



AIR QUALITY ASSESSMENT

FOR

ASPEN HOUSE, 300 KINGS ROAD, READING

AQ75801

26/05/2022

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EXECUTIVE SUMMARY

Ensafe Consultants were commissioned by Titan Property Development Limited to undertake an Air Quality Assessment in support of a proposed residential development at Aspen House, 300 Kings Road, Reading..

Ensafe (formerly REC Ltd) undertook an Air Quality Assessment for the proposed development site in March 2018. A planning application was submitted and received permissions in 2019. Following submission, the site is undergoing minor internal alterations from the original application.

The application site is located within an area identified by the Reading Borough Council as experiencing elevated pollutant concentrations. Subsequently, the Proposed Development has potential to introduce future users to poor air quality as well as, to cause impacts during the construction and operational phases. Additionally, there is potential for the proposals to cause impacts at sensitive receptors during the construction and operational phases. An Air Quality Assessment is therefore required to determine the baseline conditions at the site, assess site suitability for the proposed end-use and consider effects as a result of 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.

Dispersion modelling was undertaken in order to predict annual mean pollutant concentrations across the application site to determine exposure risk to future occupiers. Results were subsequently verified using local monitoring results provided by Reading Borough Council.

The dispersion modelling results indicated that annual mean pollutant concentrations across sensitive areas of the application site were below the relevant air quality objectives at proposed sensitive locations.

The site is therefore considered suitable for proposed end use without the implementation of protective mitigation techniques.

The level of anticipated traffic generation from the site concluded that impacts on existing pollutant levels as a result of operational phase pollutant emissions were predicted to be **not significant** in accordance with relevant screening criteria. The use of robust assumptions, where necessary, was considered to provide sufficient results confidence for an assessment of this nature.

Based on the assessment results the site is considered suitable for the proposed end use and complies with the Reading Borough Council Local Plan and National Planning Policy Framework.

1.0 INTRODUCTION

1.1 Background

Ensafe Consultants has been commissioned by Titan Property Developments Ltd, hereafter referred to as “the Client” to undertake an Air Quality Assessment in support of a proposed development, comprising of the 13 residential units, herein after referred to as the “Proposed Development”.

Ensafe (formerly REC Ltd) undertook an Air Quality Assessment (ref: AQ105140r1) for the proposed development site in March 2018. A planning application was submitted and received permissions in 2019. Following submission, the site is undergoing minor internal alterations from the original application. Due to the nature of the updates, there is little potential for additional air quality impacts to arise above those previously assessed.

As such, it is considered that the conclusions of the previously submitted assessment (AQ105140r1) would remain valid and provide a conservative approach. It is therefore considered that no further assessment is necessary, and furthermore air quality should not be viewed as a constraint to planning approval. This assessment provides the findings of the original assessment and this approach has been approved by the Environmental Health Officer at Reading Borough Council (RBC).

1.2 Site Location and Context

The application site is located at Aspen House, 300 King's Road, Reading at approximate National Grid Reference (NGR) 472760, 173210. Reference should be made to Figure 1 within Appendix A for a location plan.

The application site is located within the Reading Borough Council (RBC) Air Quality Management Area (AQMA) which has been declared due to exceedances of the annual mean Air Quality Objective (AQO) for nitrogen dioxide (NO₂). Subsequently, the Proposed Development has the potential to introduce future residential occupants into an area of elevated NO₂ and particulate matter (PM₁₀ and PM_{2.5}) concentrations, as well as to cause impacts at sensitive receptor locations during the construction and operational phases.

An Air Quality Assessment has therefore been produced to quantify annual mean NO₂, PM₁₀ and PM_{2.5} concentrations across the site to consider suitability for the proposed end-use, and to assess potential impacts as a result of the development. The assessment will be undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF) and the RBC Local Planning Policy.

1.3 Limitations

This report has been produced in accordance with Ensaf Consultants standard terms of engagement. Ensaf Consultants 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 Ensaf Consultants; a charge may be levied against such approval.

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2.0 LEGISLATION, GUIDANCE AND POLICY

The following legislation, guidance and policy will be considered and adhered to during the preparation of the Air Quality Assessment:

- European Union (EU) Directive 2008/50/EC;
- The NPPF, updated on 20th July 2021;
- The National Planning Practice Guidance (NPPG), relevant chapters produced on 1st November 2019;
- Section 82 of the Environment Act (Part IV), updated 9th November 2021;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs (DEFRA), 2007¹;
- The Air Quality Standards (Amendment) Regulations (2016);
- Local Air Quality Management Technical Guidance 2016 LAQM.TG(16), DEFRA, April 2021²;
- Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management (IAQM), v1.1, June 2016³;
- Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK (EPUK) and IAQM, January 2017⁴; and
- Reading Borough Local Plan, RBC, November 2019

2.1 UK Legislation and Guidance

The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. Air Quality Limit Values (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 (2021) 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 DEFRA and published in July 2007¹. The AQS sets out Air Quality Objectives (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.

Table 1: Air Quality Objectives

Pollutant	Air Quality Objectives	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Periods
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.

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

2 Local Air Quality Management Technical Guidance 2016 LAQM.TG(16), DEFRA, 2021

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

4 Land-Use Planning and Development Control: Planning for Air Quality, EPUK and IAQM, 2017

Table 2: Examples of Where the Air Quality Objectives Apply

Averaging Periods	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

The results of the dispersion modelling assessment will also be compared against the relevant AQOs detailed in Table 1 to determine significance.

2.2 Local Planning Policy

Reading Borough Council's (RBC)⁵ Local Plan was adopted in November 2019 and consists of all the policies for how reading will develop up to 2036.

A review of the Local Plan indicated the following policy in relation to air quality that is relevant to this assessment:

- **Policy EN15: Air Quality**

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

- 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:
 - Whether the proposal, including when combined with the cumulative effect of other developments already permitted, would worsen air quality;
 - Whether the development is within, or accessed via, an Air Quality Management Area; and

⁵ Reading Borough Local Plan, RBC, 2019

- Whether it can be demonstrated that a local worsening in air quality that would not detrimentally affect human health or the environment would be offset by an overall improvement in air quality, for instance through reduction in the need to travel.
- 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, 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.

[...]

Reference has been made to these policy during the undertaking of this Air Quality Assessment by assessing the impacts of road vehicle exhaust emissions on future site users.

3.0 METHODOLOGY

There is the potential for the Proposed Development to expose future site users to elevated NO₂, PM₁₀ and PM_{2.5} concentrations, as well as to cause impacts at sensitive locations during the construction and operational phases.

This has been assessed in accordance with the following methodology, as agreed with the EHO at RBC on 26/04/2022.

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 IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction'³.

Reference should be made to Appendix C for details of the relevant IAQM construction phase assessment criteria, which were utilised in conjunction with site specific information

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

- 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 and PM_{2.5}

A desk top survey will be undertaken to identify human and ecological receptors within the relevant assessment buffers specified by the IAQM guidance³. Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

Following the identification of sensitive receptors, a site is then allocated a risk category which is assigned to each activity, based on the scale and nature of the works, as well as the sensitivity of the area to dust impacts.

The assigned magnitude and sensitivity will then determine the overall risk and appropriate mitigation measures to be employed during construction phase activities.

The IAQM guidance³ is provided in Appendix C, with the details of the assessor's qualifications and experience. provided in Appendix D.

3.2 Operational Phase Assessment

3.2.1 Future Exposure

The Proposed Development is located within to the RBC AQMA. As such, the proposals have the potential to introduce new receptors into an area of existing poor air quality, as well as to cause impacts upon existing pollution levels at nearby sensitive receptors within the AQMA..

Detailed dispersion modelling was therefore undertaken to quantify NO₂, PM₁₀ and PM_{2.5} pollutant exposure across the site and determine suitability for the proposed use. The following modelling scenarios were utilised during the assessment:

- 2016 as baseline year for verification against latest ratified data;
- Opening year do-something (DS) (predicted traffic flows in 2020 should the proposals be completed)

Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2016 have been used within the dispersion model. The use of 2020 traffic data and 2016 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.

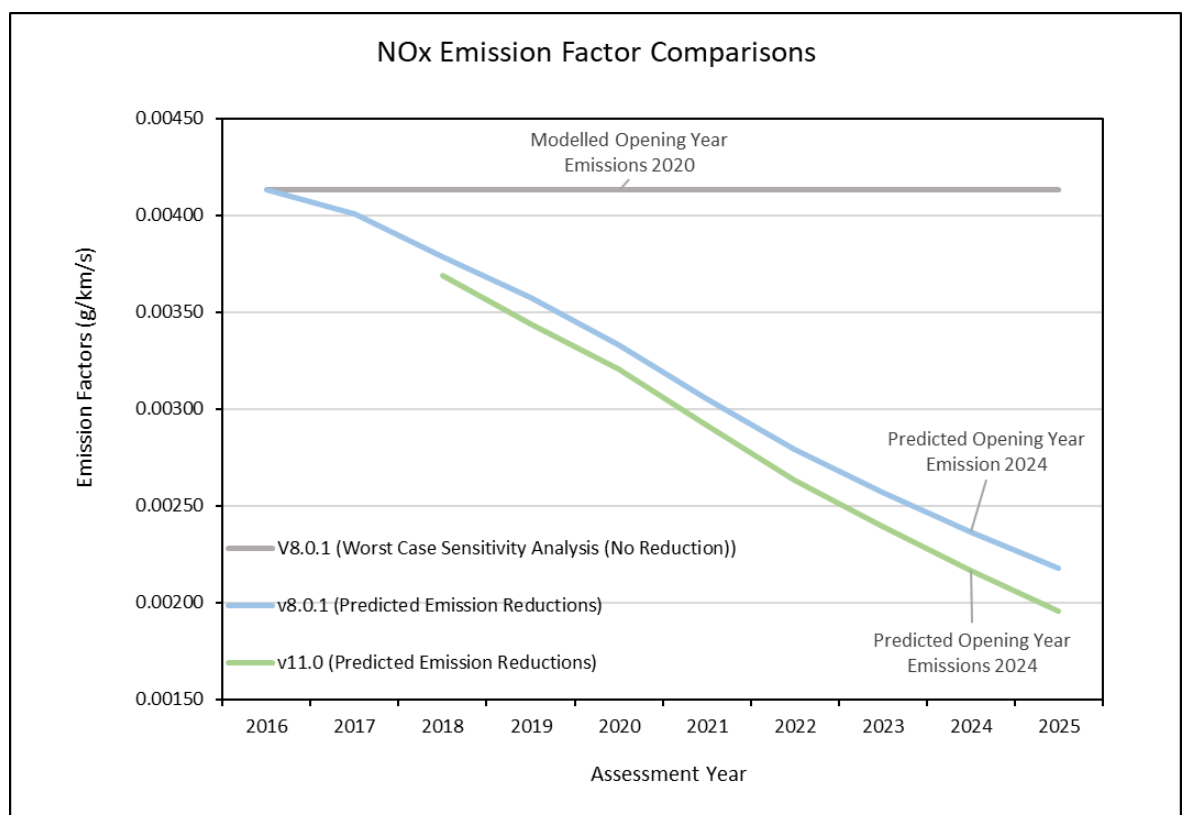
Emission Factors

Air quality is predicted to improve in the future (due to the current shift towards a greater production and uptake of low emission vehicles, supported by national government targets). However, in order to provide a robust assessment, the previous assessment used 2016 emission factors within the dispersion model, to represent the anticipated future year of the development.

