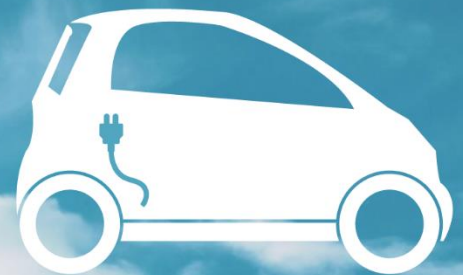




**Air Quality Assessment for
the proposed development
at Caversham Park, Reading**

**Report to Beechcroft
Developments Ltd**

March 2024



Title	Air Quality Assessment for the proposed development at Caversham Park
Client	Beechcroft Developments Ltd
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1 Introduction

Aether has been commissioned by Beechcroft Developments Ltd to undertake an air quality assessment for the proposed development at Caversham Park. From 1943, the site was home to BBC monitoring and related uses; however, in recent years the BBC has been winding down its operations. The development will consist of:

- The retention, alteration and conversion of the Grade II listed Caversham Park House to assisted living apartments (Class C2) and associated works;
- The construction of a new care home building (Class C2) immediately to the west of the main house;
- Construction of 2-storey green roof apartments (C3) in place of the existing car park to the north east of the main house;
- Construction of a courtyard of houses and flats (C3) within the clearing currently occupied by satellite dishes to the east of the main house;
- Construction of a group of houses (C3) in the enclosed field to the north of the BBC Records Centre, fronting Peppard Road and to the south of Caversham Park Drive; and
- Change of use of numbers 1 and 3 Caversham Park Drive from their existing ancillary residential use to C3 dwellings and associated works.

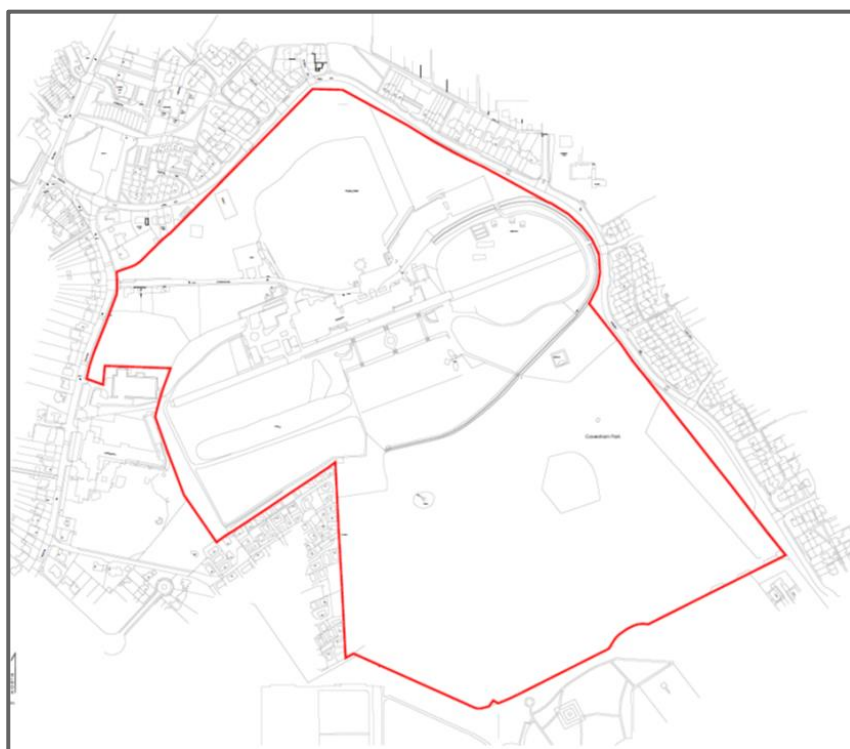
The development falls within the Borough of Reading, which suffers from elevated levels of air pollution, primarily due to high levels of traffic. It is therefore important to assess whether there will be an exceedance of the air quality objectives for particulate matter (PM₁₀ and PM_{2.5}) or nitrogen dioxide (NO₂) at the proposed site and then advise whether any action is required to reduce the residents' exposure to air pollution. In addition, it is imperative to assess the impact of the development on nearby existing receptors. The assessment utilises ADMS-Roads Urban, a comprehensive dispersion modelling tool for investigating air pollution problems due to small networks of roads and industrial sources.

A base year of 2022 has been selected as this is the most recent full calendar year that monitoring data is available for. The expected completion date of the proposed development is 2027. The assessment has therefore been completed for 2028, the expected first full year of occupation.

1.1 The Location of the Development

The proposed development is located in Caversham Park, Reading (**Figure 1**).

Figure 1: Location of the development site



1.2 Assessment Criteria

A summary of the AQOs relevant to the proposed development, as set out in the UK Air Quality Strategy¹ and Air Quality Standards Regulations 2010 (as amended by the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020²), is presented in **Table 1** below.

Table 1: UK Air Quality Objectives for NO₂ and PM₁₀ and target for PM_{2.5}

Pollutant	Concentration	Measured as
NO ₂	40 m ³ /m ³	Annual mean
	200 µg/m ³	Hourly mean not to be exceeded more than 18 times per year (99.8 th percentile)
PM ₁₀	40 µg/m ³	Annual mean
	50 µg/m ³	24 hour mean not to be exceeded more than 35 times a year (90.4 th percentile)
PM _{2.5}	20 µg/m ³	Annual mean

In January 2023, legally binding PM_{2.5} Annual Mean Concentration Target (AMCT) were prescribed in the Environmental Targets (Fine Particulate Matter) (England) Regulations

¹Department of the Environment, Transport and the Regions in Partnership with the Welsh Office, Scottish Office and Department of the Environment for Northern Ireland, 2007. The Air Quality Strategy for England, Scotland, Wales, Northern Ireland. HMSO, London.

