointed Transport Consultants for the scheme.





Road widths were estimated from aerial photography and UK highway design standards. Reference should be made to Figure 6 within Appendix I for a graphical representation of the road link locations. Vehicle speeds were estimated based on the free flow potential of each link and local speed limits.

A summary of the traffic data used in the verification scenario is provided in Table AII.1.

Table AII.1 2017 Traffic Data

Road Link	Road Width (m)	Canyon Height (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
L1	Tudor Road	0	4398	0.93	20
L1a	Tudor Road/ Caversham road	0	4398	0.93	20
L1b	Station Hill	0	4398	18.06	15
L1c	Greyfriars Road/ Station Hill	0	4398	18.06	20
L1d	Stanshawe Road	0	386	18.06	20
L1e	Stanshawe Road/ Caversham Road	0	386	18.06	15
L2	Slip Road Off Caversham Roundabout	0	6489	5.72	25
L2a	Slip Road Caversham Roundabout	0	2451	5.28	20
L2b	Friar Street	0	8940	5.60	30
L2c	Friar Street Controlled Zone	12	6489	5.72	15
L2d	Friar Street/ Station Road	0	8894	9.21	20
L2e	Station Road	0	8894	9.21	25
L3	Greyfriars Road/ Tudor Road	0	8940	5.60	20
L3a	Garrard Street/Greyfriars	12	4398	0.93	25
L3b	Garrard Street/Carpark	0	4398	0.93	20
L3c	Garrard Street	12	4398	0.93	15
L3d	Garrard Street/Station Road	0	1000	1.00	20
L4	Forbury Slip off Roundabout	0	8894	9.21	15
L4a	Forbury Road West	0	8894	9.21	25
L4b	Forbury Road	0	8894	9.21	20
L4c	Forbury Road/ Belgrave Street	0	8894	9.21	25
L4d	Belgrave Street	0	8894	9.21	30





Road Link	Road Width (m)	Canyon Height (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
L4e	Belgrave Street/ Station Road	0	8894	9.21	25
L5	Caversham Road Traffic Lights	0	8894	9.21	20
L5a	Caversham Rd Under Roundabout	0	15712	5.40	48
L5b	Slow down onto Caversham Roundabout	0	15712	5.40	48
L5c	Speed up onto Caversham Rd Southbound	0	15712	5.40	24
L5d	Caversham Road Northbound	0	12570	5.40	64
L5e	Caversham Road Northbound	0	3142	2.11	48
L6	Caversham Road Tunnel (under railway)	0	3142	2.11	48
L6a	Caversham Road Northbound	0	16568	6.00	16
L6b	Caversham Road Northbound Traffic Lights	0	16568	6.00	48
L6c	Caversham Road/Chatham Street Roundabout	0	32280	5.80	48
L6d	Caversham Rd Northbound Roundabout	0	16568	6.00	48
L6e	Caversham Rd Under Roundabout	0	16568	6.00	16
L7	Vastern Road Northbound	0	10238	3.21	32
L8a	Speed up Vastern Road Northbound	0	3314	6.00	16
L8b	Roundabout A329	0	13254	6.00	40
L9	Vastern road Southbound	0	10462	1.80	40
L9a	Vastern Road South Slowdown	0	10462	1.80	24
L10	Forbury Road East	0	10462	1.80	40
L11	Forbury Road East Traffic Light	0	10462	1.80	40
L11a	Forbury Road/ Roundabout Slowdown	0	10462	1.80	16
L12	Forbury Garden Roundabout	0	10462	1.80	30
L12a	Forbury Road Westbound	0	10462	1.80	40
L12b	Forbury Road Westbound Traffic Lights	0	10462	1.80	40
L12c	Forbury Road Speed up Westbound	0	10462	1.80	16
L13	Forbury Road Northbound	0	10462	1.80	30
L13a	Forbury Road Roundabout	0	10462	1.80	40





