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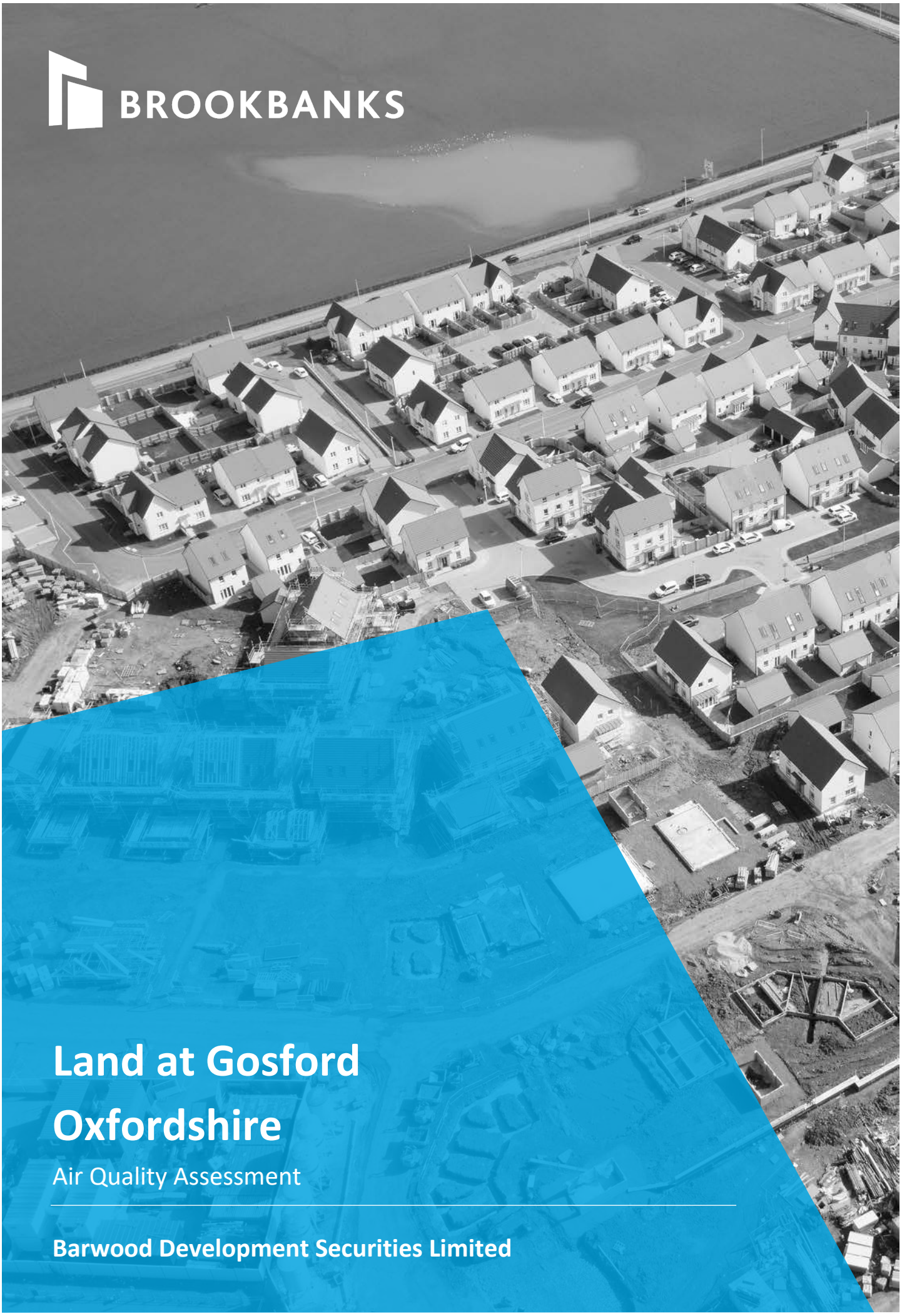

Land at Gosford Oxfordshire

Air Quality Assessment

Barwood Development Securities Limited

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1 Introduction

1.1 Brookbanks Consulting Ltd is appointed by Barwood Development Securities Ltd. to complete an air quality assessment for a proposed residential development on Land at Gosford, Oxfordshire. The location of the Proposed Development is presented in **Figure 1-1**.

1.2 Outline planning application is sought for the development of up to 370 homes, public open space (including play areas and woodland planting), sports pitches and pavilion, drainage and engineering works, with all matters reserved (appearance, landscaping, layout and scale) except for vehicular and emergency accesses to Bicester Road.

1.3 This report presents the findings of a detailed assessment of the potential impacts of the Proposed Development on local air quality during construction and operation. It also assesses the suitability of the Site for residential development with regards to exposure of future occupants to elevated pollution concentrations and impacts of the operational phase on local air quality. For both the construction and operational phases of the development the type, source and significance of potential impacts are identified and the measures that should be employed to minimise any identified impacts and exposure to elevated pollution are described.

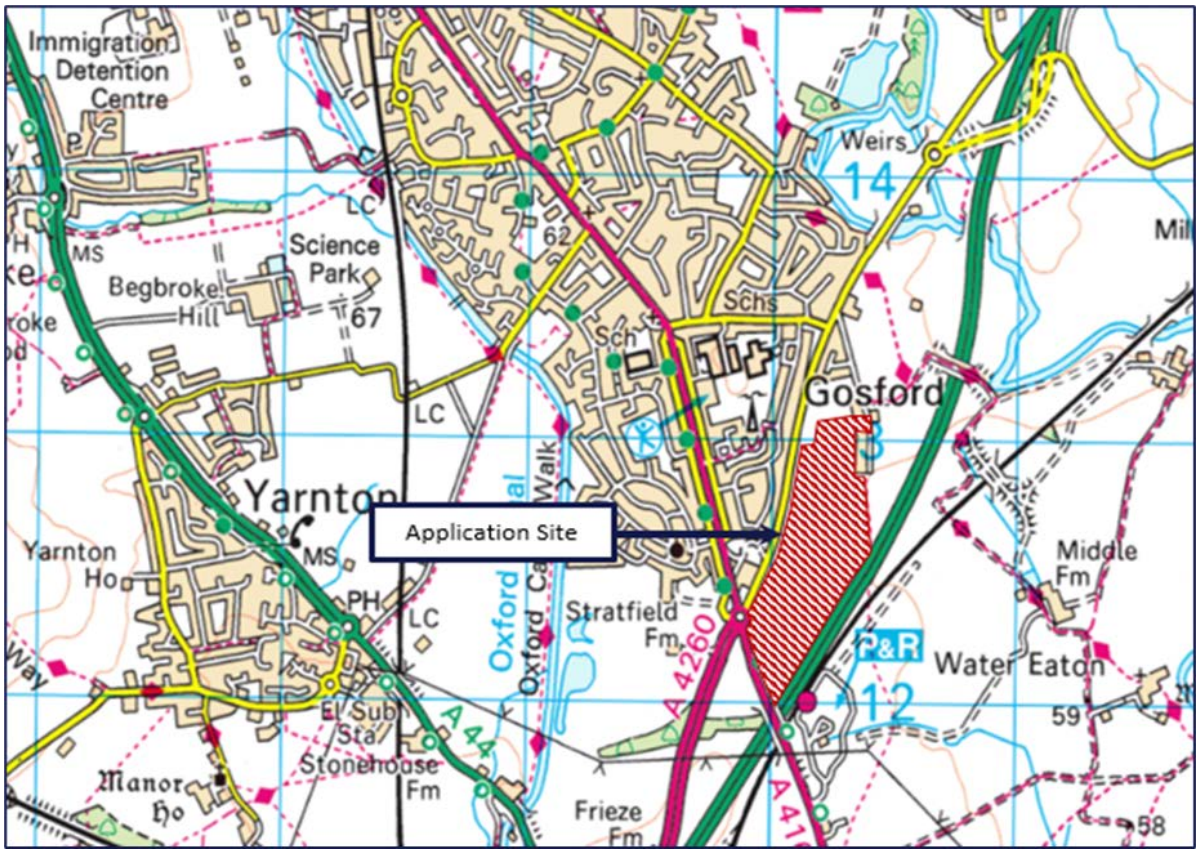

Figure 1-1: Site Location

2 Legislation and Policy

Air Quality Strategy for England, Scotland, Wales & Northern Ireland

2.1 Point one The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1] , pursuant to the requirements of Part IV of the Environment Act 1995. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.