As such, the use of 2020 traffic data with 2016 emission factors obtained from EFT v8.0.1, within the previous assessment was considered to provide an absolute worst-case scenario, which significantly overestimates potential impacts. A sufficient level of confidence can therefore be placed upon the previous assessment conclusions regarding impact significance.

Since the previous assessment was undertaken the development has a revised opening year of 2024. Given the time period since the previous assessment was undertaken, EFTv11.0 was released which provides more realistic emission profile based on real world simulations. A comparison of NO_x emission factors obtained from v8.0.1 and v11.0 for modelled and predicted years are provided in Graph 1.

Graph 1 – NO_x Emission Factor Comparisons



* Based on 1,000 AADT, 50Kph and 0% HDV%

3.2.2 Road Vehicle Exhaust Impact Assessment

Based on the details of the Proposed Development and anticipated trip generation a screening assessment in accordance with the EPUK and IAQM guidance⁴ was determined a suitable assessment approach. The assessment will determine road traffic exhaust and combustion emission impacts associated with the Proposed Development, and confirm the requirement for detailed assessment work. The EPUK and IAQM document states the following criteria to help establish when an air quality assessment is likely to be considered necessary:

- Proposals that will cause a change in Light Duty Vehicle (LDV) flows of more than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA or more than 500 elsewhere;
- Proposals that will cause a change in Heavy Duty Vehicle (HDV) flows of more than 25 AADT within or adjacent to an AQMA or more than 100 elsewhere;
- Proposals which include either a centralised plant using biofuel, a combustion plant with single or thermal input >300KWh or a standby emergency generator associated with a centralised energy centre; and
- Proposals which include combustion processes of any size.

Should the above criteria not be met, the EPUK and IAQM document considers air quality impacts associated with the scheme to be not significant and no further assessment is required. Conversely, should the criterion be exceeded it may be deemed necessary that further assessment is required.

4.0 BASELINE

Existing air quality conditions in the vicinity of the application 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 (2021), 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 AQO within their administration. As such, 1 AQMA has been declared, the closest being described as:

- RBC 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 application site is located within the AQMA. As such, there is potential for the Proposed Development to introduce future site users into an area of elevated annual mean NO₂ concentrations, and to cause air quality impacts within this sensitive area during the construction and operational phases. 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 AQMA has been designated.

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by RBC using continuous and passive methods throughout their areas of administration. A review of RBC's most recent Air Quality Monitoring Data⁶ indicated that there are currently 3 automatic analysers operated by RBC within the vicinity of the Proposed Development. Recent monitoring results from this location are shown in Table 3.

Table 3: Automatic Monitoring Results

ID	Site Name	Type	NGR (m)		Distance to Site (m)	Pollutant	Annual Mean Concentration (µg/m ³)	
			X	Y			2016	2019
Reading AURN	AURN	Urban Background	473441	173198	681	NO ₂	34.0	22.0
						PM ₁₀	13.0	13.0
						PM _{2.5}	9.0	8.0
RD1	Caversham Road	Roadside	471153	174429	2,016	NO ₂	39.0	35.0
						PM ₁₀	20.0	24.0
RD3	Oxford Road	Roadside	468700	174126	4,161	NO ₂	30.0	26.0
						PM ₁₀	22.0	21.0
RD4	London Road	Roadside	473703	173409	963	NO ₂	32.0	27.0
						PM ₁₀	119.0	17.0

As indicated in Table 3, there were no exceedances of annual mean AQOs for NO₂ at the monitoring locations in the 2016 baseline.

⁶ <https://www.reading.gov.uk/climate-and-pollution/2020-air-quality-annual-status-report-asr/>

RBC also monitor NO₂ concentrations across the borough using passive diffusion tubes. A review of the most recent air quality monitoring data indicated 4 diffusion tubes located within the vicinity of the application site, presented in Table 4.

Table 4: Diffusion Tube Monitoring Results

ID	Site Name	Type	NGR (m)		Dist' to Site (m)	Annual Mean Concentration (µg/m ³)	
			X	Y		2016	2019
DT06	Wycliffe Church	Roadside	473072	173204	312	49.0	39.0
DT07	162 London Road	Roadside	473490	173326	739	42.0	38.0
DT08	419 London Road	Roadside	473729	173432	994	42.0	35.0
DT09	276 King's Road	Roadside	472716	173218	44	32.0	26.0

As indicated in Table 4, the annual mean AQO for NO₂ was exceeded at three considered diffusion tubes during 2016 baseline year.

2019 monitoring locations presented within Table 3 and Table 4, indicates that pollutant concentrations have undergone a net decrease within the study area since the completion of the previous assessment, as such, this would lead to a reduction of baseline concentration and associated impacts.

Reference should be made to Figure 2 within Appendix A for a graphical representation of the monitoring locations.

4.3 Background Pollutant Concentrations

The total concentration of a pollutant is comprised of explicit local emission sources (such as roads and industrial sources) and the background component. The background component consists of indeterminate sources which are transported into an area from further away by meteorological conditions. Background pollutant concentrations are therefore the ambient level of pollution that is not affected by local sources of pollution.

In reality, it is not usually practical to obtain a true representation of background levels in urban areas due to corruption by local sources; background levels used in assessments may contain a mixture of both sources.

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 across grid square:

- NGR: 472500, 173500

Data for this location was downloaded from the DEFRA website⁷. For the purpose of this assessment, background concentrations are summarised in Table 5 for the verification year (2016) and the predicted development opening year (2020) as displayed within AQ105140r1. Revised development opening year (2024) background concentrations have been included for completeness.

Table 5: Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m ³)		
	2016	2020	2024
NO _x	39.23	32.55	30.69

⁷ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

Pollutant	Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)		
	2016	2020	2024
NO ₂	25.36	21.84	20.68
PM ₁₀	15.32	14.52	16.04
PM _{2.5}	9.75	9.17	11.09

As indicated in Table 5, background pollutant concentrations of NO₂, PM₁₀ and PM_{2.5} are below the relevant AQOs detailed in Table 1.

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 construction dust impacts in the following Sections.

4.4.1 Construction Phase Sensitive Receptors

There are no nationally or European designated ecological receptors within 50m of the Site boundary, or within 50m from a route used by construction vehicles on the public highway (up to 500m from the Site entrance). Therefore, the risk of dust effects at a nationally or European designated ecological receptor site from construction impacts have not been considered further in this assessment.

Human 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 Proposed Development boundary. These are summarised in Table 6.

Table 6: Earthworks and Construction Dust Sensitive Receptors

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

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

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access route. These are summarised in Table 7. 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 that construction traffic would access the Proposed Development via (A329) King's Road, to ensure a worst case trackout assessment is undertaken.

Table 7: Trackout Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors
Less than 20	More than 100
20 – 50	More than 100

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

A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 8.

Table 8: Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The site is located in a residential area. There is likely to have been a history of dust generating activities due to commuting and redevelopment processes in the locality.
The likelihood of concurrent dust generating activity on nearby sites.	A review of the RBC planning portal indicated that there are no large-scale planning applications within the vicinity of the site.
Pre-existing screening between the source and the receptors	There is no dense vegetation present along the development boundaries. Hence, there is no level of natural protective screening in any directions.
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 of the development. As such, properties to the north of the site would be most affected by dust emissions
Conclusions drawn from local topography	The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion.
Duration of the potential impact, as a receptor may become more sensitive over time	Currently the duration of the construction phase is unknown.
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline.

4.4.2 Operational Phase Sensitive Receptors

A desk top study was undertaken to identify the closest receptor locations to the application site. This indicated residential locations within close proximity to all development boundaries. There are educational and medical facility in vicinity of the application site and affected road networks, with the nearest education facility, Red Balloon Learner Centre, and medical facility, Reading Health and Dental Centre, located approximately 228m and 170m west and south of the site, respectively.

5.0 ASSESSMENT

5.1 Construction Phase Assessment

5.1.1 Step 1 – Screening

The desk-study detailed in Section 4.4.1 identified a number of receptors with a high classification of sensitivity within 350m of the site boundary, and within 50m of the anticipated trackout routes. As such, a detailed assessment of potential dust impacts was required, and summarised in the below sections.

5.1.2 Step 2A – Magnitude

The scale and nature of the works was determined to assess the magnitude of dust arising from each construction phase activity. The determination of magnitude was based upon the criteria detailed in Appendix C, with the outcome of Step 2A is summarised below in Table 9.

Demolition

There is no scope for demolition in order to prepare the site for construction. Subsequently, this aspect of the construction phase dust risk assessment has not been considered further.

Earthworks

The Proposed Development site is estimated to cover an area of approximately 500m². The magnitude of potential dust emissions related to earthwork activities is therefore considered small.

Construction

The proposals comprise the construction of 14 residential units. Given the scale of the Proposed Development the total building and infrastructure volume is less than 25,000m³. The magnitude of potential dust emissions related to construction activities is therefore considered small.

Trackout

Information on the number of HDV trips to be generated during the construction phase of the Proposed 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. The magnitude of potential dust emissions from trackout is therefore considered small.

Table 9: Dust Emission Magnitude

Magnitude of Activities		
Earthworks	Construction	Trackout
Small	Small	Small

5.1.3 Step 2B – Sensitivity

The next step (Step 2B) is to determine the sensitivity of the surrounding area, based on general principles such as amenity and aesthetics, as well as human exposure sensitivity.

Dust Soiling

As shown in Section 4.4.1, the desk top study indicated are approximately more than 100 sensitive receptors within 350m of the Proposed Development boundary and more than 100 within 50m of the anticipated trackout routes.

Based on the assessment criteria detailed in Appendix C, the sensitivity of the receiving environment to potential dust soiling impacts was considered to be high for all construction phase activities. This is because the site is situated in a predominantly residential area and the people or property would reasonably be expected to be present here for extended periods of time.