Road Link	Road Width (m)	Canyon Height (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
L13b	Chatham Street Roundabout	0	10462	1.80	40
L13c	Chatham Street/ Caversham Road Roundabout	0	10462	1.80	32
L14	Forbury Road Roundabout	0	10577	1.95	32
L15	Forbury Road South	0	8901	2.56	40
L15a	Forbury Road	0	8901	2.56	32
L15b	Forbury Road/ Watlington	0	8901	2.56	24
L16	Forbury Road Southbound	0	8901	2.56	32
L16a	Forbury Road/ Watlington	0	8901	2.56	40

A summary of the 2020 traffic data used for the proposed site operational phase scenarios is shown in Table AII.2. The road width and mean vehicle speed remained the same for the DM and DS scenarios.

Table AII.2 2020 Traffic Data

Road Link		DM		DS	
		24-hour AADT Flow	HDV Prop. (%)	24-hour AADT Flow	HDV Prop. (%)
L1	Tudor Road	4558	0.93	4731	1.31
L1a	Tudor Road/ Caversham road	4558	0.93	4731	1.31
L1b	Station Hill	4558	18.06	4731	18.44
L1c	Greyfriars Road/ Station Hill	4558	18.06	4731	18.44
L1d	Stanshawe Road	400	18.06	573	21.21
L1e	Stanshawe Road/ Caversham Road	400	18.06	573	21.21
L2	Slip Road Off Caversham Roundabout	6724	5.72	6773	5.81
L2a	Slip Road Caversham Roundabout	2540	5.28	2585	5.51
L2b	Friar Street	9264	5.60	9359	5.73
L2c	Friar Street Controlled Zone	6724	5.72	6819	5.89
L2d	Friar Street/ Station Road	9217	9.21	9312	9.34
L2e	Station Road	9217	9.21	9312	9.34





Road Link		DM		DS	
		24-hour AADT Flow	HDV Prop. (%)	24-hour AADT Flow	HDV Prop. (%)
L3	Greyfriars Road/ Tudor Road	9264	5.60	9359	5.73
L3a	Garrard Street/Greyfriars	4558	0.93	4826	1.53
L3b	Garrard Street/Carpark	4558	0.93	4826	1.53
L3c	Garrard Street	4558	0.93	4826	1.53
L3d	Garrard Street/Station Road	1036	1.00	1065	3.81
L4	Forbury Slip off Roundabout	9217	9.21	9485	9.52
L4a	Forbury Road West	9217	9.21	9485	9.52
L4b	Forbury Road	9217	9.21	9485	9.52
L4c	Forbury Road/ Belgrave Street	9217	9.21	9217	9.21
L4d	Belgrave Street	9217	9.21	9217	9.21
L4e	Belgrave Street/ Station Road	9217	9.21	9217	9.21
L5	Caversham Road Traffic Lights	9217	9.21	9485	9.52
L5a	Caversham Rd Under Roundabout	16282	5.40	16309	5.42
L5b	Slow down onto Caversham Roundabout	16282	5.40	16309	5.42
L5c	Speed up onto Caversham Rd Southbound	16282	5.40	16327	5.43
L5d	Caversham Road Northbound	13026	5.40	13071	5.43
L5e	Caversham Road Northbound	3256	2.11	3301	2.24
L6	Caversham Road Tunnel (under railway)	3256	2.11	3328	2.34
L6a	Caversham Road Northbound	17169	6.00	17196	6.02
L6b	Caversham Road Northbound Traffic Lights	17169	6.00	17196	6.02
L6c	Caversham Road/Chatham Street Roundabout	33452	5.80	33506	5.82
L6d	Caversham Rd Northbound Roundabout	17169	6.00	17214	6.03
L6e	Caversham Rd Under Roundabout	17169	6.00	17214	6.03
L7	Vastern Road Northbound	10610	3.21	10789	3.38
L8a	Speed up Vastern Road Northbound	3434	6.00	3506	6.22
L8b	Roundabout A329	13735	6.00	13806	6.06