² Statutory Instrument 2020, No. 000, The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

2023³ and also published in the Environmental Improvement Plan⁴. The PM_{2.5} AMCT to be achieved by the end of 2040 are:

- Annual average of 10 µg/m³ not to be exceeded at any monitoring station.
- Population exposure at least 35% less than in 2018.

The Environmental Improvement Plan also includes an interim target of 12 µg/m³ to be achieved by the end of January 2028.

Analysis of long-term monitoring data⁵ suggests that if the annual mean NO₂ concentration is less than 60 µg/m³ then the one-hour mean NO₂ objective is unlikely to be exceeded where road transport is the main source of pollution; this concentration has been used in this assessment to screen whether the one-hour mean objective is likely to be achieved. Similarly to NO₂, a PM₁₀ annual mean below 32 µg/m³ is used to screen whether the 24-hour PM₁₀ mean objective is likely to be achieved.

As defined by the regulations, the AQOs for the protection of human health are applicable outside of buildings (or other natural or man-made structures above or below ground) and where members of the public are regularly present. AQOs do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (i.e., centre of roadways). Guidance on where the AQOs should and should not apply is provided within LAQM.TG (22)⁶, as detailed in Table 2.

Table 2: Locations where the AQOs should and should not generally apply

Averaging Period	Objectives Should Apply at	Objectives Should Generally 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.
24-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1-hour mean	All locations where the annual mean and: 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully	Kerbside sites where the public would not be expected to have regular access.

³ Statutory Instrument 2023, No. 96, The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023.

⁴ Defra, 2023. Environmental Improvement Plan 2023. Available from: <https://www.gov.uk/government/publications/environmental-improvement-plan/environmental-improvement-plan-2023-executive-summary>

⁵ Defra, 2022. Local Air Quality Management Technical Guidance (England) 2022 (TG22). HMSO.

⁶ Defra, 2022. Local Air Quality Management Technical Guidance (England) 2022 (TG22). HMSO. <https://laqm.defra.gov.uk/air-quality/featured/uk-regions-exc-london-technical-guidance/>

Averaging Period	Objectives Should Apply at	Objectives Should Generally Not Apply at
	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 expect to spend one hour or longer.	

Using these recommendations, the annual mean objectives will apply at locations where members of the public might be regularly exposed such as building façades of residential properties, schools and hospitals and will not apply at the building façades of offices or other places of work, where members of the public do not have regular access.

In this assessment, the annual, 24-hour and 1-hour mean objectives will apply at the proposed residential development.

1.3 Local Air Quality Management

Local authorities are required to periodically review and assess the current and future quality of air in their areas. Where it is determined that an air quality objective is not likely to be met, the authority must designate an Air Quality Management Area (AQMA) and produce an Air Quality Action Plan (AQAP).

The Borough of Reading has declared one AQMA⁷ covering the town centre and major radial routes into Reading. This AQMA was declared in 2009 due to exceedances of the NO₂ objective. The proposed development is outside of this AQMA. Reading's latest AQAP was published in 2024 and identifies actions to improve air quality in the region for the period 2024-2029.⁸

1.4 The ADMS-Roads Method

Local air quality has been assessed using ADMS-Roads Urban, a comprehensive dispersion model that can be used to predict concentrations of pollutants in the vicinity of roads and small industrial sources. The model has been used for many years in support of planning applications for new residential/commercial developments.

ADMS-Roads Urban is able to provide an estimate of air quality both before and after development, taking into account important input data such as background pollutant concentrations, meteorological data, traffic flows and on-site energy generation (if applicable). The model output can be verified against local monitoring data to increase the accuracy of the predicted pollutant concentrations and this approach has been followed in this assessment.

The use of dispersion modelling enables estimates of concentrations to be made at varying heights. As a result, suggestions for appropriate mitigation measures can be

⁷ https://uk-air.defra.gov.uk/aqma/details?aqma_ref=467

⁸ <https://www.reading.gov.uk/climate-and-pollution/air-quality-action-plan/>

made where necessary, taking into consideration the identification of worst-case locations.

The most recent version of ADMS-Roads (v5.0.1) was issued in March 2022 and requires the following information to assess the impact at sensitive receptor locations:

- **Setup:** General site details and modelling options to be used
- **Source:** Source dimensions and locations, release conditions, emissions
- **Meteorology:** hourly meteorological data
- **Background:** Background concentration data
- **Grids:** Type and size of grid for output
- **Output:** Output required and sources/groups to include in the calculations.

2 Methodology

2.1 Local Pollutant Concentrations

It is good practice to include up-to-date local background pollutant concentrations in the assessment model, and also to verify modelled outputs against local monitoring data where available. This section provides an overview of the local data available for use in the assessment.