Human Health

The annual mean concentration of PM₁₀ is 15.32µg/m³ as detailed in Section 4. Based on the receptor counts provided above, the area is considered to be of low sensitivity for earthworks and construction phase activities and medium for trackout activities.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria detailed in Appendix C is summarised in Table 10.

Table 10: Sensitivity of the Surrounding Area

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

5.1.4 Step 2C – Risk

Both the magnitude and sensitivity factors are combined in Step 2C to determine the risk of dust impacts without the application of best practice mitigation measures.

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. A summary of the risk from each dust generating activity is provided in Table 11.

Table 11: Summary of Potential Unmitigated Dust Risks

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

5.1.5 Step 3 – Mitigation

The IAQM guidance³ provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the Proposed Development site as summarised in Table 12.

Table 12: Fugitive Dust Mitigation Measures

Issue	Control Measure
Communications	• Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. • Display the head or regional office contact information • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority.
Site Management	• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. • Make the complaints log available to the local authority when asked • Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.
Monitoring	• Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary. • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked • Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. • Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Preparing & Maintaining Site	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. • Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. • Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive time period • Avoid site runoff of water or mud

Issue	Control Measure
	- Keep site fencing, barriers and scaffolding clean using wet methods. - Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. - Cover, seed or fence stockpiles to prevent wind whipping.
Operating Vehicle/Machinery & Sustainable Travel	- Ensure all vehicles switch off engines when stationary - no idling vehicles. - Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable. - Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate) - Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials - Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)
Operations	- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems. - Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. - Use enclosed chutes and conveyors and covered skips. - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. - Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management	Avoid bonfires and burning of waste materials
Earthworks & Construction	- Avoid scabbling (roughening of concrete surfaces) if possible - Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Trackout	- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. - Avoid dry sweeping of large areas. - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.

Issue	Control Measure
	- Record all inspections of haul routes and any subsequent action in a site log book. - Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

5.1.6 Step 4 – Residual Impacts

Assuming the relevant mitigation measures outlined in Table 12 are implemented, the residual effect from all dust generating activities is predicted to be negligible and therefore **not significant** in accordance with the IAQM guidance³.

5.2 Operational Phase Assessment

The assessment was undertaken in accordance with the methodology detailed in Section 3.2.

5.2.1 Future Exposure

Annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were predicted across the Proposed Development for the 2020 DS scenario at a height of 1.5m to represent exposure across the ground floor level, as shown in Figures 7 to 9 within Appendix A.

Background NO₂ PM₁₀ and PM_{2.5} 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 are considered acceptable in regards to future exposure and have not been assessed further.

Nitrogen Dioxide (NO₂)

Predicted annual mean NO₂ concentrations across the Proposed Development site during the DS scenario are summarised in Table 13.

Table 13: Modelling Results - Annual Mean NO₂ at Proposed Development

Floor Level	Predicted 2020 Annual Mean NO ₂ Concentration (µg/m ³)
Ground (1.5m)	31.5 – 34.7

The predicted concentrations shown in Table 13 indicate that there were no exceedances of the AQO across sensitive areas of the Proposed Development. As such, it is considered that annual mean NO₂ levels at the Proposed Development site should not be viewed as a constraint to development.

Predictions of 1-hour NO₂ concentrations were not produced as part of the dispersion modelling assessment. LAQM.(TG16)² states if annual mean NO₂ concentrations are below 60µg/m³ then it is unlikely that the 1-hour AQO will be exceeded. As such, based on the results in Table 13, it is not predicted that on-site concentrations will exceed the 1-hour mean AQO for NO₂.

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

Particulate Matter (PM₁₀)

Predicted annual mean PM₁₀ concentrations across the Proposed Development site during the DS scenario are summarised in Table 14.

Table 14: Modelling Results - Annual Mean PM₁₀ and PM_{2.5} at Proposed Development

Floor Level	Predicted 2020 Annual Mean Concentration (µg/m ³)
	PM ₁₀
Ground (1.5m)	15.9 - 16.3

The predicted concentrations shown in Table 14 indicate that there were no exceedances of the annual mean AQOs for PM₁₀ or PM_{2.5} throughout the modelling area. As such, it is considered that annual mean PM₁₀ or PM_{2.5} levels at the Proposed Development site should not be viewed as a constraint to development.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for proposed end use without the implementation of mitigation techniques to protect future site users from elevated PM₁₀ and PM_{2.5} concentrations.

PM_{2.5} has not been modelled within the assessment as the predicted concentrations relating to annual mean PM₁₀ remain well below the AQO for PM_{2.5} (25µg/m³) and associated impacts have been deemed not significant. Since PM₁₀ contains all particulate matter with an aerodynamic diameter of less than 10µm, PM_{2.5} is effectively accounted for within these predictions; and at worst could be considered that PM_{2.5} concentrations would be equal to the predicted PM₁₀ concentrations.

5.2.2 Road Vehicle Exhaust Emission Impacts

Any additional vehicle movements associated with the Proposed Development will generate exhaust emissions, such as NO₂, PM₁₀ and PM_{2.5} on the local and regional road networks.

Based on the information provided by Crosby Transport Planning, the appointed Transport Consultants, the development will generate an average of 34 two-way vehicle movements per day. Therefore, the development will not result in a change of AADT flows of more than 100, produce over 25 HDV movements per day or significantly affect average speeds on the local road network.

Subsequently, potential air quality impacts associated with operational phase road vehicle exhaust emissions are predicted to be **not significant** in accordance the EPUK and IAQM⁴ screening criteria shown in Section 3.2.2.

6.0 CONCLUSION

Ensafe Consultants were commissioned by the Client to undertake an Air Quality Assessment in support of a proposed residential development at Aspen House, 30 Kings Road, Reading .

During the construction phase of the Proposed 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 potential air quality impacts from dust generated by construction, earthworks and trackout activities was predicted to be **not significant**.

Dispersion modelling was undertaken to quantify annual mean NO₂, PM₁₀ and PM_{2.5} concentrations across the application to assess suitability for proposed use. Modelling results were subsequently verified using RBC local monitoring data.

The dispersion modelling results indicated that annual mean NO₂, PM₁₀ and PM_{2.5} concentrations across the application site were below the relevant AQOs at the proposed sensitive use. The site is therefore considered suitable for the proposed end-use without the implementation of protective mitigation techniques to protect future amenity.

An assessment was undertaken using the EPUK and IAQM screening criteria to determine the potential for vehicle trips generated by the Proposed Development to affect local air quality. The traffic data provided by Crosby Transport Planning, indicated that Proposed Development is anticipated to generate a maximum AADT flow of 34 on the local road network. Anticipated development traffic flows are **below** the relevant EPUK and IAQM assessment thresholds and operational impacts could be screened out as **not significant**.

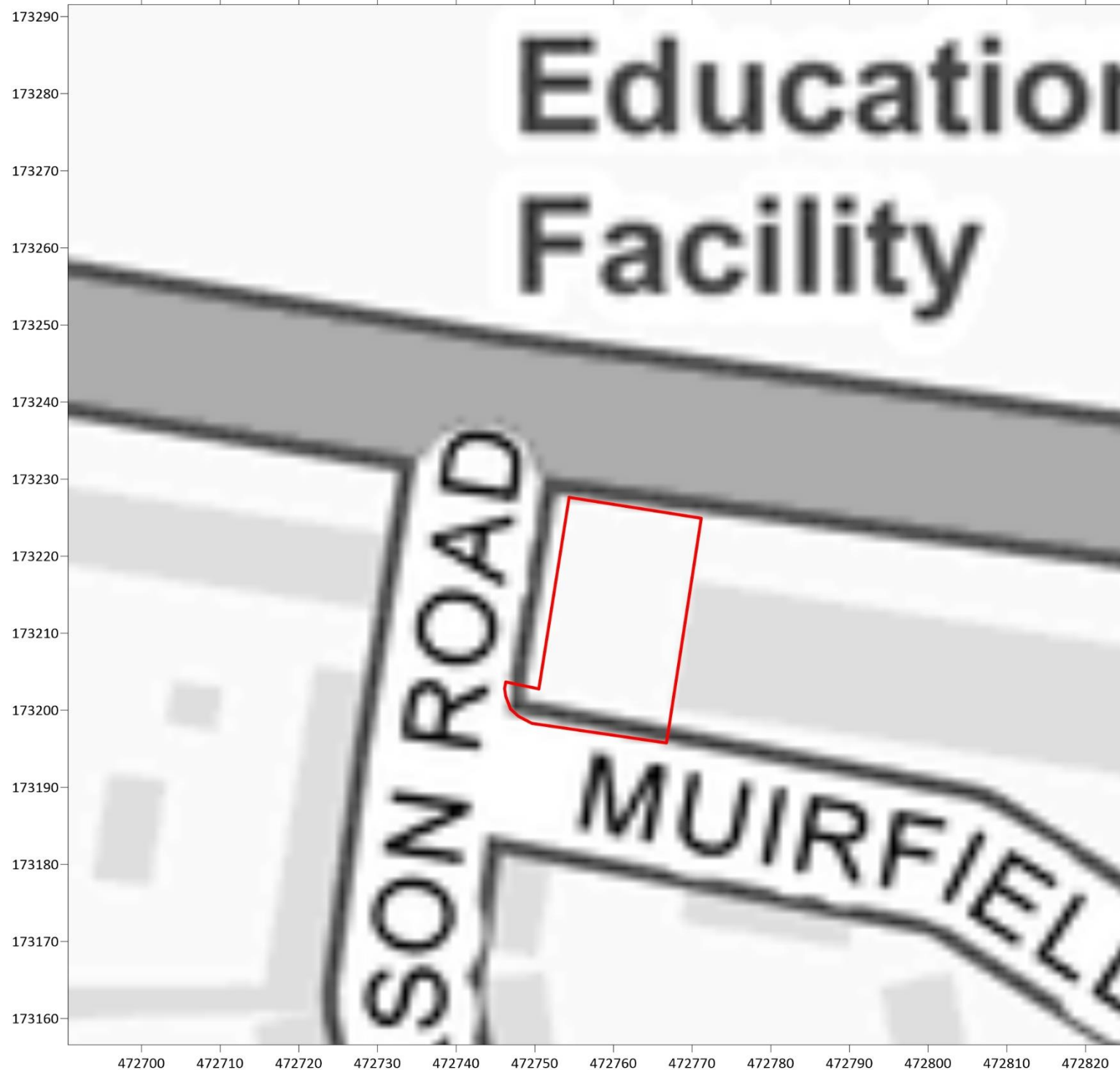
Based on the assessment results the site is considered suitable for the proposed end use and complies with the RBC Local Plan and NPPF.