2.2 The AQS sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3-butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10}, $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3) and polycyclic aromatic hydrocarbons (PAHs).

2.3 The air quality standards are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). These are general concentration limits, above which sensitive members of the public (e.g., children, the elderly and the unwell) might experience adverse health effects.

2.4 The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e., a limited number of permitted exceedances of the standard over a given period.

2.5 For some pollutants there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants (e.g., temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road).

2.6 The AQS also contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$' Local Authorities are required to work towards reducing emissions / concentrations of $PM_{2.5}$, but there is currently no statutory objective incorporated into UK law at this time.

2.7 In January 2019, the UK government released a Clean Air Strategy[2] for consultation, which outlines measures to reduce emissions from a wide range of sources including transport, farming and industry. The Strategy proposes new local powers to implement Clean Air Zones in problem areas, backed up by clear enforcement mechanisms. Whilst the UK has already adopted legally binding international targets to reduce emissions of key pollutants such as nitrogen oxides and particulate matter (as PM_{10}), the Strategy aims to reduce fine particulate emissions ($PM_{2.5}$) to ensure that public exposure to concentrations above 10 µg/m^3 is halved by 2025.

2.8 The AQS objective levels relevant to this assessment are presented in Appendix A.

Local Air Quality Management (LAQM)

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

[2] Clean Air Strategy, Defra, January 2019

2.9 Part IV of the Environment Act 1995 also requires local authorities to periodically review and assess the quality of air within their administrative area. The Reviews have to consider the present and future air quality and whether any air quality objectives prescribed in Regulations are being achieved or are likely to be achieved in the future.

2.10 Where any of the prescribed air quality objectives are not likely to be achieved, the authority concerned must designate that part an Air Quality Management Area (AQMA).

2.11 For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

2.12 The Department of Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their Review and Assessment work[3]. This guidance, referred to in this chapter as LAQM.TG(16), has been used where appropriate in the assessment.

The National Planning Policy Framework (NPPF)

2.13 The NPPF[4] sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of sustainable development. It requires Local Plans to be consistent with the principles and policies set out in the NPPF with the objective of contributing to the achievement of sustainable development.

2.14 The NPPF states that the planning system has three overarching objectives in achieving sustainable development including a requirement to '*contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy*.'

2.15 Under Section 15: Conserving and Enhancing the Natural Environment, the NPPF (paragraph 170) requires that 'planning policies and decisions should contribute to and enhance the natural local environment by …preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible help to improve local environmental conditions such as air and water quality.'

2.16 In dealing specifically with air quality the NPPF (paragraph 181) 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.'

2.17 Paragraph 183 states that 'the focus of planning policies and decisions should be on whether Proposed Development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively'.

[3] Department for Environment, Food and Rural Affairs (Defra), (2021): Part IV The Environment Act 1995 Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(16)

[4] Ministry of Housing, Communities and Local Government: National Planning Policy Framework , July 2021

Control of Dust and Particulates associated with Construction

2.18 Section 79 of the Environmental Protection Act (1990) provides the following definitions of statutory nuisance relevant to dust and particulates:

- *'Any dust or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance'*
- *'any accumulation or deposit which is prejudicial to health or a nuisance'*

2.19 Following this, Section 80 states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.20 In the context of the Proposed Development, the main potential for nuisance of this nature will arise during the construction phase - potential sources being the clearance, earthworks, construction and landscaping processes.

2.21 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist - 'nuisance' is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred. However, research has been undertaken by a number of parties to determine community responses to such impacts and correlate these to dust deposition rates.

Cherwell Local Plan

2.22 The Cherwell Local Plan[5] sets out the strategic policies for future development in the District. With regard to air quality, Policy ESD10 (Protection and Enhancement of Biodiversity and the Natural Environment) states that *'Air quality assessments will [also] be required for development proposals that would be likely to have a significantly adverse impact on biodiversity by generating an increase in air pollution*.'

2.23 In addition, Policy ESD15 (The Character of the Built and Historic Environment) states that '*New development proposals should Integrate and enhance green infrastructure and incorporate biodiversity enhancement features where possible. Well-designed landscape schemes should be an integral part of development proposals to support improvements to biodiversity, the microclimate, and air pollution and provide attractive places that improve people's health and sense of vitality*'.

2.24 The Local Plan also retains Policy ENV1 of the Adopted Local Plan 1996 , which states that '*development which is likely to cause materially detrimental levels of noise, vibration, smell, smoke, fumes or other type of environmental pollution will not normally be permitted'*. Furthermore *'the Council will seek to ensure that the amenities of the environment, and in particular the amenities of residential properties, are not unduly affected by development proposals which may cause environmental pollution, including that caused by traffic generation'*.

2.25 A Partial Review of the Local Plan (LPPR)[6] has been undertaken to address the additional need for housing in Oxfordshire. Policy PR7a sets out the policy requirements for the Proposed Development, which includes the requirement to protect the residential amenities of properties on Water Eaton Lane.

2.26 In terms of air quality impacts, the primary risk to amenity at these properties is dust generated during the construction phase of the development. Consequently, this assessment includes a dust risk assessment, undertaken in accordance with Institute of Air Quality Management Guidance, to identify the level of mitigation that will be required to ensure that off-site impacts are negligible.

[5] Cherwell Local Plan Part 1 2011-2031, Adopted 2015

[6] The Cherwell Local Plan 2011 - 2031 (Part1), Partial Review (LPPR) - Oxford's Unmet Housing Need, Adopted September 2020.

Cherwell District Council Local Air Quality Management

2.27 Local Authorities are required to regularly review and assess air quality to establish whether there are any locations where pollutant concentrations exceed the relevant air quality objectives or EU limit values. Where an exceedance is identified, the local authority is obliged to declare an Air Quality Management Area (AQMA) and prepare an Action Plan (AQAP) setting out measures to improve air quality and achieve compliance with the objective(s).

2.28 To date, Cherwell District Council (CDC) have declared four AQMAs due to measured exceedances of the air quality objectives for NO_2. One of the AQMAs is in Kidlington and incorporates a small section of Bicester Road to the north of its junction with Water Eaton Lane. The extent of the designated area is shown in **Figure 2-1**.