2.1.1 Local monitoring data

The Borough of Reading has four automatic monitoring sites which measure nitrogen dioxide (NO₂) and particulate matter (PM₁₀), and one of these sites also measures PM_{2.5}. Unfortunately, all of these automatic monitoring sites are located more than 5km from the development site and are therefore unlikely to be representative and are not discussed further. NO₂ concentrations are also measured passively at diffusion tube sites across the Borough. Details of the passive monitoring sites closest to the development site are given in Table 3. As shown below, unfortunately none of these are located within close proximity of the site either.

Monitoring results have been taken from the Council's latest Annual Status Report (ASR).⁹

Table 3: Monitoring sites closest to the Caversham Park development site

Site Name	Site Type	Pollutant	Grid Reference	Distance to Kerb (m)	Approx. Distance to development site (m)
45 Prospect Street	R	NO ₂	471558, 174919	1.5	1,650
60 Prospect Street	R	NO ₂	471557, 174944	3.0	1,630
241 Gosbrook Road	R	NO ₂	471942, 174600	6.0	1,780
Baron Cadagon	R	NO ₂	471461, 174840	5.0	1,770

⁹ Reading ASR 2023, received via email from Reading Council.

Site Name	Site Type	Pollutant	Grid Reference	Distance to Kerb (m)	Approx. Distance to development site (m)
40 George Street	R	NO ₂	471909, 174543	3.5	1,840
68 George Street	R	NO ₂	471913, 174490	3.0	1,890
Caversham Café	R	NO ₂	471401, 174790	2.0	1,840

Note: R = roadside, UB = urban background, K = kerbside, * automatic monitor

Monitoring results are presented in Table 4.

Table 4: Monitoring results for sites close to the proposed development site, 2020-2022

Objective	Site Name	2020	2021	2022
Annual mean NO ₂ (µg/m ³)	45 Prospect Street	24.6	26.9	25.1
	60 Prospect Street	21.3	24.9	22.9
	241 Gosbrook Road	22.9	24.1	24.1
	Baron Cadagon	28.5	31.5	27.2
	40 George Street	27.2	32.0	33.6
	68 George Street	18.5	21.9	23.3
	Caversham Cafe	25.6	29.8	27.8

The data shows that the annual mean NO₂ objective was not exceeded at any of the monitoring sites between 2020 and 2022. The hourly mean NO₂ objective was also not exceeded at any of the monitoring sites. Diffusion tubes do not provide information on hourly exceedances, but research¹⁰ identified a relationship between the annual and 1 hour mean objective, such that exceedances of the latter were considered unlikely where the annual mean was below 60 µg/m³. Therefore, no exceedances of the hourly mean objectives are expected at the diffusion tube monitoring sites.

Particulate monitoring at automatic sites within the borough showed no exceedances of the annual and 24 hour mean objectives during the period 2020-2022.

2.1.2 Background mapped data

Background pollutant concentration maps are available from the Defra LAQM website¹¹ and data has been extracted for the local vicinity of the proposed development for this assessment. These 2018 baseline, 1 kilometre grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites. The projections in the 2018 LAQM background maps are based on assumptions which were current before the Covid-19 outbreak in the UK. In consequence these maps do

¹⁰ As described in paragraph 7.97 of LAQM (TG22).

¹¹ <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>

not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns.

The estimated mapped background NO₂, PM₁₀, and PM_{2.5} concentrations around the development site and verification sites are shown in Table 5.

Table 5 Background concentrations at the development site and verification sites (µg/m³)

	NO ₂		PM ₁₀		PM _{2.5}	
	2022	2028	2022	2028	2022	2028
Development site	12.0	10.5	14.2	13.8	9.9	9.6
Verification sites	20.3	18.2	16.7	16.2	11.8	11.4

The 2022 and 2028 mapped background concentrations have been used in this assessment. All background concentrations are below the air quality objectives.

2.2 Model input data

Hourly meteorological data from Cippenham for 2022 has been used in the model. The wind-rose diagram is presented in Figure 2.