7.0 ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DS	Do Something
DMP	Dust Management Plan
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LA	Local Authority
LDV	Light Duty Vehicle
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
TEMPRO	Trip End Model Presentation Program
z ₀	Roughness Length

END OF REPORT

APPENDIX A - FIGURES



Legend

 Site Boundary

Title

Figure 1
Site Location

Project

Aspen House, 300 Kings Road, Reading

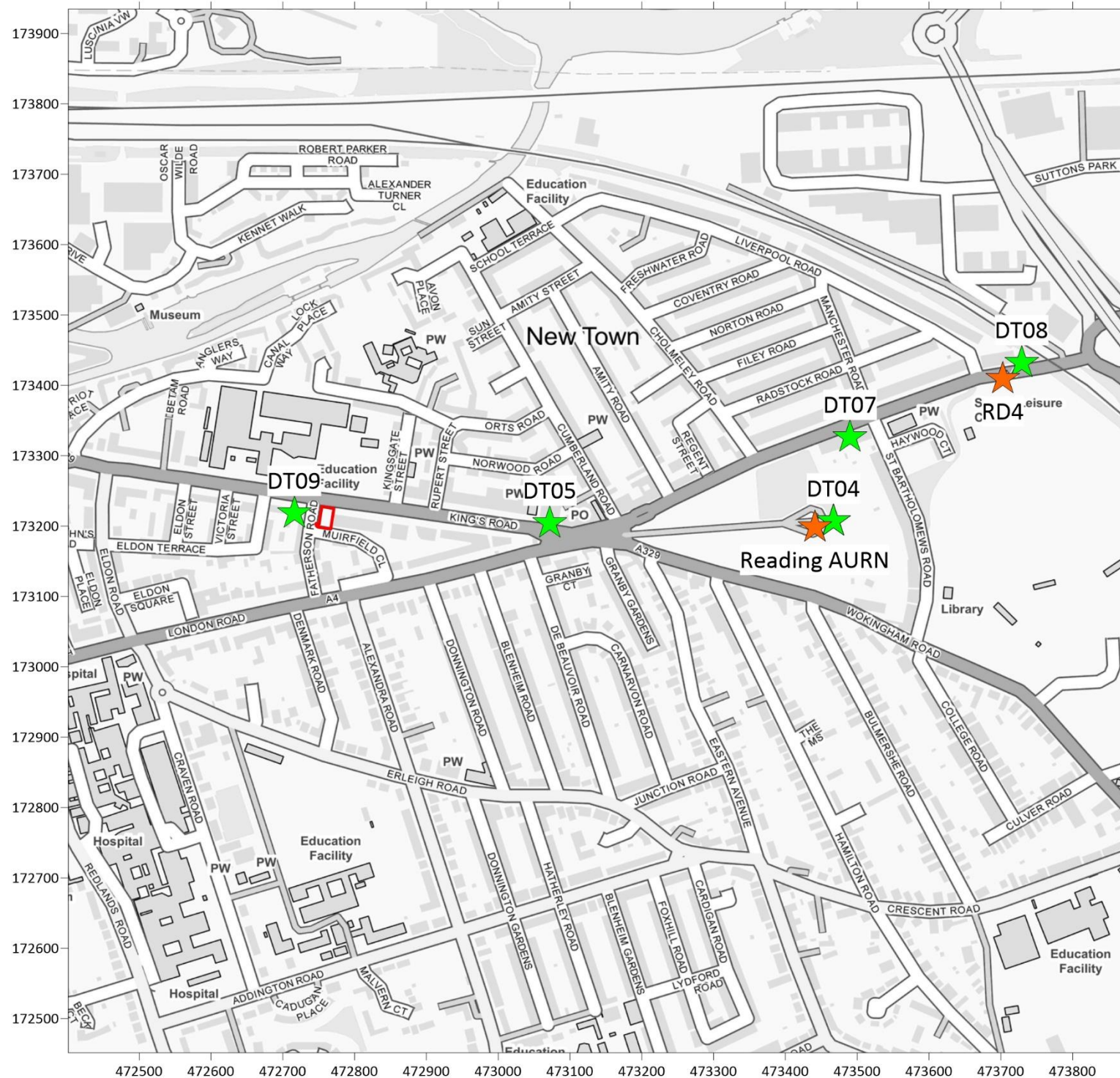
Project Number

AQ75801

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- Legend**
- Site Boundary
 - Diffusion Tube Monitoring Locations
 - Automatic Analyser Monitoring Location

Title
Figure 2
Diffusion Tube Monitoring Locations

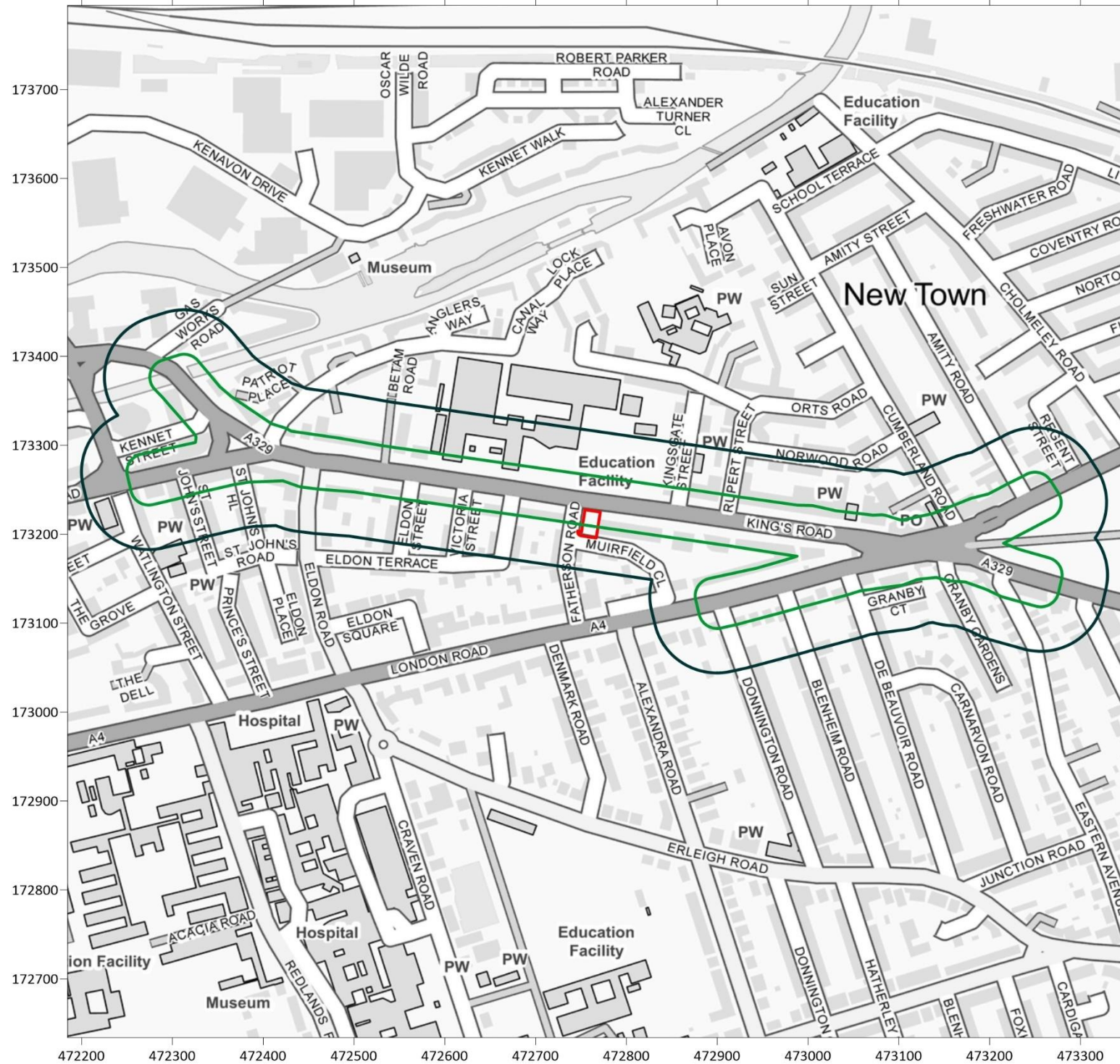
Project
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Legend

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

Title

Figure 4
Trackout Dust Buffer Zones

Project

Aspen House, 300 Kings Road, Reading

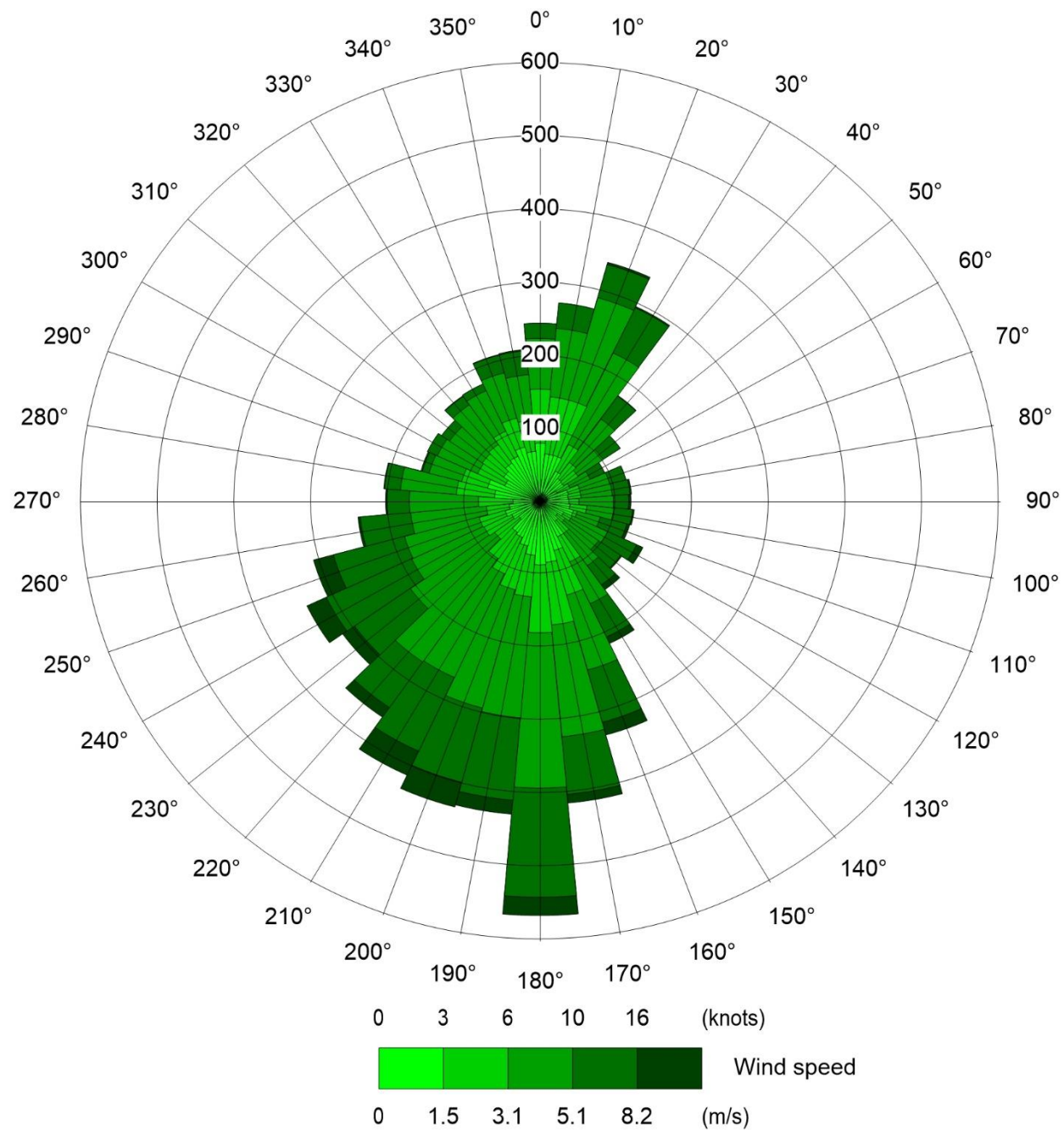
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Title