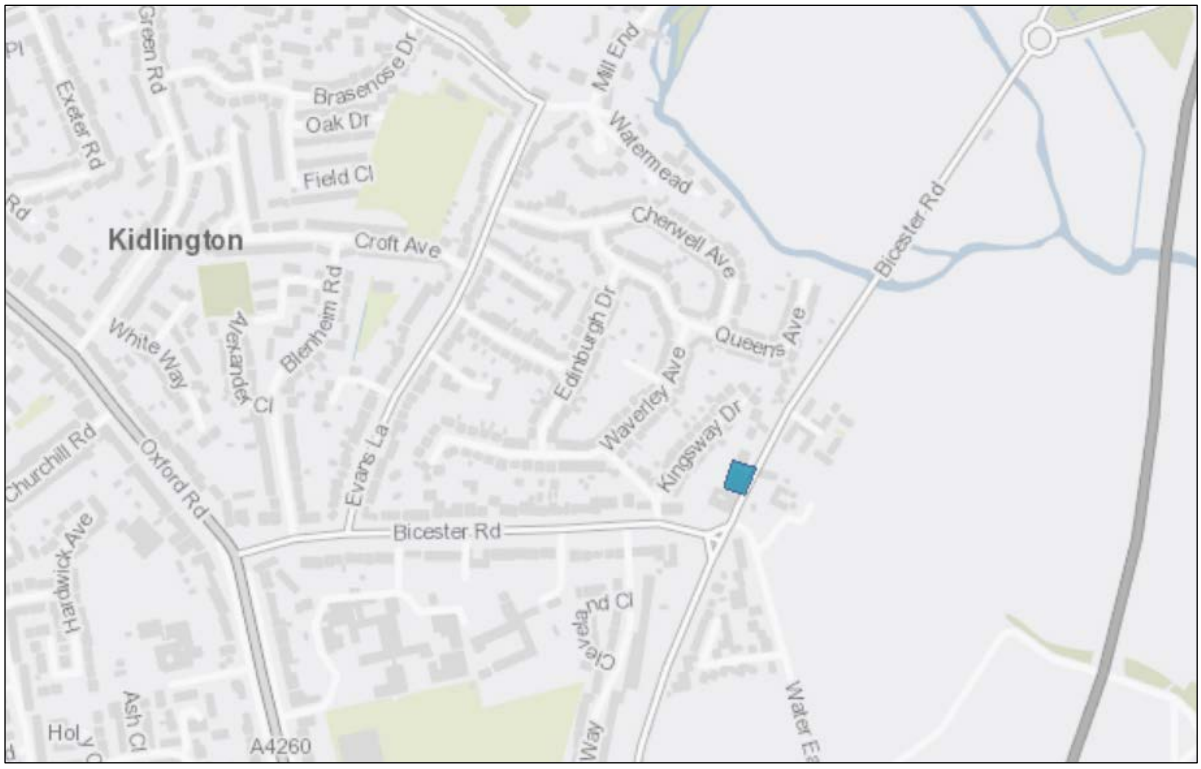

Figure 2-1: Cherwell District Council AQMA No. 3 (Kidlington)

2.29 The current AQAP[7] includes the following measures to improve air quality within the Kidlington AQMA:

- A lift share campaign at Water Eaton Park and ride;
- Promoting the use of canal towpath routes;
- Promoting the use of rail to get into Bicester; and
- Investigating traffic light management to reduce north side queuing.

[7] Cherwell District Council Air Quality Action Plan, March 2017

2.30 CDC's 2020 Air Quality Status Report[8] states that following improvements to traffic signals within the Kidlington AQMA, NO_2 concentrations have declined significantly.

3 Methodology

Scope of the Assessment

3.1 The scope of the assessment has been determined in the following way:

- Review of development proposals in the context of the surrounding area;
- Review of air quality data for the area surrounding the Site and background pollutant maps;
- Review of the traffic flow data, which has been used as an input to the air quality modelling assessment.

3.2 The development proposals will provide up to 370 dwellings; therefore, there is the potential for impacts on local air quality during both the construction and operational phases of the Proposed Development.

3.3 Details of the assessment methodology and the specific issues considered are provided below.

Construction Traffic

3.4 During construction of the Proposed Development, lorries will require access to the Site to deliver and remove materials; earthmoving plant and other mobile machinery will work on site and generators and cranes will also be in operation. These machines produce exhaust emissions; of particular concern are emissions of NO_2 and particulate matter (PM_{10} and $PM_{2.5}$).

3.5 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) air quality guidance sets out criteria to assist in establishing when an air quality assessment will be required. These criteria indicate that significant impacts on air quality outside an AQMA are unlikely to occur where a development results in less than 100 additional HGVs per day. Detailed information on the likely HGV trip generation during the construction phase is not currently available, however based on the phased nature of the development, it is anticipated to be well below this level. On this basis the impact on air quality is expected to be negligible.

Construction Dust

3.6 To assess the potential impacts associated with dust and particulate matter releases during the construction phase and to determine any necessary mitigation measures, an assessment based on the latest guidance from the Institute of Air Quality Management (IAQM)[9] has been undertaken.

3.7 This approach divides construction activities into the following four categories:

- demolition;
- earthworks;
- construction; and
- trackout.

[8] Cherwell District Council 2020 Air Quality Annual Status Report (ASR), June 2020.

[9] Institute of Air Quality Management, (February 2014), Guidance on the Assessment of Dust from Demolition and Construction.

3.8 The assessment methodology requires consideration of dust effects arising from three potential impacts:

- annoyance due to dust soiling;
- harm to ecological receptors; and
- the risk of health effects due to a significant increase in exposure to PM_{10}.

3.9 The three impacts are assessed taking into account the sensitivity of the area likely to experience these effects, with the results of the assessment being used to define appropriate mitigation measures to prevent any significant effects at nearby receptors.

3.10 The IAQM guidance sets out the assessment in a number of steps. The first is an initial screening procedure to determine where an assessment is required if:

- there are any sensitive 'human' receptors within 350 m of the site boundary or within 50m of the proposed construction haulage routes, up to 500m from the site entrance(s); or
- there are any sensitive 'ecological' receptors within 50 m of the site boundary or within 50m of the proposed construction haulage routes, up to 500m from the site entrance(s).

3.11 Step 2 of the methodology assesses the risk of dust impacts for each construction activity and takes account of:

- the scale and nature of the works, which determines the potential dust emission magnitude (step 2a); and
- the sensitivity of the area (step 2b).

3.12 Risks are described in terms of there being a low, medium or high risk of dust effects for each of the four separate potential activities. This assessment is based on both IAQM criteria and professional judgement.

3.13 The outcome of the above two steps are then combined (step 2c) to identify the risk of dust impacts, which are described in terms of there being a low, medium or high risk of dust effects for each of the four activity groups and assuming no mitigation measures are in place.

3.14 Based on the identified risk, appropriate mitigation measures are identified, as set out in the IAQM guidance.

3.15 All construction sites are different and the potential for dust impacts are dependent on a number of local factors. The methodology set out in the IAQM guidance is therefore considered as a framework for assessing dust impacts and a certain level of professional judgement is required in determining the effects from each site.

3.16 The significance of identified effects is evaluated post mitigation using professional judgement and assuming that the mitigation measures identified and set out within the assessment are implemented by way of a Dust Management Plan (DMP).

Operational Traffic

3.17 The Environmental Protection UK (EPUK) and IAQM planning guidance[10], states that detailed assessment of traffic-related impacts is required where:

- There is a change in the annual average daily traffic (AADT) flow of light goods vehicles (LGV) of more than 500 vehicles (100 within an AQMA); and/or
- There is a change in the AADT flow of heavy goods vehicles (HGV) of more than 100 vehicles (25 within an AQMA); and/or
- There is a change in the road re-alignment by more than 5m; and/or
- A new junction is introduced, which will significantly alter vehicle speeds.

[10] EPUK & IAQM (January 2017) Land-Use Planning & Development Control: Planning for Air Quality v1.2

3.18 A summary of the operational AADT flows associated with the Proposed Development is presented in Table 3-1. Road links that fall within the criteria for a detailed assessment of impacts are highlighted in bold. The impact of operational traffic associated with the Proposed Development on local air quality at receptors adjacent to all other road links are anticipated to be of negligible significance and have been scoped out of the assessment.

Road Link	LGV	HGV	AQMA
Bicester Road north of Site Access	**192**	**0**	**Yes (Kidlington)**
Bicester Road south of Site Access	**1419**	**0**	**No**
Oxford Road north of Bicester Road	115	0	No
Oxford Road south of Bicester Road	**463**	**0**	**Yes (Oxford City)**
Frieze Way west of Oxford Road	**841**	**0**	**No**
A34 north of Peartree Interchange	400	0	No

Table 3-1: Operational Traffic Flows (AADT)

3.19 The assessment of operational traffic-related air quality impacts has been undertaken using the ADMS Roads dispersion model. This is a commercially available dispersion model and has been widely validated for this type of assessment and used extensively in the Air Quality Review and Assessment process.

3.20 The model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user. Meteorological data from Brize Norton (approximately 22km west-southwest of the Proposed Development) been used for the assessment.

3.21 Based on the traffic data provided, the following scenarios have been assessed:

- 2018 Baseline (for model verification purposes);
- 2031 Baseline; and
- 2031 Baseline plus Proposed Development Traffic.

3.22 A TEMPro (National Trip End Model) growth factor has been used to project the 2018 traffic flows to 2031, to ensure the assessment takes into account the cumulative impact of traffic associated with other committed/ proposed developments in the area.

3.23 A summary of the traffic data used in the assessment can be found in Appendix B. The data includes details of annual average daily traffic flows (AADT), vehicle speeds and percentage HGV for the assessment years considered.