Figure 2: Wind-rose diagram for Cippenham meteorological data, 2022

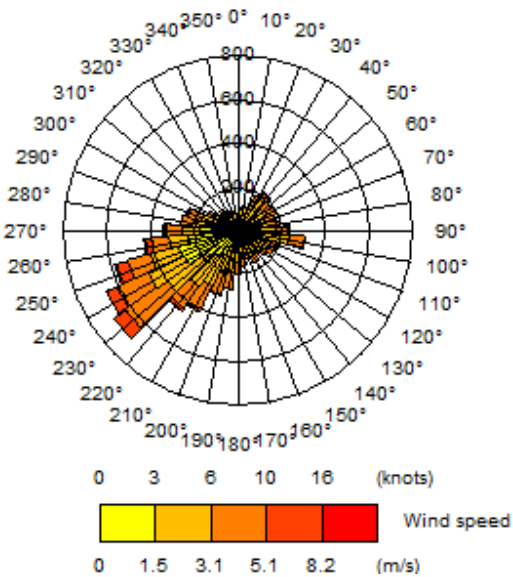
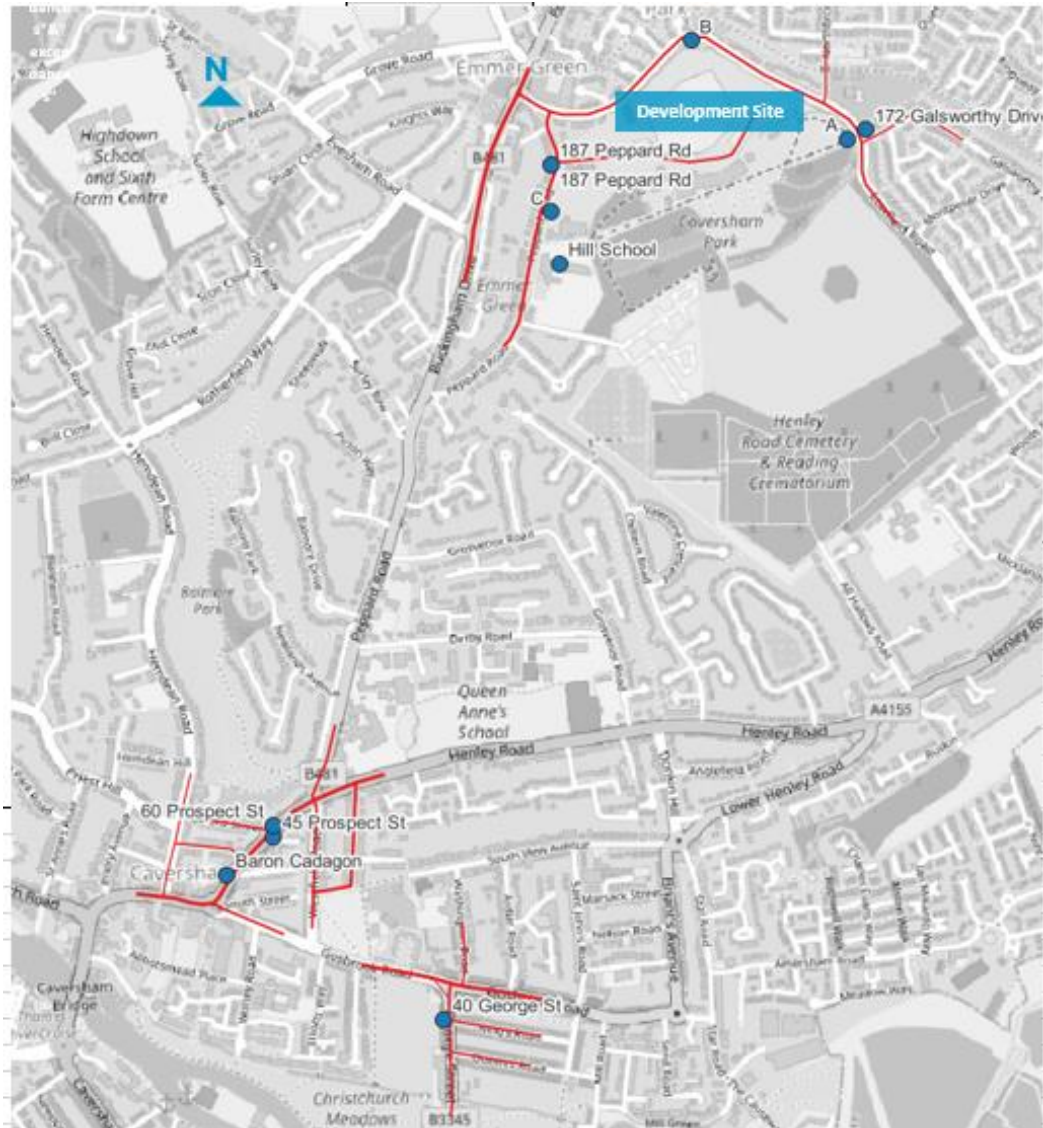


Figure 3: Road sources and receptors



Contains Ordnance Survey data © Crown copyright and database right [2024]

ArcMap software has been used to model the road source locations (red lines) that are within 200 metres of the receptor locations (blue circles). This data can then be automatically uploaded to ADMS-Roads. This generates an accurate representation of the surrounding area to be assessed in the model in terms of the length of roads and distances between sources and receptors. This is shown in **Figure 3** above. It is assumed that the contribution of other sources to NO_2 , PM_{10} and $\text{PM}_{2.5}$ is included in the background concentrations.

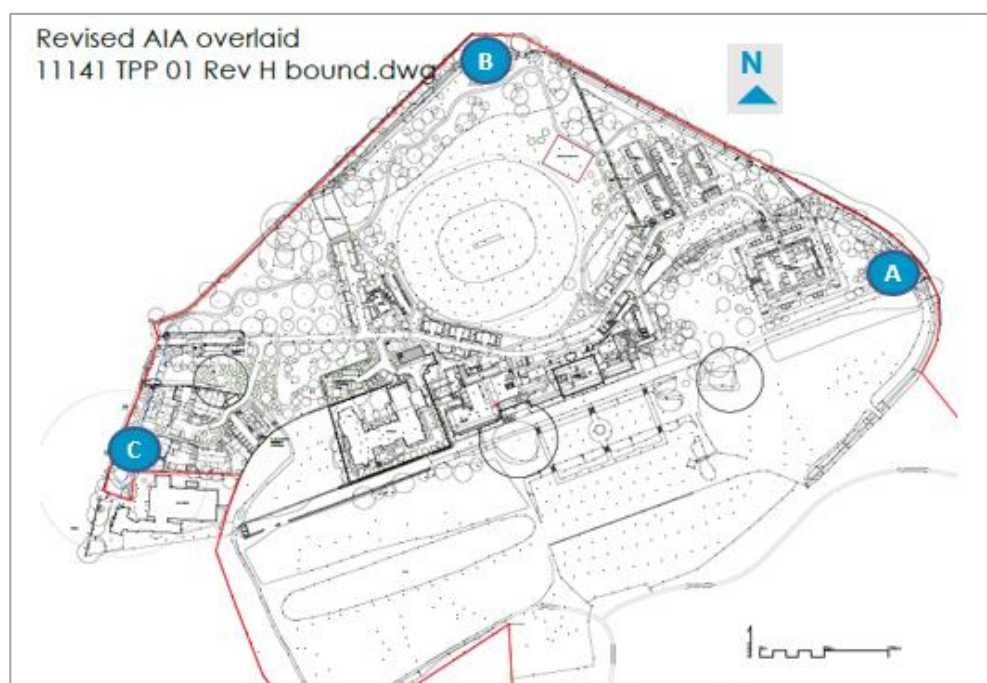
Eleven sensitive receptor locations have been selected for the assessment. A, B and C are all on the perimeter of the proposed site and have been chosen to reflect the extremities of the site and their proximity to road traffic sources. The architect's plans (**Figure 4**) show the development site in more detail with receptor locations on the site highlighted (blue circles).