Road Link		DM		DS	
		24-hour AADT Flow	HDV Prop. (%)	24-hour AADT Flow	HDV Prop. (%)
L9	Vastern road Southbound	10842	1.80	10976	1.93
L9a	Vastern Road South Slowdown	10842	1.80	10976	1.93
L10	Forbury Road East	10842	1.80	10976	1.93
L11	Forbury Road East Traffic Light	10842	1.80	10976	1.93
L11a	Forbury Road/ Roundabout Slowdown	10842	1.80	10976	1.93
L12	Forbury Garden Roundabout	10842	1.80	10976	1.93
L12a	Forbury Road Westbound	10842	1.80	10976	1.93
L12b	Forbury Road Westbound Traffic Lights	10842	1.80	10976	1.93
L12c	Forbury Road Speed up Westbound	10842	1.80	10976	1.93
L13	Forbury Road Northbound	10842	1.80	10976	1.93
L13a	Forbury Road Roundabout	10842	1.80	10976	1.93
L13b	Chatham Street Roundabout	10842	1.80	10976	1.93
L13c	Chatham Street/ Caversham Road Roundabout	10842	1.80	10976	1.93
L14	Forbury Road Roundabout	10960	1.95	11094	2.08
L15	Forbury Road South	9224	2.56	9358	2.72
L15a	Forbury Road	9224	2.56	9358	2.72
L15b	Forbury Road/ Watlington	9224	2.56	9358	2.72
L16	Forbury Road Southbound	9224	2.56	9358	2.72
L16a	Forbury Road/ Watlington	9224	2.56	9358	2.72

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 8.0.1) released in 2017, which incorporates updated COPERT 5 vehicle emissions factors for NO_x and vehicle fleet information.

There is current uncertainty over NO₂ concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2017 emission factors have been utilised for the prediction of pollution levels for all scenarios in preference to the development opening year in order to provide a robust assessment.





Street Canyon

Sections of Friars Street, Garrard Street, and Greyfriars Road are flanked by tall buildings on both sides of the highway and therefore potential street canyon effects were utilised these road links for the purpose of the dispersion modelling assessment. This allows the additional turbulent flow patterns occurring within a street with high structures on either side to be considered within the predicted concentrations. The average building height on each road were included in the model to provide robust assessment results.

Meteorological Data

Meteorological data used in this assessment was taken from Benson Airport meteorological station over the period 1st January 2017 to 31st December 2017 (inclusive). Benson Airport meteorological station is located at approximate NGR: 462190, 191600, which is approximately 22km north-west of the proposed development and is therefore considered to provide a reasonable representation of conditions at the development site.

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

Roughness Length

A roughness length (z_0) of 1.0m was used in this dispersion modelling study. This value of z_0 is considered appropriate for the morphology of the assessment area and is suggested within ADMS-Roads as being suitable for 'Cities, woodlands'.

A z_0 of 0.3m was utilised to represent the morphology of the meteorological station location and is suggested 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 in this dispersion modelling study. This value is considered appropriate for the nature of the assessment area and is suggested within ADMS-Roads as being suitable for 'Cities and large towns'.

A minimum Monin-Obukhov length of 10m was used in this dispersion modelling study. This value is considered appropriate for the nature of the meteorological station location and is suggested within ADMS-Roads as being suitable for 'Small towns <50,000'.

Background Concentrations

Annual mean concentrations from 2017 detailed in Table 15, as predicted by DEFRA, were used in the dispersion modelling assessment to represent annual mean pollutant levels in the vicinity of the site and for the verification process. Similarly, to emission factors, background concentrations for 2017 were utilised in preference to the development opening year of 2020. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the





proposals.

Since sensitive receptor were located in different grids. The background concentrations for 2017 were utilised in preference to the development opening year of 2020. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposals.