3.24 The model has been used to predict concentrations of oxides of nitrogen (NOx) and particulate matter (as PM_{10} and $PM_{2.5}$) at selected receptors using emission factors from the latest version of the Emission Factor Toolkit (EFT V11.0). The predicted concentrations of NOx have been converted to NO_2 using version 8.1 of the LAQM calculator available on the DEFRA air quality website (http://uk-air.defra.gov.uk).

3.25 To predict local air quality, the modelled concentrations must be added to local background concentrations. Defra 2019 mapped background pollutant concentrations have been used for the opening year scenario (2031) to ensure a worst-case prediction of future air quality. The background concentrations used in the assessment are provided in Table 4-3.

3.26 It is recommended, following guidance set out in LAQM.TG(16), that the model results are compared with measured data to determine whether the model results need adjusting to reflect local air quality more accurately. This process is known as verification.

3.27 LAQM.TG(16) recommends that model predictions should be within 25% (preferably 10%) of monitored concentrations for the model to be predicting with any degree of accuracy. The model has been used to predict NO_2 concentrations at diffusion tube monitoring locations on Bicester Road and Oxford Road. The results of the modelling assessment have been adjusted using the methodology given in LAQM.TG(16). Full details of the verification and calculation of adjustment factors are provided in Appendix C.

3.28 To assess the potential impacts of the Proposed Development on local air quality pollutant concentrations have been predicted at sensitive receptors adjacent to road links that will experience a potentially significant change in traffic (see Table 3-1).

3.29 LAQM.TG(16) describes in detail typical locations where consideration should be given to pollutants defined in the Regulations. Generally, the guidance suggests that all locations 'where members of the public are regularly present' should be considered. At such locations, members of the public will be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes.

3.30 For instance, on a footpath, where exposure will be transient (for the duration of passage along that path) comparison with short-term standards (i.e., 15-minute mean or 1-hour mean) may be relevant. In a school, or adjacent to a private dwelling, however; where exposure may be for longer periods, comparison with long-term standards (such as 24-hour mean or annual mean) may be most appropriate. In general terms, concentrations associated with long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.

3.31 Details of the identified sensitive receptors are provided below in Table 3-2. The location of the receptors are presented in Figure 3-1. Three receptors have also been included at the boundary of the Proposed Development, representing locations of worst-case long-term exposure for future occupants.

ID	Location	Type	Easting	Northing
1	5 Astley Ave	Residential	449980	212611
2	16 Cromwell Way	Residential	450061	212988
3	121 Bicester Road	Residential	450266	213512
4	Gosford House	Residential	450296	213540
5	16 Beagles Close	Residential	450176	213250

6	Kidlington Cemetery	Cemetery	450113	213009
7	Proposed Development 1	Residential	450087	212882
8	Proposed Development 2	Residential	449964	212440
9	Proposed Development 3	Residential	450376	212520
10	Pipal Cottage	Residential	450219	211495
11	560 Banbury Road	Residential	450333	210726

Table 3-2: Sensitive Receptors

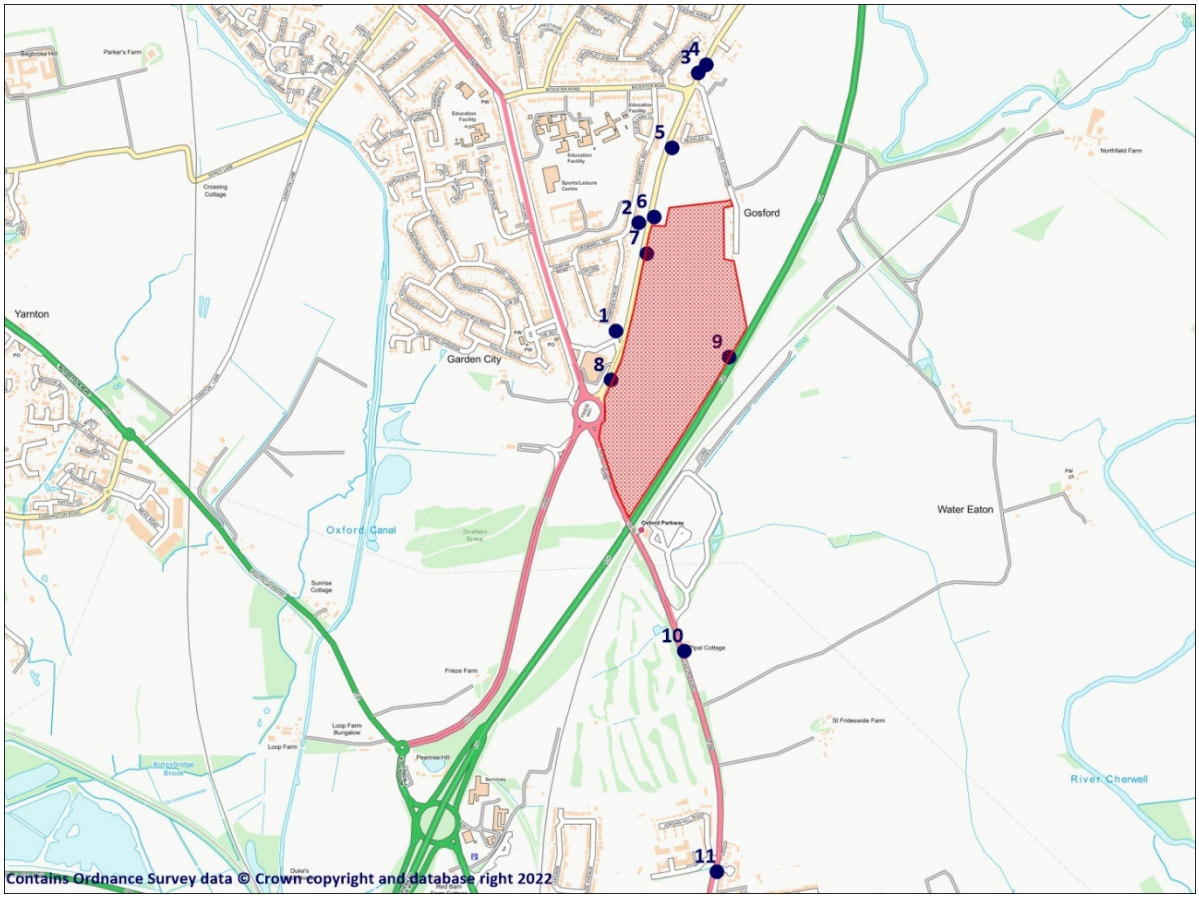

Figure 3-1: Sensitive Human Health Receptors

3.32 There are no statutory designated habitat sites or ancient woodlands within 200m of road links affected by traffic associated with the Proposed Development and therefore the impact of the Proposed Development on ecology has not been assessed.

3.33 The EPUK/IAQM planning guidance recommends that the impact at individual receptors is described by expressing the magnitude of incremental change in pollutant concentrations as a proportion of an Air Quality Assessment Level (AQAL) such as the air quality objectives set out in Appendix A. The significance of impact is then identified based on the incremental change in the context of the new total concentrations and its relationship with the assessment criteria, noting whether the impact is adverse or beneficial based on a positive or negative change in concentrations. The criteria suggested for assigning significance is set out in Table 3-3. below.

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

Table 3-3: Impact Descriptors for Individual Receptors

3.34 The guidance also states that:

- The percentage change in concentration should be rounded to a whole number;
- The table should only be used with annual mean concentrations; and
- The descriptors are for individual receptors only: overall significance should be based on professional judgment.

4 Baseline Conditions

Local Air Quality Monitoring

4.1 Cherwell District Council monitor ambient NO_2 concentrations via a network of passive diffusion tubes, of which five are located in Kidlington. Details of the monitoring sites are presented in Table 4-1 . The locations of the monitoring sites is shown in Figure 4-1. Tubes K1 is located within the Kidlington AQMA.

4.2 A summary of bias adjusted annual mean concentrations measured between 2015 and 2019 are set out in Table 4-2 below. Data for 2020 are not included due to the influence of the Covid-19 pandemic lockdowns on traffic levels.