Eight existing sensitive receptors have also been modelled:

- Hill School - a local primary school located less than 200m from the development site entrance

- 172 Galsworthy Drive: a dwelling located 20m to the east of the development site, on the junction between Lowfield Road and Galsworthy Drive
- 187 Peppard Road - ground floor of dwelling on Peppard Road, which is located opposite the site entrance, Caversham Park Drive.
- 187 Peppard Road - first floor of a dwelling on Peppard Road, which is located opposite the site entrance, Caversham Park Drive
- 40 George Street
- 45 Prospect Street
- 59 Prospect Street
- 60 Prospect Street

Figure 4: The location of the site receptors used in the modelling



2.3 Model scenarios and traffic data

Three model runs have been undertaken as follows:

- 2022 baseline to enable model verification to be undertaken
- 'Without development' in 2028 which assumes the Beechcroft development does not take place and that the site is vacant, as it is in the base year. This scenario however includes the impact of the new nearby golf course which has recently received planning permission
- 'With development' in 2028 which assumes the Beechcroft development takes place and the golf club is in operation.

Traffic count data is not available for roads adjacent to the development or verification sites, and therefore there will be uncertainty in the model input. Average annual daily traffic (AADT) count data for 2022 (the selected baseline year) has been obtained for Henley Road and the B481¹² and has been applied to roads that are expected to have similar traffic levels. It has been assumed that minor roads have an average daily AADT of 2900. Further information about the AADT assumptions used in the assessment is

¹² <http://www.dft.gov.uk/traffic-counts>

presented in Appendix B. All roads within 200 metres of the modelled receptors have been included in the assessment.

For the purpose of this assessment, the Trip End Model Presentation Program (TEMPRO)¹³ has been used to project traffic flows. It has been assumed that traffic on local roads will increase by 5.5 % between 2022 and 2028.

Glanville's Transport Assessment produced in March 2024¹⁴ concluded that the development would result in 634 additional vehicular trips compared to the current traffic levels. A previous assessment in October 2022¹⁵ concluded that 50% of trips associated with the development would apply to roads north of the site entrance, and 50% would apply to those south of the site entrance. 95% of the trips that use the southern section of Peppard Road are expected to travel via Prospect Street.

It is worth noting though that the proposed development is anticipated to result in a significant reduction (of 638 vehicles per day between the hours of 7am and 7pm) in traffic generation of the site compared to its extant use. The Transport Assessment therefore concludes that the re-development would have a beneficial impact on the safety and capacity of the surrounding road network compared to what otherwise could occur if the building and site was fully re-occupied in accordance with its previous lawful planning use.

In the absence of any other data being available, average speeds on local roads have been assumed based on the speed limit.

2.4 Conversion of NO_x to NO₂

Evidence shows that the proportion of primary NO₂ in vehicle exhaust has increased¹⁶. This means that the relationship between NO_x and NO₂ at the roadside has changed from that currently used in the ADMS model. A NO_x to NO₂¹⁷ has therefore been developed and has been used in conjunction with the ADMS model to obtain a more accurate picture of NO₂ concentrations.

2.5 Model Verification

Model verification refers to checks that are carried out on model performance at a local level. This involves the comparison of predicted versus measured concentrations. Where there is a disparity, the first step is to check the input data and the model parameters in order to minimise the errors. If required, the second step will be to determine an appropriate adjustment factor that can be applied.

In the case of NO₂, the model should be verified for NO_x as the initial step and should be carried out separately for the background contribution and the source (i.e. road traffic). Once the NO_x has been verified and adjusted as necessary, a final check should be made against the measured NO₂ concentration.

¹³ <https://www.gov.uk/government/publications/tempo-downloads>

¹⁴ Transport Assessment. Caversham Park. RG4 8TZ. Work undertaken by Glanville Consultants. 5th March 2024.

¹⁵ Transport note prepared by Glanville Consultants, received 26th October 2022

¹⁶ <http://uk-air.defra.gov.uk/assets/documents/reports/ageg/primary-no-trends.pdf>

¹⁷ <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc>

For this project, modelled annual mean road-NO_x estimates have been verified against the concentrations measured at three diffusion tube sites (see **Appendix A**). These sites were selected because they represent the monitoring sites closest to the proposed development.