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

Table All.4 Predicted Background Pollutant Concentrations for Receptors

Receptor Grid Square	Receptors	Pollutant	2017 Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)
471500, 173500	R1 to R9 & R11 to R30	NO _x	28.47
		NO ₂	45.32
		PM ₁₀	15.64
		PM _{2.5}	9.89
472500, 153500	R10	NO _x	37.74
		NO ₂	24.63
		PM ₁₀	15.12
		PM _{2.5}	9.60

NO_x to NO₂ Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO₂ concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LAQM (TG16)².

Verification

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

- ▶ Estimates of background concentrations;
- ▶ Uncertainties in source activity data such as traffic flows and emission factors;
- ▶ Variations in meteorological conditions;
- ▶ Overall model limitations; and
- ▶ Uncertainties associated with monitoring data, including locations.

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





For the purpose of this assessment model verification was undertaken for 2017, using traffic data, meteorological data and monitoring results from this year.

DTs 42, 43 and 49 were discounted as there was no traffic data available being end-terraced/ cul-de-sac monitoring locations.

DT74 was discounted due to its immediate location adjacent to the bus stop. DT75 was discounted as there was no idling taxi-rank emission available for this location. DT44 had no monitoring data available for the year of 2017

RBC undertakes diffusion tube monitoring of NO₂ concentrations at 2 suitable monitoring locations within the assessment extents. The road contribution to total NO_x concentration was calculated from the monitored NO₂ result for use in the verification process. This was undertaken following the methodology contained within the LAQM (TG16) guidance².

The monitored annual mean NO₂ concentration and calculated road NO_x concentration are summarised in Table AII.5.

Table AII.5 NO_x Verification Results

ID	Monitoring Location	Modelled Road NO _x Concentration (µg/m ³)	Monitored Road NO _x Concentration (µg/m ³)	Difference %
45	Friar Street near Nandos	32.83	49.41	33.15%
48	33 Caversham Road	23.96	36.07	34.34%

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trendline based on the linear progression through zero calculated, as shown in Graph 1. This indicated that a verification factor of **1.5053** was required to be applied to all NO_x modelling results, showing the model has a tendency to underestimate pollutant concentrations.