Figure 5

Wind Rose 2016 Benson
Meteorological Station

Project

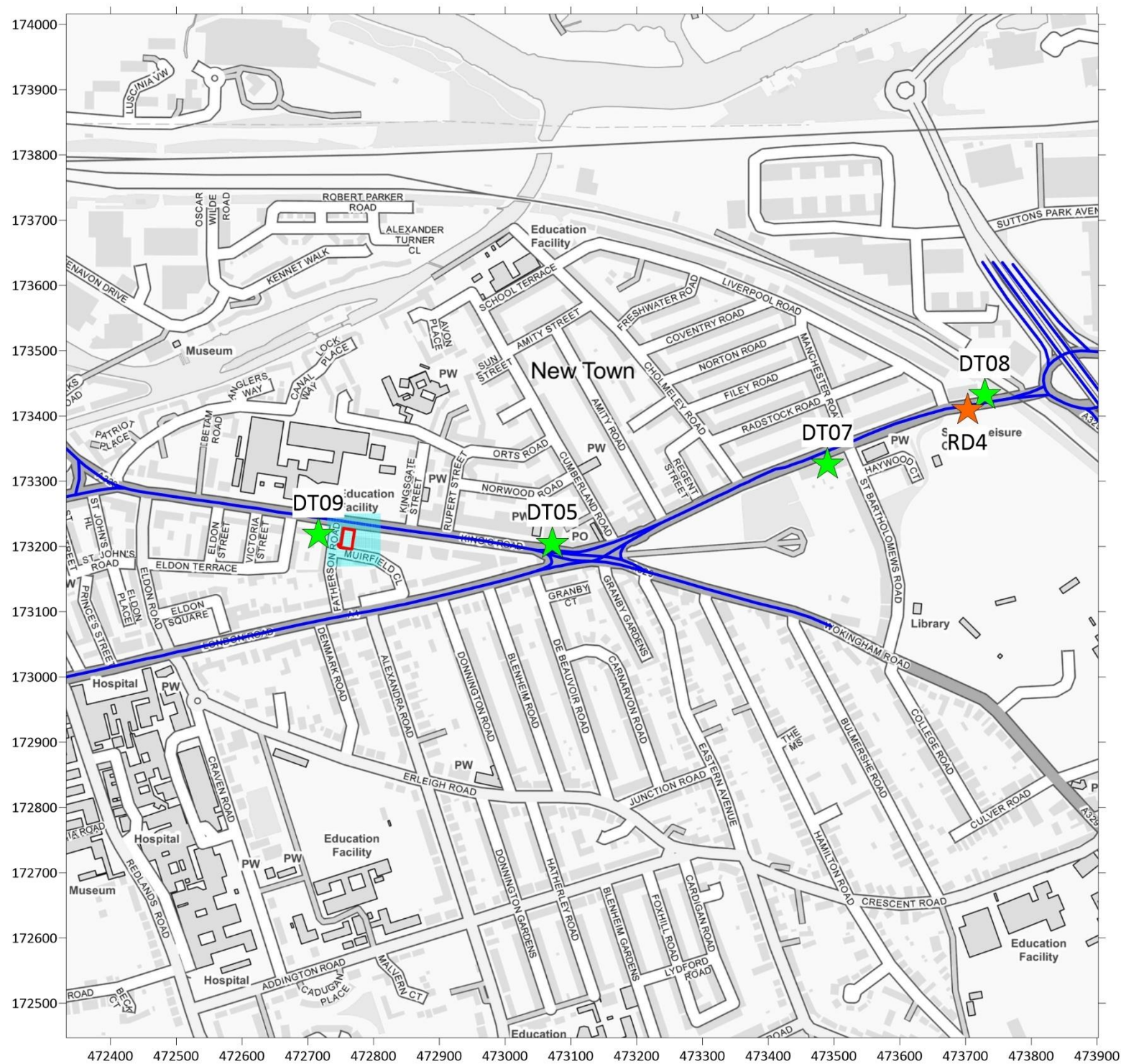
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Project Number

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

Figure 6
ADMS-Roads Input

Aspen House, 300 Kings Road, Reading

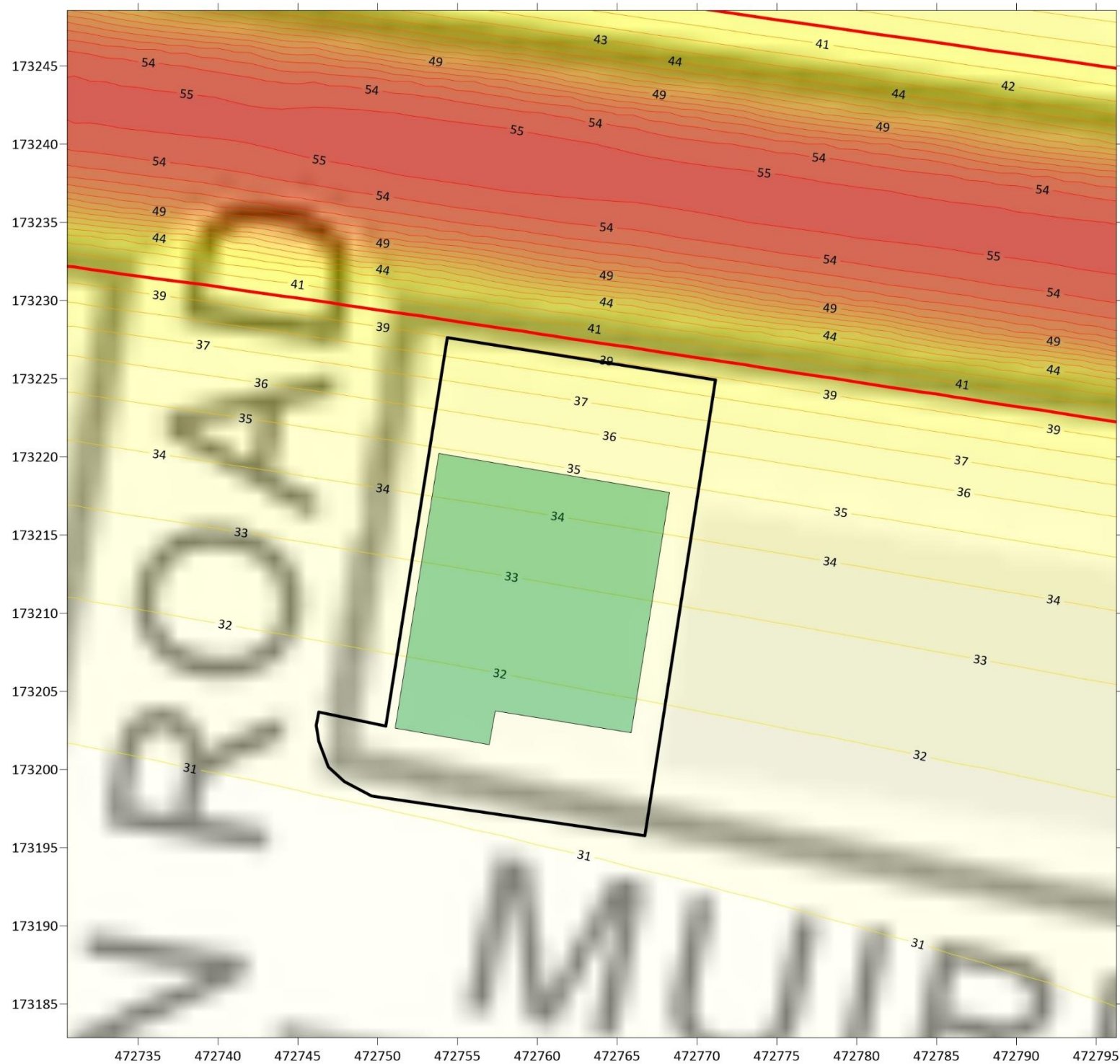
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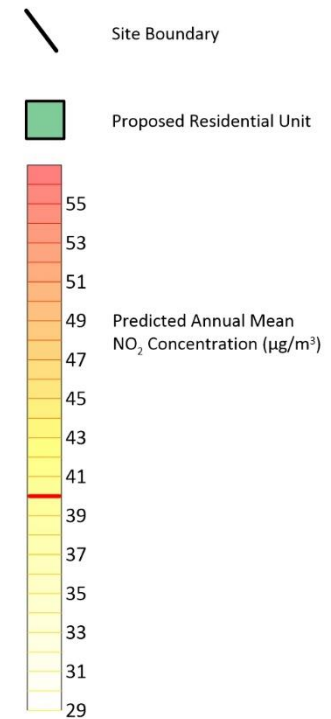
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Legend



Title

Figure 7
Predicted Annual Mean NO₂
Concentrations (µg/m³)