4.3 The measured concentrations at all locations are well within the air quality objective of 40 µg/m3. The highest concentrations are measured at the Bicester Road (2) tube, which is located within the Kidlington AQMA. Concentrations measured at Benmead Road, indicate that existing urban background concentrations in the area are less than 35% of the objective.

4.4 It is not possible to monitor short-term NO_2 concentrations using diffusion tubes; however, research[11] has concluded that exceedances of the 1-hour mean objective are generally unlikely to occur where annual mean concentrations are below 60 µg/m3. Based on the monitoring data presented in Table 4-2, an exceedance of the short-term objective is unlikely to occur at any of the monitoring sites presented.

4.5 Cherwell District Council do not monitor PM_{10} or $PM_{2.5}$ at any location in their administrative area.

Site ID	Site Name	Type	Easting	Northing
K1	Bicester Road (2)	Roadside	450267	213511
K2	Bramley Close	Roadside	450322	213587
K3	Benmead Road	Urban Background	449172	214325
K4	Langford Lane 2014	Roadside	447318	214798
K5	Oxford Road	Roadside	449122	213947

Table 4-1: Diffusion Tube Monitoring Sites

Site Name	2015	2016	2017	2018	2019
Bicester Road (2)	41.1	41.9	41.0	37.9	33.6
Bramley Close	29.5	28.5	26.7	26.3	24.0
Benmead Road	12.4	13.5	12.6	13.4	13.8
Langford Lane 2014	21.5	21.7	21.7	21.5	20.6
Oxford Road	28.3	30.5	28.8	28.9	24.7

Table 4-2: Annual Mean NO_2 Concentrations Measured by Diffusion Tube (µg/m^3)

[11] D Laxen and B Marner: Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites, July 2003

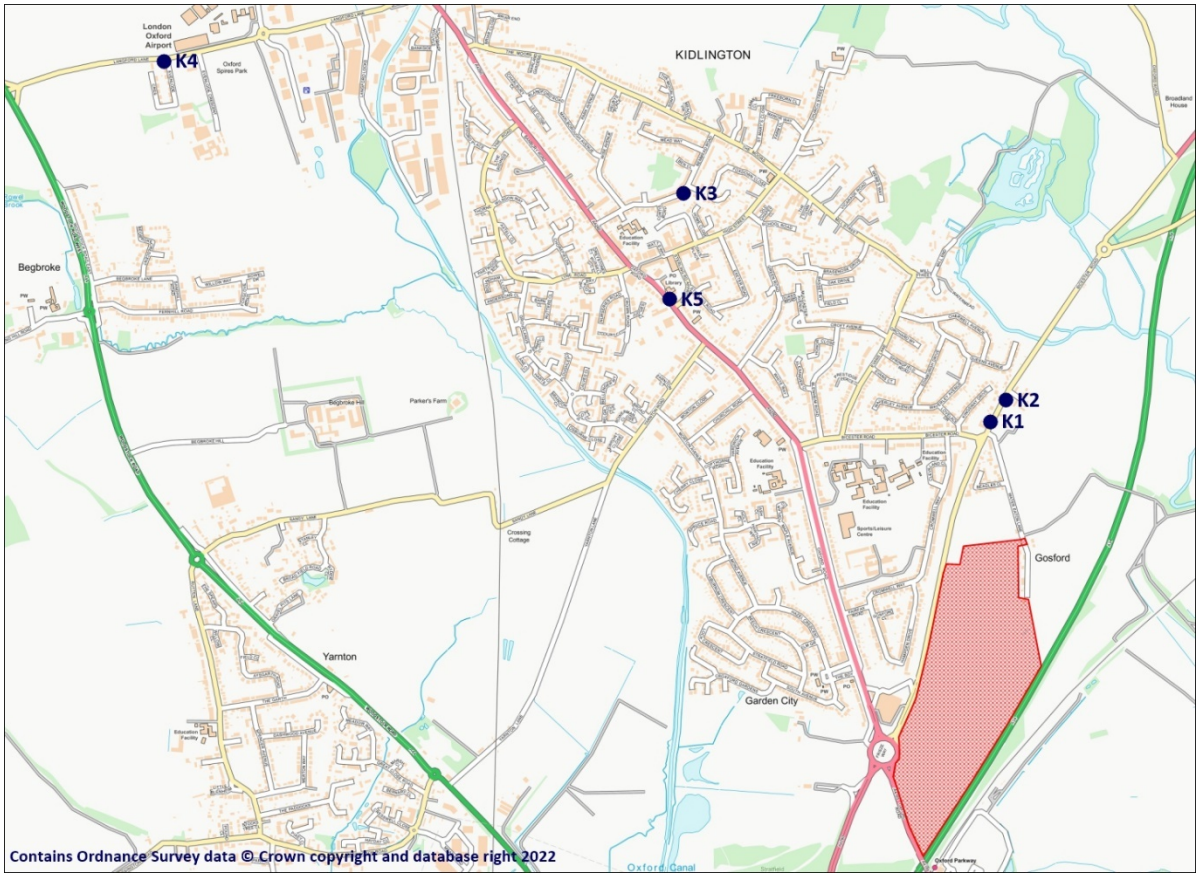

Figure 4-1: Diffusion Tube Monitoring Locations in Kidlington

Defra Background Maps

4.6 In the absence of local background monitoring data for PM_{10} and $PM_{2.5}$, concentrations have been obtained from the Defra background pollutant maps[12] . These 1 km 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 latest background maps were issued in August 2020 and are based on 2018 monitoring data.

4.7 The 2019 annual mean background NO_2, PM_{10} and $PM_{2.5}$ concentrations over the study area have been determined from contour plots of the mapped data and are presented in Table 4-3. The concentrations for all three pollutants are well within the relevant long-term air quality standards.

4.8 For the purposes of the assessment the maximum 2019 concentrations have been used to predict concentrations in the opening year of the development, 2031. The background maps predict a year-on-year reduction in concentrations due to the gradual renewal of the vehicle fleet and the uptake of electric vehicles and therefore this is a conservative approach with regard to potential impacts at sensitive receptor locations.

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

Pollutant	Annual Mean	2019 Measured	Air Quality Standard
NO_2	13.1 – 14.3	13.8	40
PM_{10}	15.9 – 16.3	n/a	40
$PM_{2.5}$	10.5 – 10.7	n/a	25

Table 4-3: 2019 Mapped Background Concentrations (µg/m^3)

5 Assessment of Impact

Construction Dust Impacts

5.1 The Site is currently a large agricultural field. There are no buildings on the Site that would require demolition therefore impacts associated with demolition activities have not been considered within this report.

5.2 Based on the IAQM guidance sensitive receptors that may be affected by dust emissions during construction activities include residential properties, educational facilities, retail premises, places of work, recreational areas and ecological receptors. The nearest residential receptors are to the east on Water Eaton Lane and to the west along Bicester Road. An assessment of construction related impacts in relation to human receptors is therefore considered necessary. There are ten existing properties within 20m of the site boundary and occupants of early phases may also be affected by dust generated by later phases. Therefore, in accordance with the guidance, the area is of 'high' sensitivity to dust soiling impacts.

5.3 Dust emissions from construction activities are unlikely to result in significant impacts on ecologically sensitive receptors beyond 50 m from the site boundary. There are no designated habitat sites within 50 m of the site boundary therefore the risk of impacts on ecological receptors is negligible and has not been considered any further within this assessment.

5.4 As detailed in Section 4, PM_{10} concentrations are not monitoring at any location within the borough. Data presented in Table 4-3 indicates background concentrations in the region of 16 µg/m^3. Based on professional experience, PM_{10} concentrations at roadside locations are unlikely to be more than a few µg higher than background concentrations. Concentrations in the vicinity of the Site are therefore expected to be less than 24 µg/m^3 and the sensitivity of the area to health impacts from dust is considered to be 'low'.

5.5 The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited would depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

5.6 A wind rose from Brize Norton Meteorological Station is provided below in Figure 5-1, which shows that the prevailing wind is from the west. Properties located to the east are therefore most likely to experience significant impacts as a result of dust generated during the construction process. The residential properties located on Water Eaton Lane are therefore most at risk of experiencing dust effects.