The adjustment factor determined for annual mean NO_x concentrations was also applied to the modelled annual mean PM₁₀ concentrations. This was done as no PM₁₀ monitoring data that is representative of the development site is available, and this approach was considered more appropriate than not applying any adjustment¹⁸.

3 Results

3.1 Results of the Dispersion Modelling

Table 5 below provides the estimated pollutant concentrations in 2028 in the 'No development' scenario, and the 'With development' scenario.

¹⁸ Paragraph 7.572 of LAQM TG(22).

Table 6: Estimated pollutant concentrations in 2028 with and without the development ($\mu\text{g}/\text{m}^3$)

Receptor	Annual mean NO ₂ concentration ($\mu\text{g} / \text{m}^3$)		Annual mean PM ₁₀ concentration ($\mu\text{g} / \text{m}^3$)		Annual mean PM _{2.5} concentration ($\mu\text{g} / \text{m}^3$)		NO ₂ Change	PM ₁₀ change	PM _{2.5} change
	2028 No Dev	2028 With Dev	2028 No Dev	2028 With Dev	2028 No Dev	2028 With Dev			
A	12.4	12.4	14.4	14.4	10.0	10.0	<0.1	<0.1	<0.1
B	12.9	13.0	14.7	14.7	10.1	10.2	0.1	<0.1	<0.1
C	12.6	12.7	14.5	14.5	10.1	10.1	0.1	<0.1	<0.1
Baron Cadagon	22.4	22.5	15.2	15.2	10.4	10.4	0.1	<0.1	<0.1
45 Prospect St	22.3	22.4	15.2	15.2	10.4	10.4	0.1	<0.1	<0.1
60 Prospect St	23.3	23.4	15.5	15.6	10.6	10.6	0.1	<0.1	<0.1
Hill School	12.3	12.3	14.3	14.3	10.0	10.0	<0.1	<0.1	<0.1
187 Peppard Rd	12.8	12.9	14.6	14.6	10.1	10.1	0.1	<0.1	<0.1
187 Peppard Rd (1 st floor)	12.6	12.7	14.5	14.5	10.1	10.1	0.1	<0.1	<0.1
172 Galsworthy Drive	12.8	12.9	14.6	14.6	10.1	10.1	0.1	<0.1	<0.1
40 George St	23.5	23.6	15.6	15.6	10.6	10.7	0.1	0.1	<0.1

Note: The changes in NO₂, PM₁₀ and PM_{2.5} presented may not exactly equal the difference in the constituent parts shown due to rounding.

Nitrogen dioxide

In the without development scenario (which takes into account the golf course development, but not the Caversham Park development), the model predicts annual mean NO₂ concentrations to be at least 68% below the AQO at receptors at the proposed development site. Concentrations are also below the AQO at all sensitive receptor sites modelled.

The estimated annual mean NO₂ concentrations at the development site are reasonable when compared to the data collected at the Prospect Street monitoring sites. Prospect Street is a busy A road with high AADTs and annual mean NO₂ concentrations are expected to be much higher at these sites than at the development site, which is surrounded by minor residential streets and open fields. It is also situated directly north of a large cemetery.

The guidance states that authorities may assume exceedances of the hourly mean objective are only likely to occur where annual mean concentrations are 60 µg/m³ or above. Therefore, it is considered highly unlikely that this objective will be exceeded at any of the receptors.

The model has also been run for a future year scenario taking into account predicted increases to traffic levels on local roads. The results indicate that annual mean NO₂ concentrations would change by 0.1 µg/m³ at worst-case locations.

Particulate matter

The model estimates no exceedance against the annual mean PM₁₀ or PM_{2.5} objective. Potential exceedances of the daily mean PM₁₀ objective can be estimated based on the annual mean¹⁹, such that:

$$\begin{aligned} \text{No. 24 – hour mean exceedances} \\ = -18.5 + 0.00145 \times \text{Annual Mean}^3 + \left(\frac{206}{\text{Annual Mean}} \right) \end{aligned}$$

On this basis, it is estimated that there will be no exceedances of the daily mean PM₁₀ limit value, regardless of whether the development goes ahead and the daily mean PM₁₀ objective would be met.

The modelling shows that all locations are expected to meet the AQO for PM_{2.5} of 20 µg/m³ and the interim target of 12 µg/m³ to be achieved by the end of January 2028.

3.2 Significance

Professional judgement is an important part of the assessment of significance. However, there are various documents available that attempt to qualitatively or quantitatively provide ways of assessing the significance of a development on air quality. The most commonly applied is Environmental Protection UK's Air Quality Guidance Document²⁰ which outlines how impacts may be assessed quantitatively. The assessment is made up of two steps – firstly to assess the magnitude of change in concentration (e.g. between with and without development) relative to the objective level, and secondly the

¹⁹ Paragraph 7.100 of LAQM TG22

²⁰ <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

percentage above/below the objective based upon the total modelled concentration at a given location or receptor. By combining these two values, you can obtain the impact descriptor. This method is presented in Table 7 below.

Table 7: Significance of change description

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94 % of AQAL	Negligible	Slight	Moderate	Moderate
95-102 % of AQAL	Slight	Moderate	Moderate	Substantial
103-109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more of AQAL	Moderate	Substantial	Substantial	Substantial

In addition to the criteria provided above, the Guidance document states that the table is intended to be used by rounding the change in percentage pollutant concentrations to whole numbers. Changes of 0 % i.e. less than 0.5 % are described as negligible.