Project

Aspen House, 300 Kings Road, Reading

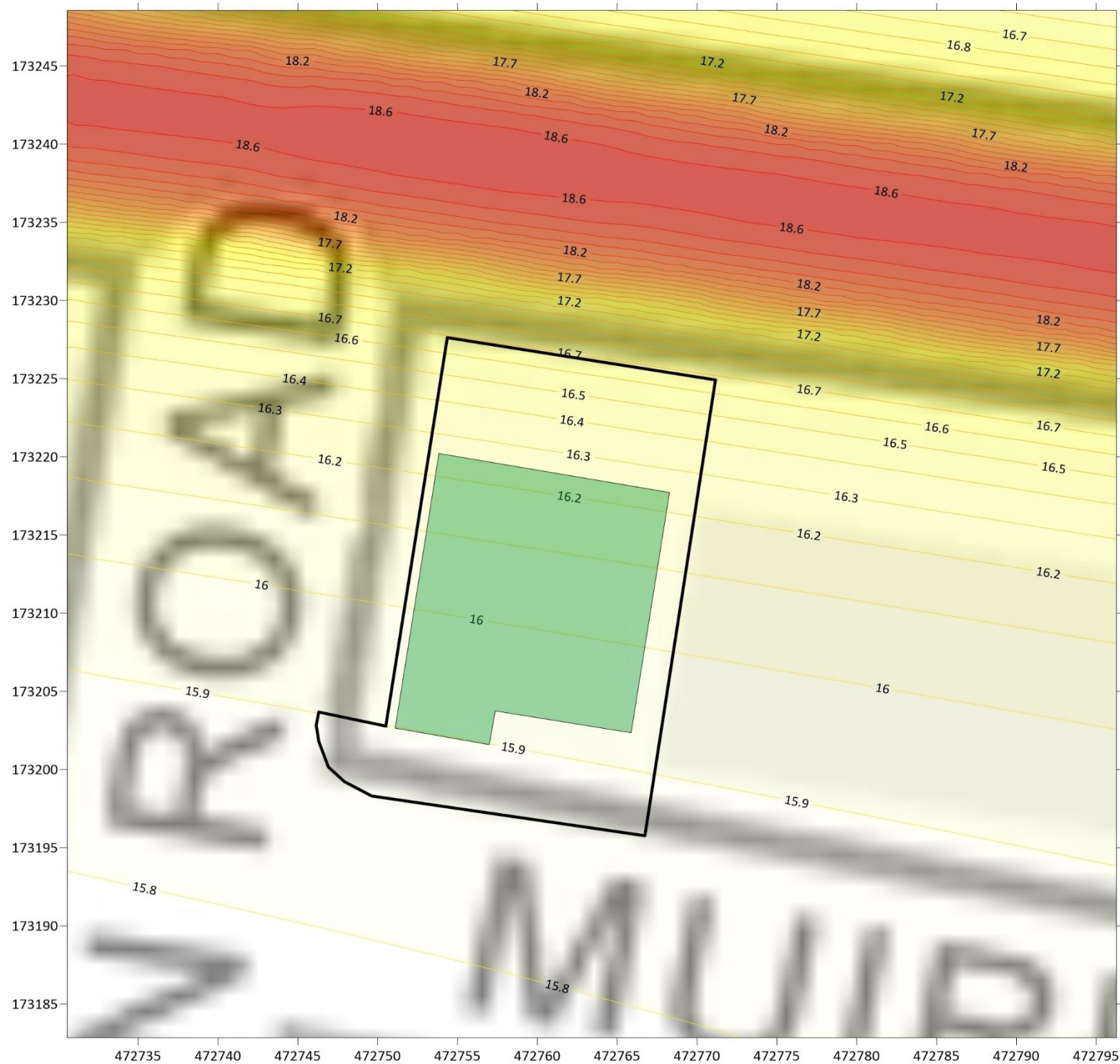
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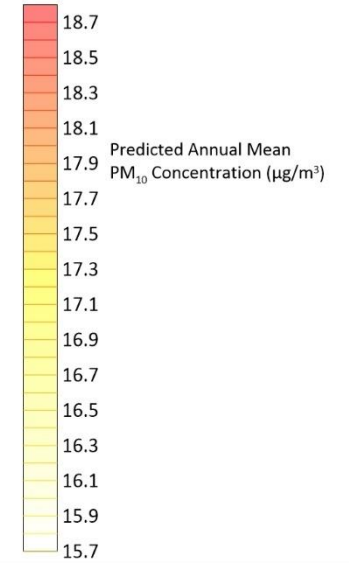


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Legend

- Site Boundary
- Proposed Residential Unit



Title

Figure 8
Predicted Annual Mean PM₁₀
Concentrations (µg/m³)

Project

Aspen House, 300 Kings Road, Reading

Project Number

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APPENDIX B – ASSESSMENT INPUTS

ASSESSMENT INPUTS

The Proposed Development has the potential to introduce future site users to poor air quality. Dispersion modelling using ADMS Roads was therefore undertaken to predict pollutant concentrations across the site to consider site suitability for the proposed end-use.

The assessment was undertaken in accordance with the guidance contained within the DEFRA document LAQM.TG(16)² and the EPUK and IAQM guidance⁴.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0). 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.

The model requires input data that details the following parameters:

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

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: 472730, 173180 and 473790, 173240 at height of 1.5m to represent the proposed ground floor level for the 2020 opening year scenario.

Results were subsequently used to produce contour plots within the Surfer software package. Reference should be made to Figure 6 within Appendix A for a graphical representation of the verification inputs and operation phase DS extents, respectively.

Traffic Flow Data

Development flow traffic data and associated network distribution was provided by Crosby Transport Planning, the appointed Transport Consultants for the scheme, and indicated that a total flow generation of 34 AADT is anticipated as a result of the Purposed Development.

Baseline traffic data for the following road links were obtained from the Department for Transport (DfT):

- A3290;
- Forbury Road
- Kings Road;
- London Road;
- Queen Road;
- Wokingham Road; and
- Watlington Street

The DfT Matrix web tool enables the user to view and download traffic flows on every link of the A-road and motorway network in Great Britain for the years 1999 to 2019. The DfT matrix is referenced in DEFRA guidance LAQM.TG(16)² as being a suitable

source of data for air quality assessments and is therefore considered to provide a reasonable representation of traffic flows in the vicinity of the site.

Growth factors provided by the Trip End Model Presentation Program (TEMPRO) software package were utilised to allow for conversion from the obtained 2016 traffic flow to 2020 which was used to represent the opening year scenario. Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards.

A summary of the traffic data used in the verification scenario is provided in Table B1.

Table B1: 2016 Verification Traffic Data

Road Link		Road Width (m)	Canyon Height	24 Hour AADT Flow	HDV Pop (%)	Mean Vehicle Speed (km/hr)	Data Source
L1	King's Road Speed Up at Eldon Road	15.8	0.0	20,743	5.5	24	DfT
L2	King's Road	12.4	0.0	20,743	5.5	40	DfT
L3	King's Road Slowdown	13.0	0.0	20,743	5.5	24	DfT
L4	King's Road onto London Road North of Junction	6.3	0.0	10,372	5.5	24	DfT
L5	King's Road onto Wokingham Road	5.8	0.0	9,211	2.0	24	DfT
L6	King's Road onto London Road South of Junction	9.7	0.0	444	6.5	24	DfT
L7	London Road Slowdown North of Junction	6.8	0.0	9,298	4.8	24	DfT
L8	Wokingham Road Slowdown	6.1	0.0	5,357	4.4	24	DfT
L9	Bus Lane onto King's Road	3.8	0.0	717	100.0	40	DfT
L10	London Road Speed Up South of Junction	5.7	0.0	12,331	4.6	24	DfT
L11	London Road onto Wokingham Road	5.2	0.0	2,325	4.8	24	DfT
L12	Wokingham Road	8.6	0.0	10,714	4.4	40	DfT
L13	London Road North of Junction	8.1	0.0	23,245	4.8	40	DfT
L14	London Road Slowdown at Cholmeley Road	8.1	0.0	23,245	4.8	24	DfT
L15	London Road	8.4	0.0	23,245	4.8	40	DfT
L16	London Road Slowdown at Manchester Road	8.4	0.0	23,245	4.8	24	DfT
L17	London Road	8.3	0.0	23,245	4.8	40	DfT
L18	London Road South of Junction	8.5	0.0	12,774	4.7	40	DfT
L19	London Road Slowdown at Alexandra Road	9.8	0.0	12,774	4.7	24	DfT
L20	London Road	8.6	0.0	12,774	4.7	40	DfT
L21	London Road Slowdown at Eldon Road	13.5	0.0	12,774	4.7	24	DfT
L22	London Road	10.2	0.0	12,774	4.7	40	DfT
L23	Watlington Street onto King's Road	11.6	0.0	20,743	5.5	24	DfT
L24	King's Road onto Queen's Road Bus Lane	5.4	0.0	717	100.0	24	DfT
L25	Watlington Street	9.3	0.0	21,182	2.3	40	DfT
L26	Queen's Road Speed Up	3.2	0.0	10,029	2.3	24	DfT
L27	Queen's Road Slowdown	10.4	0.0	10,029	2.3	24	DfT

Road Link		Road Width (m)	Canyon Height	24 Hour AADT Flow	HDV Pop (%)	Mean Vehicle Speed (km/hr)	Data Source
L28	Queen's Road	15.9	0.0	20,057	2.3	40	DfT
L29	Forbury Road Speed Up	7.9	0.0	11,014	2.8	24	DfT
L30	Forbury Road Slowdown	6.5	0.0	11,014	2.8	24	DfT
L31	London Road Slowdown at Roundabout	6.2	0.0	11,623	4.8	24	DfT
L32	London Road Speed Up at Roundabout	6.4	0.0	11,623	4.8	24	DfT
L33	Roundabout	8.1	0.0	13,854	2.0	24	DfT
L34	A3290 Southbound Slowdown	7.2	0.0	3,032	3.3	24	DfT
L35	A3290 Southbound	7.6	0.0	3,032	3.3	88	DfT
L36	Southbound Flyover	7.0	6.0	30,322	3.3	104	DfT
L37	A3290 Northbound Slowdown	11.1	0.0	3,032	3.3	24	DfT
L38	A3290 Northbound	10.6	0.0	3,032	3.3	88	DfT
L39	Northbound Flyover	7.3	6.0	30,322	3.3	104	DfT
L40	London Road Eastbound West of Roundabout	7.5	0.0	10,022	3.7	24	DfT
L41	London Road Westbound West of Roundabout	8.8	0.0	10,022	3.7	24	DfT
L42	Suttons Business Park Southbound	8.8	0.0	3,032	3.3	88	DfT
L43	Suttons Business Park Southbound Slowdown at Roundabout	6.9	0.0	3,032	3.3	24	DfT
L44	Suttons Business Park Northbound	5.3	0.0	3,032	3.3	88	DfT
L45	Suttons Business Park Northbound Speed Up at Roundabout	7.5	0.0	3,032	3.3	24	DfT

Reference should be made to Figure 6 within Appendix A for a graphical representation of the road link locations used within the verification assessment. The road width, **canyon height** and mean vehicle speed shown in Table B1 remained the same for the 2020 scenarios.