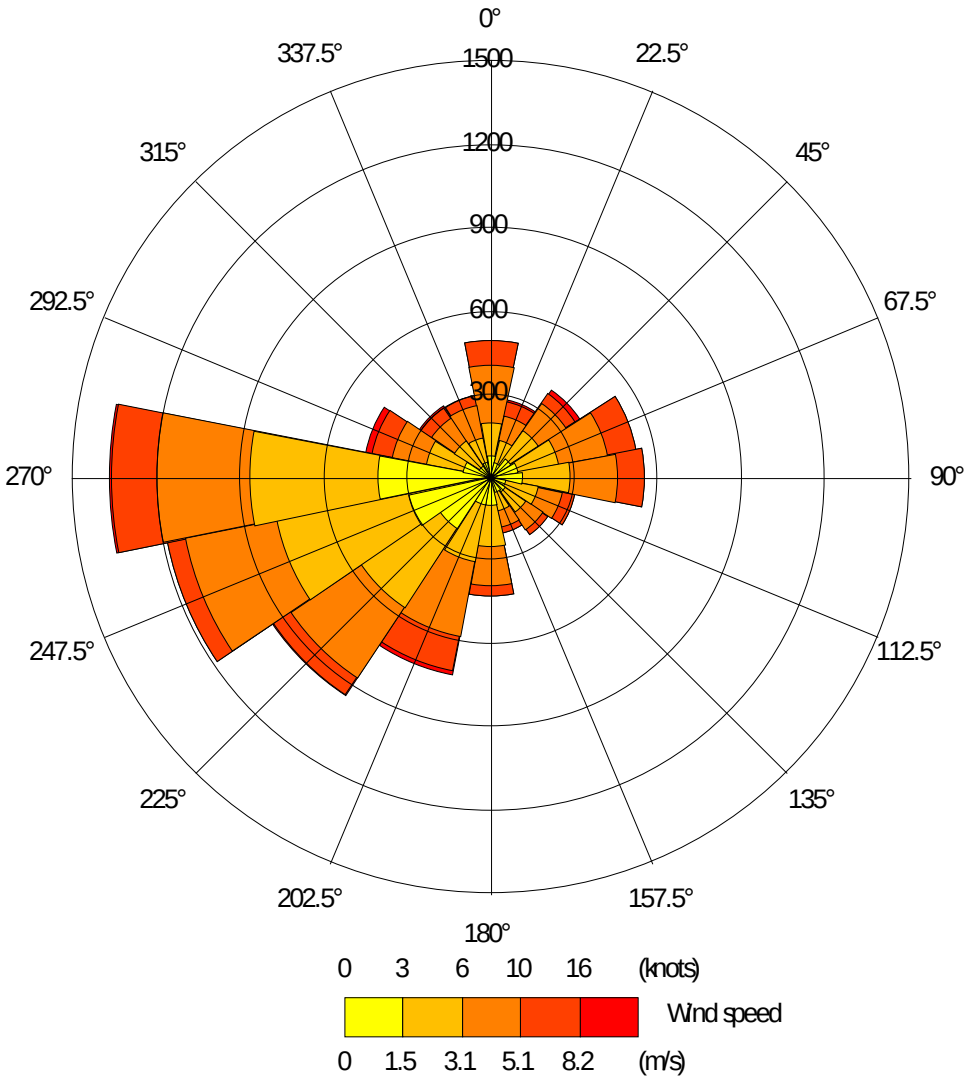

Figure 5-1: Wind Rose Brize Norton 2019

5.7 The dust emission magnitude is based on the scale of anticipated works at the Site and has been defined as small, medium or large for each of the three activities; earthworks, construction and trackout.

- Earthworks - Earthworks are those activities involved in preparing the Site for construction such as excavation of material, haulage, tipping, stockpiling and levelling. The Site covers an area of 58,000 m^2, and whilst the development will be phased, it is anticipated that there will be more than 10 earth moving vehicles operating on site at any one time. In addition, based on the size of the site, there is the potential for material to be stored on site in large bunds (> 8 m in height). The magnitude of the dust emission is therefore considered to be 'large' with regards to earthworks activities.
- Construction - There are a number of issues that can impact the dust emission class during construction activities including the size of the building, materials used for construction, the method of construction and the duration of the build. Based on the current design layout the total building volume proposed for the Site is anticipated to be > 100,000 m^3. Detailed information regarding the construction phase is not available, however It is anticipated that a significant proportion of the material used would be brick and concrete, which are potentially dusty materials. The magnitude of the dust emissions during the construction phase is therefore also considered to be 'large'.

- Trackout - The risk of impacts occurring during trackout is predominantly dependent on the number of vehicles accessing the Site on a daily basis. However, vehicle size and speed, the duration of activities and local geology are also factors that are used to determine the emission class of the Site as a result of trackout. Based on the scale and phased nature of the Proposed Development < 50 outward HGV movements are expected per day. However, it is anticipated that vehicles using the site may travel over unpaved haul roads of more than 100 m in length, resulting in the accumulation of mud and dirt on the wheels which can be tracked out onto the public highway. The magnitude of the dust emission is therefore considered to be 'large' with regards to trackout activities.

5.8 The dust emission magnitude is combined with the 'high' sensitivity of the area to dust soiling impacts and 'low' sensitivity to health impacts, to determine the risk impacts assuming no mitigation measures have been applied at the Site. The risk of impacts associated with each activity is provided in Table 5-1 below and has been used to identify specific mitigation measures for the construction phase.

Source	Emission Magnitude	Risk of Health Impacts	Risk of Dust Soiling Impacts
Earthworks	Large	Low	High
Construction	Large	Low	High
Trackout	Large	Low	High

Table 5-1: Risk of Dust Impacts Prior to Mitigation

Operational Traffic Impacts

5.9 The 2031 annual mean NO_2 concentrations predicted at the identified receptors are set out in Table 5-2.

5.10 The predicted annual mean NO_2 concentrations with the development in place are well below the air quality objective at all of the identified sensitive receptor locations.

5.11 The maximum impact occurs at 560 Banbury Road (within the Oxford City AQMA) with an increase of 0.16 µg/m^3 (<0.5% of the AQAL). In accordance with the IAQM/EPUK criteria the impact at this receptors and all other locations, including within the Kidlington AQMA, is 'negligible'.

5.12 The predicted concentrations at all locations are well below the 60 µg/m^3 threshold for a potential exceedance of the short-term objective and on this basis the risk of non-compliance at any receptor location is considered to be 'negligible'.

5.13 The predicted concentrations at the Proposed Development (receptors 7, 8 and 9) are less than 62% of the air quality standard. The Proposed Development will not, therefore, introduce new sensitive receptors into a location of poor air quality in respect of NO_2 and the impact on future occupants is considered to be 'negligible'.

ID	Receptor	2031 Baseline	20361 Baseline + Dev.	Increase (%age AQAL)	Impact
1	5 Astley Ave	15.6	15.6	0%	Negligible
2	16 Cromwell Way	15.1	15.1	0%	Negligible

3	121 Bicester Road (Kidlington AQMA)	18.8	18.8	0%	Negligible
4	Gosford House	21.4	21.5	0%	Negligible
5	16 Beagles Close	17.2	17.3	0%	Negligible
6	Kidlington Cemetery	17.3	17.3	0%	Negligible
7	Proposed Development 1	-	17.6	-	-
8	Proposed Development 2	-	18.3	-	-
9	Proposed Development 3	-	24.5	-	-
10	Pipal Cottage	20.6	20.8	0%	Negligible
11	560 Banbury Road (Oxford City AQMA)	21.8	21.9	0%	Negligible

Table 5-2: Predicted Annual Mean NO_2 Concentration (µg/m³)

5.14 The annual mean PM_{10} concentrations predicted at the identified receptors are set out in Table 5-3.

5.15 The predicted annual mean PM_{10} concentrations with the development in place are below the AQAL at all of the identified sensitive receptor locations and the impact is assessed as 'negligible'.

5.16 TG16 provides a relationship between predicted annual mean PM_{10} concentrations and the likely number of exceedances of the short-term (24-hour mean) PM_{10} objective of 50 µg/m³. The objective allows 35 exceedances per year, which is equivalent to an annual mean of 32 µg/m³. On this basis, the dispersion modelling indicates that compliance with the short term PM_{10} objective is also likely to be achieved at all of the identified receptor locations, including the Proposed Development.