The long term average concentration at the 40 George Street (the worst case in terms of modelled pollutant concentrations in all modelled scenarios) in the assessment year is receptor in the assessment year is 59% of the Air Quality Assessment Level (AQAL) and the change in concentration relative to the AQAL is 0.3%.

In applying these criteria, it can be concluded that the impact of the development on local annual mean NO₂ concentrations is likely to be 'negligible', as the change in concentration due to the development is < 0.5 % of the Air Quality Assessment Level (AQAL) at all locations.

However, this is a fairly simplistic conclusion and other factors may also need to be considered in order to make transparent conclusions. Specific factors to consider may include:

1. Number of properties affected by the slight, moderate or major impacts and a judgement of the overall balance
2. Where new exposure is being 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
3. The magnitude of the changes and descriptions of the impacts at the receptors
4. Whether or not an exceedance of an objective or limit value is predicted to arise in the study area where none existed before or an exceedance area is substantially increased
5. Whether or not the study area exceeds an objective or limit value and this exceedance is removed or the exceedance area is reduced
6. Uncertainty, including the extent to which worst case assumptions have been made
7. The extent to which an objective or limit value is exceeded, for example an annual mean of 41 µg/m³ should attract less significance than an annual mean of 51 µg/m³.

In this case, none of the above criteria are of significance, suggesting that there will be no concerns in terms of exposure to harmful pollutant concentrations across the study area.

3.3 Mitigation Measures

Based on the ADMS results, there is no specific requirement for mitigation, as concentrations are estimated to meet all of the AQOs.

However, it is widely acknowledged that there is no safe level of exposure to air pollution²¹, and as such, the developer is encouraged to consider mitigation measures to reduce emissions arising from the site. The National Planning Policy Framework²², updated December 2023, requires new developments to support sustainable travel and air quality improvements. A key theme of the NPPF is that *“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making.”* (paragraph 109).

The NPPF also states that *“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.”* (paragraph 192).

In addition, the following relevant requirements for improving air quality are outlined (paragraph 116-117):

- Give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitating access to high quality public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use
- Be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations
- All developments that will generate significant amounts of movement should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of the proposal can be assessed.

²¹ <https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution>

²² <https://www.gov.uk/government/publications/national-planning-policy-framework--2> Published in December 2023

Building on the NPPF, the Institute of Air Quality Management (IAQM) has provided guidance on the principles of good practice²³ which should be applied to all major development²⁴. Examples of good practice include:

- The provision of at least 1 Electric Vehicle (EV) “rapid charge” point per 10 residential dwellings and/or 1000 m² of commercial floor space. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made.
- All gas-fired boilers to meet a minimum standard of < 40 mg NO_x/kWh
- All gas-fired CHP plant to meet a minimum emissions standard of:
 - Spark ignition engine: 250 mg NO_x/Nm³
 - Compression ignition engine: 400 mg NO_x/Nm³
 - Gas turbine: 50 mg NO_x/Nm³
- A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of:
 - Solid biomass boiler: 275 mg NO_x/Nm³ and 25 mg PM/Nm³

Other additional or alternative mitigation measures include supporting measures in the Local Authority’s air quality action plan.

A Construction Traffic Management Plan and Travel Plan have been produced for the development which sets out measures that will be taken to minimise the impact of the construction and operational phase of the development on local air quality.

3.4 Mitigating the Impacts of the Construction Phase

Emissions and dust from the construction phase of a development can have a significant impact on local air quality. The Institute of Air Quality Management (IAQM) has produced a document titled ‘Guidance on the assessment of dust from demolition and construction’²⁵ updated in January 2024. This guidance contains a methodology for determining the significance of construction developments on local air quality using a simple four step process:

- STEP 1: Screen the requirement for a more detailed assessment
- STEP 2: Assess the risk of dust impacts
- STEP 3: Determine any required site-specific mitigation
- STEP 4: Define post mitigation effects and their significance.

The risk of dust emissions from a demolition/construction site causing loss of amenity and/or ecological impacts is related to a number of factors, including: the activities being undertaken; the duration of these activities; the size of the site; the mitigation measures implemented and meteorological conditions. In addition, the proximity of receptors to the site and the sensitivity of these receptors to dust, impacts the level of risk from dust emissions. Receptors include both ‘human receptors’ and ‘ecological receptors’. The former refers to a location where a person or property may experience adverse effects for airborne dust or dust soiling, or exposure to PM₁₀, over a time period

²³ <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

²⁴ Major developments can be defined as developments where:

(1) The number of dwellings is 10 or above, (2) The residential development is carried out on a site of more than 0.5ha where the number of dwellings is unknown, (3) The provision of more than 1000 m² commercial floor space, (4) Development carried out on land of 1ha or more, (5) Developments which introduce new exposure into an area of existing poor air quality (e.g. an AQMA) should also be considered in this context.