Graph 1 Verification Adjustment Factor



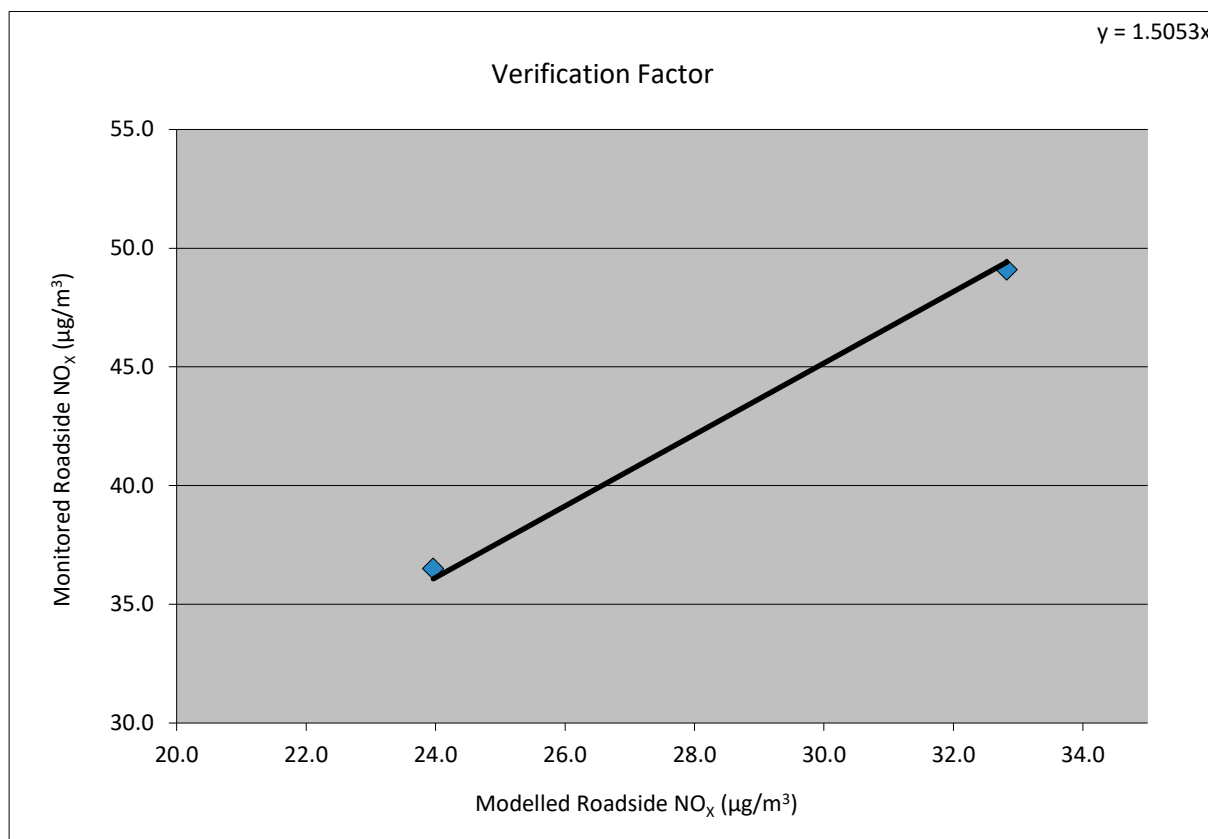


Table AII.4 presents the monitored annual mean NO₂ concentrations and the adjusted modelled total NO₂ concentration based on the above verification factor. Exceedances of the annual mean AQO for NO₂ are shown in **bold**.

Table AII.4 **NO₂ Verification Results**

ID	Monitoring Location	Monitored NO ₂ Concentration (µg/m³)	Adjusted Modelled Total NO ₂ Concentration (µg/m³)	Difference (%)
45	Friar Street Near Nandos	50.48	50.61	-0.26%
48	33 Caversham Road	45.30	45.12	0.39%

As PM₁₀ monitoring is not undertaken within the assessment extents, the NO_x verification factor of **1.5053** was also utilised to adjust model predictions of PM₁₀ in accordance with the guidance provided within LAQM (TG16)².





ADMS 5 – ASSESSMENT INPUTS

Atmospheric emissions from the proposed CHP and boiler units have the potential to result in air quality impacts in the vicinity of the development. Dispersion modelling using ADMS-5 was therefore undertaken to predict increase in NO₂ and CO concentrations at sensitive locations in order to consider potential changes and impacts as a result of the proposals.

Assessment inputs are described in the following Subsections.

Dispersion Model

Dispersion modelling was undertaken using ADMS-5 (v5.2), which is developed by CERC. ADMS-5.2 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

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

Assessment Area

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

Process Conditions

Process conditions were provided through correspondence with PBA, the Engineering Consultants for the project. Reference should be made to Table AIII.1 for dispersion modelling inputs.

Table AIII. 1 Process Conditions

Condition	Unit	CHP	Boilers
Stack location	NGR	471488.2, 173689.8	471488.1, 173690.4
Stack diameter	m	0.10	0.25
Stack height	m	79	79
Flue gas volumetric flow rate	m ³ /s	0.01	0.29
Flue gas efflux velocity	m/s	1.200	5.854
Temperature	°C	90	83

Reference should be made to Figure 13 for a graphical representation of the stack locations.





Emissions

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

Table AIII.2 Mass Emission Rates

Unit	Parameter	Mass Emission Rate (g/s)
CHP	NO _x	0.00514
	CO	0.00617
Boilers	NO _x	0.00748

Meteorological Data

Meteorological data used in this assessment was taken from Benson Meteorological Station over the period 1st January 2017 to 31st December 2017 (inclusive).