5.17 The highest predicted concentration at the Proposed Development occurs at the boundary closest to the A34 at 22.9 µg/m³, 57% of the air quality standard. The predicted concentrations at the boundary with Bicester Road are less than 50% of the objective. On this basis the Proposed Development is unlikely to introduce new sensitive receptors into a location of poor air quality in respect of PM_{10} and the impact on future occupants is considered to be 'negligible'.

ID	Receptor	2031 Baseline	20361 Baseline + Dev.	Increase (%age AQAL)	Impact
1	5 Astley Ave	17.2	17.2	0%	Negligible
2	16 Cromwell Way	16.9	16.9	0%	Negligible
3	121 Bicester Road (Kidlington AQMA)	18.3	18.3	0%	Negligible
4	Gosford House	19.4	19.4	0%	Negligible
5	16 Beagles Close	18.2	18.2	0%	Negligible
6	Kidlington Cemetery	18.2	18.2	0%	Negligible
7	Proposed Development 1	-	18.4	-	-

8	Proposed Development 2	-	19.0	-	-
9	Proposed Development 3	-	22.9	-	-
10	Pipal Cottage	20.8	20.9	0%	Negligible
11	560 Banbury Road (Oxford City AQMA)	21.1	21.2	0%	Negligible

Table 5-3: Predicted Annual Mean PM_{10} Concentration (µg/m^3)

5.18 The annual mean $PM_{2.5}$ concentrations predicted at the identified receptors are set out in Table 5-4.

5.19 The predicted annual mean $PM_{2.5}$ concentrations with the development in place are well below the air quality standards at all of the identified sensitive receptor locations. The impact at all receptors is assessed as 'negligible'.

5.20 The predicted concentrations at the Proposed Development are less than 50% of the air quality standard. On this basis the Proposed Development is unlikely to introduce new sensitive receptors into a location of poor air quality in respect of $PM_{2.5}$ and the impact on future occupants is considered to be 'negligible'.

ID	Receptor	2031 Baseline	20361 Baseline + Dev.	Increase (%age AQAL)	Impact
1	5 Astley Ave	11.2	11.2	0%	Negligible
2	16 Cromwell Way	11.0	11.0	0%	Negligible
3	121 Bicester Road (Kidlington AQMA)	11.8	11.8	0%	Negligible
4	Gosford House	12.4	12.4	0%	Negligible
5	16 Beagles Close	11.7	11.7	0%	Negligible
6	Kidlington Cemetery	11.8	11.8	0%	Negligible
7	Proposed Development 1	-	11.9	-	-
8	Proposed Development 2	-	12.2	-	-
9	Proposed Development 3	-	14.3	-	-
10	Pipal Cottage	13.2	13.2	0%	Negligible
11	560 Banbury Road (Oxford City AQMA)	13.3	13.4	0%	Negligible

Table 5-4: Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)

6 Mitigation

Construction Phase

6.1 The risk of dust soiling and human health impacts from the site has been assessed as high, prior to mitigation. In accordance with the IAQM guidance, the 'highly recommended' mitigation measures detailed in Table 6-1 should be incorporated into a Dust Management Plan or Construction Environmental Management Plan for the Proposed Development.

6.2 The significance of dust impacts on nearby receptors following the implementation of appropriate and best practice mitigation is considered to be negligible.

Category	Measure
General	• 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.
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 offsite, and the action taken to resolve the situation in the logbook. • Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.
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 windowsills within 100m of site boundary, with cleaning to be provided if necessary. • Carry out regular site inspections to monitor compliance with the DMP or CEMP. 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 PM_{10} 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.
Preparing and maintaining the 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 at 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 actives for an extensive period. • Avoid site runoff of water or mud. • Keep site fencing, barriers and scaffolding clean using wet methods. • Remove materials that have a potential to produce dust from site as soon as possible, 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 and sustainable travel	• Ensure all vehicles switch off engines when stationary - no idling vehicles. • Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable. • Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced 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
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. • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
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. • Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. • Record all inspections of haul routes and any subsequent action in a site logbook. • Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. • Access gates to be located at least 10 m from receptors where possible.

Table 6-1: Highly Recommended Mitigation Measures

Operational Phase

6.3 The results of the dispersion modelling assessment indicate that operational traffic associated with the Proposed Development will have a negligible impact on local air quality and therefore no specific mitigation is required. However, the development will implement a site wide Travel Plan (TP) which would incorporate measures aimed at reducing reliance on the use of private vehicles, encouraging the use of alternative modes such as cycling, walking and public transport.

7 Residual Effects

Construction Phase

7.1 The residual effects of dust and particulate matter generated by construction activities will be minimised by following the mitigation measures outlined within this appraisal. The residual effects are therefore considered to be negligible.

Operational Phase

7.2 The residual impact of the Proposed Development on local air quality is considered to be negligible.

8 Conclusions

8.1 An air quality impact assessment has been carried out to assess both construction and operational impacts of the Proposed Development.

8.2 During the construction phase of the Proposed Development, releases of dust and PM_{10} are likely to arise from site activities. Through good site practice and the implementation of suitable mitigation measures, the impact of dust and PM_{10} releases may be effectively mitigated, and the resultant impacts are considered to be negligible.

8.3 The ADMS model has been used to predict the impact of the Development on local NO_2, PM_{10} and $PM_{2.5}$ concentrations and to assess the suitability of the Site for residential use. The assessment found that concentrations of these pollutants, in the opening year of the development (2031), would be below the relevant objective levels at existing sensitive receptor locations and that the impact of the additional traffic associated with the Development will be negligible.

8.4 Pollutant concentrations at the Proposed Development site are predicted to be well within the relevant long and short-term objectives.

9 Limitations

9.1 The conclusions and recommendations contained herein are limited to those given the general availability of background information and the planned usage of the Site.

9.2 Third Party information has been used in the preparation this report, which Brookbanks Consulting Ltd, by necessity assumes is correct at the time of writing. While all reasonable checks have been made on data sources and the accuracy of data, Brookbanks Consulting Ltd accepts no liability for the same.

9.3 The benefits of this report are provided solely to Permission Homes Ltd for the proposed development on the Site only.

9.4 Brookbanks Consulting Ltd excludes third party rights for the information contained in the report.

Appendix A – Assessment Criteria

Pollutant	Averaging Period	Concentration (µg/m^3)	Comments
NO_2	Annual Mean	40	-
NO_2	1-Hour Mean	200	Not to be exceeded more than 18 times per year
PM_{10}	Annual Mean	40	-
PM_{10}	24-Hour Mean	50	Not to be exceeded more than 35 times per year
$PM_{2.5}$	Annual Mean	25	Air Quality Strategy Exposure Reduction Target
$PM_{2.5}$	Annual Mean	20	EU Stage 2 Limit Value

Table A1: Air Quality Standards and Objectives for the Protection of Human Health.

Appendix B – Traffic Data

Road Link	AADT	HGV(%)	Average Speed (kph)
Bicester Road	10,300	1.9%	16 - 48

Table B1: 2019 Traffic data for Model Verification

Road Link	AADT	HGV(%)	Average Speed (kph)
Bicester Road N of Site Access **	11,988	1.9%	16 - 48
Bicester Road S of Site Access	11,988	1.9%	64
Oxford Road north of Bicester Road	15,928	3.3%	64
Oxford Road south of Bicester Road	19,269	5.4%	64 (48 within Oxford City AQMA)
Frieze Way west of Oxford Road	13,591	1.9%	64
A34 N of Peartree Interchange	66,167	11.9%	112 (LGV), 96 (HGV)

Table B2: 2031 Baseline Traffic Data

** Street canyon effects were included in the model within the Kidlington AQMA where trees/bushes and houses on either side of Bicester Road are likely to be restricting the dispersion of vehicle emissions.