A summary of the 2020 traffic data is shown in Table B2.

Table B2: 2020 Traffic Data

Road Link		DS Scenario	
		24 Hr AADT Flow	HDV Prop (%)
L1	King's Road Speed Up at Eldon Road	21,759	5.5
L2	King's Road	21,759	5.5
L3	King's Road Slowdown	21,759	5.5
L4	King's Road onto London Road North of Junction	10,880	5.5
L5	King's Road onto Wokingham Road	10,414	1.8
L6	King's Road onto London Road South of Junction	465	6.5
L7	London Road Slowdown North of Junction	9,754	4.8

Road Link		DS Scenario	
		24 Hr AADT Flow	HDV Prop (%)
L8	Wokingham Road Slowdown	5,619	4.4
L9	Bus Lane onto King's Road	752	100.0
L10	London Road Speed Up South of Junction	12,935	4.6
L11	London Road onto Wokingham Road	2,438	4.8
L12	Wokingham Road	11,239	4.4
L13	London Road North of Junction	24,384	4.8
L14	London Road Slowdown at Cholmeley Road	24,384	4.8
L15	London Road	24,384	4.8
L16	London Road Slowdown at Manchester Road	24,384	4.8
L17	London Road	24,384	4.8
L18	London Road South of Junction	13,400	4.7
L19	London Road Slowdown at Alexandra Road	13,400	4.7
L20	London Road	13,400	4.7
L21	London Road Slowdown at Eldon Road	13,400	4.7
L22	London Road	13,400	4.7
L23	Watlington Street onto King's Road	21,759	5.5
L24	King's Road onto Queen's Road Bus Lane	752	100.0
L25	Watlington Street	21,969	2.3
L26	Queen's Road Speed Up	10,520	2.3
L27	Queen's Road Slowdown	10,520	2.3
L28	Queen's Road	21,040	2.3
L29	Forbury Road Speed Up	11,554	2.8
L30	Forbury Road Slowdown	11,554	2.8
L31	London Road Slowdown at Roundabout	12,192	4.8
L32	London Road Speed Up at Roundabout	12,192	4.8
L33	Roundabout	14,533	2.0
L34	A3290 Southbound Slowdown	3,181	3.3
L35	A3290 Southbound	3,181	3.3
L36	Southbound Flyover	31,808	3.3
L37	A3290 Northbound Slowdown	3,181	3.3
L38	A3290 Northbound	3,181	3.3
L39	Northbound Flyover	31,808	3.3
L40	London Road Eastbound West of Roundabout	10,513	3.7
L41	London Road Westbound West of Roundabout	10,513	3.7
L42	Suttons Business Park Southbound	3,181	3.3
L43	Suttons Business Park Southbound Slowdown at Roundabout	3,181	3.3

Road Link		DS Scenario	
		24 Hr AADT Flow	HDV Prop (%)
L44	Suttons Business Park Northbound	3,181	3.3
L45	Suttons Business Park Northbound Speed Up at Roundabout	3,181	3.3

Reference should be made to Figure 6 within Appendix A for a graphical representation of the road link locations used within the operation phase assessment.

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 20017, which incorporates updated COPERT 5v11 vehicle emissions factors for NO_x, PM₁₀ and PM_{2.5} and EURO 5 vehicle fleet sub-categories.

NO_x to NO₂ Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO₂ concentrations using the NO_x to NO₂ Calculator (v.8.1) provided by DEFRA, which is the method detailed within LAQM.TG(16)².

Meteorological Data

Meteorological data used in this assessment was taken from Benson meteorological station over the period 1st January 2016 to 31st December 2016 (inclusive).

Benson meteorological station is located at approximate NGR: 462190, 191600 which is approximately 21km north west of the Proposed Development. Although there is a large distance between the application site and Benson the use of this data has prior approval from the Environmental Health Department at RBC 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 A for a wind rose of utilised meteorological data.

Roughness Length

The specific roughness length (z_0) values used to represent conditions during the verification process, DS scenario, as well as conditions at the Benson meteorological station are summarised in Table B3.

Table B3: Utilised Roughness Lengths

Scenario	Roughness Length (m)	ADMS Description
Verification, DM and DS Scenarios	1	Cities and Woodlands
Benson meteorological station	0.3	Agricultural areas (max)

These values of z_0 are considered appropriate for the morphology of the assessment area.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere within certain urban or rural contexts. The specific length values used to represent conditions during the verification process, DS scenario, as well as conditions at the Benson are summarised in Table B4.

Table B4: Utilised Monin-Obukhov Lengths

Scenario	Monin-Obukhov Length (m)	ADMS Description
Verification, DM and DS Scenarios	30	Cities and large towns
Benson meteorological station	10	small towns <50,000

This Monin-Obukhov value is considered appropriate for the morphology of the assessment area.

Background Concentrations

The 2016 annual mean background concentrations detailed in Table 5, was used in the dispersion modelling assessment to represent annual mean pollutant levels at the Proposed Development site and local monitoring sites.

Table B5 displays the specific background concentrations as predicted by DEFRA, utilised to represent the condition at the monitoring locations used within the verification process.

Table B5: Predicted Background Pollutant Concentrations for Monitoring Locations

Monitoring Location	DEFRA Grid Square	Pollutant	2016 Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)
DT09	472500, 173500	NO _x	39.23
		NO ₂	25.36
		PM ₁₀	15.32
		PM _{2.5}	9.75
RD4, DT05, DT07, DT08	473500, 173500	NO _x	35.99
		NO ₂	23.68
		PM ₁₀	15.27
		PM _{2.5}	6.98

Verification

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

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

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

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

RBC undertakes periodic monitoring of NO₂ concentrations at 5 roadside monitoring location 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 DEFRA guidance LAQM.TG(16)². The monitored annual mean NO_x concentration and calculated road NO_x concentration are summarised in Table B6.

Table B6: NO_x Concentrations

Site ID	Monitored Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)	% Difference ((Monitored - Modelled)/Monitored) * 100
RD4	16.94	20.86	-23%
DT05	56.50	27.83	51%
DT07	39.33	17.43	56%
DT08	39.33	16.11	59%
DT09	13.52	10.34	24%

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trend line based on the linear progression through zero was calculated, as shown in Graph 1

This indicated that a verification factor of **1.8004** was required to be applied to all NO_x modelling results, showing the model overestimated pollutant concentrations throughout the assessment extents.

Graph 1 is provided below.

Graph 1 - Verification Adjustment Factor

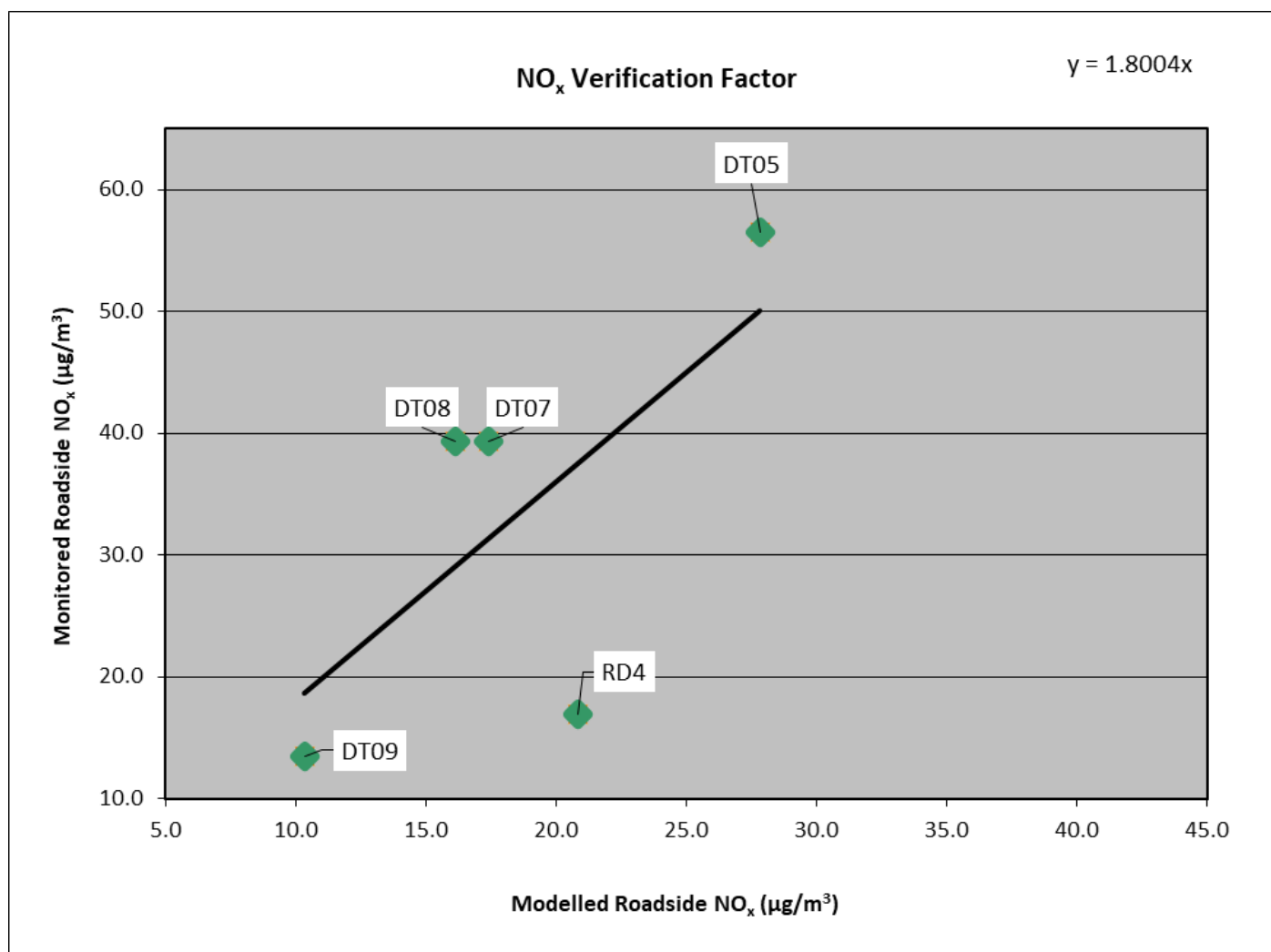


Table B7 presents the monitored annual mean NO₂ concentrations and the adjusted modelled total NO₂ concentration based on the above verification factor. Exceedances of the annual mean NO₂ AQO are highlighted in **bold**.