Roughness Length

A z_0 of 1m was used in this dispersion modelling study. A z_0 value of 0.3m was used to represent the assessment area and the meteorological station location.

Monin-Obukhov Length

A minimum Monin-Obukhov length of 30m was used to represent the assessment area and 10m was used to represent the meteorological station location.

Building Effects

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

Table AIII.4 Building Geometries

Building		NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
1	Building 1	471470.3	173731.6	57.5	37.9	37.9	176.0
2	Building 2	471396.9	173721.6	22.0	31.9	72.2	176.6
3	Building 3	471467.4	173630.9	57.2	70.9	19.1	180.0
4	Building 4	471492.7	173636.1	26.8	80.1	17.4	176.2





Building		NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
5	Building 5	471438.9	173643.5	28.4	28.4	8.4	175.0
6	Building 6	471532.7	173688.9	33.6	33.6	33.2	175.1
7	Building 7	471449.5	173687.2	19.0	12.8	41.1	172.7
8	Building 8	471213.2	173860.7	37.1	16.7	16.7	199.7
9	Building 9	471222.3	173844.9	15.9	15.9	36.4	201.2
10	Building 10	471259.2	173831.7	17.6	17.6	39.3	197.8
11	Building 11	471191.7	173800.4	47.1	47.1	16.4	202.0
12	Building 12	471576.6	173687.1	46.3	46.3	29.2	174.2
13	Building 13	471706.2	173672.7	18.4	18.4	55.1	170.9
14	Building 14	471670.6	173758.3	47.4	47.4	120.4	180.8
15	Building 15	471153.8	173362.6	50.0	85.5	20.2	168.2
16	Building 16	471817.1	173753.9	49.4	49.4	44.5	178.2
17	Building 17	471534.9	173609.8	25.2	25.2	26.6	174.8
18	Building 18	471330.5	173589.3	20.0	10.8	26.1	173.2
19	Building 19	471271.8	173673.0	28.0	48.9	14.2	191.8
20	Building 20	471290.8	173745.4	30.0	66.3	14.1	191.1
21	Building 21	471255.1	173759.8	19.8	19.8	17.6	198.8
22	Building 22	471238.5	173694.3	28.3	28.3	22.5	189.4
23	Building 23	471486.3	173687.8	76.7	22.0	22.5	175.2
24	Building 24	471358.9	173767.3	58.0	34.3	14.7	179.6

Reference should be made to Figure 13 for a graphical representation of the modelled building locations.





Air Quality Assessment
29-35 Station Road
March 2019
AQ105820r2

APPENDIX III ASSESSOR'S CURRICULUM VITAE





CONAL KEARNEY

Head of Noise and Air

BEng(Hons), MSc, MIAQM, MIEEnvSc

KEY EXPERIENCE:

Conal is a head of Head of Noise and Air with specialist experience in the air quality and odour sector. His key capabilities include:

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

QUALIFICATIONS:

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

SELECT PROJECTS SUMMARY:

Industrial Developments

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

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

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

Calder Brick Works, Yorkshire - AQA for proposed site restoration plan

Coopers Moss, St Helens AQA and dust assessment for materials import and site restoration.

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

Highways Developments

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

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

Residential Developments

Beck's Mill, Silsden – AQA and emissions calculation for proposed residential development

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

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

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

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

Kelvedon Street, Newport, South Wales – AQA for new housing development

Westcraig, Edinburgh - EIA for residential development

Public Sector

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

Cheshire County Council - compile AQ chapters for Local Transport Plan

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

Local Air Quality Management

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

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

Disley - dispersion modelling assessment for detailed and further assessments

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

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

Commercial Developments

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

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

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

Salesians School, Chertsey - AQA for school extension near M25