Road Link	AADT	HGV(%)	Average Speed (kph)
Bicester Road N of Site Access **	12,180	1.8%	16 - 48
Bicester Road S of Site Access	13,407	1.7%	64
Oxford Road north of Bicester Road	16,042	3.3%	64
Oxford Road south of Bicester Road	19,733	5.3%	64 (48 within Oxford City AQMA)
Frieze Way west of Oxford Road	14,432	1.8%	64
A34 N of Peartree Interchange	66,567	11.8%	112 (LGV), 96 (HGV)

Table B3: 2031 Baseline + Development Traffic Data

Appendix C – Model Verification

Most nitrogen dioxide (NO_2) is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant (NOx) emissions. Verification of concentrations predicted by the ADMS model has followed the methodology presented in LAQM.TG(16).

Predicted annual mean road-NOx (i.e., the component of total NOx coming from road traffic) concentrations have been compared with the 2019 annual mean concentrations measured by the following Cherwell District Council diffusion tubes:

- Bicester Road (2)
- Bramley Close

The measured NO_2 concentrations are converted into an equivalent measured road-NOx concentrations using the Defra NOx from NO_2 calculator and the maximum 2019 mapped annual mean background NO_2 concentration of 14.1 µg/m^3. A comparison of the measured and modelled road-NOx concentrations is presented in Figure C1.

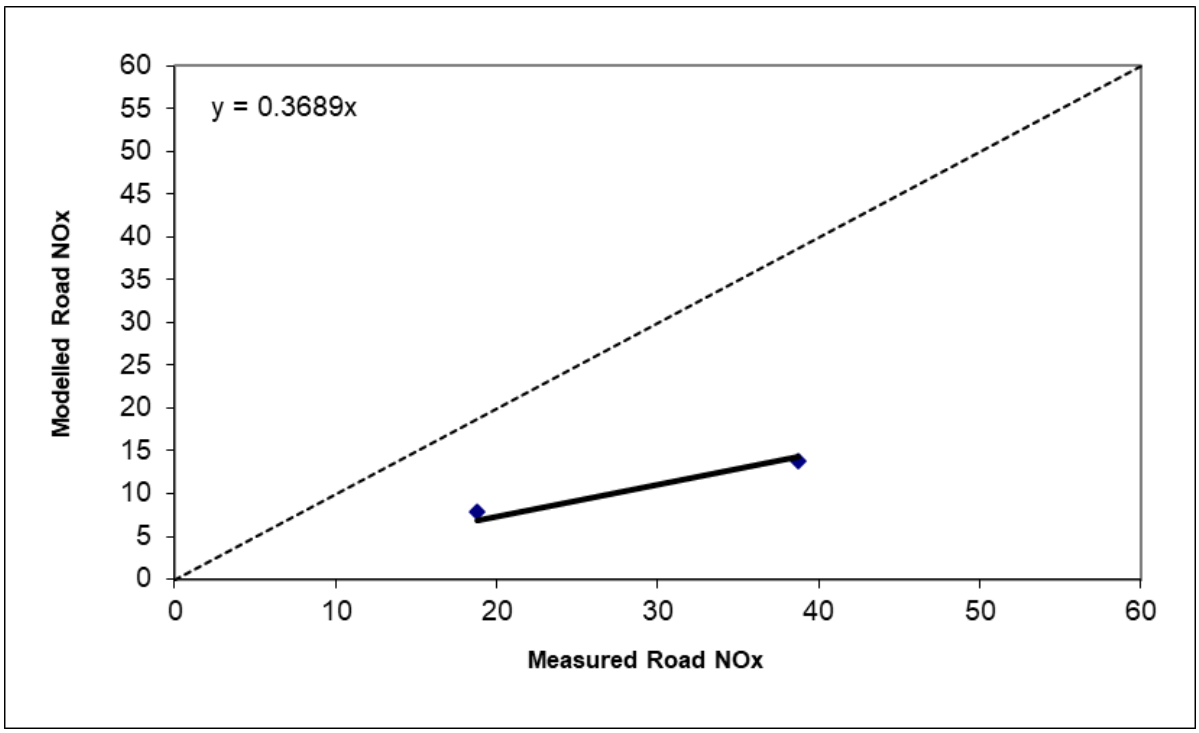

Table C1: Comparison of Modelled Road NOx with measured Road NOx

A primary adjustment factor is determined as the ratio between the measured road-NOx contribution and the model derived road-NOx contribution, forced through zero (1/0.3689 = 2.7). This factor is applied to the modelled road-NOx concentration for each monitoring location to provide an adjusted modelled road-NOx concentration. An equivalent adjusted road-NO_2 concentration is then calculated using the Defra NOx to NO_2 calculator, which can be added to the background to provide an adjusted modelled NO_2 concentration. A comparison between the adjusted modelled NO_2 concentration and the measured NO_2 concentration at each monitoring location is presented in Figure C2.

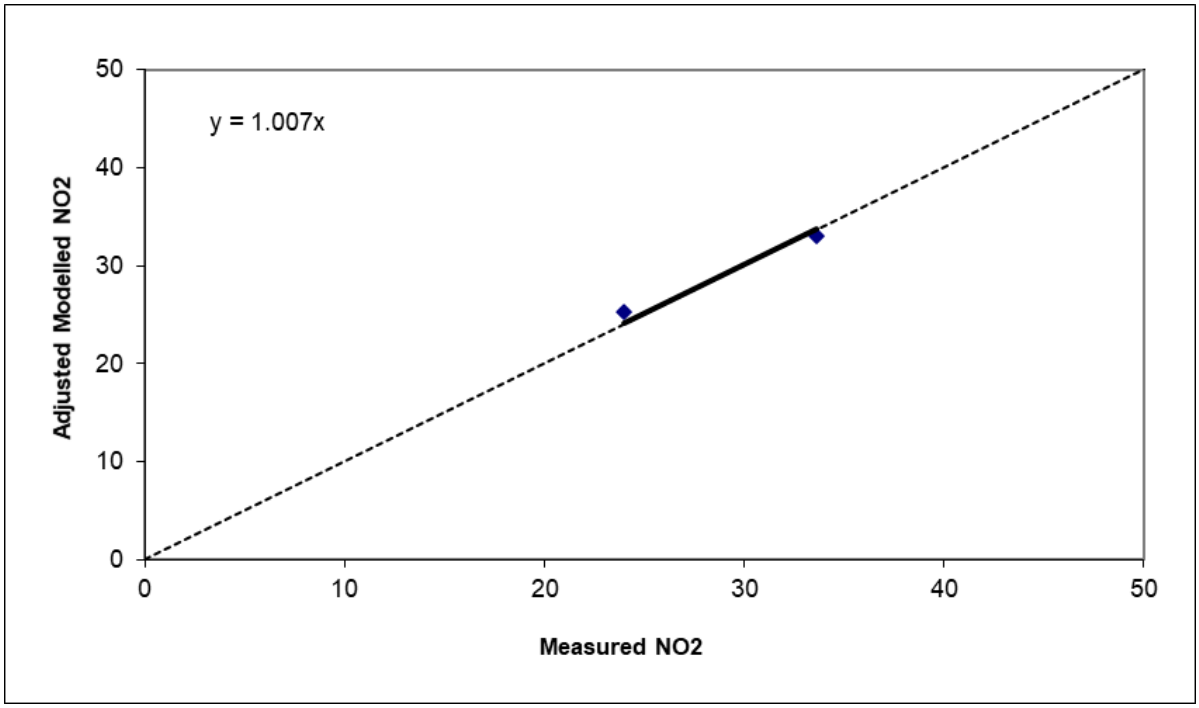

Table C1: Comparison of Adjusted Modelled NO_2 with measured NO_2

The average performance of the model can be expressed as the Root Mean Square Error (RMSE), which in accordance with LAQM.TG(16) should ideally be less than 10% of the relevant air quality standard (in this case, the annual mean NO2 objective of 40µg/m^3). The RMSE for the comparison of the modelled and measured NO_2 concentrations is 1.0 µg/m^3, 2.6% of the air quality objective. On this basis the modelled concentrations are considered to provide an acceptable estimate of local air quality and further adjustment is not required.

In the absence of particulate monitoring data suitable for verification, the primary adjustment factor has also been applied to the modelled Road-PM_{10} and Road-$PM_{2.5}$ concentrations, in accordance with the guidance.

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