²⁵ <http://iaqm.co.uk/guidance/>

relevant to the air quality objectives (see **Table 1**). Ecological receptors are defined as any sensitive habitat affected by dust soiling, through both direct and indirect effects. Following assessment of the impacts of dust as a result of the development, a qualitative risk impact level can be assigned, ranging from 'negligible' to 'high risk'. Based on the designated risk impact level, the mitigation measures which are appropriate for all sites and are applicable specifically to demolition, earthworks, construction and trackout can be determined. Examples of the general measures include:

- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site
- 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
- Ensure all loads entering and leaving the site are covered
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation

The use of the outlined IAQM methodology for assessing the impacts of dust from demolition/construction is considered to be current best practice. Therefore, it is recommended that the developer refers to the relevant IAQM documentation, to help reduce the impact of dust and vehicle exhaust emissions, and liaises with the Local Authority to come up with an acceptable dust management strategy.

4 Summary and Conclusions

An air quality assessment has been undertaken for a proposed residential development at Caversham Park. Reading Council has declared one Air Quality Management Area (AQMA) due to the exceedances of the annual mean nitrogen dioxide (NO₂) objective. The proposed development falls outside of this AQMA.

The ADMS-Roads dispersion model has been used to determine the impact of emissions from road traffic on sensitive receptors. Predicted concentrations have been compared with the air quality objectives. The results of the assessment indicate that annual mean concentrations are expected to be below the relevant AQOs for NO₂, PM₁₀ and PM_{2.5}, regardless of whether the development takes place or not.

The future scenario predicts that pollutant concentrations will change by a maximum of 0.1 µg/m³ at worst case locations. Therefore, no mitigation is required as the air quality objectives are predicted to be met. Both a Travel Plan and Construction Traffic Management Plan have been produced which outline measures to minimise the impact of the development on local air quality during both the construction and operational phases.

Appendix A – Model Verification

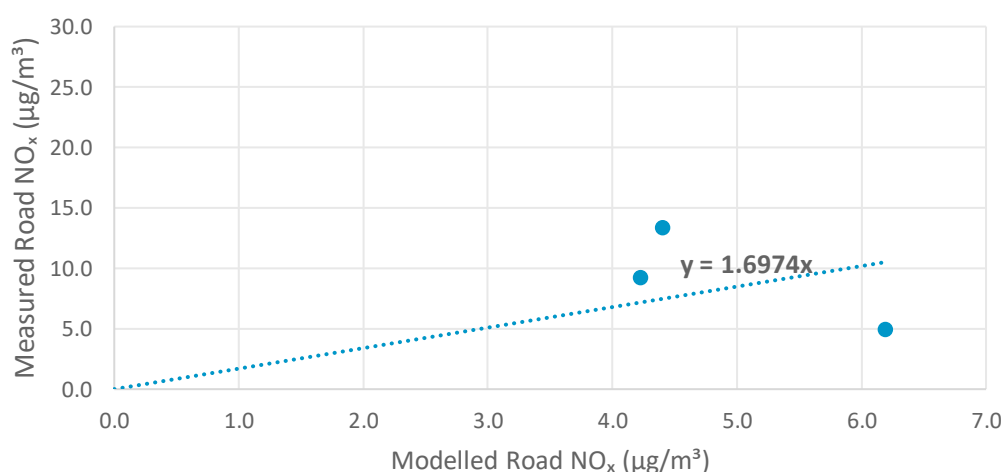
In order to verify modelled pollutant concentrations generated in the assessment, the model has been run to predict the annual mean road-NO_x concentration during 2022 at the diffusion tube sites on Prospect Street (Baron Cadagon, 45 Prospect Street, 60 Prospect Street) described in **Table 3** and **Table 4**.

The model output of road-NO_x has been compared with the 'measured' road-NO_x. Measured NO_x for the monitoring sites was calculated using the NO_x to NO₂ calculator¹⁷.

A primary adjustment factor was determined to convert between the 'measured' road contribution and the model derived road contribution (**Figure A.1**). This factor was then applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations. Total NO₂ concentrations were then determined by combining the adjusted modelled road-NO_x concentrations with the 2022 background NO₂ concentration.

The results imply that the model was under-predicting the road-NO_x contribution. This is a common occurrence.

Figure A.1: Comparison of Measured road-NO_x to unadjusted modelled road-NO_x concentrations



RMSE

The root mean square error (RMSE) is used to define the average error or uncertainty of the model. The following RMSE value has been calculated:

NO₂: 3.05

If the RMSE values are higher than ±25 % of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. Ideally an RMSE within 10 % of the objective would be derived. In this case the model is being assessed against the annual mean objective, which is 40 µg/m³ for NO₂. An RMSE value of less than 10 % of the objective (less than 4 µg/m³) is obtained and therefore the model behaviour is acceptable.

Appendix B – Traffic Data

Table B.1: Traffic data for the 2022 base year

Road links	Annual Average Daily Traffic (AADT)	% Heavy Duty Vehicles (HDV)	Speed (kph)
Henley Road (used for Prospect Street, George Street and Gosbrook Road)	7146	2.6	48.3
B481 (used for Buckingham Drive and Peppard Road)	10005	2.4	48.3
Minor Road (all other roads modelled)	2900	2	48.3

Note: With development results in an average daily traffic increase of 317 on roads north of the site access, 317 on roads south of the site access. It is assumed that 95% of traffic leaving the site towards south will use Prospect Street.

Traffic generation for the nearby golf development was taken from the air quality assessment for this development on the Council's website.²⁶

²⁶ <https://images.reading.gov.uk/2021/11/RGC-ES-Vol-4-Appendix-E-Air-Quality.pdf>



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