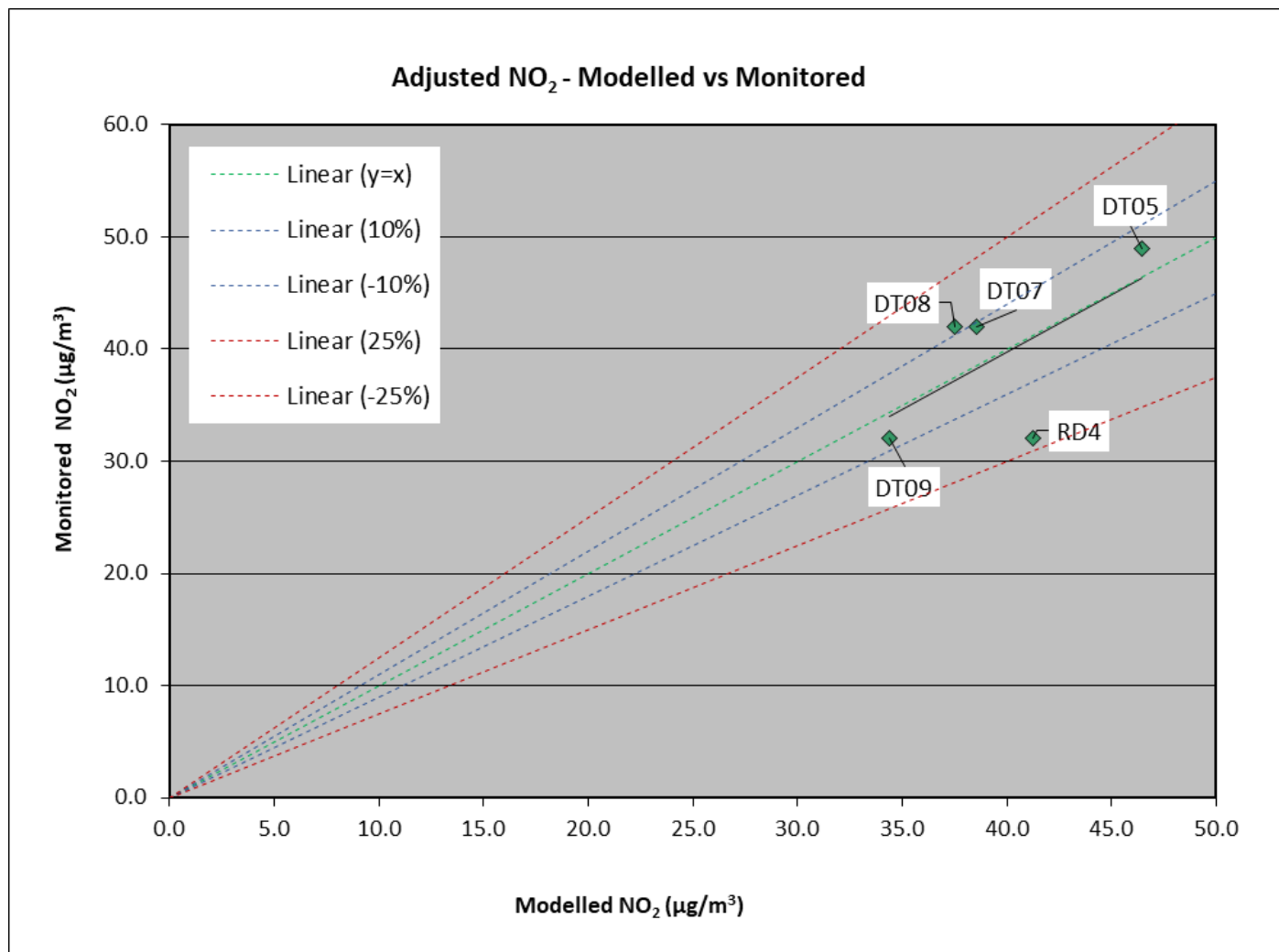
Table B7: NO₂ Concentrations

Site ID	Monitored Road NO ₂ Concentration (µg/m³)	Adjusted Modelled Road NO ₂ Concentration (µg/m³)	% Difference ((Monitored - Modelled)/Monitored) * 100
RD4	32.00	41.24	-29%
DT05	49.00	46.46	5%
DT07	42.00	38.57	8%
DT08	42.00	37.52	11%
DT09	32.00	34.39	-7%

As demonstrated in Table B7, the percentage difference between modelled and monitored concentrations is deemed acceptable and is less than 25% in all cases, and less than 10% at Insert Number locations. This reduces uncertainties in the model predictions and provide a robust representation of pollutant concentrations in accordance with the guidance suggested in LAQM.TG(16)².

A graphical representation of the adjusted NO₂ concentrations is provided within Graph 2.

Graph 2 – Modelled vs Monitored NO₂



RBC also undertakes monitoring of annual mean PM₁₀ concentrations at two monitoring locations within the assessment extents, it was therefore possible to provide a separate PM₁₀ verification factor. The dispersion model was run with the traffic input data previously detailed for 2016 to predict the 2016 concentration at the monitoring locations. The results are shown in Table B8.

Table B8: PM₁₀ Concentrations

Site ID	Modelled Road PM ₁₀ Concentration (µg/m³) ^a	Monitored Road PM ₁₀ Concentration (µg/m³) ^b	Background PM ₁₀	Monitored PM ₁₀	Adjustment Factor ^c
RD4	1.62	2.11	15.27	19.00	1.1249

Where:

- ^a Raw modelled road contribution from ADMS model file (.plt)
- ^b Calculated by subtracting the background concentration from the monitored concentration in line with LAQM.TG(16)
- ^c Adjustment Factor applied to modelled total PM₁₀ results [Monitored Road PM₁₀/Modelled Road PM₁₀]

The monitored and modelled PM_{10} road contribution concentrations were compared. This indicated that a verification factor of **1.1249** was required to be applied to all PM_{10} modelling results, showing the model has a tendency to underestimate pollutant concentrations throughout the assessment extents. As $PM_{2.5}$ monitoring is not undertaken within the assessment extents, a PM_{10} adjustment factor of **1.1249** was utilised to adjust model predictions of $PM_{2.5}$ in accordance with the guidance provided within LAQM.TG(16)².

APPENDIX D – CONSTRUCTION PHASE ASSESSMENT CRITERIA

CONSTRUCTION PHASE METHODOLOGY

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'³.

Activities are 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 and PM_{2.5}.

The assessment steps are detailed below.

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.

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
- 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 C1.

Table C1: 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

Magnitude	Activity	Criteria
		- 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
	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	<10 HDV (3.5t) outward movements in any one day - Surface material with low potential for dust release - Unpaved road length <50m

Step 2B defines the sensitivity of the area around the development site for construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table C2.

Table C2: 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	Internationally or nationally designated site e.g. Special Area of Conservation

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
	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	
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 C3.

Table C3: Sensitivity of the Area to Dust Soiling Effects on People and Property

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

Table C4 outlines the sensitivity of the area to human health impacts.

Table C4: 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
	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	Greater than 32µg/m ³	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32µg/m ³	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m ³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	Less than 24µg/m ³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	More than 1	Low	Low	Low	Low	Low

Table C5 outlines the sensitivity of the area to ecological impacts.

Table C5: 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 C6 outlines the risk category from demolition activities.

Table C6: Dust Risk Category from Demolition

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

Table C7 outlines the risk category from earthworks and construction activities.

Table C7: Dust Risk Category from Earthworks and Construction

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

Table C8 outlines the risk category from trackout.

Table C8: Dust Risk Category from Trackout

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

Step 3

Step 3 requires the identification of site-specific mitigation measures within the IAQM 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.

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'.

APPENDIX D – ASSESSORS CURRICULUM VITAE

RACHAEL HARRISON

Air Quality Consultant

BSc (Hons), AMIEnvSc, AIAQM

KEY EXPERIENCE

Rachael is an Environmental Consultant with specialist experience in the air quality sector. His key capabilities include:

- Production of Air Quality Assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, retail and commercial sectors.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of pollutant concentrations at various floor levels and assessment of suitability of development sites for proposed end-use.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Assessment of Odour Impact from commercial and industrial processes in line with Environment Agency (EA) and IAQM methodologies and guidance
- Quantification of Ecological Impacts associated with Nitrogen and Acid Deposition from industrial processes
- Production of air quality mitigation strategies for developments throughout the UK.

SELECT PROJECTS SUMMARY

- Prescott Garden Centre - for a residential development of 227 dwellings.
- Keighley Road, Halifax – Air Quality assessment with dust and odour for residential development adjacent farm.
- New Bedford Road, Luton -AQA for residential redevelopment adjacent rail station
- Sovereign Crescent- AQA for ecological impacts on designated sites as a result of residential development.
- Banbury Magistrates Court – Production of AQA for redevelopment of existing building for residential use.
- Meat Market, Glasgow – AQA for development of residential units

ES Chapters

- Halsnead - Production of a number of ES chapters for large-scale residential developments
- Reading Metropolitan – Road, Rail and Energy Assessment for large-scale mixed use multi storey buildings
- Warburton Lane - EIA for a medium scale residential development within Manchester
- C02 Central Dock - EIA for a large scale residential development of 650 dwellings

Odour Assessments

- Wright Street, Renfrew – Quantitative odour assessment in support of a proposed residential development adjacent to a waste water treatment works.
- Optimus Point, Leicester - Qualitative assessment in support of a warehouse development in close proximity to existing vape production.
- Café Torelli, Kew - Kitchen odour risk assessment in support of a existing coffee shop and hot food takeaway.

London Experience

- The Bear Project - AQA for a mixed use development located within the Lewisham AQMA.
- Summerstown, Merton- AQA for a residential development located within the Merton AQMA and AQN Assessment
- Old Police Station - AQA for a residential development located within the Richmond AQMA
- Kings George's gate, Tolworth - AQA for mixed use scheme in AQMA in Kingston upon Thames, including an AQN and vertical slice modelling.
- Rotherhithe Street, Southwark - AQA for a residential development within the Southwark AQMA

Car Park Developments

- Radcliffe/Whitefield/Hollinwood Park & Rides – A series of extension to existing P&R facilities within Greater Manchester
- Beck Hill MSCP – Development of a multistorey car park in place of existing surface car park.
- Welwyn MSCP - Development of a multistorey car park in place of existing surface car park.

Monitoring & Surveying Experience

- Co-ordination and management of NO2 diffusion tube monitoring surveys in accordance with DEFRA guidance.
- Odour Acuity certified, undertaken numerous site sniff tests

QUALIFICATIONS

- Bachelor of Science
- Odour Acuity Certified Master of Science
- Member of the Institute of Environmental Science (IES)
- Member of Institute of Air Quality Management (IAQM)